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US ARMY CORPS
OF ENGINEERS
New England District

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Task 22D Post-Third Party Validated Soil Chemistry Data Report NTCRA Soils

CENTREDALE MANOR RESTORATION PROJECT SUPERFUND SITE HUMAN HEALTH AND BASELINE RISK ASSESSMENTS

Section 1
Dioxin/Furan Results

QA/QC Narrative
Soil and QC Results

QA/QC Narrative

DIOXIN/FURAN NTCRA SOILS QA/QC SUMMARY
QC Batch 49038-82

PROJECT: USACE NAE Delivery Order #01 Centredale

PARAMETER: Dioxin/Furan by High Resolution Mass Spectrometry (HRMS)

LABORATORY: Battelle, Columbus, OH

MATRIX: Soil

SAMPLE CUSTODY: Two soil samples were received at Battelle Columbus on November 3, 2001. The soil samples were processed for Dioxin/Furan analyses.

Samples were received in good condition and the cooler temperature upon receipt was 4.8°C.

QA/QC MEASUREMENT PERFORMANCE CRITERIA:

	Reference Method	Blank	Surrogate Recovery	LCS/MS Recovery	SRM % Diff.	MS/MSD Replicate Relative Precision	Achieved RL (pg/g dry)	Project Goals [c] (pg/g dry)
Dioxin/ Furan/	L-23 Battelle SOP ASAT.II-001-02	<5× MDL, or associated samples > 10x blank values	25-150% Recovery	*LCS:* Method 1613B, Table 6 OPR[a] *MS:* NA for this sample set	≤30% PD[b]	NA for this sample set	Tetras: 4.67 – 9.60 Penta-Hepta: 23.35 – 48.02 Octas: 46.69 – 96.04	Tetras : 0.008 – 0.587 Penta-Hepta: 0.008 – 2,050 Octas: 4,670-137,000

[a] Method 1613B, Table 6 OPR requirements documented on LCS summary report table.
[b] Certified values must be >5× the MDL.
[c] Range of action goals from Centredale Manor Tasks QAPP page 99 of 509

METHOD: Soil samples were processed and analyzed for seventeen 2,3,7,8-substituted polychlorinated dibenzo-p-dioxins and dibenzofurans (PCDD/PCDF) following general procedures in EPA Method 1613 as outlined in the Centredale Manor Task 22 QAPP (5/23/01) and as summarized below.

Sample Preparation – The samples were processed in BATCH 49038-82. Aliquots of each soil sample were weighed into individual jars and mixed with Hydromatrix drying agent. Approximately 1 g wet weight of each soil sample was used. The two samples plus four QC samples were prepared for PCDD/PCDF only. The soil/Hydromatrix mixtures were placed into Accelerated Solvent Extraction (ASE) cells and spiked with $^{13}C_{12}$-labeled PCDD/PCDF internal standard solutions. The laboratory control spike (LCS) sample was spiked with native PCDD/PCDF at this time. The samples were ASE extracted using toluene. Each extract was then spiked with 2,3,7,8-TCDD-$^{37}Cl_4$ cleanup standard for monitoring recovery of analytes through the cleanup procedures. Each extract was acid/base washed. The extracts were then processed through acid/base

METHOD (cont):

silica, alumina, and carbon cleanup columns. The extracts were spiked with 1,2,3,4-TCDD-$^{13}C_{12}$ and 1,2,3,7,8,9-HxCDD-$^{13}C_{12}$ recovery standard and concentrated to a final sample volume of 20 µL. Two samples (2004320 and 2004320DUP) exhibited poor internal standard recoveries during the initial instrument run. Therefore, the column fractions (2 stacked silica/alumina columns and 1 one carbon column) for each of the two samples were combined and run through 3 sets of acid silica columns, 2 sets of stacked acid/base columns, and carbon columns in order to recover additional internal standard. The extracts were recombined with the initial extract in the original GC vial and concentrated to 20 µL. No additional recovery standard spike was added.

PCDD/PCDF Analysis – Each extract was analyzed by gas chromatography/high resolution mass spectrometry (GC/HRMS) in the selected ion-monitoring mode at a resolution of 10,000 or greater. A DB5 column was used for initial analysis of the seventeen 2,3,7,8-PCDD/PCDF; and a DB225 column was used for second column confirmation of 2,3,7,8-TCDF.

The following revisions to Method 1613 as well as several items to note specifically related to these analyses are summarized below:

1. Quality control samples processed with this batch of samples included one method blank, one LCS, one soil standard reference material, and one sample prepared in duplicate. Matrix spikes were not prepared as discussed with the client due to the expected high level of analytes in the samples prohibiting the ability to spike the native analytes at >5× the background level.

2. The GC/HRMS instrumentation was calibrated for PCDD/PCDF at levels specified in Method 1613 with one additional calibration standard at concentrations equivalent to ½ the level of Method 1613's lowest calibration point. The calibration range corresponds to the following levels in the samples assuming an average sample dry weight of 0.5 g of soil and a final sample volume of 20 µL: 10 to 8,000 pg/g dry for tetra compounds, 50 to 40,000 pg/g dry for penta through hepta compounds, and 100 to 80,000 pg/g dry for octa compounds.

Any additional minor revisions to Method 1613 are fully documented in the analytical record.

HOLDING TIMES:

Samples were prepared for analysis in one analytical batch. Samples were extracted within 2 days of receipt at the laboratory and completely analyzed within 12 days of extraction.

Batch	Extraction Date	Analysis Date
49038-82	11/5/2001	11/8-11/14/2001
		11/17/2001 (confirms)

DIOXIN/FURAN NTCRA SOILS QA/QC SUMMARY
QC Batch 49038-82

DETECTION LIMITS:

Dioxin/furan results are reported relative to the sample-specific reporting limits (also referred to as QL in the QAPP) for that compound. The sample-specific RL is based on the low calibration standard and adjusted for sample specific processing factors and volumes, as follow:

RL = (Concentration in Low Std. × final extract volume × dilution factors)/ Sample size

Where,
Concentration in low standard = 0.25 to 2.5 pg/µL
Final Extract Volume = 20 µL
Dilution Factor = documented in project file
Sample Size = approximately 0.5-g dry

Achieved RLs did not meet project detection limit goals for most target compounds. As noted in the QAPP, the project detection limit goals are provided for perspective rather than as a requirement for the analytical methods. If detection limits cannot be achieved, this will be addressed in the uncertainty discussions in the risk assessment.

BLANKS:

One laboratory method blank was processed with the analytical batch. Blanks are analyzed to ensure that the sample extraction and analysis methods were free of contamination.

49038-82– Several analytes were detected at a trace level; however, the levels detected were below the reporting level.

LABORATORY CONTROL SAMPLE

A laboratory control sample (LCS) was prepared with the analytical batch. The percent recoveries of target compounds were calculated to measure data quality in terms of accuracy.

49038-82– The LCS samples met the criteria found in Table 6 of Method 1613, Revision B for PCDD/PCDF.

INTERNAL STANDARDS:

Fifteen internal standards were added to each sample prior to processing, one standard was added after extraction and prior to sample cleanup. Internal standard recoveries were calculated to measure data quality in terms of accuracy (sample processing efficiency).

49038-82– Recoveries of internal standards were within 25-150% for all samples. In the two samples that were re-processed, the measurement of the cleanup standard on the DB-5 initial analysis was hindered by an interfering species so the confirm (DB-225) results were reported.

REPLICATES:

A laboratory duplicate was prepared with the batch. The relative percent differences (RPD) between laboratory replicate analyses for target compounds were calculated to measure data quality in terms of precision.

49038-82– The RPD for the PCDD/PCDF analytes detected above the action level of >10X MDL were all below the 30% limit except for 2,3,7,8-TCDD and 2,3,7,8-TCDF which had RPDs of 45% and 48%, respectively.

SRM: A standard reference material was prepared with the analytical batch. The percent difference (PD) between detected concentrations and certified values was calculated to measure data quality in terms of accuracy.

49038-82– All analytes in the SRM were found to be within the limit of 30% difference from consensus values with the exception of 1,2,3,4,7,8,9-HpCDF which had a PD of 30.7%.

REFERENCES:

Battelle 2001. *Centredale Manor Restoration Project Superfund Site Baseline Risk Assessment, Initial Project Planning and Support.* Tasks 19-22 QAPP prepared under contract to USACE NAE. Delivery Order #59. May 23, 2001. 509pp + apps.

QUALITY ASSURANCE STATEMENT

Project Title: USACE/NED, Centredale Manor Task 22 Rush Soil Samples

Project Number: G487002-22D2

Description of Data: Soil samples for dioxin/furan

Description of audit and review activities:
1)Reviewed sample preparation Laboratory Record Books (LRB). Tracked COC from sample receipt to analytical injection. Reviewed standard/spike preparation records. Resolved all resulting LRB numbers (i.e. sample tracking numbers) with analytical designations. Reviewed data package for data recording consistent with Good Laboratory Practices (GLP's).

2)Reviewed analytical (HRMS) data. Reviewed all hand-entered parameters (e.g. sample masses, sample names, calibration curve date, etc) for each analytical run. Reviewed calibrations results to ensure that Relative Response Factors (RRF) were ±20% of calibration RRF. Reviewed 10% data transfer to spreadsheets. Reviewed confirmation runs and accurate data transfer.

3)Reviewed spreadsheets. Accessed e-file of excel spreadsheets and reviewed formula and relative and absolute cell addresses to ensure accurate data transposition.

4)Reviewed report. Ensured report accurately reflected raw data and resulting spreadsheets.

Description of outstanding issues or deficiencies which may affect data quality:
1) Minor QC issues were submitted to the analytical staff for correction, no outstanding issues present.

Zachary Willenberg
Quality Assurance Specialist
Atmospheric Science and Applied Technology
Battelle

11-28-01
Date

Soil and QC Results

PROJECT_NAME	Centredale RUSH SOILS							
LABORATORY	BCO							
SDG	49038-82							
ANALYSIS_METH	MOD 1613B							
CLASS	DIOXIN							
CASE								
IDL								
CRDL_CRQL								
FINAL_RESULT								
FINAL_QUAL								
COMMENTS								
VALID_COMMENT								
	QC_TYPE	M_BLANK						
	SAMPLE_NO							
	FRACTION	T						
	SAMPLE_SIZE	0.6463						
	SAMPLE_SIZE_UNITS	G DRY						
	PCT_MOIST							
	SAMPLE_DATE							
	EXTRACT_DATE	11/5/01						
	LAB_EXTRACTION_ID	49038-82-07						
	LAB_ID	48401-44-04						
CAS_NO	PARAMETER	LAB_RESULT	UNITS	LAB_QUAL	MDL	TEQ	ANAL_DATE	DIL_FACTOR
1746-01-6	2,3,7,8-TCDD	1.12	PG/G DRY	J	7.74	1.1227	11/9/01	1.000
40321-76-4	1,2,3,7,8-PeCDD	38.68	PG/G DRY	U	38.68	0.0000	11/9/01	1.000
39227-28-6	1,2,3,4,7,8-HxCDD	2.56	PG/G DRY	J	38.68	0.2559	11/9/01	1.000
57653-85-7	1,2,3,6,7,8-HxCDD	38.68	PG/G DRY	U	38.68	0.0000	11/9/01	1.000
19408-74-3	1,2,3,7,8,9-HxCDD	3.13	PG/G DRY	J	38.68	0.3134	11/9/01	1.000
35822-46-9	1,2,3,4,6,7,8-HpCDD	5.48	PG/G DRY	J	38.68	0.0548	11/9/01	1.000
3268-87-9	OCDD	26.73	PG/G DRY	J	77.36	0.0267	11/9/01	1.000
51207-31-9	2,3,7,8-TCDF	7.74	PG/G DRY	U	7.74	0.0000	11/9/01	1.000
57117-41-6	1,2,3,7,8-PeCDF	1.41	PG/G DRY	J	38.68	0.0703	11/9/01	1.000
57117-31-4	2,3,4,7,8-PeCDF	1.59	PG/G DRY	J	38.68	0.7973	11/9/01	1.000
70648-26-9	1,2,3,4,7,8-HxCDF	2.16	PG/G DRY	J	38.68	0.2164	11/9/01	1.000
57117-44-9	1,2,3,6,7,8-HxCDF	1.82	PG/G DRY	J	38.68	0.1822	11/9/01	1.000
72918-21-9	1,2,3,7,8,9-HxCDF	2.03	PG/G DRY	J	38.68	0.2034	11/9/01	1.000
60851-34-5	2,3,4,6,7,8-HxCDF	2.57	PG/G DRY	J	38.68	0.2573	11/9/01	1.000
67562-39-4	1,2,3,4,6,7,8-HpCDF	3.17	PG/G DRY	J	38.68	0.0317	11/9/01	1.000
55673-89-7	1,2,3,4,7,8,9-HpCDF	4.50	PG/G DRY	J	38.68	0.0450	11/9/01	1.000
39001-02-0	OCDF	21.32	PG/G DRY	J	77.36	0.0213	11/9/01	1.000
51207-31-9	TOTAL TETRA-FURANS	7.74	PG/G DRY	U	7.74		11/9/01	1.000
41903-57-5	TOTAL TETRA-DIOXINS	1.12	PG/G DRY	J	7.74		11/9/01	1.000
30402-15-4	TOTAL PENTA-FURANS	3.00	PG/G DRY	J	38.68		11/9/01	1.000
36088-22-9	TOTAL PENTA-DIOXINS	38.68	PG/G DRY	U	38.68		11/9/01	1.000
55684-94-1	TOTAL HEXA-FURANS	9.61	PG/G DRY	J	38.68		11/9/01	1.000
34465-46-8	TOTAL -HEXA-DIOXINS	6.09	PG/G DRY	J	38.68		11/9/01	1.000
38998-75-3	TOTAL HEPTA-FURANS	7.67	PG/G DRY	J	38.68		11/9/01	1.000
37871-00-4	TOTAL HEPTA-DIOXINS	8.88	PG/G DRY	J	38.68		11/9/01	1.000
76523-40-5	13C-2,3,7,8-TCDD	58	PCT_REC				11/9/01	1.000
109719-79-1	13C-1,2,3,7,8-PeCDD	62	PCT_REC				11/9/01	1.000
109719-80-4	13C-1,2,3,4,7,8-HxCDD	59	PCT_REC				11/9/01	1.000
109719-81-5	13C-1,2,3,6,7,8-HxCDD	67	PCT_REC				11/9/01	1.000
109719-83-7	13C-1,2,3,4,6,7,8-HpCDD	70	PCT_REC				11/9/01	1.000
114423-97-1	13C-OCDD	60	PCT_REC				11/9/01	1.000
89059-46-1	13C-2,3,7,8-TCDF	57	PCT_REC				11/9/01	1.000
109719-77-9	13C-1,2,3,7,8-PeCDF	56	PCT_REC				11/9/01	1.000
116843-02-8	13C-2,3,4,7,8-PeCDF	80	PCT_REC				11/9/01	1.000
114423-98-2	13C-1,2,3,4,7,8-HxCDF	60	PCT_REC				11/9/01	1.000
116843-03-9	13C-1,2,3,6,7,8-HxCDF	61	PCT_REC				11/9/01	1.000
116843-04-0	13C-1,2,3,7,8,9-HxCDF	61	PCT_REC				11/9/01	1.000
116843-05-1	13C-2,3,4,6,7,8-HxCDF	62	PCT_REC				11/9/01	1.000
116843-09-5	13C-1,2,3,4,6,7,8-HpCDF	68	PCT_REC				11/9/01	1.000
109719-94-0	13C-1,2,3,4,7,8,9-HpCDF	66	PCT_REC				11/9/01	1.000
85508-50-5	37Cl-2,3,7,8-TCDD	50	PCT_REC				11/9/01	1.000

PROJECT_NAME	Centredale RUSH SOILS							
LABORATORY	BCO							
SDG	49038-82							
ANALYSIS_METH	MOD 1613B							
CLASS	DIOXIN							
CASE								
IDL								
CRDL_CRQL								
FINAL_RESULT								
FINAL_QUAL								
COMMENTS								
VALID_COMMENT								
	QC_TYPE	NORMAL						
	SAMPLE_NO	2004539						
	FRACTION	T						
	SAMPLE_SIZE	0.7142						
	SAMPLE_SIZE_UNITS	G DRY						
	PCT_MOIST	32.37						
	SAMPLE_DATE	10/10/01						
	EXTRACT_DATE	11/5/01						
	LAB_EXTRACTION_ID	49038-82-04						
	LAB_ID	49037-19-03						
CAS_NO	PARAMETER	LAB_RESULT	UNITS	LAB_QUAL	MDL	TEQ	ANAL_DATE	DIL_FACTOR
1746-01-6	2,3,7,8-TCDD	2152.53	PG/G DRY		7.00	2152.0	11/9/01	1.000
40321-76-4	1,2,3,7,8-PeCDD	7.89	PG/G DRY	J	35.00	3.9442	11/9/01	1.000
39227-28-6	1,2,3,4,7,8-HxCDD	14.19	PG/G DRY	J	35.00	1.4187	11/9/01	1.000
57653-85-7	1,2,3,6,7,8-HxCDD	41.87	PG/G DRY		35.00	4.1865	11/9/01	1.000
19408-74-3	1,2,3,7,8,9-HxCDD	41.35	PG/G DRY		35.00	4.1348	11/9/01	1.000
35822-46-9	1,2,3,4,6,7,8-HpCDD	906.84	PG/G DRY		35.00	9.0684	11/9/01	1.000
3268-87-9	OCDD	6485.15	PG/G DRY		70.01	6.4852	11/9/01	1.000
51207-31-9	2,3,7,8-TCDF	10.62	PG/G DRY	#	7.00	1.0620	11/9/01	1.000
57117-41-6	1,2,3,7,8-PeCDF	4.37	PG/G DRY	J	35.00	0.2187	11/9/01	1.000
57117-31-4	2,3,4,7,8-PeCDF	7.13	PG/G DRY	J	35.00	3.5635	11/9/01	1.000
70648-26-9	1,2,3,4,7,8-HxCDF	22.52	PG/G DRY	J	35.00	2.2516	11/9/01	1.000
57117-44-9	1,2,3,6,7,8-HxCDF	10.98	PG/G DRY	J	35.00	1.0985	11/9/01	1.000
72918-21-9	1,2,3,7,8,9-HxCDF	35.00	PG/G DRY	U	35.00	0.0000	11/9/01	1.000
60851-34-5	2,3,4,6,7,8-HxCDF	9.23	PG/G DRY	J	35.00	0.9233	11/9/01	1.000
67562-39-4	1,2,3,4,6,7,8-HpCDF	110.62	PG/G DRY		35.00	1.1062	11/9/01	1.000
55673-89-7	1,2,3,4,7,8,9-HpCDF	9.50	PG/G DRY	J	35.00	0.0950	11/9/01	1.000
39001-02-0	OCDF	254.20	PG/G DRY		70.01	0.2542	11/9/01	1.000
51207-31-9	TOTAL TETRA-FURANS	101.17	PG/G DRY		7.00		11/9/01	1.000
41903-57-5	TOTAL TETRA-DIOXINS	2152.53	PG/G DRY		7.00		11/9/01	1.000
30402-15-4	TOTAL PENTA-FURANS	184.28	PG/G DRY		35.00		11/9/01	1.000
36088-22-9	TOTAL PENTA-DIOXINS	7.89	PG/G DRY	J	35.00		11/9/01	1.000
55684-94-1	TOTAL HEXA-FURANS	228.79	PG/G DRY		35.00		11/9/01	1.000
34465-46-8	TOTAL -HEXA-DIOXINS	278.14	PG/G DRY		35.00		11/9/01	1.000
38998-75-3	TOTAL HEPTA-FURANS	246.61	PG/G DRY		35.00		11/9/01	1.000
37871-00-4	TOTAL HEPTA-DIOXINS	1500.67	PG/G DRY		35.00		11/9/01	1.000
76523-40-5	13C-2,3,7,8-TCDD	49	PCT_REC				11/9/01	1.000
109719-79-1	13C-1,2,3,7,8-PeCDD	73	PCT_REC				11/9/01	1.000
109719-80-4	13C-1,2,3,4,7,8-HxCDD	73	PCT_REC				11/9/01	1.000
109719-81-5	13C-1,2,3,6,7,8-HxCDD	72	PCT_REC				11/9/01	1.000
109719-83-7	13C-1,2,3,4,6,7,8-HpCDD	88	PCT_REC				11/9/01	1.000
114423-97-1	13C-OCDD	86	PCT_REC				11/9/01	1.000
89059-46-1	13C-2,3,7,8-TCDF	37	PCT_REC	#			11/9/01	1.000
109719-77-9	13C-1,2,3,7,8-PeCDF	67	PCT_REC				11/9/01	1.000
116843-02-8	13C-2,3,4,7,8-PeCDF	84	PCT_REC				11/9/01	1.000
114423-98-2	13C-1,2,3,4,7,8-HxCDF	67	PCT_REC				11/9/01	1.000
116843-03-9	13C-1,2,3,6,7,8-HxCDF	63	PCT_REC				11/9/01	1.000
116843-04-0	13C-1,2,3,7,8,9-HxCDF	70	PCT_REC				11/9/01	1.000
116843-05-1	13C-2,3,4,6,7,8-HxCDF	70	PCT_REC				11/9/01	1.000
116843-09-5	13C-1,2,3,4,6,7,8-HpCDF	78	PCT_REC				11/9/01	1.000
109719-94-0	13C-1,2,3,4,7,8,9-HpCDF	85	PCT_REC				11/9/01	1.000
85508-50-5	37Cl-2,3,7,8-TCDD	44	PCT_REC				11/9/01	1.000

PROJECT_NAME	Centredale RUSH SOILS							
LABORATORY	BCO							
SDG	49038-82							
ANALYSIS_METH	MOD 1613B							
CLASS	DIOXIN							
CASE								
IDL								
CRDL_CRQL								
FINAL_RESULT								
FINAL_QUAL								
COMMENTS								
VALID_COMMENT								
	QC_TYPE	SOIL SRM						
	SAMPLE_NO	CIL EDF 2513						
	FRACTION	T						
	SAMPLE_SIZE	1.0116						
	SAMPLE_SIZE_UNITS	G DRY						
	PCT_MOIST							
	SAMPLE_DATE							
	EXTRACT_DATE	11/5/01						
	LAB_EXTRACTION_ID	49038-82-05						
	LAB_ID	48514-92-03						
CAS_NO	PARAMETER	LAB_RESULT	UNITS	LAB_QUAL	MDL	TEQ	ANAL_DATE	DIL_FACTOR
1746-01-6	2,3,7,8-TCDD	5.0	PCT DIFF		4.94	483.23	11/9/01	1.000
40321-76-4	1,2,3,7,8-PeCDD	3.2	PCT DIFF		24.71	495.51	11/9/01	1.000
39227-28-6	1,2,3,4,7,8-HxCDD	4.3	PCT DIFF		24.71	93.835	11/9/01	1.000
57653-85-7	1,2,3,6,7,8-HxCDD	4.9	PCT DIFF		24.71	91.231	11/9/01	1.000
19408-74-3	1,2,3,7,8,9-HxCDD	9.0	PCT DIFF		24.71	98.106	11/9/01	1.000
35822-46-9	1,2,3,4,6,7,8-HpCDD	8.2	PCT DIFF		24.71	15.039	11/9/01	1.000
3268-87-9	OCDD	12.5	PCT DIFF		49.43	3.9490	11/9/01	1.000
51207-31-9	2,3,7,8-TCDF	4.4	PCT DIFF		4.94	46.990	11/9/01	1.000
57117-41-6	1,2,3,7,8-PeCDF	17.2	PCT DIFF		24.71	50.992	11/9/01	1.000
57117-31-4	2,3,4,7,8-PeCDF	7.7	PCT DIFF		24.71	463.30	11/9/01	1.000
70648-26-9	1,2,3,4,7,8-HxCDF	8.5	PCT DIFF		24.71	95.473	11/9/01	1.000
57117-44-9	1,2,3,6,7,8-HxCDF	5.7	PCT DIFF		24.71	100.43	11/9/01	1.000
72918-21-9	1,2,3,7,8,9-HxCDF	11.7	PCT DIFF		24.71	91.601	11/9/01	1.000
60851-34-5	2,3,4,6,7,8-HxCDF	10.4	PCT DIFF		24.71	100.44	11/9/01	1.000
67562-39-4	1,2,3,4,6,7,8-HpCDF	17.3	PCT DIFF		24.71	14.899	11/9/01	1.000
55673-89-7	1,2,3,4,7,8,9-HpCDF	30.7	PCT DIFF	&	24.71	14.634	11/9/01	1.000
39001-02-0	OCDF	12.0	PCT DIFF		49.43	2.5190	11/9/01	1.000
51207-31-9	TOTAL TETRA-FURANS	NA	PG/G DRY		4.94		11/9/01	1.000
41903-57-5	TOTAL TETRA-DIOXINS	NA	PG/G DRY		4.94		11/9/01	1.000
30402-15-4	TOTAL PENTA-FURANS	NA	PG/G DRY		24.71		11/9/01	1.000
36088-22-9	TOTAL PENTA-DIOXINS	NA	PG/G DRY		24.71		11/9/01	1.000
55684-94-1	TOTAL HEXA-FURANS	NA	PG/G DRY		24.71		11/9/01	1.000
34465-46-8	TOTAL -HEXA-DIOXINS	NA	PG/G DRY		24.71		11/9/01	1.000
38998-75-3	TOTAL HEPTA-FURANS	NA	PG/G DRY		24.71		11/9/01	1.000
37871-00-4	TOTAL HEPTA-DIOXINS	NA	PG/G DRY		24.71		11/9/01	1.000
76523-40-5	13C-2,3,7,8-TCDD	52	PCT_REC				11/9/01	1.000
109719-79-1	13C-1,2,3,7,8-PeCDD	67	PCT_REC				11/9/01	1.000
109719-80-4	13C-1,2,3,4,7,8-HxCDD	66	PCT_REC				11/9/01	1.000
109719-81-5	13C-1,2,3,6,7,8-HxCDD	68	PCT_REC				11/9/01	1.000
109719-83-7	13C-1,2,3,4,6,7,8-HpCDD	82	PCT_REC				11/9/01	1.000
114423-97-1	13C-OCDD	82	PCT_REC				11/9/01	1.000
89059-46-1	13C-2,3,7,8-TCDF	57	PCT_REC				11/9/01	1.000
109719-77-9	13C-1,2,3,7,8-PeCDF	62	PCT_REC				11/9/01	1.000
116843-02-8	13C-2,3,4,7,8-PeCDF	87	PCT_REC				11/9/01	1.000
114423-98-2	13C-1,2,3,4,7,8-HxCDF	69	PCT_REC				11/9/01	1.000
116843-03-9	13C-1,2,3,6,7,8-HxCDF	65	PCT_REC				11/9/01	1.000
116843-04-0	13C-1,2,3,7,8,9-HxCDF	66	PCT_REC				11/9/01	1.000
116843-05-1	13C-2,3,4,6,7,8-HxCDF	68	PCT_REC				11/9/01	1.000
116843-09-5	13C-1,2,3,4,6,7,8-HpCDF	73	PCT_REC				11/9/01	1.000
109719-94-0	13C-1,2,3,4,7,8,9-HpCDF	81	PCT_REC				11/9/01	1.000
85508-50-5	37Cl-2,3,7,8-TCDD	47	PCT_REC				11/9/01	1.000

PROJECT_NAME	Centredale RUSH SOILS							
LABORATORY	BCO							
SDG	49038-82							
ANALYSIS_METH	MOD 1613B							
CLASS	DIOXIN							
CASE								
IDL								
CRDL_CRQL								
FINAL_RESULT								
FINAL_QUAL								
COMMENTS								
VALID_COMMENT								
	QC_TYPE	NORMAL						
	SAMPLE_NO	2004320						
	FRACTION	T						
	SAMPLE_SIZE	0.5371						
	SAMPLE_SIZE_UNITS	G DRY						
	PCT_MOIST	48.53						
	SAMPLE_DATE	10/1/01						
	EXTRACT_DATE	11/5/01						
	LAB_EXTRACTION_ID	49038-82-02						
	LAB_ID	49037-19-02						
CAS_NO	PARAMETER	LAB_RESULT	UNITS	LAB_QUAL	MDL	TEQ	ANAL_DATE	DIL_FACTOR
1746-01-6	2,3,7,8-TCDD	127542.09	PG/G DRY		9.31	127542	11/13/01	1.000
40321-76-4	1,2,3,7,8-PeCDD	206.39	PG/G DRY		46.55	103.100	11/13/01	1.000
39227-28-6	1,2,3,4,7,8-HxCDD	241.27	PG/G DRY		46.55	24.1200	11/13/01	1.000
57653-85-7	1,2,3,6,7,8-HxCDD	898.07	PG/G DRY		46.55	89.8000	11/13/01	1.000
19408-74-3	1,2,3,7,8,9-HxCDD	931.16	PG/G DRY		46.55	93.1100	11/13/01	1.000
35822-46-9	1,2,3,4,6,7,8-HpCDD	36862.63	PG/G DRY		46.55	368.600	11/13/01	1.000
3268-87-9	OCDD	284138.76	PG/G DRY		93.09	284.100	11/13/01	1.000
51207-31-9	2,3,7,8-TCDF	561.29	PG/G DRY	#	9.31	56.1290	11/13/01	1.000
57117-41-6	1,2,3,7,8-PeCDF	120.94	PG/G DRY		46.55	6.04700	11/13/01	1.000
57117-31-4	2,3,4,7,8-PeCDF	1153.46	PG/G DRY		46.55	576.700	11/13/01	1.000
70648-26-9	1,2,3,4,7,8-HxCDF	3229.15	PG/G DRY		46.55	322.900	11/13/01	1.000
57117-44-9	1,2,3,6,7,8-HxCDF	897.28	PG/G DRY		46.55	89.7200	11/13/01	1.000
72918-21-9	1,2,3,7,8,9-HxCDF	32.82	PG/G DRY	J	46.55	3.28250	11/13/01	1.000
60851-34-5	2,3,4,6,7,8-HxCDF	339.50	PG/G DRY		46.55	33.9500	11/13/01	1.000
67562-39-4	1,2,3,4,6,7,8-HpCDF	1676.36	PG/G DRY		46.55	16.7600	11/13/01	1.000
55673-89-7	1,2,3,4,7,8,9-HpCDF	689.72	PG/G DRY		46.55	6.89720	11/13/01	1.000
39001-02-0	OCDF	2733.26	PG/G DRY		93.09	2.73330	11/13/01	1.000
51207-31-9	TOTAL TETRA-FURANS	5443.41	PG/G DRY		9.31		11/13/01	1.000
41903-57-5	TOTAL TETRA-DIOXINS	127542.09	PG/G DRY		9.31		11/13/01	1.000
30402-15-4	TOTAL PENTA-FURANS	10521.60	PG/G DRY		46.55		11/13/01	1.000
36088-22-9	TOTAL PENTA-DIOXINS	557.35	PG/G DRY		46.55		11/13/01	1.000
55684-94-1	TOTAL HEXA-FURANS	13472.71	PG/G DRY		46.55		11/13/01	1.000
34465-46-8	TOTAL -HEXA-DIOXINS	6619.69	PG/G DRY		46.55		11/13/01	1.000
38998-75-3	TOTAL HEPTA-FURANS	4095.25	PG/G DRY		46.55		11/13/01	1.000
37871-00-4	TOTAL HEPTA-DIOXINS	57176.00	PG/G DRY		46.55		11/13/01	1.000
76523-40-5	13C-2,3,7,8-TCDD	52	PCT_REC				11/13/01	1.000
109719-79-1	13C-1,2,3,7,8-PeCDD	71	PCT_REC				11/13/01	1.000
109719-80-4	13C-1,2,3,4,7,8-HxCDD	68	PCT_REC				11/13/01	1.000
109719-81-5	13C-1,2,3,6,7,8-HxCDD	88	PCT_REC				11/13/01	1.000
109719-83-7	13C-1,2,3,4,6,7,8-HpCDD	90	PCT_REC				11/13/01	1.000
114423-97-1	13C-OCDD	94	PCT_REC				11/13/01	1.000
89059-46-1	13C-2,3,7,8-TCDF	29	PCT_REC	#			11/13/01	1.000
109719-77-9	13C-1,2,3,7,8-PeCDF	69	PCT_REC				11/13/01	1.000
116843-02-8	13C-2,3,4,7,8-PeCDF	80	PCT_REC				11/13/01	1.000
114423-98-2	13C-1,2,3,4,7,8-HxCDF	68	PCT_REC				11/13/01	1.000
116843-03-9	13C-1,2,3,6,7,8-HxCDF	65	PCT_REC				11/13/01	1.000
116843-04-0	13C-1,2,3,7,8,9-HxCDF	81	PCT_REC				11/13/01	1.000
116843-05-1	13C-2,3,4,6,7,8-HxCDF	77	PCT_REC				11/13/01	1.000
116843-09-5	13C-1,2,3,4,6,7,8-HpCDF	85	PCT_REC				11/13/01	1.000
109719-94-0	13C-1,2,3,4,7,8,9-HpCDF	83	PCT_REC				11/13/01	1.000
85508-50-5	37Cl-2,3,7,8-TCDD	86	PCT_REC	#			11/13/01	1.000

PROJECT_NAME	Centredale RUSH SOILS							
LABORATORY	BCO							
SDG	49038-82							
ANALYSIS_METH	MOD 1613B							
CLASS	DIOXIN							
CASE								
IDL								
CRDL_CRQL								
FINAL_RESULT								
FINAL_QUAL								
COMMENTS								
VALID_COMMENT								
	QC_TYPE	DUPLICATE						
	SAMPLE_NO	2004320						
	FRACTION	T						
	SAMPLE_SIZE	0.5206						
	SAMPLE_SIZE_UNITS	G DRY						
	PCT_MOIST	48.53						
	SAMPLE_DATE	10/1/01						
	EXTRACT_DATE	11/5/01						
	LAB_EXTRACTION_ID	49038-82-03						
	LAB_ID	49037-19-02						
CAS_NO	PARAMETER	LAB_RESULT	UNITS	LAB_QUAL	MDL	TEQ	ANAL_DATE	DIL_FACTOR
1746-01-6	2,3,7,8-TCDD	80550.87	PG/G DRY		9.60	80550	11/14/01	1.000
40321-76-4	1,2,3,7,8-PeCDD	190.39	PG/G DRY		48.02	95.190	11/14/01	1.000
39227-28-6	1,2,3,4,7,8-HxCDD	236.09	PG/G DRY		48.02	23.600	11/14/01	1.000
57653-85-7	1,2,3,6,7,8-HxCDD	1076.21	PG/G DRY		48.02	107.60	11/14/01	1.000
19408-74-3	1,2,3,7,8,9-HxCDD	1047.10	PG/G DRY		48.02	104.70	11/14/01	1.000
35822-46-9	1,2,3,4,6,7,8-HpCDD	44060.68	PG/G DRY		48.02	440.60	11/14/01	1.000
3268-87-9	OCDD	342576.76	PG/G DRY		96.04	342.50	11/14/01	1.000
51207-31-9	2,3,7,8-TCDF	913.53	PG/G DRY	#	9.60	91.353	11/14/01	1.000
57117-41-6	1,2,3,7,8-PeCDF	115.99	PG/G DRY		48.02	5.7993	11/14/01	1.000
57117-31-4	2,3,4,7,8-PeCDF	1340.85	PG/G DRY		48.02	670.40	11/14/01	1.000
70648-26-9	1,2,3,4,7,8-HxCDF	4200.67	PG/G DRY		48.02	420.00	11/14/01	1.000
57117-44-9	1,2,3,6,7,8-HxCDF	1145.07	PG/G DRY		48.02	114.50	11/14/01	1.000
72918-21-9	1,2,3,7,8,9-HxCDF	29.55	PG/G DRY	J	48.02	2.9546	11/14/01	1.000
60851-34-5	2,3,4,6,7,8-HxCDF	340.14	PG/G DRY		48.02	34.010	11/14/01	1.000
67562-39-4	1,2,3,4,6,7,8-HpCDF	1982.45	PG/G DRY		48.02	19.820	11/14/01	1.000
55673-89-7	1,2,3,4,7,8,9-HpCDF	895.45	PG/G DRY		48.02	8.9545	11/14/01	1.000
39001-02-0	OCDF	2540.05	PG/G DRY		96.04	2.5400	11/14/01	1.000
51207-31-9	TOTAL TETRA-FURANS	4778.32	PG/G DRY		9.60		11/14/01	1.000
41903-57-5	TOTAL TETRA-DIOXINS	80550.87	PG/G DRY		9.60		11/14/01	1.000
30402-15-4	TOTAL PENTA-FURANS	14027.17	PG/G DRY		48.02		11/14/01	1.000
36088-22-9	TOTAL PENTA-DIOXINS	190.39	PG/G DRY		48.02		11/14/01	1.000
55684-94-1	TOTAL HEXA-FURANS	15516.81	PG/G DRY		48.02		11/14/01	1.000
34465-46-8	TOTAL -HEXA-DIOXINS	7878.64	PG/G DRY		48.02		11/14/01	1.000
38998-75-3	TOTAL HEPTA-FURANS	5012.23	PG/G DRY		48.02		11/14/01	1.000
37871-00-4	TOTAL HEPTA-DIOXINS	67514.84	PG/G DRY		48.02		11/14/01	1.000
76523-40-5	13C-2,3,7,8-TCDD	53	PCT_REC				11/14/01	1.000
109719-79-1	13C-1,2,3,7,8-PeCDD	75	PCT_REC				11/14/01	1.000
109719-80-4	13C-1,2,3,4,7,8-HxCDD	77	PCT_REC				11/14/01	1.000
109719-81-5	13C-1,2,3,6,7,8-HxCDD	78	PCT_REC				11/14/01	1.000
109719-83-7	13C-1,2,3,4,6,7,8-HpCDD	93	PCT_REC				11/14/01	1.000
114423-97-1	13C-OCDD	88	PCT_REC				11/14/01	1.000
89059-46-1	13C-2,3,7,8-TCDF	33	PCT_REC	#			11/14/01	1.000
109719-77-9	13C-1,2,3,7,8-PeCDF	72	PCT_REC				11/14/01	1.000
116843-02-8	13C-2,3,4,7,8-PeCDF	64	PCT_REC				11/14/01	1.000
114423-98-2	13C-1,2,3,4,7,8-HxCDF	78	PCT_REC				11/14/01	1.000
116843-03-9	13C-1,2,3,6,7,8-HxCDF	69	PCT_REC				11/14/01	1.000
116843-04-0	13C-1,2,3,7,8,9-HxCDF	81	PCT_REC				11/14/01	1.000
116843-05-1	13C-2,3,4,6,7,8-HxCDF	78	PCT_REC				11/14/01	1.000
116843-09-5	13C-1,2,3,4,6,7,8-HpCDF	83	PCT_REC				11/14/01	1.000
109719-94-0	13C-1,2,3,4,7,8,9-HpCDF	86	PCT_REC				11/14/01	1.000
85508-50-5	37Cl-2,3,7,8-TCDD	90	PCT_REC	#			11/14/01	1.000

PROJECT_NAME	Centredale RUSH SOILS							
LABORATORY	BCO							
SDG	49038-82							
ANALYSIS_METH	MOD 1613B							
CLASS	DIOXIN							
CASE								
IDL								
CRDL_CRQL								
FINAL_RESULT								
FINAL_QUAL								
COMMENTS								
VALID_COMMENT								
	QC_TYPE	LCS						
	SAMPLE_NO	OPR						
	FRACTION	T						
	SAMPLE_SIZE	1.0708						
	SAMPLE_SIZE_UNITS	G DRY						
	PCT_MOIST							
	SAMPLE_DATE							
	EXTRACT_DATE	11/5/01						
	LAB_EXTRACTION_ID	49038-82-06						
	LAB_ID	48401-44-04						
CAS_NO	PARAMETER	LAB_RESULT	UNITS	LAB_QUAL	MDL	TEQ	ANAL_DATE	DIL_FACTOR
1746-01-6	2,3,7,8-TCDD	88	PCT_REC		4.67	8.8360	11/8/01	1.000
40321-76-4	1,2,3,7,8-PeCDD	91	PCT_REC		23.35	22.780	11/8/01	1.000
39227-28-6	1,2,3,4,7,8-HxCDD	98	PCT_REC		23.35	4.8940	11/8/01	1.000
57653-85-7	1,2,3,6,7,8-HxCDD	97	PCT_REC		23.35	4.8373	11/8/01	1.000
19408-74-3	1,2,3,7,8,9-HxCDD	97	PCT_REC		23.35	4.8473	11/8/01	1.000
35822-46-9	1,2,3,4,6,7,8-HpCDD	90	PCT_REC		23.35	0.4523	11/8/01	1.000
3268-87-9	OCDD	98	PCT_REC		46.69	0.0978	11/8/01	1.000
51207-31-9	2,3,7,8-TCDF	87	PCT_REC		4.67	0.8653	11/8/01	1.000
57117-41-6	1,2,3,7,8-PeCDF	99	PCT_REC		23.35	2.4708	11/8/01	1.000
57117-31-4	2,3,4,7,8-PeCDF	95	PCT_REC		23.35	23.710	11/8/01	1.000
70648-26-9	1,2,3,4,7,8-HxCDF	93	PCT_REC		23.35	4.6429	11/8/01	1.000
57117-44-9	1,2,3,6,7,8-HxCDF	93	PCT_REC		23.35	4.6546	11/8/01	1.000
72918-21-9	1,2,3,7,8,9-HxCDF	88	PCT_REC		23.35	4.3800	11/8/01	1.000
60851-34-5	2,3,4,6,7,8-HxCDF	93	PCT_REC		23.35	4.6585	11/8/01	1.000
67562-39-4	1,2,3,4,6,7,8-HpCDF	94	PCT_REC		23.35	0.4676	11/8/01	1.000
55673-89-7	1,2,3,4,7,8,9-HpCDF	93	PCT_REC		23.35	0.4673	11/8/01	1.000
39001-02-0	OCDF	100	PCT_REC		46.69	0.1004	11/8/01	1.000
51207-31-9	TOTAL TETRA-FURANS	NA	PCT_REC		4.67		11/8/01	1.000
41903-57-5	TOTAL TETRA-DIOXINS	NA	PCT_REC		4.67		11/8/01	1.000
30402-15-4	TOTAL PENTA-FURANS	NA	PCT_REC		23.35		11/8/01	1.000
36088-22-9	TOTAL PENTA-DIOXINS	NA	PCT_REC		23.35		11/8/01	1.000
55684-94-1	TOTAL HEXA-FURANS	NA	PCT_REC		23.35		11/8/01	1.000
34465-46-8	TOTAL -HEXA-DIOXINS	NA	PCT_REC		23.35		11/8/01	1.000
38998-75-3	TOTAL HEPTA-FURANS	NA	PCT_REC		23.35		11/8/01	1.000
37871-00-4	TOTAL HEPTA-DIOXINS	NA	PCT_REC		23.35		11/8/01	1.000
76523-40-5	13C-2,3,7,8-TCDD	55	PCT_REC				11/8/01	1.000
109719-79-1	13C-1,2,3,7,8-PeCDD	68	PCT_REC				11/8/01	1.000
109719-80-4	13C-1,2,3,4,7,8-HxCDD	66	PCT_REC				11/8/01	1.000
109719-81-5	13C-1,2,3,6,7,8-HxCDD	81	PCT_REC				11/8/01	1.000
109719-83-7	13C-1,2,3,4,6,7,8-HpCDD	79	PCT_REC				11/8/01	1.000
114423-97-1	13C-OCDD	77	PCT_REC				11/8/01	1.000
89059-46-1	13C-2,3,7,8-TCDF	58	PCT_REC				11/8/01	1.000
109719-77-9	13C-1,2,3,7,8-PeCDF	63	PCT_REC				11/8/01	1.000
116843-02-8	13C-2,3,4,7,8-PeCDF	93	PCT_REC				11/8/01	1.000
114423-98-2	13C-1,2,3,4,7,8-HxCDF	68	PCT_REC				11/8/01	1.000
116843-03-9	13C-1,2,3,6,7,8-HxCDF	75	PCT_REC				11/8/01	1.000
116843-04-0	13C-1,2,3,7,8,9-HxCDF	70	PCT_REC				11/8/01	1.000
116843-05-1	13C-2,3,4,6,7,8-HxCDF	73	PCT_REC				11/8/01	1.000
116843-09-5	13C-1,2,3,4,6,7,8-HpCDF	80	PCT_REC				11/8/01	1.000
109719-94-0	13C-1,2,3,4,7,8,9-HpCDF	78	PCT_REC				11/8/01	1.000
85508-50-5	37Cl-2,3,7,8-TCDD	45	PCT_REC				11/8/01	1.000

PROJECT_NAME	Centredale RUSH SOILS								
LABORATORY	BCO								
SDG	49038-82								
ANALYSIS_METH	MOD 1613B								
CLASS	DIOXIN								
CASE									
IDL									
CRDL_CRQL									
FINAL_RESULT									
FINAL_QUAL									
COMMENTS									
VALID_COMMENT									
	QC_TYPE	LCS							
	SAMPLE_NO	OPR							
	FRACTION	T							
	SAMPLE_SIZE	1.0708							
	SAMPLE_SIZE_UNITS	G DRY							
	PCT_MOIST								
	SAMPLE_DATE								
	EXTRACT_DATE	11/5/01							
	LAB_EXTRACTION_ID	49038-82-06							
	LAB_ID	48401-44-04							
						Method 1613B				
CAS_NO	PARAMETER	LAB_RESULT	UNITS	LAB_QUAL	Limits (ng/ml)	MDL	TEQ	ANAL_DATE	DIL_FACTOR
1746-01-6	2,3,7,8-TCDD	8.84	NG/ML		6.7 - 15.8	5.05	8.8360	11/8/01	1.000
40321-76-4	1,2,3,7,8-PeCDD	45.57	NG/ML		35 - 71	25.27	22.780	11/8/01	1.000
39227-28-6	1,2,3,4,7,8-HxCDD	48.94	NG/ML		35 - 82	25.27	4.8940	11/8/01	1.000
57653-85-7	1,2,3,6,7,8-HxCDD	48.37	NG/ML		38 - 67	25.27	4.8373	11/8/01	1.000
19408-74-3	1,2,3,7,8,9-HxCDD	48.47	NG/ML		32 - 81	25.27	4.8473	11/8/01	1.000
35822-46-9	1,2,3,4,6,7,8-HpCDD	45.23	NG/ML		35 - 70	25.27	0.4523	11/8/01	1.000
3268-87-9	OCDD	97.85	NG/ML		78 - 144	50.55	0.0978	11/8/01	1.000
51207-31-9	2,3,7,8-TCDF	8.65	NG/ML		7.5 - 15.8	5.05	0.8653	11/8/01	1.000
57117-41-6	1,2,3,7,8-PeCDF	49.42	NG/ML		40 - 67	25.27	2.4708	11/8/01	1.000
57117-31-4	2,3,4,7,8-PeCDF	47.43	NG/ML		34 - 80	25.27	23.710	11/8/01	1.000
70648-26-9	1,2,3,4,7,8-HxCDF	46.43	NG/ML		36 - 67	25.27	4.6429	11/8/01	1.000
57117-44-9	1,2,3,6,7,8-HxCDF	46.55	NG/ML		42 - 65	25.27	4.6546	11/8/01	1.000
72918-21-9	1,2,3,7,8,9-HxCDF	43.80	NG/ML		39 - 65	25.27	4.3800	11/8/01	1.000
60851-34-5	2,3,4,6,7,8-HxCDF	46.58	NG/ML		35 - 78	25.27	4.6585	11/8/01	1.000
67562-39-4	1,2,3,4,6,7,8-HpCDF	46.76	NG/ML		41 - 61	25.27	0.4676	11/8/01	1.000
55673-89-7	1,2,3,4,7,8,9-HpCDF	46.73	NG/ML		39 - 69	25.27	0.4673	11/8/01	1.000
39001-02-0	OCDF	100.44	NG/ML		63 -170	50.55	0.1004	11/8/01	1.000
51207-31-9	TOTAL TETRA-FURANS	NA	NG/ML		NA	5.05		11/8/01	1.000
41903-57-5	TOTAL TETRA-DIOXINS	NA	NG/ML		NA	5.05		11/8/01	1.000
30402-15-4	TOTAL PENTA-FURANS	NA	NG/ML		NA	25.27		11/8/01	1.000
36088-22-9	TOTAL PENTA-DIOXINS	NA	NG/ML		NA	25.27		11/8/01	1.000
55684-94-1	TOTAL HEXA-FURANS	NA	NG/ML		NA	25.27		11/8/01	1.000
34465-46-8	TOTAL -HEXA-DIOXINS	NA	NG/ML		NA	25.27		11/8/01	1.000
38998-75-3	TOTAL HEPTA-FURANS	NA	NG/ML		NA	25.27		11/8/01	1.000
37871-00-4	TOTAL HEPTA-DIOXINS	NA	NG/ML		NA	25.27		11/8/01	1.000
76523-40-5	13C-2,3,7,8-TCDD	55.45	NG/ML		20 - 175			11/8/01	1.000
109719-79-1	13C-1,2,3,7,8-PeCDD	67.85	NG/ML		21 - 227			11/8/01	1.000
109719-80-4	13C-1,2,3,4,7,8-HxCDD	66.50	NG/ML		21 - 193			11/8/01	1.000
109719-81-5	13C-1,2,3,6,7,8-HxCDD	81.45	NG/ML		25 - 163			11/8/01	1.000
109719-83-7	13C-1,2,3,4,6,7,8-HpCDD	78.90	NG/ML		26 - 166			11/8/01	1.000
114423-97-1	13C-OCDD	154.50	NG/ML		26 - 397			11/8/01	1.000
89059-46-1	13C-2,3,7,8-TCDF	57.95	NG/ML		22 - 152			11/8/01	1.000
109719-77-9	13C-1,2,3,7,8-PeCDF	62.75	NG/ML		21 - 192			11/8/01	1.000
116843-02-8	13C-2,3,4,7,8-PeCDF	92.85	NG/ML		13 - 328			11/8/01	1.000
114423-98-2	13C-1,2,3,4,7,8-HxCDF	68.30	NG/ML		19 - 202			11/8/01	1.000
116843-03-9	13C-1,2,3,6,7,8-HxCDF	74.75	NG/ML		21 - 159			11/8/01	1.000
116843-04-0	13C-1,2,3,7,8,9-HxCDF	70.00	NG/ML		17 - 205			11/8/01	1.000
116843-05-1	13C-2,3,4,6,7,8-HxCDF	72.85	NG/ML		22 - 176			11/8/01	1.000
116843-09-5	13C-1,2,3,4,6,7,8-HpCDF	80.00	NG/ML		21 - 158			11/8/01	1.000
109719-94-0	13C-1,2,3,4,7,8,9-HpCDF	77.85	NG/ML		20 - 186			11/8/01	1.000
85508-50-5	37Cl-2,3,7,8-TCDD	4.45	NG/ML		3.1 - 19.1			11/8/01	1.000

Section 2
Third Party Validation Report

- Steve Stodola
US EPA Approval Signature

12/19/01
Date

December 14, 2001
B-01-12-Y-1
Revised: December 17, 2001

Ms. Christine Clark
Regional Sample Control Custodian
Office of Environmental Measurement and Evaluation
U.S. EPA Region I
11 Technology Drive
North Cheslmsford, MA 01863

Re: TO No. 04, Task No. 2, TDF No. 0356
Case No. Rush Soils, SDG No. B10F1-12301
Battelle Laboratories - Columbus, OH
Centredale Manor, North Providence, RI

Dioxin/Furan: 2/Soil/2004320, 2004539

Dear Ms. Clark:

A Tier III data validation was performed on the Dioxin/Furan analytical data for two soil samples collected by USACE for the U.S. EPA at the Centredale Manor Site in North Providence, RI. The Dioxin/Furan samples were analyzed according to EPA Method 1613B, September 15, 1997. The samples were validated using first the criteria in the Centredale Manor Tasks 19-22 QAPP (5/23/01) prepared by Battelle Duxbury Operations which include the criteria in EPA Method 1613B, September 15, 1997, defaulting next to Region I, EPA-NE Data Validation Functional Guidelines for Evaluating Environmental Analyses, December 1996 criteria, and to EPA Region I's Environmental Services Assistance Team Dioxin Data Validation SOP ESAT-01-0007 (01/31/01). The data were evaluated based on the following parameters:

	•	Overall Evaluation of Data and Potential Usability Issues
*	•	Data Completeness (CSF Audit - Tier I)
*	•	Preservation and Technical Holding Times
	•	PE Samples/Accuracy Check
*	•	Window Defining Mix
*	•	Initial and Continuing Calibrations
*	•	Chromatographic Resolution
*	•	Instrument Sensitivity Check
	•	Blanks
NR	•	Matrix Spike/Matrix Spike Duplicate
*	•	Laboratory Control Sample
	•	Laboratory and Field Duplicates
*	•	Internal/Clean-up Standards
*	•	Sample Analysis and Identification
	•	Sample Quantitation
*	•	Estimated Detection Limits (EDL) and Estimated Maximum Possible Concentration (EMPC)
	•	2378-TCDD Toxicity Equivalents (TE) and Isomer Specificity

* • Required Sample Reruns and Second Column Confirmation
• System Performance

* - All criteria were met for this parameter.
NR - Not Required for quick turnaround samples.

The following information was used to generate the Data Validation Memorandum attachments:

Table I: Recommendation Summary Table - summarizes validation recommendations

Table II: Overall Evaluation of Data - summarizes site objectives and potential usability issues

Data Summary Tables - summarize accepted, qualified, and rejected data

Overall Evaluation of Data and Potential Usability Issues

The following is a summary of the site investigation/assessment objectives as found in Centredale Manor Tasks 19-22 QAPP (5/23/01):

- To generate data of quality to be used for human health (HHRA) and ecological risk assessments (ERA).

One Standard Reference Material (SRM) sample from Cambridge Isotope Laboratories (CIL) was evaluated for this SDG (CIL EDF 2513 for Dioxin/Furan congeners in soil). All congeners were within the Centredale Manor Tasks 19-22 QAPP (5/23/01) specified criteria of 30 %D from the consensus value except for 1234789-HpCDF.

The method blanks exhibited low level contamination. This contamination problem does not have an impact on the usability of the data. Contaminants were found in both the blanks and the field samples. When the analyte concentrations in the field samples were less than the corresponding blank action level, the field sample results reported by the laboratory are qualified as non-detected (U) on the Data Summary Table. See Table I for a summary of the qualifiers applied due to blank contamination.

Data validation indicated minor data quality problems which do not significantly impact the usability of the data. See the discussion below for details. The reported results are usable for the site objectives.

PE Samples/Accuracy Check

One Standard Reference Material (SRM) sample from Cambridge Isotope Laboratories (CIL) was evaluated for this SDG (CIL EDF 2513 for Dioxin/Furan congeners in soil). All congeners were within the Centredale Manor Tasks 19-22 QAPP (5/23/01) specified criteria of 30 %D from the consensus value except for 1234789-HpCDF.

The following table summarizes the SRM sample results which did not meet criterion and the resulting sample qualifications:

PE Sample Number	Congener	%D	Action	
			Positive Detects	NDs
CIL EDF 2513	1234789-HpCDF	31	J	UJ

The ESAT data validator estimated (J) positive results for the 1234789-HpCDF congener in all samples from this SDG due to %D greater than 30% of the consensus value.

Congener	Affected Samples	
	Positive Detects (J)	NDs (UJ)
1234789-HpCDF	2004320	2004539

Blanks

All of the blanks associated with this SDG were evaluated for contamination. The following table lists the highest concentration of analytes found in the various blanks associated with these samples. The table lists the contamination found in the blanks along with the action levels and the affected samples:

Congener	Type of Blank	Blank Concentration ng/Kg	Action Level ng/Kg	Samples Affected
12378-PeCDF	Method Blank (11/09/01)	1.4	7.0	2004539
23478-PeCDF	Method Blank (11/09/01)	1.6	8.0	2004539
234678-HxCDF	Method Blank (11/09/01)	2.6	13	2004539
1234789-HpCDF	Method Blank (11/09/01)	4.5	22	2004539
Total PeCDD	Method Blank (11/09/01)	1.0	10	2004539

Blank actions are based on Region I, EPA-NE Data Validation Functional Guidelines for Evaluating Environmental Analyses, December 1996 and EPA Region I's Environmental Services Assistance Team Dioxin Data Validation SOP ESAT-01-0007 (01/31/01) criteria. Blank action levels are calculated as ten times the highest concentration of the contaminant determined in any blank for common contaminants (OCDD/OCDF and Total Homologues) and five times the highest concentration for all other analytes. The positive sample results that are

less than the blank action level are reported as non-detects (U) at the reported concentration on the Data Summary Table.

Laboratory and Field Duplicates

One laboratory duplicate pair was evaluated for this SDG 2004320/2004320Dup.

The table below summarizes the soil duplicate results that did not meet the laboratory duplicate criterion of Relative Percent Difference (RPD) < 30% for soils/sediments as specified in Centredale Manor Tasks 19-22 QAPP (5/23/01).

Congener	2004320	2004320Dup	RPD	Action		Affected Samples
	% Solids (51.5%)	% Solids (51.5%)				
	Sample Conc. (ng/Kg)	Duplicate Conc. (ng/Kg)		Positive Detects	NDs	
2378-TCDD	128000	80600	45	J	UJ	2004320
2378-TCDF	561	914	48	J	UJ	2004320

2378-TCDD and 2378-TCDF were estimated (J) in sample 2004320 due to duplicate precision outside criterion.

Sample Quantitation

Concentrations quantitated below the lowest calibration standard are flagged (J) on the Data Summary Tables. Quantitation is not accurate when the reported results are below the lowest calibration standard.

2378-TCDD Toxicity Equivalents (TE) and Isomer Specificity

All TE values reported on the Data Summary Tables have been calculated by the ESAT data validator using the validated data discussed above in this report. As a result, the TE values in the Data Summary Table may differ from the values reported by the laboratory. The validated data accounts for blank contamination and any necessary dilutions. The TE calculations include the reported EMPC values. The TEF values used by ESAT are the ones published in EPA/625/3-89/016, "Interim Procedures for Estimating Risks Associated with Exposure to Mixtures of Chlorinated Dibenzo-p-Dioxins and Dibenzofurans (CDDs and CDFs)" 1989 Update, Part II, page 13.

System Performance

No trends noted.

December 14, 2001
B-01-12-Y-1
Revised: December 17, 2001

Very truly yours,

LOCKHEED ENVIRONMENTAL

Janine Bartels
Principal Scientist

Louis Macri
ESAT Program Manager

cc: Cornell Rosiu, EPA RPM (DV Memorandum, Data Summary Table)

Attachments: Table I: Recommendation Summary Table
Table II: Overall Evaluation of Data
Data Summary Tables
Data Validation Worksheets
Analytical Method
DQO Summary Form
Field Sampling Notes

Table I
Recommendation Summary Table for Dioxins/Furans
Centredale Manor Site
Case No.: Rush Soils/SDG No.: B10F1-12301

Sample Nos.	2004320	2004539
Compound		
2378-TCDD	J[3]	A
12378-PeCDD	A	A
123478-HxCDD	A	A
123678-HxCDD	A	A
123789-HxCDD	A	A
1234678-HpCDD	A	A
OCDD	A	A
2378-TCDF	J[3]	A
12378-PeCDF	A	J[2]
23478-PeCDF	A	J[2]
123478-HxCDF	A	A
123678-HxCDF	A	A
123789-HxCDF	A	A
234678-HxCDF	A	J[2]
1234678-HpCDF	A	A
1234789-HpCDF	J[1]	J[1,2]
OCDF	A	A

Table I
Recommendation Summary Table for Dioxins/Furans

A	-	Accept results.
J^1	-	PE %D outside criterion; J detects.
J^2	-	Method blank contamination; positive sample results less than the blank action level are reported as non-detects (U) at the concentration reported.
J^3	-	Laboratory duplicate RPD outside criterion; J detects.

EPA-NE - Data Validation Worksheet

Overall Evaluation of Data - Data Validation Memorandum - Table II

DIOXIN/FURAN ANALYSIS					
DQO (list all DQOs)	Sampling and/or Analytical Method Appropriate Yes or No	Measurement Error		Sampling Variability	Potential Usability Issues
		Analytical Error	Sampling Error*		
The following is a summary of the site investigation/assessment objectives as found in Centredale Manor Tasks 19-22 QAPP (5/23/01): To generate data of quality to be used for human health (HHRA) and ecological risk assessments (ERA).	Yes, Sampling Method appropriate for all samples Yes, Analytical Method appropriate for all samples.	Refer to qualification in R/S Key on Table I: 1,2,3	Refer to qualification in R/S Key on Table I: NA	**	One Standard Reference Material (SRM) sample from Cambridge Isotope Laboratories (CIL) was evaluated for this SDG (CIL EDF 2513 for Dioxin/Furan congeners in soil). All congeners were within the Centredale Manor Tasks 19-22 QAPP (5/23/01) specified criteria of 30 %D from the consensus value except for 1234789-HpCDF. The method blanks exhibited low level contamination. This contamination problem does not have an impact on the usability of the data. Contaminants were found in both the blanks and the field samples. When the analyte concentrations in the field samples were less than the corresponding blank action level, the field sample results reported by the laboratory are qualified as non-detected (U) on the Data Summary Table. See Table I for a summary of the qualifiers applied due to blank contamination. Data validation indicated minor data quality problems which do not significantly impact the usability of the data. See the data validation memorandum for details. The reported results are usable for the site objectives.

* The evaluation of "sampling error" cannot be completely assessed in the data validation.
** Sampling variability is not assessed in data validation.

Validator: _____

Date: 12/12/01

SITE: Centredale Manor - N. Providence, RI
CASE NO. Rush Soils SDG No. B10F1-12301
LABORATORY: Battelle - Columbus, OH

SAMPLE NUMBER:	Toxicity	2004320#			2004539#		
STATION LOCATION:	Equivalency	2004320			2004539		
MATRIX:	Factors (1)	SOIL			SOIL		
TCDD/TCDF CONC.:		ng/Kg		DL/EMPC	ng/Kg		DL/EMPC
2,3,7,8-TCDD	1.0	128000	J		2150		
1,2,3,7,8-PeCDD	0.5	206			7.89	J	
1,2,3,4,7,8-HxCDD	0.1	241			14.2	J	
1,2,3,6,7,8-HxCDD	0.1	898			41.9		
1,2,3,7,8,9-HxCDD	0.1	931			41.3		
1,2,3,4,6,7,8-HpCDD	0.01	36900			907		
OCDD	0.001	284000			6490		
2,3,7,8-TCDF	0.1	561	J		10.6		
1,2,3,7,8-PeCDF	0.05	121				U	4.37
2,3,4,7,8-PeCDF	0.5	1150				U	7.13
1,2,3,4,7,8-HxCDF	0.1	3230			22.5	J	
1,2,3,6,7,8-HxCDF	0.1	897			11.0	J	
1,2,3,7,8,9-HxCDF	0.1	32.8	J			U	3.44
2,3,4,6,7,8-HxCDF	0.1	340				U	9.23
1,2,3,4,6,7,8-HpCDF	0.01	1680			111		
1,2,3,4,7,8,9-HpCDF	0.01	690	J			UJ	9.50
OCDF	0.001	2730			254		
TOTAL TCDD		128000	J		2150	J	
TOTAL PeCDD		557	J			UJ	7.89
TOTAL HxCDD		6620	J		278	J	
TOTAL HpCDD		57200	J		1500	J	
TOTAL TCDF		5440	J		101	J	
TOTAL PeCDF		10500	J		184	J	
TOTAL HxCDF		13500	J		229	J	
TOTAL HpCDF		4100	J		247	J	
TOXIC EQUIVALENT(1):		129000	J		2190	J	
PERCENT SOLIDS:		51.5			67.6		
DILUTION FACTOR:		1.0			1.0		
DATE SAMPLED:		11/02/01			11/02/01		
DATE OF RECEIPT:		11/03/01			11/03/01		
SAMPLE EXTRACTION DATE:		11/05/01			11/05/01		
ANALYSIS DATE:		11/13/01			11/09/01		
LAB SAMPLE ID:		49038-82-02			49038-82-04		

* = The values in this column are either the Detection Limits (DL) or the Estimated Maximum Possible Concentration (EMPC). The EMPC results are marked with a "*". The DL values are unmarked. The EMPC values are not qualified with a "J", since they are already estimated.
# = Results are reported on a dry weight basis.
(1) = The Toxic Equivalent concentrations are calculated with the Toxicity Equivalency Factors (TEFs) found in "Interim Procedures for Estimating Risks Associated with Exposures to Mixtures of Chlorinated Dibenzo-p-Dioxins and Dibenzofurans (CDDs and CDFs)" 1989 Update, Part II, Page 13.
Concentrations reported by the laboratory below the lowest standard are flagged (J) on the Data Summary Table as estimated values. All other necessary qualifications are defined in Table I.

SITE: Centredale Manor - N. Providence, RI
CASE NO. Rush Soils SDG No. B10F1-12301
LABORATORY: Battelle - Columbus, OH

SAMPLE NUMBER:	Toxicity	2004320#			2004539#			
STATION LOCATION:	Equivalency	2004320			2004539			
MATRIX:	Factors (1)	SOIL			SOIL			
TCDD/TCDF CONC.:		ng/Kg		DL/EMPC	ng/Kg		DL/EMPC	
2,3,7,8-TCDD	1.0	128000	J		2150			
1,2,3,7,8-PeCDD	1.0	206			7.89	J		
1,2,3,4,7,8-HxCDD	0.1	241			14.2	J		
1,2,3,6,7,8-HxCDD	0.1	898			41.9			
1,2,3,7,8,9-HxCDD	0.1	931			41.3			
1,2,3,4,6,7,8-HpCDD	0.01	36900			907			
OCDD	0.0001	284000			6490			
2,3,7,8-TCDF	0.1	561	J		10.6			
1,2,3,7,8-PeCDF	0.05	121				U	4.37	
2,3,4,7,8-PeCDF	0.5	1150				U	7.13	
1,2,3,4,7,8-HxCDF	0.1	3230			22.5	J		
1,2,3,6,7,8-HxCDF	0.1	597			11.0	J		
1,2,3,7,8,9-HxCDF	0.1	32.8	J			U	3.44	
2,3,4,6,7,8-HxCDF	0.1	340				U	9.23	
1,2,3,4,6,7,8-HpCDF	0.01	1680			111			
1,2,3,4,7,8,9-HpCDF	0.01	690	J			UJ	9.50	
OCDF	0.0001	2730			254			
TOTAL TCDD		128000	J		2150	J		
TOTAL PeCDD		557	J			UJ	7.89	
TOTAL HxCDD		6620	J		278	J		
TOTAL HpCDD		57200	J		1500	J		
TOTAL TCDF		5440	J		101	J		
TOTAL PeCDF		10500	J		184	J		
TOTAL HxCDF		13500	J		229	J		
TOTAL HpCDF		4100	J		247	J		
TOXIC EQUIVALENT(1):		130000	J		2190	J		
PERCENT SOLIDS:		51.5			67.6			
DILUTION FACTOR:		1.0			1.0			
DATE SAMPLED:		11/02/01			11/02/01			
DATE OF RECEIPT:		11/03/01			11/03/01			
SAMPLE EXTRACTION DATE:		11/05/01			11/05/01			
ANALYSIS DATE:		11/18/01			11/09/01			
LAB SAMPLE ID:		49036-62-02			49036-62-04			

* = The values in this column are either the Detection Limits (DL) or the Estimated Maximum Possible Concentration (EMPC). The EMPC results are marked with a "*". The DL values are unmarked. The EMPC values are not qualified with a "J", since they are already estimated.
# = Results are reported on a dry weight basis.
(1) The Toxic Equivalent concentration is calculated with the Toxicity Equivalency Factors (TEFs) found in "Toxic Equivalency Factors (TEFs) for PCBs, PCDDs, PCDFs for Humans and Wildlife", Environmental Health Perspectives, Volume 106, Number (12), December 1998, Table 1, page 778.
Concentrations reported by the laboratory below the lowest standard are flagged (J) on the Data Summary Table as estimated values. All other necessary qualifications are defined in Table I.