DEPARTMENT OF THE ARMY
US ARMY CENTER FOR HEALTH PROMOTION AND PREVENTIVE MEDICINE
5158 BLACKHAWK ROAD
ABERDEEN PROVING GROUND MD 21010-5403

10 JUN 2009

MCHB-TS-RDE

MEMORANDUM FOR Office of the Command Surgeon (MAJ (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, Balad, Iraq, 6 March–10 April 2009, U_IRQ_BALAD_CM_A10_20090410

1. The enclosed assessment details the occupational and environmental health (OEH) risk characterization for ambient air particulate matter samples collected by 223rd Medical Detachment—Preventive Medicine personnel at Balad, Iraq, 6 March–10 April 2009. Nineteen of twenty samples are valid.

2. The OEH risk estimate for exposure to particulate matter less than 10 micrometers in diameter and metals in the ambient air at Balad, Iraq is **low**. Exposure to the ambient air is expected to have little or no impact on unit readiness.

FOR THE COMMANDER:

(b) (6)

Director, Health Risk Management

Encl

CF: (w/encl)
223rd MED DET (Commander/CPT (b) (6)
223rd MED DET (Detachment Sergeant/SFC (b) (6)
223rd MED DET (XO/CPT (b) (6)
111th MMB (FHP OIC Clinic Ops/1LT (b) (6)
332 EMDG/BEE (AF PM/Balad AB)
MNC-I (Command Surgeon/LTC (b) (6)
MNF-I CJ148 (Commander/CDR (b) (6)
ARCENT (Command Surgeon/LTC (b) (6)
ARCENT (Force Health Protection Officer/LTC (b) (6)
CFLCC/USA 3RD MDSC (CPT (b) (6)
44th MEDCOM (Environmental Science Officer/SFC (b) (6)
44th MEDCOM (Environmental Science Officer/MSG (b) (6)
(CONT)

MCHB-TS-RDE
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CF: (CONT)
44th MEDCOM (Environmental Science Officer/CPT (b) (6)
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TF 44 MED (Force Health Protection Officer/LTC (b) (6)
TF 44 MED (Force Health Protection Officer/SFC (b) (6))
421st MMB (Preventive Medicine OIC/1LT (b) (6)
421st MMB (Preventive Medicine NCO/SSG (b) (6)
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USACHPPM-EUR (MCHB-AE-EE/CPT (b) (6)

U.S. Army Center for Health Promotion and Preventive Medicine

DEPLOYMENT OCCUPATIONAL AND ENVIRONMENTAL
HEALTH RISK CHARACTERIZATION
AMBIENT AIR PARTICULATE MATTER SAMPLES
BALAD, IRAQ
6 MARCH–10 APRIL 2009
U_IRQ_BALAD_CM_A10_20090410

Preventive Medicine Survey: 40-5f1

USCHPPM

Readiness Thru Health

DEPLOYMENT OCCUPATIONAL AND ENVIRONMENTAL
HEALTH RISK CHARACTERIZATION
AMBIENT AIR PARTICULATE MATTER SAMPLES
BALAD, IRAQ
6 MARCH–10 APRIL 2009
U_IRQ_BALAD_CM_A10_20090410

1. REFERENCES.

a. Department of the Army, Field Manual (FM) 5–19, Composite Risk Management, 21 August 2006.

b. 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.

c. USACHPPM Reference Document (RD) 230, Chemical Exposure Guidelines for Deployed Military Personnel, Version 1.3, May 2003 with January 2004 addendum

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

2. PURPOSE. According to U.S. Department of Defense medical surveillance requirements, this occupational and environmental health (OEH) risk management characterization documents the identification and assessment of chemical hazards that pose potential health and operational risks to deployed troops. Specifically, the samples and information provided on the associated field data sheets were used to estimate the operational health risk associated with exposure to identified chemical hazards in the air at Balad, Iraq.

3. SCOPE. This assessment addresses the analytical results for nineteen ambient air samples collected from Balad, Iraq, 6 March–10 April 2009. These samples are limited in time, area, and media. Therefore, this report should not be considered a complete assessment of the overall OEH hazards to which troops may be exposed at this location. However, this assessment has been performed using operational risk management (ORM) doctrine FM 5–19, and the relatively conservative (protective) assumptions and methods provided in TG 230, to facilitate decision making that can minimize the likelihood of significant risks.

4. BACKGROUND AND EXPOSURE ASSUMPTIONS. The samples were collected to assess the potential for adverse health effects to troops routinely and continuously breathing the ambient air at Balad, Iraq. The samples were indicated to be obtained from the burn pit, West Postal Exchange (PX), fuel pits, H-7 living area, East PX, Passengers (PAX) Terminal, Moral Welfare and Recreation (MWR) West, Dining Facility (DFAC) number (#) 3, DFAC #4, H-6 housing courtyard, and the Provost Marshal area. All personnel are expected to remain at this

location for approximately 1 year. A conservative (protective) assumption is that all personnel inhale the ambient air for 24 hours/day for 365 days (1 year). In addition, it is assumed that control measures and/or personal protective equipment are not used.

5. METHOD.

a. General. The USACHPPM Deployment Environmental Surveillance Program uses the TG 230 methodology and associated military exposure guidelines (MEGs) to assess identified hazards and estimate risk in a manner consistent with doctrinal risk management procedures and terminology. This method includes identification of the hazard(s), assessment of the hazard severity and probability, and determination of a risk estimate and associated level of confidence. As part of the hazard identification step, the long-term (1-year) MEGs are used as screening criteria to identify those hazards that are potential health threats. These 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. Short-term MEGs are used to assess one time or intermittent exposures. The underlying toxicological basis for the MEGs is addressed in the RD 230. Since toxicological information about potential health effects varies among different chemicals, the determination of severity of effects when MEGs are exceeded involves professional judgment. Hazards with exposure concentrations greater than MEGs are identified as potential health threats, carried through the hazard assessment process, and assigned a risk estimate consistent with ORM methodology. Hazards that are either not detected or are present only at levels below the 1-year MEGs are not considered health threats and, therefore, are automatically assigned a low operational risk estimate.

b. Assessment of Ambient Air Particulate Matter. The PM is one of six air pollutants for which the U.S. Environmental Protection Agency (USEPA) has promulgated National Ambient Air Quality Standards (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 that are grouped according to the severity of health concerns. The USACHPPM uses the AQI categories to characterize the operational risk from PM. If any PM sample concentration is above the threshold of the AQI good quality air category, it is identified as a hazard. 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. 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 both healthy personnel, and those with pre-existing sensitivities. Hazard probability is based on the frequency that anticipated exposures are above a threshold that is representative of the hazard severity category.

6. HAZARD IDENTIFICATION.

a. Sample Information. Nineteen valid samples were collected with the DPS™ apparatus. One additional sample was invalid due to battery failure. (DPS™ is a registered trademark of SKC, Inc.)

b. Laboratory Analysis. The nineteen valid samples and were analyzed for PM less than or equal to 10 micrometers in diameter (PM_{10}) and metals. Detected metals identified above the laboratory reportable limit were compared to MEGs presented in TG 230, while PM_{10} concentrations were compared to the AQI. Appendix A shows a summary of the samples assessed in this report. Appendix B shows a sample results summary table. Appendix C shows complete analytical results.

c. Hazard Identification

(1) Particulate Matter. Since PM_{10} was measured at a concentration above the AQI good range, PM_{10} is identified as a potential health threat requiring further assessment. The PM air pollutants 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. The PM can include dust, silica, soil, metals, organic compounds, allergens, and compounds, such as, nitrates or sulfates that are formed by condensation or transformation of combustion exhaust. The PM chemical composition and size vary considerably depending on the source. Primary sources of PM_{10} at the specified location are assumed to be windblown dust and sand.

(2) Metals. No detected metals were found at concentrations greater than their respective MEGs. Therefore, the OEH risk estimate for exposure to metals completed in the lab analysis in the ambient air at this location is considered **low**.

7. HAZARD ASSESSMENT.

a. Hazard Severity. The average concentration of PM_{10} was 189 micrograms per cubic meter ($\mu g/m^3$). This concentration falls within the range of concentrations that are 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. 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 hazard probability reflects the likelihood that the exposures at the location are represented by the concentrations used to determine the hazard severity. 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 NAAQS of 150 µg/m³. During this sampling event, the range of PM_{10} concentrations was 64–366 µg/m^3, so 13 of 19 (68 percent) samples were above 150 µg/m^3. Since the assumption is that all or most personnel at this location are equally exposed to the ambient air, the probability that personnel will be exposed to PM_{10} concentrations above 150 µg/m^3 is considered **likely**.

c. Risk Estimate and Confidence. The hazard severity and probability levels described above were used with the ORM matrix in TG 230, Table 3–3, or FM 5–19 to provide a risk estimate for exposure to each identified hazard. Table 1 summarizes the risk estimate for each identified hazard. The risk estimate for exposure to PM_{10} in the ambient air at Balad, Iraq is considered **low**. According to TG 230, Table 3–5, confidence in the risk estimate is considered **medium**. In general, the confidence level in risk estimates is usually low to medium due to consistent lack of specific exposure information associated with troop movement and activity patterns; other routes/sources of potential OEH hazards not identified; and uncertainty regarding impacts of multiple chemicals present, particularly those affecting the same body organs/systems.

Table 1. Risk Estimate Summary for Exposure to PM_{10} in the Ambient Air at Balad, Iraq

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

8. CONCLUSION. The OEH risk estimate for exposure to PM_{10} and metals in the ambient air at Balad, Iraq is **low**. Exposure to the ambient air is expected to have little or no impact on unit readiness.

9. RECOMMENDATIONS AND NOTE.

a. Recommendations.

(1) Attempt to collect samples from this location at least once every 6 days for the deployment duration (or as long as possible) to better characterize the PM_{10} and metals ambient air concentrations to which personnel are typically exposed. Sampling on consecutives days does not represent conditions to which personnel may experience during the deployment duration.

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

b. Note. 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 that 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.

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

SAMPLING SUMMARY
AMBIENT AIR PARTICULATE MATTER SAMPLES
BALAD, IRAQ
6 MARCH–10 APRIL 2009

Sample ID	Field/Local Sample ID	Location	Start Date/Time	Exposure Notes	Sample Time	Invalid Sample	Filter ID
00000RX3	IRQ_BALAD_PM10DPS_09066-01	ANACONDA	2009/03/06 1050	Directly across from the Burn Pit by Logistics Class 8 building.	1442.0 min	No	47-08-1367
00000RX4	IRQ_BALAD_PM10DPS_09066-02	ANACONDA	2009/03/06 1145	Across West PX by Helicopter Flight line.	1440.0 min	No	47-08-1365
00000RX6	IRQ_BALAD_PM10DPS_09066-03	ANACONDA	2009/03/06 1255	Across the street from fuel pits	1440.0 min	No	47-08-1366
00000RX9	IRQ_BALAD_PM10DPS_09066-04	ANACONDA	2009/03/06 1330	On a fence line behind the H7 C pod near civilian E pod living area by a motor pool yard. Construction near sampling.	1440.0 min	No	47-08-1375
00000RXC	IRQ_BALAD_PM10DPS_09079-07	ANACONDA	2009/03/20 1023		1436.0 min	No	47-08-1396
00000RXE	IRQ_BALAD_PM10DPS_09079-02	ANACONDA	2009/03/20 0935	Hangout area for soldiers while they eat	1420.0 min	No	47-08-1398
00000RXG	IRQ_BALAD_PM10DPS_09079-03	ANACONDA	2009/03/20 1035		1401.0 min	No	47-08-1397
00000RXH	IRQ_BALAD_PM10DPS_09079-04	ANACONDA	2009/03/20 1005	Soldiers spend short periods of time traveling in and out	1414.0 min	No	47-08-1399
00000RXI	IRQ_BALAD_PM10DPS_09086-01	ANACONDA	2009/03/27 1033	Soldiers in area entering, exiting terminal area daily for short periods of time.	1440.0 min	No	47-08-1386

Deployment OEH Risk Characterization, Ambient Air PM Samples, Balad, Iraq, 6 Mar–10 Apr 09, U_IRQ_BALAD_CM_A10_20090410

Sample ID	Field/Local Sample ID	Location	Start Date/Time	Exposure Notes	Sample Time	Invalid Sample	Filter ID
00000RXK	IRQ_BALAD_PM10DPS_09086-02	ANACONDA	2009/03/27 0930	Soldiers are in daily	1445.0 min	No	47-08-1385
00000RXL	IRQ_BALAD_PM10DPS_09086-03	ANACONDA	2009/03/27 1107	Soldiers live in area and are in area regularly.	1441.0 min	No	47-08-1387
00000RXM	IRQ_BALAD_PM10DPS_09093-01	ANACONDA	2009/04/03 0944	Soldiers run on street, also eat at Taco Bell and go to clinics in area.	1454.0 min	No	47-08-1394
00000RXO	IRQ_BALAD_PM10DPS_09093-02	ANACONDA	2009/04/03 0923	Soldiers in area daily entering PX.	1492.0 min	No	47-08-1400
00000RXP	IRQ_BALAD_PM10DPS_09093-03	ANACONDA	2009/04/03 1040	Close to entrance of DFAC and Troop housing #1. This is at least 100ft away.	1359.0 min	No	47-08-1302
00000RXQ	IRQ_BALAD_PM10DPS_09093-04	ANACONDA	2009/04/03 1002	Workers in burn pit area and class I yard.	1418.0 min	No	47-08-1301
00000RXU	IRQ_BALAD_PM10DPS_09093-05	ANACONDA	2009/04/03 1200	high traffic area with MWR facilities and Greenbean	1442.0 min	No	47-08-1303
00000RXW	IRQ_BALAD_PM10DPS_09100-01	ANACONDA	2009/04/10 1034	Soldiers conduct PT on run path and visit MWR West daily	1411.0 min	No	47-08-1314
00000RY0	IRQ_BALAD_PM10DPS_09100-02	ANACONDA	2009/04/10 0926	Soldiers enter area to eat at DFAC daily, up to 3 times a day	1420.0 min	No	47-08-1311
00000RY1	IRQ_BALAD_PM10DPS_09100-03	ANACONDA	2009/04/10 0942	Alongside walk/run path near offices that soldiers are at daily.	1418.0 min	No	47-08-1312
	IRQ_BALAD_PM10DPS_09100-04	ANACONDA	2009/04/10 0956	Soldiers entering/exiting terminal daily and transient housing across street	1418.0 min	Yes	47-08-1313

APPENDIX B

SAMPLE RESULTS SUMMARY
AMBIENT AIR PARTICULATE MATTER SAMPLES
BALAD, IRAQ
6 MARCH–10 APRIL 2009

Parameter	Units	Laboratory Results		Samples (Valid)		USACHPPM TG230 Military Exposure Guidelines	
						1 year	
		Maximum	Average	#	# > RL	# > MEG	MEG
Lead	µg/m^3	1.1341	0.30005	19	8	0	12
Manganese	µg/m^3	0.14783	0.074299	19	1	0	3.4
PM 10	µg/m^3	366	189	19	19	19	50
Zinc	µg/m^3	0.45599	0.2037	19	2	0	2400

Note:
Highlighted values indicate the parameter was detected at a concentration above a MEG

APPENDIX C

DETAILED SAMPLE RESULTS
AMBIENT AIR PARTICULATE MATTER SAMPLES
BALAD, IRAQ
6 MARCH–10 APRIL 2009

			Sample ID	00000RX3	00000RX4	00000RX6	00000RX9	00000RXC	00000RXE
			Field/Local Sample ID	IRQ_BALAD_PM10DPS_09066-01	IRQ_BALAD_PM10DPS_09066-02	IRQ_BALAD_PM10DPS_09066-03	IRQ_BALAD_PM10DPS_09066-04	IRQ_BALAD_PM10DPS_09079-07	IRQ_BALAD_PM10DPS_09079-02
			Country	Iraq	Iraq	Iraq	Iraq	Iraq	Iraq
			Location	ANACONDA	ANACONDA	ANACONDA	ANACONDA	ANACONDA	ANACONDA
			Start Date	2009/03/06 1050	2009/03/06 1145	2009/03/06 1255	2009/03/06 1330	2009/03/20 1023	2009/03/20 0935
Parameter	CAS	Class	Units	Results					
Antimony	7440-36-0	Metals	µg/m^3	< 0.074568	< 0.069099	< 0.073877	< 0.070502	< 0.067283	< 0.072977
Arsenic	7440-38-2	Metals	µg/m^3	< 0.037284	< 0.034549	< 0.036939	< 0.035251	< 0.033641	< 0.036488
Beryllium	7440-41-7	Metals	µg/m^3	< 0.037284	< 0.034549	< 0.036939	< 0.035251	< 0.033641	< 0.036488
Cadmium	7440-43-9	Metals	µg/m^3	< 0.037284	< 0.034549	< 0.036939	< 0.035251	< 0.033641	< 0.036488
Chromium	7440-47-3	Metals	µg/m^3	< 0.037284	< 0.034549	< 0.036939	< 0.035251	< 0.033641	< 0.036488
Lead	7439-92-1	Metals	µg/m^3	< 0.074568	< 0.069099	< 0.073877	< 0.070502	< 0.067283	< 0.072977
Manganese	7439-96-5	Metals	µg/m^3	< 0.14914	< 0.13820	< 0.14775	< 0.14100	< 0.13457	< 0.14595
Nickel	7440-02-0	Metals	µg/m^3	< 0.037284	< 0.034549	< 0.036939	< 0.035251	< 0.033641	< 0.036488
PM 10			µg/m^3	145	64	185	71	99	115
Vanadium	7440-62-2	Metals	µg/m^3	< 0.14914	< 0.13820	< 0.14775	< 0.14100	< 0.13457	< 0.14595
Zinc	7440-66-6	Metals	µg/m^3	0.44517	< 0.34549	< 0.36939	< 0.35251	< 0.33641	< 0.36488

Deployment OEH Risk Characterization, Ambient Air PM Samples, Balad, Iraq, 6 Mar–10 Apr 09, U_IRQ_BALAD_CM_A10_20090410

			Sample ID	00000RXG	00000RXH	00000RXI	00000RXK	00000RXL	00000RXM
			Field/Local Sample ID	IRQ_BALAD_PM10DPS_09079-03	IRQ_BALAD_PM10DPS_09079-04	IRQ_BALAD_PM10DPS_09086-01	IRQ_BALAD_PM10DPS_09086-02	IRQ_BALAD_PM10DPS_09086-03	IRQ_BALAD_PM10DPS_09093-01
			Country	Iraq	Iraq	Iraq	Iraq	Iraq	Iraq
			Location	ANACONDA	ANACONDA	ANACONDA	ANACONDA	ANACONDA	ANACONDA
			Start Date	2009/03/20 1035	2009/03/20 1005	2009/03/27 1033	2009/03/27 0930	2009/03/27 1107	2009/04/03 0944
Parameter	CAS	Class	Units	Results					
Antimony	7440-36-0	Metals	µg/m^3	< 0.069299	< 0.070370	< 0.068757	< 0.072427	< 0.067050	< 0.068776
Arsenic	7440-38-2	Metals	µg/m^3	< 0.034649	< 0.035185	< 0.034378	< 0.036214	< 0.033525	< 0.034388
Beryllium	7440-41-7	Metals	µg/m^3	< 0.034649	< 0.035185	< 0.034378	< 0.036214	< 0.033525	< 0.034388
Cadmium	7440-43-9	Metals	µg/m^3	< 0.034649	< 0.035185	< 0.034378	< 0.036214	< 0.033525	< 0.034388
Chromium	7440-47-3	Metals	µg/m^3	< 0.034649	< 0.035185	< 0.034378	< 0.036214	< 0.033525	< 0.034388
Lead	7439-92-1	Metals	µg/m^3	< 0.069299	< 0.070370	0.13476	0.13327	0.077777	1.0867
Manganese	7439-96-5	Metals	µg/m^3	< 0.13860	< 0.14074	0.14783	< 0.14485	< 0.13410	< 0.13755
Nickel	7440-02-0	Metals	µg/m^3	< 0.034649	< 0.035185	< 0.034378	< 0.036214	< 0.033525	< 0.034388
PM 10			µg/m^3	173	140	366	320	220	229
Vanadium	7440-62-2	Metals	µg/m^3	< 0.13860	< 0.14074	< 0.13751	< 0.14485	< 0.13410	< 0.13755
Zinc	7440-66-6	Metals	µg/m^3	< 0.34649	0.45599	< 0.34378	< 0.36214	< 0.33525	< 0.34388

Deployment OEH Risk Characterization, Ambient Air PM Samples, Balad, Iraq, 6 Mar–10 Apr 09, U_IRQ_BALAD_CM_A10_20090410

			Sample ID	00000RXO	00000RXP	00000RXQ	00000RXU	00000RXW	00000RY0	00000RY1
			Field/Local Sample ID	IRQ_BALAD_PM10DPS_09093-02	IRQ_BALAD_PM10DPS_09093-03	IRQ_BALAD_PM10DPS_09093-04	IRQ_BALAD_PM10DPS_09093-05	IRQ_BALAD_PM10DPS_09100-01	IRQ_BALAD_PM10DPS_09100-02	IRQ_BALAD_PM10DPS_09100-03
			Country	Iraq	Iraq	Iraq	Iraq	Iraq	Iraq	Iraq
			Location	ANACONDA	ANACONDA	ANACONDA	ANACONDA	ANACONDA	ANACONDA	ANACONDA
			Start Date	2009/04/03 0923	2009/04/03 1040	2009/04/03 1002	2009/04/03 1200	2009/04/10 1034	2009/04/10 0926	2009/04/10 0942
Parameter	CAS	Class	Units	Results						
Antimony	7440-36-0	Metals	µg/m^3	< 0.067024	< 0.067508	< 0.070522	< 0.070763	< 0.070872	< 0.070423	< 0.070522
Arsenic	7440-38-2	Metals	µg/m^3	< 0.033512	< 0.033754	< 0.035261	< 0.035382	< 0.035436	< 0.035211	< 0.035261
Beryllium	7440-41-7	Metals	µg/m^3	< 0.033512	< 0.033754	< 0.035261	< 0.035382	< 0.035436	< 0.035211	< 0.035261
Cadmium	7440-43-9	Metals	µg/m^3	< 0.033512	< 0.033754	< 0.035261	< 0.035382	< 0.035436	< 0.035211	< 0.035261
Chromium	7440-47-3	Metals	µg/m^3	< 0.033512	< 0.033754	< 0.035261	< 0.035382	< 0.035436	< 0.035211	< 0.035261
Lead	7439-92-1	Metals	µg/m^3	0.98525	1.1341	0.7969	0.96238	< 0.070872	< 0.070423	< 0.070522
Manganese	7439-96-5	Metals	µg/m^3	< 0.13405	< 0.13502	< 0.14104	< 0.14153	< 0.14174	< 0.14085	< 0.14104
Nickel	7440-02-0	Metals	µg/m^3	< 0.033512	< 0.033754	< 0.035261	< 0.035382	< 0.035436	< 0.035211	< 0.035261
PM 10			µg/m^3	253	230	233	217	156	179	202
Vanadium	7440-62-2	Metals	µg/m^3	< 0.13405	< 0.13502	< 0.14104	< 0.14153	< 0.14174	< 0.14085	< 0.14104
Zinc	7440-66-6	Metals	µg/m^3	< 0.33512	< 0.33754	< 0.35261	< 0.35382	< 0.35436	< 0.35211	< 0.35261