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MCHB-IP-RDE

01 JUN 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, Bagram, Afghanistan, 26 October 2010-24 January 2011, U\_AFG\_BAGRAM\_CM\_A25\_20110106

1. The enclosed report details the assessment of particulate matter (PM) air samples collected by 71st Medical Detachment personnel, Bagram, Afghanistan, 26 October 2010-24 January 2011.
2. The samples were collected for airborne PM less than 2.5 micrometers in diameter (PM<sub>2.5</sub>) and analyzed for a set of metals typically found in PM. PM<sub>2.5</sub> 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<sub>2.5</sub> during daytime sampling on a typical exposure day in the sampled timeframe is **low** and on a peak exposure day it is **moderate**. The tactical risk estimate for PM<sub>2.5</sub> during nighttime sampling on both typical and peak exposure nights during the sampled timeframe is **low**.

FOR THE DIRECTOR:

Encl

(b) (6)

Portfolio Director, Health Risk Management

CF: (w/encl)

71st MED DET (Commander/MAJ (b) (6))

71st MED DET (XO/CPT (b) (6))

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(CONT)

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SUBJECT: Deployment Occupational and Environmental Health Surveillance Sample Report, Airborne Particulate Matter, Bagram, Afghanistan, 26 October 2010-24 January 2011, U\_AFG\_BAGRAM\_CM\_A25\_20110106

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**U.S. ARMY PUBLIC HEALTH COMMAND (Provisional)**

5158 Blackhawk Road, Aberdeen Proving Ground, Maryland 21010-5403

Deployment Occupational and Environmental Health Surveillance Sample Report,  
U\_AFG\_BAGRAM\_CM\_A25\_20110106  
Health Risk Management Portfolio

Airborne Particulate Matter, Bagram, Afghanistan

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

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Preventive Medicine Surveys: 40-5f1

## ACKNOWLEDGMENTS

Use of trademark name(s) does not imply endorsement by the U.S. Army but is intended only to assist in the identification of a specific product.

**DEPLOYMENT OCCUPATIONAL AND ENVIRONMENTAL  
HEALTH SURVEILLANCE SAMPLE REPORT  
AIRBORNE PARTICULATE MATTER  
BAGRAM, AFGHANISTAN  
26 OCTOBER 2010-24 JANUARY 2011  
U\_AFG\_BAGRAM\_CM\_A25\_20110106**

## **1 References**

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See Appendix A for a list of references.

## **2 Purpose**

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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 71st Medical Detachment on 26 October 2010-24 January 2011 at Bagram, 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**

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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. This report, therefore, 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**

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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 Table 1.

**Table 1. 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
00003RIU	AFG BAGRAM PM25DPS 10299	Landfill	2010/10/26 1122	No
00003RK4	AFG BAGRAM PM25DPS 10299	Warrior Base Camp	2010/10/26 1142	No
00003R41	AFG BAGRAM PM25DPS 10348	Landfill	2010/12/14 0600	No
00003RH8	AFG BAGRAM PM25DPS 10348	Warrior Base Camp	2010/12/14 0600	No
00003RHJ	AFG BAGRAM PM25DPS 10348	Landfill	2010/12/14 0600	No
00003Y31	AFG_BAGRAM_PM25 DPS_10358	Landfill Corner	2010/12/24 0600	No
00003Y3X	AFG_BAGRAM_PM25 DPS_10358	Landfill Guard Tower	2010/12/24 0600	No
00003Y3Y	AFG_BAGRAM_PM25 DPS_10358	Warrior Base Camp	2010/12/24 0600	No
00003Y3I	AFG_BAGRAM_PM25 DPS_11006	Landfill Guard Tower	2011/01/06 0800	No
00003Y3L	AFG_BAGRAM_PM25 DPS_11006	Warrior Base Camp	2011/01/06 0800	No
00003RM0	AFG BAGRAM 10302	Landfill	2010/10/29 1800	No
00003RM6	AFG BAGRAM PM25DPS 10302	Landfill	2010/10/29 1800	No
00003RN0	AFG BAGRAM PM25DPS 10302	Warrior Base Camp	2010/10/29 1800	Yes, Damaged Sampling Media
00003Y3R	AFG_BAGRAM_PM25 DPS_10350	Landfill Corner	2010/12/16 1800	No
00003Y3T	AFG_BAGRAM_PM25 DPS_10350	Landfill	2010/12/16 1800	No
00003Y3W	AFG_BAGRAM_PM25 DPS_10350	Warrior Base Camp	2010/12/16 1800	No
00003Y39	AFG_BAGRAM_PM25 DPS_10358	Landfill Guard Tower	2010/12/30 1800	Yes, Sample Malfunction
00003Y3O	AFG_BAGRAM_PM25 DPS_10364	Landfill Corner	2010/12/30 1800	Yes, Sample Malfunction
00003Y3M	AFG_BAGRAM_PM25 DPS_10364	Warrior Base Camp	2010/12/31 1800	Yes, Sample Malfunction
0000442I	AFG BAGRAM PM25DPS 11024	Landfill	2011/01/24 0800	No
0000444B	AFG BAGRAM PM25DPS 11024	Warrior Base Camp	2011/01/24 0800	No
000044F1	AFG BAGRAM	Landfill Guard	2011/01/24	No

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
	PM25DPS 11024	Tower	0800	
0000442Q	AFG BAGRAM PM25DPS 11012	Warrior Base Camp	2011/01/12 2000	No
0000442W	AFG BAGRAM PM25DPS 11012	Landfill	2011/01/12 2000	No
0000445K	AFG BAGRAM PM25DPS 11012	Landfill	2011/01/12 2000	No

## 5 Exposure Setting

Tables 2 and 3 contain information about the sampling location, environmental conditions, and associated potential population exposure. 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 Table 1. Correction and clarification of exposure assumptions by the sampling unit is encouraged.

**Table 2. Exposure Information for Daytime Sampling**

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 <sub>2.5</sub> ) and metals in the ambient air at this location.
What is the population at risk?	Entire base camp population.
What is the timeframe under consideration?	The samples were collected on 26 October, 14 December, 24 December 2010, 6 January and 24 January 2011. This encompasses a timeframe of approximately 12 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 12 weeks is being considered.
What are the activity patterns of the exposed population?	Typical exertion across the base camp. It is assumed personnel spend part of each day indoors.
What is known about sources of potential contamination?	Smoke from the burn pit at the forward operating base (FOB) landfill.
What is known about the exposure setting?	The Bagram burn pit is run 24 hours a day, 7 days a week while the tower guards operate in 12-hour shifts.
What are the exposure pathways?	Inhalation.
Where are the sampling sites relative to where exposure occurs?	Samplers were placed at the Landfill corner and landfill guard tower near the burn pit, while another sampler was placed at the Warrior Base Camp near the living area, dining facility and other commercial activities.

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

**Table 3. Exposure Information for Nighttime Sampling**

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 <sub>2.5</sub> ) and metals in the ambient air at this location.
What is the population at risk?	Entire base camp population.
What is the timeframe under consideration?	The samples were collected on 29 October, 16 December 2010 and 24 January 2011. This encompasses a timeframe of approximately 12 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 12 weeks is being considered.
What are the activity patterns of the exposed population?	Typical exertion across the base camp. It is assumed personnel spend part of each day indoors.
What is known about sources of potential contamination?	Smoke from the burn pit at the forward operating base (FOB) landfill.
What is known about the exposure setting?	The Bagram burn pit is run 24 hours a day, 7 days a week while the tower guards operate in 12-hour shifts.
What are the exposure pathways?	Inhalation.
Where are the sampling sites relative to where exposure occurs?	Samplers were placed at the Landfill corner and landfill guard tower near the burn pit, while another sampler was placed at the Warrior Base Camp near the living area, dining facility and other commercial activities.

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

## 6 Prescreen

Tables 4 and 5 show 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 Tables 4 and 5 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 May 2011.

**Table 4. Results of Prescreen for Daytime Sampling**

Parameter	Detections/ Samples	Peak Single Sample Concentration (µg/m <sup>3</sup> )	1-year Negligible MEG (µg/m <sup>3</sup> )	Result
PM <sub>2.5</sub>	13/13	599	15	Retain as potential hazard

Legend: µg/m<sup>3</sup> = micrograms per cubic meter



**Table 5. Results of Prescreen for Nighttime Sampling**

Parameter	Detections/ Samples	Peak Single Sample Concentration ( $\mu\text{g}/\text{m}^3$ )	1-year Negligible MEG ( $\mu\text{g}/\text{m}^3$ )	Result
PM <sub>2.5</sub>	8/8	366	15	Retain as potential hazard

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

## 7 Acute Risk Assessment

### 7.1 Acute Screen

Tables 6 and 7 show 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 6. Results of Acute Screen for Daytime Sampling**

Parameter	Peak Sample Day Concentration ( $\mu\text{g}/\text{m}^3$ )	Screening MEG ( $\mu\text{g}/\text{m}^3$ )	Result
PM <sub>2.5</sub>	599	24-hour Negligible MEG: 65	Retain as acute hazard

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

**Table 7. Results of Acute Screen for Nighttime Sampling**

Parameter	Peak Sample Day Concentration ( $\mu\text{g}/\text{m}^3$ )	Screening MEG ( $\mu\text{g}/\text{m}^3$ )	Result
PM <sub>2.5</sub>	366	24-hour Negligible MEG: 65	Retain as acute hazard

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

### 7.2 Hazard Severity

Tables 8 and 9 summarize 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 8. Hazard Severity for Daytime Sampling**

Parameter	Concentration ( $\mu\text{g}/\text{m}^3$ )	Comparison MEGs ( $\mu\text{g}/\text{m}^3$ )	Hazard Severity
PM <sub>2.5</sub>	Peak: 599	Is $\geq$ 24-hour Critical MEG: 500	Critical
	Average: 206	Is $>$ 24-hour Negligible MEG: 65, but $<$ 24-hour Marginal MEG: 250	Negligible

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

**Table 9. Hazard Severity for Nighttime Sampling**

Parameter	Concentration ( $\mu\text{g}/\text{m}^3$ )	Comparison MEGs ( $\mu\text{g}/\text{m}^3$ )	Hazard Severity
PM <sub>2.5</sub>	Peak: 366	Is $>$ 24-hour Marginal MEG: 250, but $<$ 24-hour Critical MEG: 500	Marginal
	Average: 176	Is $>$ 24-hour Negligible MEG: 65, but $<$ 24-hour Marginal MEG: 250	Negligible

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

### 7.3 Hazard Probability

Tables 10 and 11 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 10. Hazard Probability Scoring for PM<sub>2.5</sub> Daytime Sampling**

Concentration ( $\mu\text{g}/\text{m}^3$ )	Hazard Probability Scoring for Exposure Factors				Hazard Probability
	Degree of Exposure	Representativeness of Sample Data	Duration of Exposure	Rate of Exposure	
Peak: 599	Score 2: Concentration is $>$ Critical MEG and next higher severity MEG does not exist.	Score 2: Field data adequately estimate population exposure (Routine Sampling).	Score 1: Field exposure duration to MEG exposure duration ratio is $<1$ ( $<$ 24-hour exposure compared to 24-hour MEG).	Score 2: Typical exertion (no information to indicate otherwise).	Total Score 7: Seldom
Average: 206	Score 2: Concentration is at or between 25th and 75th percentiles of severity range.	Score 2: Field data adequately estimate population exposure (Routine Sampling).	Score 1: Field exposure duration to MEG exposure duration ratio is $<1$ ( $<$ 24-hour exposure compared to 24-hour MEG).	Score 2: Typical exertion (no information to indicate otherwise).	Total Score 7: Seldom

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

**Table 11. Hazard Probability Scoring for PM<sub>2.5</sub> Nighttime Sampling**

Concentration (µg/m <sup>3</sup> )	Hazard Probability Scoring for Exposure Factors				Hazard Probability
	Degree of Exposure	Representativeness of Sample Data	Duration of Exposure	Rate of Exposure	
Peak: 366	Score 2: Concentration is at or between 25th and 75th percentiles of severity range.	Score 2: Field data adequately estimate population exposure (Routine Sampling).	Score 1: Field exposure duration to MEG exposure duration ratio is <1 (<24-hour exposure compared to 24-hour MEG).	Score 2: Typical exertion (no information to indicate otherwise).	Total Score 7: Seldom
Average: 176	Score 2: Concentration is at or between 25th and 75th percentiles of severity range.	Score 2: Field data adequately estimate population exposure (Routine Sampling).	Score 1: Field exposure duration to MEG exposure duration ratio is <1 (<24-hour exposure compared to 24-hour MEG).	Score 2: Typical exertion (no information to indicate otherwise).	Total Score 7: Seldom

**7.4 Tactical Risk Estimate**

Table 12 and 13 summarize 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 12. Risk Assessment Summary for Daytime Sampling**

Parameter	Type of Exposure	Hazard Severity	Hazard Probability	Tactical Risk Estimate
PM <sub>2.5</sub>	Peak	Critical	Seldom	Moderate
	Average	Negligible	Seldom	Low
Metals	None identified as acute hazards.			

**Table 13. Risk Assessment Summary for Nighttime Sampling**

Parameter	Type of Exposure	Hazard Severity	Hazard Probability	Tactical Risk Estimate
PM <sub>2.5</sub>	Peak	Marginal	Seldom	Low
	Average	Negligible	Seldom	Low
Metals	None identified as acute hazards.			

## 8 Conclusion

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Based on the sample results and associated exposure information assessed in this report, the tactical risk estimate for PM<sub>2.5</sub> during daytime sampling on a typical exposure day in the sampled timeframe is **low** and on a peak exposure day it is **moderate**. The tactical risk estimate for PM<sub>2.5</sub> during nighttime sampling on both typical and peak exposure nights 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 these risk levels.

## 9 Limitations

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### 9.1 Field Data Quality

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

Some of the samples were invalid due to improper sample collection and damaged filters.

### 9.2 Sample Receipt at USAPHC (Prov) Laboratory

The sample set was packaged correctly.

### 9.3 Laboratory Data Quality

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

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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.

## 11 Points of Contact

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

(b) (6)

Environmental Scientist  
Deployment Environmental Surveillance  
Program

Approved by:

(b) (6)

Acting Program Manager  
Deployment Environmental Surveillance

## Appendix A

### References

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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.