



NAFB 2003
DEPARTMENT OF THE AIR FORCE
HEADQUARTERS 49TH FIGHTER WING (ACC)
HOLLOMAN AIR FORCE BASE, NEW MEXICO

11 AUG 2003

MEMORANDUM FOR NEW MEXICO ENVIRONMENT DEPARTMENT

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SUBJECT: Submittal of Fourth Quarter 2002 Monitoring Report, 20,000-Pound Open Detonation Unit (ODU) and Quality Assurance/Quality Control Report

1. Attached is the Fourth Quarter 2002 20,000-pound ODU Monitoring Report and the Fourth Quarter 2002 Monitoring Quality Assurance/Quality Control Report (Atchs 1 and 2, respectively).
2. The monitoring reports contain the results of soil sampling following the detonation events of 04 Oct 02. These results were compared to decision criteria specified in Attachment J of the Operating Permit. Results from these analyses show that the ODU operations are effective.
3. If you have any questions or require additional information, please contact Ms. Debbie Hartell or Mr. Darvin St. John at (505) 572-3931.

Howard E. Moffitt
HOWARD E. MOFFITT
Deputy Base Civil Engineer

Attachments:

1. Fourth Quarter 2002 Monitoring Report 20,000-Pound Open Detonation Unit
2. Fourth Quarter 2002 Monitoring Quality Assurance/Quality Control Report

cc w/Atchs:

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Virginia*

Final

*Fourth Quarter 2002 Monitoring Report
20,000-Pound Open Detonation Unit*

*Holloman Air Force Base,
New Mexico*

June 2003



*49 CES/CEV
Holloman Air Force Base,
New Mexico*

**FINAL
FOURTH QUARTER 2002 MONITORING REPORT
20,000-POUND OPEN DETONATION UNIT**

Prepared for:

Holloman Air Force Base
49 CES/CEV
550 Tabosa Avenue
Holloman AFB, New Mexico 88330

Prepared by:

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Under Contract No. DACW45-94-D-0003

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U.S. Army Corps of Engineers
Omaha District
Omaha, Nebraska

June 2003

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LIST OF ACRONYMS

AFB	Air Force Base
DQO	data quality objective
EOD	explosive ordnance disposal
EPA	United States Environmental Protection Agency
mg/kg	milligrams per kilogram
NCP	National Contingency Plan
OD	Open Detonation
QA	quality assurance
QC	quality control
RDX	Hexahydro-1,3,5-trinitro-1,3,5-triazine
USAF	United States Air Force
UTL	upper tolerance limit
Work Plan	Final Work Plan Addendum

1.0 INTRODUCTION

During the fourth quarter of 2002, Holloman Air Force Base (AFB) performed the 18th quarterly sampling event at the 20,000-Pound Open Detonation (OD) Unit in accordance with Attachment J of the operating permit Sampling and Analysis Plan (USAF, 1996). Twelve locations were sampled for metals and explosive compounds and the analytical results were compared to the decision criteria outlined on page 33 of Attachment J of the operating permit. No sample results exceeded the decision criteria, and therefore, no changes to operations at the 20,000-Pound OD Unit are recommended. The following report summarizes the field operations, analytical results, potential risk, and conclusions from the 18th quarterly sampling event.

2.0 FIELD OPERATIONS

The fourth quarter 2002 detonation event occurred on October 3, and sampling was conducted on October 4, 2002. A total of 12 soil samples and one field duplicate were collected from 3 different strata within the boundaries of the 20,000-Pound OD Unit. Field and quality assurance/quality control (QA/QC) samples were obtained following the procedures outlined in the Final Work Plan Addendum for the 20,000-Pound Open Detonation Unit (Work Plan) (Foster Wheeler, 1999). Samples were analyzed for metals and explosive compounds as specified in the Work Plan.

During the field operations, the dimensions of each stratum were measured and recorded, and a grid was developed based on these measurements. Random sampling locations were determined following the guidelines established in the Work Plan. Sample locations are listed in Table 2-1.

Samples were labeled according to the following number sequence: OD-SO-s-x, where:

OD = open detonation

SO = soil

s = stratum (A, B, or C)

x = sequential sample number within each stratum (01, 02, 03, 04)

Table 2-1. Fourth Quarter 2002 Sample Locations

Stratum: A			
Number of Samples: 4			
Number of Potential			
Sampling Locations (n): 16			
Scale Factor (n-1): 15			
Sample Number	Random Number	Scaled Random Number	Grid-to-Node Sample
1	0.773	11.6	A12
2	0.741	11.1	A11
3	0.866	13.0	A13
4	0.542	8.1	A8

Stratum: B			
Number of Samples: 4			
Number of Potential			
Sampling Locations (n): 20			
Scale Factor (n-1): 19			
Sample Number	Random Number	Scaled Random Number	Grid-to-Node Sample
1	0.954	18.1	B18
2	0.525	10.0	B10
3	0.554	10.5	B11
4	0.625	11.9	B12

Stratum: C			
Number of Samples: 4			
Number of Potential			
Sampling Locations (n): 24			
Scale Factor (n-1): 23			
Sample Number	Random Number	Scaled Random Number	Grid-to-Node Sample
1	0.537	12.3	C12
2	0.654	15.0	C15
3	0.094	2.2	C2
4	0.444	10.2	C10

The area sampled was based on wind data recorded at the time of the July 30, August 28, September 13, and October 3, 2002 detonations. The assumption was made that any small particles from the detonation events would settle downwind of the detonation location. Figure 2-1 illustrates the strata layout and the sample locations associated with the October 4, 2002 sampling event. The wind data are presented below:

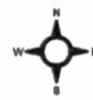
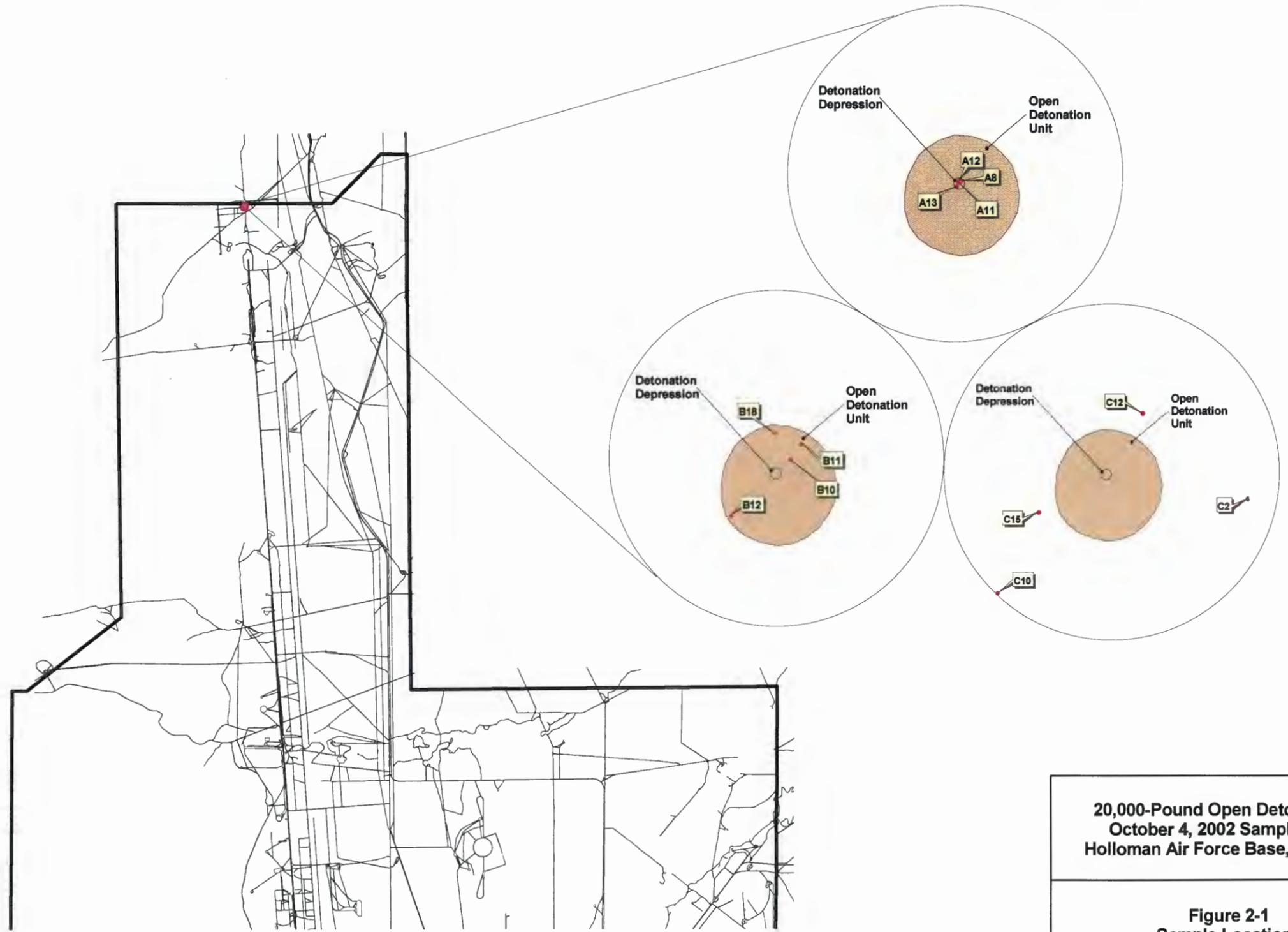
- July 30, 2002 (9:04)—wind direction 170 degrees/wind speed 12 knots
- August 28, 2002 (16:51)—wind direction 160 degrees/wind speed 13 knots
- September 13, 2002 (9:45)—wind direction 70 degrees/wind speed 4 knots
- October 3, 2002 (14:01)—wind direction 260 degrees/wind speed 30 knots

3.0 ANALYTICAL RESULTS

This section presents an evaluation of the QA/QC data associated with the analytical results for the fourth quarter 2002 monitoring event. Analytical methods for chemical analysis were taken from the latest revision of United States Environmental Protection Agency (EPA) Test Methods for Evaluating Solid Waste, SW-846, Third Edition and Updates (EPA, 1986).

3.1 QUALITY ASSURANCE/QUALITY CONTROL SUMMARY

The QC data were reviewed to determine usability and achievement of project data quality objectives (DQOs). The review focused on laboratory method blanks, matrix and control sample spikes, surrogate recoveries, and holding times. Overall, QC data associated with this sampling event indicate that project measurement data are reliable and fulfill project DQOs.



LEGEND

- Sample Locations
- Open Detonation Unit
- Streets and Roads
- Installation Boundary

**20,000-Pound Open Detonation Unit
 October 4, 2002 Sampling Event
 Holloman Air Force Base, New Mexico**

**Figure 2-1
 Sample Locations**



The explosives data (EPA SW-846 Methods 8330 and 8332) for this monitoring event are reported to the method detection limit. A “J” qualifier signifying an estimated concentration was assigned to concentrations reported below the sample-specific detection limit (also known as the method reporting limit) and above the method detection limit. Explosive compounds that were not detected are reported with a “U” qualifier accompanying the sample detection limit.

The reported metals results are uncensored; all instrument response measurements are reported as measured concentrations. A “B” qualifier was assigned to reported concentrations that were less than the sample detection limit and indicates that there is less confidence associated with the reported concentration (i.e., estimated quantitation). Metals that were not detected are reported with a “U” qualifier accompanying the sample detection limit.

3.2 RESULTS SUMMARY

Soil samples were collected and analyzed for the parameters specified in the operating permit and outlined in Table 3-1. Complete analytical results and the associated chain-of-custody record for the fourth quarter 2002 monitoring event are provided in Appendix A. This section summarizes the analytical results and provides a comparison of the sample results with the site-specific background values.

3.2.1 Explosives Results

Explosive compounds detected during this monitoring event were reported below the sample-specific detection limit (J-qualified by the laboratory). The following explosive compounds were detected:

- Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX) in four samples below the sample detection limit (OD-SO-A-02, OD-SO-A-04, OD-SO-B-03, OD-SO-C-01)
- Nitroglycerine in one sample (OD-SO-A-04) below the sample detection limit
- Nitrobenzene in one sample (OD-SO-A-02) below the sample detection limit

Table 3-1. Analytical Methods and Parameters

EPA SW-846 Method 6010B (Metals)
Antimony
Arsenic
Barium
Beryllium
Cadmium
Chromium (total)
Copper
Lead
Nickel
Selenium
Silver
EPA SW-846 Method 7471A
Mercury
EPA SW-846 Method 8330 (Explosives)
2-Amino-4,6-dinitrotoluene
4-Amino-2,6-dinitrotoluene
1,3,5-Trinitrobenzene
1,3-Dinitrobenzene
2,4,6-Trinitrotoluene
2,4-Dinitrotoluene
2,6-Dinitrotoluene
2-Nitrotoluene
3-Nitrotoluene
4-Nitrotoluene
HMX
Nitrobenzene
RDX
Tetryl
PETN
EPA SW-846 Method 8332 (Nitroamine Explosives)
Nitroglycerine

Notes:

EPA United States Environmental Protection Agency
 HMX octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine
 PETN pentaerythritol tetranitrate
 RDX hexahydro-1,3,5-trinitro-1,3,5-triazine
 Tetryl methyl-2,4,6-trinitrophenylnitramine

Table 3-2. Maximum Detected Concentrations, Frequency of Detections, and UTLs for Explosives and Metals

Constituent	Maximum Detected Concentration	Frequency of Detections	Site-Specific Background UTLs ¹
Metals	mg/kg		mg/kg
Antimony	0.44B	11/12	7.3
Arsenic	2.3	12/12	37
Barium	76.4	12/12	84
Beryllium	0.41	12/12	0.40
Cadmium	0.92	7/12	1.0
Chromium	9.0	12/12	6.6
Copper	14.3	12/12	4.8
Lead ²	11.8	12/12	na
Nickel	5.9	12/12	5.6
Silver	0.2	2/12	0.7
Explosives	µg/kg		µg/kg
Nitrobenzene	70J	1/12	NA
Nitroglycerine	3600J	1/12	NA
RDX	160J	4/12	NA

Notes:

- ¹ UTLs are taken from 20,000-Pound Open Detonation Unit Background Study and Quarterly Monitoring Work Plan, Part II—Background Study (Radian, 1997). Bolded values indicate exceedance of the site-specific background UTLs.
- ² A discussion of the lead screening level is included in Section 4.2.
- µg/kg micrograms per kilogram
mg/kg milligrams per kilogram
na Background value not available in Background Study (Radian, 1997)
B Sample value for metal constituent was detected below sample detection limit; therefore, it is an estimated value.
J Sample value for organic constituent was detected below sample detection limit; therefore, it is an estimated value.
NA Background values are not applicable to organic constituents.
RDX hexahydro-1,3,5-trinitro-1,3,5-triazine
UTL upper tolerance limit

Because no site-specific background upper tolerance limits (UTLs) exist for explosives at this site (Radian, 1997), the detected compounds were carried forward to the risk evaluation phase. The maximum detected concentrations of explosive compounds for the fourth quarter 2002 monitoring event are presented in Table 3-2. The risk evaluation is described in Section 4.0 of this report.

3.2.2 Metals Results

Metals detected for this monitoring event were reported above the sample-specific detection limit (no laboratory qualifier) and below the sample-specific detection limit, but above the method detection limit ("B" qualifier). Metals that were not detected were reported at the sample detection limit accompanied by a "U" qualifier, signifying a nondetect value. The following metals were detected:

- Antimony in 11 samples below the sample detection limit (all sample IDs except for OD-SO-B-01)
- Arsenic in 9 samples below the sample detection limit and in 3 samples above the sample detection limit (all sample IDs)
- Barium, chromium, copper, and lead in all samples above the sample detection limit (all sample IDs)
- Beryllium in 8 samples below the sample detection limit and in 4 samples above the sample detection limit (all sample IDs)
- Cadmium in 3 samples below the sample detection limit (OD-SO-A-01, OD-SO-A-04, OD-SO-C-02) and in 4 samples above the sample detection limit (OD-SO-A-02, OD-SO-C-01, -03, -04)
- Nickel in 1 sample below the sample detection limit and 11 samples above the sample detection limit (all sample IDs)
- Silver in 1 sample below the sample detection limit (OD-SO-A-02) and in 1 sample above the sample detection limit (OD-SO-C-03)

The metals analytical results were compared to the site-specific background UTLs listed in the table (Radian, 1997). The maximum detected concentrations of beryllium, chromium, copper, and nickel exceeded the UTLs. Because no UTL or toxicity values exist for lead, detections of lead were compared to the EPA Region 6 Human Health Medium-Specific Screening Levels (EPA, 2003a). The maximum detected concentrations for metals during the fourth quarter 2002 monitoring event are presented in Table 3-2.

4.0 EVALUATION OF POTENTIAL RISK

Inorganic constituents that exceeded site-specific background UTLs and all detected organic constituents were evaluated to determine whether the constituent concentrations at the 20,000-Pound OD Unit pose a potential risk to human health. This section describes the methodology

that was used for this evaluation, as well as the results of the noncarcinogenic and carcinogenic risk evaluations.

4.1 METHODOLOGY

The 20,000-Pound OD Unit is located in an isolated area of Holloman AFB. Access to the area is restricted to authorized explosive ordnance disposal (EOD) personnel working at the site during a detonation. Unauthorized entry to the site is prevented by security fences and continuous surveillance in addition to warning signs. The evaluation of potential risk was based on the amount of soil incidentally ingested by the EOD personnel in a realistic, but conservative, exposure scenario. This exposure scenario considered the frequency of detonations, the amount of time spent at the 20,000-Pound OD Unit for each detonation, and the length of time personnel would be assigned to this duty.

It was assumed that a maximum of 20 detonations would be conducted in 1 year. This is a conservative estimate because the actual number of detonations is approximately 15 per year. The site is routinely inspected on the day after detonation, and therefore it was also assumed that EOD personnel are at the 20,000-Pound OD Unit for 2 days during each detonation. Thus, 40 days per year was used as the exposure frequency in the risk assessment calculations. This estimate of exposure is still very conservative because the personnel are only onsite for a portion of the day of detonation and the day following detonation. It was therefore assumed that only half of the soil that is incidentally ingested during those 40 days is obtained at the site. Finally, the exposure scenario assumed that the same personnel attend every detonation for 5 years. Since only military personnel staff the EOD office, 5 years is a conservative estimate because military personnel are frequently reassigned to different units or duties. The exposure scenario is further defined in the Risk Evaluation Calculation Sheet in Appendix B.

The maximum detected concentrations of antimony, arsenic, barium, cadmium, and silver did not exceed the site-specific background UTLs, so these analytes were not analyzed in the risk evaluation phase (see Table 3-2). Beryllium, chromium, copper, and nickel exceeded the site-specific background UTLs; therefore, these metals were assessed in the risk evaluation phase. Given that lead does not have a background UTL or toxicity value, it was not quantitatively evaluated in the risk evaluation phase; however, a qualitative discussion is presented in Section

4.2. The only detected organic compounds were explosives (nitrobenzene, nitroglycerine, and RDX). There are no background values for these explosive compounds; therefore, they were included in the risk evaluation.

The maximum detected concentrations of beryllium, chromium, copper, nickel, nitrobenzene, nitroglycerine, and RDX (listed in Table 3-2) were used to calculate risk. It was conservatively assumed that personnel are exposed to the maximum concentration of these constituents throughout the length of the exposure scenario described above.

4.2 RESULTS OF RISK EVALUATION

Table 4-1 presents the noncancer risk (i.e., hazard quotient) and cancer risk estimates for each of the constituents that were analyzed in the risk assessment phase, as well as the hazard index (sum of the hazard quotients) and the total cancer risk. The hazard index is a conservative estimate because it assumes that the toxic effects of the different chemicals are additive.

The National Contingency Plan (NCP) risk range goal is a hazard index of less than 1.0 and a cancer risk estimate less than 1×10^{-6} (Title 40 of the Code of Federal Regulations, Part 300). Below these levels, no significant adverse effects are anticipated. At the 20,000-Pound OD Unit, all of the hazard quotients and the hazard index are well below 1.0; the hazard index is 0.00032 (see Table 4-1). The total cancer risk for the site of 7×10^{-10} is well below the NCP goal of 1×10^{-6} . The total cancer risk is solely based on the individual cancer risks for nitroglycerine and RDX, which are the only constituents classified as oral carcinogens or have carcinogenic toxicity data.

The maximum detection of lead was compared to the EPA Region 6 Human Health Medium-Specific Screening Level (EPA, 2003a) for the industrial worker exposure scenario (1,400 milligrams per kilogram [mg/kg]). Because the maximum detected concentration of 11.8 mg/kg is considerably less than 1,400 mg/kg, no risk attributed to lead exposure is anticipated at this site.

All constituents meet the decision criteria specified in Attachment J of the operating permit. All inorganic constituents were either below site-specific background levels, or the calculated site-specific risk estimates were well below the NCP goals. Lead was below the EPA Region 6

screening level. The calculated site-specific risk estimates for the three detected organic constituents (nitrobenzene, nitroglycerine, and RDX) were also well below the NCP goals. The results of the site-specific risk estimates indicate that no adverse effects are anticipated from exposure during detonation events at the 20,000-Pound OD Unit.

Table 4-1. Results of Carcinogenic and Noncarcinogenic Risk Calculations

Constituent	Non-carcinogenic Intake (mg/kg/day)	Carcinogenic Intake (mg/kg/day)	Oral RfD (mg/kg/day)	Oral RfD Source	Oral Slope Factor (mg/kg/day) ⁻¹	Oral Slope Factor Source	Hazard Quotient ¹	Cancer Risk
Metals								
Beryllium	3.2E-08	2.3E-09	0.002	IRIS	NA	NA	0.00002	NAP
Chromium ²	7.0E-07	5.0E-08	0.003	IRIS	NAP	IRIS	0.00023	NC
Copper	1.1E-06	8.0E-08	0.037	EPA R6	NAP	IRIS	0.000030	NC
Nickel	4.6E-07	3.3E-08	0.02	IRIS	NA	IRIS	0.000023	NAP
Explosives								
Nitrobenzene	5.5E-09	3.9E-10	0.0005	IRIS	NAP	IRIS	0.0000110	NAP
Nitroglycerine	2.8E-07	2.0E-08	NA	NA	0.014	EPA R9	NA	2.8E-10
RDX	1.0E-06	8.9E-08	0.003	IRIS	0.11	IRIS	0.0000042	9.8E-11
Total =							0.00032	7E-10

Notes:

- ¹ The sum of the hazard quotients is the hazard index.
- ² The toxicity value for hexavalent chromium was conservatively used.
- 1.0E-03 The designation of 1.0E-03 is equivalent to 1.0 x 10⁻³ or 0.001.
- EPA R6 EPA Region 6. Human Health Medium-Specific Screening Levels, February 2003a.
- EPA R9 EPA Region 9. Preliminary Remediation Goals, October, 2002.
- IRIS EPA Integrated Risk Information System. Online. Accessed April 24, 2003b.
- mg/kg/day milligrams per kilogram per day
- NA toxicity data not available
- NAP Not applicable; constituent is a Class "D" carcinogen through oral exposure (not known to be carcinogenic to humans).
- NC Not calculated; constituent is noncarcinogenic via oral exposure, or no toxicity data exist.
- RDX hexahydro-1,3,5-trinitro-1,3,5-triazine
- RfD reference dose

5.0 CONCLUSIONS

The results of comparing the fourth quarter 2002 monitoring data (18th quarterly event) with the decision criteria specified in Attachment J of the operating permit indicate that the treatment operations at the 20,000-Pound OD Unit are effective. A statistical analysis will be performed on the risk evaluation results from the first eight quarterly monitoring events to determine whether further quarterly monitoring at the 20,000-Pound OD Unit will be recommended.

6.0 REFERENCES

EPA (United States Environmental Protection Agency)

1986. SW-846, Test Methods for Evaluating Solid Waste, Third Edition and Updates.

2002 (October). Region 9. Preliminary Remediation Goals.

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2003b. Integrated Risk Information System. <http://www.epa.gov/iriswebp/iris/index.html>
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1999 (January). Final Work Plan Addendum for the 20,000-Pound Open Detonation Unit,
Holloman Air Force Base, New Mexico.

Radian (Radian Corporation)

1997 (December). 20,000-Pound Open Detonation Unit Background Study and
Quarterly Monitoring Work Plan. Part II—Background Study, Holloman Air Force Base,
New Mexico.

USAF (United States Air Force)

1996. Holloman Air Force Base Open Detonation Treatment Unit Permit Attachment J,
Sampling and Analysis Plan.

APPENDIX A

Analytical Data

**Holloman Air Force Base
20,000-Pound Open Detonation Unit
Fourth Quarter 2002
Analytical Sample Results**

<u>Location</u>	<u>Sample Date</u>	<u>Method</u>	<u>Parameter</u>	<u>Flag</u>	<u>Value</u>	<u>Units</u>	<u>EPA Qualifier</u>	
OD-SO-A-01	10/4/2002	ASTM_D2216	Solids, percent		84	%		
		SW6010B	Antimony	B	0.38	mg/kg		
			Arsenic	B	0.84	mg/kg		
			Barium		32.4	mg/kg		
			Beryllium	B	0.098	mg/kg		
			Cadmium	B	0.07	mg/kg		
			Chromium		2.8	mg/kg		
			Copper		2.8	mg/kg		
			Lead		2.1	mg/kg		
			Nickel		1.6	mg/kg		
			Selenium	U	0.26	mg/kg		
			Silver	U	0.038	mg/kg		
			SW7471A	Mercury	U	0.018	mg/kg	
			SW8330	1,3,5-Trinitrobenzene	U	100	ug/kg	
				1,3-Dinitrobenzene	U	100	ug/kg	
		2,4,6-Trinitrotoluene		U	100	ug/kg		
		2,4-Dinitrotoluene		U	100	ug/kg		
		2,6-Dinitrotoluene		U	100	ug/kg		
		2-Amino-4,6-Dinitrotoluene		U	100	ug/kg		
		4-Amino-2,6-Dinitrotoluene		U	100	ug/kg		
		HMX		U	200	ug/kg		
		m-Nitrotoluene		U	200	ug/kg		
		Nitrobenzene		U	100	ug/kg		
		o-Nitrotoluene		U	200	ug/kg		
		p-Nitrotoluene		U	200	ug/kg		
		Pentaerythritol Tetranitrate		U	500	ug/kg		
		RDX		U	200	ug/kg		
		Tetryl		U	200	ug/kg		
		SW8332		Nitroglycerine	U	6000	ug/kg	
		OD-SO-A-02		ASTM_D2216	Solids, percent		79	%
SW6010B	Antimony			B	0.35	mg/kg		
	Arsenic			B	0.81	mg/kg		

EPA Qualifier J = estimated detect based on QC criteria

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EPA Qualifier UJ = estimated non-detect based on QC criteria

**Holloman Air Force Base
20,000-Pound Open Detonation Unit
Fourth Quarter 2002
Analytical Sample Results**

<u>Location</u>	<u>Sample Date</u>	<u>Method</u>	<u>Parameter</u>	<u>Flag</u>	<u>Value</u>	<u>Units</u>	<u>EPA Qualifier</u>	
OD-SO-A-02	10/4/2002	SW6010B	Barium		28.2	mg/kg		
			Beryllium	B	0.067	mg/kg		
			Cadmium		0.92	mg/kg		
			Chromium		3	mg/kg		
			Copper		6.3	mg/kg		
			Lead		2.9	mg/kg		
			Nickel		1.2	mg/kg		
			Selenium	U	0.26	mg/kg		
			Silver	B	0.06	mg/kg		
			SW7471A	Mercury	U	0.019	mg/kg	
			SW8330	1,3,5-Trinitrobenzene	U	100	ug/kg	
			1,3-Dinitrobenzene	U	100	ug/kg		
			2,4,6-Trinitrotoluene	U	100	ug/kg		
		2,4-Dinitrotoluene	U	100	ug/kg			
		2,6-Dinitrotoluene	U	100	ug/kg			
		2-Amino-4,6-Dinitrotoluene	U	100	ug/kg			
		4-Amino-2,6-Dinitrotoluene	U	100	ug/kg			
		HMX	U	200	ug/kg			
		m-Nitrotoluene	U	200	ug/kg			
		Nitrobenzene	J	70	ug/kg			
		o-Nitrotoluene	U	200	ug/kg			
		p-Nitrotoluene	U	200	ug/kg			
		Pentaerythritol Tetranitrate	U	500	ug/kg			
		RDX	J	160	ug/kg	J		
		Tetryl	U	200	ug/kg			
		SW8332	Nitroglycerine	U	6300	ug/kg		
		OD-SO-A-03		ASTM_D2216	Solids, percent		74	%
SW6010B	Antimony			B	0.34	mg/kg		
Arsenic	B			0.99	mg/kg			
Barium				21.4	mg/kg			
Beryllium	B			0.033	mg/kg			
Cadmium	U			0.034	mg/kg			

EPA Qualifier J = estimated detect based on QC criteria

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EPA Qualifier UJ = estimated non-detect based on QC criteria

**Holloman Air Force Base
20,000-Pound Open Detonation Unit
Fourth Quarter 2002
Analytical Sample Results**

<u>Location</u>	<u>Sample Date</u>	<u>Method</u>	<u>Parameter</u>	<u>Flag</u>	<u>Value</u>	<u>Units</u>	<u>EPA Qualifier</u>			
OD-SO-A-03	10/4/2002	SW6010B	Chromium		1.4	mg/kg				
			Copper		0.93	mg/kg				
			Lead		0.85	mg/kg				
			Nickel	B	0.47	mg/kg				
			Selenium	U	0.29	mg/kg				
			Silver	U	0.042	mg/kg				
			SW7471A	Mercury	U	0.02	mg/kg			
			SW8330	1,3,5-Trinitrobenzene	U	100	ug/kg			
				1,3-Dinitrobenzene	U	100	ug/kg			
		2,4,6-Trinitrotoluene		U	100	ug/kg				
		2,4-Dinitrotoluene		U	100	ug/kg				
		2,6-Dinitrotoluene		U	100	ug/kg				
		2-Amino-4,6-Dinitrotoluene		U	100	ug/kg				
		4-Amino-2,6-Dinitrotoluene		U	100	ug/kg				
		HMX		U	200	ug/kg				
		m-Nitrotoluene		U	200	ug/kg				
		Nitrobenzene		U	100	ug/kg				
		o-Nitrotoluene		U	200	ug/kg				
		p-Nitrotoluene		U	200	ug/kg				
		Pentaerythritol Tetranitrate		U	500	ug/kg				
		RDX		U	200	ug/kg				
		Tetryl		U	200	ug/kg				
		SW8332		Nitroglycerine	U	6800	ug/kg			
		OD-SO-A-04			ASTM_D2216	Solids, percent		81	%	
					SW6010B	Antimony	B	0.37	mg/kg	
						Arsenic	B	1	mg/kg	
			Barium				36.9	mg/kg		
			Beryllium			B	0.12	mg/kg		
Cadmium	B		0.1			mg/kg				
Chromium			3.2			mg/kg				
Copper			3.1			mg/kg				
Lead			2			mg/kg				

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**Holloman Air Force Base
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<u>Location</u>	<u>Sample Date</u>	<u>Method</u>	<u>Parameter</u>	<u>Flag</u>	<u>Value</u>	<u>Units</u>	<u>EPA Qualifier</u>		
OD-SO-A-04	10/4/2002	SW6010B	Nickel		1.9	mg/kg			
			Selenium	U	0.26	mg/kg			
			Silver	U	0.038	mg/kg			
				SW7471A	Mercury	U	0.019	mg/kg	
				SW8330	1,3,5-Trinitrobenzene	U	100	ug/kg	
					1,3-Dinitrobenzene	U	100	ug/kg	
					2,4,6-Trinitrotoluene	U	100	ug/kg	
					2,4-Dinitrotoluene	U	100	ug/kg	
					2,6-Dinitrotoluene	U	100	ug/kg	
					2-Amino-4,6-Dinitrotoluene	U	100	ug/kg	
					4-Amino-2,6-Dinitrotoluene	U	100	ug/kg	
					HMX	U	200	ug/kg	
					m-Nitrotoluene	U	200	ug/kg	
					Nitrobenzene	U	100	ug/kg	
					o-Nitrotoluene	U	200	ug/kg	
					p-Nitrotoluene	U	200	ug/kg	
					Pentaerythritol Tetranitrate	U	500	ug/kg	
					RDX	J	130	ug/kg	J
					Tetryl	U	200	ug/kg	
				SW8332	Nitroglycerine	J	3600	ug/kg	
		OD-SO-B-01		ASTM_D2216	Solids, percent		79	%	
	SW6010B		Antimony	U	0.3	mg/kg			
			Arsenic	B	0.78	mg/kg			
			Barium		28.4	mg/kg			
			Beryllium	B	0.084	mg/kg			
			Cadmium	U	0.03	mg/kg			
			Chromium		2.6	mg/kg			
			Copper		2.2	mg/kg			
			Lead		1.8	mg/kg			
			Nickel		1.4	mg/kg			
			Selenium	U	0.26	mg/kg			
			Silver	U	0.038	mg/kg			

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EPA Qualifier UJ = estimated non-detect based on QC criteria

**Holloman Air Force Base
20,000-Pound Open Detonation Unit
Fourth Quarter 2002
Analytical Sample Results**

<u>Location</u>	<u>Sample Date</u>	<u>Method</u>	<u>Parameter</u>	<u>Flag</u>	<u>Value</u>	<u>Units</u>	<u>EPA Qualifier</u>			
OD-SO-B-01	10/4/2002	SW7471A	Mercury	U	0.019	mg/kg				
		SW8330	1,3,5-Trinitrobenzene	U	100	ug/kg				
			1,3-Dinitrobenzene	U	100	ug/kg				
			2,4,6-Trinitrotoluene	U	100	ug/kg				
			2,4-Dinitrotoluene	U	100	ug/kg				
			2,6-Dinitrotoluene	U	100	ug/kg				
			2-Amino-4,6-Dinitrotoluene	U	100	ug/kg				
			4-Amino-2,6-Dinitrotoluene	U	100	ug/kg				
			HMX	U	200	ug/kg				
			m-Nitrotoluene	U	200	ug/kg				
			Nitrobenzene	U	100	ug/kg				
			o-Nitrotoluene	U	200	ug/kg				
			p-Nitrotoluene	U	200	ug/kg				
			Pentaerythritol Tetranitrate	U	500	ug/kg				
			RDX	U	200	ug/kg				
			Tetryl	U	200	ug/kg				
				SW8332	Nitroglycerine	U	6300	ug/kg		
OD-SO-B-01D		ASTM_D2216	Solids, percent		79	%				
		SW6010B	Antimony	B	0.35	mg/kg				
			Arsenic	B	0.91	mg/kg				
			Barium		29.9	mg/kg				
			Beryllium	B	0.091	mg/kg				
			Cadmium	B	0.042	mg/kg				
			Chromium		2.8	mg/kg				
			Copper		2.4	mg/kg				
			Lead		1.4	mg/kg				
			Nickel		1.6	mg/kg				
			Selenium	U	0.25	mg/kg				
			Silver	U	0.037	mg/kg				
					SW7471A	Mercury	U	0.019	mg/kg	
					SW8330	1,3,5-Trinitrobenzene	U	100	ug/kg	
						1,3-Dinitrobenzene	U	100	ug/kg	

EPA Qualifier J = estimated detect based on QC criteria

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EPA Qualifier UJ = estimated non-detect based on QC criteria

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Analytical Sample Results**

<u>Location</u>	<u>Sample Date</u>	<u>Method</u>	<u>Parameter</u>	<u>Flag</u>	<u>Value</u>	<u>Units</u>	<u>EPA Qualifier</u>			
OD-SO-B-01D	10/4/2002	SW8330	2,4,6-Trinitrotoluene	U	100	ug/kg				
			2,4-Dinitrotoluene	U	100	ug/kg				
			2,6-Dinitrotoluene	U	100	ug/kg				
			2-Amino-4,6-Dinitrotoluene	U	100	ug/kg				
			4-Amino-2,6-Dinitrotoluene	U	100	ug/kg				
			HMX	U	200	ug/kg				
			m-Nitrotoluene	U	200	ug/kg				
			Nitrobenzene	U	100	ug/kg				
			o-Nitrotoluene	U	200	ug/kg				
			p-Nitrotoluene	U	200	ug/kg				
			Pentaerythritol Tetranitrate	U	500	ug/kg				
			RDX	U	200	ug/kg				
			Tetryl	U	200	ug/kg				
					SW8332	Nitroglycerine	U	6300	ug/kg	
OD-SO-B-02		ASTM_D2216	Solids, percent		81	%				
		SW6010B	Antimony	B	0.4	mg/kg				
			Arsenic	B	0.87	mg/kg				
			Barium		28.8	mg/kg				
			Beryllium	B	0.091	mg/kg				
			Cadmium	U	0.032	mg/kg				
			Chromium		2.4	mg/kg				
			Copper		2.7	mg/kg				
			Lead		1.3	mg/kg				
			Nickel		1.3	mg/kg				
			Selenium	U	0.27	mg/kg				
			Silver	U	0.039	mg/kg				
					SW7471A	Mercury	U	0.018	mg/kg	
					SW8330	1,3,5-Trinitrobenzene	U	100	ug/kg	
	1,3-Dinitrobenzene	U	100	ug/kg						
	2,4,6-Trinitrotoluene	U	100	ug/kg						
	2,4-Dinitrotoluene	U	100	ug/kg						
	2,6-Dinitrotoluene	U	100	ug/kg						

**Holloman Air Force Base
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Analytical Sample Results**

<u>Location</u>	<u>Sample Date</u>	<u>Method</u>	<u>Parameter</u>	<u>Flag</u>	<u>Value</u>	<u>Units</u>	<u>EPA Qualifier</u>	
OD-SO-B-02	10/4/2002	SW8330	2-Amino-4,6-Dinitrotoluene	U	100	ug/kg		
			4-Amino-2,6-Dinitrotoluene	U	100	ug/kg		
			HMX	U	200	ug/kg		
			m-Nitrotoluene	U	200	ug/kg		
			Nitrobenzene	U	100	ug/kg		
			o-Nitrotoluene	U	200	ug/kg		
			p-Nitrotoluene	U	200	ug/kg		
			Pentaerythritol Tetranitrate	U	500	ug/kg		
			RDX	U	200	ug/kg		
			Tetryl	U	200	ug/kg		
		SW8332	Nitroglycerine	U	6200	ug/kg		
OD-SO-B-03		ASTM_D2216	Solids, percent		78	%		
		SW6010B	Antimony	B	0.34	mg/kg		
			Arsenic	B	0.72	mg/kg		
			Barium		26	mg/kg		
			Beryllium	B	0.049	mg/kg		
			Cadmium	U	0.031	mg/kg		
			Chromium		1.8	mg/kg		
			Copper		2.4	mg/kg		
			Lead		0.99	mg/kg		
			Nickel		1	mg/kg		
			Selenium	U	0.26	mg/kg		
			Silver	U	0.039	mg/kg		
			SW7471A	Mercury	U	0.02	mg/kg	
			SW8330	1,3,5-Trinitrobenzene	U	100	ug/kg	
				1,3-Dinitrobenzene	U	100	ug/kg	
				2,4,6-Trinitrotoluene	U	100	ug/kg	
				2,4-Dinitrotoluene	U	100	ug/kg	
				2,6-Dinitrotoluene	U	100	ug/kg	
				2-Amino-4,6-Dinitrotoluene	U	100	ug/kg	
				4-Amino-2,6-Dinitrotoluene	U	100	ug/kg	
			HMX	U	200	ug/kg		

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OD-SO-B-03	10/4/2002	SW8330	m-Nitrotoluene	U	200	ug/kg		
			Nitrobenzene	U	100	ug/kg		
			o-Nitrotoluene	U	200	ug/kg		
			p-Nitrotoluene	U	200	ug/kg		
			Pentaerythritol Tetranitrate	U	500	ug/kg		
			RDX	J	120	ug/kg	J	
			Tetryl	U	200	ug/kg		
		SW8332	Nitroglycerine	U	6400	ug/kg		
OD-SO-B-04		ASTM_D2216	Solids, percent		79	%		
		SW6010B	Antimony	B	0.39	mg/kg		
			Arsenic	B	0.91	mg/kg		
			Barium		31.6	mg/kg		
			Beryllium	B	0.11	mg/kg		
			Cadmium	U	0.032	mg/kg		
			Chromium		2.8	mg/kg		
			Copper		2.2	mg/kg		
			Lead		1.5	mg/kg		
			Nickel		1.5	mg/kg		
			Selenium	U	0.27	mg/kg		
			Silver	U	0.04	mg/kg		
			SW7471A	Mercury	U	0.02	mg/kg	
			SW8330	1,3,5-Trinitrobenzene	U	100	ug/kg	
				1,3-Dinitrobenzene	U	100	ug/kg	
				2,4,6-Trinitrotoluene	U	100	ug/kg	
				2,4-Dinitrotoluene	U	100	ug/kg	
				2,6-Dinitrotoluene	U	100	ug/kg	
				2-Amino-4,6-Dinitrotoluene	U	100	ug/kg	
				4-Amino-2,6-Dinitrotoluene	U	100	ug/kg	
				HMX	U	200	ug/kg	
				m-Nitrotoluene	U	200	ug/kg	
				Nitrobenzene	U	100	ug/kg	
			o-Nitrotoluene	U	200	ug/kg		

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OD-SO-B-04	10/4/2002	SW8330	p-Nitrotoluene	U	200	ug/kg		
			Pentaerythritol Tetranitrate	U	500	ug/kg		
			RDX	U	200	ug/kg		
			Tetryl	U	200	ug/kg		
		SW8332	Nitroglycerine	U	6400	ug/kg		
OD-SO-C-01		ASTM_D2216	Solids, percent		86	%		
		SW6010B	Antimony	B	0.44	mg/kg		
			Arsenic		1.3	mg/kg		
			Barium		47.3	mg/kg		
			Beryllium		0.19	mg/kg		
			Cadmium		0.84	mg/kg		
			Chromium		4.8	mg/kg		
			Copper		7.1	mg/kg		
			Lead		5.4	mg/kg		
			Nickel		5.2	mg/kg		
			Selenium	U	0.22	mg/kg		
			Silver	U	0.033	mg/kg		
			SW7471A	Mercury	U	0.017	mg/kg	
			SW8330	1,3,5-Trinitrobenzene	U	100	ug/kg	
				1,3-Dinitrobenzene	U	100	ug/kg	
				2,4,6-Trinitrotoluene	U	100	ug/kg	
				2,4-Dinitrotoluene	U	100	ug/kg	
				2,6-Dinitrotoluene	U	100	ug/kg	
				2-Amino-4,6-Dinitrotoluene	U	100	ug/kg	
				4-Amino-2,6-Dinitrotoluene	U	100	ug/kg	
				HMX	U	200	ug/kg	
				m-Nitrotoluene	U	200	ug/kg	
				Nitrobenzene	U	100	ug/kg	
				o-Nitrotoluene	U	200	ug/kg	
				p-Nitrotoluene	U	200	ug/kg	
				Pentaerythritol Tetranitrate	U	500	ug/kg	
				RDX	J	99	ug/kg	J

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OD-SO-C-01	10/4/2002	SW8330	Tetryl	U	200	ug/kg			
		SW8332	Nitroglycerine	U	5800	ug/kg			
OD-SO-C-02		ASTM_D2216	Solids, percent		82	%			
		SW6010B	Antimony	B	0.32	mg/kg			
			Arsenic	B	1.4	mg/kg			
			Barium		49.8	mg/kg			
			Beryllium		0.19	mg/kg			
			Cadmium	B	0.17	mg/kg			
			Chromium		4.7	mg/kg			
			Copper		5.8	mg/kg			
			Lead		4.4	mg/kg			
			Nickel		2.9	mg/kg			
			Selenium	U	0.25	mg/kg			
			Silver	U	0.037	mg/kg			
			SW7471A	Mercury	U	0.019	mg/kg		
			SW8330	1,3,5-Trinitrobenzene	U	100	ug/kg		
				1,3-Dinitrobenzene	U	100	ug/kg		
				2,4,6-Trinitrotoluene	U	100	ug/kg		
				2,4-Dinitrotoluene	U	100	ug/kg		
				2,6-Dinitrotoluene	U	100	ug/kg		
				2-Amino-4,6-Dinitrotoluene	U	100	ug/kg		
				4-Amino-2,6-Dinitrotoluene	U	100	ug/kg		
				HMX	U	200	ug/kg		
				m-Nitrotoluene	U	200	ug/kg		
				Nitrobenzene	U	100	ug/kg		
				o-Nitrotoluene	U	200	ug/kg		
				p-Nitrotoluene	U	200	ug/kg		
				Pentaerythritol Tetranitrate	U	500	ug/kg		
				RDX	U	200	ug/kg		
				Tetryl	U	200	ug/kg		
				SW8332	Nitroglycerine	U	6100	ug/kg	
		OD-SO-C-03		ASTM_D2216	Solids, percent		89	%	

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OD-SO-C-03	10/4/2002	SW6010B	Antimony	B	0.38	mg/kg				
			Arsenic		1.9	mg/kg				
			Barium		74	mg/kg				
			Beryllium		0.38	mg/kg				
			Cadmium		0.4	mg/kg				
			Chromium		8.5	mg/kg				
			Copper		13.7	mg/kg				
			Lead		7.3	mg/kg				
			Nickel		5.5	mg/kg				
			Selenium	U	0.22	mg/kg				
			Silver		0.2	mg/kg				
			SW7471A	Mercury	U	0.017	mg/kg			
			SW8330	1,3,5-Trinitrobenzene	U	100	ug/kg			
				1,3-Dinitrobenzene	U	100	ug/kg			
				2,4,6-Trinitrotoluene	U	100	ug/kg			
		2,4-Dinitrotoluene		U	100	ug/kg				
		2,6-Dinitrotoluene		U	100	ug/kg				
		2-Amino-4,6-Dinitrotoluene		U	100	ug/kg				
		4-Amino-2,6-Dinitrotoluene		U	100	ug/kg				
		HMX		U	200	ug/kg				
		m-Nitrotoluene		U	200	ug/kg				
		Nitrobenzene		U	100	ug/kg				
		o-Nitrotoluene		U	200	ug/kg				
		p-Nitrotoluene		U	200	ug/kg				
		Pentaerythritol Tetranitrate		U	500	ug/kg				
		RDX		U	200	ug/kg				
		Tetryl		U	200	ug/kg				
		SW8332		Nitroglycerine	U	5600	ug/kg			
		OD-SO-C-04			ASTM_D2216	Solids, percent		92	%	
					SW6010B	Antimony	B	0.33	mg/kg	
			Arsenic				2.3	mg/kg		
			Barium		76.4	mg/kg				

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OD-SO-C-04	10/4/2002	SW6010B	Beryllium		0.41	mg/kg		
			Cadmium		0.71	mg/kg		
			Chromium		9	mg/kg		
			Copper		14.3	mg/kg		
			Lead		11.8	mg/kg		
			Nickel		5.9	mg/kg		
			Selenium	U	0.2	mg/kg		
			Silver	U	0.029	mg/kg		
			SW7471A	Mercury	U	0.016	mg/kg	
			SW8330	1,3,5-Trinitrobenzene	U	100	ug/kg	
			1,3-Dinitrobenzene	U	100	ug/kg		
			2,4,6-Trinitrotoluene	U	100	ug/kg		
			2,4-Dinitrotoluene	U	100	ug/kg		
		2,6-Dinitrotoluene	U	100	ug/kg			
		2-Amino-4,6-Dinitrotoluene	U	100	ug/kg			
		4-Amino-2,6-Dinitrotoluene	U	100	ug/kg			
		HMX	U	200	ug/kg			
		m-Nitrotoluene	U	200	ug/kg			
		Nitrobenzene	U	100	ug/kg			
		o-Nitrotoluene	U	200	ug/kg			
		p-Nitrotoluene	U	200	ug/kg			
		Pentaerythritol Tetranitrate	U	500	ug/kg			
		RDX	U	200	ug/kg			
		Tetryl	U	200	ug/kg			
		SW8332	Nitroglycerine	U	5400	ug/kg		

APPENDIX B

Risk Evaluation Calculation Sheet

EOD Exposure Scenario

Noncarcinogenic Risk:

$$Intake (mg / kg / d) = \frac{C \cdot EF \cdot ED \cdot \frac{IRS_a}{10^6} \cdot FC}{BW_a \cdot AT_n}$$

$$HQ = \frac{Intake}{RfD_o}$$

Carcinogenic Risk:

$$Intake (mg / kg / d) = \frac{C \cdot EF \cdot ED \cdot \frac{IRS_a}{10^6} \cdot FC}{BW_a \cdot AT_c}$$

$$CR = Intake \cdot CSF_o$$

Exposure Variables	Value	Symbol
Conversion factor (mg/kg)	10 ⁶	10 ⁶
Body weight, adult (kg)	70	BW _a
Constituent concentration in soil (mg/kg)	Constituent-specific	C
Cancer risk	Calculated	CR
Oral Slope factor [(mg/kg/d) ⁻¹]	Constituent-specific	CSF _o
Exposure duration, total (y)	5	ED
Exposure frequency (d/y)	40	EF
Fraction of soil ingested from contaminated area (unitless)	0.5	FC
Hazard quotient	Calculated	HQ
Ingestion rate of soil, adult (mg/d)	100	IRS _a
Oral Reference dose (mg/kg/d)	Constituent-specific	RfD _o
Averaging time carcinogens (d) (70 yrs × 365 days)	25550	AT _c
Averaging time noncarcinogens (d) (5 yrs × 365 days)	1825	AT _n

d = day

kg = kilograms

mg = milligrams

y = year

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Final

*Fourth Quarter 2002 Monitoring Report
Quality Assurance/Quality Control
20,000-Pound Open Detonation Unit*

*Holloman Air Force Base,
New Mexico*

June 2003



*49 CES/CEV
Holloman Air Force Base,
New Mexico*

**FINAL
FOURTH QUARTER 2002 MONITORING REPORT
QUALITY ASSURANCE/QUALITY CONTROL RESULTS
20,000-POUND OPEN DETONATION UNIT**

Prepared for:

Holloman Air Force Base
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June 2003

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LIST OF ACRONYMS

AFB	Air Force Base
DQO	data quality objective
EPA	United States Environmental Protection Agency
Foster Wheeler	Foster Wheeler Environmental Corporation
GPL	GPL Laboratories, LLLP
LCS	laboratory control sample
MDL	method detection limit
MRL	method reporting limit
MS/MSD	matrix spike/matrix spike duplicate
OD	Open Detonation
QA	quality assurance
QC	quality control
RDX	Hexahydro-1,3,5-trinitro-1,3,5-triazine
RPD	relative percent difference
USAF	United States Air Force

EXECUTIVE SUMMARY

On October 4, 2002, the 18th quarterly sampling event was conducted at the Holloman Air Force Base (AFB) 20,000-Pound Open Detonation (OD) Unit in accordance with the Holloman AFB Open Detonation Treatment Unit Sampling and Analysis Plan, Permit Attachment J (USAF, 1996). Twelve soil samples and one field duplicate sample were collected from three different strata within the boundaries of the 20,000-Pound OD Unit and analyzed for metals and explosive compounds by GPL Laboratories, LLLP (GPL), Gaithersburg, Maryland. Analytical methods for chemical analysis were taken from the latest revision of the United States Environmental Protection Agency (EPA) Test Methods for Evaluating Solid Waste, SW-846, Third Edition and Updates (EPA, 1986). These methods included:

- Metals—EPA 6010B
- Mercury—EPA 7471A
- Explosives—EPA 8330
- Nitroamine explosives—EPA 8332

Analytical results for the metals and explosives analyses are reported below the method reporting limit (MRL) and above the method detection limit (MDL). Sample concentrations reported below the MRL are identified with a “B” (metals) or a “J” (explosives) in the “Flag” data element field in the quality control (QC) and analytical data presented in Appendices A and B.

The Foster Wheeler Environmental Corporation (Foster Wheeler) project chemist reviewed the field and laboratory QC data associated with the 13 soil samples (includes field duplicate) to determine the usability and defensibility of the 18th quarterly event analytical data. Review of the QC data indicated project measurement data were reliable and fulfilled project data quality objectives (DQOs). Sampling and analysis precision and accuracy for the 18th quarterly event analytical data were acceptable, and valid conclusions may be drawn from the field sample data.

1.0 SUMMARY OF QUALITY ASSURANCE DATA EVALUATION

The laboratory QC samples associated with the 20,000-Pound OD Unit sample analyses include method blanks, laboratory control samples (LCSs), matrix spike/matrix spike duplicate (MS/MSD) samples, and laboratory duplicate samples. The method blanks were used to assess potential contamination in the laboratory, and the other types of laboratory QC samples were used to measure the analytical method precision and accuracy. A field duplicate sample and equipment rinse blank sample were also collected and analyzed to evaluate the precision associated with the field sampling and laboratory analysis and assess potential cross-contamination of equipment during sampling. The results of the laboratory and field QC data analyses are presented in Section 1.0 of this report.

The data review procedures used for the 20,000-Pound OD Unit were performed in accordance with the Holloman AFB Final Work Plan Addendum for 20,000-Pound Open Detonation Unit (Foster Wheeler, 1999) and the EPA Contract Laboratory Program National Functional Guidelines for Organic and Inorganic Data Review (EPA, 1994a; 1994b). One hundred percent of the analytical data were reviewed for the following criteria:

- Completeness of data deliverables
- Extraction and analysis holding times
- Method blank data
- LCS recovery
- MS/MSD recovery
- System monitoring compounds
- Laboratory duplicate sample
- Field duplicate sample
- Equipment rinse blank sample (explosives only this event)
- Overall data assessment and usability

The results of the data validation procedure were documented and are maintained in the project files. A summary of these results is presented in Section 2.0 of this report.

Following the data validation procedure, the appropriate validation qualifiers were appended to the project analytical database in the "EPA Qualifier" data element field. The qualifiers that may be used for the 20,000-Pound OD Unit include J, UJ, R, and B:

J—Positive value is considered to be an estimate based on associated QC data.

UJ—Nondetect value is considered to be an estimate based on associated QC data.

R—Value is considered unreliable and is unusable based on associated QC data.

B—Value is associated with method or equipment blank contamination.

Based on the QC sample data, the appropriate data qualifiers were appended to the analytical data results for the 18th quarterly sampling event. The QC data indicated the control mechanisms were effective in ensuring measurement data reliability within the expected limits of sampling and analytical error.

1.1 DATA DELIVERABLES

Data completeness is evaluated through review of the hardcopy analytical data packages in comparison with the chain-of-custody record and the electronic data file. The deliverables are reviewed for completeness to ensure that all samples submitted to the laboratory for analysis have been reported and documented. From the quality assurance (QA) review of the hardcopy data packages and the electronic data file, all project analytical documentation was determined to be complete. A data deliverable completeness objective of 100 percent was achieved.

1.2 HOLDING TIMES

Representativeness of the data is determined through review of sample extraction and analysis holding times in conjunction with review of the blank data in accordance with the EPA analytical method holding time guidelines. All extractions and analyses were performed within the holding time guidelines for the 18th quarterly sampling event.

1.3 LABORATORY METHOD BLANK SAMPLES

Laboratory method blank samples were analyzed with each batch of field samples collected for each analytical method and evaluated as part of the validation process. No detections were reported above the MRL in the method blank samples for explosives and metals for the 18th quarterly sampling event. The representativeness of the data based on method blank data results

was 100 percent for data reported above and below the MRL. Method blank data are presented in Appendix B.

1.4 LABORATORY CONTROL SAMPLES

The LCSs were analyzed with each batch of field samples for each analytical method. The LCS spike recoveries reported at concentrations above or below the method-specific control limits will result in qualification of those analytes in the associated field samples. The LCS data are used in conjunction with the MS/MSD recovery data and the system monitoring compound recoveries (explosives) to determine the accuracy of the analytical data. The LCS recoveries for metals and explosives were within the method control limits for all parameters with the exception of the hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX) LCS recovery, which was above the control limit at 107 percent. As a result, four low-level detections of RDX were J-qualified, signifying estimated data values. LCS spike recoveries indicated a high level of accuracy associated with the analytical data. LCS spike recoveries are presented in Appendix B.

1.5 MATRIX SPIKE/MATRIX SPIKE DUPLICATE SAMPLES

Laboratory MS/MSD samples were analyzed at a frequency of one per batch of field samples for the explosives methods and MS samples were analyzed at a frequency of one per batch of field samples for the metals methods. The MS/MSD sample recoveries were evaluated in conjunction with the other batch QC sample recoveries to determine the need for qualification of analytical data. The MS/MSD recoveries for explosives and the MS recoveries for metals were within the method-specific control limits, or did not result in data qualification. The MS/MSD recoveries for o-nitrotoluene and the MSD recoveries for nitroglycerine and m-nitrotoluene were above the control limit; however, there were no detections of these explosives in the field sample data. Therefore, these compounds did not require data qualification. MS/MSD recoveries indicated no matrix interference associated with the sample analyses. MS/MSD sample recoveries are presented in Appendix B.

1.6 SYSTEM MONITORING COMPOUNDS

System monitoring compounds, also known as surrogate spike compounds, are used for the explosives analyses to monitor the performance of an individual sample during extraction and

analysis. Surrogate spike recoveries were evaluated for explosives, EPA methods 8330 and 8332. Surrogate spike recoveries for both methods were within the method control limits.

1.7 LABORATORY DUPLICATE SAMPLE RESULTS

One laboratory duplicate sample was analyzed for each of the metals methods to evaluate analytical method precision. The relative percent difference (RPD) between the duplicate and the primary sample was calculated and compared to the laboratory-established method control criteria (20 percent). Based on the results of the laboratory duplicate sample, the RPDs for metals were within the 20 percent RPD criteria. The laboratory duplicate sample data indicated a high level of precision associated with the sample analyses.

1.8 FIELD DUPLICATE SAMPLE RESULTS

One field duplicate soil sample (OD-SO-B-01) was collected for the 18th quarterly sampling event and analyzed for metals and explosives. Detections of explosives and metals above the MRL in the field sample and the corresponding duplicate were within the 50 percent RPD criteria for all compounds. The field duplicate data indicated a high level of precision associated with the field sampling and laboratory analyses. Field duplicate sample results and field sample data are presented in Appendix A.

1.9 EQUIPMENT RINSE BLANK RESULTS

Equipment rinse blank samples are collected to assess cross-contamination of equipment during sampling activities. One equipment rinse blank sample was collected for explosives for the 18th quarterly sampling event. The equipment blank for metals analysis was inadvertently not collected for this event. There were no detections of explosives reported above the MRL in the equipment blank sample. Equipment rinse blank data indicated cross-contamination did not occur during sampling activities. Equipment rinse blank data are presented in Appendix A.

2.0 DATA ASSESSMENT AND USABILITY

As a result of the data validation procedure, it was determined that one percent of the analytical data for the 18th quarterly sampling event was qualified as estimated; however, these data are still usable to achieve the project DQOs. The percent of J- and UJ-qualified data is based on the number of estimated analytical values (4) compared to the total number of analytical field sample values (336) for the event. Review of the QC data associated with the field sample data indicates

all analytical data for the 20,000-Pound OD Unit 18th quarterly sampling event are valid and fulfill project DQOs. Analytical data are usable to determine that operation of the 20,000-Pound OD Unit is not imposing environmental impact to soils above risk-based cleanup levels. A data completeness objective of 100 percent was achieved for the 18th quarterly sampling event.

3.0 REFERENCES

EPA (United States Environmental Protection Agency)

1986. SW-846, Test Methods for Evaluating Solid Waste, Third Edition and Updates.

1994a. Contract Laboratory Program National Functional Guidelines for Organic Data Review. EPA 540/R-94/012.

1994b. Contract Laboratory Program National Functional Guidelines for Inorganic Data Review. EPA 540/R-94/013.

Foster Wheeler (Foster Wheeler Environmental Corporation)

1999. Holloman Air Force Base Final Work Plan Addendum for 20,000-Pound Open Detonation Unit.

USAF (United States Air Force)

1996. Holloman Air Force Base Open Detonation Treatment Unit Permit Attachment J, Sampling and Analysis Plan.

APPENDIX A

Analytical Data

**Holloman Air Force Base
20,000-Pound Open Detonation Unit
Fourth Quarter 2002
Analytical Sample Results**

<u>Location</u>	<u>Sample Date</u>	<u>Method</u>	<u>Parameter</u>	<u>Flag</u>	<u>Value</u>	<u>Units</u>	<u>EPA Qualifier</u>
OD-SO-A-01	10/4/2002	ASTM_D2216	Solids, percent		84	%	
		SW6010B	Antimony	B	0.38	mg/kg	
			Arsenic	B	0.84	mg/kg	
			Barium		32.4	mg/kg	
			Beryllium	B	0.098	mg/kg	
			Cadmium	B	0.07	mg/kg	
			Chromium		2.8	mg/kg	
			Copper		2.8	mg/kg	
			Lead		2.1	mg/kg	
			Nickel		1.6	mg/kg	
			Selenium	U	0.26	mg/kg	
			Silver	U	0.038	mg/kg	
		SW7471A	Mercury	U	0.018	mg/kg	
		SW8330	1,3,5-Trinitrobenzene	U	100	ug/kg	
			1,3-Dinitrobenzene	U	100	ug/kg	
			2,4,6-Trinitrotoluene	U	100	ug/kg	
			2,4-Dinitrotoluene	U	100	ug/kg	
			2,6-Dinitrotoluene	U	100	ug/kg	
			2-Amino-4,6-Dinitrotoluene	U	100	ug/kg	
			4-Amino-2,6-Dinitrotoluene	U	100	ug/kg	
			HMX	U	200	ug/kg	
			m-Nitrotoluene	U	200	ug/kg	
			Nitrobenzene	U	100	ug/kg	
			o-Nitrotoluene	U	200	ug/kg	
			p-Nitrotoluene	U	200	ug/kg	
			Pentaerythritol Tetranitrate	U	500	ug/kg	
			RDX	U	200	ug/kg	
			Tetryl	U	200	ug/kg	
		SW8332	Nitroglycerine	U	6000	ug/kg	
OD-SO-A-02		ASTM_D2216	Solids, percent		79	%	
		SW6010B	Antimony	B	0.35	mg/kg	
			Arsenic	B	0.81	mg/kg	

EPA Qualifier J = estimated detect based on QC criteria

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EPA Qualifier UJ = estimated non-detect based on QC criteria

**Holloman Air Force Base
20,000-Pound Open Detonation Unit
Fourth Quarter 2002
Analytical Sample Results**

<u>Location</u>	<u>Sample Date</u>	<u>Method</u>	<u>Parameter</u>	<u>Flag</u>	<u>Value</u>	<u>Units</u>	<u>EPA Qualifier</u>			
OD-SO-A-02	10/4/2002	SW6010B	Barium		28.2	mg/kg				
			Beryllium	B	0.067	mg/kg				
			Cadmium		0.92	mg/kg				
			Chromium		3	mg/kg				
			Copper		6.3	mg/kg				
			Lead		2.9	mg/kg				
			Nickel		1.2	mg/kg				
			Selenium	U	0.26	mg/kg				
			Silver	B	0.06	mg/kg				
			Mercury	U	0.019	mg/kg				
		SW7471A	1,3,5-Trinitrobenzene	U	100	ug/kg				
			1,3-Dinitrobenzene	U	100	ug/kg				
			2,4,6-Trinitrotoluene	U	100	ug/kg				
			2,4-Dinitrotoluene	U	100	ug/kg				
			2,6-Dinitrotoluene	U	100	ug/kg				
			2-Amino-4,6-Dinitrotoluene	U	100	ug/kg				
			4-Amino-2,6-Dinitrotoluene	U	100	ug/kg				
			HMX	U	200	ug/kg				
			m-Nitrotoluene	U	200	ug/kg				
			Nitrobenzene	J	70	ug/kg				
		SW8330	o-Nitrotoluene	U	200	ug/kg				
			p-Nitrotoluene	U	200	ug/kg				
			Pentaerythritol Tetranitrate	U	500	ug/kg				
			RDX	J	160	ug/kg	J			
			Tetryl	U	200	ug/kg				
			Nitroglycerine	U	6300	ug/kg				
			OD-SO-A-03		ASTM_D2216	Solids, percent		74	%	
					SW6010B	Antimony	B	0.34	mg/kg	
						Arsenic	B	0.99	mg/kg	
						Barium		21.4	mg/kg	
		Beryllium				B	0.033	mg/kg		
		Cadmium	U	0.034	mg/kg					

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EPA Qualifier UJ = estimated non-detect based on QC criteria

**Holloman Air Force Base
20,000-Pound Open Detonation Unit
Fourth Quarter 2002
Analytical Sample Results**

<u>Location</u>	<u>Sample Date</u>	<u>Method</u>	<u>Parameter</u>	<u>Flag</u>	<u>Value</u>	<u>Units</u>	<u>EPA Qualifier</u>		
OD-SO-A-03	10/4/2002	SW6010B	Chromium		1.4	mg/kg			
			Copper		0.93	mg/kg			
			Lead		0.85	mg/kg			
					Nickel	B	0.47	mg/kg	
					Selenium	U	0.29	mg/kg	
					Silver	U	0.042	mg/kg	
				SW7471A	Mercury	U	0.02	mg/kg	
				SW8330	1,3,5-Trinitrobenzene	U	100	ug/kg	
			1,3-Dinitrobenzene		U	100	ug/kg		
			2,4,6-Trinitrotoluene		U	100	ug/kg		
			2,4-Dinitrotoluene		U	100	ug/kg		
			2,6-Dinitrotoluene		U	100	ug/kg		
			2-Amino-4,6-Dinitrotoluene		U	100	ug/kg		
			4-Amino-2,6-Dinitrotoluene		U	100	ug/kg		
			HMX		U	200	ug/kg		
			m-Nitrotoluene		U	200	ug/kg		
			Nitrobenzene		U	100	ug/kg		
			o-Nitrotoluene		U	200	ug/kg		
			p-Nitrotoluene		U	200	ug/kg		
			Pentaerythritol Tetranitrate		U	500	ug/kg		
			RDX		U	200	ug/kg		
			Tetryl		U	200	ug/kg		
					SW8332	Nitroglycerine	U	6800	ug/kg
OD-SO-A-04		ASTM_D2216	Solids, percent			81	%		
		SW6010B	Antimony	B	0.37	mg/kg			
			Arsenic	B	1	mg/kg			
			Barium		36.9	mg/kg			
			Beryllium	B	0.12	mg/kg			
			Cadmium	B	0.1	mg/kg			
			Chromium		3.2	mg/kg			
			Copper		3.1	mg/kg			
			Lead		2	mg/kg			

EPA Qualifier J = estimated detect based on QC criteria

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**Holloman Air Force Base
20,000-Pound Open Detonation Unit
Fourth Quarter 2002
Analytical Sample Results**

<u>Location</u>	<u>Sample Date</u>	<u>Method</u>	<u>Parameter</u>	<u>Flag</u>	<u>Value</u>	<u>Units</u>	<u>EPA Qualifier</u>		
OD-SO-A-04	10/4/2002	SW6010B	Nickel		1.9	mg/kg			
			Selenium	U	0.26	mg/kg			
			Silver	U	0.038	mg/kg			
				SW7471A	Mercury	U	0.019	mg/kg	
				SW8330	1,3,5-Trinitrobenzene	U	100	ug/kg	
					1,3-Dinitrobenzene	U	100	ug/kg	
					2,4,6-Trinitrotoluene	U	100	ug/kg	
					2,4-Dinitrotoluene	U	100	ug/kg	
					2,6-Dinitrotoluene	U	100	ug/kg	
					2-Amino-4,6-Dinitrotoluene	U	100	ug/kg	
					4-Amino-2,6-Dinitrotoluene	U	100	ug/kg	
					HMX	U	200	ug/kg	
					m-Nitrotoluene	U	200	ug/kg	
					Nitrobenzene	U	100	ug/kg	
					o-Nitrotoluene	U	200	ug/kg	
					p-Nitrotoluene	U	200	ug/kg	
					Pentaerythritol Tetranitrate	U	500	ug/kg	
					RDX	J	130	ug/kg	J
					Tetryl	U	200	ug/kg	
				SW8332	Nitroglycerine	J	3600	ug/kg	
OD-SO-B-01		ASTM_D2216	Solids, percent		79	%			
		SW6010B	Antimony	U	0.3	mg/kg			
			Arsenic	B	0.78	mg/kg			
			Barium		28.4	mg/kg			
			Beryllium	B	0.084	mg/kg			
			Cadmium	U	0.03	mg/kg			
			Chromium		2.6	mg/kg			
			Copper		2.2	mg/kg			
			Lead		1.8	mg/kg			
			Nickel		1.4	mg/kg			
			Selenium	U	0.26	mg/kg			
			Silver	U	0.038	mg/kg			

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OD-SO-B-01	10/4/2002	SW7471A	Mercury	U	0.019	mg/kg			
		SW8330	1,3,5-Trinitrobenzene	U	100	ug/kg			
			1,3-Dinitrobenzene	U	100	ug/kg			
			2,4,6-Trinitrotoluene	U	100	ug/kg			
			2,4-Dinitrotoluene	U	100	ug/kg			
			2,6-Dinitrotoluene	U	100	ug/kg			
			2-Amino-4,6-Dinitrotoluene	U	100	ug/kg			
			4-Amino-2,6-Dinitrotoluene	U	100	ug/kg			
			HMX	U	200	ug/kg			
			m-Nitrotoluene	U	200	ug/kg			
			Nitrobenzene	U	100	ug/kg			
			o-Nitrotoluene	U	200	ug/kg			
			p-Nitrotoluene	U	200	ug/kg			
			Pentaerythritol Tetranitrate	U	500	ug/kg			
			RDX	U	200	ug/kg			
			Tetryl	U	200	ug/kg			
			SW8332	Nitroglycerine	U	6300	ug/kg		
		OD-SO-B-01D		ASTM_D2216	Solids, percent		79	%	
				SW6010B	Antimony	B	0.35	mg/kg	
					Arsenic	B	0.91	mg/kg	
	Barium				29.9	mg/kg			
	Beryllium			B	0.091	mg/kg			
	Cadmium			B	0.042	mg/kg			
	Chromium				2.8	mg/kg			
	Copper				2.4	mg/kg			
	Lead				1.4	mg/kg			
	Nickel				1.6	mg/kg			
	Selenium			U	0.25	mg/kg			
	Silver			U	0.037	mg/kg			
	SW7471A			Mercury	U	0.019	mg/kg		
	SW8330	1,3,5-Trinitrobenzene	U	100	ug/kg				
		1,3-Dinitrobenzene	U	100	ug/kg				

EPA Qualifier J = estimated detect based on QC criteria

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OD-SO-B-01D	10/4/2002	SW8330	2,4,6-Trinitrotoluene	U	100	ug/kg		
			2,4-Dinitrotoluene	U	100	ug/kg		
			2,6-Dinitrotoluene	U	100	ug/kg		
			2-Amino-4,6-Dinitrotoluene	U	100	ug/kg		
			4-Amino-2,6-Dinitrotoluene	U	100	ug/kg		
			HMX	U	200	ug/kg		
			m-Nitrotoluene	U	200	ug/kg		
			Nitrobenzene	U	100	ug/kg		
			o-Nitrotoluene	U	200	ug/kg		
			p-Nitrotoluene	U	200	ug/kg		
			Pentaerythritol Tetranitrate	U	500	ug/kg		
			RDX	U	200	ug/kg		
			Tetryl	U	200	ug/kg		
				SW8332	Nitroglycerine	U	6300	ug/kg
OD-SO-B-02		ASTM_D2216	Solids, percent		81	%		
		SW6010B	Antimony	B	0.4	mg/kg		
			Arsenic	B	0.87	mg/kg		
			Barium		28.8	mg/kg		
			Beryllium	B	0.091	mg/kg		
			Cadmium	U	0.032	mg/kg		
			Chromium		2.4	mg/kg		
			Copper		2.7	mg/kg		
			Lead		1.3	mg/kg		
			Nickel		1.3	mg/kg		
			Selenium	U	0.27	mg/kg		
			Silver	U	0.039	mg/kg		
			SW7471A	Mercury	U	0.018	mg/kg	
			SW8330	1,3,5-Trinitrobenzene	U	100	ug/kg	
	1,3-Dinitrobenzene	U	100	ug/kg				
	2,4,6-Trinitrotoluene	U	100	ug/kg				
	2,4-Dinitrotoluene	U	100	ug/kg				
	2,6-Dinitrotoluene	U	100	ug/kg				

EPA Qualifier J = estimated detect based on QC criteria

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EPA Qualifier UJ = estimated non-detect based on QC criteria

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OD-SO-B-02	10/4/2002	SW8330	2-Amino-4,6-Dinitrotoluene	U	100	ug/kg				
			4-Amino-2,6-Dinitrotoluene	U	100	ug/kg				
			HMX	U	200	ug/kg				
			m-Nitrotoluene	U	200	ug/kg				
			Nitrobenzene	U	100	ug/kg				
			o-Nitrotoluene	U	200	ug/kg				
			p-Nitrotoluene	U	200	ug/kg				
			Pentaerythritol Tetranitrate	U	500	ug/kg				
			RDX	U	200	ug/kg				
			Tetryl	U	200	ug/kg				
			SW8332	Nitroglycerine	U	6200	ug/kg			
			OD-SO-B-03		ASTM_D2216	Solids, percent		78	%	
					SW6010B	Antimony	B	0.34	mg/kg	
Arsenic	B	0.72				mg/kg				
Barium		26				mg/kg				
Beryllium	B	0.049				mg/kg				
Cadmium	U	0.031				mg/kg				
Chromium		1.8				mg/kg				
Copper		2.4				mg/kg				
Lead		0.99				mg/kg				
Nickel		1				mg/kg				
Selenium	U	0.26				mg/kg				
Silver	U	0.039				mg/kg				
SW7471A	Mercury	U				0.02	mg/kg			
SW8330	1,3,5-Trinitrobenzene	U				100	ug/kg			
	1,3-Dinitrobenzene	U			100	ug/kg				
	2,4,6-Trinitrotoluene	U			100	ug/kg				
	2,4-Dinitrotoluene	U			100	ug/kg				
	2,6-Dinitrotoluene	U			100	ug/kg				
	2-Amino-4,6-Dinitrotoluene	U			100	ug/kg				
	4-Amino-2,6-Dinitrotoluene	U			100	ug/kg				
HMX	U	200	ug/kg							

**Holloman Air Force Base
20,000-Pound Open Detonation Unit
Fourth Quarter 2002
Analytical Sample Results**

<u>Location</u>	<u>Sample Date</u>	<u>Method</u>	<u>Parameter</u>	<u>Flag</u>	<u>Value</u>	<u>Units</u>	<u>EPA Qualifier</u>	
OD-SO-B-03	10/4/2002	SW8330	m-Nitrotoluene	U	200	ug/kg		
			Nitrobenzene	U	100	ug/kg		
			o-Nitrotoluene	U	200	ug/kg		
			p-Nitrotoluene	U	200	ug/kg		
			Pentaerythritol Tetranitrate	U	500	ug/kg		
			RDX	J	120	ug/kg	J	
			Tetryl	U	200	ug/kg		
		SW8332	Nitroglycerine	U	6400	ug/kg		
OD-SO-B-04		ASTM_D2216	Solids, percent		79	%		
		SW6010B	Antimony	B	0.39	mg/kg		
			Arsenic	B	0.91	mg/kg		
			Barium		31.6	mg/kg		
			Beryllium	B	0.11	mg/kg		
			Cadmium	U	0.032	mg/kg		
			Chromium		2.8	mg/kg		
			Copper		2.2	mg/kg		
			Lead		1.5	mg/kg		
			Nickel		1.5	mg/kg		
			Selenium	U	0.27	mg/kg		
			Silver	U	0.04	mg/kg		
			SW7471A	Mercury	U	0.02	mg/kg	
			SW8330	1,3,5-Trinitrobenzene	U	100	ug/kg	
				1,3-Dinitrobenzene	U	100	ug/kg	
				2,4,6-Trinitrotoluene	U	100	ug/kg	
				2,4-Dinitrotoluene	U	100	ug/kg	
				2,6-Dinitrotoluene	U	100	ug/kg	
				2-Amino-4,6-Dinitrotoluene	U	100	ug/kg	
				4-Amino-2,6-Dinitrotoluene	U	100	ug/kg	
				HMX	U	200	ug/kg	
			m-Nitrotoluene	U	200	ug/kg		
			Nitrobenzene	U	100	ug/kg		
			o-Nitrotoluene	U	200	ug/kg		

EPA Qualifier J = estimated detect based on QC criteria

EPA Qualifier UJ = estimated non-detect based on QC criteria

**Holloman Air Force Base
20,000-Pound Open Detonation Unit
Fourth Quarter 2002
Analytical Sample Results**

<u>Location</u>	<u>Sample Date</u>	<u>Method</u>	<u>Parameter</u>	<u>Flag</u>	<u>Value</u>	<u>Units</u>	<u>EPA Qualifier</u>	
OD-SO-B-04	10/4/2002	SW8330	p-Nitrotoluene	U	200	ug/kg		
			Pentaerythritol Tetranitrate	U	500	ug/kg		
			RDX	U	200	ug/kg		
			Tetryl	U	200	ug/kg		
		SW8332	Nitroglycerine	U	6400	ug/kg		
OD-SO-C-01		ASTM_D2216	Solids, percent		86	%		
		SW6010B	Antimony	B	0.44	mg/kg		
			Arsenic		1.3	mg/kg		
			Barium		47.3	mg/kg		
			Beryllium		0.19	mg/kg		
			Cadmium		0.84	mg/kg		
			Chromium		4.8	mg/kg		
			Copper		7.1	mg/kg		
			Lead		5.4	mg/kg		
			Nickel		5.2	mg/kg		
			Selenium	U	0.22	mg/kg		
			Silver	U	0.033	mg/kg		
			SW7471A	Mercury	U	0.017	mg/kg	
			SW8330	1,3,5-Trinitrobenzene	U	100	ug/kg	
				1,3-Dinitrobenzene	U	100	ug/kg	
				2,4,6-Trinitrotoluene	U	100	ug/kg	
				2,4-Dinitrotoluene	U	100	ug/kg	
				2,6-Dinitrotoluene	U	100	ug/kg	
				2-Amino-4,6-Dinitrotoluene	U	100	ug/kg	
				4-Amino-2,6-Dinitrotoluene	U	100	ug/kg	
				HMX	U	200	ug/kg	
				m-Nitrotoluene	U	200	ug/kg	
				Nitrobenzene	U	100	ug/kg	
				o-Nitrotoluene	U	200	ug/kg	
				p-Nitrotoluene	U	200	ug/kg	
				Pentaerythritol Tetranitrate	U	500	ug/kg	
				RDX	J	99	ug/kg	J

EPA Qualifier J = estimated detect based on QC criteria

EPA Qualifier UJ = estimated non-detect based on QC criteria

**Holloman Air Force Base
20,000-Pound Open Detonation Unit
Fourth Quarter 2002
Analytical Sample Results**

<u>Location</u>	<u>Sample Date</u>	<u>Method</u>	<u>Parameter</u>	<u>Flag</u>	<u>Value</u>	<u>Units</u>	<u>EPA Qualifier</u>		
OD-SO-C-01	10/4/2002	SW8330	Tetryl	U	200	ug/kg			
		SW8332	Nitroglycerine	U	5800	ug/kg			
OD-SO-C-02		ASTM_D2216	Solids, percent		82	%			
		SW6010B	Antimony	B	0.32	mg/kg			
			Arsenic	B	1.4	mg/kg			
			Barium		49.8	mg/kg			
			Beryllium		0.19	mg/kg			
			Cadmium	B	0.17	mg/kg			
			Chromium		4.7	mg/kg			
			Copper		5.8	mg/kg			
			Lead		4.4	mg/kg			
			Nickel		2.9	mg/kg			
			Selenium	U	0.25	mg/kg			
			Silver	U	0.037	mg/kg			
			SW7471A	Mercury	U	0.019	mg/kg		
			SW8330	1,3,5-Trinitrobenzene	U	100	ug/kg		
				1,3-Dinitrobenzene	U	100	ug/kg		
				2,4,6-Trinitrotoluene	U	100	ug/kg		
				2,4-Dinitrotoluene	U	100	ug/kg		
				2,6-Dinitrotoluene	U	100	ug/kg		
				2-Amino-4,6-Dinitrotoluene	U	100	ug/kg		
				4-Amino-2,6-Dinitrotoluene	U	100	ug/kg		
		HMX		U	200	ug/kg			
		m-Nitrotoluene		U	200	ug/kg			
		Nitrobenzene		U	100	ug/kg			
		o-Nitrotoluene	U	200	ug/kg				
		p-Nitrotoluene	U	200	ug/kg				
		Pentaerythritol Tetranitrate	U	500	ug/kg				
		RDX	U	200	ug/kg				
		Tetryl	U	200	ug/kg				
		SW8332	Nitroglycerine	U	6100	ug/kg			
		OD-SO-C-03		ASTM_D2216	Solids, percent		89	%	

EPA Qualifier J = estimated detect based on QC criteria

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EPA Qualifier UJ = estimated non-detect based on QC criteria

**Holloman Air Force Base
20,000-Pound Open Detonation Unit
Fourth Quarter 2002
Analytical Sample Results**

<u>Location</u>	<u>Sample Date</u>	<u>Method</u>	<u>Parameter</u>	<u>Flag</u>	<u>Value</u>	<u>Units</u>	<u>EPA Qualifier</u>		
OD-SO-C-03	10/4/2002	SW6010B	Antimony	B	0.38	mg/kg			
			Arsenic		1.9	mg/kg			
			Barium		74	mg/kg			
			Beryllium		0.38	mg/kg			
			Cadmium		0.4	mg/kg			
			Chromium		8.5	mg/kg			
			Copper		13.7	mg/kg			
			Lead		7.3	mg/kg			
			Nickel		5.5	mg/kg			
			Selenium	U	0.22	mg/kg			
		Silver		0.2	mg/kg				
		SW7471A	Mercury	U	0.017	mg/kg			
		SW8330	1,3,5-Trinitrobenzene	U	100	ug/kg			
			1,3-Dinitrobenzene	U	100	ug/kg			
			2,4,6-Trinitrotoluene	U	100	ug/kg			
			2,4-Dinitrotoluene	U	100	ug/kg			
			2,6-Dinitrotoluene	U	100	ug/kg			
			2-Amino-4,6-Dinitrotoluene	U	100	ug/kg			
			4-Amino-2,6-Dinitrotoluene	U	100	ug/kg			
			HMX	U	200	ug/kg			
			m-Nitrotoluene	U	200	ug/kg			
			Nitrobenzene	U	100	ug/kg			
			o-Nitrotoluene	U	200	ug/kg			
			p-Nitrotoluene	U	200	ug/kg			
			Pentaerythritol Tetranitrate	U	500	ug/kg			
			RDX	U	200	ug/kg			
			Tetryl	U	200	ug/kg			
			SW8332	Nitroglycerine	U	5600	ug/kg		
		OD-SO-C-04		ASTM_D2216	Solids, percent		92	%	
				SW6010B	Antimony	B	0.33	mg/kg	
					Arsenic		2.3	mg/kg	
			Barium		76.4	mg/kg			

**Holloman Air Force Base
20,000-Pound Open Detonation Unit
Fourth Quarter 2002
Analytical Sample Results**

<u>Location</u>	<u>Sample Date</u>	<u>Method</u>	<u>Parameter</u>	<u>Flag</u>	<u>Value</u>	<u>Units</u>	<u>EPA Qualifier</u>
OD-SO-C-04	10/4/2002	SW6010B	Beryllium		0.41	mg/kg	
			Cadmium		0.71	mg/kg	
			Chromium		9	mg/kg	
			Copper		14.3	mg/kg	
			Lead		11.8	mg/kg	
			Nickel		5.9	mg/kg	
			Selenium	U	0.2	mg/kg	
			Silver	U	0.029	mg/kg	
			Mercury	U	0.016	mg/kg	
		SW8330	1,3,5-Trinitrobenzene	U	100	ug/kg	
			1,3-Dinitrobenzene	U	100	ug/kg	
			2,4,6-Trinitrotoluene	U	100	ug/kg	
			2,4-Dinitrotoluene	U	100	ug/kg	
			2,6-Dinitrotoluene	U	100	ug/kg	
			2-Amino-4,6-Dinitrotoluene	U	100	ug/kg	
			4-Amino-2,6-Dinitrotoluene	U	100	ug/kg	
			HMX	U	200	ug/kg	
			m-Nitrotoluene	U	200	ug/kg	
			Nitrobenzene	U	100	ug/kg	
			o-Nitrotoluene	U	200	ug/kg	
		p-Nitrotoluene	U	200	ug/kg		
		SW8332	Pentaerythritol Tetranitrate	U	500	ug/kg	
			RDX	U	200	ug/kg	
			Tetryl	U	200	ug/kg	
			Nitroglycerine	U	5400	ug/kg	

APPENDIX B
Quality Control Data

Analytical Report For 210076

for

Foster Wheeler Environmental Corp.

Project Manager : Pam Moss

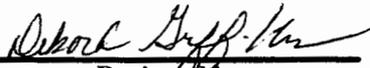
Project Name : Holliman AFB 20000 lb

November 4, 2002

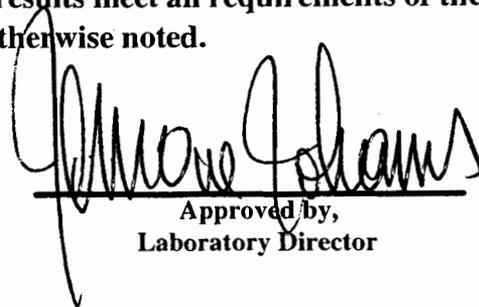
GPL

Laboratories

GPL Laboratories, LLLP Certifies that the test results meet all requirements of the NELAC Standards unless otherwise noted.



Reviewed by,
Project Manager



Approved by,
Laboratory Director

202 Perry Parkway Gaithersburg, MD 20877 Phone (301) 926-6802 Fax: (301) 840-1209
www.gplab.com

TOTAL # OF PAGES : 91

0 1

CASE NARRATIVE

CLIENT: FOSTER WHEELER ENVIRONMENTAL CORP
PROJECT/SITE: HOLLIMAN AFB 2000 LB
WORK ORDER(S): 210076
REVIEW DATE: 11/4/02

The Case Narrative, Chain of Custody, Sample Receipt Checklist, Methods of Analysis Checklist and the cover page of the Sample Analysis Report, are integral parts of GPL Laboratories' report package. If you did not receive all of these documents, please contact GPL immediately.

Sample Receipt

Fourteen soil samples were received on 10/08/2002. The samples were delivered by Federal Express. The samples were received intact. Sample receipt conditions and temperatures are documented on the Sample Receipt Checklist.

Sample Analysis

Samples were prepared and analyzed by GPL using the analytical methodologies indicated on the Methods of Analysis Checklist. In some chromatographic analyses, manual integration is used instead of automated integration because it produces more accurate results. All manual integrations are denoted on the sample quantitation report as "m".

Explosives/HPLC

1. One water and thirteen soil samples were extracted and analyzed for explosive compounds using SW846 method 8330.
2. Matrix spike and matrix spike duplicate analyses were performed on sample OD-SO-B-01D. Percent recoveries of 2-Nitrotoluene in the MS and MSD and 3-Nitrotoluene in the MSD were slightly above the control limits. All other target analyte recoveries were within control limits.
3. Matrix spike and matrix spike duplicate analyses were not performed for the water sample due to lack of extra sample volume.
4. A laboratory control sample was extracted and analyzed along with each of the sample matrix. Percent recoveries of 2-Nitrotoluene and RDX were slightly above control limits in soil BKS57241 and 2,4-DNT and 1,3,5-TNB were also below the limits in the water BKS57161. All other target analyte recoveries were within control limits for both sample matrixes.
5. Explosive compounds 2,4-DNT and 2,6-DNT co-elute on the primary column and the confirmation column. The mixture of 2,4-DNT and 2,6-DNT in the LCS and MS/MSD samples is quantitated and reported as 2,4-DNT. A peak detected in the retention time window of 2,4-DNT and 2,6-DNT on both columns will be reported as an isomeric pair in samples under the results for 2,4-DNT.
6. Manual integration was performed on some data files, when automatic integration provided by the software was inappropriate. Some forms were "hand" corrected due to software limitations.

PETN

1. One water and thirteen soil samples were extracted and analyzed for PETN using modified SW846 method 8330.

CASE NARRATIVE

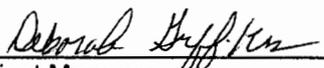
2. Matrix spike and matrix spike duplicate analyses were performed on sample OD-SO-B-01D. The percent recoveries were within control limits.
3. Matrix spike and matrix spike duplicate analyses were not performed for the water sample due to insufficient sample volume.
4. A laboratory control sample was extracted and analyzed along with each of the sample matrix. All the percent recoveries were within control limits.
5. Manual integration was performed on some data files, when automatic integration provided by the software was inappropriate. Some forms were "hand" corrected due to software limitations.

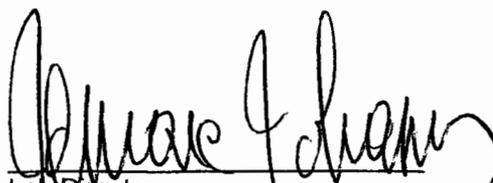
Nitroglycerine

1. Thirteen soil samples were extracted and analyzed for Nitroglycerine using modified SW846 method 8332. One water sample was also analyzed by direct injection for Nitroglycerine using SW846 method 8332.
2. Matrix spike and matrix spike duplicate analyses were performed on sample OD-EB-01 for water sample. All recoveries were within control limits.
3. Matrix spike and matrix spike duplicate analyses were performed on sample OD-SO-B-01D for soil samples. Percent recovery of Nitroglycerine in the MSD was out of the limits. All other recoveries were within control limits
4. A laboratory control sample was analyzed along with each of the sample matrix. Percent recoveries were within the control limit in both matrixes.
5. Manual integration was performed on some data files, when automatic integration provided by the software was inappropriate. Some forms were "hand" corrected due to software limitations.

Metals

1. Thirteen soil samples were analyzed for arsenic, antimony, barium, beryllium, cadmium, chromium, copper, lead, nickel, silver, selenium, and mercury by EPA SW846 methods.
2. A matrix spike, duplicate, and serial dilution were performed on sample OD-SO-A-01 for all required ICP analytes. They were within the control limits.
3. A matrix spike, and duplicate were performed on sample OD-SO-B-03 for mercury. They were within the control limits.
4. Calibration standards are verified against independent check standards purchased from a commercial vendor of environmental standards.
5. All GPL QA/QC criteria were met.


Project Manager


Lab Director

SAMPLE DATA PACKAGE

NITROGLYCERINE DATA

- A. QC Summary
- B. Sample Data
- C. Standards Data
- D. Raw QC Data

GP Environmental Services, Inc

SAMPLE NO
OD-SO-B-01DMSD

Lab Name : GPL Laboratories

SDG NO : 210076

Method : SW8332

Lab Code GPL

Lab Sample ID : 210076-013-013-1/1MSD

Matrix : SOIL Analysis Date : 10/25/2002

Compound	Spike Added (ug/kg)		CONCENTRATION (ug/kg)			%RECOVERY		% RPD	RPD Limit	QC Limits
	MS	MSD	Sample	MS	MSD	MS	MSD			
Nitroglycerine	63000	63000	0	61000	78000	97	124 *	24	25	50-118

Column to be used to flag recovery and RPD Values with an aster

* Values Outside of QC Limits.

RPD 0 Out of 1 Outside Limit
Spike Recovery : 1 Out of 2 outside limit

SAMPLE NO

OD-EB-01MSD

Lab Name : GPL Laboratories

SDG NO : 210076

Method : SW8332

Lab Code GPL

Lab Sample ID : 210076-014-014-1/2MSD

Matrix : WATER Analysis Date : 11/01/2002

Compound	Spike Added (ug/L)		CONCENTRATION (ug/L)			%RECOVERY		% RPD	RPD Limit	QC Limits
	MS	MSD	Sample	MS	MSD	MS	MSD			
Nitroglycerine	20000	20000	0	19000	18000	95	90	5	25	50-125

Column to be used to flag recovery and RPD Values with an aster

* Values Outside of QC Limits.

RPD 0 Out of 1 Outside Limit

Spike Recovery : 0 Out of 2 outside limit

LCS SUMMARY

SAMPLE NO
BKS57230

Lab Name : GPL Laboratories
Lab Code : GPL
Matrix : SOIL
Method : SW8332

Contract. : Holliman AFB 20000 lb
SDG NO : 210076
Lab Sample ID : BKS57230
Analysis Date : 10/25/2002

COMPOUND	SPIKE ADDED (ug/kg)	BLANK CONCENTRATION (ug/kg)	LCS CONCENTRATION (ug/kg)	LCS % REC	QC LIMITS
Nitroglycerine	50000	0	46000	92	60-140

* Values Outside of QC Limits.

LCS SUMMARY

SAMPLE NO
BKS57606

Lab Name : GPL Laboratories
 Lab Code : GPL
 Matrix : WATER
 Method : SW8332

Contract. : Holliman AFB 20000 lb
 SDG NO : 210076
 Lab Sample ID : BKS57606
 Analysis Date : 11/01/2002

COMPOUND	SPIKE ADDED (ug/L)	BLANK CONCENTRATION (ug/L)	LCS CONCENTRATION (ug/L)	LCS % REC	QC LIMITS
Nitroglycerine	20000	0	19000	95	70-120

* Values Outside of QC Limits.

GPL
FORM 4
SEMI-VOLATILE METHOD BLANK SUMMARY

SAMPLE NO

BLK57230

Lab Name : GPL Laboratories Client : Foster Wheeler Environmental Corp
 Lab Code GPL SAS NO. : 57230
 Lab File ID : LB15923.D SDG NO : 210076
 Date Analyzed 10/25/2002 Lab Sample ID : BLK57230
 Date Extracted : 10/11/2002 Time Analyzed 16:35
 Matrix :(Soil/Water). SOIL Level :(Low/Med)

HIS METHOD BLANK APPLIES TO THE FOLLOWING SAMPLES,MS AND MSD

Client Sample ID	Lab Sample ID	Lab File ID	Date Analyzed
BKS57230	BKS57230	LB15924.D	10/25/2002
OD-SO-A-01	210076-001-001-1/1	LB15925.D	10/25/2002
OD-SO-A-02	210076-002-002-1/1	LB15926.D	10/25/2002
OD-SO-A-03	210076-003-003-1/1	LB15927.D	10/25/2002
OD-SO-A-04	210076-004-004-1/1	LB15928.D	10/25/2002
OD-SO-B-01	210076-005-005-1/1	LB15929.D	10/25/2002
OD-SO-B-02	210076-006-006-1/1	LB15930.D	10/25/2002
OD-SO-B-03	210076-007-007-1/1	LB15931.D	10/25/2002
OD-SO-B-04	210076-008-008-1/1	LB15932.D	10/25/2002
OD-SO-C-01	210076-009-009-1/1	LB15935.D	10/25/2002
OD-SO-C-02	210076-010-010-1/1	LB15936.D	10/25/2002
OD-SO-C-03	210076-011-011-1/1	LB15937.D	10/25/2002
OD-SO-C-04	210076-012-012-1/1	LB15938.D	10/25/2002
OD-SO-B-01D	210076-013-013-1/1	LB15939.D	10/25/2002
OD-SO-B-01DMS	210076-013-013-1/1MS	LB15940.D	10/25/2002
OD-SO-B-01DMSD	210076-013-013-1/1MSD	LB15941.D	10/25/2002

SAMPLE NO BLK57606

Lab Name :	<u>GPL Laboratories</u>	Client. :	<u>Foster Wheeler Environmental Corp</u>
Lab Code	<u>GPL</u>	SAS NO. :	<u>57606</u>
Lab File ID :	<u>LB16025.D</u>	SDG NO :	<u>210076</u>
Date Analyzed	<u>11/01/2002</u>	Lab Sample ID :	<u>BLK57606</u>
Date Extracted :	<u>11/01/2002</u>	Time Analyzed	<u>17:26</u>
Matrix :(Soil/Water).	<u>WATER</u>	Level :(Low/Med	<u></u>

HIS METHOD BLANK APPLIES TO THE FOLLOWING SAMPLES,MS AND MSD

Client Sample ID	Lab Sample ID	Lab File ID	Date Analyzed
BKS57606	BKS57606	LB16026.D	11/01/2002
OD-EB-01	210076-014-014-1/2	LB16027.D	11/01/2002
OD-EB-01MS	210076-014-014-1/2MS	LB16028.D	11/01/2002
OD-EB-01MSD	210076-014-014-1/2MSD	LB16029.D	11/01/2002

SAMPLE DATA PACKAGE

EXPLOSIVE DATA

- A. QC Summary**
- B. Sample Data**
- C. Standards Data**
- D. Raw QC Data**

GPL Laboratories, LLLP

Surrog Recovery Summary

Matrix : SOIL

Analytical Method : SW8330

SDG No : 210076

Surrogate	NO2ANIL4
Lower QC Limits	24
Upper QC Limits	140
Sample ID	
BKS57241	100
BLK57241	100
OD-SO-A-01	86
OD-SO-A-02	76
OD-SO-A-03	91
OD-SO-A-04	78
OD-SO-B-01	87
OD-SO-B-01D	92
OD-SO-B-01DMS	96
OD-SO-B-01DMSD	98
OD-SO-B-02	93
OD-SO-B-03	92
OD-SO-B-04	91
OD-SO-C-01	100
OD-SO-C-02	85
OD-SO-C-03	91
OD-SO-C-04	92

2003

* Value outside of QC Limts

NO2ANIL4 = 4-Nitroaniline

Surrogate Recovery Summary

Matrix : WATER

Analytical Method : SW8330

SDG No : 210076

Surrogate	NO2ANIL4
Lower QC Limits	22
Upper QC Limits	100

Sample ID	
BKS57161	91
BLK57161	80
OD-EB-01	60

2004

* Value outside of QC Limts

NO2ANIL4 = 4-Nitroaniline

MS/MSD RECOVERY

SAMPLE NO

OD-SO-B-01DMSD

Lab Name : GPL Laboratories

SDG NO : 210076

Method : SW8330

Lab Code GPL

Lab Sample ID : 210076-013-013-1/1MSD

Matrix : SOIL Analysis Date : 10/19/2002

Compound	Spike Added (ug/kg)		CONCENTRATION (ug/kg)			%RECOVERY		% RPD	RPD Limit	QC Limits
	MS	MSD	Sample	MS	MSD	MS	MSD			
1,3,5-Trinitrobenzene	1500	1500	0	1100	1300	73	87	18	25	20-150
1,3-Dinitrobenzene	1500	1500	0	1600	1600	107	107	0	25	70-127
2,4,6-Trinitrotoluene	1500	1500	0	1500	1600	100	107	7	25	46-150
2,4-Dinitrotoluene	3000	3000	0	2100	2100	70	70	0	25	56-100
2-Amino-4,6-Dinitrotoluene	1500	1500	0	2000	2000	133	133	0	25	43-150
4-Amino-2,6-Dinitrotoluene	1500	1500	0	1400	1500	93	100	7	25	39-136
HMX	3000	3000	0	3100	3300	103	110	7	25	70-113
Nitrobenzene	1500	1500	0	1700	1700	113	113	0	25	70-120
RDX	3000	3000	0	3000	3300	100	110	10	25	70-124
Tetryl	3000	3000	0	2700	2900	90	97	7	25	20-103
m-Nitrotoluene	3000	3000	0	3200	3500	107	117 *	9	25	70-109
o-Nitrotoluene	3000	3000	0	3500	3600	117 *	120 *	3	25	70-116
p-Nitrotoluene	3000	3000	0	3300	3300	110	110	0	25	72-114

Column to be used to flag recovery and RPD Values with an aster

* Values Outside of QC Limits.

RPD 0 Or 13 Outside Limit
Spike Recovery : 3 Out of 26 outside limit

LCS SUMMARY

SAMPLE NO

BKS57241

Lab Name : GPL Laboratories
 Lab Code : GPL
 Matrix : SOIL
 Method : SW8330

Contract. : Holliman AFB 20000 lb
 SDG NO : 210076
 Lab Sample ID : BKS57241
 Analysis Date : 10/18/2002

COMPOUND	SPIKE ADDED (ug/kg)	BLANK CONCENTRATION (ug/kg)	LCS CONCENTRATION (ug/kg)	LCS % REC	QC LIMITS
1,3,5-Trinitrobenzene	1500	0	940	63	56-150
1,3-Dinitrobenzene	1500	0	1500	100	62-112
2,4,6-Trinitrotoluene	1500	0	1500	100	41-150
2,4-Dinitrotoluene	3000	0	2400	80	65-177
2-Amino-4,6-Dinitrotoluene	1500	0	1400	93	33-209
4-Amino-2,6-Dinitrotoluene	1500	0	1400	93	62-112
HMX	3000	0	3000	100	53-123
Nitrobenzene	1500	0	1900	127	15-192
RDX	3000	0	3200	107 *	66-101
Tetryl	3000	0	1000	33	8-153
m-Nitrotoluene	3000	0	3200	107	64-116
o-Nitrotoluene	3000	0	3400	113 *	71-108
p-Nitrotoluene	3000	0	3200	107	68-117

* Values Outside of QC Limits.

LCS SUMMARY

SAMPLE NO

BKS57161

Lab Name : GPL Laboratories
 Lab Code : GPL
 Matrix : WATER
 Method : SW8330

Contract. : Holliman AFB 20000 Ib
 SDG NO : 210076
 Lab Sample ID : BKS57161
 Analysis Date : 10/11/2002

COMPOUND	SPIKE ADDED (ug/L)	BLANK CONCENTRATION (ug/L)	LCS CONCENTRATION (ug/L)	LCS % REC	QC LIMITS
1,3,5-Trinitrobenzene	3.9	0	2.4	62 *	69-150
1,3-Dinitrobenzene	3.9	0	3.5	90	68-109
2,4,6-Trinitrotoluene	3.9	0	3.4	87	66-150
2,4-Dinitrotoluene	7.8	0	4.6	59 *	69-174
2-Amino-4,6-Dinitrotoluene	3.9	0	5.1	131	73-169
4-Amino-2,6-Dinitrotoluene	3.9	0	3.5	90	48-121
HMX	7.8	0	7.4	95	58-114
Nitrobenzene	3.9	0	3.5	90	56-126
Nitroglycerine	130	0	110	85	50-150
RDX	7.8	0	7.6	98	67-102
Tetryl	7.8	0	6.4	82	10-113
m-Nitrotoluene	7.8	0	7.4	95	60-122
o-Nitrotoluene	7.8	0	7.9	101	50-127
p-Nitrotoluene	7.8	0	7.7	99	62-121

* Values Outside of QC Limits.

GPL
FORM 4
EXPLOSIVE METHOD BLANK SUMMARY

SAMPLE NO

BLK57241

Lab Name : GPL Laboratories Client. : Foster Wheeler Environmental Corp
 Lab Code GPL SAS NO. : 57241
 Lab File ID : LCA3400.D SDG NO : 210076
 Date Analyzed 10/18/2002 Lab Sample ID : BLK57241
 Date Extracted : 10/11/2002 Time Analyzed 15:13
 Matrix :(Soil/Water). SOIL Level :(Low/Med) _____

HIS METHOD BLANK APPLIES TO THE FOLLOWING SAMPLES,MS AND MSD

Client Sample ID	Lab Sample ID	Lab File ID	Date Analyzed
BKS57241	BKS57241	LCA3401.D	10/18/2002
OD-SO-A-01	210076-001-001-1/1	LCA3402.D	10/18/2002
OD-SO-A-02	210076-002-002-1/1	LCA3403.D	10/18/2002
OD-SO-A-03	210076-003-003-1/1	LCA3404.D	10/18/2002
OD-SO-A-04	210076-004-004-1/1	LCA3405.D	10/18/2002
OD-SO-B-01	210076-005-005-1/1	LCA3406.D	10/18/2002
OD-SO-B-02	210076-006-006-1/1	LCA3407.D	10/18/2002
OD-SO-B-03	210076-007-007-1/1	LCA3408.D	10/18/2002
OD-SO-B-04	210076-008-008-1/1	LCA3409.D	10/18/2002
OD-SO-C-01	210076-009-009-1/1	LCA3414.D	10/18/2002
OD-SO-C-02	210076-010-010-1/1	LCA3415.D	10/18/2002
OD-SO-C-03	210076-011-011-1/1	LCA3416.D	10/18/2002
OD-SO-C-04	210076-012-012-1/1	LCA3417.D	10/18/2002
OD-SO-B-01D	210076-013-013-1/1	LCA3418.D	10/18/2002
OD-SO-B-01DMS	210076-013-013-1/1MS	LCA3419.D	10/19/2002
OD-SO-B-01DMSD	210076-013-013-1/1MSD	LCA3420.D	10/19/2002

SAMPLE NO BLK57161

Lab Name :	<u>GPL Laboratories</u>	Client. :	<u>Foster Wheeler Environmental Corp</u>
Lab Code	<u>GPL</u>	SAS NO. :	<u>57161</u>
Lab File ID :	<u>LCA3225.D</u>	SDG NO :	<u>210076</u>
Date Analyzed	<u>10/11/2002</u>	Lab Sample ID :	<u>BLK57161</u>
Date Extracted :	<u>10/10/2002</u>	Time Analyzed	<u>19:07</u>
Matrix :(Soil/Water).	<u>WATER</u>	Level :(Low/Med	<u></u>

HIS METHOD BLANK APPLIES TO THE FOLLOWING SAMPLES,MS AND MSD

Client Sample ID	Lab Sample ID	Lab File ID	Date Analyzed
BKS57161	BKS57161	LCA3226.D	10/11/2002
BKS57161	BKS57161	LCA3227.D	10/11/2002
OD-EB-01	210076-014-014-1/2	LCA3230.D	10/11/2002

SAMPLE DATA PACKAGE

PETN DATA

- A. QC Summary
- B. Sample Data
- C. Standards Data
- D. Raw QC Data

GP Environmental Services, Inc

A. QC Summary

- 1. Surrogate Percent Recovery Summary**
- 2. Matrix Spike/Matrix Spike Duplicate Summary**
- 3. Laboratory Control Standard Summary (where applicable)**
- 4. Method Blank Summary**

GPL Laboratories, LLLP

SAMPLE NO

OD-SO-B-01DMSD

Lab Name : GPL Laboratories

SDG NO : 210076

Method : SW8330

Lab Code GPL

Lab Sample ID : 210076-013-013-1/1MSD

Matrix : SOIL Analysis Date : 10/17/2002

Compound	Spike Added (ug/kg)		CONCENTRATION (ug/kg)			%RECOVERY		% RPD	RPD Limit	QC Limits
	MS	MSD	Sample	MS	MSD	MS	MSD			
Pentaerythritol Tetranitrate	2000	2000	0	2100	2100	105	105	0	25	77-150

SAMPLE NO

OD-SO-B-01DMSD

Lab Name : GPL Laboratories

SDG NO : 210076

Method : SW8330

Lab Code GPL

Lab Sample ID : 210076-013-013-1/1MSD

Matrix : SOIL Analysis Date : 10/19/2002

Compound	Spike Added (ug/kg)		CONCENTRATION (ug/kg)			%RECOVERY		% RPD	RPD Limit	QC Limits
	MS	MSD	Sample	MS	MSD	MS	MSD			
1,3,5-Trinitrobenzene	1500	1500	0	1100	1300	73	87	18	25	20-150
1,3-Dinitrobenzene	1500	1500	0	1600	1600	107	107	0	25	70-127
2,4,6-Trinitrotoluene	1500	1500	0	1500	1600	100	107	7	25	46-150
2,4-Dinitrotoluene	3000	3000	0	2100	2100	70	70	0	25	56-100
2-Amino-4,6-Dinitrotoluene	1500	1500	0	2000	2000	133	133	0	25	43-150
4-Amino-2,6-Dinitrotoluene	1500	1500	0	1400	1500	93	100	7	25	39-136
HMX	3000	3000	0	3100	3300	103	110	7	25	70-113
Nitrobenzene	1500	1500	0	1700	1700	113	113	0	25	70-120
RDX	3000	3000	0	3000	3300	100	110	10	25	70-124
Tetryl	3000	3000	0	2700	2900	90	97	7	25	20-103

Column to be used to flag recovery and RPD Values with an aster

* Values Outside of QC Limits.

RPD 0 Out of 14 Outside Limit

Spike Recovery : 3 Out of 28 outside limit

LCS SUMMARY

SAMPLE NO

BKS57240

Lab Name : GPL Laboratories
 Lab Code : GPL
 Matrix : SOIL
 Method : SW8330

Contract. : Holliman AFB 20000 lb
 SDG NO : 210076
 Lab Sample ID : BKS57240
 Analysis Date : 10/17/2002

COMPOUND	SPIKE ADDED (ug/kg)	BLANK CONCENTRATION (ug/kg)	LCS CONCENTRATION (ug/kg)	LCS % REC	QC LIMITS
Pentaerythritol Tetranitrate	2000	0	2000	100	50-125

LCS SUMMARY

SAMPLE NO
BKS57162

Lab Name : GPL Laboratories
 Lab Code : GPL
 Matrix : WATER
 Method : SW8330

Contract. : Holliman AFB 20000 lb
 SDG NO : 210076
 Lab Sample ID : BKS57162
 Analysis Date : 10/17/2002

COMPOUND	SPIKE ADDED (ug/L)	BLANK CONCENTRATION (ug/L)	LCS CONCENTRATION (ug/L)	LCS % REC	QC LIMITS
Pentaerythritol Tetranitrate	5.2	0	5.7	110	50-125

* Values Outside of QC Limits.

SAMPLE NO
BLK57240

Lab Name : GPL Laboratories Client. : Foster Wheeler Environmental Corp
 Lab Code GPL SAS NO. : 57240
 Lab File ID : LCC6395U.D SDG NO : 210076
 Date Analyzed 10/17/2002 Lab Sample ID : BLK57240
 Date Extracted : 10/11/2002 Time Analyzed 10:45
 Matrix :(Soil/Water). SOIL Level :(Low/Med)

HIS METHOD BLANK APPLIES TO THE FOLLOWING SAMPLES,MS AND MSD

Client Sample ID	Lab Sample ID	Lab File ID	Date Analyzed
BKS57240	BKS57240	LCC6396U.D	10/17/2002
OD-SO-A-01	210076-001-001-1/1	LCC6397U.D	10/17/2002
OD-SO-A-02	210076-002-002-1/1	LCC6398U.D	10/17/2002
OD-SO-A-03	210076-003-003-1/1	LCC6399U.D	10/17/2002
OD-SO-A-04	210076-004-004-1/1	LCC6401U.D	10/17/2002
OD-SO-B-01	210076-005-005-1/1	LCC6402U.D	10/17/2002
OD-SO-B-02	210076-006-006-1/1	LCC6403U.D	10/17/2002
OD-SO-B-03	210076-007-007-1/1	LCC6404U.D	10/17/2002
OD-SO-B-04	210076-008-008-1/1	LCC6405U.D	10/17/2002
OD-SO-C-01	210076-009-009-1/1	LCC6406U.D	10/17/2002
OD-SO-C-02	210076-010-010-1/1	LCC6407U.D	10/17/2002
OD-SO-C-03	210076-011-011-1/1	LCC6408U.D	10/17/2002
OD-SO-C-04	210076-012-012-1/1	LCC6409U.D	10/17/2002
OD-SO-B-01D	210076-013-013-1/1	LCC6410U.D	10/17/2002
OD-SO-B-01DMS	210076-013-013-1/1MS	LCC6414U.D	10/17/2002
OD-SO-B-01DMSD	210076-013-013-1/1MSD	LCC6415U.D	10/17/2002

SAMPLE NO BLK57162

Lab Name :	<u>GPL Laboratories</u>	Client. :	<u>Foster Wheeler Environmental Corp</u>
Lab Code	<u>GPL</u>	SAS NO. :	<u>57162</u>
Lab File ID :	<u>LCC6390U.D</u>	SDG NO :	<u>210076</u>
Date Analyzed	<u>10/17/2002</u>	Lab Sample ID :	<u>BLK57162</u>
Date Extracted :	<u>10/10/2002</u>	Time Analyzed	<u>09:08</u>
Matrix :(Soil/Water).	<u>WATER</u>	Level :(Low/Med	<u></u>

HIS METHOD BLANK APPLIES TO THE FOLLOWING SAMPLES,MS AND MSD

Client Sample ID	Lab Sample ID	Lab File ID	Date Analyzed
BKS57162	BKS57162	LCC6391U.D	10/17/2002
OD-EB-01	210076-014-014-1/2	LCC6394U.D	10/17/2002

METALS PACKAGE

GPL Laboratories, LLLP

GPL - Maryland Laboratory

Metals Data Reporting Form

Initial Calibration Verification Standard

SDG: 210076

Instrument: ICPST

Units: ug/L

Chart Number: 021025V.ARC

Acceptable Range: 90% - 110%

Standard Source: HIGH PURITY

Standard ID: _____

Element	WL/ Mass	True Conc	IVICV 10/25/02 1:49 PM		Found	%	Found	%	Found	%	Found	%
			Found	Rec								
Antimony	206.838	400.0	409.19	102.3								
Arsenic	189.042	400.0	421.29	105.3								
Barium	493.409	400.0	398.62	99.7								
Beryllium	313.042	40.0	40.23	100.6								
Cadmium	226.502	40.0	42.14	105.3								
Chromium	267.716	400.0	406.11	101.5								
Copper	324.753	400.0	394.21	98.6								
Lead	220.353	400.0	403.22	100.8								
Nickel	231.604	400.0	406.33	101.6								
Selenium	196.026	400.0	409.84	102.5								
Silver	328.068	40.0	402.94	1007.4								

GPL - Maryland Laboratory

Metals Data Reporting Form

Initial Calibration Verification Standard

SDG: 210076

Instrument: CVAA

Units: ug/L

Chart Number: HG021021.PRN

Acceptable Range: 80% - 120%

Standard Source: CPI

Standard ID: _____

Element	WL/ Mass	True Conc	Ck2 10/21/02 3:21 PM		Found	% Rec	Found	% Rec	Found	% Rec	Found	% Rec
			Found	% Rec								
Mercury	253.7	5.0	5.12	102.4								

GPL - Maryland Laboratory

Metals Data Reporting Form

Continuing Calibration Verification

SDG: 210076

Instrument: ICPST

Units: ug/L

Chart Number: 021025V.ARC

Acceptable Range: 90% - 110%

Standard Source: HIGH PURITY

Standard ID: _____

Element	WL/ Mass	True Conc	CVCCV 10/25/02 2:03 PM		CVCCV3 10/25/02 3:00 PM		CVCCV3 10/25/02 4:45 PM		CVCCV3 10/25/02 6:16 PM		CVCCV4 10/25/02 7:48 PM	
			Found	% Rec	Found	% Rec	Found	% Rec	Found	% Rec	Found	% Rec
Antimony	206.838	1000.0	1026.02	102.6	1030.33	103.0	1045.91	104.6	1061.67	106.2	1079.38	107.9
Arsenic	189.042	1000.0	1009.24	100.9	1010.50	101.0	1013.07	101.3	1026.74	102.7	1037.05	103.7
Barium	493.409	500.0	501.34	100.3	500.61	100.1	506.17	101.2	511.19	102.2	520.29	104.1
Beryllium	313.042	50.0	49.97	99.9	50.45	100.9	51.85	103.7	53.05	106.1	54.02	108.0
Cadmium	226.502	500.0	495.40	99.1	495.42	99.1	501.33	100.3	509.17	101.8	516.34	103.3
Chromium	267.716	500.0	497.87	99.6	500.76	100.2	504.75	100.9	509.22	101.8	514.58	102.9
Copper	324.753	500.0	504.07	100.8	505.39	101.1	502.23	100.4	503.66	100.7	509.64	101.9
Lead	220.353	500.0	498.20	99.6	503.46	100.7	505.19	101.0	511.40	102.3	513.16	102.6
Nickel	231.604	500.0	492.83	98.6	493.14	98.6	500.42	100.1	507.77	101.6	515.20	103.0
Selenium	196.026	1000.0	1010.46	101.0	1020.65	102.1	1021.39	102.1	1035.83	103.6	1047.80	104.8
Silver	328.068	500.0	511.08	102.2	509.80	102.0	509.04	101.8	509.61	101.9	513.87	102.8

GPL - Maryland Laboratory

Metals Data Reporting Form

Continuing Calibration Verification

SDG: 210076

Instrument: ICPST

Units: ug/L

Chart Number: 021025V.ARC

Acceptable Range: 90% - 110%

Standard Source: HIGH PURITY

Standard ID: _____

Element	WL/ Mass	True Conc	CVCCV4 10/25/02 9:20 PM		CVCCV4 10/25/02 10:52 PM		CVCCV5 10/26/02 12:23 AM		CVCCV5 10/26/02 1:55 AM		CVCCV5 10/26/02 3:27 AM	
			Found	% Rec	Found	% Rec	Found	% Rec	Found	% Rec	Found	% Rec
			Antimony	206.838	1000.0	1081.53	108.2	1081.69	108.2	1093.03	109.3	1078.65
Arsenic	189.042	1000.0	1032.47	103.2	1035.84	103.6	1045.57	104.6	1031.03	103.1	1047.67	104.8
Barium	493.409	500.0	521.03	104.2	520.11	104.0	525.89	105.2	520.17	104.0	527.42	105.5
Beryllium	313.042	50.0	54.27	108.5	54.19	108.4	54.71	109.4	53.95	107.9	53.90	107.8
Cadmium	226.502	500.0	516.97	103.4	515.52	103.1	521.74	104.3	514.22	102.8	514.11	102.8
Chromium	267.716	500.0	515.24	103.0	513.86	102.8	519.71	103.9	512.13	102.4	512.20	102.4
Copper	324.753	500.0	507.32	101.5	507.22	101.4	516.09	103.2	509.26	101.9	516.40	103.3
Lead	220.353	500.0	515.15	103.0	516.63	103.3	537.57	107.5	517.03	103.4	515.71	103.1
Nickel	231.604	500.0	516.30	103.3	515.32	103.1	520.55	104.1	514.21	102.8	513.90	102.8
Selenium	196.026	1000.0	1052.55	105.3	1054.54	105.5	1065.94	106.6	1054.03	105.4	1063.24	106.3
Silver	328.068	500.0	513.21	102.6	510.63	102.1	519.55	103.9	513.04	102.6	518.44	103.7

GPL - Maryland Laboratory

Metals Data Reporting Form

Continuing Calibration Verification

SDG: 210076

Instrument: ICPST

Units: ug/L

Chart Number: 021025V.ARC

Acceptable Range: 90% - 110%

Standard Source: HIGH PURITY

Standard ID: _____

Element	WL/ Mass	True Conc	CVCCV6 10/26/02 4:59 AM		CVCCV6 10/26/02 6:01 AM							
			Found	% Rec	Found	% Rec	Found	% Rec	Found	% Rec	Found	% Rec
Antimony	206.838	1000.0	1087.51	108.8	1095.14	109.5						
Arsenic	189.042	1000.0	1044.44	104.4	1049.72	105.0						
Barium	493.409	500.0	525.24	105.0	528.14	105.6						
Beryllium	313.042	50.0	53.38	106.8	53.60	107.2						
Cadmium	226.502	500.0	508.30	101.7	510.77	102.2						
Chromium	267.716	500.0	505.13	101.0	508.55	101.7						
Copper	324.753	500.0	513.68	102.7	517.96	103.6						
Lead	220.353	500.0	514.26	102.9	520.23	104.0						
Nickel	231.604	500.0	508.87	101.8	512.23	102.4						
Selenium	196.026	1000.0	1063.33	106.3	1080.64	108.1						
Silver	328.068	500.0	514.65	102.9	518.88	103.8						

GPL - Maryland Laboratory

Metals Data Reporting Form

Continuing Calibration Verification

SDG: 210076

Argument: CVAA

Units: ug/L

Chart Number: HG021021.PRN

Acceptable Range: 80% - 120%

Standard Source: CPI

Standard ID: _____

Element	WL/ Mass	True Conc	Ck5 10/21/02 3:29 PM		Ck5 10/21/02 4:02 PM		Ck5 10/21/02 4:33 PM		Ck5 10/21/02 5:04 PM		Ck5 10/21/02 5:14 PM	
			Found	% Rec								
			Found	% Rec								
Mercury	253.7	5.0	5.07	101.4	5.07	101.4	5.06	101.2	5.02	100.4	5.07	101.4

GPL - Maryland Laboratory

Metals Data Reporting Form

Contract Required Detection Limit Standard

SDG: 210076

Instrument: ICPST

Units: ug/L

Chart Number: 021025V.ARC

Acceptable Range: 50% - 150%

Standard Source: HIGH PURITY

Standard ID: _____

Element	WL/ Mass	True Conc	OWCHECK(PQL 10/25/02 2:17 PM)		Found	% Rec	Found	% Rec	Found	% Rec	Found	% Rec
			Found	% Rec								
Antimony	206.838	20.0	20.96	104.8								
Arsenic	189.042	20.0	20.06	100.3								
Barium	493.409	5.0	4.97	99.5								
Beryllium	313.042	2.0	1.94	96.8								
Cadmium	226.502	6.0	6.16	102.7								
Chromium	267.716	5.0	5.06	101.2								
Copper	324.753	10.0	9.62	96.2								
Lead	220.353	10.0	9.16	91.6								
Nickel	231.604	10.0	8.67	86.7								
Selenium	196.026	20.0	20.87	104.3								
Silver	328.068	3.0	3.49	116.5								

GPL - Maryland Laboratory

Metals Data Reporting Form

Contract Required Detection Limit Standard

SDG: 210076

Instrument: CVAA

Units: ug/L

Chart Number: HG021021.PRN

Acceptable Range: 50% - 150%

Standard Source: ABSOLUTE

Standard ID: _____

Element	WL/ Mass	True Conc	Ck4 10/21/02 3:26 PM		Found	% Rec	Found	% Rec	Found	% Rec	Found	% Rec
			Found	% Rec								
Mercury	253.7	0.2	0.16	82.0								

GPL - Maryland Laboratory

Metals Data Reporting Form

Initial Calibration Blank Results

SDG: 210076

Instrument: ICPST

Units: ug/L

Chart Number: 021025V.ARC

Standard Source: _____

Standard ID: _____

Element	WL/ Mass	Report Limit	BHCB 10/25/02 1:56 PM		Found	Q	Found	Q	Found	Q	Found	Q
			Found	Q								
Antimony	206.838	20	4.0	U								
Arsenic	189.042	20	5.1	U								
Barium	493.409	5	0.6	U								
Beryllium	313.042	2	0.1	U								
Cadmium	226.502	6	0.4	U								
Chromium	267.716	5	1.0	U								
Copper	324.753	10	1.0	U								
Lead	220.353	10	1.7	U								
Nickel	231.604	10	1.7	U								
Selenium	196.026	20	3.4	U								
Silver	328.068	3	0.6	B								

GPL - Maryland Laboratory

Metals Data Reporting Form

Initial Calibration Blank Results

SDG: 210076

Instrument: CVAA

Units: ug/L

Chart Number: HG021021.PRN

Standard Source: _____

Standard ID: _____

Element	WL/ Mass	Report Limit	Ck3 10/21/02 3:24 PM							
			Found	Q	Found	Q	Found	Q	Found	Q
Mercury	253.7	0.2	0.1	U						

GPL - Maryland Laboratory

Metals Data Reporting Form

Preparation Blank Results

SDG: 210076

Lab Sample ID: BLK57167

Matrix: Soil Units: mg/kg Prep Date: 10/10/02 Prep Batch: 57167

Weight: 1.00 Volume: 100 Percent Moisture: NA

Element	WL/ Mass	IDL	Report Limit	Conc	Q	DF	Instr	Anal Date	Anal Time
Antimony	206.838	0.40	2.0	0.56	B	1	ICPST	10/26/02	2:41
Arsenic	189.042	0.51	2.0	0.51	U	1	ICPST	10/26/02	2:41
Barium	493.409	0.060	0.50	0.072	B	1	ICPST	10/26/02	2:41
Beryllium	313.042	0.010	0.20	-0.035	B	1	ICPST	10/26/02	2:41
Cadmium	226.502	0.040	0.60	0.040	U	1	ICPST	10/26/02	2:41
Chromium	267.716	0.10	0.50	0.14	B	1	ICPST	10/26/02	2:41
Copper	324.753	0.10	1.0	-0.25	B	1	ICPST	10/26/02	2:41
Lead	220.353	0.17	1.0	0.20	B	1	ICPST	10/26/02	2:41
Nickel	231.604	0.17	1.0	-0.71	B	1	ICPST	10/26/02	2:41
Selenium	196.026	0.34	2.0	0.34	U	1	ICPST	10/26/02	2:41
Silver	328.068	0.050	0.30	0.050	U	1	ICPST	10/26/02	2:41

Comments: Color(Before): BLACK Color(After): YELLOW Clarity(After): CLEAR Texture: FINE

GPL - Maryland Laboratory

Metals Data Reporting Form

Preparation Blank Results

SDG: 210076

Lab Sample ID: BLK57352

Matrix: Soil Units: mg/kg Prep Date: 10/18/02 Prep Batch: 57352

Weight: 0.60 Volume: 100 Percent Moisture: NA

Element	WL/ Mass	IDL	Report Limit	Conc	Q	DF	Instr	Anal Date	Anal Time
Mercury	253.7	0.017	0.033	0.017	U	1	CVAA	10/21/02	16:18

Comments: _____

5.03.8

U Result is less than the IDL
B Result is between IDL and RL

Form 3 Equivalent

4041

GPL - Maryland Laboratory

Metals Data Reporting Form

Continuing Calibration Blank Result

SDG: 210076

Instrument: ICPST

Units: ug/L

Chart Number: 021025V.ARC

Standard Source: _____

Standard ID: _____

Element	WL/ Mass	Report Limit	BCCCB 10/25/02 2:10 PM		BCCCB3 10/25/02 3:07 PM		BCCCB3 10/25/02 4:52 PM		BCCCB3 10/25/02 6:24 PM		BCCCB4 10/25/02 7:56 PM	
			Found	Q	Found	Q	Found	Q	Found	Q	Found	Q
Antimony	206.838	20	4.0	U	4.0	U	4.0	U	4.0	U	4.0	U
Arsenic	189.042	20	5.1	U	5.1	U	5.1	U	5.1	U	5.1	U
Barium	493.409	5	0.6	U	0.6	U	0.6	U	0.6	U	0.6	U
Beryllium	313.042	2	0.1	U	-0.1	B	-0.2	B	-0.3	B	-0.4	B
Cadmium	226.502	6	0.4	U	0.4	U	0.4	U	0.4	U	0.4	U
Chromium	267.716	5	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
Copper	324.753	10	1.0	U	1.0	U	-1.4	B	-2.2	B	-2.9	B
Lead	220.353	10	1.7	U	1.7	U	2.1	B	1.7	U	1.7	U
Nickel	231.604	10	1.7	U	1.7	U	1.7	U	1.7	U	1.7	U
Selenium	196.026	20	3.4	U	3.4	U	3.4	U	3.4	U	3.4	U
Silver	328.068	3	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U

GPL - Maryland Laboratory

Metals Data Reporting Form

Continuing Calibration Blank Result

SDG: 210076

Instrument: ICPST

Units: ug/L

Chart Number: 021025V.ARC

Standard Source: _____

Standard ID: _____

Element	WL/ Mass	Report Limit	BCCCB4 10/25/02 9:27 PM		BCCCB4 10/25/02 10:59 PM		BCCCB5 10/26/02 12:31 AM		BCCCB5 10/26/02 2:03 AM		BCCCB5 10/26/02 3:35 AM	
			Found	Q	Found	Q	Found	Q	Found	Q	Found	Q
Antimony	206.838	20	4.0	U	4.0	U	4.0	U	4.0	U	4.0	U
Arsenic	189.042	20	5.1	U	5.1	U	5.1	U	5.1	U	5.1	U
Barium	493.409	5	0.6	U	0.6	U	0.6	U	0.6	U	0.6	U
Beryllium	313.042	2	-0.4	B	-0.4	B	-0.4	B	-0.4	B	-0.3	B
Cadmium	226.502	6	0.4	U	0.4	U	0.4	U	0.4	U	0.4	U
Chromium	267.716	5	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
Copper	324.753	10	-3.3	B	-3.0	B	-2.9	B	-3.3	B	-3.1	B
Lead	220.353	10	1.7	U	1.7	U	2.4	B	1.7	U	1.7	U
Nickel	231.604	10	-1.9	B	1.7	U	1.7	U	1.7	U	1.7	U
Selenium	196.026	20	3.4	U	3.4	U	3.4	U	3.4	U	3.4	U
Silver	328.068	3	0.5	U	0.5	U	0.6	B	0.5	U	0.5	U

GPL - Maryland Laboratory

Metals Data Reporting Form

Continuing Calibration Blank Result

SDG: 210076

Instrument: ICPST

Units: ug/L

Chart Number: 021025V.ARC

Standard Source: _____

Standard ID: _____

Element	WL/ Mass	Report Limit	BCCCB6 10/26/02 5:07 AM		BCCCB6 10/26/02 6:08 AM		Found	Q	Found	Q
			Found	Q	Found	Q				
Antimony	206.838	20	4.0	U	4.0	U				
Arsenic	189.042	20	5.1	U	5.1	U				
Barium	493.409	5	0.6	U	0.6	U				
Beryllium	313.042	2	-0.4	B	-0.3	B				
Cadmium	226.502	6	0.4	U	0.4	U				
Chromium	267.716	5	1.0	U	1.0	U				
Copper	324.753	10	-2.9	B	-3.1	B				
Lead	220.353	10	1.7	U	1.7	U				
Nickel	231.604	10	1.7	U	1.7	U				
Selenium	196.026	20	3.4	U	3.4	U				
Silver	328.068	3	0.5	U	0.8	B				

GPL - Maryland Laboratory

Metals Data Reporting Form

Continuing Calibration Blank Result

SDG: 210076

Instrument: CVAA

Units: ug/L

Chart Number: HG021021.PRN

Standard Source: _____

Standard ID: _____

Element	WL/ Mass	Report Limit	Ck6 10/21/02 3:31 PM		Ck6 10/21/02 4:05 PM		Ck6 10/21/02 4:35 PM		Ck6 10/21/02 5:06 PM		Ck6 10/21/02 5:17 PM	
			Found	Q								
Mercury	253.7	0.2	0.1	U								

GPL - Maryland Laboratory

Metals Data Reporting Form

Interference Check Standard A

SDG: 210076

Instrument: ICPST

Units: ug/L

Chart Number: 021025V.ARC

Acceptable Range: 80% - 120%

Standard Source: HIGH PURITY

Standard ID: _____

Element	WL/ Mass	Reporting Limit	True Conc	IAICSA 10/25/02 2:31 PM				
				Found	Found	Found	Found	Found
Antimony	206.838	20		4				
Arsenic	189.042	20		1				
Barium	493.409	5		1				
Beryllium	313.042	2		0				
Cadmium	226.502	6		5				
Chromium	267.716	5		1				
Copper	324.753	10		1				
Lead	220.353	10		4				
Nickel	231.604	10		2				
Selenium	196.026	20		-4				
Silver	328.068	3		0				

GPL - Maryland Laboratory

Metals Data Reporting Form

Interference Check Standard AB

SDG: 210076

Instrument: ICPST

Units: ug/L

Chart Number: 021025V.ARC

Acceptable Range: 80% - 120%

Standard Source: HIGH PURITY

Standard ID: _____

Element	WL/ Mass	True Conc	IBICSAB 10/25/02 2:42 PM		Found	% Rec	Found	% Rec	Found	% Rec	Found	% Rec
			Found	% Rec								
Antimony	206.838	600	620.6	103.4								
Arsenic	189.042	100	106.2	106.2								
Barium	493.409	500	517.6	103.5								
Beryllium	313.042	500	496.3	99.3								
Cadmium	226.502	1000	976.9	97.7								
Chromium	267.716	500	492.5	98.5								
Copper	324.753	500	530.5	106.1								
Lead	220.353	50	52.4	104.8								
Nickel	231.604	1000	951.7	95.2								
Selenium	196.026	50	50.2	100.5								
Silver	328.068	200	213.4	106.7								

GPL - Maryland Laboratory

Metals Data Reporting Form

Matrix Spike Sample Results

SDG: 210076

Spike Sample ID: SP210076-001-001-1/1

Original Sample ID: S 210076-001-001-1/1 Client ID: OD-SO-A-01

Matrix: Soil Units: mg/kg Prep Date: 10/10/02 Prep Batch: 57167

Weight: 1.62 Volume: 100 Percent Moisture: 15.90

Element	WL/ Mass	OS Conc	Q	MS Conc	Q	Spike Level	% Rec	OS DF	MS DF	Instr	OS Anal Date	OS Anal Time	MS Anal Date	MS Anal Time
Antimony	206.8	0.38	B	6.8		7.3399	87.1	1	1	ICPST	10/26/02	2:57	10/26/02	3:12
Arsenic	189.0	0.84	B	8.5		7.3399	105.1	1	1	ICPST	10/26/02	2:57	10/26/02	3:12
Barium	493.4	32.4		113		73.399	110.3	1	1	ICPST	10/26/02	2:57	10/26/02	3:12
Beryllium	313.0	0.098	B	3.8		3.6699	101.6	1	1	ICPST	10/26/02	2:57	10/26/02	3:12
Cadmium	226.5	0.070	B	7.0		7.3399	94.7	1	1	ICPST	10/26/02	2:57	10/26/02	3:12
Chromium	267.7	2.8		39.0		36.699	98.7	1	1	ICPST	10/26/02	2:57	10/26/02	3:12
Copper	324.8	2.8		42.5		36.699	108.1	1	1	ICPST	10/26/02	2:57	10/26/02	3:12
Lead	220.4	2.1		73.2		73.399	96.8	1	1	ICPST	10/26/02	2:57	10/26/02	3:12
Nickel	231.6	1.6		36.8		36.699	96.0	1	1	ICPST	10/26/02	2:57	10/26/02	3:12
Selenium	196.0	0.26	U	7.3		7.3399	99.9	1	1	ICPST	10/26/02	2:57	10/26/02	3:12
Silver	328.1	0.038	U	7.7		7.3399	104.4	1	1	ICPST	10/26/02	2:57	10/26/02	3:12

Comments: Sample Date: 10/04/02 Sample Time: 11:30 AM Color(Before): BLACK Color(After): YELLOW Clarity(After):
CLEAR Texture: FINE

5.03.8

NC Percent recovery was not calculated

Form 5A Equivalent

* Duplicate analysis RPD was not within limits

E Serial dilution percent difference not within limits

U Result is less than the IDL

4048

GPL - Maryland Laboratory

Metals Data Reporting Form

Matrix Spike Sample Results

SDG: 210076

Spike Sample ID: SP210076-007-007-1/1

Original Sample ID: S 210076-007-007-1/1 Client ID: OD-SO-B-03

Matrix: Soil Units: mg/kg Prep Date: 10/18/02 Prep Batch: 57352

Weight: 0.64 Volume: 100 Percent Moisture: 21.92

Element	WL/ Mass	OS Conc	Q	MS Conc	Q	Spike Level	% Rec	OS DF	MS DF	Instr	OS Anal Date	OS Anal Time	MS Anal Date	MS Anal Time
Mercury	253.7	0.020	U	0.58		0.6003	96.0	1	1	CVAA	10/21/02	16:43	10/21/02	16:48

Comments: Sample Date: 10/04/02 Sample Time: 11:57 AM

5.03.8

- NC Percent recovery was not calculated
- * Duplicate analysis RPD was not within limits
- E Serial dilution percent difference not within limits
- U Result is less than the IDL
- B Result is between IDL and RL

Form 5A Equivalent

4049

GPL - Maryland Laboratory

Metals Data Reporting Form

Sample Duplicate RPD Report

SDG: 210076

Duplicate Sample ID: D 210076-001-001-1/1

Original Sample ID: S 210076-001-001-1/1 Client ID: OD-SO-A-01

Matrix: Soil Units: mg/kg Prep Date: 10/10/02 Prep Batch: 57167

Weight: 1.57 Volume: 100 Percent Moisture: 15.90

Element	WL/ Mass	OS Conc	Q	Dupe Conc	Q	% RPD	OS DF	Dupe DF	Instr	OS Anal Date	OS Anal Time	Dupe Anal Date	Dupe Anal Time
Antimony	206.838	0.38	B	0.49	B	23.5	1	1	ICPST	10/26/02	2:57	10/26/02	3:04
Arsenic	189.042	0.84	B	0.98	B	15.9	1	1	ICPST	10/26/02	2:57	10/26/02	3:04
Barium	493.409	32.4		33.5		3.3	1	1	ICPST	10/26/02	2:57	10/26/02	3:04
Beryllium	313.042	0.098	B	0.097	B	0.5	1	1	ICPST	10/26/02	2:57	10/26/02	3:04
Cadmium	226.502	0.070	B	0.078	B	10.1	1	1	ICPST	10/26/02	2:57	10/26/02	3:04
Chromium	267.716	2.8		2.8		0.9	1	1	ICPST	10/26/02	2:57	10/26/02	3:04
Copper	324.753	2.8		2.9		4.1	1	1	ICPST	10/26/02	2:57	10/26/02	3:04
Lead	220.353	2.1		2.0		6.0	1	1	ICPST	10/26/02	2:57	10/26/02	3:04
Nickel	231.604	1.6		1.6		0.4	1	1	ICPST	10/26/02	2:57	10/26/02	3:04
Selenium	196.026	0.26	U	0.26	U		1	1	ICPST	10/26/02	2:57	10/26/02	3:04
Silver	328.068	0.038	U	0.038	U		1	1	ICPST	10/26/02	2:57	10/26/02	3:04

GPL - Maryland Laboratory

Metals Data Reporting Form

Sample Duplicate RPD Report

SDG: 210076

Duplicate Sample ID: D 210076-007-007-1/1

Original Sample ID: S 210076-007-007-1/1 Client ID: OD-SO-B-03

Matrix: Soil Units: mg/kg Prep Date: 10/18/02 Prep Batch: 57352

Weight: 0.63 Volume: 100 Percent Moisture: 21.92

Element	WL/ Mass	OS Conc	Q	Dupe Conc	Q	% RPD	OS DF	Dupe DF	Instr	OS Anal Date	OS Anal Time	Dupe Anal Date	Dupe Anal Time
Mercury	253.7	0.020	U	0.020	U		1	1	CVAA	10/21/02	16:43	10/21/02	16:46

GPL - Maryland Laboratory

Metals Data Reporting Form

Laboratory Control Sample Results

SDG: 210076

Lab Sample ID: BKS57167

Matrix: Soil Units: mg/kg Prep Date: 10/10/02 Prep Batch: 57167

Weight: 1.00 Volume: 100 Percent Moisture: NA

Element	WL/ Mass	Spike Level	Conc	Percent Recovery	Q	Range	DF	Instr	Anal Date	Anal Time
Antimony	206.838	10.0	10.5	104.6		80-120	1	ICPST	10/26/02	2:49
Arsenic	189.042	10.0	9.6	96.2		80-120	1	ICPST	10/26/02	2:49
Barium	493.409	100	102	102.1		80-120	1	ICPST	10/26/02	2:49
Beryllium	313.042	5.0	5.3	106.6		80-120	1	ICPST	10/26/02	2:49
Cadmium	226.502	10.0	10.2	102.2		80-120	1	ICPST	10/26/02	2:49
Chromium	267.716	50.0	51.3	102.6		80-120	1	ICPST	10/26/02	2:49
Copper	324.753	50.0	50.5	101.0		80-120	1	ICPST	10/26/02	2:49
Lead	220.353	100	99.8	99.8		80-120	1	ICPST	10/26/02	2:49
Nickel	231.604	50.0	50.5	101.0		80-120	1	ICPST	10/26/02	2:49
Selenium	196.026	10.0	8.9	89.3		80-120	1	ICPST	10/26/02	2:49
Silver	328.068	10.0	9.7	97.4		80-120	1	ICPST	10/26/02	2:49

Comments: Color(Before): BLACK Color(After): YELLOW Clarity(After): CLEAR Texture: FINE

GPL - Maryland Laboratory

Metals Data Reporting Form

Laboratory Control Sample Results

SDG: 210076

Lab Sample ID: BKS57352

Matrix: Soil Units: mg/kg Prep Date: 10/18/02 Prep Batch: 57352

Weight: 0.60 Volume: 100 Percent Moisture: NA

Element	WL/ Mass	Spike Level	Conc	Percent Recovery	Q	Range	DF	Instr	Anal Date	Anal Time
Mercury	253.7	0.50	0.50	100.7		80-120	1	CVAA	10/21/02	16:20

Comments: _____

5.03.8

NC Percent recovery was not calculated
U Result is less than the IDL

Form 7 Equivalent

4053

GPL - Maryland Laboratory

Metals Data Reporting Form

Serial Dilution RPD Report

SDG: 210076

Serial Dilution Sample ID: SE210076-001-001-1/1

Original Sample ID: S 210076-001-001-1/1 Client ID: OD-SO-A-01

Matrix: Soil Units: mg/kg Prep Date: 10/10/02 Prep Batch: 57167

Weight: 1.56 Volume: 100 Percent Moisture: 15.90

Element	WL/ Mass	OS Conc	Q	Serial Dilution Conc	Q	Percent Diff	OS DF	Ser Dil DF	Instr	OS Anal Date	OS Anal Time	Ser Dil Anal Date	Ser Dil Anal Time
Antimony	206.838	0.38	B	1.7	B	345.1	1	5	ICPST	10/26/02	2:57	10/26/02	3:43
Arsenic	189.042	0.84	B	1.9	U	100.0	1	5	ICPST	10/26/02	2:57	10/26/02	3:43
Barium	493.409	32.4		32.6		0.6	1	5	ICPST	10/26/02	2:57	10/26/02	3:43
Beryllium	313.042	0.098	B	0.038	U	100.0	1	5	ICPST	10/26/02	2:57	10/26/02	3:43
Cadmium	226.502	0.070	B	0.15	U	100.0	1	5	ICPST	10/26/02	2:57	10/26/02	3:43
Chromium	267.716	2.8		3.2		13.7	1	5	ICPST	10/26/02	2:57	10/26/02	3:43
Copper	324.753	2.8		2.2	B	20.5	1	5	ICPST	10/26/02	2:57	10/26/02	3:43
Lead	220.353	2.1		4.5		112.3	1	5	ICPST	10/26/02	2:57	10/26/02	3:43
Nickel	231.604	1.6		1.2	B	23.7	1	5	ICPST	10/26/02	2:57	10/26/02	3:43
Selenium	196.026	0.26	U	1.3	U		1	5	ICPST	10/26/02	2:57	10/26/02	3:43
Silver	328.068	0.038	U	0.19	U		1	5	ICPST	10/26/02	2:57	10/26/02	3:43

Comments: Sample Date: 10/04/02 Sample Time: 11:30 AM Color(Before): BLACK Color(After): YELLOW Clarity(After): CL

5.03.8

E Serial dilution percent difference not within limits

Form 9 Equivalent

U Result is less than the IDL

B Result is between IDL and RL

4054