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MCHB-IP-RDE

05 OCT 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, 2 May-19 June 2011, U_AFG_KANDAHAR_IP_A25_20110619

1. The enclosed report details the assessment of particulate matter (PM) air samples collected by 5th Preventive Medical Detachment personnel, Kandahar, Afghanistan, 2 May-19 June 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 $PM_{2.5}$ at the burn pit, morale welfare and recreation (MWR), board walk and South Park on both typical and peak exposure days during the sampled timeframe is **low.**

FOR THE DIRECTOR:

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Portfolio Director, Health Risk Management

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U.S. ARMY PUBLIC HEALTH COMMAND
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Deployment Occupational and Environmental Health Surveillance Sample Report, U_AFG_KANDAHAR_IP_A25_20110619
Health Risk Management Portfolio

Airborne Particulate Matter, Kandahar, Afghanistan

Prepared by (b) (6)
Deployment Environmental Surveillance Program

Preventive Medicine Surveys: 40-5f1

ACKNOWLEDGEMENTS

DEPLOYMENT OCCUPATIONAL AND ENVIRONMENTAL HEALTH SURVEILLANCE SAMPLE REPORT AIRBORNE PARTICULATE MATTER KANDAHAR, AFGHANISTAN 2 MAY-19 JUNE 2011 U_AFG_KANDAHAR_IP_A25_20110619

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 5th Preventive Medical Detachment on 2 May-19 June 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 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-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 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 3 August 2011.

Table 1. Results of Prescreen

Parameter	Detections/ Samples	Peak Single Sample Concentration (µg/m^3)	1-year Negligible MEG (µg/m^3)	Result
$PM_{2.5}$ at Board Walk	4/4	86	15	Retain as potential hazard
$PM_{2.5}$ at Burn Pit	5/5	205	15	Retain as potential hazard
$PM_{2.5}$ at MWR	3/3	137	15	Retain as potential hazard
$PM_{2.5}$ at South Park	6/6	150	15	Retain as potential hazard
Antimony ^{J} at Burn Pit	5/5	0.082919	171	Exclude as potential hazard
Lead at Board Walk	1/4	0.22803	12.2	Exclude as potential hazard
Lead at Burn Pit	2/5	0.13129	12.2	Exclude as potential hazard
Lead at South Park	2/6	0.29087	12.2	Exclude 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 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	86	24 hour Negligible MEG: 65	Retain as acute hazard
$PM_{2.5}$ at Burn Pit	205	24 hour Negligible MEG: 65	Retain as acute hazard
$PM_{2.5}$ at MWR	137	24 hour Negligible MEG: 65	Retain as acute hazard
$PM_{2.5}$ at South Park	150	24 hour Negligible MEG: 65	Retain 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 3. Hazard Severity

Parameter	Concentration (µg/m^3)	Comparison MEGs (µg/m^3)	Hazard Severity
$PM_{2.5}$ at Board Walk	Peak: 86	Is > 24-hour Negligible MEG: 65, but < 24-hour Marginal MEG: 250	Negligible
	Average: 71	Is > 24-hour Negligible MEG: 65, but < 24-hour Marginal MEG: 250	Negligible
$PM_{2.5}$ at Burn Pit	Peak: 205	Is > 24-hour Negligible MEG: 65, but < 24-hour Marginal MEG: 250	Negligible
	Average: 123	Is > 24-hour Negligible MEG: 65, but < 24-hour Marginal MEG: 250	Negligible
$PM_{2.5}$ at MWR	Peak: 137	Is > 24-hour Negligible MEG: 65, but < 24-hour Marginal MEG: 250	Negligible
	Average: 72	Is > 24-hour Negligible MEG: 65, but < 24-hour Marginal MEG: 250	Negligible
$PM_{2.5}$ South Park	Peak: 150	Is > 24-hour Negligible MEG: 65, but < 24-hour Marginal MEG: 250	Negligible
	Average: 86	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.

Parameter	Concentration ($\mu g/m^3$)	Hazard Probability
$PM_{2.5}$ at Board Walk	Peak: 86	Unlikely
	Average: 71	Unlikely
$PM_{2.5}$ at Burn Pit	Peak: 205	Occasional
	Average: 123	Seldom
$PM_{2.5}$ at MWR	Peak: 191	Seldom
	Average: 98	Unlikely
$PM_{2.5}$ South Park	Peak: 150	Seldom
	Average: 86	Unlikely

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

7.4 Tactical Risk Estimate

Table 4 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 4. Risk Assessment Summary

Parameter	Type of Exposure	Hazard Severity	Hazard Probability	Tactical Risk Estimate
$PM_{2.5}$ at Board Walk	Peak	Negligible	Unlikely	Low
	Average	Negligible	Unlikely	Low
$PM_{2.5}$ at Burn Pit	Peak	Negligible	Occasional	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
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 $PM_{2.5}$ at all sampled sites on both typical and peak exposure days during the sampled timeframe 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 these risk levels.

9 Limitations

9.1 Field Data Quality

Field data provided with the samples were adequate.

One of the samples was invalid due to a flow differential.

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.

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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Appendix A

References

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Appendix B

Sample Identification Information

DOEHRS-EH 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
00004SPD	AFG_KANDAH_10199_PM2.5DPS	Burn Pit	2011/05/02 0911	1440.0 minutes	No
00004ST8	AFG_KANDAH_10199_PM2.5DPS	South Park	2011/05/02 0922	1440.0 minutes	No
00004ST1	AFG_KANDAH_10199_PM2.5DPS	MWR	2011/05/02 0938	1440.0 minutes	No
00004STQ	AFG_KANDAH_10199_PM2.5DPS	Board Walk	2011/05/02 0951	1440.0 minutes	No
00004SC1	AFG_KANDAH_10199_PM2.5DPS	Burn Pit	2011/05/14 0833	1440.0 minutes	No
00004SBS	AFG_KANDAH_10199_PM2.5DPS	South Park	2011/05/14 0844	1440.0 minutes	No
00004SEW	AFG_KANDAH_10199_PM2.5DPS	Board Walk	2011/05/14 0855	1440.0 minutes	No
00004SA1	AFG_KANDAH_10199_PM2.5DPS	South Park	2011/05/26 0920	1440.0 minutes	No
00004SA2	AFG_KANDAH_10199_PM2.5DPS	Burn Pit	2011/05/26 0928	1440.0 minutes	No
00004S9P	AFG_KANDAH_10199_PM2.5DPS	Board Walk	2011/05/26 0939	1440.0 minutes	Yes-Flow Differential
00004S9Z	AFG_KANDAH_10199_PM2.5DPS	MWR	2011/05/26 0946	1440.0 minutes	No
00004YIS	AFG KANDAH 11158 PM25DPS	Burn Pit	2011/06/07 1048	1440.0 minutes	No
00004YIV	AFH KANDAH 11158 PM25DPS	South Park	2011/06/07 1104	1440.0 minutes	No
00004YJB	AFG KANDAH 11158 PM25DPS	Board Walk	2011/06/07 1130	1440.0 minutes	No
00004YJX	AFG KANDAH 10199 PM25DPS	Board Walk	2011/06/19 0746	1440.0 minutes	No
00004YJR	AFG KANDAH 10199 PM25DPS	South Park	2011/06/19 0802	1440.0 minutes	No
00004YKE	AFG KANDAH 10199 PM25DPS	MWR	2011/06/19 0813	1440.0 minutes	No
00004YK6	AFG KANDAH 10199 PM25DPS	Burn Pit	2011/06/19 0834	1440.0 minutes	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 2 May-19 June 2011. This encompasses a timeframe of approximately 7 weeks 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 7 weeks 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 samples were collected near 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 2 May-19 June 2011. This encompasses a timeframe of approximately 7 weeks 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 7 weeks 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 $PM_{2.5}$ 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?	Not indicated on field data sheets
What is the timeframe under consideration?	The samples were collected on 2 May-19 June 2011. This encompasses a timeframe of approximately 7 weeks 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 7 weeks 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 computer room #2.

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

Table C-4. 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 2 May-19 June 2011. This encompasses a timeframe of approximately 7 weeks 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 7 weeks 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

Appendix D

Hazard Probability Scoring Tables

Table D-1. Hazard Probability Scoring for $PM_{2.5}$ at Board Walk

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: 86	Score 1: Concentration below is the 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: 71	Score 1: Concentration below is the 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-2. 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: 205	Score 3: Concentration is above the 75th percentile of the 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 8: Occasional
Average: 123	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-3. 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: 137	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: 72	Score 1: Concentration is below the 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-4 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: 150	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: 86	Score 1: Concentration is below the 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