



DEPARTMENT OF THE ARMY
US ARMY INSTITUTE OF PUBLIC HEALTH
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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, Kandahar, Afghanistan, 6 June-27 November 2010, U_AFG_KANDAHAR_CM_A25_20101127

1. The enclosed report details the assessment of particulate matter (PM) air samples collected by 4th Preventive Medicine Detachment personnel from four sites at Kandahar, Afghanistan, 6 June-27 November 2010. 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.
2. Based on the sample results and associated exposure information assessed in this report, the tactical risk estimate for PM_{2.5} in the area of the Boardwalk on a typical exposure day in the sampled timeframe is **low** and on a peak exposure day it is **moderate**.
3. Based on the sample results and associated exposure information assessed in this report, the tactical risk estimate for PM_{2.5} in the area of the incinerators and burn pit on both typical and peak exposure days during the sampled timeframe is **low**. The tactical risk estimate for cadmium in the area of the incinerators and burn pit on both typical and peak exposure days during the sampled timeframe is **low**. The samples collected near the burn pit during this sampling event were not intended to specifically characterize exposure to burn pit emissions.
4. Based on the sample results and associated exposure information assessed in this report, the tactical risk estimate for PM_{2.5} in the area of the gym and MWR building on a typical exposure day in the sampled timeframe is **low** and on a peak exposure day it is **moderate**.
5. Based on the sample results and associated exposure information assessed in this report, the tactical risk estimate for PM_{2.5} in the South Park area on both typical and peak exposure days during the sampled timeframe is **low**.

MCHB-IP-RDE

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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_KANDAHAR_CM_A25_20101127
Health Risk Management Portfolio

Airborne Particulate Matter, Kandahar, Afghanistan

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

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Preventive Medicine Surveys: 40-5f1

ACKNOWLEDGMENTS

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**DEPLOYMENT OCCUPATIONAL AND ENVIRONMENTAL
HEALTH SURVEILLANCE SAMPLE REPORT
AIRBORNE PARTICULATE MATTER
KANDAHAR, AFGHANISTAN
6 JUNE-27 NOVEMBER 2010
U_AFG_KANDAHAR_CM_A25_20101127**

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 4th Preventive Medicine Detachment on 6 June-27 November 2010 at four sites 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. 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

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 particulate matter. 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 parameters identified as potential hazards because their peak single sample concentrations were 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. The prescreening is conducted as described in USAPHC (Prov) TG 230, section 3.4.3. The sample results were compared to MEGs on 19 January 2011.

Table 1. Results of Prescreen

Parameter	Detections/ Samples	Peak Single Sample Concentration ($\mu\text{g}/\text{m}^3$)	1-year Negligible MEG ($\mu\text{g}/\text{m}^3$)	Result
Cadmium at Burn Pit	2/12	0.023611	0.00685	Retain as potential hazard
PM _{2.5} at Boardwalk	14/14	769	15	Retain as potential hazard
PM _{2.5} at Burn Pit	15/15	342	15	Retain as potential hazard
PM _{2.5} at MWR	17/17	778	15	Retain as potential hazard
PM _{2.5} at South Park	12/12	206	15	Retain as potential hazard

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

7 Acute Risk Assessment

7.1 Acute Screen

Table 2 shows parameters identified as acute hazards because their peak sample day concentrations were greater than their acute screening MEGs. Acute hazards are further assessed to estimate the acute 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 ($\mu\text{g}/\text{m}^3$)	Screening MEG ($\mu\text{g}/\text{m}^3$)	Result
Cadmium at Burn Pit	0.023611	14-day MEG: 0.0205	Retain as acute hazard
PM _{2.5} at Boardwalk	769	24-hour Negligible MEG: 65	Retain as acute hazard
PM _{2.5} at Burn Pit	342	24-hour Negligible MEG: 65	Retain as acute hazard
PM _{2.5} at MWR	778	24-hour Negligible MEG: 65	Retain as acute hazard
PM _{2.5} at South Park	206	24-hour Negligible MEG: 65	Retain as acute hazard

Legend: $\mu\text{g}/\text{m}^3$ = 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 ($\mu\text{g}/\text{m}^3$)	Comparison MEGs ($\mu\text{g}/\text{m}^3$)	Hazard Severity
Cadmium at Burn Pit	Peak: 0.023611	Is > 14-day Negligible MEG: 0.0205, but \leq 8-hour Negligible MEG: 41	Negligible
	Average: 0.017006	Is \leq 14-day Negligible MEG: 0.0205	Negligible
PM _{2.5} at Boardwalk	Peak: 769	Is \geq 24-hour Critical MEG: 500	Critical
	Average: 217	Is > 24-hour Negligible MEG: 65, but < 24-hour Marginal MEG: 250	Negligible
PM _{2.5} at Burn Pit	Peak: 342	Is \geq 24-hour Marginal MEG: 250, but < 24-hour Critical MEG: 500	Marginal
	Average: 188	Is > 24-hour Negligible MEG: 65, but < 24-hour Marginal MEG: 250	Negligible
PM _{2.5} at MWR	Peak: 778	Is \geq 24-hour Critical MEG: 500	Critical
	Average: 178	Is > 24-hour Negligible MEG: 65, but < 24-hour Marginal MEG: 250	Negligible
PM _{2.5} at South Park	Peak: 206	Is > 24-hour Negligible MEG: 65, but < 24-hour Marginal MEG: 250	Negligible
	Average: 80	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

Table 4 summarizes the hazard probability determinations for each acute hazard. Appendix D contains the hazard probability scoring tables per location. Refer to USAPHC (Prov) TG 230, section 3.4.5.3 for additional information about hazard probability scoring methodology.

Table 4. Hazard Probability

Parameter	Concentration (µg/m ³)	Hazard Probability
Cadmium at Burn Pit	Peak: 0.023611	Unlikely
	Average: 0.017006	Unlikely
PM _{2.5} at Boardwalk	Peak: 769	Seldom
	Average: 217	Occasional
PM _{2.5} at Burn Pit	Peak: 342	Seldom
	Average: 188	Seldom
PM _{2.5} at MWR	Peak: 778	Seldom
	Average: 178	Seldom
PM _{2.5} at South Park	Peak: 206	Occasional
	Average: 80	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 101-5-1 "Operational Terms and Graphics."

Table 5. Risk Assessment Summary

Parameter	Type of Exposure	Hazard Severity	Hazard Probability	Tactical Risk Estimate
Cadmium at Burn Pit	Peak	Negligible	Unlikely	Low
	Average	Negligible	Unlikely	Low
PM _{2.5} at Boardwalk	Peak	Critical	Seldom	Moderate
	Average	Negligible	Occasional	Low
PM _{2.5} at Burn Pit	Peak	Marginal	Seldom	Low
	Average	Negligible	Seldom	Low
PM _{2.5} at MWR	Peak	Critical	Seldom	Moderate
	Average	Negligible	Seldom	Low
PM _{2.5} at South Park	Peak	Negligible	Occasional	Low
	Average	Negligible	Unlikely	Low

8 Conclusion

Refer to USAPHC (Prov) TG 230, Table 3-2 for the potential consequences to military operations and force readiness associated with each risk level. Based on the sample results and associated exposure information assessed in this report:

- The tactical risk estimate for PM_{2.5} in the area of the Boardwalk 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_{2.5} in the area of the incinerators and burn pit on both typical and peak exposure days during the sampled timeframe is **low**. The tactical risk estimate for cadmium in the area of the incinerators and burn pit on both typical and peak exposure days during the sampled timeframe is **low**. The samples collected near the burn pit during this sampling event were not intended to specifically characterize exposure to burn pit emissions.
- The tactical risk estimate for PM_{2.5} in the area of the gym and MWR building 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_{2.5} in the South Park area on both typical and peak exposure days during the sampled timeframe is **low**.

9 Limitations

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 equipment failure.

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

The assessment of risk for cadmium at the burn pit is solely based on estimated data, using a method detection limit that is higher than the MEG.

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

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 101-5-1, Operational Terms and Graphics, 30 September 1997.
5. USAPHC (Prov) Technical Guide (TG) 230, Chemical Exposure Guidelines for Deployed Military Personnel, June 2010.

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.

Review proper sampling techniques to reduce the amount of invalid samples due to improper sampling technique or incomplete field data sheets.

11 Points of Contact

The USAPHC (Prov), AIPH POCs for this assessment are Ms. (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).

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Environmental Scientist
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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	Sample Invalid (Yes/No) Reason for Invalid Sample
00002OJ1	AFG_KANDAH_101 21PM2.5DPS	Burn Pit	2010/05/01 0929	No
00002OJZ	AFG_KANDAH_101 21PM2.5DPS	MWR	2010/05/01 0958	No
00002OK4	AFG_KANDAH_101 21PM2.5DPS	Board Walk	2010/05/01 1043	No
00002OJW	AFG_KANDAH_101 21_PM2.5DPS	South Park	2010/05/01 0947	Yes, Flow differential
00002OQ7	AFG_KANDAH_101 21PM2.5DPS	MWR	2010/05/13 1436	No
00002OT4	AFG_KANDAH_101 21_PM2.5DPS	Board Walk	2010/05/13 1530	Yes, Damaged Sampling Media
00002OQ4	AFG_KANDAH_101 21PM2.5DPS	Burn Pit	2010/05/13 1630	No
00002OQ2	AFG_KANDAH_101 21_PM2.5DPS	South Park	2010/05/13 1649	No
00002OM5	AFG_KANDAH_101 21PM2.5DPS	Burn Pit	2010/05/25 1122	No
00002OL9	AFG_KANDAH_101 21_PM2.5DPS	Board Walk	2010/05/25 1147	No
00002OMA	AFG_KANDAH_101 21_PM2.5DPS	South Park	2010/05/25 1035	Yes, Flow differential
00002OQE	AFG_KANDAH_101 21_PM2.5DPS	MWR	2010/05/28 1042	No
000032FH	AFG_KANDAH_101 21_PM2.5DPS	Board Walk	2010/06/06 1051	Yes, Missing Field Data
00002TVH	AFG_KANDAH_101 21_PM2.5DPS	Board Walk	2010/06/24 0920	Yes, Sample Malfunction
000031TH	AFG_KANDAH_101 21_PM2.5DPS	Board Walk	2010/07/06 1117	No
000031TQ	AFG_KANDAH_101 99_PM2.5DPS	Board Walk	2010/07/18 1111	No
000037DA	AFG_KANDAH_101 99_PM2.5DPS	Board Walk	2010/08/11 1128	No

**DOEH Surveillance Sample Report, Airborne PM, Kandahar, Afghanistan, 6 Jun-27 Nov 10,
U_AFG_KANDAHAR_CM_A25_20101127**

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
000037FH	AFG_KANDAH_10199_PM2.5DPS	Board Walk	2010/08/23 1145	No
00003C2Y	AFG_KANDAH_10199_PM2.5DPS	Board Walk	2010/09/04 1149	No
00003CK5	AFG_KANDAH_10199_PM2.5DPS	Board Walk	2010/09/16 1037	No
00003CH4	AFG_KANDAH_10199_PM2.5DPS	Board Walk	2010/09/28 1453	No
00003HMO	AFG KANDAH 10199 PM25DPS	Board Walk	2010/10/10 1558	No
00003J3Y	AFG_KANDAH_10199_PM25DPS	Board Walk	2010/10/22 1042	No
00003OMD	AFG_KANDAH_10199_PM2.5DPS	Board Walk	2010/11/06 1030	No
00003OXA	AFG_KANDAH_10199_PM2.5DPS	Board Walk	2010/11/15 1400	No
00003OZX	AFG_KANDAH_10199_PM2.5DPS	Board Walk	2010/11/27 1525	No
000031RC	AFG_KANDAH_10121PM2.5DPS	Burn Pit	2010/06/06 1300	No
00002TVZ	AFG_KANDAH_10121_PM2.5DPS	Burn Pit	2010/06/24 1010	No
000031TD	AFG_KANDAH_10121PM2.5DPS	Burn Pit	2010/07/06 1015	No
000031TP	AFG_KANDAH_10199PM2.5DPS	Burn Pit	2010/07/18 1059	Yes, Flow Differential
000032F9	AFG_KANDAH_10199PM2.5DPS	Burn Pit	2010/07/30 1010	Yes, Missing Field Data
000037EM	AFG_KANDAH_10199_PM2.5DPS	Burn Pit	2010/08/11 1048	No
000037FU	AFG_KANDAH_10199_PM2.5DPS	Burn Pit	2010/08/23 0920	No
00003C2W	AFG_KANDAH_10199PM2.5DPS	Burn Pit	2010/09/04 0945	No
00003CJT	AFG_KANDAH_10199PM2.5DPS	Burn Pit	2010/09/16 1534	No
00003HN5	AFG KANDAH 10199 PM25DPS	Burn Pit	2010/10/10 1800	No
00003ILV	AFG KANDAH 10199PM25DPS	Burn Pit	2010/10/22 1030	No

DOEH Surveillance Sample Report, Airborne PM, Kandahar, Afghanistan, 6 Jun-27 Nov 10,
 U_AFG_KANDAHAR_CM_A25_20101127

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
00003OMM	AFG_KANDAH_10199_PM2.5DPS	Burn Pit	2010/11/06 1100	No
00003OX3	AFG_KANDAH_10199_PM2.5DPS	Burn Pit	2010/11/15 1349	No
00003OZF	AFG_KANDAH_10199_PM2.5DPS	Burn Pit	2010/11/27 1515	No
000031NX	AFG_KANDAH_10121_PM2.5DPS	Morale Welfare and Recreation (MWR)	2010/06/06 1032	No
00002TVJ	AFG_KANDAH_10121_PM2.5DPS	MWR	2010/06/24 0944	No
000031WM	AFG_KANDAH_10121_PM2.5DPS	MWR	2010/07/06 1033	No
000031TL	AFG_KANDAH_10199_PM2.5DPS	MWR	2010/07/18 1025	No
000037F4	AFG_KANDAH_10199_PM2.5DPS	MWR	2010/08/11 1113	No
000037FF	AFG_KANDAH_10199_PM2.5DPS	MWR	2010/08/23 1130	No
00003CGO	AFG_KANDAH_10199_PM2.5DPS	MWR	2010/09/04 1015	No
00003CJC	AFG_KANDAH_10199_PM10DPS	MWR	2010/09/16 1057	No
00003CH9	AFG_KANDAH_10193_PM10DPS	MWR	2010/09/28 1443	No
00003HMI	AFG KANDAH 10199 PM25DPS	MWR	2010/10/10 1500	No
00003J3J	AFG_KANDAH_10199_PM25DPS	MWR	2010/10/22 1042	No
00003OMQ	AFG_KANDAH_10199_PM2.5DPS	MWR	2010/11/06 1134	No
00003OX7	AFG_KANDAH_10199_PM2.5DPS	MWR	2010/11/15 1335	No
00003P09	AFG_KANDAH_10199_PM2.5DPS	MWR	2010/11/27 1455	No
000031SO	AFG_KANDAH_10121_PM2.5DPS	South Park	2010/06/06 1230	No
00002TVN	AFG_KANDAH_10121_PM2.5DPS	South Park	2010/06/24 1000	No

**DOEH Surveillance Sample Report, Airborne PM, Kandahar, Afghanistan, 6 Jun-27 Nov 10,
U_AFG_KANDAHAR_CM_A25_20101127**

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
000031WL	AFG_KANDAH_10121_PM10DPS	South Park	2010/07/06 1025	Yes, Flow Differential
000032F2	AFG_KANDAH_10199_PM2.5DPS	South Park	2010/07/18 0953	Yes, Missing Field Data
000032F6	AFG_KANDAH_10199_PM2.5DPS	South Park	2010/07/30 1017	Yes, Flow Differential
000037D0	AFG_KANDAH_10199_PM2.5DPS	South Park	2010/08/11 1058	Yes, Sample Malfunction
000037FR	AFG_KANDAH_10199_PM2.5DPS	South Park	2010/08/23 1115	No
00003C2X	AFG_KANDAH_10199_PM2.5DPS	South Park	2010/09/04 1100	No
00003C0U	AFG_KANDAH_10199_PM2.5DPS	South Park	2010/09/16 1011	No
00003CGZ	AFG_KANDAH_10199_PM2.5DPS	South Park	2010/09/28 1432	No
00003HN6	AFG KANDAH 10199 PM25DPS	South Park	2010/10/10 1630	No
00003J38	AFG_KANDAH_10199_PM25DPS	South Park	2010/10/22 1050	No
00003OMR	AFG_KANDAH_10199_PM2.5DPS	South Park	2010/11/06 1200	No
00003OWX	AFG_KANDAH_10199_PM2.5DPS	South Park	2010/11/15 1356	No
00003P03	AFG_KANDAH_10199_PM2.5DPS	South Park	2010/11/27 1547	No

Appendix C

Exposure Setting Information

Table C-1. Exposure Information for the Boardwalk Site

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 in the area of the Boardwalk.
What is the timeframe under consideration?	The samples were collected on 6 June-27 November 2010. This encompasses a timeframe of approximately 6 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 6 months is being considered.
What are the activity patterns of the exposed population?	Typical exertion. It is assumed personnel spend part of each day indoors.
What is known about sources of potential contamination?	Information not provided.
What is known about the exposure setting?	The Boardwalk is located by the hockey rink and volleyball court. It is assumed many personnel frequent this area.
What are the exposure pathways?	Inhalation.
Where are the sampling sites relative to where exposure occurs?	The sampler was next to the hockey rink.

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

Table C-2. Exposure Information for the Burn Pit Site

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 in the area of the burn pit and incinerators.
What is the timeframe under consideration?	The samples were collected 6 June-27 November 2010. This encompasses a timeframe of approximately 6 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 6 months is being considered.
What are the activity patterns of the exposed population?	Typical exertion. It is assumed personnel spend part of each day indoors.
What is known about sources of potential contamination?	Incinerators and Burn pit.
What is known about the exposure setting?	Information not provided, but it is assumed few personnel frequent the area.
What are the exposure pathways?	Inhalation.
Where are the sampling sites relative to where exposure occurs?	The sampler was attached to a building near the two incinerators and active burn pit.

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

Table C-3. Exposure Information for the Morale Welfare and Recreation (MWR) Site

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 in the area of the MWR building.
What is the timeframe under consideration?	The samples were collected 6 June-27 November 2010. This encompasses a timeframe of approximately 6 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 6 months is being considered.
What are the activity patterns of the exposed population?	Typical exertion. It is assumed personnel spend part of each day indoors.
What is known about sources of potential contamination?	Information not provided.
What is known about the exposure setting?	Information not provided, but it is assumed the area around the sample site is frequented by all personnel at this camp.
What are the exposure pathways?	Inhalation.
Where are the sampling sites relative to where exposure occurs?	The sampler was located between the gym and MWR computer room #2.

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

Table C-4. Exposure Information for the South Park Site

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 in the South Park area.
What is the timeframe under consideration?	The samples were collected 6 June-27 November 2010. This encompasses a timeframe of approximately 6 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 6 months is being considered.
What are the activity patterns of the exposed population?	Typical exertion. It is assumed personnel spend part of each day indoors.
What is known about sources of potential contamination?	Information not provided.
What is known about the exposure setting?	The South Park area appears to be a living area with latrines and tents.
What are the exposure pathways?	Inhalation.
Where are the sampling sites relative to where exposure occurs?	The sampler was located on a post 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 Cadmium at the Burn Pit Site

Concentration ($\mu\text{g}/\text{m}^3$)	Hazard Probability Scoring for Exposure Factors				Hazard Probability
	Degree of Exposure	Represent- ativeness of Sample Data	Duration of Exposure	Rate of Exposure	
Peak: 0.023611	Score 1: Concentration is less than the 8-hour Negligible MEG.	Score 2: Field data adequately estimates population exposure for timeframe.	Score 1: Field exposure duration to MEG exposure duration ratio is <1 (Personnel will not spend 8 hours at sample site and compared to 8- hour MEG).	Score 2: Typical exertion (no information to indicate otherwise).	Total Score 6: Unlikely
Average: 0.017006	Score 1: Concentration is less than the 8-hour Negligible MEG.	Score 2: Field data adequately estimates population exposure for timeframe.	Score 1: Field exposure duration to MEG exposure duration ratio is <1 (Personnel will not spend 8 hours at the sample site and compared to 8- hour MEG).	Score 2: Typical exertion (no information to indicate otherwise).	Total Score 6: Unlikely

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

Table D-2. Hazard Probability Scoring for PM_{2.5} at the Burn Pit Site

Concentration (µg/m ³)	Hazard Probability Scoring for Exposure Factors				Hazard Probability
	Degree of Exposure	Representativeness of Sample Data	Duration of Exposure	Rate of Exposure	
Peak: 342	Score 2: Concentration is at or between 25th and 75th percentiles of severity range.	Score 2: Field data adequately estimates population exposure for timeframe.	Score 1: Field exposure duration to MEG exposure duration ratio is <1 (Personnel will not spend the entire 24-hours at the sampling location and it is assumed they spend part of each day indoors).	Score 2: Typical exertion (no information to indicate otherwise).	Total Score 7: Seldom
Average: 188	Score 2: Concentration is at or between 25th and 75th percentiles of severity range.	Score 2: Field data adequately estimates population exposure for timeframe.	Score 1: Field exposure duration to MEG exposure duration ratio is <1 (Personnel will not spend the entire 24-hours at the sampling location and it is assumed they spend part of each day indoors).	Score 2: Typical exertion (no information to indicate otherwise).	Total Score 7: Seldom

Table D-3. Hazard Probability Scoring for PM_{2.5} at the Boardwalk Site

Concentration (µg/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: 769	Score 2: Concentration is >Critical MEG and next higher severity MEG does not exist.	Score 2: Field data adequately estimates population exposure for timeframe.	Score 1: Field exposure duration to MEG exposure duration ratio is <1 (Personnel will not spend the entire 24- hours at the sampling location and it is assumed they spend part of each day indoors).	Score 2: Typical exertion (no information to indicate otherwise).	Total Score 7: Seldom
Average: 217	Score 3: Concentration is >75th percentile of severity range.	Score 2: Field data adequately estimates population exposure for timeframe.	Score 1: Field exposure duration to MEG exposure duration ratio is <1 (Personnel will not spend the entire 24- hours at the sampling location and it is assumed they spend part of each day indoors).	Score 2: Typical exertion (no information to indicate otherwise).	Total Score 8: Occasional

Table D-4. Hazard Probability Scoring for PM_{2.5} at the MWR Site

Concentration (µg/m ³)	Hazard Probability Scoring for Exposure Factors				Hazard Probability
	Degree of Exposure	Representativeness of Sample Data	Duration of Exposure	Rate of Exposure	
Peak: 778	Score 2: Concentration is >Critical MEG and next higher severity MEG does not exist.	Score 2: Field data adequately estimates population exposure for timeframe.	Score 1: Field exposure duration to MEG exposure duration ratio is <1 (Personnel will not spend the entire 24-hours at the sampling location and it is assumed they spend part of each day indoors).	Score 2: Typical exertion (no information to indicate otherwise).	Total Score 7: Seldom
Average: 178	Score 2: Concentration is at or between 25th and 75th percentiles of severity range.	Score 2: Field data adequately estimates population exposure for timeframe.	Score 1: Field exposure duration to MEG exposure duration ratio is <1 (Personnel will not spend the entire 24-hours at the sampling location and it is assumed they spend part of each day indoors).	Score 2: Typical exertion (no information to indicate otherwise).	Total Score 7: Seldom

Table D-5. Hazard Probability Scoring for PM_{2.5} at the South Park Site

Concentration (µg/m ³)	Hazard Probability Scoring for Exposure Factors				Hazard Probability
	Degree of Exposure	Representativeness of Sample Data	Duration of Exposure	Rate of Exposure	
Peak: 206	Score 3: Concentration is >75th percentile of severity range.	Score 2: Field data adequately estimates population exposure for timeframe.	Score 1: Field exposure duration to MEG exposure duration ratio is <1 (Personnel will not spend the entire 24-hours at the sampling location and it is assumed they spend part of each day indoors).	Score 2: Typical exertion (no information to indicate otherwise).	Total Score 8: Occasional
Average: 80	Score 1: Concentration is <25th percentile of severity range.	Score 2: Field data adequately estimates population exposure for timeframe.	Score 1: Field exposure duration to MEG exposure duration ratio is <1 (Personnel will not spend the entire 24-hours at the sampling location and it is assumed they spend part of each day indoors).	Score 2: Typical exertion (no information to indicate otherwise).	Total Score 6: Unlikely