DEPARTMENT OF THE ARMY
US ARMY PUBLIC HEALTH COMMAND (PROVISIONAL)
5158 BLACKHAWK ROAD
ABERDEEN PROVING GROUND MD 21010-5403

MCHB-TS-RDE

16 MAR 2010

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

SUBJECT: Deployment Occupational and Environmental Health Risk Characterization, Ambient Air Particulate Matter Samples, Taji, Iraq, 10 November-18 December 2009, U_IRQ_TAJI_CM_A10_20091218

1. The enclosed assessment details the occupational and environmental health (OEH) risk characterization for ambient air particulate matter samples collected by 705th Military Police Battalion personnel, Taji, Iraq, 10 November-18 December 2009. Thirty three of the thirty six filters submitted are valid samples.

2. The OEH risk estimate for exposure to particulate matter less than 10 micrometers in diameter (PM_{10}) and analyzed metals in the ambient air at Taji, Iraq on the sampled dates is **low**. Degraded unit readiness from exposure to the ambient air during this sampling event is not expected; periods with similar ambient conditions are expected to cause few, if any, health effects.

FOR THE COMMANDER:

(b) (6)

Director, Health Risk Management

Encl

CF: (w/encl)
224th MED DET (Commander/MAJ (b) (6)
224th MED DET (XO/CPT (b) (6)
705th MP BN (Environmental Science and Safety Officer/CPT (b) (6)
USF-I (Command Surgeon Office/LTC (b) (6)
USF-I CJ148 (Commander/CDR (b) (6)
ARCENT (Command Surgeon Office/MAJ (b) (6)
ARCENT (Force Health Protection Officer/LTC (b) (6)
CFLCC/USA 3d MDSC (MAJ (b) (6)
1st MED BDE (Environmental Science Officer/SFC (b) (6)
1st MED BDE (Environmental Science Officer/MSG (b) (6)
1st MED BDE (Environmental Science Officer/CPT (b) (6)
(CONT)

MCHB-TS-RDE
SUBJECT: Deployment Occupational and Environmental Health Risk Characterization, Ambient Air Particulate Matter Samples, Taji, Iraq, 10 November-18 December 2009, U_IRQ_TAJI_CM_A10_20091218

CF: (w/encl) (CONT)
118th MMB (FHP ESO/MAJ (b) (6)
61st MMB (Preventive Medicine OIC/CPT (b) (6)
61st MMB (Preventive Medicine NCO/SSG (b) (6)
227th MED DET PM (Commander/MAJ (b) (6)
MND-B (Command Surgeon Office/CPT (b) (6)
USAPHC-EUR (MCHB-AE-EE/CPT (b) (6)

U.S. Army Public Health Command
(Provisional)

USAPHC

DEPLOYMENT OCCUPATIONAL AND ENVIRONMENTAL
HEALTH RISK CHARACTERIZATION
AMBIENT AIR PARTICULATE MATTER SAMPLES
TAJI, IRAQ
10 NOVEMBER-18 DECEMBER 2009
U_IRQ_TAJI_CM_A10_20091218

Preventive Medicine Survey: 40-5f1

PHC FORM 433-E (MCHB-CS-IP), NOV 09

DEPLOYMENT OCCUPATIONAL AND ENVIRONMENTAL
HEALTH RISK CHARACTERIZATION
AMBIENT AIR PARTICULATE MATTER SAMPLES
TAJI, IRAQ
10 NOVEMBER-18 DECEMBER 2009
U_IRQ_TAJI_CM_A10_20091218

1. REFERENCES. See Appendix A for a list of references.

2. PURPOSE AND SCOPE. This occupational and environmental health (OEH) risk characterization addresses the analytical results for ambient air particulate matter (PM) less than 10 micrometers in diameter (PM_{10}) and metals samples collected on 10 November-18 December 2009 at Taji, Iraq in accordance with U.S. Department of Defense medical surveillance requirements. Thirty-three of the thirty-six filters submitted are valid samples. This sample set was assessed using the methodology described in Appendix B. This report should not be considered a complete assessment of the overall OEH hazards to which troops may be exposed at Taji, Iraq.

3. BACKGROUND AND EXPOSURE ASSUMPTIONS. Ambient air PM_{10} and metals samples were collected from the burn pit, dining facility (DFAC), modular detainee housing unit (MDHU), Soldier housing unit (SHU), and the Spartan gate at Taji, Iraq, 10 November-18 December 2009. There is a 24 hour burn pit present in the vicinity. No adverse weather conditions were reported for the sampling event. All personnel are expected to remain at this location for greater than 1 year. A conservative (protective) assumption is that all personnel inhale the ambient air 24 hours/day for 365 days (1 year). In addition, it is assumed that control measures and/or personal protective equipment are not used.

4. SAMPLE COLLECTION AND ANALYSIS.

a. Sample Collection. This ambient air PM_{10} and metals sample set was collected using the Deployable Particulate Sampler (DPS™) apparatus. Appendix C presents an information summary of the PM filters submitted by 705th Military Police Battalion personnel. (DPS™ is a trademark of SKC, Inc.)

b. Laboratory Analysis. The U.S. Army Public Health Command (Provisional) (USAPHC (Prov)), formerly U.S. Army Center for Health Promotion and Preventive Medicine (USACHPPM), laboratory weighs the ambient air PM filters to determine PM mass and calculate a concentration. The USAPHC (Prov) laboratory analyzes the filters

to determine metals concentrations. Metals detected above the laboratory reportable limit were compared to military exposure guidelines (MEGs) published in USACHPPM Technical Guide (TG) 230, while PM_{10} concentrations were assessed using the methodology described in Appendix B. Appendix C shows an information summary of the filters assessed in this report. Appendix D shows a sample results summary table. Appendices E through K show complete analytical results.

5. HAZARD IDENTIFICATION.

a. Particulate Matter. Since PM was measured at a concentration above the Air Quality Index good range, PM is identified as a potential health threat requiring further assessment. Air particulates include solid particles and liquid droplets, emitted directly into the air by sources, such as power plants, motor vehicles, aircraft, generators, construction activities, fires, and natural windblown dust. Airborne particulates can include dust, silica, soil, metals, organic compounds, allergens, and compounds, such as, nitrates or sulfates formed by condensation or transformation of combustion exhaust. Particulate chemical composition and size vary considerably depending on the source.

b. Metals. No metals were found at concentrations greater than their respective MEGs. Therefore, the OEH risk estimate for exposure to metals in the ambient air at this location is considered **low**.

6. HAZARD ASSESSMENT.

a. Hazard Severity. The average concentration of PM_{10} was 154 micrograms per cubic meter ($\mu g/m^3$). This concentration falls within the range of concentrations believed to pose significant health concerns to susceptible groups, which in the military can include asthmatics or persons with pre-existing cardiopulmonary disease. Otherwise, generally healthy troops may have some eye, nasal, or throat irritation causing little or no impact on unit readiness. Therefore, the hazard severity is considered negligible.

b. Hazard Probability. The hazard probability reflects the likelihood that the exposures at the location are represented by the concentrations used to determine the hazard severity. Although the average PM_{10} sample concentration was within the negligible severity range, it is important to examine the individual samples to determine whether the average concentration is dominated by outliers or if it is representative of a typical exposure. The probability that the severity of a hazard is negligible is based on a comparison of individual sample concentrations to the PM_{10} 24-hour National Ambient Air Quality Standards (NAAQS) of 150 $\mu g/m^3$. During this sampling event, the range of PM_{10} sample concentrations was 38-396 $\mu g/m^3$, and 14 of 33 (42 percent) of samples

were above 150 µg/m^3; therefore, the probability that personnel in the sampled area(s) will be exposed to PM_{10} greater than 150 µg/m^3 is considered occasional.

c. Risk Estimate and Confidence. Table 1 summarizes the risk estimate for each identified hazard.

Table 1. Risk Estimate Summary for Exposure to PM_{10} and Metals in Ambient Air, Taji, Iraq, 10 November-18 December 2009

Parameter	Hazard Severity	Hazard Probability	Hazard-Specific Risk Estimate	Operational Risk Estimate	Confidence
PM_{10}	Negligible	Occasional	LOW	LOW	LOW
Metals	No parameters detected above a MEG		LOW		

7. CONCLUSION. The OEH risk estimate for exposure to PM_{10} and analyzed metals in ambient air at Taji, Iraq, 10 November-18 December 2009 is **low**. Degraded unit readiness from exposure to the ambient air during this sampling event is not expected; periods with similar ambient conditions are expected to cause few, if any, health effects.

8. RECOMMENDATIONS AND NOTES.

a. Recommendations.

(1) Collect PM samples from Taji, Iraq at least once every 6 days (if possible) for the deployment duration (or as long as possible) to better characterize the ambient air PM and metals exposures.

(2) Restrict outdoor physical activities where possible during periods of visibly high particulate levels.

b. Notes.

(1) This OEH risk assessment is specific to the exposure assumptions identified above and the sample results assessed in this report. If the assumed exposure scenario changes or additional information is available, provide the updated information so the risk estimate can be reassessed. If additional samples from this site and/or area are collected, a new OEH risk assessment will be completed.

(2) As part of a Comprehensive Military Medical Surveillance Program, required by Department of Defense Directive 6490.02E and Department of Defense Instruction 6490.03, this report has been submitted to the Deployment Occupational and Environmental Health Surveillance (DOEHS)-Data Portal. You can view this and other archived DOEHS data at https://doehrswww.apgea.army.mil/doehrs-oehs/. If you have additional DOEHS data for Taji, Iraq it can also be submitted via this Web site.

9. POINTS OF CONTACT. The USAPHC (Prov) points of contact for this assessment are Ms. (b) (6) and Mr. (b) (6). Ms. (b) (6) may be contacted at e-mail (b) (6); 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)

MAJ, MS
Program Manager
Deployment Environmental Surveillance

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, Field Manual (FM) 5-19, Composite Risk Management, 21 August 2006.

4. U.S. Army Center for Health Promotion and Preventive Medicine (USACHPPM) Technical Guide (TG) 230, Chemical Exposure Guidelines for Deployed Military Personnel, Version 1.3, May 2003 with the January 2004 addendum.

5. Memorandum, USACHPPM (MCHB-TS-RDE), 27 April 2007, Subject: Deployment Operational Risk Characterization Method for Particulate Matter.

APPENDIX B

METHODOLOGY

B-1. SCOPE OF RISK ASSESSMENTS. The U.S. Army Public Health Command (Provisional) (USAPHC (Prov)), formerly U.S. Army Center for Health Promotion and Preventive Medicine (USACHPPM), Deployment Environmental Surveillance Program (DESP) characterizes deployment occupational and environmental health (OEH) risks which may impact mission capability (that is, operational risks). Each characterization is performed using risk management doctrine (Field Manual (FM) 5-19), and the relatively conservative (protective) assumptions and methods provided in the USACHPPM Technical Guide (TG) 230, to facilitate decision making that can minimize the likelihood of significant risks. A risk estimate is generated for each sample or sample set sent to the USAPHC (Prov) laboratory for analysis. These risk estimates are provided to preventive medicine personnel with information about potential operational risks and associated health effects. Samples received are generally limited in time, area, and media. Therefore, any risk characterization based on a sample or sample set should not be considered a complete characterization of the overall OEH hazards to which troops may be exposed at a location.

B-2. RISK ASSESSMENT METHODOLOGY.

a. General. The USACHPPM TG 230 methodology (identification of the hazard(s), assessment of the hazard severity and probability, and determination of a risk estimate and confidence level), military exposure guidelines (MEGs), and National Ambient Air Quality Standards (NAAQS) are used to characterize the risk from identified OEH hazards. Each component of the methodology is described in more detail below.

b. Hazard Identification.

(1) Hazard Definition. For the purpose of conducting these risk assessments, an OEH hazard is any biological, chemical, or physical parameter detected in a medium by field testing or laboratory analysis. The detected parameter could pose a health threat if personnel are exposed to it at levels greater than its respective MEG.

(2) Screening the Hazards.

(a) General. The purpose of screening the hazards is to focus the risk assessment on the most important/credible health threats. Concentrations of identified hazards are screened against the long-term (1-year) MEGs. The 1-year MEGs

represent exposure concentrations at or below which no significant health effects (including delayed or chronic disease or significant increased risk of cancer) are anticipated even after 1 year of continuous daily exposures. For exposures that are known to be brief or intermittent (such as, 24 hours, less than 2 weeks, etc.), short-term MEGs can be used (when available).

(b) Ambient Air Particulate Matter. Particulate matter is one of six air pollutants for which the U.S. Environmental Protection Agency (USEPA) has promulgated NAAQS in the interest of protecting public health. In addition, the USEPA developed the Air Quality Index (AQI) to communicate daily air quality to the public using six descriptive categories ranging from "good" to "hazardous." The AQI categories for PM are based on concentration ranges grouped according to health concern severity. The USAPHC (Prov) uses the AQI categories to characterize the operational risk from PM. Particulate matter sample concentrations are screened against the upper bound of the AQI good air quality concentration range. If any PM sample concentration is above this threshold, PM is identified as a hazard.

(3) Hazards that are Not Credible Health Threats. If concentrations of identified hazards are below the screening MEGs, it can be assumed that they do not pose a health threat. In these cases, a hazard assessment is not conducted and the estimated risk from exposure to these hazards is assumed to be low.

(4) Hazards that are Credible Health Threats. If concentrations of identified hazards are above the screening MEGs, they are considered credible health threats, and a hazard assessment is conducted for each one.

c. Hazard Assessment.

(1) Hazard Severity.

(a) General. When concentrations of an OEH hazard are greater than the screening MEG, the severity of the health threat associated with the hazard must be estimated. Determine whether the concentration of the hazard also exceeds short-term guidelines. Significant health and/or mission impacts may be anticipated when both long- and short-term guidelines are exceeded. Many OEH hazards with long-term guidelines have no parallel short-term guidelines. In such cases, professional judgment is necessary to estimate the hazard severity. Estimating the hazard severity involves determining the proportion of individuals within the population of interest that will experience effects and the severity of the effects. In practice, this can be difficult due to the limited and variable toxicological and epidemiological data available for most OEH hazards. Conclusions about the hazard severity must be made with an understanding

of the limitations of currently available data used to develop the MEGs and the risk assessment process in general.

(b) Multiple Samples. The average concentration of the OEH hazard is compared to the short- and long-term MEGs to determine hazard severity for sample sets where samples are collected on different days or multiple samples are collected on the same day from the same source.

(c) Ambient Air Particulate Matter. Hazard severity is determined by comparing the average PM concentration for a specific location and timeframe to PM concentration ranges identified as either negligible or marginal. This process is described in more detail in Appendix A, reference 5. Negligible concentration levels correspond to mild respiratory effects among generally healthy troops, with more significant effects among sensitive persons, such as asthmatics or those with existing cardiopulmonary disease. Marginal concentration levels are expected to pose more significant health effects among healthy personnel, and those with pre-existing sensitivities.

(2) Hazard Probability.

(a) General. The hazard probability represents the likelihood that individuals within a population of interest during a specified time period will actually be exposed to concentrations of an OEH hazard that are greater than a MEG. The MEGs were developed using certain conservative exposure assumptions that may not reflect actual exposure conditions. The primary factors in estimating the hazard probability are how closely actual exposure conditions match those used to develop the MEG, and what proportion of the population of interest will be exposed to the hazard.

(b) Ambient Air Particulate Matter. Hazard probability is based on the frequency that anticipated exposures are above a threshold that is representative of the hazard severity category. This process is described in more detail in Appendix A, reference 5. However, using USACHPPM TG 230 methodology and reference 4 to estimate the hazard probability for PM when a small number of samples are collected or number of days that are sampled often results in a risk estimate that is not consistent with actual exposure outcomes. Until a more refined assessment method can be published in USACHPPM TG 230, the method the USAPHC (Prov) DESP uses to characterize the risk from PM deviates slightly from USACHPPM TG 230 and reference 4. When less than four samples are collected or number of days are sampled and received for risk characterization, a hazard probability is not estimated; the hazard severity determines the risk estimate. A negligible severity represents a low risk and a marginal severity represents a moderate risk.

(3) Risk Estimate.

(a) The estimated hazard severity and probability levels are used with the Risk Assessment Matrix published in USACHPPM TG 230 and FM 5-19 to provide a risk estimate for exposure to each OEH hazard identified as a credible health threat. Therefore, communication of operational risks from OEH hazards can be made in the same context as other operational risks. The risk estimate is based on the highest estimated risk for the OEH hazards identified. Each level of operational risk has a defined mission impact and unit status description.

(b) Each risk estimate is specific to exposure assumptions derived from information on the field data sheets, communication with the collecting unit, and the associated sample results. If the assumed exposure scenario changes, additional/updated information should be provided so the risk estimate can be reassessed.

(c) If additional samples from Taji, Iraq and source are collected, a new risk estimate will be generated based upon exposure scenario information provided with the samples.

(4) Confidence. A confidence level is assigned to each risk estimate. The degree of confidence is particularly important when determining possible courses of action. The confidence level should integrate uncertainties associated with the hazard severity and probability determinations. Typical areas of uncertainty include: sampling or field data quality; actual exposure conditions and comparability to the exposure assumptions used to develop the MEGs or other comparison level; expected symptoms of exposure, including consideration of exposure to multiple hazards; and whether the predicted health outcome is plausible, given weight of evidence or real-world experiences. In general, confidence in risk estimates is usually low to medium.

APPENDIX C

INFORMATION SUMMARY
AMBIENT AIR PARTICULATE MATTER SAMPLES
TAJI, IRAQ
10 NOVEMBER-18 DECEMBER 2009

DOEHRS Sample ID	Field/Local Sample ID	Site	Start Date/Time	Sample Duration	Invalid Sample	Filter ID
00001KN7	IRQCPTAJI09314PM10	Burn Pit	2009/11/10 0921	1440.0 minutes	No	47-09-2182
00001KN8	IRQCPTAJI09314PM10	Spartan Gate	2009/11/10 0943	1440.0 minutes	No	47-09-2184
00001KN9	IRQCPTAJI09315PM10	DFAC	2009/11/11 1025	1440.0 minutes	No	47-09-2179
00001KNC	IRQCPTAJI09315PM10	MDHU	2009/11/11 1028	1440.0 minutes	No	47-09-2180
00001KNO	IRQCPTAJI09316PM10	SHU	2009/11/12 1050	1440.0 minutes	No	47-09-2177
00001KO0	IRQCPTAJI09316PM10	Spartan Gate	2009/11/12 1112	1440.0 minutes	No	47-09-2178
00001KOA	IRQCPTAJI09316	MDHU	2009/11/13 1100	1440.0 minutes	No	47-09-2001
00001KOG	IRQCPTAJI09316PM10	Burn Pit	2009/11/13 1116	1440.0 minutes	No	47-09-2176
00001KOJ	IRQCPTAJI09318PM10	Spartan Gate	2009/11/14 1519	1440.0 minutes	No	47-09-2026
00001KOM	IRQCPTAJI09318	DFAC	2009/11/14 1515	1350.0 minutes	No	47-09-2027
00001KOO	IRQCPTAJI09	Spartan Gate	2009/11/17 1118	1440.0 minutes	No	47-09-2031
00001KOQ	IRQCPTAJI09	Burn Pit	2009/11/17 1125	1440.0 minutes	No	47-09-2032
00001KOR	IRQCPTAJI09322PM10	DFAC	2009/11/18 1030	1440.0 minutes	No	47-09-2033
00001KOU	IRQCPTAJI09323PM10	SHU	2009/11/19 0947	1440.0 minutes	No	47-09-2034
00001KOW	IRQCPTAJI09323PM10	Spartan Gate	2009/11/19 1043	1440.0 minutes	No	47-09-2035
00001KOZ	IRQCPTAJI09319PM10	Burn Pit	2009/11/15 1053	1442.0 minutes	Yes, Damaged Sampling Media	47-09-2028

Deployment OEH Risk Characterization, Ambient Air PM Samples, Taji, Iraq, 10 Nov-18 Dec 09, U_IRQ_TAJI_CM_A10_20091218

DOEHRS Sample ID	Field/Local Sample ID	Site	Start Date/Time	Sample Duration	Invalid Sample	Filter ID
00001KP3	IRQCPTAJI09320	SHU	2009/11/16 0946	1454.0 minutes	Yes, Damaged Sampling Media	47-09-2029
00001KP5	IRQCPTAJI09320PM10	MDHU	2009/11/16 1100	1441.0 minutes	Yes, Damaged Sampling Media	47-09-2030
00001MW8	IRQCPTTAJI09327PM10	Spartan Gate	2009/11/23 1144	1444.0 minutes	No	47-09-2039
00001MW9	IRQCPTTAJI09329PM10	Spartan Gate	2009/11/26 1013	1440.0 minutes	No	47-09-2043
00001MWB	IRQCPTTAJI09331PM10	Spartan Gate	2009/11/27 1359	1441.0 minutes	No	47-09-2044
00001MWE	IRQCPTTAJI09327PM10	SHU	2009/11/24 1050	1441.0 minutes	No	47-09-2041
00001MWG	IRQCPTTAJI09331PM10	SHU	2009/11/27 1025	1440.0 minutes	No	47-09-2045
00001MWH	IRQCPTTAJI09334PM10	SHU	2009/11/30 1503	1441.0 minutes	No	47-09-2048
00001MWJ	IRQCPTTAJI09328PM10	DFAC	2009/11/24 1050	1440.0 minutes	No	47-09-2040
00001MWK	IRQCPTAJI09 PM10	DFAC	2009/11/30 1500	1441.0 minutes	No	47-09-2047
00001MWN	IRQCPTAJI09329PM10	Burn Pit	2009/11/25 1135	1440.0 minutes	No	47-09-2042
00001MWO	IRQCPTAJI09 PM10	Burn Pit	2009/11/29 1005	1440.0 minutes	No	47-09-2046
00001PXM	IRQ TAJI 09345 PM10-1	Spartan Gate	2009/12/11 1015	1440.0 minutes	No	47-09-2010
00001PXX	IRQ TAJI 09345 PM10-2	Burn Pit	2009/12/11 1017	1440.0 minutes	No	47-09-2011
00001PYF	IRQ TAJI 09348 PM10-1	SHU	2009/12/14 1025	1440.0 minutes	No	47-09-2012
00001PYH	IRQ TAJI 09348 PM10-2	DFAC	2009/12/14 1030	1440.0 minutes	No	47-09-2013
00001PYN	IRQ TAJI 09350 PM10-2	Spartan Gate	2009/12/16 1320	1440.0 minutes	No	47-09-2014
00001PYQ	IRQ TAJI 09350 PM10-1	Burn Pit	2009/12/16 1305	1440.0 minutes	No	47-09-2015
00001PYR	IRQ TAJI 09352 PM10-2	DFAC	2009/12/18 0828	1440.0 minutes	No	47-09-2016
00001PYS	IRQ TAJI 09352 PM10-1	SHU	2009/12/18 0817	1440.0 minutes	No	47-09-2017

LEGEND:
DOEHRS Sample ID = Defense Occupational and Environmental Health Readiness System Sample Identification Number
DFAC = dining facility
MDHU = modular detainee housing unit
SHU = Soldier housing unit

APPENDIX D

RESULTS SUMMARY
AMBIENT AIR PARTICULATE MATTER SAMPLES
TAJI, IRAQ
10 NOVEMBER-18 DECEMBER 2009

Parameter[1]	Units	Concentration		Valid Samples		USACHPPM TG 230 Military Exposure Guidelines[3] 1-year	
		Maximum	Average[2]	#	# > Laboratory Reporting Limit	# > MEG	MEG
Antimony	µg/m^3	0.12083	0.03151	33	6	0	12
Arsenic	µg/m^3	0.018519	0.013259	33	3	0	1.1
Cadmium	µg/m^3	0.018519	0.013186	33	4	0	0.24
Chromium	µg/m^3	0.018519	0.013239	33	7	0	12
Lead	µg/m^3	10.278	0.76366	33	22	0	12
Manganese	µg/m^3	0.15278	0.055463	33	4	0	3.4
PM_{10}	µg/m^3	396	154	33	33	31	50
Zinc	µg/m^3	0.36181	0.13797	33	1	0	2400

[1] Highlighted values indicate the parameter was detected at a concentration above a MEG.
[2] Where parameters are not detected in a sample during analyses, half of the laboratory reporting limit is used in the average.
[3] This table was created from DOEHRS on 12 February 2010. The MEGs in DOEHRS are current as of June 2009.

LEGEND:
USACHPPM = U.S. Army Center for Health Promotion and Preventive Medicine
µg/m^3 = micrograms per cubic meter
MEGs = military exposure guidelines
TG = technical guide
PM_{10} = particulate matter less than 10 micrometers in diameter

APPENDIX E

ANALYTICAL SAMPLE RESULTS
AMBIENT AIR PARTICULATE MATTER SAMPLES
TAJI, IRAQ
10 NOVEMBER-18 DECEMBER 2009

DOEHRS Sample ID			00001KN7	00001KN8	00001KN9	00001KNC	00001KNO
Field/Local Sample ID			IRQCPTAJI 09314PM10	IRQCPTAJI 09314PM10	IRQCPTAJI 09315PM10	IRQCPTAJI 09315PM10	IRQCPTAJI 09316PM10
Site			Burn Pit	Spartan Gate	DFAC	MDHU	SHU
Start Date/Time			2009/11/10 0921	2009/11/10 0943	2009/11/11 1025	2009/11/11 1028	2009/11/12 1050
Parameter	Class	Units	Concentration[1,2]				
Antimony	Metals	µg/m^3	< 0.069444	< 0.069444	< 0.069444	< 0.069444	< 0.069444
Arsenic	Metals	µg/m^3	< 0.034722	< 0.034722	< 0.034722	< 0.034722	< 0.034722
Beryllium	Metals	µg/m^3	< 0.034722	< 0.034722	< 0.034722	< 0.034722	< 0.034722
Cadmium	Metals	µg/m^3	< 0.034722	< 0.034722	< 0.034722	< 0.034722	< 0.034722
Chromium	Metals	µg/m^3	< 0.034722	< 0.034722	< 0.034722	< 0.034722	< 0.034722
Lead	Metals	µg/m^3	< 0.069444	< 0.069444	0.088889	0.082639	0.59375
Manganese	Metals	µg/m^3	< 0.13889	< 0.13889	< 0.13889	< 0.13889	< 0.13889
Nickel	Metals	µg/m^3	< 0.034722	< 0.034722	< 0.034722	< 0.034722	< 0.034722
PM_{10}		µg/m^3	149	255	196	133	102
Vanadium	Metals	µg/m^3	< 0.13889	< 0.13889	< 0.13889	< 0.13889	< 0.13889
Zinc	Metals	µg/m^3	< 0.34722	< 0.34722	< 0.34722	< 0.34722	< 0.34722

[1]< X.XX = Below laboratory reporting limit (X.XX)
[2]Laboratory reporting limit is parameter and sample specific
LEGEND:
DOEHRS Sample ID = Deployment Occupational and Environmental Health Readiness System Sample Identification Number
µg/m^3 = micrograms per cubic meter
PM_{10} = particulate matter less than 10 micrometers in diameter
MDHU = modular detainee housing unit
SHU = Soldiers housing unit
DFAC = dining facility

APPENDIX F

ANALYTICAL SAMPLE RESULTS
AMBIENT AIR PARTICULATE MATTER SAMPLES
TAJI, IRAQ
10 NOVEMBER-18 DECEMBER 2009

DOEHRS Sample ID			00001KO0	00001KOA	00001KOG	00001KOJ	00001KOM
Field/Local Sample ID			IRQCPTAJI 09316PM10	IRQCPTAJI 09316	IRQCPTAJI 09316PM10	IRQCPTAJI 09318PM10	IRQCPTAJI 09318
Site			Spartan Gate	MDHU	Burn Pit	Spartan Gate	DFAC
Start Date/Time			2009/11/12 1112	2009/11/13 1100	2009/11/13 1116	2009/11/14 1519	2009/11/14 1515
Parameter	Class	Units	Concentration[1,2]				
Antimony	Metals	µg/m^3	< 0.069444	0.1125	0.12083	< 0.069444	< 0.074074
Arsenic	Metals	µg/m^3	< 0.034722	< 0.034722	< 0.034722	< 0.034722	< 0.037037
Beryllium	Metals	µg/m^3	< 0.034722	< 0.034722	< 0.034722	< 0.034722	< 0.037037
Cadmium	Metals	µg/m^3	< 0.034722	< 0.034722	< 0.034722	< 0.034722	< 0.037037
Chromium	Metals	µg/m^3	< 0.034722	< 0.034722	< 0.034722	< 0.034722	< 0.037037
Lead	Metals	µg/m^3	1.5903	9.4444	10.278	0.14444	0.16963
Manganese	Metals	µg/m^3	0.15278	< 0.13889	< 0.13889	< 0.13889	< 0.14815
Nickel	Metals	µg/m^3	< 0.034722	< 0.034722	< 0.034722	< 0.034722	< 0.037037
PM_{10}		µg/m^3	350	184	222	174	243
Vanadium	Metals	µg/m^3	< 0.13889	< 0.13889	< 0.13889	< 0.13889	< 0.14815
Zinc	Metals	µg/m^3	< 0.34722	< 0.34722	< 0.34722	< 0.34722	< 0.37037

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LEGEND:
DOEHRS Sample ID = Deployment Occupational and Environmental Health Readiness System Sample Identification Number
µg/m^3 = micrograms per cubic meter
PM_{10} = particulate matter less than 10 micrometers in diameter
MDHU = modular detainee housing unit
DFAC = dining facility

APPENDIX G

ANALYTICAL SAMPLE RESULTS
AMBIENT AIR PARTICULATE MATTER SAMPLES
TAJI, IRAQ
10 NOVEMBER-18 DECEMBER 2009

DOEHRS Sample ID			00001KOO	00001KOQ	00001KOR	00001KOU	00001KOW
Field/Local Sample ID			IRQCPTAJI09	IRQCPTAJI09	IRQCPTAJI 09322PM10	IRQCPTAJI 09323PM10	IRQCPTAJI 09323PM10
Site			Spartan Gate	Burn Pit	DFAC	SHU	Spartan Gate
Start Date/Time			2009/11/17 1118	2009/11/17 1125	2009/11/18 1030	2009/11/19 0947	2009/11/19 1043
Parameter	Class	Units	Concentration[1,2]				
Antimony	Metals	µg/m^3	< 0.069444	< 0.069444	< 0.069444	< 0.069444	< 0.069444
Arsenic	Metals	µg/m^3	< 0.034722	< 0.034722	< 0.034722	< 0.034722	< 0.034722
Beryllium	Metals	µg/m^3	< 0.034722	< 0.034722	< 0.034722	< 0.034722	< 0.034722
Cadmium	Metals	µg/m^3	< 0.034722	< 0.034722	< 0.034722	< 0.034722	< 0.034722
Chromium	Metals	µg/m^3	< 0.034722	< 0.034722	< 0.034722	< 0.034722	< 0.034722
Lead	Metals	µg/m^3	< 0.069444	0.1625	< 0.069444	0.10278	0.10694
Manganese	Metals	µg/m^3	< 0.13889	< 0.13889	< 0.13889	< 0.13889	< 0.13889
Nickel	Metals	µg/m^3	< 0.034722	< 0.034722	< 0.034722	< 0.034722	< 0.034722
PM_{10}		µg/m^3	56	92	38	71	47
Vanadium	Metals	µg/m^3	< 0.13889	< 0.13889	< 0.13889	< 0.13889	< 0.13889
Zinc	Metals	µg/m^3	< 0.34722	< 0.34722	< 0.34722	< 0.34722	0.36181

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µg/m^3 = micrograms per cubic meter
PM_{10} = particulate matter less than 10 micrometers in diameter
SHU = Soldiers housing unit
DFAC = dining facility

APPENDIX H

ANALYTICAL SAMPLE RESULTS
AMBIENT AIR PARTICULATE MATTER SAMPLES
TAJI, IRAQ
10 NOVEMBER-18 DECEMBER 2009

DOEHRS Sample ID			00001MW8	00001MW9	00001MWB	00001MWE	00001MWG
Field/Local Sample ID			IRQCPTTAJI 09327PM10	IRQCPTTAJ I09329PM10	IRQCPTTAJI 09331PM10	IRQCPTTAJI 09327PM10	IRQCPTTAJI 09331PM10
Site			Spartan Gate	Spartan Gate	Spartan Gate	SHU	SHU
Start Date/Time			2009/11/23 1144	2009/11/26 1013	2009/11/27 1359	2009/11/24 1050	2009/11/27 1025
Parameter	Class	Units	Concentration[1,2]				
Antimony	Metals	$\mu g/m^3$	< 0.069252	< 0.069444	< 0.069396	< 0.069396	< 0.069444
Arsenic	Metals	$\mu g/m^3$	< 0.034626	< 0.034722	< 0.034698	< 0.034698	< 0.034722
Beryllium	Metals	$\mu g/m^3$	< 0.034626	< 0.034722	< 0.034698	< 0.034698	< 0.034722
Cadmium	Metals	$\mu g/m^3$	< 0.034626	< 0.034722	< 0.034698	< 0.034698	< 0.034722
Chromium	Metals	$\mu g/m^3$	< 0.034626	< 0.034722	< 0.034698	< 0.034698	< 0.034722
Lead	Metals	$\mu g/m^3$	< 0.069252	< 0.069444	< 0.069396	0.07703	< 0.069444
Manganese	Metals	$\mu g/m^3$	< 0.13850	< 0.13889	< 0.13879	< 0.13879	< 0.13889
Nickel	Metals	$\mu g/m^3$	< 0.034626	< 0.034722	< 0.034698	< 0.034698	< 0.034722
PM_{10}		$\mu g/m^3$	51	200	86	175	79
Vanadium	Metals	$\mu g/m^3$	< 0.13850	< 0.13889	< 0.13879	< 0.13879	< 0.13889
Zinc	Metals	$\mu g/m^3$	< 0.34626	< 0.34722	< 0.34698	< 0.34698	< 0.34722

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DOEHRS Sample ID = Deployment Occupational and Environmental Health Readiness System Sample Identification Number
$\mu g/m^3$ = micrograms per cubic meter
PM_{10} = Particulate matter less than 10 micrometers in diameter
SHU = Soldiers housing unit

APPENDIX I

ANALYTICAL SAMPLE RESULTS
AMBIENT AIR PARTICULATE MATTER SAMPLES
TAJI, IRAQ
10 NOVEMBER-18 DECEMBER 2009

DOEHRS Sample ID			00001MWH	00001MWJ	00001MWK	00001MWN	00001MWO
Field/Local Sample ID			IRQCPTTAJI 09334PM10	IRQCPTTAJI 09328PM10	IRQCPTAJI 09PM10	IRQCPTAJI 09329PM10	IRQCPTAJI 09 PM10
Site			SHU	DFAC	DFAC	Burn Pit	Burn Pit
Start Date/Time			2009/11/30 1503	2009/11/24 1050	2009/11/30 1500	2009/11/25 1135	2009/11/29 1005
Parameter	Class	Units	Concentration[1,2]				
Antimony	Metals	µg/m^3	< 0.069396	< 0.069444	< 0.069396	< 0.069444	< 0.069444
Arsenic	Metals	µg/m^3	< 0.034698	< 0.034722	< 0.034698	< 0.034722	< 0.034722
Beryllium	Metals	µg/m^3	< 0.034698	< 0.034722	< 0.034698	< 0.034722	< 0.034722
Cadmium	Metals	µg/m^3	< 0.034698	< 0.034722	< 0.034698	< 0.034722	< 0.034722
Chromium	Metals	µg/m^3	< 0.034698	< 0.034722	< 0.034698	< 0.034722	< 0.034722
Lead	Metals	µg/m^3	< 0.069396	0.078472	< 0.069396	1.4444	< 0.069444
Manganese	Metals	µg/m^3	< 0.13879	< 0.13889	< 0.13879	< 0.13889	< 0.13889
Nickel	Metals	µg/m^3	< 0.034698	< 0.034722	< 0.034698	< 0.034722	< 0.034722
PM_{10}		µg/m^3	108	186	102	68	90
Vanadium	Metals	µg/m^3	< 0.13879	< 0.13889	< 0.13879	< 0.13889	< 0.13889
Zinc	Metals	µg/m^3	< 0.34698	< 0.34722	< 0.34698	< 0.34722	< 0.34722

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µg/m^3 = micrograms per cubic meter
PM_{10} = particulate matter less than 10 micrometers in diameter
SHU = Soldiers housing unit
DFAC = dining facility

APPENDIX J

ANALYTICAL SAMPLE RESULTS
AMBIENT AIR PARTICULATE MATTER SAMPLES
TAJI, IRAQ
10 NOVEMBER-18 DECEMBER 2009

DOEHRS Sample ID			00001PXM	00001PXX	00001PYF	00001PYH
Field/Local Sample ID			IRQ TAJI 09345 PM10-1	IRQ TAJI 09345 PM10-2	IRQ TAJI 09348 PM10-1	IRQ TAJI 09348 PM10-2
Site			Spartan Gate	Burn Pit	SHU	DFAC
Start Date/Time			2009/12/11 1015	2009/12/11 1017	2009/12/14 1025	2009/12/14 1030
Parameter	Class	Units	Concentration[1,2]			
Antimony	Metals	µg/m^3	0.00083333	0.0013194	< 0.00034722	< 0.00034722
Arsenic	Metals	µg/m^3	< 0.00034722	0.00049306	< 0.00034722	< 0.00034722
Beryllium	Metals	µg/m^3	< 0.00017361	< 0.00017361	< 0.00017361	< 0.00017361
Cadmium	Metals	µg/m^3	7.6389E-06	0.000014583	< 0.00000034722	< 0.00000034722
Chromium	Metals	µg/m^3	0.00027083	0.00020139	< 0.00017361	0.00018056
Lead	Metals	µg/m^3	0.083333	0.125	0.00063889	0.00056944
Manganese	Metals	µg/m^3	0.00076389	< 0.00069444	< 0.00069444	< 0.00069444
Nickel	Metals	µg/m^3	< 0.00034722	< 0.00034722	< 0.00034722	< 0.00034722
PM_{10}		µg/m^3	212	144	114	101
Vanadium	Metals	µg/m^3	< 0.00034722	< 0.00034722	< 0.00034722	< 0.00034722
Zinc	Metals	µg/m^3	< 0.0034722	< 0.0034722	< 0.0034722	< 0.0034722

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LEGEND:
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PM_{10} = particulate matter less than 10 micrometers in diameter
SHU = Soldiers housing unit
DFAC = dining facility

APPENDIX K

ANALYTICAL SAMPLE RESULTS
AMBIENT AIR PARTICULATE MATTER SAMPLES
TAJI, IRAQ
10 NOVEMBER-18 DECEMBER 2009

DOEHRS Sample ID			00001PYN	00001PYQ	00001PYR	00001PYS
Field/Local Sample ID			IRQ TAJI 09350 PM10-2	IRQ TAJI 09350 PM10-1	IRQ TAJI 09352 PM10-2	IRQ TAJI 09352 PM10-1
Site			Spartan Gate	Burn Pit	DFAC	SHU
Start Date/Time			2009/12/16 1320	2009/12/16 1305	2009/12/18 0828	2009/12/18 0817
Parameter	Class	Units	Concentration[1,2]			
Antimony	Metals	µg/m^3	< 0.00034722	< 0.00034722	0.0014583	0.0014583
Arsenic	Metals	µg/m^3	< 0.00034722	< 0.00034722	0.00054861	0.00053472
Beryllium	Metals	µg/m^3	< 0.00017361	< 0.00017361	< 0.00017361	< 0.00017361
Cadmium	Metals	µg/m^3	< 0.00000034722	< 0.00000034722	0.000018056	0.000013889
Chromium	Metals	µg/m^3	0.00022222	0.00020833	0.00030556	0.00031944
Lead	Metals	µg/m^3	0.0040972	0.0051389	0.11806	0.11806
Manganese	Metals	µg/m^3	< 0.00069444	< 0.00069444	0.0020833	0.0020139
Nickel	Metals	µg/m^3	< 0.00034722	< 0.00034722	< 0.00034722	< 0.00034722
PM_{10}		µg/m^3	62	198	396	392
Vanadium	Metals	µg/m^3	< 0.00034722	< 0.00034722	< 0.00034722	< 0.00034722
Zinc	Metals	µg/m^3	< 0.0034722	< 0.0034722	< 0.0034722	< 0.0034722

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