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MCHB-IP-RDE

25 JUL 2011

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, Kandahar, Afghanistan, 4 March-20 April 2011, U_AFG_KANDAHAR_IP_A25_20110420

1. The enclosed report details the assessment of particulate matter (PM) air samples collected by 5th Preventive Medicine Detachment personnel, Kandahar, Afghanistan, 4 March-20 April 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 sample results and associated exposure information assessed in this report, the tactical risk estimate for $PM_{2.5}$ on both typical and peak exposure days at the burn pit, MWR, and South Park during the sampled timeframe is **low**.

FOR THE DIRECTOR:

(b) (6)

Encl

Portfolio Director, Health Risk Management

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U.S. ARMY PUBLIC HEALTH COMMAND (Provisional)
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Deployment Occupational and Environmental Health Surveillance Sample Report,
U_AFG_KANDAHAR_IP_A25_20110420
Health Risk Management Portfolio

Airborne Particulate Matter, Kandahar, Afghanistan

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Preventive Medicine Surveys: 40-5f1

ACKNOWLEDGMENTS

DEPLOYMENT OCCUPATIONAL AND ENVIRONMENTAL HEALTH SURVEILLANCE SAMPLE REPORT AIRBORNE PARTICULATE MATTER KANDAHAR, AFGHANISTAN 4 MARCH-20 APRIL 2011 U_AFG_KANDAHAR_IP_A25_20110420

1 References

See Appendix A for a list of references.

2 Purpose

This report provides the U.S. Army Public Health Command (Provisional) (USAPHC (Prov)), Army Institute of Public Health (AIPH) assessment of the laboratory analytical results and exposure information associated with the samples collected by 5th Preventive Medicine Detachment on 4 March-20 April 2011 at Kandahar, 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 (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 (Prov), AIPH, and weighed to determine particulate mass and calculate ambient concentrations. The USAPHC (Prov), 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-Environmental Health (DOEHRS-EH). Log into the DOEHRS-EH and search for the samples using the DOEHRS sample identification numbers (IDs) provided in Appendix B.

5 Exposure Setting

Appendix C contains information about the sampling location, environmental conditions, and associated potential population exposure for each sample site. The information was provided on the field data sheets submitted with the sample set unless otherwise noted. Information about the individual samples including sample date and site, is provided in Appendix B. Correction and clarification of exposure assumptions by the sampling unit is encouraged.

6 Prescreen

Table 1 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 1 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 14 June 2011.

Table 1. Results of Prescreen

Parameter	Detections/Samples	Peak Single Sample Concentration ($\mu g/m^3$)	1-year Negligible MEG ($\mu g/m^3$)	Result
$PM_{2.5}$ at Board Walk	3/3	43	15	Retain as potential hazard
$PM_{2.5}$ at Burn Pit	5/5	273	15	Retain as potential hazard
$PM_{2.5}$ at MWR	3/3	179	15	Retain as potential hazard
$PM_{2.5}$ at South Park	5/5	191	15	Retain as potential hazard
Cadmium at Burn Pit	2/5	0.0597	0.00685	Retain as potential hazard

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

7 Acute Risk Assessment

7.1 Acute Screen

Table 2 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 2. Results of Acute Screen

Parameter	Peak Sample Day Concentration (µg/m^3)	Screening MEG (µg/m^3)	Result
$PM_{2.5}$ at Board Walk	43	24 hour Negligible MEG: 65	Exclude as acute hazard
$PM_{2.5}$ at Burn Pit	273	24 hour Negligible MEG: 65	Retain as acute hazard
$PM_{2.5}$ at MWR	179	24 hour Negligible MEG: 65	Retain as acute hazard
$PM_{2.5}$ at South Park	191	24 hour Negligible MEG: 65	Retain as acute hazard
Cadmium	0.0597	14 day Negligible MEG: 0.000021	Exclude as acute hazard

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

7.2 Hazard Severity

Table 3 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 3. Hazard Severity

Parameter	Concentration (µg/m^3)	Comparison MEGs (µg/m^3)	Hazard Severity
$PM_{2.5}$ at Burn Pit	Peak: 273	Is ≥ 24-hour Marginal MEG: 250, but < 24-hour Critical MEG: 500	Marginal
	Average: 169	Is > 24-hour Negligible MEG: 65, but < 24-hour Marginal MEG: 250	Negligible
$PM_{2.5}$ at MWR	Peak: 179	Is > 24-hour Negligible MEG: 65, but < 24-hour Marginal MEG: 250	Negligible
	Average: 101	Is > 24-hour Negligible MEG: 65, but < 24-hour Marginal MEG: 250	Negligible
$PM_{2.5}$ at South Park	Peak: 191	Is > 24-hour Negligible MEG: 65, but < 24-hour Marginal MEG: 250	Negligible
	Average: 98	Is > 24-hour Negligible MEG: 65, but < 24-hour Marginal MEG: 250	Negligible

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

7.3 Hazard Probability

Table 4 summarizes 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 4. Hazard Probability Scoring for $PM_{2.5}$

Parameter	Concentration ($\mu g/m^3$)	Hazard Probability
$PM_{2.5}$ at Burn Pit	Peak: 273	Unlikely
	Average: 169	Seldom
$PM_{2.5}$ at MWR	Peak: 179	Unlikely
	Average: 101	Seldom
$PM_{2.5}$ at South Park	Peak: 191	Seldom
	Average: 98	Unlikely

7.4 Tactical Risk Estimate

Table 5 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 Field Manual 1-02 "Operational Terms and Graphics."

Table 5. Risk Assessment Summary

Parameter	Type of Exposure	Hazard Severity	Hazard Probability	Tactical Risk Estimate
$PM_{2.5}$ at Burn Pit	Peak	Marginal	Unlikely	Low
	Average	Negligible	Seldom	Low
$PM_{2.5}$ at MWR	Peak	Negligible	Seldom	Low
	Average	Negligible	Unlikely	Low
$PM_{2.5}$ at South Park	Peak	Negligible	Seldom	Low
	Average	Negligible	Unlikely	Low
$PM_{2.5}$ at Board Walk	Not identified as an acute hazard.			
Cadmium at Burn Pit	Not identified as an acute hazard.			
Other Metals	None identified as acute hazards at the sites sampled.			

8 Conclusion

Based on the sample results and associated exposure information assessed in this report, the tactical risk estimate for $PM_{2.5}$ on both typical and peak exposure days at the burn pit, MWR, and south park during the sampled timeframe is **low**. Refer to USAPHC (Prov) TG 230, Table 3-2 for the potential consequences to military operations and force readiness associated with this risk level.

9 Limitations

9.1 Field Data Quality

The field data sheets provided with the sample set were adequately filled out.

The sample collected at the MWR on 9 April 2011 was invalid due to a flow differential.

9.2 Sample Receipt at USAPHC (Prov) 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 (Prov), 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.

If an OEHSA and/or specific sampling plans have not yet been completed for Kandahar, Afghanistan, 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 (Prov), AIPH POCs for this assessment are Ms. (b) (6) and Ms. (b) (6). Ms. (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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LTC, MS
Program Manager
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Appendix A

References

1. Department of Defense Directive (DoDD) 6490.02E, Comprehensive Health Surveillance, 21 October 2004.

2. Department of Defense Instruction (DoDI) 6490.03, Deployment Health, 11 August 2006.

3. Department of the Army (DA) Field Manual (FM) 5-19, Composite Risk Management, 21 August 2006.

4. DA FM 1-02, Operational Terms and Graphics, 21 September 2004.

5. USAPHC (Prov) Technical Guide (TG) 230, Chemical Exposure Guidelines for Deployed Military Personnel, June 2010.

Appendix B

Sample Identification Information

DOEHRS-EH Sample ID	Sample ID Reported on Field Data Sheet	Sample Site	Date and Time Sample Collected	Sample Invalid (Yes/No) Reason for Invalid Sample
00004CSJ	AFG_KANDAH_10199 PM2.5DPS	Burn Pit	2011/03/04 1344	No
00004CSM	AFG_KANDAH_10199 PM2.5DPS	South Park	2011/03/04 1414	No
00004CSL	AFG_KANDAH_10199 PM2.5DPS	MWR	2011/03/04 1420	No
00004CSB	AFG_KANDAH_10199 _PM2.5DPS	Board Walk	2011/03/04 1439	No
00004CRN	AFG_KANDAH_10199 _PM2.5DPS	Burn Pit	2011/03/15 1415	No
00004CRC	AFG_KANDAH_10199 _PM2.5DPS	South Park	2011/03/15 1441	No
00004CRS	AFG_KANDAH_10199 _PM2.5DPS	Board Walk	2011/03/15 1520	No
00004CRJ	AFG_KANDAH_10199 _PM2.5DPS	MWR	2011/03/16 1508	No
00004CPI	AFG_KANDAH_10199 _PM2.5DPS	Burn Pit	2011/03/27 0918	No
00004CPE	AFG_KANDAH_10199 _PM2.5DPS	South Park	2011/03/27 0935	No
00004CP2	AFG_KANDAH_10199 _PM2.5DPS	MWR	2011/03/27 0950	No
00004NLP	AFG_KANDAH_10199 PM2.5DPS	Burn Pit	2011/04/09 1036	No
00004NLN	AFG_KANDAH_10199 _PM2.5DPS	South Park	2011/04/09 1047	No
00004NLO	AFG_KANDAH_10199 _PM2.5DPS	MWR	2011/04/09 1100	Yes-Flow Differential
00004NLJ	AFG_KANDAH_10199 _PM2.5DPS	Board Walk	2011/04/20 1030	No
00004NLK	AFG_KANDAH_10199 PM2.5DPS	Burn Pit	2011/04/20 1030	No

DOEH Surveillance Sample Report, Airborne PM, Kandahar, Afghanistan, 4 Mar-20 Apr 11, U_AFG_KANDAHAR_IP_A25_20110420

DOEHRS-EH Sample ID	Sample ID Reported on Field Data Sheet	Sample Site	Date and Time Sample Collected	Sample Invalid (Yes/No) Reason for Invalid Sample
00004NLL	AFG_KANDAH_10199_PM2.5DPS	MWR	2011/04/20 1030	No
00004NLM	AFG_KANDAH_10199_PM2.5DPS	South Park	2011/04/20 1030	No

Appendix C

Exposure Setting Information

Table C-1. Exposure Information for $PM_{2.5}$ Board Walk

Questions About Exposure	Information Provided and Assumptions
What is the exposure event or ambient environmental condition under consideration?	Exposure to PM less than 2.5 micrometers in diameter ($PM_{2.5}$) and metals in the ambient air at this location.
What is the population at risk?	The population that frequents the area near the board walk.
What is the timeframe under consideration?	The samples were collected on 4 March-20 April 2011. This encompasses a timeframe of approximately 1 month from the first day of sampling to the last. Although personnel will be deployed to this location for approximately 1 year, only this timeframe of 1 month is being considered.
What are the activity patterns of the exposed population?	Typical exertion across the base camp.
What is known about sources of potential contamination?	No active industry around the sampling location. Constant traffic of soldiers and civilians.
What is known about the exposure setting?	The sample was collected hear a hockey rink and volleyball court at Kandahar, Afghanistan.
What are the exposure pathways?	Inhalation.
Where are the sampling sites relative to where exposure occurs?	Specific information about the sampler location was not provided.

Note: Questions are extracted from USAPHC (Prov) TG 230

Table C-2. Exposure Information for $PM_{2.5}$ Burn Pit

Questions About Exposure	Information Provided and Assumptions
What is the exposure event or ambient environmental condition under consideration?	Exposure to PM less than 2.5 micrometers in diameter ($PM_{2.5}$) and metals in the ambient air at this location.
What is the population at risk?	The population that frequents the burn pit.
What is the timeframe under consideration?	The samples were collected on 4 March-20 April 2011. This encompasses a timeframe of approximately 1 month from the first day of sampling to the last. Although personnel will be deployed to this location for approximately 1 year, only this timeframe of 1 month is being considered.
What are the activity patterns of the exposed population?	Typical exertion.
What is known about sources of potential contamination?	The burn pit is located by two incinerators.
What is known about the exposure setting?	Information not provided in the field data sheets.
What are the exposure pathways?	Inhalation.
Where are the sampling sites relative to where exposure occurs?	Specific information about the sampler location was not provided.

Note: Questions are extracted from USAPHC (Prov) TG 230

Table C-3. Exposure Information for $PM_{2.5}$ South Park

Questions About Exposure	Information Provided and Assumptions
What is the exposure event or ambient environmental condition under consideration?	Exposure to PM less than 2.5 micrometers in diameter ($PM_{2.5}$) and metals in the ambient air at this location.
What is the population at risk?	Not indicated on field data sheets
What is the timeframe under consideration?	The samples were collected on 4 March-20 April 2011. This encompasses a timeframe of approximately 1 months from the first day of sampling to the last. Although personnel will be deployed to this location for approximately 1 year, only this timeframe of 1 month is being considered.
What are the activity patterns of the exposed population?	Typical exertion.
What is known about sources of potential contamination?	Not indicated on field data sheets
What is known about the exposure setting?	Information not provided in the field data sheets.
What are the exposure pathways?	Inhalation.
Where are the sampling sites relative to where exposure occurs?	The sample equipment was placed between the latrines and tents.

Note: Questions are extracted from USAPHC (Prov) TG 230

Table C-4. Exposure Information for $PM_{2.5}$ MWR

Questions About Exposure	Information Provided and Assumptions
What is the exposure event or ambient environmental condition under consideration?	Exposure to PM less than 2.5 micrometers in diameter ($PM_{2.5}$) and metals in the ambient air at this location.
What is the population at risk?	The population that is working on the new living area.
What is the timeframe under consideration?	The samples were collected on 4 March-20 April 2011. This encompasses a timeframe of approximately 1 months from the first day of sampling to the last. Although personnel will be deployed to this location for approximately 1 year, only this timeframe of 1 month is being considered.
What are the activity patterns of the exposed population?	Typical exertion.
What is known about sources of potential contamination?	Not indicated on field data sheets
What is known about the exposure setting?	Information not provided in the field data sheets.
What are the exposure pathways?	Inhalation.
Where are the sampling sites relative to where exposure occurs?	The sample equipment was placed between the Gym and MWR computer room #2.

Note: Questions are extracted from USAPHC (Prov) TG 230

Appendix D

Hazard Probability Scoring Tables

Table D-1. Hazard Probability Scoring for $PM_{2.5}$ at Burn Pit

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: 273	Score 1: Concentration is <25th percentile of severity range. . .	Score 2: Field data adequately estimates population exposure (Routine Sampling).	Score 1: Field exposure duration to MEG exposure duration is <1 (Personnel will not spend the entire 24-hours at the sampling location).	Score 2: Typical exertion (no information to indicate otherwise).	Total Score 6: Unlikely
Average: 169	Score 2: Concentration is at or between 25th and 75th percentiles of severity range.	Score 2: Field data adequately estimates population exposure (Routine Sampling).	Score 1: Field exposure duration to MEG exposure duration is <1 (Personnel will not spend the entire 24-hours at the sampling location).	Score 2: Typical exertion (no information to indicate otherwise).	Total Score 7: Seldom

Table D-2. Hazard Probability Scoring for $PM_{2.5}$ at MWR

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: 179	Score 2: Concentration is at or between 25th and 75th percentiles of severity range. .	Score 2: Field data adequately estimates population exposure (Routine Sampling).	Score 1: Field exposure duration to MEG exposure duration is <1 (Personnel will not spend the entire 24-hours at the sampling location).	Score 2: Typical exertion (no information to indicate otherwise).	Total Score 7: Seldom
Average: 105	Score 1: Concentration is <25th percentile of severity range.	Score 2: Field data adequately estimates population exposure (Routine Sampling).	Score 1: Field exposure duration to MEG exposure duration is <1 (Personnel will not spend the entire 24-hours at the sampling location).	Score 2: Typical exertion (no information to indicate otherwise).	Total Score 6: Unlikely

Table D-3. Hazard Probability Scoring for $PM_{2.5}$ at South Park

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: 191	Score 2: Concentration is at or between 25th and 75th percentiles of severity range. .	Score 2: Field data adequately estimates population exposure (Routine Sampling).	Score 1: Field exposure duration to MEG exposure duration is <1 (Personnel will not spend the entire 24-hours at the sampling location).	Score 2: Typical exertion (no information to indicate otherwise).	Total Score 7: Seldom
Average: 98	Score 1: Concentration is <25th percentile of severity range.	Score 2: Field data adequately estimates population exposure (Routine Sampling).	Score 1: Field exposure duration to MEG exposure duration is <1 (Personnel will not spend the entire 24-hours at the sampling location).	Score 2: Typical exertion (no information to indicate otherwise).	Total Score 6: Unlikely