Characterization of Dioxin Emissions From Sources That Use Ball Clays

Emission Test Report: Unimin Corporation, Gleason, TN

Final Report
(Non-Confidential Version)

EPA-453/R-10-001

CHARACTERIZATION OF DIOXIN EMISSIONS FROM SOURCES THAT USE BALL CLAYS

EMISSION TEST REPORT: UNIMIN CORPORATION, GLEASON, TN

FINAL REPORT **(**Non-Confidential Version**)**

U.S. ENVIRONMENTAL PROTECTION AGENCY
Office of Air Quality Planning and Standards
Sector Policies and Programs Division
Research Triangle Park, North Carolina 27711

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Section 1.
Introduction

1.1 Test Summary

1.1.1 Background

The EPA has determined that certain ball clay mineral deposits contain naturally-occurring dioxins. Ball clay processing facilities use low temperature dryers and heated milling systems to process ball clay prior to shipment to customers. The purpose of this emission test was to characterize dioxin (and furan) emissions from these dryers and milling systems. The test results will be used by EPA to determine the need for gathering any additional data related to thermal processing of ball clay.

1.1.2 Scope

RTI presented MRI with Work Assignment No. 1-08 to conduct the emissions test from two process lines at the selected ball clay test site. Under the work assignment MRI conducted emissions testing for polychlorinated dibenzodioxins (PCDDs) and polychlorinated dibenzofurans (PCDFs), carbon dioxide (CO_2), and oxygen (O_2).

Three 4-hour test runs, using EPA Method 23 to measure dioxin and furan emissions, were conducted at each of the two test stack locations within the facility. In addition, the CO_2 and O_2 concentrations were measured during each run using EPA Method 3 at the dryer and Method 3A at the mill.

During testing, process and pollution control equipment operating data were obtained by RTI. In addition, RTI collected process samples at two points (feed and product) within each process line during the test runs. These samples also were analyzed for PCDDs/PCDFs.

1.2 Test Program Organization

The following individuals were the key personnel in the management and execution of this project:

The EPA Work Assignment Managers (WAMs):

Ms. Mary Johnson [during the test program]
U.S. Environmental Protection Agency
Office of Air Quality Planning and Standards
Sector Policies and Programs Division
Research Triangle Park, NC 27711
Telephone: (919) 541-5025

Mr. Brian Shrager
U.S. Environmental Protection Agency
Office of Air Quality Planning and Standards
Sector Policies and Programs Division
Research Triangle Park, NC 27711
Telephone: (919) 541-7689

The EPA on-site testing WAM:

Clyde E. Riley [during the test program]
U.S. Environmental Protection Agency
Office of Air Quality Planning and Standards
Emissions, Monitoring and Analysis Division
Emission Measurement Center
Research Triangle Park, NC 27711

J. Kaye Whitfield [current testing WAM]
U.S. Environmental Protection Agency
Office of Air Quality Planning and Standards
Emissions, Monitoring and Analysis Division
Source Measurement and Analysis Group
Research Triangle Park, NC 27711
Telephone: (919) 541-2509

The RTI Work Assignment Leader (WAL):

Mr. Mark Turner
Research Triangle Institute
800 Park Office
Highway 54
Research Triangle Park, NC 27709
Telephone: (919) 316-3743

The MRI Task Leader for this project:

Mr. John Hosenfeld
Midwest Research Institute
425 Volker Blvd.
Kansas City, MO 64110-2299
Telephone: (816) 753-7600, ext. 1336

Figure 1-1 presents the test program organization, major lines of communication, and names and phone numbers of responsible individuals.

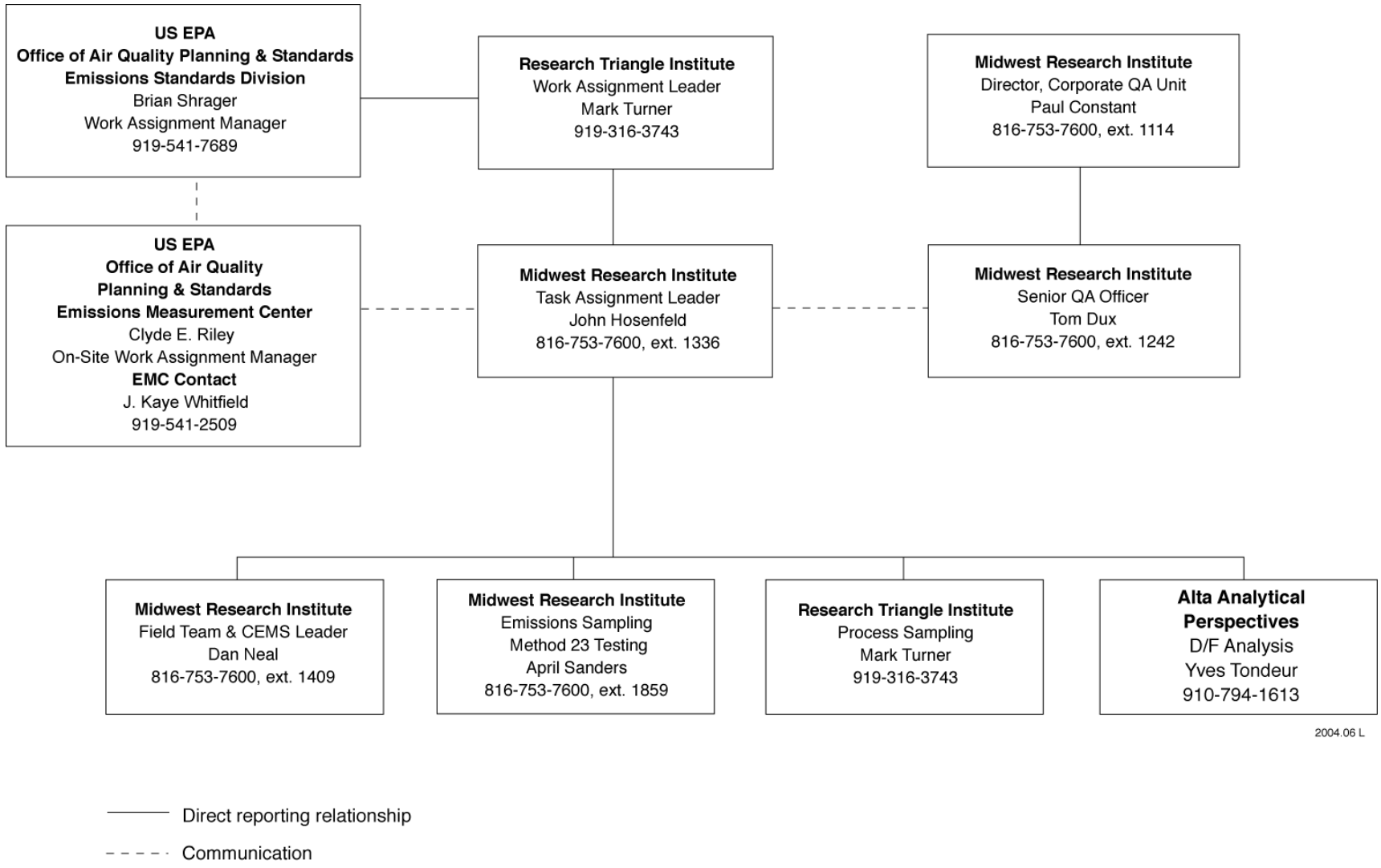

Figure 1-1. Test Program Organization

Section 2.
Process Description and Test Locations

2.1 Description of Processes Tested

Emissions testing for PCDDs and PCDFs was conducted at the Unimin Corporation ball clay processing facility located in Gleason, Tennessee during a two week period in August 2003. Two processes were tested during the emission testing program; Mill No. 3 (mill) was tested on August 13, 14, and 15, 2003, and the Semi-Dry Dryer (dryer) was tested on August 18, 19, and 20, 2003. This section provides a brief description of the processes tested.

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This information is provided in the confidential version of this document.

2.2 Process Operations During Testing

This section describes process operations during testing. Summary data are presented that represent the average of the parameters monitored during each emission test run. **CBI Data Removed**: Additional information is provided in the confidential version of this document. The following sections describe process operations during testing for the mill and the dryer, respectively.

2.2.1 Mill No. 3

The mill was tested on August 13, 14, and 15, 2003. Several process operating parameters were monitored to ensure that the mill was operating normally during emissions testing. These parameters included baghouse inlet temperature, baghouse pressure drop, mill operating temperature, and mill production rate. **CBI Data Removed**: Additional information is provided in the confidential version of this document. During testing, values for each of these parameters were manually recorded on data log sheets at least every 30 minutes beginning before testing began and continuing for one reading after the test was concluded. The mill operating temperature is measured at the mill outlet. **CBI Data Removed**: Additional information is provided in the confidential version of this document. The average hourly rate (for each shift during which testing occurred) was obtained from plant personnel at the conclusion of testing the mill.

CBI Data Removed
Additional information is provided in the confidential version of this document.

Table 2-1 presents a summary of the process operating parameters recorded for the mill during the testing program. **CBI Data Removed**: Additional information is provided in the confidential version of this document. Raw data sheets for these parameters are found in Appendix G.

Table 2-1. Summary of Process Operating Parameters Monitored During Testing for the Mill

Test Run No.	Date Tested	Ball Clay Product Processed	Mill Operating Temperature, °C (°F)	Baghouse Inlet Temperature, °C (°F)	Baghouse Pressure Drop, Inches of Water	Mill Production Rate, Mg/Hour (Tons/Hour)
1Re[a]	8/13/03	SB Blend	b	b	2.5	b
2	8/14/03	SB Blend	b	b	2.5	b
3	8/15/03	Rex	b	b	2.5	b
Average =			b	b	2.5	b

[a]1Re refers to Run 1 retest; Run 1 was aborted due to failed leak check.

[b] **CBI data removed**: See confidential version of document.

2.2.2 Semi-Dry Dryer

The dryer was tested on August 18, 19, and 20, 2003. Several process operating parameters were monitored to ensure that the dryer was operating normally during emissions testing. These parameters included baghouse inlet temperature, baghouse pressure drop, dryer operating temperature, and dryer production rate. **CBI Data Removed**: Additional information is provided in the confidential version of this document. During testing, values for each of these parameters were recorded on data log sheets at least every 30 minutes beginning before testing began and continuing for one reading after the test was concluded. The dryer operating temperature is the temperature of the supply air to the dryer. **CBI Data Removed**: Additional information is provided in the confidential version of this document. The average hourly rate (for each shift during which testing occurred) was obtained from plant personnel at the conclusion of testing the dryer.

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Table 2-2 presents a summary of the process operating parameters recorded for the dryer during the testing program. **CBI Data Removed**: Additional information is provided in the confidential version of this document. Raw data sheets for these parameters are found in Appendix G.

Table 2-2. Summary of Process Operating Parameters Monitored During Testing for the Dryer

Test Run No.	Date Tested	Ball Clay Product Processed	Dryer Operating Temperature, °C (°F)	Baghouse Inlet Temperature, °C (°F)	Baghouse Pressure Drop, Inches of Water	Dryer Production Rate, Mg/Hour (Tons/Hour)
4	8/18/03	SB Blend	a	a	5.5	a
5	8/19/03	SB Blend	a	a	5.6	a
6	8/20/03	SB Blend	a	a	5.7	a
Average =			a	a	5.6	a

[a] **CBI data removed**: See confidential version of document.

2.3 Sampling and Emission Measurement Locations

2.3.1 Location 1—Mill Baghouse

Sampling was conducted for PCDD/PCDF emissions at the mill baghouse outlet stack. The existing test platform plus an added platform section was used for the sampling trains and test personnel. The modified platform was L-shaped to allow access to both ports. The metering box (console) was located and operated approximately 5 feet away, on one section of the new platform. Gas sampling and analytical instrumentation for CO_2 and O_2 was located and operated approximately 100 feet away in the environmentally-controlled MRI mobile lab.

The sampling location was within the 28-foot-long straight vertical section of the mill baghouse outlet stack. Sampling was conducted approximately 16 feet downstream and 12 feet upstream of the nearest flow disturbances. Because a downstream flow disturbance existed at about 5 duct diameters (rather than 8) from the sample location, 40 traverse points were used during sampling. The sampling location is presented in Figure 2-3. Two 4-inch ports were installed in the stack at approximately 40 inches above the platform. The top rail of the existing platform railing was removed 9 inches on either side of the additional ports to accommodate train movement on the platform. A small 2-inch port was installed to accommodate CEMS sampling 12 inches below and offset 180 degrees from the existing ports.

The internal diameter of the cross-sectional sampling area inside the stack is approximately 36 inches. A total of 40 traverse (sampling) points were used for the Method 23 traversing sampling train, 20 on each traverse (through each port) across the internal diameter of the duct. Each traverse consisted of one pass with 6-minute readings per point at isokinetic conditions. Total sampling time for each run was 240 minutes or 4 hours for the Method 23 sampling train.

One 2-inch port with threaded plug (2-inch pipe coupling) was installed for gas sampling and instrumental analysis for CO_2 and O_2. The placement of the CEM probe end in the stack was at a point of average velocity.

2.3.2 Location 2—Dryer Baghouse

Sampling was also conducted for PCDD/PCDF emissions at the dryer baghouse outlet stack. A modified test platform and the existing walkway adjacent to the product screw feeder were used for the sampling trains and test personnel. The metering box (console) was located on the modified test platform. Fugitive emissions were observed in the dryer baghouse vicinity. Thus, with the concurrence of the on-site WAM, the MRI mobile lab was left at the mill to avoid potential contamination from ambient conditions. The distance from the mobile lab with the CEMS to the dryer precluded installing the CEMS sampling line. Therefore, gas sampling for CO_2 and O_2 was performed by collecting an integrated bag sample from the console during the test run.

The sampling location was in the 16.6-foot long straight vertical run of the dryer baghouse outlet stack (45 feet total height). Sampling was conducted approximately 5 feet upstream and 11 feet downstream of the nearest flow disturbances. Because a downstream flow disturbance existed at about 5 duct diameters (rather than 8) from the sample location, 40 traverse points were used during sampling. This location is presented in Figure 2-4. Two 4-inch ports were installed at approximately 40 inches above the platform. The ideal port location would have been to have one port with a traverse that is congruent to the direction of the bend prior to the ports. However, due to process obstructions interfering with the operation of the sampling equipment at the test location, the ports were positioned 45 degrees off this ideal direction. This requirement becomes less critical as the distance from the disturbance increases and is not expected to have a significant effect on data. The top rail of the existing platform railing was removed 9 inches on either side of the additional ports to accommodate train movement on the platform.

The internal diameter of the cross sectional sampling area inside the stack is approximately 24 inches. A total of 40 traverse (sampling) points were used by the Method 23 traversing sampling train, 20 on each traverse (through each port) across the internal diameter of the duct. Each traverse consisted of one pass with 6-minute readings per point at isokinetic conditions. Total sampling time for each run was 240 minutes or 4 hours for the Method 23 sampling train.

2.4 Process Feed and Product Sampling

An integral part of the test program was the sampling and subsequent analysis of both the ball clay feed and product from the mill and the dryer. During each test run, samples of the feed material and samples of the product were taken using aluminum foil-lined scoops at least every 30 minutes beginning before testing began and continuing for one sample after the test was concluded. The feed material and product samples were placed in separate aluminum-foil-lined trays; each tray was covered with aluminum foil after each sample was placed in the tray to protect the sample from contamination. At the end of each test run, the trays were removed to a secure location, the samples were mixed and composited, and the composited samples were placed in labeled sample bottles for

PCDD/PCDF analysis. A duplicate of each sample was provided to the Unimin representative.

Samples of the ball clay feed material to the mill were collected at the inlet to the mill using an aluminum-foil-lined scoop. Samples of the ball clay product from the mill were collected from one of the primary cyclone product collection pipes using a separate aluminum-foil-lined scoop. Material sampling logs for the ball clay feed material to the mill and the mill product are located in Appendix G.

Samples of the ball clay feed material to the dryer were collected at the inlet to the dryer using an aluminum-foil-lined scoop. Samples of the ball clay product from the dryer were collected from the sampling port for the second stage bucket elevator for the dryer using a separate aluminum-foil-lined scoop. Material sampling logs for the ball clay feed material to the dryer and the dryer product are located in Appendix G.

2.5 Correlation of Sample Identification Numbers With Test Runs

Table 2-3 provides a correlation of the sample identification numbers with the test runs. The data in Table 2-3 are provided to allow the reader to readily identify the relevant raw data for the test runs in the Appendices.

Table 2-3. Correlation of Sample Identification Numbers With Test Runs

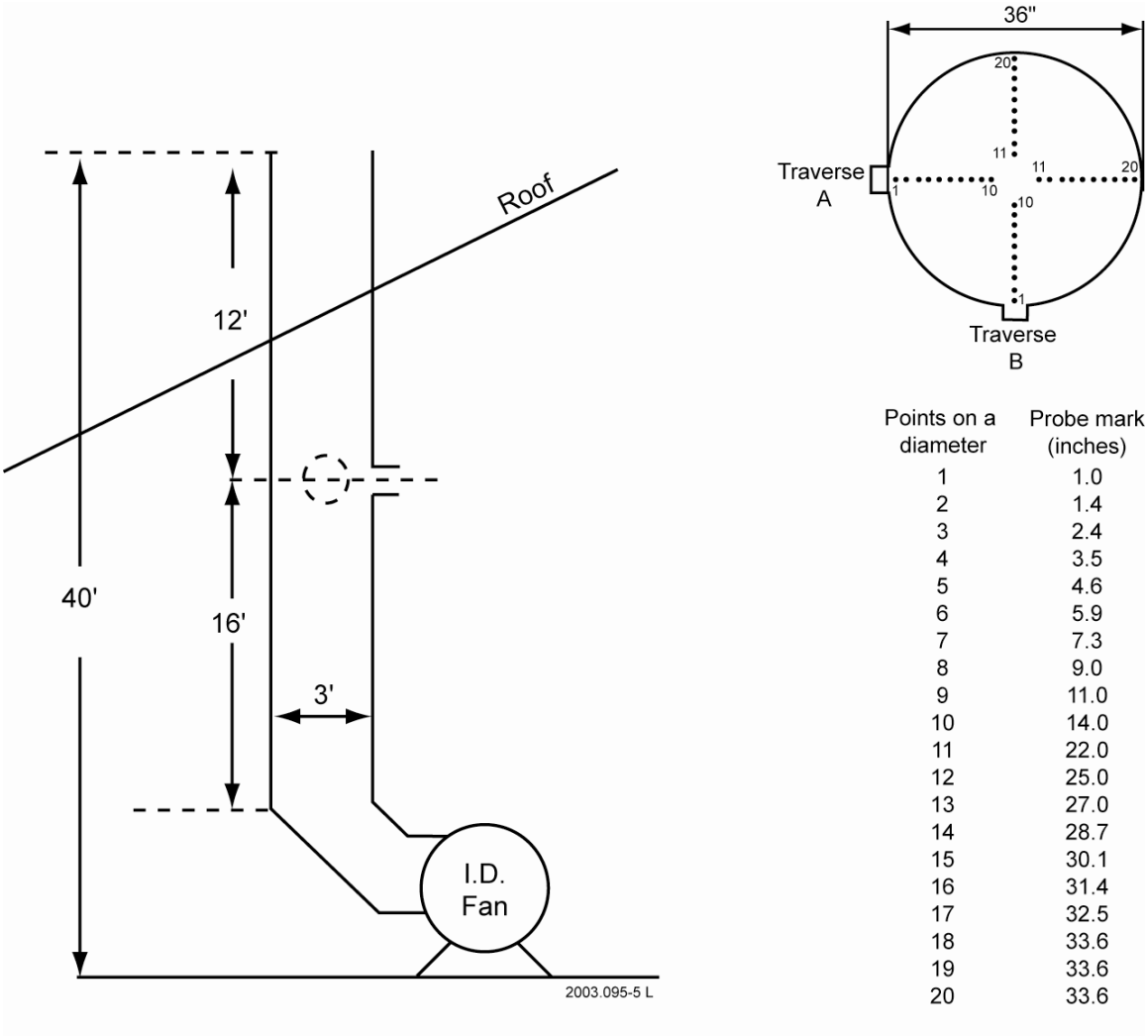
Test Run No.	Sample Collection Date	Method 23 Sample ID Numbers	Mill Feed Sample ID Numbers (Method 8290)	Mill Product Sample ID Numbers (Method 8290)	Dryer Feed Sample ID Numbers (Method 8290)	Dryer Product Sample ID Numbers (Method 8290)
1Re	8/13/03	1009	1111	1121		
2	8/14/03	2009	2111	2121		
3	8/15/03	3009	3111	3121		
4	8/18/03	4004			4211	4221
5	8/19/03	5004			5211	5221
6	8/20/03	6004			6211	6221

(CBI data removed. See confidential version of document.)

Figure 2-1. Process Flow Diagram for the Mill Process at Unimin Corporation, Gleason, TN

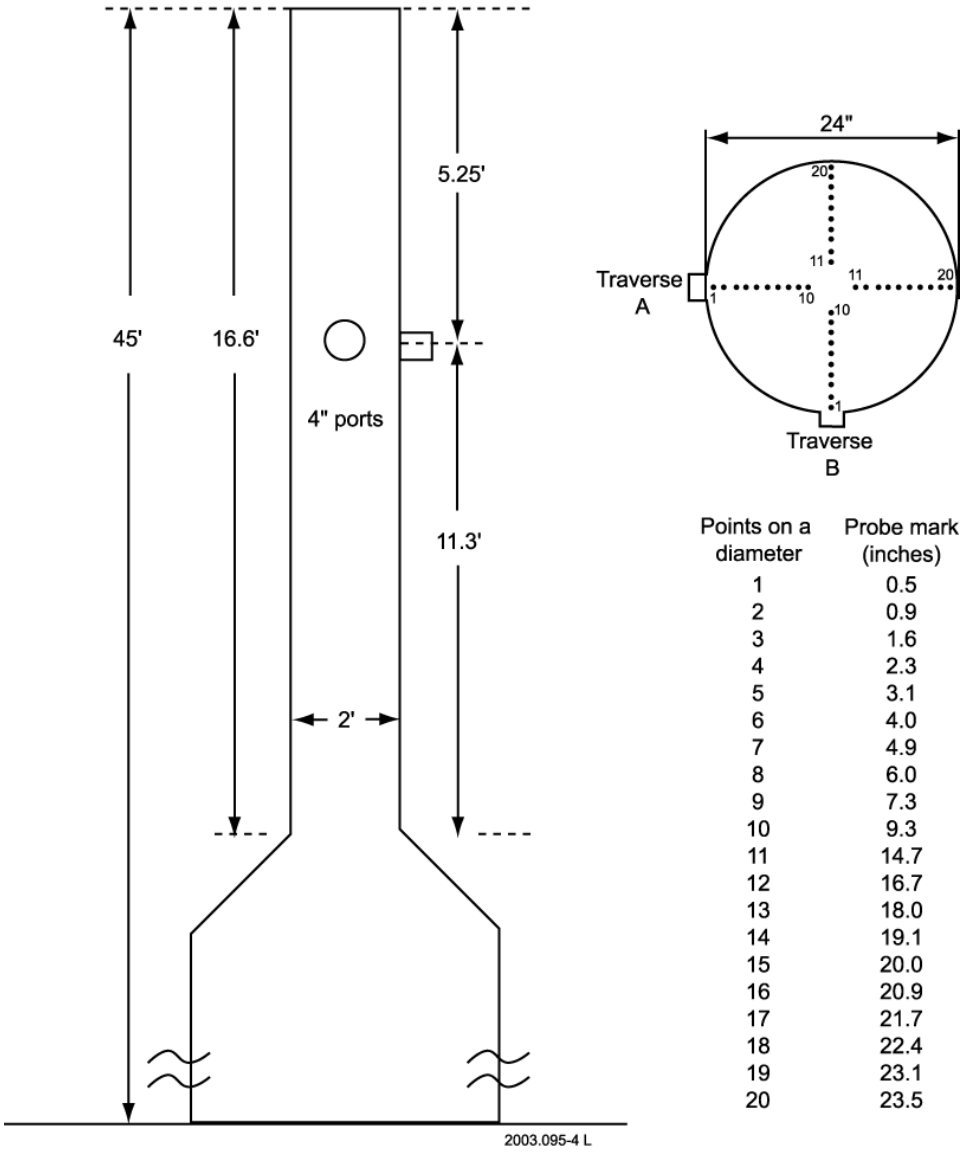
(CBI data removed. See confidential version of document.)

Figure 2-2. Process Flow Diagram for the Dryer Process at Unimin Corporation, Gleason, TN



Points on a diameter	Probe mark (inches)
1	1.0
2	1.4
3	2.4
4	3.5
5	4.6
6	5.9
7	7.3
8	9.0
9	11.0
10	14.0
11	22.0
12	25.0
13	27.0
14	28.7
15	30.1
16	31.4
17	32.5
18	33.6
19	33.6
20	33.6

Figure 2-3. Mill Sampling Location



Points on a diameter	Probe mark (inches)
1	0.5
2	0.9
3	1.6
4	2.3
5	3.1
6	4.0
7	4.9
8	6.0
9	7.3
10	9.3
11	14.7
12	16.7
13	18.0
14	19.1
15	20.0
16	20.9
17	21.7
18	22.4
19	23.1
20	23.5

Figure 2-4. Dryer Sampling Location

Section 3.
Test Results

3.1 Objectives

The purpose of this test was to assist EPA in determining the emission levels of PCDDs and PCDFs from a ball clay facility. PCDDs and PCDFs include the 2,3,7,8-congeners and their totals.

The primary objectives of this EPA-sponsored demonstration were:

- To determine if PCDDs and PCDFs are emitted from dryers at ball clay processing facilities
- To determine if PCDDs and PCDFs are emitted from heated mills at ball clay processing facilities
- To estimate potential PCDDs and PCDFs emissions from these sources.

3.2 Test Matrix

Testing was conducted during periods of production that were expected to be representative of the facility's normal operations. Testing was conducted over three test runs at two sampling locations. Each test run was performed over a 4-hour period.

The test matrix, which includes the number of samples or sample component sets collected during each run is presented in Table 3-1. The emission stack and process samples (feed and product) to be analyzed for PCDDs/PCDFs were transferred to Alta Analytical Perspectives in Wilmington, North Carolina, for subsequent analysis.

3.3 Field Test Changes and Problems

The leak check at port change during Run 1 (mill baghouse test location) did not pass the < 0.02 cubic feet per minute criteria, and, consequently, the run was aborted; thus, the corresponding next run of the test sequence was identified as Run 1 Retest. A high pressure drop across the sampling train was observed during Runs 1 and 1 Retest, most likely due to restrictions in the XAD-2 trap. The high pressure drop was compensated for by using a smaller nozzle during subsequent test runs. The smaller nozzles were large enough to ensure an adequate sample volume collection.

The sampling time was reduced from 5.3 hours to 4 hours due to the limited work schedule at the facility. This decision was jointly made by the on-site EPA WAM, RTI, and MRI. Plant operations stopped promptly at 1:00 pm daily, leaving limited time to complete setup, make port changes, and complete a 4-hour run. A quick turnaround

Table 3-1. Test Matrix: Summary of Emission and Process Sampling and Analytical Parameters and Methods

Sampling location	Sampling or measurement time	Sampling method and sample size	Emission parameters	Number of runs/samples	Preparation method	Analytical method
Mill baghouse emission stack	4 hours	40 *CFR* 60, Appendix A, Method 23, ≥ 6.0 m^3	PCDDs/PCDFs	3	Soxhlet extraction	EPA Method 23 HRGC/HRMS (SW-846, Method 8290A)
		40 *CFR* 60, Appendix A, Method 2	Velocity, pressure, temp., volumetric flow rate	3	NA	Pitot tube, Thermocouple
		40 *CFR* 60, Appendix A, Method 4, ≥ 6.0 m^3	Moisture	3	NA	Gravimetric
		40 *CFR* 60, Appendix A, Method 3A, ≥ 2L/min sampling rate	CO_2 and O_2	Continuous during each run for a total of 3 runs	Particulate matter and moisture removal	NDIR for CO_2 Micro-fuel cell for O_2
Dryer baghouse emission stack	4 hours	40 *CFR* 60, Appendix A, Method 23, ≥ 6.0 m^3	PCDDs/PCDFs	3	Soxhlet extraction	EPA Method 23 HRGC/HRMS (SW-846, Method 8290A)
		40 *CFR* 60, Appendix A, Method 2	Velocity, pressure, temp., volumetric flow rate	3	NA	Pitot tube, Thermocouple
		40 *CFR* 60, Appendix A, Method 4, ≥ 6.0 m^3	Moisture	3	NA	Gravimetric
		40 *CFR* 60, Appendix A, Methods 3 and 3B	CO_2 and O_2	One integrated bag during each run for a total of 3 runs	NA	Orsat
Mill Feed sample	Composite of grab samples collected every 30 min thereafter for 4 hr starting 30 min prior to start of run	ASTM D6051-01, 50-g (approx) grab samples collected/composited/mixed/ quartered until two 8-oz samples obtained	PCDDs/PCDFs	2 composite samples collected and split: one sample for analysis and one sample to be retained by the facility	Soxhlet extraction	HRGC/HRMS (SW-846, Method 8290A)
Dryer Feed sample	Composite of grab samples collected every 30 min thereafter for 4 hr starting 30 min prior to start of run	ASTM D6051-01, 50-g (approx) grab samples collected/composited/mixed/ quartered until two 8-oz samples obtained	PCDDs/PCDFs	2 composite samples collected and split: one sample for analysis and one sample to be retained by the facility	Soxhlet extraction	HRGC/HRMS (SW-846, Method 8290A)
Mill product sample	Composite of grab samples collected every 30 min thereafter for 4 hr starting 30 min prior to start of run	ASTM D6051-01, 50-g (approx) grab samples collected/composited then mixed/quartered until two 8-oz samples are obtained	PCDDs/PCDFs	2 composite samples collected and split: one sample for analysis and one sample to be retained by the facility	Soxhlet extraction	HRGC/HRMS (SW-846, Method 8290A)
Dryer product sample	Composite of grab samples collected every 30 min thereafter for 4 hr starting 30 min prior to start of run	ASTM D6051-01, 50-g (approx) grab samples collected/composited/mixed/ quartered until two 8-oz samples obtained	PCDDs/PCDFs	2 composite samples collected and split: one sample for analysis and one sample to be retained by the facility	Soxhlet extraction	HRGC/HRMS (SW-846, Method 8290A)

analysis of the first test run emission sample provided results that were above detection limits for dioxins, supporting the adequacy of using 4-hour test runs. With the shortened run time, only one traverse through a port was needed during all test runs.

Due to process obstructions at the mill, the appropriate length probe could not be used to reach the farthest two points on each traverse. Thus, with the concurrence of the on-site EPA WAM, the third to the last point on each traverse point was sampled three times for a total of 18 minutes.

Additionally, the process obstructions at the dryer created a need to use a heated sample transfer line on the first traverse (Port B), and then the second traverse (Port A) was sampled with the probe directly attached to the train hot box.

Due to concerns that ball clay dust generated during loading operations at the dryer location could cause high background contamination of samples, the mobile laboratory with CEMS was not moved to this area. Therefore, O_2 and CO_2 samples were collected using a gas bag for an integrated sample during the run. Analysis was performed by Orsat instead of CEMS.

3.4 Summary of Test Results

A summary of dioxin and furan testing performed is provided in Table 3-1. Since process data were collected by RTI, emissions as related to feed rates or other process parameters were calculated by RTI. Results are reported for the mill in Tables 3-2 through 3-7 and for the dryer in Tables 3-8 through 3-13. Sample custody records are given in Appendix A. Field sampling and analytical data are included in Appendix B, and field equipment calibration records are given in Appendix C. Summary analytical reports are included in Appendix D.

For each location, dioxin and furan emission results are presented first by total amount found within a given homologue with the resultant emission factor, and next by the 2,3,7,8-substituted compounds, followed by the resultant emission factor. The feed and product sample results are reported on a dry basis.

Any value below the detection limit is treated as a null value when presenting totals for dioxins and furans. The detection limit is determined as any peak with less than a 2½ signal-to-noise ratio and is represented in the report tables by parentheses (#). Values reported in parentheses with a less-than sign in front of them (< #) indicate that a peak was observed at greater than 2½ times the signal, but that it was observed at less than one-tenth the lowest point on the calibration curve.

3.4.1 Mill Test Results

A summary of total PCDD/PCDF results at the mill baghouse outlet is provided in Table 3-2. PCDD/PCDF results for the mill baghouse outlet are provided in Tables 3-3 and 3-4. As noted in Table 3-3, the internal quantitation standard (IQS) recoveries (used for sample quantification) corresponding to the Run 1 Retest sample were greater than 130 percent but less than 152 percent. The internal standard recovery values are presented and discussed in Section 5.

Clay feed and product sample results for the mill process are provided in Tables 3-5 and 3-6. As noted in these tables, results for the 1,2,3,4,6,7,8-heptachloro-dioxins (HpCDD) and octochloro-dioxins (OCDDs) exceeded the upper limit of the calibration curve. Alta Analytical Perspectives has examined the data and found that these results are within the linear range of the calibration curve. Note that these results already reflect a ten-fold dilution for the OCDD samples.

Data obtained from the emission sampling trains at the mill are summarized in Table 3-7. Each sampling train provided data on gas velocity, stack temperature, stack pressure, and volumetric flow rates. The O_2 and CO_2 results reported were obtained by CEMS for the first three runs. Stack flow rates appear slightly elevated at the mill for Run 3.

3.4.2 Dryer Test Results

A summary of PCDD/PCDF results at the dryer is provided in Table 3-8. PCDD/PCDF results for dryer stack emissions are provided in Tables 3-9and 3-10.

Clay feed and product sample results for the dryer process are provided in Tables 3-11 and 3-12. As noted in these tables, results for HpCDD and OCDD exceeded the upper limit of the calibration curve. Alta Analytical Perspectives has examined the data and found that these results are within the linear range of the curve with the exception of Run 4 feed and product, as well as Run 5 feed. For these three samples, the reported concentrations for OCDD may be underestimated by as much as 50 percent. Note that these results already reflect a ten-fold dilution for the OCDD sample results.

Data obtained from the emission sampling trains at the dryer are summarized in Table 3-13.

Table 3-2. Summary of Total Dioxin/Furan Results for Mill Samples

	Run 1 Retest	Run 2	Run 3	Average
Air Emissions				
Total PCDDs and PCDFs				
Total PCDDs (pg/dscm)	117	167	119	135
Total PCDFs (pg/dscm)	16.3	77.6	70.1	54.7
Total PCDDs and PCDFs (pg/dscm)	134	245	189	189
Emission Rates/Factors				
Dry Clay Process Rate (Mg/hr)	b	b	b	b
Material Analyses				
Clay Feed[a]				
Total PCDDs and PCDFs (pg/g)	b	b	b	b
Clay Product[a]				
Total PCDDs and PCDFs (pg/g)	b	b	b	b

[a] Clay feed and product concentrations are calculated on a dry basis.
[b] **CBI data removed**: See confidential version of document.

Table 3-3. Dioxin/Furan Homolog Results for Mill Stack Samples

Analyte	Run 1 Retest[b]	Run 2	Run 3	Average
Dioxins (pg/dscm)				
TCDD	27.1	43.9	30.0	
PeCDD	16.6	30.7	15.7	
HxCDD	10.7	26.6	8.4	
HpCDD	12.1	17.8	15.4	
OCDD	50.8	48.3	49.6	
Total PCDDs (pg/dscm)[a]	117	167	119	135
Furans (pg/dscm)				
TCDF	4.86	24.7	17.6	
PeCDF	2.98	20.5	17.5	
HxCDF	3.55	17.7	17.2	
HpCDF	27.4	11.5	12.4	
OCDF	2.15	3.30	5.39	
Total PCDFs (pg/dscm)[a]	16.3	77.6	70.1	54.7
Total PCDDs and PCDFs (pg/dscm)	134	245	189	189

[a] Totals do not include values below detection limit; they are treated as zeros.

[b] Recoveries for corresponding Internal Quantitation Standards were all above 130 percent, but less than 152 percent. See Section 5.2 for further explanation.

Table 3-4. Dioxin/Furan Homolog Emission Factors for Mill Stack Samples

	Emission Rate, pg/hr			Process Rate, Mg/hr[b]			Emission Factor, pg/Mg[b]			
Homolog	Run 1 Re	Run 2	Run 3	Run 1 RE	Run 2	Run 3	Run 1 Re	Run 2	Run 3	Average
Total TCDD	8.09E+05	1.32E+06	9.89E+05							
Total PeCDD	4.96E+05	9.18E+05	5.18E+05							
Total HxCDD	3.19E+05	7.97E+05	2.79E+05							
Total HpCDD	3.61E+05	5.32E+05	5.09E+05							
Total OCDD	1.52E+06	1.45E+06	1.64E+06							
Total CDD	3.50E+06	5.01E+06	3.93E+06							
Total TCDF	1.45E+05	7.40E+05	5.82E+05							
Total PeCDF	8.89E+04	6.13E+05	5.78E+05							
Total HxCDF	1.06E+05	5.29E+05	5.67E+05							
Total HpCDF	8.19E+04	3.43E+05	4.08E+05							
Total OCDF	6.43E+04	9.89E+04	1.78E+05							
Total CDF	**4.86E+05**	**2.32E+06**	**2.31E+06**							
Total CDD/CDF	**3.99E+06**	**7.33E+06**	**6.24E+06**							
2,3,7,8 TCDD	5.83E+04	7.21E+04	6.08E+04							
1,2,3,7,8 PeCDD	2.89E+04	4.62E+04	(<4.75E+04)							
1,2,3,4,7,8 HxCDD	(1.67E+04)	(2.67E+04)	(3.65E+04)							
1,2,3,6,7,8 HxCDD	(<2.51E+04)	(<4.41E+04)	(<4.75E+04)							
1,2,3,7,8,9 HxCDD	2.73E+04	5.38E+04	(<4.75E+04)							
1,2,3,4,6,7,8 HpCDD	1.62E+05	2.47E+05	2.27E+05							
Total OCDD	1.52E+06	1.45E+06	1.64E+06							
2,3,7,8 TCDF	1.35E+04	3.72E+04	8.66E+04							
1,2,3,7,8 PeCDF	(4.71E+04)	{5.31E+04}	(<4.75E+04)							
2,3,4,7,8 PeCDF	(<2.51E+04)	7.22E+04	9.79E+04							
1,2,3,4,7,8 HxCDF	(<2.51E+04)	8.75E+04	9.11E+04							
1,2,3,6,7,8 HxCDF	(<2.51E+04)	7.85E+04	7.62E+04							
2,3,4,6,7,8 HxCDF	(<2.51E+04)	{7.90E+04}	7.78E+04							
1,2,3,7,8,9 HxCDF	(5.98E+03)	(5.53E+03)	(6.97E+03)							
1,2,3,4,6,7,8 HpCDF	5.33E+04	2.35E+05	2.37E+05							
1,2,3,6,7,8,9 HpCDF	(7.94E+03)	(1.12E+04)	4.87E+04							
Total OCDF	6.43E+04	9.88E+04	1.78E+05							

[a] Non-detect values, designated by parentheses ( ), listed are sample- and analyte-specific and are calculated as "0" in the table "subtotals and totals" results. Estimated Maximum Possible Concentration (EMPC) peak values, designated by brackets { }, listed are sample- and analyte-specific, and using the Table isomer value shown, are included in the "subtotals" results.

[b] **CBI data removed**: See confidential version of document.

Table 3-5. Dioxin/Furan Mill Clay Feed Homolog Results[a]

Analyte	Run 1 Retest	Run 2	Run 3	Average
Clay Feed	SB Blend	SB Blend	REX	
Dioxins (pg/g dry wt.)				
TCDD				
PeCDD				
HxCDD				
HpCDD				
OCDD				
Total PCDDs[b]				
Furans (pg/g dry wt.)				
TCDF				
PeCDF				
HxCDF				
HpCDF				
OCDF				
Total PCDFs[b]				
Total PCDDs and PCDFs (pg/g, ng/kg, dry wt.)				

[a] **CBI data removed**: See confidential version of document.

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Table 3-6. Dioxin/Furan Mill Clay Product Homolog Results[a]

Analyte	Run 1 Retest	Run 2	Run 3	Average
Clay Product	SB Blend	SB Blend	REX	
Dioxins (pg/g dry wt.)				
TCDD				
PeCDD				
HxCDD				
HpCDD				
OCDD				
Total PCDDs[b]				
Furans (pg/g dry wt.)				
TCDF				
PeCDF				
HxCDF				
HpCDF				
OCDF				
Total PCDFs[b]				
Total PCDDs and PCDFs (pg/g, ng/kg, dry wt.)				

[a] **CBI data removed**: See confidential version of document.

Table 3-7. Mill Sampling and Stack Parameters

	Sampling Time	Sample Gas Volume		CEMS Analysis [a]		Moisture Content	Average Stack Temp.	Stack Static Pressure		Stack Velocity	Stack Flow Rate
	(min)	(acm)	(dscm)	% CO_2	% O_2	(%)	(°C)	(mm Hg)	% Isokinetic	(m/min)	(dscm/hr)
Mill											
Run 1Retest	240	6.271	5.942	0.69	19.8	b	62	-0.39	104	990	29,860
Run 2	240	3.556	3.392	0.69	19.7	b	63	-0.39	105	987	29,940
Run 3	240	3.666	3.471	0.60	19.8	b	61	-0.39	97.5	1,077	33,000
Average =				0.66	19.8	b	62		NA	1,020	30,930

[a] Percent CO_2 and O_2 for Runs 1 Retest through 3 were analyzed by CEMS.
[b] **CBI data removed**: See confidential version of document.

Table 3-8. Summary of Total Dioxin/Furan Results for Dryer Samples

	Run 4	Run 5	Run 6	Average
Air Emissions				
Total PCDDs/PCDFs				
Total PCDDs (pg/dscm)	255	353	370	326
Total PCDFs (pg/dscm)	48.4	25.0	5.97	26.5
Total PCDDs and PCDFs (pg/dscm)	304	378	376	353
Emission Rates/Factors				
Dry Clay Process Rate (Mg/hr)	b	b	b	b
Material Analyses				
Clay Feed[a]				
Total PCDDs and PCDFs (pg/g)	b	b	b	b
Total 2,3,7,8-TCDD TEQ (pg/g)	b	b	b	b
Clay Product[a]				
Total PCDDs and PCDFs (pg/g)	b	b	b	b
Total 2,3,7,8-TCDD TEQ (pg/g)	b	b	b	b

[a] Clay feed and product concentrations are calculated on a dry basis.
[b] **CBI data removed**: See confidential version of document.

Table 3-9. Dioxin/Furan Homolog Results for Dryer Stack Samples

Analyte	Run 4	Run 5	Run 6	Average
Dioxins (pg/dscm)				
TCDD	21.0	13.0	18.0	
PeCDD	17.1	20.6	19.4	
HxCDD	23.7	28.3	24.0	
HpCDD	28.0	37.2	32.8	
OCDD	165.7	253.5	276.4	
Total PCDDs (pg/dscm)[a]	255	353	370	326
Furans (pg/dscm)				
TCDF	11.36	9.27	(0.479)	
PeCDF	11.83	7.23	(0.997)	
HxCDF	12.38	3.99	4.42	
HpCDF	9.11	2.68	1.55	
OCDF	3.78	1.88	1.58	
Total PCDFs (pg/dscm)[a]	48.4	25.0	7.55	27.0
Total PCDDs and PCDFs (pg/dscm)	304	378	378	353

[a] Non-detect values, designated by parentheses (), listed are sample- and analyte-specific and are calculated as "0" in the table "subtotals and totals" results. Estimated Maximum Possible Concentration peak values, designated by brackets {}, listed are sample- and analyte-specific, and using the Table isomer value shown, are included in the "subtotals" results.

Table 3-10. Dioxin/Furan Homolog Emission Factors for Dryer Stack Samples

Homolog	Emission Rate, pg/hr			Process Rate, Mg/hr[b]			Emission Factor, pg/Mg[b]			
	Run 4	Run 5	Run 6	Run 4	Run 5	Run 6	Run 4	Run 5	Run 6	Average
Total TCDD	4.40E+05	2.68E+05	3.64E+05							
Total PeCDD	3.57E+05	4.26E+05	3.91E+05							
Total HxCDD	4.95E+05	5.83E+05	4.84E+05							
Total HpCDD	5.85E+05	7.68E+05	6.62E+05							
Total OCDD	3.46E+06	5.23E+06	5.59E+06							
Total CDD	5.34E+06	7.28E+06	7.49E+06							
Total TCDF	2.37E+05	1.91E+05	(9.68E+03)							
Total PeCDF	2.47E+05	1.49E+05	(2.01E+04)							
Total HxCDF	2.59E+05	8.24E+04	8.94E+04							
Total HpCDF	1.90E+05	5.53E+04	3.13E+04							
Total OCDF	7.90E+04	3.88E+04	(<4.14E+04)							
Total CDF	1.01E+06	5.17E+05	1.21E+05							
Total CDD/CDF	**6.35E+06**	**7.80E+06**	**7.61E+06**							
2,3,7,8 TCDD	2.47E+04	{1.87E+04}	2.28E+04							
1,2,3,7,8 PeCDD	2.60E+04	2.91E+04	3.07E+04							
1,2,3,4,7,8 HxCDD	(1.49E+04)	(1.64E+04)	(1.16E+04)							
1,2,3,6,7,8 HxCDD	(<2.13E+04)	3.81E+04	2.42E+04							
1,2,3,7,8,9 HxCDD	5.64E+04	{6.61E+04}	5.09E+04							
1,2,3,4,6,7,8 HpCDD	2.51E+05	3.31E+05	2.67E+05							
Total OCDD	3.46E+06	5.23E+06	5.59E+06							
2,3,7,8 TCDF	{1.66E+04}	2.27E+04	(9.68E+04)							
1,2,3,7,8 PeCDF	2.39E+04	(1.91E+04)	(2.10E+04)							
2,3,4,7,8 PeCDF	3.78E+04	3.00E+04	(1.94E+04)							
1,2,3,4,7,8 HxCDF	4.04E+04	{2.71E+04}	(<2.07E+04)							
1,2,3,6,7,8 HxCDF	3.59E+04	(<2.15E+04)	(<2.07E+04)							
2,3,4,6,7,8 HxCDF	3.58E+04	{2.32E+04}	(<2.07E+04)							
1,2,3,7,8,9 HxCDF	(<2.13E+04)	(4.98E+04)	(6.17E+04)							
1,2,3,4,6,7,8 HpCDF	1.04E+05	5.54E+04	3.13E+04							
1,2,3,6,7,8,9 HpCDF	2.52E+04	(1.19E+04)	(5.63E+04)							
Total OCDF	7.90E+04	(<4.29E+04)	(4.14E+04)							

[a] Non-detect values, designated by parentheses ( ), listed are sample- and analyte-specific and are calculated as "0" in the table "subtotals and totals" results. Estimated Maximum Possible Concentration peak values, designated by brackets { }, listed are sample- and analyte-specific, and using the Table isomer value shown, are included in the "subtotals" results.

[b] **CBI data removed**: See confidential version of document.

Table 3-11. Dioxin/Furan Dryer Clay Feed Homolog Results[a]

Analyte	Run 4	Run 5	Run 6	Average
Product Type	SB Blend	SB Blend	SB Blend	
Dioxins (pg/g dry wt.)				
TCDD				
PeCDD				
HxCDD				
HpCDD				
OCDD				
Total PCDDs[c]				
Furans (pg/g dry wt.)				
TCDF				
PeCDF				
HxCDF				
HpCDF				
OCDF				
Total PCDFs[c]				
Total PCDDs and PCDFs (pg/g dry wt.)				

[a] **CBI data removed**: See confidential version of document.

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Table 3-12. Dioxin/Furan Dryer Clay Product Homolog Results[a]

Analyte	Run 4	Run 5	Run 6	Average
Product Type	SB Blend	SB Blend	SB Blend	
Dioxins (pg/g dry wt.)				
TCDD				
PeCDD				
HxCDD				
HpCDD				
OCDD				
Total PCDDs[c]				
Furans (pg/g dry wt.)				
TCDF				
PeCDF				
HxCDF				
HpCDF				
OCDF				
Total PCDFs[c]				
Total PCDDs and PCDFs (pg/g dry wt.)				

[a] **CBI data removed**: See confidential version of document.

Table 3-13. Dryer Sampling and Stack Parameters

	Sampling Time	Sample Gas Volume		Orsat Analysis [a]		Moisture Content	Average Stack Temp.	Stack Static Pressure	% Iso-kinetic	Stack Velocity	Stack Flow Rate
	(min)	(acm)	(dscm)	% CO_2	% O_2	(%)	(°C)	(mm Hg)		(m/min)	(dscm/hr)
Dryer											
Run 4	240	5.229	4.896	0.3	19.7	b	54.4	-0.11	96.5	1,499	20,900
Run 5	240	5.073	4.813	0.2	19.7	b	55.3	-0.11	96.0	1,476	20,650
Run 6	240	5.139	4.885	0.2	19.8	b	52.1	-0.11	99.5	1,427	20,210
Average =				0.2	19.7	b	54		NA	1,470	20,590

[a] Percent CO_2 and O_2 for Runs 4 through 6 were analyzed by Orsat.
[b] **CBI data removed**: See confidential version of document.

Section 4.
Procedures for Sampling, Analysis, and Process Data Collection

This section describes the sampling, analysis, and process data collection procedures that were used for this test project. The published methods and Standard Operating Procedures (SOPs) that were used are cited. Details providing clarification and any modifications to or deviations from the published methods are presented in this section. Otherwise, the cited methods were followed.

4.1 Sampling Methods

4.1.1 Emissions Sampling Procedures

The emission samples collected required the use of the sampling system(s) as shown at each test location:

(1) Mill Baghouse
- EPA Method 23 isokinetic sampling train for PCDDs and PCDFs.
- EPA Method 3A for CO_2 and O_2.

(2) Dryer Baghouse
- EPA Method 23 isokinetic sampling train for PCDDs and PCDFs.
- EPA Method 3 for CO_2 and O_2.

The following methods were employed in the use and operation of these sampling trains and systems.

4.1.1.1 Sample and Velocity Traverses

Method 1 in Appendix A of 40 *CFR* 60 (basis for MRI SOP MRI-8401) was used to establish traverse (sampling) points at the two test locations for the traversing sampling trains. A check for absence of cyclonic flow was conducted at each location prior to the start of sampling. No cyclonic or nonparallel flow conditions were found at either location.

4.1.1.2 Determination of Gas Velocity and Volumetric Flow Rates

Method 2 in Appendix A of 40 *CFR* 60 (basis for MRI SOP MRI-8402) was used to measure gas velocities and volumetric flow rates with Type S pitot tubes that are

components of the traversing sampling trains. Pitot tubes meeting the dimensional specifications in the method were used. The pitot tube coefficient was adjusted for blockage in the gas stream caused by the probe assembly used during sampling in the duct having internal an diameter of 24 inches. An average adjusted coefficient for each such pitot tube was calculated in a spreadsheet using procedures cited in Method 2. The static pressure was determined within the gas stream as indicated in Method 2.

An aneroid barometer calibrated against a mercury barometer was used to measure atmospheric pressure at the sampling locations.

4.1.1.3 Determination of Moisture Content

Method 4 in Appendix A of 40 *CFR* 60 incorporated as part of Method 23 was used to determine the moisture (water vapor) content of the gas stream. Moisture collected during sampling was determined gravimetrically from the difference between the initial and final weights of all of the impingers in a train, including the resin cartridge.

4.1.1.4 Sampling of PCDDs and PCDFs

Method 23 in Appendix A of 40 *CFR* 60 (basis for MRI SOP MRI-8404) was used to collect samples to be analyzed for dioxins and furans. A schematic of a sampling train is presented in Figure 4-1. The Method 23 sampling train is based upon the apparatus design normally employed for sampling conducted under USEPA Method 5 modified to include a special coiled condenser and sorbent module assembly for collection for PCDDs/PCDFs. The types and content of each impinger was as follows:

1. 2-L Modified Greenburg-Smith with a shortened stem (knockout), empty.
2. 500 mL Modified Greenburg-Smith containing 100 mL of Milli-Q grade water.
3. 500 mL Greenburg-Smith containing 100 mL of Milli-Q grade water.
4. 500 mL Modified Greenburg-Smith, empty.
5. 500 mL Modified Greenburg-Smith containing 200 g silica SiO_2.
6. 500 mL Modified Greenburg-Smith containing 200 g silica SiO_2.

Clarifications of and modifications to the method are included in the following discussion.

Nickel-plated stainless steel nozzles and quartz glass probe liners were used in the probes. The internal surface of the compression fittings used for connecting nozzles to probe liners are permanently coated with abrasion-resistant Teflon® to prevent sample gas contact with the stainless steel, and the connections were positioned within each probe. Due to the very limited space at the mill baghouse, a heated sample transfer line was used between the probe and sampling train.

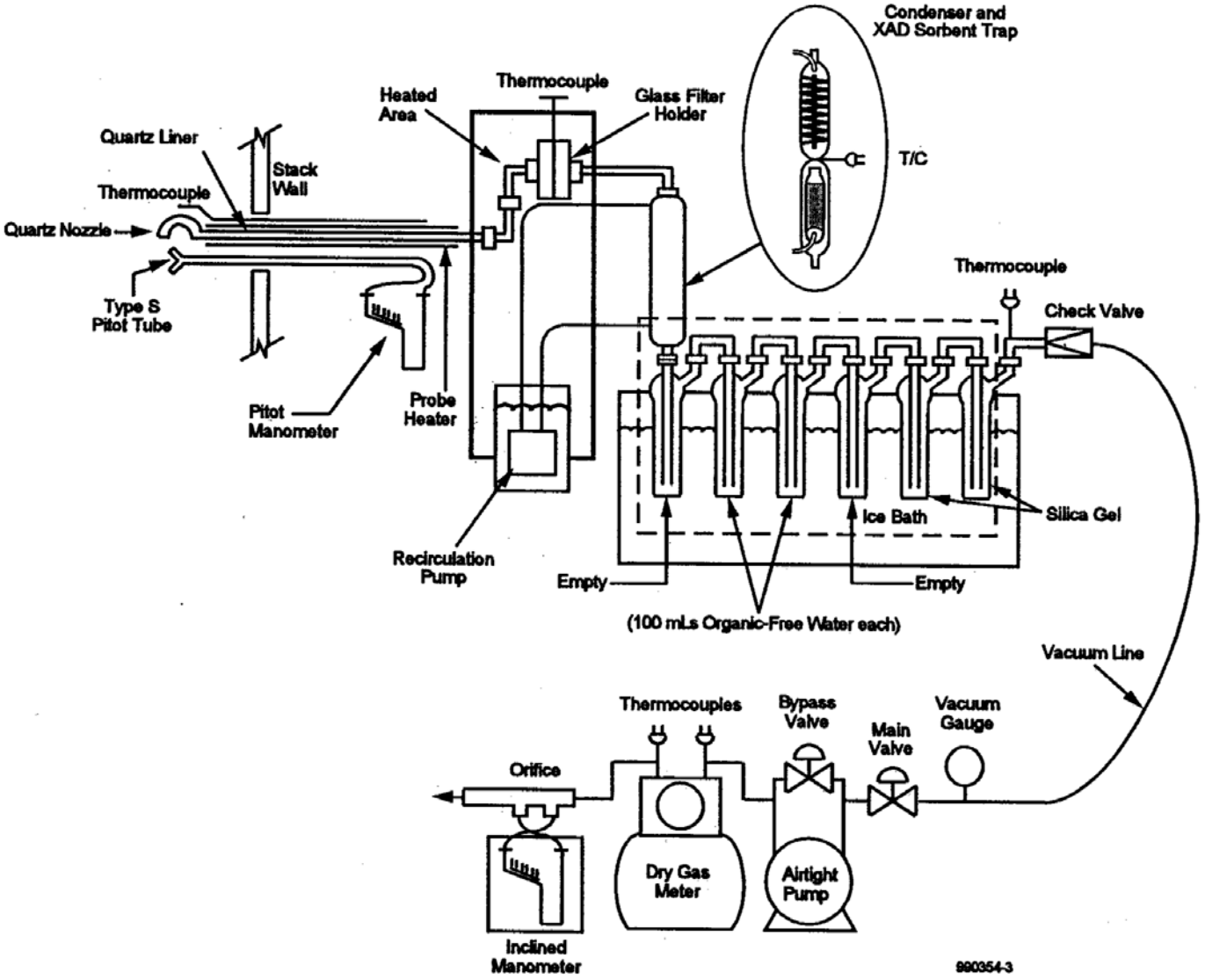


Figure 4-1. Method 23 Sampling Train for PCDDs and PCDFs

Since no significant quantities of particulate matter were observed during the first sampling run, no cyclone/flask assembly was used in front of the filter holder thereafter. During the first sampling run a significant pressure drop across the sampling train was observed and sampling was stopped so that the filter could be recovered and replaced. Leak checks were conducted prior to replacing filters and before continuing the sampling. The large pressure drop across the sampling train was compensated for in subsequent runs by using a smaller nozzle diameter. All filters were submitted to the analytical laboratory for analysis as described below in Section 4.2.1.

Filter supports in the filter holders were Teflon® frits. Quartz fiber filters having the same specifications described in the method were used. Each cartridge (sorbent trap) was loaded with approximately 40 grams of XAD-2 resin.

Two silica gel impingers were used in each train. In addition, the first 500-mL impinger in the sampling train was replaced with a 2-L impinger to minimize any need to swap impinger components during test runs.

Sample recovery procedures used were those specified in the method with one exception: excluding methylene chloride rinses for train components as preapproved by EPA prior to the field test. Acetone and toluene were used for rinsing train components. The acetone and toluene solvents used during the test were each from one lot. The acetone and toluene rinses were collected separately in the field, but in the lab were combined for extraction and analysis of dioxins and furans. The sample recovery scheme used for the trains is presented in Figure 4-2. The condensate collected in the impingers was weighed and discarded.

Blanks were collected in the field during the test. A Method 23 sampling train (using previously recovered glassware) was charged and leak checked at one sampling location and then returned for sample recovery. This sample (blank train) was submitted for PCDDs/PCDFs analysis along with the field samples. In addition, a set of reagent blanks consisting of one filter, one XAD, 400 mL acetone, 200 mL toluene, and 200 mL Milli-Q water was collected and archived for possible future evaluation. The reagent blank samples will remain in MRI storage until approval of the final test report and will not be sent to the laboratory for analysis unless requested by the WAM.

A summary of isokinetic results from each run was provided to the on-site WAM for review before the next run was initiated.

All post-test calibrations were performed at the MRI facility.

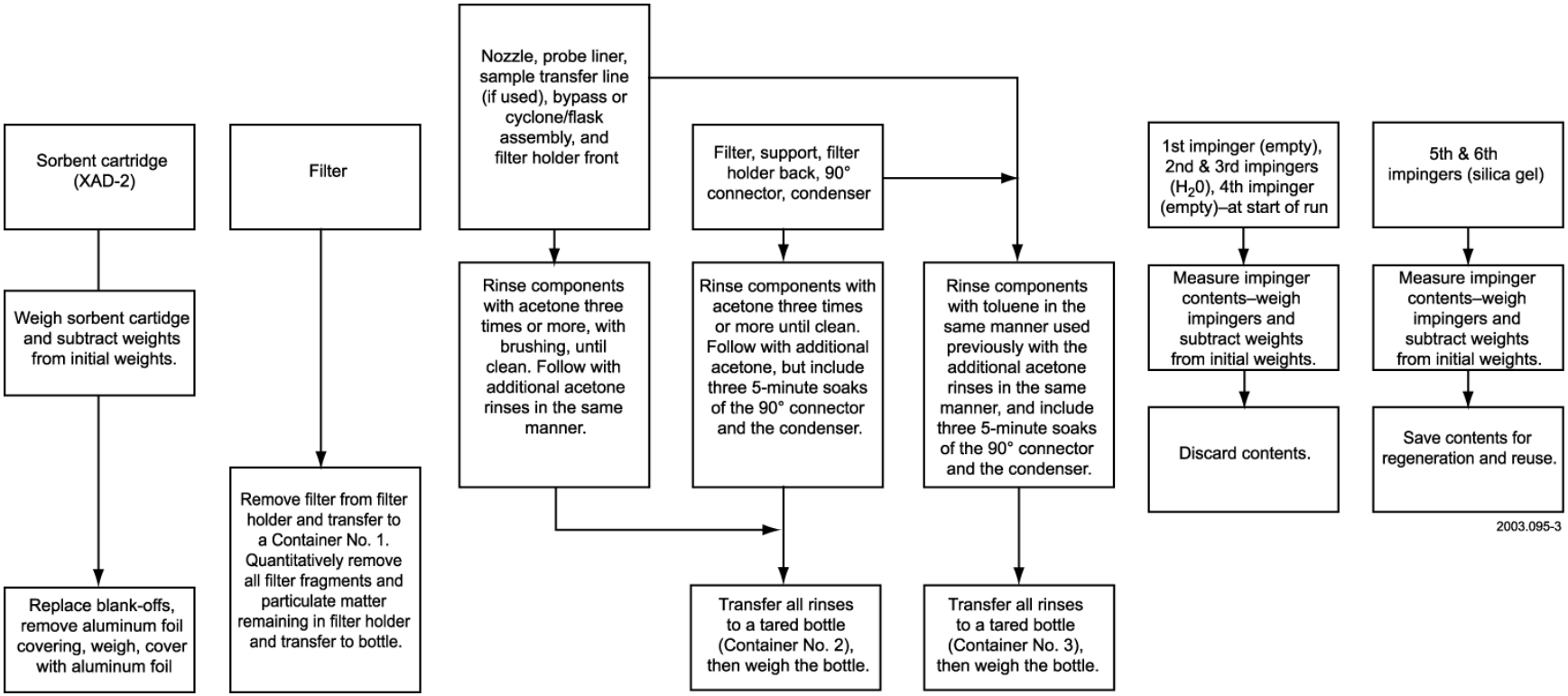


Figure 4-2. Sample Recovery Scheme

4.1.1.5 Sampling and Analysis for CO_2 and O_2

Because of concerns with background contamination at the mill test location, Method 3 in Appendix A of 40 *CFR* 60 (basis for MRI SOP MRI-8406) was used to determine CO_2 and O_2 at that location. Multi-point, integrated gas bag samples were collected simultaneously with the traversing/isokinetic sampling for analysis of O_2 and CO_2 with subsequent determination of dry gas molecular weight. The integrated gas sampling apparatus used to collect the samples was a component of each traversing sampling train. Integrated gas samples were extracted at a constant rate from the exhaust of a traversing sampling train just upstream from the outlet of the dry gas meter outlet orifice.

The train was purged for one minute with stack gas then integrated gas sampling was started. Sampling was conducted at a constant rate throughout the run while the traversing/isokinetic sampling was in progress. Each integrated gas sampling apparatus was leak checked before and after each test run. The tubing at the connection to the dry gas meter outlet orifice was closed off, the integrated sampling apparatus pump was turned on, and the integrated sampling apparatus flow control valve was fully opened. No flow at the tubing outlet (i.e., where the gas sample bag would be connected during sampling), was used to indicate the apparatus was leak-free. Gas samples were analyzed with an Orsat analyzer.

At the dryer, a Continuous Emission Monitoring System (CEMS) was set up and operated according to Method 3A in Appendix A of 40 *CFR* 60 to sample and analyze for CO_2 and O_2. Clarifications of and modifications to the methods are included in the following discussion.

All calibration gases were certified according to EPA Protocol 1. Gas concentrations that were used are shown in Table 4-1.

Table 4-1. Calibration Gases

Emission parameter	Zero-level gas	Mid-level gas	High-level gas
CO_2	Zero in nitrogen	10% v/v	18% v/v
O_2	Zero gas	12% v/v	21% v/v

A schematic of the sampling and analytical system used is presented in Figure 4-3. A brief description of each component follows:

Probe—3/8-inch outside diameter (OD) stainless steel (SS) sample line housed in a 1-inch SS heated sheath of sufficient length to reach the center of the stack. The stack end of the probe was fitted with a sintered SS 10-micron prefilter which was back-flushed after each run.

Sample gas conditioner (for moisture removal)—Chiller. The sample gas conditioner attaches to the back of the probe. It has a probe bracket, which is attached to

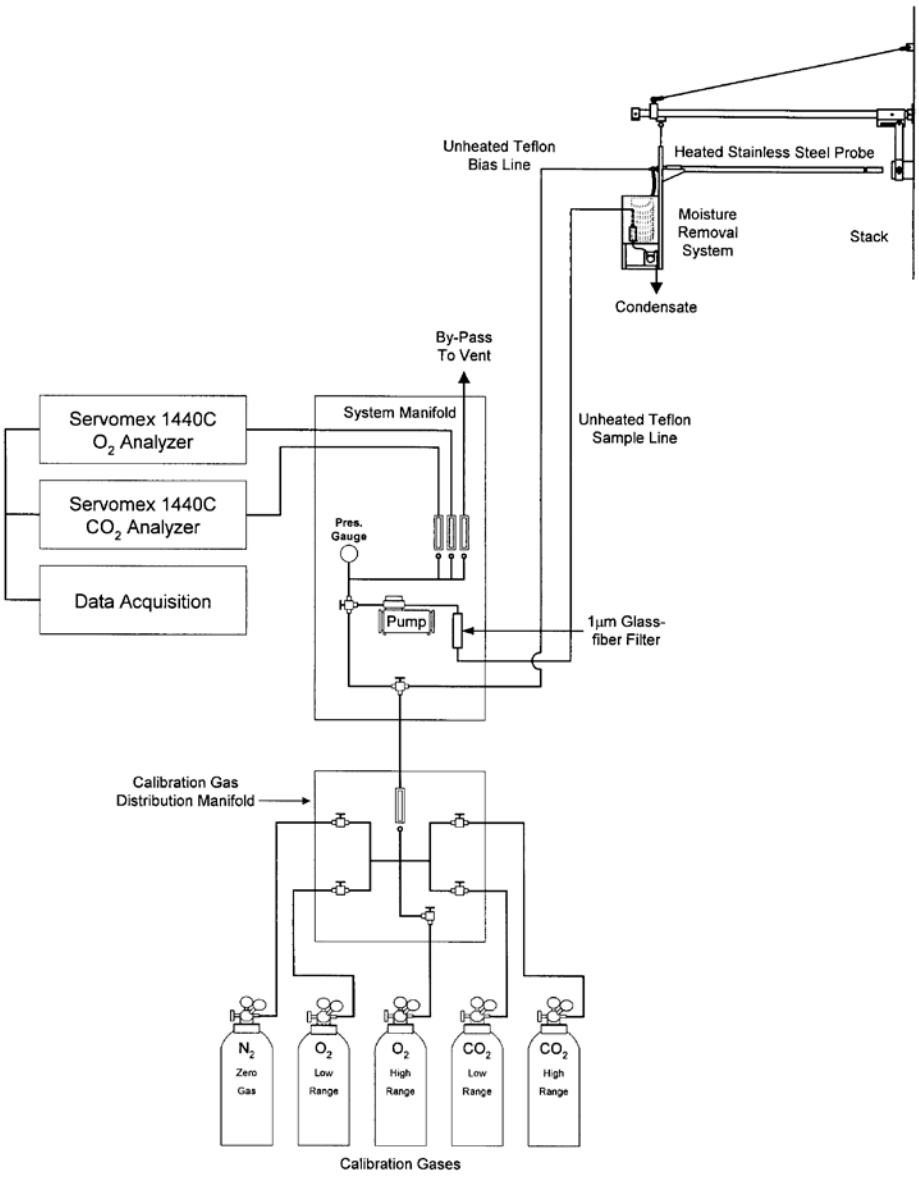


Figure 4-3. Instrumental Measurement System for CO_2 and O_2

an ice bath. At this point the probe liner is connected to a 3/8-inch Teflon tube. The Teflon tube is coiled within the ice bath. As the hot stack gas is pulled through the chilled section of tubing in the ice bath the moisture in the gas is turned to condensate, which is collected in a moisture trap at the bottom of the coil. The conditioned gas sample is pulled out the top of the moisture trap into the sample line. The condensate is drained out the bottom of the moisture trap by a peristaltic pump.

Sample line—Consists of a 3/8-inch OD Teflon tube, which is attached to the exit of the sample gas conditioner and to the inlet of the sample gas distribution system at the other end. In the same nylon sheath is a 1/4-inch OD Teflon tube, or Bias line, which is used to deliver calibration gases to a tee located at the back of the probe and in front of the sample gas conditioner. Various length sections from 25 to 100 feet are available and can be jointed together to reach sampling locations.

Sample gas and calibration gas distribution manifold—Located in the sample trailer. It is capable of pulling 1 to 10 L/minute (dry gas), although normal gas delivery to the CEMS is typically 2 L/minute, and can distribute the sample gas flow to five separate analyzers simultaneously. It can also deliver EPA Protocol 1 gases directly to the analyzers or to the back of the probe for a system bias check. The gas distribution manifold is located in the sampling trailer downstream of the sample gas conditioner and upstream of the selected analyzer(s).

Data acquisition system—Located in the sample trailer. MRI uses LABTECH Notebook Pro for Windows 95, Version 10.12, which is an integrated system that provides data acquisition, monitoring, and control. The system is designed such that each data channel can be configured separately with different characteristics. The normal mode of operation is continuous data collection written to disk in the background, while performing foreground tasks and displaying data in real time (1-minute averages). This system is run on a Pentium laptop computer with a 1-G hard drive. MRI also uses an identical computer (which can serve as a backup) for data transfer and processing. With the use of a spreadsheet designed and developed by MRI, calibration results are instantaneous and preliminary test results are available while on-site.

O_2 analyzer—Located in the sample trailer. Servomex, Model 01440CISTD uses the principle of Magneto-pneumatic technique to measure the concentration of O_2 (%) in the gas stream. It has measurement ranges of 0% to 25% and 0% to 100%.

CO_2 analyzer—Located in the sample trailer. Servomex, Model 01440CISTD uses a single beam, dual wavelength IR technique to measure the concentration of CO_2 (%) in the gas stream. It has measurement ranges of 0% to 20% and 0% to 25%.

4.1.2 Process Sampling Procedures

During each of the test runs, raw feed and product samples were collected for PCDDs/PCDFs analysis. Sampling was conducted as during the pretest site survey. Individual, representative "grab" samples, were collected using EPA-accepted methods (ASTM D6051-96) whereby several equal, grab samples of approximately 50 g each were collected over a period of time (if possible, every 30 minutes, beginning at least 30 minutes prior to the start of each test run and ending 30 minutes after the completion of each test run) and composited/mixed/quartered until the ideal sample size became available. An aluminum scoop wrapped in disposable aluminum foil and a large mixing container was used for sample collection and mixing.

Sufficient material was taken from the composited process sample to fill an 8-ounce glass container. A second sample was collected from this composite with one each of these samples sent to the lab for analysis, and the second sample retained by the plant. Any remaining material was returned to the plant. Special precleaned glass containers provided by the laboratory were used to collect, store and ship the field samples. The sealed field samples were wrapped with aluminum foil and placed in plastic bags along with a sample traceability form. The samples were then placed in their own insulated

shipping containers (separate from the emission samples) with ice and shipped by Federal Express overnight at the conclusion of the entire sample collection period.

4.2 Analytical Procedures

The analytical methodology and procedures used by Alta Analytical Perspectives for this project are standardized methods and EPA-approved procedures. Any modifications to the analytical methods used on this project are described below.

4.2.1 EPA Method 23 Samples

Before the sampling event, the sampling modules were prepared by the laboratory using precleaned XAD-2 resin and spiked with a known amount of five labeled PCDD/F surrogate standards. Upon return to the laboratory, the sample components recovered from the Method 23 trains (i.e., XAD-2 resin, rinses, and filter) were combined and extracted in the laboratory using toluene Soxhlet Dean-Stark extraction. The procedure for extraction involved placing the XAD-2 resin, concentrated rinses, and filter samples in the Soxhlet apparatus, spiking with $^{13}C_{12}$ PCDD/PCDF internal standards, and extracting for a minimum of 16 hours.

The extract was split, with one-half being subjected to the sample fractionation procedures and analyzed for dioxins and furans, and one-half being archived. The final extract was prepared with the addition of recovery standards and provided for analysis by HRGC/HRMS using a final volume of 20 µL.

Extracts were analyzed for dioxins and furans based on the procedures specified in Method 8290A, "Polychlorinated Dibenzodioxins (PCDDs) and Polychlorinated Dibenzofurans (PCDFs) by High-Resolution Gas Chromatography/High-Resolution Mass Spectrometry (HRGC/HRMS)," found in "Test Methods for Evaluating Solid Waste, Physical/Chemical (SW-846)." This analytical procedure included the separation of isomers of dioxin and furan using high-resolution gas chromatography followed by high-resolution mass spectrometry. Initial and continuing calibration criteria adhered to Method 23 criteria. The target analyte amounts and surrogate and internal standard recoveries were quantitated according to Method 23. A schematic of the analytical process is presented in Figure 4-4.

Note that a more robust Batch Control Spike (BCS_3) has been incorporated into the method in place of the Laboratory Control Spike. Information on BCS_3 matrix spiking is provided in Appendix E. Specifically, Batch Control Spikes (BCS_3):

- Were prepared in stages at the same time as the batch of field samples; i.e., at each phase involving the addition to the samples of the extraction, cleanup, and injection standards. For air matrices, the Batch CS_3 was initiated at the same point as when the XAD cartridges were prepared for sampling.

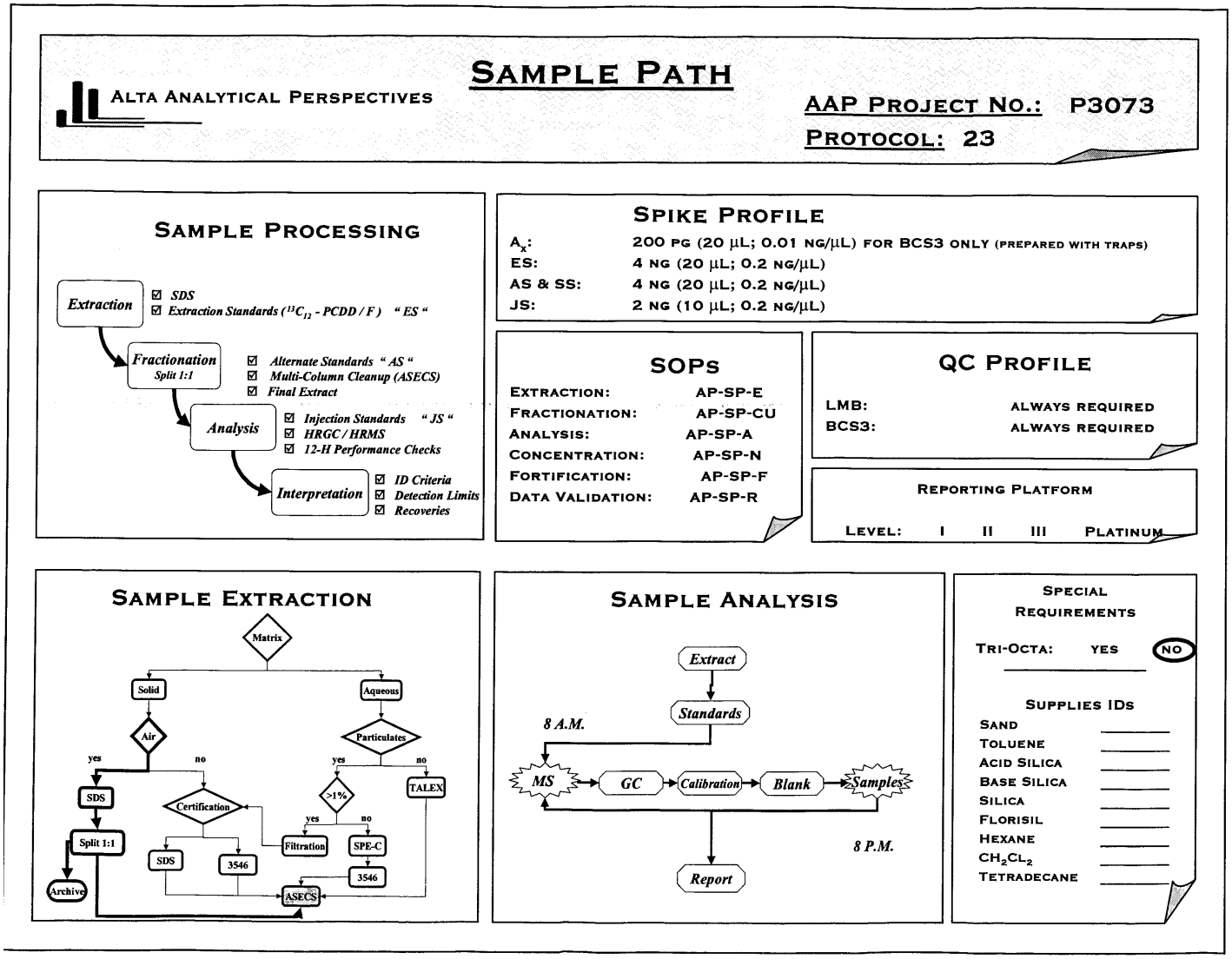


Figure 4-4. Schematic of EPA Method 23 and SW846 8290 Emission Samples Analysis Path

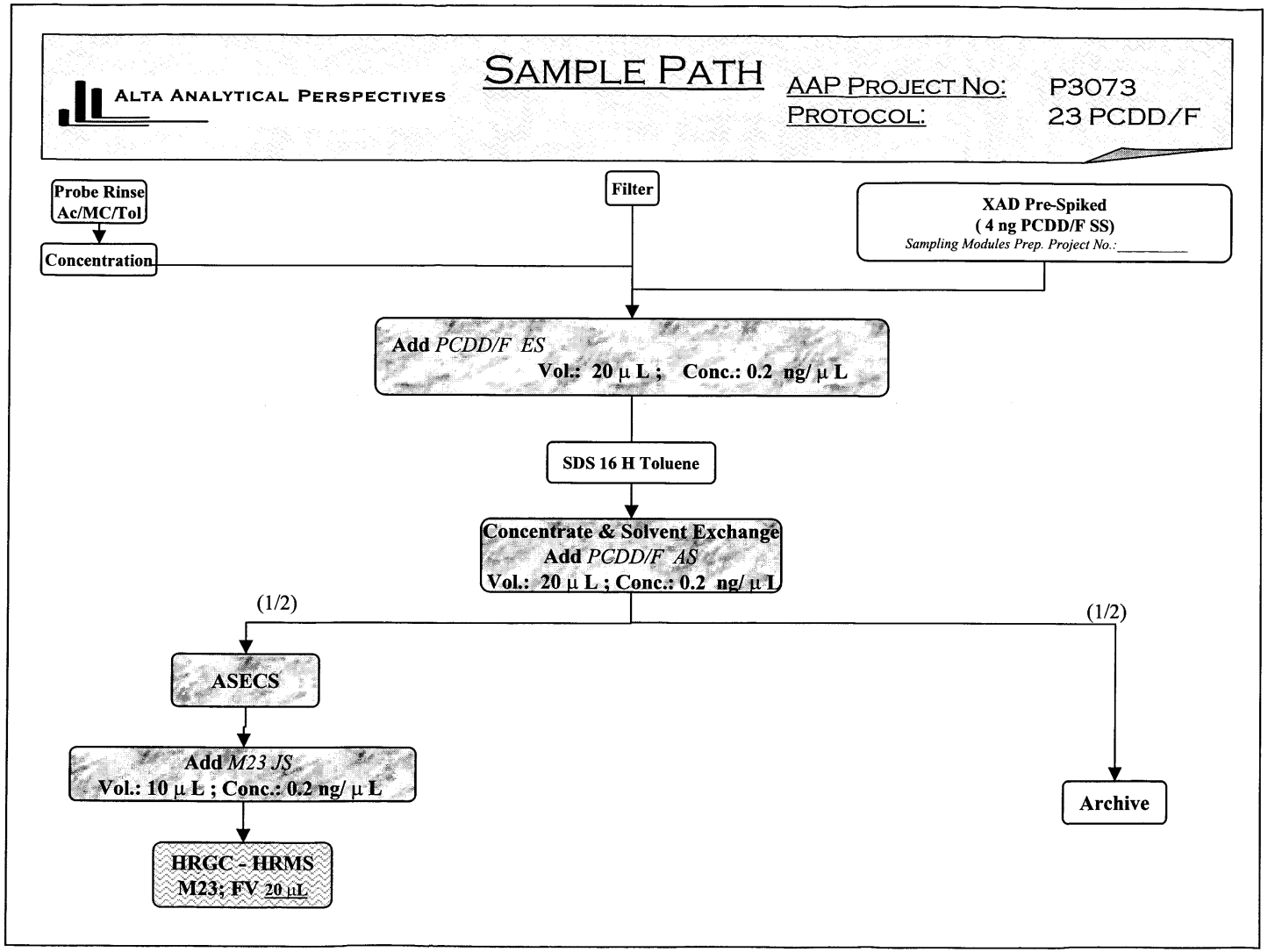


Figure 4-4. Schematic of EPA Method 23 and SW846 8290 Emission Samples Analysis Path (Continued)

- Consisted of one Batch CS_3 per batch of 20 samples or less—regardless of the matrix type—processed through the same spiking scheme with the same spiking solutions, same analyst, same delivery system, and at the same time as the field samples. The laboratory ensured that sufficient Batch CS_3s was prepared to provide front- and back-end calibration verifications for all the samples as well as re-injections, when necessary.
- Were then analyzed at the beginning and at the end of each 12-hour analytical sequence during which samples are analyzed.

In order to use the front- and back-end Batch CS_3s averaged RRFs to process the samples, the individual front- and back-end RRFs needed to meet a number of requirements (independent verification, RPD, and PD or bias). This information is provided in Appendix F, BCS_3 Performance Criteria. Details on performance criteria associated with the BCS_3 are also available from the laboratory SOPs.

4.2.2 Process Samples

EPA Method 8290A was used to analyze the process samples. Method 8290A is a high-resolution gas chromatography/high-resolution mass spectrometry (HRGC/HRMS) analytical procedure capable of measuring low parts per trillion levels (picograms per g). Each process sample was thoroughly mixed and a 10-gram sample was removed, weighed, extracted, and analyzed for 17 PCDD/F congeners. The extracts were reanalyzed following a ten-fold dilution due to OCDD detector saturation. Reported concentrations have been adjusted. Even though HpCDD and OCDD results were above the highest point on the calibration curve, only OCDD was reanalyzed because review of HpCDD data suggested results were within the linear range of the curve. A separate aliquot is mixed, oven-dried at 125°C for 16 hours, and percent moisture is determined to calculate an equivalent 10-gram sample. A schematic of the analytical process is presented in Figure 4-5.

4.3 Process Data

In order to ensure that the processes were operating in a manner that was representative of normal operating conditions during testing, close contact was maintained with the facility operators and specific process data were collected. As the data were collected, process and control device operating parameters were monitored to ensure that they were within the normal ranges, as specified by the facility. In addition, at the beginning of each test day, a schedule was obtained of any planned process changes, product changeovers, or other process-related information that could impact the test program. Any abnormal process conditions were discussed with the facility operators to determine if testing should be suspended.

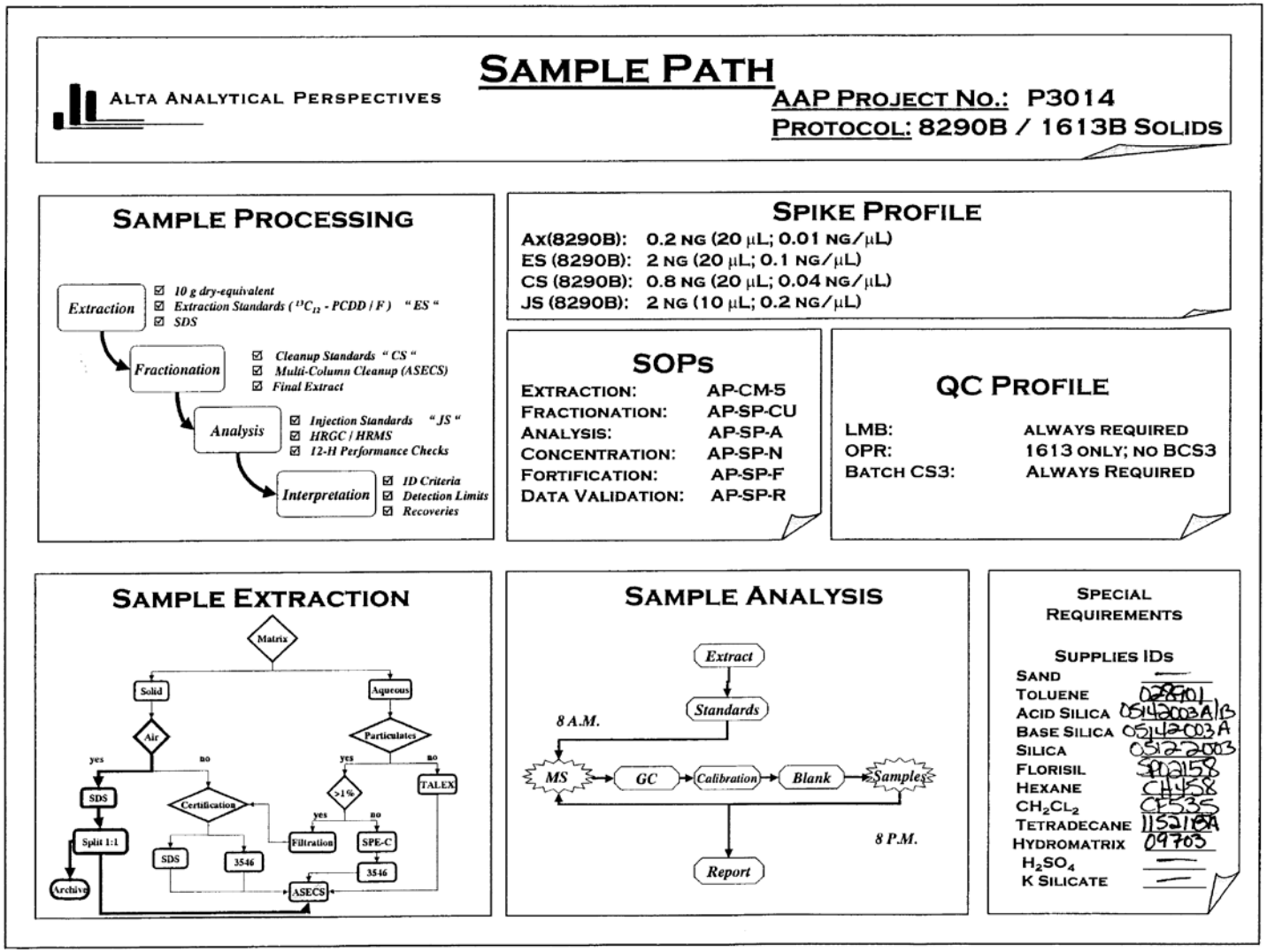


Figure 4-5. Schematic of Process Samples Analysis Path

Section 5.
QA/QC Activities

This section summarizes the QA/QC activities associated with this project. The QA/QC requirements and emission measurement and data quality objectives for this project were presented in the Quality Assurance Project Plan (QAPP). Major components of QC procedures included: (1) sampling equipment calibrations, (2) procedural elements of the methods such as leak checks, proper traversing, placement of sampling probes, verification of the integrity of metering systems prior to the start of sampling, etc., and (3) the use of QC samples in the analytical approach such as reagent blanks, run-used train blank, method blanks, batch control spikes, duplicate injections of the BCS_3, and internal standard and surrogate standard spiking. Data quality objectives, as specified in the project QA plan, are evaluated in Section 5.1. Internal standard and surrogate standard recoveries are presented in Section 5.2. Based on the QA activities, a discussion of data quality is presented in Section 5.3.

5.1 QA/QC Objectives Summary

Data quality criteria along with an evaluation results based on the QC criteria are provided in Tables 5-4 through 5-6.

Results for blank samples associated with this test are summarized in Table 5-4. All blank sample results were well below the lowest point on the calibration curve.

Clay feed and product sample results for the 1,2,3,4,6,7,8-Hepta-Dioxins and OCDDs exceeded the upper limit of the calibration curve. Alta Analytical Perspectives has examined the data and found that these results are within the range of the curve for the clay samples except for the Run 5 product, and Run 6 feed and product samples, which may be underestimated by as much as 50 percent. Note that these results already reflect a ten-fold dilution for the OCDD samples.

For one emission sampling train sample, the recoveries for the internal standards exceeded the Method 23 specification of 130 percent. This is addressed in more detail in Section 5.2 below.

All sample transfers were documented on Chain-of-Custody sheets. Samples were maintained in the field at temperatures between 1.0 and 7.5°C; after shipping they arrived at the lab at temperatures between 8 and 23°C. All samples were analyzed within the specified holding times (sampled < 28 days after XAD preparation, extracted < 30 days after sample collection, and analyzed < 45 days after extraction).

5.2 Internal Standard and Surrogate Standard Recoveries

Internal standard and surrogate standard recovery results are summarized in Tables 5-4 and 5-5. Additional standard recovery data are included in Appendix D of this report.

As noted in Table 5-4, the internal standard recoveries corresponding to the Run 1 Retest sample were above the 130 percent requirement of Method 23, but beneath 152 percent. Because the internal standard recoveries were all consistently high for Run 1 Retest, and the surrogate standard recoveries for the same run were all consistently lower (70 to 76 percent) than those for the other two runs at the mill (97 to 106 percent), it is reasonable to conclude that the amount of the internal standard solution added to the Run 1 Retest sample slightly exceeded that specified. This, in turn, could have resulted in a low bias in the sample results. Since the surrogate standard recoveries for Run 1 are within the method objectives of 70 to 130 percent, the sample data are reasonable to use. Results could be corrected for the apparent low bias, but MRI has selected not to do this since the collection efficiency results indicated by the surrogate standard recoveries are within the QA limits, and the accompanying method blank, sampling standard, and BCS_3 results are all within the QA objectives.

Internal standard recoveries corresponding to Run 4 Product and Run 5 Feed were also greater than 130 percent for ^{13}C-OCDD. No attributable cause is discernable considering the recoveries for the remaining labeled congeners were within limits. The fact that the accompanying method blank, sampling standard, and BCS_3 results are all within the QA objectives suggests that the results are acceptable.

5.3 Discussion

As part of the QA review process to ensure accurate reporting the report and supporting records were audited. One run was traced from the field measurement records to original analytical data through the derived test results. Based on the data review, the test results were found to be correctly reported, traceable, and met the quality assurance objectives of the test program. Any exceptions from data quality criteria are discussed in the report and associated results have been flagged in the data tables.

Table 5-1. Calibration QC Criteria for Sampling Equipment

Parameter	Calibration technique	Reference standard	Acceptance limit	Frequency	Criteria met? (Y/N)
Sampling nozzle	Measure 3 diameters to nearest 0.001 in and average measurements	Micrometer	Difference between high and low measurements, ≤ 0.004 in	Prior to sampling	Yes
Dry gas metering system—volume	Compare with calibrated critical orifices, 40 *CFR* 60, Appendix A, Method 5, Section 16.2	Calibrated critical orifice	Difference between individual calibration factor values and average value, ≤ ±0.02	Prior to test series, and in the field after test series	Yes
	Use field test data to compute a calibration check value, EPA Method ALT-009	NA	Difference between calibration check value must be ≤ ±5% of initial calibration factor	After test series	Yes
Dry gas meter thermocouples	Compare to mercury-in-glass thermometer	ASTM thermometer	≤ ±5.4°F difference from reference	Before and after test series	Yes
Stack Gas stream thermocouple	Compare to value generated by dry well monitored with potentiometer thermocouple system	Hart Model 9100A dry well calibration system	Difference of ≤ ±1.5% of minimum absolute stack temperature from absolute reference temperature (unsaturated gas streams)	Before and after test series	Yes
Final impinger outlet temperature sensor (thermocouple)	Compare to mercury-in-glass thermometer	ASTM thermometer	≤ ±2°F difference from reference	Before and after test series	Yes
Filter temperature sensor (thermocouple)	Compare to mercury-in-glass thermometer	ASTM thermometer	≤ ±5.4°F difference from reference	Before and after test series	Yes
Aneroid barometer	Compare to calibrated mercury barometer	Mercury column barometer	≤ ±0.1 in Hg difference from reference	Before and after test series	Yes
Type S pitot tube	Measure dimensions according to 40 *CFR* 60, Appendix A, Method 2 for baseline coefficient of 0.84	Micrometer and angle finder	Meets dimensional criteria specified in Method 2, Section 6.1 and Figures 2-2 and 2-3	Before and after test series	Yes

Table 5-2. Criteria for Emission Measurement and Data Quality

Test parameters	Matrix	Method of determination	Frequency	Accuracy objective	Precision objective	Objective met? (Y/N)
Dioxin/ Furan	Method 23 train samples	Surrogate standards (spiked in lab during preparation of XAD for sampling trains)	Each field sample and blank	70% to 130% recovery	NA	Yes
		Internal standards	Each field sample and blank	40 - 130% recovery (tetra-hexa) 25 - 130% rec. (hepta-octa)	NA	see Note 1
		BCS_3 standards	Each analytical batch	80 - 120% recovery	NA	Yes
		Laboratory reagent blank	One XAD/filter	Levels less than lowest calibration standard	NA	Yes
Moisture (water vapor)	Impinger contents	Balance calibration check with calibration weight	Prior to initial and final gravimetric determinations	± 0.1g	NA	RPD < 0.1% of check weight.
Moisture, Pressure, temp., and velocity	Gas stream being measured	Secondary technical review of field test data and equipment calibration records relative to EPA Methods 1-5	Ongoing during testing	Validated by meeting posttest equipment calibration tolerances	NA	Yes
CO_2 and O_2, by Orsat	Stack Gas	Single analysis of ambient air	Prior to sample analysis	98% to 102% (assuming air at 20.9% O_2)	2% RPD	Yes
		Triplicate analysis of test samples	Each sample	NA	2% RPD	Yes
CO_2 and O_2, by instrument analyzer on site	Stack gas	Analyzer calibration error check with zero, mid-range, and high-range calibration gases	After system setup each day and more often when needed	≤ ±2% of span for the difference between system response and calibration gas value for any of the calibration gases	NA	Yes
		Sampling system bias check with zero and either of the upscale calibration gases	After the calibration error check, during calibration drift tests	≤ ±5% of span for the difference between analyzer response for the initial calibration error check and system response for the initial bias check for either of the calibration gases	NA	Yes
		Response time determination	During the initial bias check each day	NA	NA	Yes
		Zero and calibration drift tests	Repeat the bias check after each run or more often if needed	≤ ±5% of span for the difference between analyzer response for the initial calibration error check and system response for the final bias check for either of the calibration gases	≤ ±3% of span for the difference between final and initial system.	Yes

NA = Not Applicable.

Note 1: Method 23 internal standard recoveries corresponding to Run 1 Retest were >130%. A likely cause is discussed in the text and may have resulted in a low bias for this sample. The accompanying method blank, sampling standard, and BCS_3 results are all within the QA objectives.

Table 5-3. Criteria for Assessing Data Quality of Process Sample Analyses

Test parameters	Matrix	Method of determination	Frequency	Accuracy objective	Precision objective	Objective met? (Y/N)
Dioxin/ Furan	Raw Feed, and Final Product	Clean-up standards	Each sample	40% to 135% recovery for all 2,3,7,8-substituted internal standards	NA	Yes
		Duplicate extraction and analysis	One sample per matrix for the test	NA	25% RPD for analytes present above the reporting limit	NA See Note 2.
		Laboratory reagent blank	One sample per matrix for the test	Levels less than lowest calibration standard	NA	Yes

Note 2: Duplicate extraction and analysis was not intended to be included in the test plan.

Table 5-4. Method 23 Internal Standard and Surrogate Standard Recoveries

Analyte	Method blank Run 1 Retest	Method blank Runs 2-6	Field blank train	Mill			Dryer		
				Run 1 Retest	Run 2	Run 3	Run 4	Run 5	Run 6
Internal Standard (IQS) % Recoveries: QA objective 40-130% for tetra-hexa; 25-130% for hepta-octa									
^{13}C-2,3,7,8-TCDD	106	74.1	82.2	139	84.7	82.4	87.0	60.8	51.9
^{13}C-1,2,3,7,8-PeCDD	109	75.4	85.8	143	87.5	82.9	90.0	63.5	53.8
^{13}C-1,2,3,6,7,8-HxCDD	95.6	79.2	88.7	138	88.6	86.9	92.2	64.5	54.4
^{13}C-1,2,3,4,6,7,8-HpCDD	106	82.3	88.3	147	90.9	91.9	96.3	67.6	57.8
^{13}C-1,2-OCDD	89.2	79.6	87.7	133	90.6	90.9	99.9	68.0	57.4
^{13}C-2,3,7,8-TCDF	116	87.2	82.1	152	86.2	83.9	87.6	62.2	49.9
^{13}C-1,2,3,7,8-PeCDF	111	76.2	86.1	146	86.3	83.6	89.1	63.7	52.0
^{13}C-1,2,3,6,7,8-HxCDF	90.9	76.7	88.4	132	88.2	84.7	92.2	62.9	52.3
^{13}C-1,2,3,4,6,7,8-HpCDF	105	81.7	87.2	147	89.6	90.3	95.5	66.9	56.6
^{13}C-OCDF	79.3	80.8	88.6	127	89.3	90.1	98.9	67.4	56.2
Surrogate Standard % Recoveries: QA objective 70-130%									
^{37}Cl-2,3,7,8-TCDD	Note 1	98.8	99.1	75.7	97.9	102	97.9	100	103
^{13}C-1,2,3,4,7,8-HxCDD	Note 1	101	100	73.4	99.7	106	99.4	102	102
^{13}C-2,3,4,7,8-PeCDF	Note 1	98.2	96.7	75.0	97.0	100	98.9	102	103
^{13}C-1,2,3,4,7,8-HxCDF	Note 1	102	98.9	75.8	98.7	104	99.4	104	106
^{13}C-1,2,3,4,7,8,9-HpCDF	Note 1	98.0	97.7	70.3	98.1	103	97.7	99	104
Independent Laboratory Check Spike, %: QA objective 40-130%									
^{13}C-1,2,3,7,8,9-HxCDF	107	79.9	87.8	112	90.3	87.3	91.8	65.8	51.7

Recoveries outside of the QA objectives are highlighted; see Section 5.2 for further explanation.
Note 1: This lab method blank was prepared with sand in lieu of XAD-2 resin in order to save the resin for Runs 2-6.

Table 5-5. BCS_3 Surrogate Recoveries

Analyte	Run 1 Retest		Runs 2-6	
	BCS3A	BCS3B	BCS3A	BCS3B
Extraction Standard, ES, %: QA objective 80-120%				
^{13}C-2,3,7,8-TCDD	100	96.5	108	109
^{13}C-1,2,3,7,8-PeCDD	108	109	108	107
^{13}C-1,2,3,6,7,8-HxCDD	96.8	96	102	107
^{13}C-1,2,3,4,6,7,8-HpCDD	101	104	108	106
^{13}C-OCDD	93.4	101	109	107
^{13}C-2,3,7,8-TCDF	102	103	109	110
^{13}C-1,2,3,7,8-PeCDF	105	108	106	106
^{13}C-1,2,3,6,7,8-HxCDF	110	107	102	100
^{13}C-1,2,3,4,6,7,8-HpCDF	109	111	107	102
^{13}C-OCDF	106	112	103	106
Surrogate Spike, SS, %: QA objective 80-120%				
^{37}Cl-2,3,7,8-TCDD	96.6	97.2	86.6	88
^{13}C-1,2,3,4,7,8-HxCDD	90.3	92	92.6	87.2
^{13}C-2,3,4,7,8-PeCDF	101	100	92.3	92.8
^{13}C-1,2,3,4,7,8-HxCDF	90.1	92.8	89.8	87.2
^{13}C-1,2,3,4,7,8,9-HpCDF	94.7	93.1	84.9	87.6
Alternate Standard, AS, %: QA objective 80-120%				
^{13}C-1,2,3,7,8,9-HxCDF	90.4	91	94.7	92.6

Table 5-6. Method 8290 Internal Standard Recoveries

Analyte	Method blank	Mill Run 1	Mill Run 2	Mill Run 3	Dryer Run 4	Dryer Run 5	Dryer Run 6
Clay Feed							
Dioxins							
^{13}C-TCDD	90.6	92.3	90.8	92.2	97.2	101	77.4
^{13}C-PeCDD	86.2	91.5	87.5	88.4	93.5	97.1	76.8
^{13}C-HxCDD	90.5	84.6	90.6	86.5	88.9	92.3	73.6
^{13}C-HxCDD	89.1	85.8	86.9	84.4	87.3	91.5	72.9
^{13}C-HxCDD	91.4	83.3	89.9	83.9	90.4	97	73
^{13}C-HpCDD	90.4	82.8	94.5	86.6	93.7	97.1	79.2
^{13}C-OCDD	85	74.2	105	98.4	136	145	107
Furans							
^{13}C-TCDF	98.1	92.9	88.1	92.7	96.5	98.6	77.4
^{13}C-PeCDF	86.8	90	85.3	90	97.5	97.7	76.5
^{13}C-PeCDF	87.1	92.4	87.6	89.3	96.5	101	77.8
^{13}C-HxCDF	90.5	95.8	98	89.6	90.4	93.3	76.5
^{13}C-HxCDF	89	94.7	98.5	91.9	94.8	94.1	75.9
^{13}C-HxCDF	91.7	91.1	97.2	89.3	92.9	97.2	76.4
^{13}C-HxCDF	90.2	92	91.2	83.3	91.4	92.8	73.2
^{13}C-HpCDF	89.6	80.2	86.4	82.1	84.4	85.8	70
^{13}C-HpCDF	90.6	85.8	87.2	79.5	87	85.6	68
^{13}C-OCDF	84.4	86.2	90.7	83.9	91.4	95.8	75.5
Clay Product							
Dioxins							
^{13}C-TCDD	90.6	87.5	89.8	92.6	93.3	102	89.7
^{13}C-PeCDD	86.2	86.6	84.8	87.9	95.8	97.1	89.2
^{13}C-HxCDD	90.5	82.5	87.7	85.2	94.9	98.1	81.3
^{13}C-HxCDD	89.1	80.5	89.6	83.5	95.2	98.1	80.2
^{13}C-HxCDD	91.4	81.6	87.2	83.3	97.3	94.3	79.7
^{13}C-HpCDD	90.4	76.5	90.4	87.1	105	80.7	76
^{13}C-OCDD	85	72.7	97.6	100	157	82.2	84.3
Furans							
^{13}C-TCDF	98.1	91.2	91	91	97.4	99.7	97.2
^{13}C-PeCDF	86.8	85.4	86.9	87.4	95.2	96.8	90.1
^{13}C-PeCDF	87.1	86.8	86.3	87.6	97.3	98.9	88.6
^{13}C-HxCDF	90.5	90	97.7	86.7	101	107	92.1
^{13}C-HxCDF	89	90.1	103	86.9	102	108	92.7
^{13}C-HxCDF	91.7	87.7	91.8	86.4	99.3	109	91.4
^{13}C-HxCDF	90.2	89.7	89.3	85.3	97.9	106	89.1
^{13}C-HpCDF	89.6	78.2	82.5	81.6	92.4	91.7	82.9
^{13}C-HpCDF	90.6	80.9	85.5	77.3	96.6	95.7	82.6
^{13}C-OCDF	84.4	81.5	87.1	81.9	101	94	87

Recoveries outside of the QA objectives (40% to 135%) are highlighted; see Section 5.2 for further explanation.

Appendix A

Sample Custody Records

Sample Log-In Checklist

ALTA ANALYTICAL PERSPECTIVES

	Yes	No
1. Date Samples Arrived: 8-14-03 Initials: BP DT		
2. Time / Date logged in: 10:00 8-14-03 Refrigerator: F-6 Initials: BT		
3. Samples Arrived By: (circle one) Airborne Express (Federal Express) UPS Emery Freezer Truck Company Courier DHL Other		
4. Shipping Preservation: (circle) (Ice) / (Blue Ice) / Dry Ice / None Temp °C 17, 16°		
5. Shipping Documentation Present? (circle one) Shipping Label (Airbill) Tracking Number 8214 3600 5942 8214 3600 5953	✓	
6. Shipping Container(s) Intact? If no, describe condition below.	✓	
7. Container Custody Seals Present and Intact? If not intact, describe condition below.		✓
8. Sample Custody Seals Present and Intact? If not intact, describe condition below. No. of Seals _____ or Seal No.		✓
9. Sample Container Intact? If no, indicate sample condition below.	✓	
10. Chain of Custody (COC) or other Sample Documentation Present?	✓	
11. COC/Documentation Acceptable? If no, complete COC Anomaly Form.		✓
12. Shipping Container: (circle) (ALTA) ANALYTICAL PERSPECTIVES Client Return or (Retain) or Dispose		
13. Container and/or Bottles Requested?		✓
14. Sample Control Check In/Out Log Completed?	✓	
15. Drinking Water Sample? If yes, Acceptable Preservation? (circle) Y or N		✓
16. Imported Soil? If yes, apply appropriate label.		✓

Client Project: _____

AAP Project No.: P3265

CHAIN OF CUSTODY ANOMALY

Upon receipt of your samples, we found the following items omitted from the chain-of-custody (COC). Check as appropriate.

- Sampler: ☐
- Relinquished by: ☐
- Date: Time: ☐
- Sample ID: ☐
- ALL Sample Date: S ☒
- Sample Description: ☐
- Analysis(es) Requested: ☐
- Turnaround Time Requested: ☒
- Containers Qty: ☐
- Type: ☐
- Matrix Type: ☐
- Preservative: ☐
- Drinking Water Requirement: ☐

Other Comments:

_____

_____

Please note these omissions for future reference.

P3265

☒ CHAIN OF CUSTODY RECORD
☐ SAMPLE TRACEABILITY RECORD

Container (Cooler) No. XAD SC 2

Page 1 of 1

Transfer No.

Checked by (Initials)/Date

Lock or Seal Intact (Yes) or No)/Time

Field Sample Custodian:
A. Sanders

Storage Requirements:
☒ Ice water, ≤ 4°C
☐ Dry ice
☐ Room Temp., ≤ 26°C
☐ Other: _____

105	2				
DA	FX/DA				
Yes	105				
1230	1700 ✓				

* 110249.2.001.04 1009
M23 XAD CARTRIDGE # P3166 007
Emission Sample - Mill
Remarks:

✓ ✓
Remarks:

110249.2.001.04 1007
M23 FILTER
Emission Sample - Mill
For disposal call:Hosenfeld
MIDWEST RESEARCH INSTITUTE
Remarks:

Remarks:

Remarks:

Remarks:

Remarks:

Remarks:

Remarks:

as per Dave Hockey

Remarks:

* Friday → give verbal TEQ + Totals to John. H's cell; leave on voice mail if he doesn't answer. 14AUG03 *

Remarks: Using XAD ID AS SAMPLE ID DT
Missing dates on both samples BT

Sample Transfers:

Relinquished By:	Received By:	Date	Time	No.	Reason for Transfer:
A Sanders	D. Albert	8/13/03	12:20	1	Transfer for shipping
D Albert	FEDEX	8/13/03	~17:00	2	Ship to Laboratory
	Brian Bodnar	8-14-03	10:00	3	
				4	

93-4 SEV surm wksht 020293

43265 12

☒ CHAIN OF CUSTODY RECORD
☐ SAMPLE TRACEABILITY RECORD

Container (Cooler) No. N/A

Page 1 of 1 Transfer No.

Checked by (Initials)/Date

Lock or Seal Intact (Yes or No)/Time

Field Sample Custodian:
A. Sanders

Storage Requirements:
☒ ~~Ice water, ≤ 4°C~~ ~~ex EA 8/13~~
☐ Dry ice
☐ Room Temp., ≤ 26°C
☒ Other: BLUE ICE

	2				
EA	EA/DA				
905	905				
123 ✓	1700 ✓				

110249.2.001.04 1006
M23 ~~ACETONE~~ RINSES
Emission Sample - Mill
Remarks:

110249.2.001.04 1010
M23 TOLUENE QA RINSE
Emission Sample - Mill
For disposal call:Hosenfeld
MIDWEST RESEARCH INSTITUTE
Remarks:

Remarks:

Remarks:

Remarks:

Remarks:

Remarks:

Remarks:

Remarks:

Remarks:

Remarks:

Remarks:

Remarks:
* missing dates on both samples - JS

Sample Transfers:

Relinquished By:	Received By:	Date	Time	No.	Reason for Transfer:
A. Sanders	A. Albert	8/13/03	12:20	1	Transfer for shipping
A. Albert	FEDEX	8/13/03	~17:00	2	Ship to Lab
	Ben Bodner	8-14-03	10:00	3	
				4	

93-4 SEV surm wksht 020293

Alta Analytical Perspectives - Sample Receiving Picture

Project ID: P3265

File: V:\Pictures_Samples\P3265-2.JPG

Created: 14 August 2003 10:42 am

Sample Log-In Checklist

#	Item	Yes	No
1.	Date Samples Arrived: 8-22-03 Initials: Bria Ponder BO		
2.	Time / Date logged in: 10:45 8-22-03 Refrigerator: F-6 Initials: BO		
3.	Samples Arrived By: (circle one) Airborne Express **(Federal Express)** UPS Emery Freezer Truck Company Courier DHL Other		
4.	Shipping Preservation: (circle) Ice **(Blue Ice)** Dry Ice / None Temp °C 8, 21, 23, 19, 10, 11, 11		
5.	Shipping Documentation Present? (circle one) Shipping Label 8214 3600 5806; Airbill 8214 3600 5791; Tracking Number 8214 3600 5817, 8214 3600 5770 → (4 coolers)	✓	
6.	Shipping Container(s) Intact? If no, describe condition below.	✓	
7.	Container Custody Seals Present and Intact? If not intact, describe condition below.		✓
8.	Sample Custody Seals Present and Intact? If not intact, describe condition below. No. of Seals ______ or Seal No.		✓
9.	Sample Container Intact? If no, indicate sample condition below.	✓	
10.	Chain of Custody (COC) or other Sample Documentation Present?	✓	
11.	COC/Documentation Acceptable? If no, complete COC Anomaly Form.		✓
12.	Shipping Container: (circle) **(ALTA ANALYTICAL PERSPECTIVES)** Client Return or **(Retain)** or Dispose		
13.	Container and/or Bottles Requested?		✓
14.	Sample Control Check In/Out Log Completed?	✓	
15.	Drinking Water Sample? If yes, Acceptable Preservation? (circle) Y or N		✓
16.	Imported Soil? If yes, apply appropriate label.		✓

ALTA ANALYTICAL PERSPECTIVES

Client Project Name: 110249, 2.001.04

AAP Project No.: P3290

CHAIN OF CUSTODY ANOMALY

Upon receipt of your samples, we found the following items omitted from the chain-of-custody (COC). Check as appropriate.

- Sampler: ☐
- Relinquished by: ☐
- Date: Time: ☐
- Sample ID: ☐
- ALL Sample Dates: ☒
- Sample Description: ☐
- *Analysis(es) Requested: ☐
- *Turnaround Time Requested: ☒
- Containers Qty: ☐
- Type: ☐
- Matrix Type: ☐
- Preservative: ☐
- Drinking Water Requirement: ☐

Other Comments:

*Standard 21 day as per John Hausfeld
BO 22AUG03

Please note these omissions for future reference.

Sample Log-In Checklist

	Yes	No
1. Date Samples Arrived: 8-22-03 Initials: [signature]		
2. Time / Date logged in: 10:45 8-22-03 Refrigerator: F-6 Initials: [signature]		
3. Samples Arrived By: (circle one) Airborne Express (Federal Express) UPS Emery Freezer Truck Company Courier DHL Other		
4. Shipping Preservation: (circle) (Ice) (Blue Ice) Dry Ice / None Temp °C 8°C 23° 23° 19° 26° 26° 26		
5. Shipping Documentation Present? (circle one) Shipping Label 8214 3600 5806 8214 3600 5791 (Airbill) Tracking Number 8214 3600 5817 8214 3600 5790 (4 coolers)	✓	
6. Shipping Container(s) Intact? If no, describe condition below.	✓	
7. Container Custody Seals Present and Intact? If not intact, describe condition below.		✓
8. Sample Custody Seals Present and Intact? If not intact, describe condition below. No. of Seals _____ or Seal No.		✓
9. Sample Container Intact? If no, indicate sample condition below.	✓	
10. Chain of Custody (COC) or other Sample Documentation Present?	✓	
11. COC/Documentation Acceptable? If no, complete COC Anomaly Form.		✓
12. Shipping Container: (circle) (ALTA ANALYTICAL PERSPECTIVES) Client Return or (Retain) or Dispose		
13. Container and/or Bottles Requested?		✓
14. Sample Control Check In/Out Log Completed?	✓	
15. Drinking Water Sample? If yes, Acceptable Preservation? (circle) Y or N		✓
16. Imported Soil? If yes, apply appropriate label.		✓

ALTA ANALYTICAL PERSPECTIVES

Client Project: ID#40249.1.003
Same as P3014 – as per John H. – 8/22/03

AAP Project No.: P3289

CHAIN OF CUSTODY ANOMALY

Upon receipt of your samples, we found the following items omitted from the chain-of-custody (COC). Check as appropriate.

- Sampler: ☐
- Relinquished by: ☐
- Date: Time: ☐
- Sample ID: ☐
- Sample Dates: ☒ ALL – on samples
- Sample Description: ☐
- Analysis(es) Requested: ☐
- Turnaround Time Requested: ☐
- Containers Qty: ☐
- Type: ☐
- Matrix Type: ☐
- Preservative: ☐
- Drinking Water Requirement: ☐

Other Comments:

_____

_____

Please note these omissions for future reference.

P3290 1/3

SAMPLE CONDITION AT RECEIVING LABORATORY

MRI Project No. 110249.2.001.04

Sample Type: Filters, XAD cartridges, train rinse samples, and field reagent blank samples from emissions testing using Method 23 sampling trains.

Target Analytes: PCDD/PCDF by 40 *CFR* 60, Appendix A, Method 23 according to project test protocol.

Blank Train

Field Sample Condition Information Documented By A Sanders Date: 8/21/03

Sample No.	Field Weight (g), or Condition	Lab Weight (g), or Condition	Comments	Received and Checked By
1011	492.2	N/A	Sample Date: 20AUG03 as per John H. -20AUG03	
1012	N/A			
1013	958.8			
1014	intact			
1015	intact			
1016				
1017				
1018				
1019				

The purpose of this form is to document the condition and to verify the integrity of samples received by the analytical laboratory. The Field Laboratory Leader completes the first two columns with sample numbers and final gross field sample weights of liquid samples or the condition of other samples as applicable. The analytical laboratory sample custodian, the analytical coordinator, the analyst, or a designee observes all samples received, reweighs liquid samples that do not have contents level marks or that are suspect, notes the condition of other samples, and documents all observations on this form.

P3290 3/3

SAMPLE CONDITION AT RECEIVING LABORATORY

MRI Project No. 110249.2.001.04

Sample Type: Filters, XAD cartridges, train rinse samples, and field reagent blank samples from emissions testing using Method 23 sampling trains.

Target Analytes: PCDD/PCDF by 40 *CFR* 60, Appendix A, Method 23 according to project test protocol.

Field Sample Condition Information Documented By A. Sanders Date: 8/15/03

Sample No.	Field Weight (g), or Condition	Lab Weight (g), or Condition	Comments	Received and Checked By
~~1001~~ No data gjs				
1002			as per John H. —to 22AUG03	
1003				
1004				
1005				
1006	691.0		*Sample Dates:	
1007	intact		*DID NOT	
1008	N/A	N/A	RECIEVE	
1009	intact		WITH THIS	
1010	959.7		PROJECT...~~Fast~~ TAT	
~~2001~~ No data gjs			P3265. —to 22AUG03	
2002				
2003				
2004				
2005				
2006 **	gjs ~~547.9~~ 245.5			
2007	intact		*14AUG03	
2008	N/A	N/A		
2009	intact			
2010 **	gjs ~~808.9~~ 578.9			
~~3001~~ No data gjs				
3002				
3003				
3004				
3005				
3006 (*)(*)	gjs ~~740.0~~ 513.5		*15AUG03	
3007	intact			
3008	N/A	N/A		
3009	357.7/intact			
3010	904.3			
~~No data gjs~~				

The purpose of this form is to document the condition and to verify the integrity of samples received by the analytical laboratory. The Field Laboratory Leader completes the first two columns with sample numbers and final gross field sample weights of liquid samples or the condition of other samples as applicable. The analytical laboratory sample custodian, the analytical coordinator, the analyst, or a designee observes all samples received, reweighs liquid samples that do not have contents level marks or that are suspect, notes the condition of other samples, and documents all observations on this form.

(*)(*) Transferred to smaller sample bottle

P3290 3/3

SAMPLE CONDITION AT RECEIVING LABORATORY

MRI Project No. 110249.2.001.04

Sample Type: Filters, XAD cartridges, train rinse samples, and field reagent blank samples from emissions testing
using Method 23 sampling trains.

Target Analytes: PCDD/PCDF by 40 *CFR* 60, Appendix A, Method 23 according to project test protocol.

Field Sample Condition Information Documented By A Sanders Date: 8/21/03

Sample No.	Field Weight (g), or Condition	Lab Weight (g), or Condition	Comments	Received and Checked By
4001	614.5		#Sample Dates: as per John H. to	
4002	intact		#15AUG03 22AUG03	
4003	N/A			
4004	intact			
4005	1016.8			
4006	No data QJS			
4007				
4008				
4009				
4010				
5001	622.0			
5002	intact		#19AUG03	
5003	N/A			
5004	intact			
5005	1076.3			
5006				
5007	No data			
5008				
5009	QJS			
5010				
6001	615.2			
6002	intact		#20AUG03	
6003	N/A			
6004	intact			
6005	1105.5 1036.3 QJS			
6006	No data			
6007				
6008				
6009	QJS			
6010				

The purpose of this form is to document the condition and to verify the integrity of samples received by the analytical laboratory. The Field Laboratory Leader completes the first two columns with sample numbers and final gross field sample weights of liquid samples or the condition of other samples as applicable. The analytical laboratory sample custodian, the analytical coordinator, the analyst, or a designee observes all samples received, reweighs liquid samples that do not have contents level marks or that are suspect, notes the condition of other samples, and documents all observations on this form.

P3290 1/2

SAMPLE ID	1015-BLANK	2009	3009	4004
TRAP ID	P3166-005	P3166-001	P3166-004	P3166-012
DATE SAMPLED	20AUG03	14AUG03	15AUG03	18AUG03
FILTER	✓	✓	✓	✓
XAD	✓	✓	✓	✓
ACE/MC	✓	✓	✓	✓
TOLUENE	✓	✓	✓	✓
ACE/MC BACK HALF RINSE	X EE to 22AUG03			
TOLUENE BACK HALF RINSE				
IMPINGER CATCH				
NOTES & OBSERVATIONS				

T3290 2/2

SAMPLE ID	5004	6004		
TRAP ID	P3166-010	P3166-003		
DATE SAMPLED	19AUG03	20AUG03		
FILTER	✓	✓		
XAD	✓	✓		
ACE/MC	✓	✓		OK 22AUG03
TOLUENE	✓	✓		
ACE/MC BACK HALF RINSE				
TOLUENE BACK HALF RINSE				
IMPINGER CATCH				
NOTES & OBSERVATIONS				

P3290 1/4

☒ CHAIN OF CUSTODY RECORD
☐ SAMPLE TRACEABILITY RECORD

Container (Cooler) No. BL1

Page 1 of 1 Transfer No.

Checked by (Initials)/Date

Lock or Seal Intact (Yes or No)/Time

Field Sample Custodian: A. Sanders

Storage Requirements:
☒ Ice water, ≤ 4°C
☐ Dry ice
☐ Room Temp., ≤ 26°C
☒ Other: BLUE ICE

i					
DA 8/21					
(Y)					
✓					

110249, 2.001.04 1015
M23 XAD CARTRIDGE #P3166-005
~~Reagent~~ TRAIN Blank Samples

Remarks: EVIDENCE TAPE ON BAG SEALING CARTRIDGE OK

110249, 2.001.04 1011
M23 ACETONE Train - DEMETRIOS
~~Reagent~~ Blank Samples

V

Remarks: ~300 mL * REMOVED FROM COOLER & SHIPPED IN DANGEROUS GOODS BOX 8/21 DA

110249, 2.001.04 1013
M23 TOLUENE Train
~~Reagent~~ Blank Samples

✓

Remarks: ~530 mL * REMOVED FROM COOLER & SHIPPED IN DANGEROUS GOODS BOX 8/21 DA

110249, 2.001.04 1014
M23 FILTER
Reagent Blank Samples
For disposal call: Hosenfeld
MIDWEST RESEARCH INSTITUTE

V

Remarks:

Remarks:

No Further Data Obs 8/18/03

Remarks:

Remarks:

Remarks:

Remarks:

Remarks:

Remarks:

Sample Transfers: * POR DATA REQS 08/21/03 DA

Relinquished By:	Received By:	Date	Time	No.	Reason for Transfer:
R Sanders	D. Allsworth	08/21/03	0807	(1)	SHIPPING TO LAB FOR ANALYSIS
D. Allsworth	FEDEX	08/21/03	~1700	(2)	SHIPPER
	Brian Pardue	8/20/03	10:45	3	
				4	

* Missing dates on all samples. BP

93-4 SEV sum wksht 020293

P3290 3/4

☒ CHAIN OF CUSTODY RECORD
☐ SAMPLE TRACEABILITY RECORD

Container (Cooler) No. XAD-1

Page 1 of 1

Transfer No.
Checked by (Initials)/Date
Lock or Seal Intact (Yes or No)/Time

Field Sample Custodian:
A. Sanders

Storage Requirements:
☒ Ice water, ≤ 4°C
☐ Dry ice
☐ Room Temp., ≤ 26°C
☒ Other: BLUE ICE

Transfer No.	Checked by (Initials)/Date	Lock or Seal Intact (Yes or No)/Time
1		
2 8/21		
(1)		
✓		

* 110249.2.001.04 2009
M23 XAD CARTRIDGE #P3166-001
Emission Sample - Mill

* 110249.2.001.04 3009
M23 XAD CARTRIDGE #P3166-004
Emission Sample - Mill

* 110249.2.001.04 4004
M23 XAD CARTRIDGE #P3166-012
Emission Sample - Dryer

* 110249.2.001.04 5004
M23 XAD CARTRIDGE #P3166-010
Emission Sample - Dryer

* 110249.2.001.04 6004
M23 XAD CARTRIDGE #P3166-003
Emission Sample - Dryer

For disposal call: Hosenfeld
MIDWEST RESEARCH INSTITUTE

Remarks:

No further data required
8/20/03

Sample Transfers:

Relinquished By:	Received By:	Date	Time	No.	Reason for Transfer:
A. Sanders	D. Albarty	8/21/03	0805	(1)	SHIPPING TO LAB FOR ANALYSIS
D. Albarty	FEDEX	8/21/03	~1700	(2)	SHIPPER
	[illegible]	8-22-03	10:45	3	
				4	

* Missing dates on all samples. BT

93-4 SEV sum wksht 020293

P3290 3/4

☒ CHAIN OF CUSTODY RECORD
☐ SAMPLE TRACEABILITY RECORD

Container (Cooler) No. Filters

Page 1 of 1

Field Sample Custodian: A. Sanders

Storage Requirements:
☒ Ice water, ≤ 4°C
☐ Dry ice
☐ Room Temp., ≤ 26°C
☒ Other: Blue ice

	Transfer No.					
	Checked by (Initials)/Date	DN 8/21				
	Lock or Seal Intact (Yes or No)/Time	(Y)				

*	110249.2.001.04 2007 M23 FILTER Emission Sample - Mill	✓				
	Remarks:					
*	110249.2.001.04 3007 M23 FILTER Emission Sample - Mill	✓				
	Remarks:					
*	110249.2.001.04 4002 M23 FILTER Emission Sample - Dryer	✓				
	Remarks:					
*	110249.2.001.04 5002 M23 FILTER Emission Sample - Dryer	✓				
	Remarks:					
*	110249.2.001.04 6002 M23 FILTER Emission Sample - Dryer	✓				
	Remarks:					
	For disposal call: Hosenfeld MIDWEST RESEARCH INSTITUTE					
	Remarks:					
	No further data QA 8/20/03					
	Remarks:					
	Remarks:					
	Remarks:					
	Remarks:					

Sample Transfers:

Relinquished By:	Received By:	Date	Time	No.	Reason for Transfer:
A. Sanders	D. Alberty	8/21/03	0800	1	SHIPPING TO LAB
D. Alberty	FEDEX	8/21/03	~1700	2	SHIPPER
	[illegible]	8-22-03	10145	3	
				4	

* Missing date on all samples JT

93-4 SEV surm wksht 020293

P3290 4/4

☒ CHAIN OF CUSTODY RECORD
☐ SAMPLE TRACEABILITY RECORD

Container (Cooler) No. Rinses *

Page 1 of ____ Transfer No.

Checked by (Initials)/Date

Lock or Seal Intact (Yes or No)/Time

Field Sample Custodian: A. Sanders

Storage Requirements:
☒ Ice water, ≤ 4°C
☐ Dry ice
☐ Room Temp., ≤ 26°C
☒ Other: Blue ice

Transfer No.	1					
Checked by (Initials)/Date	BA 8/21					
Lock or Seal Intact (Yes or No)/Time	(Y)					
	✓					

	Sample Description		Remarks
*	110249.2.001.04 2006 M23 ~~FRONT HALF~~ Acetone RINSES Emission Sample - Mill	✓	~95 mL NOTE - ALL SAMPLES WERE REMOVED 8/21 AND SHIPPED IN DANGEROUS GOODS BOXES BA
*	110249.2.001.04 2010 M23 TOLUENE QA RINSE Emission Sample - Mill	✓	~360 mL "
*	110249.2.001.04 3006 M23 ~~FRONT HALF~~ Acetone RINSES Emission Sample - Mill	✓	~310 mL "
*	110249.2.001.04 3010 M23 TOLUENE QA RINSE Emission Sample - Mill	✓	~470 mL "
*	110249.2.001.04 4001 M23 FRONT-~~HALF RINSES~~ Acetone Emission Sample - Dryer	✓	~450 mL "
*	110249.2.001.04 4005 M23 TOLUENE QA RINSE Emission Sample - Dryer	✓	~600 mL "
*	110249.2.001.04 5001 M23 ~~FRONT HALF~~ Acetone RINSES Emission Sample - Dryer	✓	~460 mL "
*	110249.2.001.04 5005 M23 TOLUENE QA RINSE Emission Sample - Dryer	✓	~670 mL "
*	110249.2.001.04 6001 M23 ~~FRONT HALF~~ Acetone RINSES Emission Sample - Dryer	✓	"
*	110249.2.001.04 6005 M23 TOLUENE QA RINSE Emission Sample - Dryer For disposal call: Hosenfeld MIDWEST RESEARCH INSTITUTE	✓	"
	No further data. gjs 8/26/03		

Sample Transfers: * BROKEN UP INTO 3 DANG. GOODS BOXES PER IATA REGS 8/21 BA

Relinquished By:	Received By:	Date	Time	No.	Reason for Transfer:
R Sanders	D. Albury	8/21/03	0811	(1)	SHIPPING TO LAB FOR ANALYSIS
D. Albury	FEDEX	8/21/03	~1700	(2)	SHIPPER
	Brian Tardiff	8-22-03	10145	3	
				4	

93-4 SEV sum wksht 020293

* Missing dates on all samples BA

☒ CHAIN OF CUSTODY RECORD
☐ SAMPLE TRACEABILITY RECORD

Container (Cooler) No. RGBL1

Page 1 of 1

Transfer No.

Checked by (Initials)/Date

Lock or Seal Intact (Yes or No)/Time

Field Sample Custodian: A. Sanders

Storage Requirements:
- ☐ Ice water, ≤ 4°C
- ☐ Dry ice
- ☒ Room Temp., ≤ 26°C
- ☐ Other: _____

Transfer No.	1	2				
Checked by (Initials)/Date						
Lock or Seal Intact (Yes or No)/Time						
110249.2.001.04 2011 M23 ACETONE Reagent Blank Samples	✓	✓				
Remarks:						
110249.2.001.04 2013 M23 TOLUENE Reagent Blank Samples	✓	✓				
Remarks:						
110249.2.001.04 2014 M23 FILTER Reagent Blank Samples	✓	✓				
Remarks:						
110249.2.001.04 2015 M23 XAD CARTRIDGE #P3166-008 Reagent Blank Samples	✓	✓				
Remarks:						
110249.2.001.04 2016 M23 MILLI-Q WATER Reagent Blank Samples	✓	✓				
Remarks:						
For disposal call: Hosenfeld MIDWEST RESEARCH INSTITUTE						
Remarks:						
No Further Data Required						
Remarks:						
Remarks:						
Remarks:						
Remarks:						

Sample Transfers:

Relinquished By:	Received By:	Date	Time	No.	Reason for Transfer:
A Sanders	D. Nye	8/21/03	0750	1	Transfer to MRI
D. Nye	A Sanders	8/25/03	10:00	2	Archive at MRI
				3	
				4	

93-4 SEV surm wksht 020293

P3289 1/2

☒ CHAIN OF CUSTODY RECORD
☐ SAMPLE TRACEABILITY RECORD

Container (Cooler) No. Alta 1

Page 1 of 2 (see on A) 8/24/03 Transfer No.

Checked by (Initials)/Date

Lock or Seal Intact (Yes or No)/Time

Field Sample Custodian: M. TURNOR

Storage Requirements:
☒ Ice water, ≤ 4°C
☐ Dry ice
☐ Room Temp., ≤ 26°C
☒ Other: BLUE ICE

	1					
	DT 8/21					
	Y					

(Sample Container Label)	Remarks:
1111	CLAY SAMPLES
1121	"
2111	"
2121	"
3111	"
3121	"
4211	"
4221	"
5211	"
5221	"

Sample Transfers:

Relinquished By:	Received By:	Date	Time	No.	Reason for Transfer:
M. Turnor	D. Albert	8/21/03	0906	①	SHIPPING TO LAB FOR ANALYSIS
D. Albert	FEDEX	8/21/03	~1700	②	SHIPPOL
		8-22-03	10:45	3	
				4	

M8290

93-4 SEV surm wksht 020293

Same P.O. as P3014 (nine samples) as per John th — 22AUG03

P3289 2/2

☒ CHAIN OF CUSTODY RECORD
☐ SAMPLE TRACEABILITY RECORD

Container (Cooler) No. _____

Page 2 of 2 Transfer No.

Checked by (Initials)/Date

Lock or Seal Intact (Yes or No)/Time

Field Sample Custodian: M. TURNER

Storage Requirements:
☑ Ice water, ≤ 4°C
☐ Dry ice
☐ Room Temp., ≤ 26°C
☒ Other: BLUE ICE

(Sample Container Label)	Transfer No.						
	1						
	DA 8/21						
	Y						
6211	Remarks: CLAY SAMPLES						
6221	Remarks: "						
	Remarks:						
	Remarks:						
	Remarks:						
	Remarks:						
	Remarks:						
	Remarks:						
	Remarks:						
	Remarks:						

Sample Transfers:

Relinquished By:	Received By:	Date	Time	No.	Reason for Transfer:
M. Turner	D. Alberts	8/21/03	0906	①	SHIPPING TO CAS FOR ANALYSIS
D. Alberts	FEDEX	8/21/03	N1700	②	SHIPPER
	Bob Podmore	8-22-03	10:45	3	
				4	

93-4 SEV surm wksht 020293

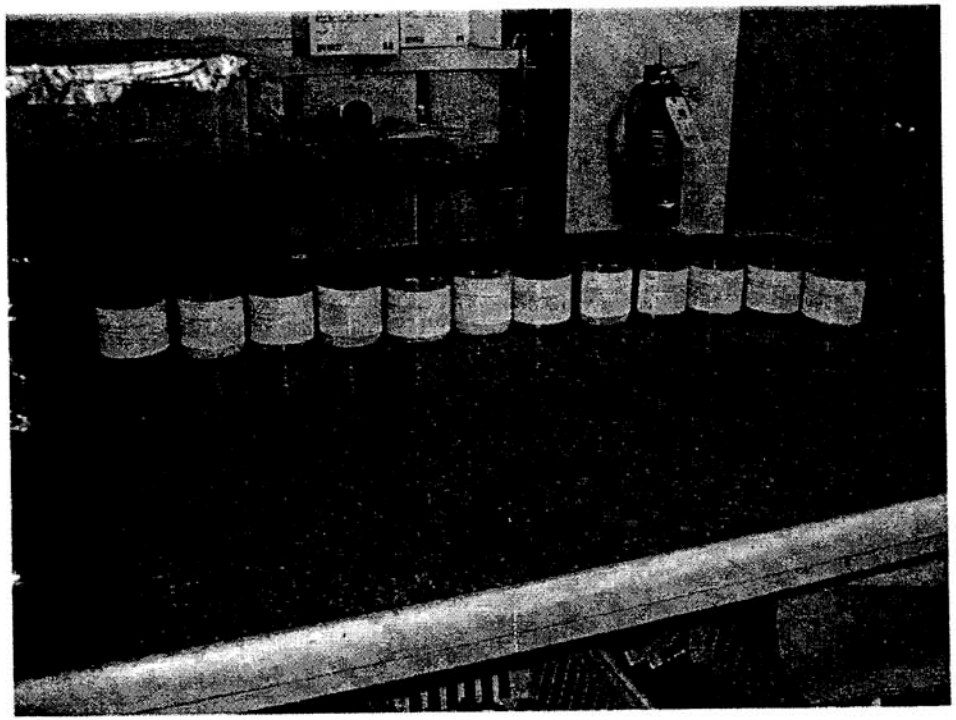
Alta Analytical Perspectives - Sample Receiving Picture

Project ID: P3290

File: V:\Pictures_Samples\P3290-1.JPG

Created: 22 August 2003 3:18 pm

Alta Analytical Perspectives - Sample Receiving Picture



Project ID: P3289

File: V:\Pictures_Samples\P3289-1.JPG

Created: 22 August 2003 2:19 pm

Appendix B

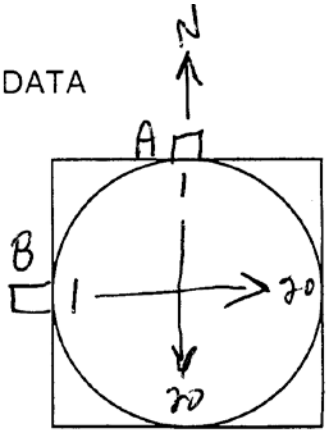
Sampling Data and Field Analytical Records

Appendix B-1

Emissions Sample Collection

VELOCITY TRAVERSE DATA

Project No. 110249.2.001.05
Run No. Pre 1 Date 5-13-03
Plant [redacted]
Sampling Location Boiler/Lay Dryer [redacted]
Operator(s) Rosenfeld / Cuffe
Barometric Pressure, in. Hg 29.88
Site to Barometer Elevation 30 ft.
Corrected Barometric Pressure
Pitot No. Pitot Cp
T/C No. Temp. Meter No. 4 3917
Stack Area, sq.ft.
Static Pressure, in. H_2O
Assumed Moisture, %
Assumed $\%CO_2$ Assumed $\%O_2$
Initial Pitot Leak Check Pass
Final Pitot Leak Check pass
Comments:



Traverse Point Layout

Start Time 1115 End Time 1200

TRAVERSE POINT NUMBER	VELOCITY HEAD, Δp in. H_2O	STACK TEMP. °F	ROTATION ANGLE α	TP
A 1	~~1.75~~	~~128.8~~ 124.5	~~+8~~	
2	1.40	130.7	+2	
3	1.60	131.6	+5	
4	1.25	131.8	+1	
5	1.25	131.9	+1	
6	1.80	131.6	0	
7	1.90	131.2	-2	
8	1.80	131.2	-4	
9	1.90	132.1	-4	1.2
10	1.90	131.8	-4	
11	1.90	131.2	-4	
12	2.0	131.2	-7	
13	1.95	131.7	-6	
14	1.95	131.4	-6	
15	1.95	131.6	-6	
16	2.0	131.7	-5	
17	2.0	131.4	-7	
18	2.0	131.2	-5	
19	2.0	131.1	-7	
20	1.90	131.1	-5	

TRAVERSE POINT NUMBER	VELOCITY HEAD, Δp in. H_2O	STACK TEMP. °F	ROTATION ANGLE α	
B-1	0.76	129.4	-5	
B 2	0.99	130.4	+3	
3	1.5	131.0	+5	
4	1.6	131.1	+7	
5	1.7	131.0	+6	
6	1.7	130.9	+5	
7	1.8	131.0	0	
8	1.8	131.1	0	
9	1.8	131.8	0	
10	1.8	131.9	+1	
11	1.85	132.2	-2	
12	1.85	132.1	-2	
13	1.9	132.0	-1	
14	1.95	131.7	-4	
15	1.95	131.8	-2	
16	1.95	132.1	-2	
17	2.0	132.5	-2	
18	2.0	132.7	-4	
19	2.0	133.1	-4	
20	2.0	133.2	-2	

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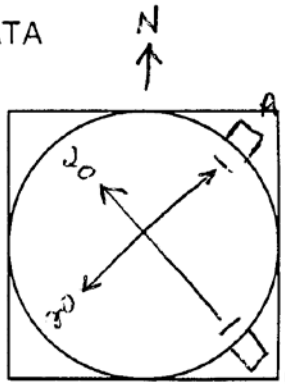
VELOCITY TRAVERSE DATA

Project No. 110249
Run No. Pre 1 Date 8-12-03
Plant [redacted]
Sampling Location Mill Stack Outlet
Operator(s) Neal / Griffin
Barometric Pressure, in. Hg
Site to Barometer Elevation 20 ft.
Corrected Barometric Pressure
Pitot No. Pitot Cp
T/C No. Temp. Meter No. N7
Stack Area, sq.ft.
Static Pressure, in. H_2O
Assumed Moisture, %
Assumed $\%CO_2$ Assumed $\%O_2$
Initial Pitot Leak Check Pass
Final Pitot Leak Check Pass
Comments:



Traverse Point Layout

TP .37 ~~Static~~ @ B 10

Start Time 0645 End Time 0720

TRAVERSE POINT NUMBER	VELOCITY HEAD, Δp in. H_2O	STACK TEMP. °F	ROTATION ANGLE α	
A-1	.52	138	0	
2	.53	139	2	
3	.63	141	3	
4	.66	141	8	
5	.74	142	11	
6	.72	142	5	
7	.60	141	2	
8	.62	141	2	
9	.51	140	2	
10	.50	142	4	
11	.72	142	14	
12	.91	142	16	
13	1.1	142	16	
14	1.2	141	20	
15	1.4	141	14	
16	1.4	142	16	
17	1.3	142	18	

TRAVERSE POINT NUMBER	VELOCITY HEAD, Δp in. H_2O	STACK TEMP. °F	ROTATION ANGLE α	
B-1	.62	138	5	
B-2	.57	141	0	
B-3	.38	140	0	
B-4	.60	140	1	
B-5	.60	141	3	
B-6	.62	141	5	
B-7	.70	140	6	
B-8	.60	140	4	
B-9	.57	142	3	
B-10	.57	141	6	
B-11	.75	141	18	
B-12	.92	142	2	
B-13	.98	142	6	
B-14	1.1	142	8	
B-15	1.3	140	2	
B-16	1.3	141	4	
B-17	1.3	141	9	

BH 9/11/03

93-3 SEV sur frm 020393

Emission Measurements Data Summary
Measurement Equipment Information and Leak Check Data

PCDD/PCDF

Project no. 110249.2.001.05
Client EPA/ESD/RTI
Facility CBI
Facility location [redacted]
Source tested Mill [redacted]
Emission measurement location Stack Outlet
Test run no. 1-Retest
Sampling train no. M23-1
Operator(s) Dave Griffin

Test run date(s) August 13, 2003
Run start time 05:30 AM
Run stop time 10:48 AM

8-26-03
Signature/Date

Measurement Equipment Identification and Specifications

Metering console no.	N7	
Dry gas meter (DGM) calibration factor (Y)	1.002	
Orifice meter factor (ΔH@)	1.794 in. H_2O	
DGM calibration factor (Y_{qa}) from sampling data	1.029	
Comparison of Y_{qa} to Y (must be within ±5% of Y)	within ±5%	
Temperature controller* no.	N/A	
Temperature meter* no.	N/A	
Additional thermocouple no.	N/A	
Sample transfer line no.	N/A	
Umbilical cable no(s).	N-16-2	
Sample box no.	10288	
Impinger outlet connector no.	UH-1	
Filter no(s).	23-1RE	
Probe no.	3-2	
Effective probe length	3.0 feet	0.91 m
Probe liner	Heated glass tubing	
Gas stream temperature thermocouple no.	36-2	
Pitot tube no.	M-126	
Pitot tube coefficient	0.840	
Sampling nozzle no.	N7	
Sampling nozzle type	Nichol button-hook	
Sampling nozzle inside diameter at inlet tip	0.249 inches	6.32 mm
Barometer no.	X-4029	
Altitude difference from emission measurement location to barometer or reference point at the test site	-29 feet	-8.8 m
Altitude difference from metering console location to barometer or reference point at the test site	-20 feet	-6.1 m

* Not part of console; or used with peripheral equipment.

Sampling Train Leak Check Data

Gas stream pressure measurement system - Leak check from pitot tube tip

	Time	Result
Initial	05:20 AM	Pass
Final	10:55 AM	PASS

Sampling system - Leak check from nozzle

	Time	Pump Vacuum, in. Hg	Leak Rate, dcfm
Initial	05:30 AM	15.0	0.003
Final	07:35 AM	20.0	0.001
Initial	08:00 AM	15.0	0.002
Final	09:40 AM	21.0	0.001
Initial	09:50 AM	15.0	0.003
Final	10:00 AM	21.0	0.001
Initial	10:05 AM	15.0	0.002
Final	10:55 AM	21.0	0.001

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Emission Measurements Data Summary
Source and Sampling Data
PCDD/PCDF

Project no.	110249.2.001.05		
Client	EPA/ESD/RTI		
Facility	CBI		
Facility location	[redacted]		
Source tested	Mill [redacted]		
Emission measurement location	Stack Outlet		
Test run no.	1-Retest	**Test run date(s)**	August 13, 2003
Sampling train no.	M23-1	**Run start time**	05:30 AM
Total sampling time	240.00 minutes	**Run stop time**	10:48 AM

Gas Stream Measurement Results

Volumetric flow rate at dry standard conditions	17,574	dscfm	497.65	dscm/min.
Volumetric flow rate at dry standard conditions	1,054,451	dscf/hr	29,858.7	dscm/hr
Volumetric flow rate at standard conditions	19,856	scfm	562.26	scm/min.
Standard Conditions are	**68**	**°F and**	**760**	**mm Hg**
Volumetric flow rate at actual conditions	22,957	acfm	650.06	acm/min.
Volumetric flow rate at actual conditions	1,377,390	acf/hr	39,003.4	acm/hr
Average velocity	54.13	ft./sec.	16.498	m/sec.
Average velocity	3,248	ft./min.	989.9	m/min.
Square root of velocity head	0.9104	$(\text{in. } H_2O)^{0.5}$	4.588	$(\text{mm } H_2O)^{0.5}$
Velocity head	0.829	in. H_2O	21.05	mm H_2O
Absolute temperature	603.1	°R	335.1	K
Temperature	143.4	°F	61.9	°C
Absolute pressure	29.58	in. Hg	751.3	mm Hg
Static pressure	0.00	in. H_2O	0.0	mm H_2O
Barometric pressure at start of run	29.58	in. Hg	751.3	mm Hg
Barometric pressure at end of run	N/A	in. Hg	N/A	mm Hg
Moisture (as water vapor) content	11.49	% by volume	11.49	% by volume
Wet gas molecular weight	29.74	lb/lb-mole	29.74	g/g-mole
Dry gas molecular weight	31.27	lb/lb-mole	31.27	g/g-mole
Carbon dioxide concentration, dry-basis	19.5	% by volume	19.5	% by volume
Oxygen concentration, dry-basis	0.5	% by volume	0.5	% by volume
Carbon monoxide concentration, dry-basis		% by volume		% by volume

Gas Stream Cross-Sectional Area at Emission Measurement Location

Stack or duct type	Circular			
First diameter	36.000	inches	0.9144	m
Second diameter	36.000	inches	0.9144	m
Gas stream cross-sectional area	7.0686	ft.²	0.65669	m²

Gas Sampling Results

Gas sample volume, corrected, at standard conditions	209.840	dscf	5.9420	dscm
Gas sample volume as read on dry gas meter	221.453	ft.³	6.2709	m³
Volume correction for failed leak checks	0.000	ft.³	0.0000	m³
Gas sample volume corrected for leakage	221.453	ft.³	6.2709	m³
Absolute dry gas meter temperature	555.7	°R	308.7	K
Dry gas meter temperature	96.0	°F	35.6	°C
Absolute dry gas meter pressure	29.80	in. Hg	756.9	mm Hg
Orifice meter differential pressure (ΔH)	2.977	in. H_2O	75.63	mm H_2O
Barometric pressure at start of run	29.59	in. Hg	751.6	mm Hg
Barometric pressure at end of run	N/A	in. Hg	N/A	mm Hg
Condensate collected in sampling train	577.8	grams	577.8	grams
Isokinetic sampling variation	103.99	%		

Other Supporting Data

Barometric pressure at test site at start of run	29.61	in. Hg	752.1	mm Hg
Barometric pressure at test site at end of run	N/A	in. Hg	N/A	mm Hg
Cross-sectional area of sampling nozzle inlet	3.382E-04	ft.²	3.142E-05	m²
Pitot tube coefficient	0.840			

Dry gas meter calibration factor (Y)	1.002
Dry gas meter calibration factor (Y_{qa}) from sampling data	1.029
Comparison of Y_{qa} to Y (difference must be within ±5% of Y)	within ±5%
Orifice meter factor (ΔH@)	1.794 in. H_2O
Potential moisture (as water vapor) content based on condensate collected	11.49 % by volume
Potential moisture (as water vapor) content based on gas stream parameters	N/A % by volume

9/14/03

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Test Run Field Data Sheet - PCDD/PCDF

Project no. 110249.2.001.05 Emission measurement location: Stack Outlet
Test run no. 1-Retest Date(s): August 13, 2003 Train no. M23-1

Traverse Port-Point Number	Clock Time 24-hr	Cumulative Sampling Time, minutes	Dry Gas Meter Reading, (V_m), ft.³		Orifice Pressure Differential (ΔH), inches H_2O		Velocity Head, (Δp), inches H_2O	Gas Stream Temp., (t_s), °F	Dry Gas Meter Temperature (t_m), °F		Pump Vacuum, in. Hg	Impinger Outlet Temp., °F	Probe Outlet Temp., °F	Filter Holder Temp., °F	XAD Inlet Temp., °F	STL Outlet Temp., °F	Isokinetic Sampling Variation, percent
			Desired	Actual	Desired	Actual			Inlet	Outlet							
STRT	5:30:00	0.00		839.211													
A1	5:36:00	6.00	843.689	843.480	1.734	1.800	0.560	135	77	77	8.0	58	248	260	44		100.0
A2	5:42:00	12.00	848.099	848.000	1.676	1.800	0.540	136	80	78	11.0	53	252	259	42		107.6
A3	5:48:00	18.00	852.641	852.820	1.774	1.900	0.570	136	82	79	12.0	53	253	258	42		111.4
A4	5:54:00	24.00	857.401	857.600	1.938	2.100	0.620	136	86	81	12.0	55	248	257	42		105.4
A5	6:00:00	30.00	862.367	862.470	2.101	2.100	0.670	136	89	82	12.0	57	249	257	43		102.9
A6	6:06:00	36.00	867.351	867.450	2.108	2.200	0.670	136	91	84	12.0	54	251	257	43		104.8
A7	6:12:00	42.00	872.570	872.700	2.303	2.400	0.730	136	93	86	13.0	53	250	257	44		105.6
A8	6:18:00	48.00	877.543	877.850	2.087	2.300	0.660	137	95	87	13.0	53	248	256	44		108.7
A9	6:24:00	54.00	882.487	882.990	2.056	2.300	0.650	139	97	89	13.0	53	252	255	44		109.1
A10	6:30:00	60.00	887.212	888.050	1.875	2.100	0.590	138	98	90	12.0	52	248	257	43		112.3
A11	6:36:00	66.00	892.641	893.370	2.469	2.500	0.780	139	98	91	13.0	52	249	258	44		102.8
A12	6:42:00	72.00	898.310	898.950	2.686	2.700	0.850	141	100	92	14.0	52	248	257	44		103.3
A13	6:48:00	78.00	904.598	904.900	3.300	3.300	1.050	143	100	93	18.0	54	252	257	45		99.3
A14	6:54:00	84.00	911.322	911.260	3.763	3.600	1.200	144	101	94	19.0	57	251	257	46		99.3
A15	7:00:00	90.00	918.046	917.710	3.760	3.600	1.200	145	101	95	20.0	58	249	257	47		100.6
A16	7:06:00	96.00	924.770	924.200	3.758	3.700	1.200	146	101	96	20.0	56	252	256	48		101.3
A17	7:12:00	102.00	931.499	930.700	3.764	3.700	1.200	145	101	96	20.0	54	251	257	50		101.4
A18	7:18:00	108.00	938.228	937.200	3.761	3.700	1.200	146	101	97	20.0	54	251	257	52		101.4
A18	7:24:00	114.00	944.963	943.700	3.767	3.700	1.200	145	101	97	20.0	54	248	257	50		101.3
A18	7:30:00	120.00	951.693	950.200	3.761	3.700	1.200	146	101	97	20.0	54	250	257	49		101.4
	8:00:00	120.00		950.564													
B1	8:06:00	126.00	955.299	953.900	0.884	1.000	0.280	145	94	94	7.0	65	252	259	59		107.9
B2	8:12:00	132.00	959.539	957.970	1.510	1.700	0.480	145	94	94	10.0	43	251	261	50		100.7
B3	8:18:00	138.00	964.354	962.950	1.945	2.200	0.620	146	96	93	13.0	44	249	260	47		108.5
B4	8:24:00	144.00	969.501	968.210	2.205	2.500	0.700	146	100	95	15.0	50	253	258	46		107.4
B5	8:30:00	150.00	974.271	973.330	1.895	2.200	0.600	146	101	95	14.0	53	249	258	46		112.7
B6	8:36:00	156.00	978.968	978.460	1.835	2.200	0.580	146	102	96	14.0	55	252	257	46		114.6
B7	8:42:00	162.00	983.833	983.630	1.964	2.200	0.620	146	103	97	14.0	56	249	257	46		111.5
B8	8:48:00	168.00	988.887	988.800	2.121	2.300	0.670	146	103	97	14.0	55	252	257	47		107.3
B9	8:54:00	174.00	993.559	993.970	1.810	2.200	0.570	146	104	98	14.0	55	252	257	47		116.1
B10	9:00:00	180.00	998.702	999.220	2.188	2.300	0.690	147	105	99	14.0	55	248	257	47		107.1
B11	9:06:00	186.00	1,004.135	1,004.730	2.442	2.700	0.770	146	105	99	16.0	55	253	257	48		106.4
B12	9:12:00	192.00	1,010.008	1,010.700	2.851	3.100	0.900	146	105	100	18.0	52	252	257	48		106.7

Remarks: Note: Any DGM reading above that is flagged with an asterisk was not taken at the precise time. Operator(s): Dave Griffin

8-26-03
Signature/Date

9/11/03

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Test Run Field Data Sheet - PCDD/PCDF

Project no. 110249.2.001.05 Emission measurement location: Stack Outlet

Test run no. 1-Retest Date(s): August 13, 2003 Train no. M23-1

Traverse Port-Point Number	Clock Time 24-hr	Cumulative Sampling Time, minutes	Dry Gas Meter Reading, (V_m), ft.³		Orifice Pressure Differential (ΔH), inches H_2O		Velocity Head, (Δp), inches H_2O	Gas Stream Temp., (t_s), °F	Dry Gas Meter Temperature (t_m), °F		Pump Vacuum, in. Hg	Impinger Outlet Temp., °F	Probe Outlet Temp., °F	Filter Holder Temp., °F	XAD Inlet Temp., °F	STL Outlet Temp., °F	Isokinetic Sampling Variation, percent
			Desired	Actual	Desired	Actual			Inlet	Outlet							
B13	9:18:00	198.00	1,015.885	1,016.670	2.854	3.200	0.900	146	106	100	19.0	48	249	256	48		106.6
B14	9:24:00	204.00	1,022.384	1,022.900	3.480	3.400	1.100	146	106	101	21.0	47	248	257	49		100.6
B15	9:30:00	210.00	1,029.161	1,029.120	3.781	3.400	1.200	147	105	101	21.0	48	250	257	49		96.3
B16	9:36:00	216.00	1,035.943	1,035.293	3.787	3.400	1.200	146	105	101	21.0	48	250	256	50		95.5
	9:54:00	216.00		1,035.592													
	9:55:00	217.00	1,037.406	1,036.700	4.068	3.400	1.300	146	99	99	21.0	48	250	256	50		99.5
B17	10:25:00	217.00		1,037.247													
	10:30:00	222.00	1,043.787	1,042.530	4.068	3.800	1.300	146	99	99	21.0	53	251	258	66		95.0
B18	10:36:00	228.00	1,050.747	1,048.950	4.047	3.700	1.300	146	96	96	21.0	47	253	257	67		96.7
B18	10:42:00	234.00	1,057.163	1,055.420	3.438	3.700	1.100	146	97	96	21.0	59	249	257	64		105.8
B18	10:48:00	240.00	1,063.872	1,061.874	3.745	3.700	1.200	147	99	96	21.0	61	251	257	59		101.0

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9/11/03

Remarks: Note: Any DGM reading above that is flagged with an asterisk was not taken at the precise time. Operator(s): Dave Griffin

8-26-03
Signature/Date

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Emission Measurements Data Summary
Measurement Equipment Information and Leak Check Data

PCDD/PCDF

Project no. 110249.2.001.05
Client EPA/ESD/RTI
Facility CBI
Facility location [redacted]
Source tested Mill [redacted]
Emission measurement location Stack Outlet
Test run no. 2
Sampling train no. M23-2
Operator(s) Dave Griffin

Test run date(s) August 14, 2003
Run start time 05:50 AM
Run stop time 10:05 AM

8-26-03
Signature/Date

Measurement Equipment Identification and Specifications

Metering console no.	N7	
Dry gas meter (DGM) calibration factor (Y)	1.002	
Orifice meter factor (ΔH@)	1.794 in. H_2O	
DGM calibration factor (Y_{qa}) from sampling data	1.002	
Comparison of Y_{qa} to Y (must be within ±5% of Y)	within ±5%	
Temperature controller* no.	N/A	
Temperature meter* no.	N/A	
Additional thermocouple no.	N/A	
Sample transfer line no.	N/A	
Umbilical cable no(s).	N-16-2	
Sample box no.	012003	
Impinger outlet connector no.	UH-12	
Filter no(s).	23-2	
Probe no.	3-2	
Effective probe length	3.0 feet	0.91 m
Probe liner	Heated glass tubing	
Gas stream temperature thermocouple no.	36-2	
Pitot tube no.	M-126	
Pitot tube coefficient	0.840	
Sampling nozzle no.	N12	
Sampling nozzle type	Nichol button-hook	
Sampling nozzle inside diameter at inlet tip	0.187 inches	4.75 mm
Barometer no.	X-4029	
Altitude difference from emission measurement location to barometer or reference point at the test site	-29 feet	-8.8 m
Altitude difference from metering console location to barometer or reference point at the test site	-20 feet	-6.1 m

* Not part of console; or used with peripheral equipment.

Sampling Train Leak Check Data

Gas stream pressure measurement system - Leak check from pitot tube tip

	Time	Result
Initial	05:25 AM	Pass
Final	10:07 AM	PASS

Sampling system - Leak check from nozzle

	Time	Pump Vacuum, in. Hg	Leak Rate, dcfm
Initial	05:30 AM	15.0	0.001
Initial	07:53 AM	9.0	0.001
Initial	07:57 AM	15.0	0.001
Initial	10:08 AM	9.0	0.006

9/11/03

Emission Measurements Data Summary
Source and Sampling Data

PCDD/PCDF

Project no.	110249.2.001.05		
Client	EPA/ESD/RTI		
Facility	CBI		
Facility location	[redacted]		
Source tested	Mill[redacted]		
Emission measurement location	Stack Outlet		
Test run no.	2	**Test run date(s)**	August 14, 2003
Sampling train no.	M23-2	**Run start time**	05:50 AM
Total sampling time	240.00 minutes	**Run stop time**	10:05 AM

Gas Stream Measurement Results

Volumetric flow rate at dry standard conditions	17,620	dscfm	498.94	dscm/min.
Volumetric flow rate at dry standard conditions	1,057,189	dscf/hr	29,936.3	dscm/hr
Volumetric flow rate at standard conditions	19,900	scfm	563.52	scm/min.
Standard Conditions are	**68 °F**	**and**	**760 mm Hg**	
Volumetric flow rate at actual conditions	22,899	acfm	648.42	acm/min.
Volumetric flow rate at actual conditions	1,373,919	acf/hr	38,905.0	acm/hr
Average velocity	53.99	ft./sec.	16.457	m/sec.
Average velocity	3,239	ft./min.	987.4	m/min.
Square root of velocity head	0.9103	$(\text{in. } H_2O)^{0.5}$	4.588	$(\text{mm } H_2O)^{0.5}$
Velocity head	0.829	in. H_2O	21.05	mm H_2O
Absolute temperature	605.7	°R	336.5	K
Temperature	146.1	°F	63.4	°C
Absolute pressure	29.85	in. Hg	758.2	mm Hg
Static pressure	0.00	in. H_2O	0.0	mm H_2O
Barometric pressure at start of run	29.85	in. Hg	758.2	mm Hg
Barometric pressure at end of run	N/A	in. Hg	N/A	mm Hg
Moisture (as water vapor) content	11.46	% by volume	11.46	% by volume
Wet gas molecular weight	29.75	lb/lb-mole	29.75	g/g-mole
Dry gas molecular weight	31.27	lb/lb-mole	31.27	g/g-mole
Carbon dioxide concentration, dry-basis	19.5	% by volume	19.5	% by volume
Oxygen concentration, dry-basis	0.5	% by volume	0.5	% by volume
Carbon monoxide concentration, dry-basis		% by volume		% by volume

Gas Stream Cross-Sectional Area at Emission Measurement Location

Stack or duct type	Circular		
First diameter	36.000	inches	0.9144 m
Second diameter	36.000	inches	0.9144 m
Gas stream cross-sectional area	7.0686	ft.²	0.65669 m²

Gas Sampling Results

Gas sample volume, corrected, at standard conditions	119.788	dscf	3.3920	dscm
Gas sample volume as read on dry gas meter	125.574	ft.³	3.5559	m³
Volume correction for failed leak checks	0.000	ft.³	0.0000	m³
Gas sample volume corrected for leakage	125.574	ft.³	3.5559	m³
Absolute dry gas meter temperature	554.5	°R	308.0	K
Dry gas meter temperature	94.8	°F	34.9	°C
Absolute dry gas meter pressure	29.93	in. Hg	760.3	mm Hg
Orifice meter differential pressure (ΔH)	1.101	in. H_2O	27.96	mm H_2O
Barometric pressure at start of run	29.86	in. Hg	758.4	mm Hg
Barometric pressure at end of run	N/A	in. Hg	N/A	mm Hg
Condensate collected in sampling train	328.8	grams	328.8	grams
Isokinetic sampling variation	104.98	%		

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Other Supporting Data

Barometric pressure at test site at start of run	29.88	in. Hg	759.0	mm Hg
Barometric pressure at test site at end of run	N/A	in. Hg	N/A	mm Hg
Cross-sectional area of sampling nozzle inlet	1.907E-04	ft.²	1.772E-05	m²
Pitot tube coefficient	0.840			

Dry gas meter calibration factor (Y)	1.002
Dry gas meter calibration factor (Y_{qa}) from sampling data	1.002
Comparison of Y_{qa} to Y (difference must be within ±5% of Y)	within ±5%
Orifice meter factor (ΔH@)	1.794 in. H_2O
Potential moisture (as water vapor) content based on condensate collected	11.46 % by volume
Potential moisture (as water vapor) content based on gas stream parameters	N/A % by volume

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Test Run Field Data Sheet - PCDD/PCDF

Project no. 110249.2.001.05 — Emission measurement location: Stack Outlet

Test run no. 2 — Date(s): August 14, 2003 — Train no. M23-2 —

Traverse Port-Point Number	Clock Time 24-hr	Cumulative Sampling Time, minutes	Dry Gas Meter Reading, (V_m), ft.³		Orifice Pressure Differential (ΔH), inches H_2O		Velocity Head, (Δp), inches H_2O	Gas Stream Temp., (t_s), °F	Dry Gas Meter Temperature (t_m), °F		Pump Vacuum, in. Hg	Impinger Outlet Temp., °F	Probe Outlet Temp., °F	Filter Holder Temp., °F	XAD Inlet Temp., °F	STL Outlet Temp., °F	Isokinetic Sampling Variation, percent
			Desired	Actual	Desired	Actual			Inlet	Outlet							
STRT	5:50:00	0.00		62.445													
A18	5:56:00	6.00	66.418	66.450	1.372	1.500	1.400	142	80	79	8.0	60	248	257	66		105.7
A18	6:02:00	12.00	70.403	70.450	1.375	1.500	1.400	143	83	80	8.0	54	248	258	61		105.3
A18	6:08:00	18.00	74.257	74.400	1.282	1.400	1.300	143	86	81	9.0	53	254	257	60		107.5
A17	6:14:00	24.00	78.267	78.450	1.383	1.500	1.400	144	88	83	9.0	52	249	257	43		105.9
A16	6:20:00	30.00	82.285	82.430	1.385	1.500	1.400	144	90	83	9.0	52	249	257	43		103.9
A15	6:26:00	36.00	86.169	86.500	1.290	1.400	1.300	145	92	85	9.0	53	251	257	44		109.9
A14	6:32:00	42.00	90.062	90.460	1.293	1.400	1.300	145	94	86	9.0	54	250	257	45		106.7
A13	6:38:00	48.00	93.567	94.150	1.047	1.100	1.050	144	94	86	8.0	54	251	257	45		110.4
A12	6:44:00	54.00	96.850	97.440	0.918	0.920	0.920	145	94	87	7.0	55	254	256	46		105.1
A11	6:50:00	60.00	99.839	100.320	0.759	0.690	0.760	146	95	89	6.0	56	250	256	47		101.0
A10	6:56:00	66.00	102.585	102.870	0.640	0.550	0.640	145	94	89	6.0	60	252	257	49		97.4
A9	7:02:00	72.00	105.226	105.440	0.592	0.520	0.590	145	95	90	5.0	57	252	257	50		102.1
A8	7:08:00	78.00	107.993	108.040	0.650	0.570	0.650	146	94	90	6.0	54	252	257	50		98.6
A7	7:14:00	84.00	110.765	110.820	0.651	0.650	0.650	146	95	91	6.0	53	248	257	50		105.2
A6	7:20:00	90.00	113.543	113.590	0.653	0.650	0.650	145	96	92	6.0	53	249	257	50		104.6
A5	7:26:00	96.00	116.171	116.290	0.584	0.580	0.580	145	97	92	6.0	53	248	257	50		107.8
A4	7:32:00	102.00	118.801	118.950	0.584	0.580	0.580	145	97	93	6.0	54	253	257	50		106.1
A3	7:38:00	108.00	121.545	121.750	0.635	0.630	0.630	145	98	93	6.0	54	253	257	50		107.1
A2	7:44:00	114.00	124.040	124.270	0.525	0.522	0.520	145	98	94	6.0	55	251	257	51		105.9
A1	7:50:00	120.00	126.464	126.700	0.495	0.470	0.490	145	98	95	5.0	56	250	258	51		105.1
	8:05:00	120.00		126.956													
B18	8:11:00	126.00	130.652	130.850	1.304	1.400	1.300	146	96	95	9.0	65	251	257	59		103.9
B18	8:17:00	132.00	134.585	134.730	1.304	1.400	1.300	147	98	95	9.0	58	249	258	50		103.5
B18	8:23:00	138.00	138.681	139.110	1.409	1.500	1.400	147	101	96	9.0	61	250	257	50		112.2
B17	8:29:00	144.00	142.623	143.030	1.304	1.400	1.300	149	101	96	9.0	57	249	257	49		104.3
B16	8:35:00	150.00	146.571	146.950	1.308	1.400	1.300	148	102	96	9.0	55	249	257	49		104.1
B15	8:41:00	156.00	150.377	150.780	1.213	1.300	1.200	147	104	97	8.0	55	248	257	50		105.5
B14	8:47:00	162.00	154.021	154.580	1.111	1.200	1.100	148	104	97	8.0	55	249	257	50		109.4
B13	8:53:00	168.00	157.465	157.940	0.991	0.910	0.980	148	104	98	7.0	56	253	257	50		102.3
B12	8:59:00	174.00	160.769	161.040	0.911	0.790	0.900	148	104	99	7.0	55	249	257	50		98.4
B11	9:05:00	180.00	163.807	163.900	0.770	0.680	0.760	148	104	99	7.0	54	249	257	50		98.8
B10	9:11:00	186.00	166.622	166.700	0.661	0.560	0.650	147	104	100	6.0	54	249	257	50		104.3
B9	9:17:00	192.00	169.203	169.230	0.556	0.510	0.550	149	103	99	6.0	54	250	257	50		102.8

Remarks: Note: Any DGM reading above that is flagged with an asterisk was not taken at the precise time. Operator(s): Dave Griffin

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Test Run Field Data Sheet - PCDD/PCDF

Project no. 110249.2.001.05 Emission measurement location: Stack Outlet

Test run no. 2 Date(s): August 14, 2003 Train no. M23-2

Traverse Port-Point Number	Clock Time 24-hr	Cumulative Sampling Time, minutes	Dry Gas Meter Reading, (V_m), ft³		Orifice Pressure Differential (ΔH), inches H_2O		Velocity Head, (Δp), inches H_2O	Gas Stream Temp., (t_s), °F	Dry Gas Meter Temperature (t_m), °F		Pump Vacuum, in. Hg	Impinger Outlet Temp., °F	Probe Outlet Temp., °F	Filter Holder Temp., °F	XAD Inlet Temp., °F	STL Outlet Temp., °F	Isokinetic Sampling Variation, percent
			Desired	Actual	Desired	Actual			Inlet	Outlet							
B8	9:23:00	198.00	171.947	171.970	0.628	0.620	0.620	149	104	100	6.0	54	248	257	51		104.7
B7	9:29:00	204.00	174.652	174.730	0.610	0.610	0.600	147	104	100	6.0	55	249	257	51		107.1
B6	9:35:00	210.00	177.286	177.360	0.579	0.550	0.570	148	104	100	6.0	54	248	257	51		104.7
B5	9:41:00	216.00	179.920	179.990	0.579	0.550	0.570	148	104	100	6.0	55	252	257	51		104.7
B4	9:47:00	222.00	182.263	182.480	0.457	0.450	0.450	148	104	101	6.0	56	254	258	51		111.5
B3	9:53:00	228.00	184.503	184.690	0.418	0.370	0.410	148	105	102	5.0	56	250	258	53		103.5
B2	9:59:00	234.00	186.354	186.540	0.285	0.250	0.280	148	105	101	5.0	55	250	258	53		104.9
B1	10:05:00	240.00	188.175	188.275	0.276	0.230	0.270	147	105	102	5.0	56	252	257	52		100.0

Remarks: Note: Any DGM reading above that is flagged with an asterisk was not taken at the precise time. Operator(s): Dave Griffin

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Emission Measurements Data Summary
Measurement Equipment Information and Leak Check Data

PCDD/PCDF

Project no. 110249.2.001.05
Client EPA/ESD/RTI
Facility CBI
Facility location [redacted]
Source tested Mill [redacted]
Emission measurement location Stack Outlet
Test run no. 3
Sampling train no. M23-1
Operator(s) Dave Griffin

Test run date(s) August 15, 2003
Run start time 06:10 AM
Run stop time 10:20 AM

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Signature/Date

Measurement Equipment Identification and Specifications

Metering console no.	N7	
Dry gas meter (DGM) calibration factor (Y)	1.002	
Orifice meter factor (ΔH@)	1.794 in. H_2O	
DGM calibration factor (Y_{qa}) from sampling data	1.002	
Comparison of Y_{qa} to Y (must be within ±5% of Y)	within ±5%	
Temperature controller* no.	N/A	
Temperature meter* no.	N/A	
Additional thermocouple no.	N/A	
Sample transfer line no.	N/A	
Umbilical cable no(s).	N-16-2	
Sample box no.	10288	
Impinger outlet connector no.	UH-1	
Filter no(s).	23-6	
Probe no.	3-2	
Effective probe length	3.0 feet	0.91 m
Probe liner	Heated glass tubing	
Gas stream temperature thermocouple no.	36-2	
Pitot tube no.	M-126	
Pitot tube coefficient	0.840	
Sampling nozzle no.	N12	
Sampling nozzle type	Nichol button-hook	
Sampling nozzle inside diameter at inlet tip	0.187 inches	4.75 mm
Barometer no.	X-4029	
Altitude difference from emission measurement location to barometer or reference point at the test site	-29 feet	-8.8 m
Altitude difference from metering console location to barometer or reference point at the test site	-20 feet	-6.1 m

* Not part of console; or used with peripheral equipment.

Sampling Train Leak Check Data

Gas stream pressure measurement system - Leak check from pitot tube tip

	Time	Result
Initial	05:47 AM	Pass
Final	10:24 AM	PASS

Sampling system - Leak check from nozzle

	Time	Pump Vacuum, in. Hg	Leak Rate, dcfm
Initial	05:50 AM	15.0	0.001
Initial	08:12 AM	8.0	0.002
Initial	08:20 AM	15.0	0.002
Initial	10:25 AM	9.0	0.001

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Emission Measurements Data Summary
Source and Sampling Data
PCDD/PCDF

Project no.	110249.2.001.05		
Client	EPA/ESD/RTI		
Facility	CBI		
Facility location	[redacted]		
Source tested	Mill [redacted]		
Emission measurement location	Stack Outlet		
Test run no.	3	**Test run date(s)**	August 15, 2003
Sampling train no.	M23-1	**Run start time**	06:10 AM
Total sampling time	240.00 minutes	**Run stop time**	10:20 AM

Gas Stream Measurement Results

Volumetric flow rate at dry standard conditions	19,421	dscfm	549.95	dscm/min.
Volumetric flow rate at dry standard conditions	1,165,279	dscf/hr	32,997.0	dscm/hr
Volumetric flow rate at standard conditions	21,828	scfm	618.10	scm/min.
Standard Conditions are	**68**	**°F and**	**760**	**mm Hg**
Volumetric flow rate at actual conditions	24,976	acfm	707.25	acm/min.
Volumetric flow rate at actual conditions	1,498,578	acf/hr	42,435.0	acm/hr
Average velocity	58.89	ft./sec.	17.950	m/sec.
Average velocity	3,533	ft./min.	1,077.0	m/min.
Square root of velocity head	0.9621	$(\text{in. } H_2O)^{0.5}$	4.849	$(\text{mm } H_2O)^{0.5}$
Velocity head	0.926	in. H_2O	23.51	mm H_2O
Absolute temperature	602.1	°R	334.5	K
Temperature	142.5	°F	61.4	°C
Absolute pressure	29.84	in. Hg	757.9	mm Hg
Static pressure	0.00	in. H_2O	0.0	mm H_2O
Barometric pressure at start of run	29.84	in. Hg	757.9	mm Hg
Barometric pressure at end of run	N/A	in. Hg	N/A	mm Hg
Moisture (as water vapor) content	11.03	% by volume	11.03	% by volume
Wet gas molecular weight	27.77	lb/lb-mole	27.77	g/g-mole
Dry gas molecular weight	28.98	lb/lb-mole	28.98	g/g-mole
Carbon dioxide concentration, dry-basis	0.5	% by volume	0.5	% by volume
Oxygen concentration, dry-basis	19.5	% by volume	19.5	% by volume
Carbon monoxide concentration, dry-basis		% by volume		% by volume

Gas Stream Cross-Sectional Area at Emission Measurement Location

Stack or duct type	Circular		
First diameter	36.000	inches	0.9144 m
Second diameter	36.000	inches	0.9144 m
Gas stream cross-sectional area	7.0686	ft.²	0.65669 m²

Gas Sampling Results

Gas sample volume, corrected, at standard conditions	122.564	dscf	3.4706	dscm
Gas sample volume as read on dry gas meter	129.465	ft.³	3.6660	m³
Volume correction for failed leak checks	0.000	ft.³	0.0000	m³
Gas sample volume corrected for leakage	129.465	ft.³	3.6660	m³
Absolute dry gas meter temperature	558.5	°R	310.3	K
Dry gas meter temperature	98.8	°F	37.1	°C
Absolute dry gas meter pressure	29.92	in. Hg	760.0	mm Hg
Orifice meter differential pressure (ΔH)	1.080	in. H_2O	27.44	mm H_2O
Barometric pressure at start of run	29.85	in. Hg	758.2	mm Hg
Barometric pressure at end of run	N/A	in. Hg	N/A	mm Hg
Condensate collected in sampling train	322.1	grams	322.1	grams
Isokinetic sampling variation	97.45	%		

Other Supporting Data

Barometric pressure at test site at start of run	29.87	in. Hg	758.7	mm Hg
Barometric pressure at test site at end of run	N/A	in. Hg	N/A	mm Hg
Cross-sectional area of sampling nozzle inlet	1.907E-04	ft.²	1.772E-05	m²
Pitot tube coefficient	0.840			

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Dry gas meter calibration factor (Y)	1.002
Dry gas meter calibration factor (Y_{qa}) from sampling data	1.002
Comparison of Y_{qa} to Y (difference must be within ±5% of Y)	within ±5%
Orifice meter factor (ΔH@)	1.794 in. H_2O
Potential moisture (as water vapor) content based on condensate collected	11.03 % by volume
Potential moisture (as water vapor) content based on gas stream parameters	N/A % by volume

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Test Run Field Data Sheet - PCDD/PCDF

Project no. 110249.2.001.05 — Emission measurement location: Stack Outlet
Test run no. 3 — Date(s): August 15, 2003 — Train no. M23-1

Traverse Port-Point Number	Clock Time 24-hr	Cumulative Sampling Time, minutes	Dry Gas Meter Reading, (V_m), ft³		Orifice Pressure Differential (ΔH), inches H_2O		Velocity Head, (Δp), inches H_2O	Gas Stream Temp., (t_s), °F	Dry Gas Meter Temperature (t_m), °F		Pump Vacuum, in. Hg	Impinger Outlet Temp., °F	Probe Outlet Temp., °F	Filter Holder Temp., °F	XAD Inlet Temp., °F	STL Outlet Temp., °F	Isokinetic Sampling Variation, percent
			Desired	Actual	Desired	Actual			Inlet	Outlet							
INITIAL	6:10:00	0.00		189.752													
A1	6:16:00	6.00	192.442	192.440	0.623	0.630	0.670	140	85	84	4.0	66	251	258	66		97.4
A2	6:22:00	12.00	195.175	195.190	0.641	0.650	0.690	142	87	85	5.0	56	248	261	58		98.0
A3	6:28:00	18.00	197.933	197.970	0.651	0.660	0.700	143	89	86	5.0	52	254	260	57		98.2
A4	6:34:00	24.00	200.698	200.790	0.653	0.660	0.700	143	91	87	5.0	51	251	257	57		99.4
A5	6:40:00	30.00	203.582	203.690	0.708	0.700	0.760	144	92	88	5.0	50	251	256	46		98.0
A6	6:46:00	36.00	206.548	206.710	0.749	0.740	0.800	142	93	88	6.0	49	254	257	45		99.2
A7	6:52:00	42.00	209.442	209.650	0.712	0.710	0.760	143	94	89	6.0	49	253	257	45		99.0
A8	6:58:00	48.00	212.341	212.580	0.713	0.710	0.760	143	95	90	6.0	48	251	257	46		98.5
A9	7:04:00	54.00	215.168	215.250	0.677	0.650	0.720	143	96	91	6.0	47	249	257	45		92.0
A10	7:10:00	60.00	217.919	218.200	0.639	0.590	0.680	144	97	92	6.0	47	254	256	46		104.5
A11	7:16:00	66.00	220.957	221.210	0.780	0.750	0.830	144	97	92	6.0	48	251	258	46		96.5
A12	7:22:00	72.00	224.262	224.510	0.922	0.890	0.980	144	98	93	6.0	48	249	258	46		97.2
A13	7:28:00	78.00	227.684	227.920	0.987	0.950	1.050	144	98	93	7.0	48	249	257	46		97.1
A14	7:34:00	84.00	231.350	231.450	1.130	1.050	1.200	144	100	94	7.0	47	254	257	46		93.8
A15	7:40:00	90.00	235.170	235.100	1.224	1.150	1.300	145	101	95	7.0	47	248	257	45		93.1
A16	7:46:00	96.00	238.987	238.960	1.224	1.300	1.300	145	101	95	8.0	47	249	257	46		98.5
A17	7:52:00	102.00	242.966	242.960	1.327	1.400	1.400	142	102	96	8.0	47	253	257	46		98.0
A18	7:58:00	108.00	246.944	246.940	1.326	1.400	1.400	143	103	96	8.0	47	249	257	46		97.5
A18	8:04:00	114.00	250.933	251.050	1.330	1.400	1.400	142	104	97	8.0	46	248	257	46		100.4
A18	8:10:00	120.00	254.921	255.097	1.330	1.400	1.400	142	104	97	8.0	47	250	257	45		98.8
INITIAL	8:20:00	120.00		255.301													
B1	8:26:00	126.00	257.409	257.500	0.438	0.440	0.460	141	99	97	4.0	59	250	258	55		93.8
B2	8:32:00	132.00	260.168	260.200	0.639	0.640	0.670	140	100	97	5.0	48	253	257	47		95.3
B3	8:38:00	138.00	262.804	262.940	0.582	0.580	0.610	141	101	98	5.0	47	254	257	48		101.3
B4	8:44:00	144.00	265.564	265.770	0.638	0.640	0.670	142	101	98	6.0	48	251	257	48		99.9
B5	8:50:00	150.00	268.287	268.520	0.620	0.600	0.650	142	102	99	6.0	49	248	257	48		98.4
B6	8:56:00	156.00	271.175	271.300	0.697	0.620	0.730	141	102	99	6.0	50	251	257	48		93.8
B7	9:02:00	162.00	273.942	274.050	0.639	0.620	0.670	142	103	99	6.0	51	254	257	49		96.8
B8	9:08:00	168.00	276.672	276.800	0.622	0.620	0.650	140	103	99	6.0	52	250	257	49		98.1
B9	9:14:00	174.00	279.423	279.590	0.631	0.620	0.660	141	103	100	6.0	52	252	257	49		98.8
B10	9:20:00	180.00	282.174	282.270	0.631	0.620	0.660	142	104	100	6.0	52	251	257	50		94.9
B11	9:26:00	186.00	285.367	285.470	0.850	0.850	0.890	142	104	100	7.0	49	254	257	49		97.6
B12	9:32:00	192.00	288.674	288.890	0.910	0.910	0.950	141	105	101	7.0	47	252	257	49		100.8

Remarks: Note: Any DGM reading above that is flagged with an asterisk was not taken at the precise time. Operator(s): Dave Griffin

8-26-03
Signature/Date

9/11/03

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Test Run Field Data Sheet - PCDD/PCDF

Project no. 110249.2.001.05 Emission measurement location: Stack Outlet

Test run no. 3 Date(s): August 15, 2003 Train no. M23-1

Traverse Port-Point Number	Clock Time 24-hr	Cumulative Sampling Time, minutes	Dry Gas Meter Reading, (V_m), ft³		Orifice Pressure Differential (ΔH), inches H_2O		Velocity Head, (Δp), inches H_2O	Gas Stream Temp., (t_s), °F	Dry Gas Meter Temperature (t_m), °F		Pump Vacuum, in. Hg	Impinger Outlet Temp., °F	Probe Outlet Temp., °F	Filter Holder Temp., °F	XAD Inlet Temp., °F	STL Outlet Temp., °F	Isokinetic Sampling Variation, percent
			Desired	Actual	Desired	Actual			Inlet	Outlet							
B13	9:38:00	198.00	292.019	292.200	0.929	0.930	0.970	142	106	102	7.0	47	254	259	49		96.4
B14	9:44:00	204.00	295.501	295.690	1.006	1.000	1.050	142	107	102	7.0	48	253	257	49		97.6
B15	9:50:00	210.00	299.229	299.410	1.151	1.100	1.200	142	108	103	8.0	48	252	257	49		97.2
B16	9:56:00	216.00	303.108	303.240	1.247	1.300	1.300	142	108	103	8.0	49	253	257	49		96.2
B17	10:02:00	222.00	307.136	307.240	1.342	1.400	1.400	143	109	104	9.0	50	248	257	50		96.7
B18	10:08:00	228.00	311.168	311.270	1.343	1.400	1.400	143	110	104	9.0	50	251	257	51		97.4
B18	10:14:00	234.00	315.203	315.310	1.345	1.400	1.400	143	111	104	9.0	51	249	257	55		97.5
B18	10:20:00	240.00	319.386	319.421	1.444	1.500	1.500	142	111	105	9.0	51	251	257	43		95.8

Remarks: Note: Any DGM reading above that is flagged with an asterisk was not taken at the precise time. Operator(s): Dave Griffin

9/11/03

8-26-03
Signature/Date

Emission Measurements Data Summary
Measurement Equipment Information and Leak Check Data

PCDD/PCDF

Project no. 110249.2.001.05
Client EPA/ESD/RTI
Facility CBI
Facility location [redacted]
Source tested Dryer Stack
Emission measurement location Stack Outlet
Test run no. 4
Sampling train no. M23-1
Operator(s) Dave Griffin

Test run date(s) August 18, 2003
Run start time 07:50 AM
Run stop time 12:20 PM

James Neal 8-26-03
Signature/Date

Measurement Equipment Identification and Specifications

Metering console no.	N7	
Dry gas meter (DGM) calibration factor (Y)	1.002	
Orifice meter factor (ΔH@)	1.794 in. H_2O	
DGM calibration factor (Y_{qa}) from sampling data	1.021	
Comparison of Y_{qa} to Y (must be within ±5% of Y)	within ±5%	
Temperature controller* no.	N/A	
Temperature meter* no.	N/A	
Additional thermocouple no.	N/A	
Sample transfer line no.	N/A	
Umbilical cable no(s).	N-16-2	
Sample box no.	10288	
Impinger outlet connector no.	UH-1	
Filter no(s).	23-6	
Probe no.	3-5	
Effective probe length	3.0 feet	0.91 m
Probe liner	Heated glass tubing	
Gas stream temperature thermocouple no.	36-12	
Pitot tube no.	M-104	
Pitot tube coefficient	0.840	
Sampling nozzle no.	N12	
Sampling nozzle type	Nichol button-hook	
Sampling nozzle inside diameter at inlet tip	0.187 inches	4.75 mm
Barometer no.	X-4029	
Altitude difference from emission measurement location to barometer or reference point at the test site	-29 feet	-8.8 m
Altitude difference from metering console location to barometer or reference point at the test site	-20 feet	-6.1 m

* Not part of console; or used with peripheral equipment.

Sampling Train Leak Check Data

Gas stream pressure measurement system - Leak check from pitot tube tip

	Time	Result
Initial	07:25 AM	Pass
Final	09:55 AM	PASS
Initial	10:15 AM	PASS
Final	12:25 PM	PASS

Sampling system - Leak check from nozzle

	Time	Pump Vacuum, in. Hg	Leak Rate, dcfm
Initial	07:30 AM	15.0	0.001
Final	10:00 AM	12.0	0.002
Initial	10:16 AM	15.0	0.001
Final	12:26 PM	12.0	0.002

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Emission Measurements Data Summary
Source and Sampling Data

PCDD/PCDF

Project no.	110249.2.001.05		
Client	EPA/ESD/RTI		
Facility	CBI		
Facility location	[redacted]		
Source tested	Dryer Stack		
Emission measurement location	Stack Outlet		
Test run no.	4	**Test run date(s)**	August 18, 2003
Sampling train no.	M23-1	**Run start time**	07:50 AM
Total sampling time	240.00 minutes	**Run stop time**	12:20 PM

Gas Stream Measurement Results

Volumetric flow rate at dry standard conditions	12,303 dscfm	348.39	dscm/min.
Volumetric flow rate at dry standard conditions	738,195 dscf/hr	20,903.4	dscm/hr
Volumetric flow rate at standard conditions	13,664 scfm	386.93	scm/min.
Standard Conditions are	**68 °F and**	**760**	**mm Hg**
Volumetric flow rate at actual conditions	15,448 acfm	437.44	acm/min.
Volumetric flow rate at actual conditions	926,881 acf/hr	26,246.4	acm/hr
Average velocity	81.95 ft./sec.	24.980	m/sec.
Average velocity	4,917 ft./min.	1,498.8	m/min.
Square root of velocity head	1.3493 $(\text{in. } H_2O)^{0.5}$	6.800	$(\text{mm } H_2O)^{0.5}$
Velocity head	1.821 in. H_2O	46.24	mm H_2O
Absolute temperature	589.6 °R	327.5	K
Temperature	129.9 °F	54.4	°C
Absolute pressure	29.57 in. Hg	751.1	mm Hg
Static pressure	0.00 in. H_2O	0.0	mm H_2O
Barometric pressure at start of run	29.57 in. Hg	751.1	mm Hg
Barometric pressure at end of run	N/A in. Hg	N/A	mm Hg
Moisture (as water vapor) content	9.96 % by volume	9.96	% by volume
Wet gas molecular weight	27.87 lb/lb-mole	27.87	g/g-mole
Dry gas molecular weight	28.96 lb/lb-mole	28.96	g/g-mole
Carbon dioxide concentration, dry-basis	0.3 % by volume	0.3	% by volume
Oxygen concentration, dry-basis	19.7 % by volume	19.7	% by volume
Carbon monoxide concentration, dry-basis	% by volume		% by volume

Gas Stream Cross-Sectional Area at Emission Measurement Location

Stack or duct type	Circular	
First diameter	24.000 inches	0.6096 m
Second diameter	24.000 inches	0.6096 m
Gas stream cross-sectional area	3.1416 $ft.^2$	0.29186 m^2

Gas Sampling Results

Gas sample volume, corrected, at standard conditions	172.892 dscf	4.8958 dscm
Gas sample volume as read on dry gas meter	184.670 $ft.^3$	5.2293 m^3
Volume correction for failed leak checks	0.000 $ft.^3$	0.0000 m^3
Gas sample volume corrected for leakage	184.670 $ft.^3$	5.2293 m^3
Absolute dry gas meter temperature	560.9 °R	311.6 K
Dry gas meter temperature	101.2 °F	38.5 °C
Absolute dry gas meter pressure	29.72 in. Hg	754.8 mm Hg
Orifice meter differential pressure (ΔH)	2.009 in. H_2O	51.04 mm H_2O
Barometric pressure at start of run	29.58 in. Hg	751.3 mm Hg
Barometric pressure at end of run	N/A in. Hg	N/A mm Hg
Condensate collected in sampling train	405.6 grams	405.6 grams
Isokinetic sampling variation	96.45 %	

Other Supporting Data

Barometric pressure at test site at start of run	29.60 in. Hg	751.8 mm Hg
Barometric pressure at test site at end of run	N/A in. Hg	N/A mm Hg
Cross-sectional area of sampling nozzle inlet	1.907E-04 $ft.^2$	1.772E-05 m^2
Pitot tube coefficient	0.840	

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Dry gas meter calibration factor (Y)	1.002
Dry gas meter calibration factor (Y_{qa}) from sampling data	1.021
Comparison of Y_{qa} to Y (difference must be within ±5% of Y)	within ±5%
Orifice meter factor (ΔH@)	1.794 in. H_2O
Potential moisture (as water vapor) content based on condensate collected	9.96 % by volume
Potential moisture (as water vapor) content based on gas stream parameters	N/A % by volume

Test Run Field Data Sheet - PCDD/PCDF

Project no. 110249.2.001.05 Emission measurement location: Stack Outlet

Test run no. 4 Date(s): August 18, 2003 Train no. M23-1

Traverse Port-Point Number	Clock Time 24-hr	Cumulative Sampling Time, minutes	Dry Gas Meter Reading, (V_m), ft.³		Orifice Pressure Differential (ΔH), inches H_2O		Velocity Head, (Δp), inches H_2O	Gas Stream Temp., (t_s), °F	Dry Gas Meter Temperature (t_m), °F		Pump Vacuum, in. Hg	Impinger Outlet Temp., °F	Probe Outlet Temp., °F	Filter Holder Temp., °F	XAD Inlet Temp., °F	STL Outlet Temp., °F	Isokinetic Sampling Variation, percent
			Desired	Actual	Desired	Actual			Inlet	Outlet							
INITIAL	7:50:00	0.00		320.295													
B1	7:56:00	6.00	322.933	322.970	0.591	0.590	0.620	127	86	87	5.0	53	250	257	49	250	97.8
B2	8:02:00	12.00	326.266	326.400	0.941	0.940	0.990	129	88	88	8.0	51	249	256	43	250	99.2
B3	8:08:00	18.00	330.368	330.150	1.422	1.500	1.500	131	90	89	9.0	50	250	257	44	250	88.1
B4	8:14:00	24.00	334.736	334.500	1.613	1.700	1.700	130	91	88	10.0	51	250	257	44	250	96.0
INITIAL	8:17:00	24.00		334.500													
B5	8:23:00	30.00	339.184	338.950	1.667	1.700	1.750	129	92	90	11.0	52	250	247	45	248	96.5
B6	8:29:00	36.00	343.707	343.410	1.719	1.800	1.800	129	94	91	11.0	54	250	254	45	250	95.1
B7	8:35:00	42.00	348.295	348.070	1.767	1.900	1.850	130	95	92	12.0	56	249	256	46	250	97.9
B8	8:41:00	48.00	352.888	352.780	1.765	1.900	1.850	132	97	93	12.0	56	250	257	46	248	98.9
B9	8:47:00	54.00	357.555	357.510	1.820	1.900	1.900	130	98	93	12.0	59	250	257	47	250	97.7
B10	8:53:00	60.00	362.242	362.280	1.830	1.900	1.900	129	100	95	12.0	54	250	257	45	250	98.1
B11	8:59:00	66.00	366.990	367.090	1.878	1.950	1.950	129	100	95	12.0	54	251	257	45	250	97.7
B12	9:05:00	72.00	371.746	371.950	1.881	1.950	1.950	129	101	96	12.0	55	250	257	46	250	98.5
B13	9:11:00	78.00	376.574	376.790	1.936	2.000	2.000	128	102	97	12.0	56	249	257	46	250	96.6
B14	9:17:00	84.00	381.399	381.650	1.931	2.000	2.000	130	102	98	12.0	57	249	257	47	250	97.1
B15	9:23:00	90.00	386.359	386.520	2.038	2.050	2.100	127	103	98	12.0	54	249	256	47	250	94.7
B16	9:29:00	96.00	391.324	391.420	2.040	2.050	2.100	127	103	99	12.0	54	251	257	47	250	95.2
B17	9:35:00	102.00	396.298	396.320	2.045	2.050	2.100	126	103	100	12.0	55	248	256	47	250	95.0
B18	9:41:00	108.00	401.326	401.280	2.090	2.100	2.150	127	103	100	12.0	56	250	257	46	250	95.1
B18	9:47:00	114.00	406.349	406.220	2.085	2.100	2.150	129	104	100	12.0	57	248	257	47	250	94.8
B18	9:53:00	120.00	411.252	411.082	1.984	2.000	2.050	131	104	101	12.0	58	249	256	48	250	95.6
INITIAL	10:20:00	120.00		411.396													
A1	10:26:00	126.00	414.969	414.950	0.960	1.000	1.000	136	100	100	8.0	67	250	261	57	*	100.7
A2	10:32:00	132.00	418.998	418.840	1.345	1.400	1.400	135	101	100	9.0	46	250	259	46		93.1
A3	10:38:00	138.00	423.443	423.200	1.637	1.700	1.700	133	101	100	10.0	48	251	257	45		94.6
A4	10:44:00	144.00	427.965	427.610	1.689	1.700	1.750	133	103	101	10.0	51	248	257	45		94.0
A5	10:50:00	150.00	432.553	432.200	1.738	1.800	1.800	133	104	101	11.0	54	248	257	46		96.5
A6	10:56:00	156.00	437.213	436.910	1.789	1.850	1.850	133	105	102	11.0	52	250	257	46		97.5
A7	11:02:00	162.00	441.938	441.630	1.840	1.950	1.900	132	105	102	11.0	50	250	257	47		96.3
A8	11:08:00	168.00	446.675	446.410	1.847	2.000	1.900	131	106	103	12.0	50	251	257	46		97.3
A9	11:14:00	174.00	451.474	451.210	1.895	2.000	1.950	131	106	103	12.0	50	249	257	46		96.4
A10	11:20:00	180.00	456.286	456.140	1.901	2.000	1.950	130	107	104	12.0	51	251	257	47		98.8
A11	11:26:00	186.00	461.161	461.000	1.951	2.100	2.000	130	108	104	12.0	53	252	257	47		96.1

* Sample transfer line not used; probe connected directly to box.

Remarks: Note: Any DGM reading above that is flagged with an asterisk was not taken at the precise time. Operator(s): Dave Griffin

9-26-03
Signature/Date

9/11/03

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Test Run Field Data Sheet - PCDD/PCDF

Project no. 110249.2.001.05 — Emission measurement location: Stack Outlet

Test run no. 4 — Date(s): August 18, 2003 — Train no. M23-1 — Page 2 of 2

Traverse Port-Point Number	Clock Time 24-hr	Cumulative Sampling Time, minutes	Dry Gas Meter Reading, (V_m), ft.³		Orifice Pressure Differential (ΔH), inches H_2O		Velocity Head, (Δp), inches H_2O	Gas Stream Temp., (t_s), °F	Dry Gas Meter Temperature (t_m), °F		Pump Vacuum, in. Hg	Impinger Outlet Temp., °F	Probe Outlet Temp., °F	Filter Holder Temp., °F	XAD Inlet Temp., °F	STL Outlet Temp., °F	Isokinetic Sampling Variation, percent
			Desired	Actual	Desired	Actual			Inlet	Outlet							
A12	11:32:00	192.00	466.045	465.950	1.956	2.100	2.000	129	108	105	12.0	53	251	257	47		97.7
A13	11:38:00	198.00	470.934	470.930	1.960	2.100	2.000	128	108	105	12.0	53	249	257	48		98.2
A14	11:44:00	204.00	475.826	475.900	1.960	2.100	2.000	129	109	106	12.0	55	249	257	48		97.9
A15	11:50:00	210.00	480.719	480.860	1.960	2.100	2.000	129	109	106	12.0	55	252	258	49		97.7
A16	11:56:00	216.00	485.620	485.830	1.961	2.100	2.000	130	111	107	12.0	57	250	257	51		97.8
A17	12:02:00	222.00	490.526	490.790	1.963	2.050	2.000	130	111	108	12.0	57	249	257	52		97.5
A18	12:08:00	228.00	495.441	495.680	1.968	2.000	2.000	129	112	108	12.0	53	248	258	50		95.9
A19	12:14:00	234.00	500.365	500.550	1.972	2.000	2.000	129	113	109	12.0	54	248	257	49		95.4
A20	12:20:00	240.00	505.228	505.279	1.923	1.900	1.950	129	113	109	11.0	53	248	257	51		93.8

Remarks: Note: Any DGM reading above that is flagged with an asterisk was not taken at the precise time. Operator(s): Dave Griffin

8-26-03
Signature/Date

2/11/03

Nomorept.xls 10/31/2001 (rev. M5 Final Data Report.xls [DataSheet] 8/26/2003 2:28 PM)

Emission Measurements Data Summary
Measurement Equipment Information and Leak Check Data

PCDD/PCDF

Project no. 110249.2.001.05
Client EPA/ESD/RTI
Facility CBI
Facility location [redacted]
Source tested Dryer Stack [redacted]
Emission measurement location Stack Outlet
Test run no. 5
Sampling train no. M23-1
Operator(s) Dave Griffin

Test run date(s) August 19, 2003
Run start time 06:05 AM
Run stop time 10:30 AM

8-26-03
Signature/Date

Measurement Equipment Identification and Specifications

Metering console no.	N7	
Dry gas meter (DGM) calibration factor (Y)	1.002	
Orifice meter factor (ΔH@)	1.794 in. H_2O	
DGM calibration factor (Y_{qa}) from sampling data	1.022	
Comparison of Y_{qa} to Y (must be within ±5% of Y)	within ±5%	
Temperature controller* no.	N/A	
Temperature meter* no.	N/A	
Additional thermocouple no.	N/A	
Sample transfer line no.	N/A	
Umbilical cable no(s).	N-16-2	
Sample box no.	10288	
Impinger outlet connector no.	UH-1	
Filter no(s).	23-9	
Probe no.	3-5	
Effective probe length	3.0 feet	0.91 m
Probe liner	Heated glass tubing	
Gas stream temperature thermocouple no.	36-12	
Pitot tube no.	M-104	
Pitot tube coefficient	0.840	
Sampling nozzle no.	N12	
Sampling nozzle type	Nichol button-hook	
Sampling nozzle inside diameter at inlet tip	0.187 inches	4.75 mm
Barometer no.	X-4029	
Altitude difference from emission measurement location to barometer or reference point at the test site	-29 feet	-8.8 m
Altitude difference from metering console location to barometer or reference point at the test site	-20 feet	-6.1 m

* Not part of console; or used with peripheral equipment.

Sampling Train Leak Check Data

Gas stream pressure measurement system - Leak check from pitot tube tip

	Time	Result
Initial	05:55 AM	Pass
Final	08:08 AM	PASS
Initial	08:25 AM	PASS
Final	10:35 AM	PASS

Sampling system - Leak check from nozzle

	Time	Pump Vacuum, in. Hg	Leak Rate, dcfm
Initial	06:00 AM	15.0	0.003
Final	08:10 AM	11.0	0.002
Initial	08:26 AM	15.0	0.003
Final	10:33 AM	11.0	0.001

9/11/03

Emission Measurements Data Summary
Source and Sampling Data

PCDD/PCDF

Project no. 110249.2.001.05
Client EPA/ESD/RTI
Facility CBI
Facility location [redacted]
Source tested Dryer Stack [redacted]
Emission measurement location Stack Outlet
Test run no. 5 — **Test run date(s)** August 19, 2003
Sampling train no. M23-1 — **Run start time** 06:05 AM
Total sampling time 240.00 minutes — **Run stop time** 10:30 AM

Gas Stream Measurement Results

Volumetric flow rate at dry standard conditions	12,155 dscfm	344.20	dscm/min.
Volumetric flow rate at dry standard conditions	729,325 dscf/hr	20,652.2	dscm/hr
Volumetric flow rate at standard conditions	13,434 scfm	380.42	scm/min.
Standard Conditions are	**68 °F and**	**760**	**mm Hg**
Volumetric flow rate at actual conditions	15,212 acfm	430.74	acm/min.
Volumetric flow rate at actual conditions	912,690 acf/hr	25,844.5	acm/hr
Average velocity	80.70 ft./sec.	24.597	m/sec.
Average velocity	4,842 ft./min.	1,475.8	m/min.
Square root of velocity head	1.3284 $(\text{in. } H_2O)^{0.5}$	6.695	$(\text{mm } H_2O)^{0.5}$
Velocity head	1.765 in. H_2O	44.82	mm H_2O
Absolute temperature	591.3 °R	328.5	K
Temperature	131.6 °F	55.3	°C
Absolute pressure	29.61 in. Hg	752.1	mm Hg
Static pressure	0.00 in. H_2O	0.0	mm H_2O
Barometric pressure at start of run	29.61 in. Hg	752.1	mm Hg
Barometric pressure at end of run	N/A in. Hg	N/A	mm Hg
Moisture (as water vapor) content	9.52 % by volume	9.52	% by volume
Wet gas molecular weight	27.90 lb/lb-mole	27.90	g/g-mole
Dry gas molecular weight	28.94 lb/lb-mole	28.94	g/g-mole
Carbon dioxide concentration, dry-basis	0.2 % by volume	0.2	% by volume
Oxygen concentration, dry-basis	19.7 % by volume	19.7	% by volume
Carbon monoxide concentration, dry-basis	% by volume		% by volume

Gas Stream Cross-Sectional Area at Emission Measurement Location

Stack or duct type	Circular		
First diameter	24.000 inches	0.6096	m
Second diameter	24.000 inches	0.6096	m
Gas stream cross-sectional area	3.1416 $ft.^2$	0.29186	m^2

Gas Sampling Results

Gas sample volume, corrected, at standard conditions	169.974 dscf	4.8131	dscm
Gas sample volume as read on dry gas meter	179.155 $ft.^3$	5.0731	m^3
Volume correction for failed leak checks	0.000 $ft.^3$	0.0000	m^3
Gas sample volume corrected for leakage	179.155 $ft.^3$	5.0731	m^3
Absolute dry gas meter temperature	554.2 °R	307.9	K
Dry gas meter temperature	94.5 °F	34.7	°C
Absolute dry gas meter pressure	29.75 in. Hg	755.7	mm Hg
Orifice meter differential pressure (ΔH)	1.938 in. H_2O	49.23	mm H_2O
Barometric pressure at start of run	29.62 in. Hg	752.3	mm Hg
Barometric pressure at end of run	N/A in. Hg	N/A	mm Hg
Condensate collected in sampling train	379.3 grams	379.3	grams
Isokinetic sampling variation	95.97 %		

Other Supporting Data

Barometric pressure at test site at start of run	29.64 in. Hg	752.9	mm Hg
Barometric pressure at test site at end of run	N/A in. Hg	N/A	mm Hg
Cross-sectional area of sampling nozzle inlet	1.907E-04 $ft.^2$	1.772E-05	m^2
Pitot tube coefficient	0.840		

Dry gas meter calibration factor (Y)	1.002
Dry gas meter calibration factor (Y_{qa}) from sampling data	1.022
Comparison of Y_{qa} to Y (difference must be within ±5% of Y)	within ±5%
Orifice meter factor (ΔH@)	1.794 in. H_2O
Potential moisture (as water vapor) content based on condensate collected	9.52 % by volume
Potential moisture (as water vapor) content based on gas stream parameters	N/A % by volume

8/11/03

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Test Run Field Data Sheet - PCDD/PCDF

Project no. 110249.2.001.05 — Emission measurement location: Stack Outlet
Test run no. 5 — Date(s): August 19, 2003 — Train no. M23-1 — Page 1 of 2

Traverse Port-Point Number	Clock Time 24-hr	Cumulative Sampling Time, minutes	Dry Gas Meter Reading, (V_m), ft.³		Orifice Pressure Differential (ΔH), inches H_2O		Velocity Head, (Δp), inches H_2O	Gas Stream Temp., (t_s), °F	Dry Gas Meter Temperature (t_m), °F		Pump Vacuum, in. Hg	Impinger Outlet Temp., °F	Probe Outlet Temp., °F	Filter Holder Temp., °F	XAD Inlet Temp., °F	STL Outlet Temp., °F	Isokinetic Sampling Variation, percent
			Desired	Actual	Desired	Actual			Inlet	Outlet							
INITIAL	6:05:00	0.00		505.489													
B1	6:11:00	6.00	507.345	507.430	0.295	0.310	0.320	143	82	83	3.0	58	249	255	54	250	100.4
B2	6:17:00	12.00	510.727	510.890	0.979	1.000	1.050	135	83	83	7.0	48	250	256	44	250	98.2
B3	6:23:00	18.00	514.710	514.850	1.358	1.400	1.450	132	84	83	9.0	44	251	257	42	250	95.4
B4	6:29:00	24.00	518.904	519.070	1.501	1.600	1.600	132	86	84	9.0	43	251	248	43	250	96.6
B5	6:35:00	30.00	523.242	523.380	1.601	1.700	1.700	131	88	85	10.0	44	250	253	44	250	95.4
B6	6:41:00	36.00	527.555	527.700	1.580	1.700	1.700	140	89	86	10.0	45	251	256	44	250	96.2
B7	6:47:00	42.00	531.949	532.060	1.639	1.700	1.750	136	90	86	10.0	46	250	257	45	250	95.3
B8	6:53:00	48.00	536.417	536.520	1.691	1.750	1.800	135	91	87	10.0	47	250	258	46	250	95.8
B9	6:59:00	54.00	540.966	541.060	1.751	1.800	1.850	131	91	88	11.0	47	250	257	47	250	95.8
B10	7:05:00	60.00	545.511	545.580	1.748	1.800	1.850	132	91	88	11.0	48	250	257	48	250	95.5
B11	7:11:00	66.00	550.121	550.190	1.797	1.850	1.900	132	92	88	11.0	49	247	257	49	250	96.0
B12	7:17:00	72.00	554.806	554.830	1.853	1.900	1.950	130	93	89	11.0	49	250	257	52	250	95.1
B13	7:23:00	78.00	559.492	559.510	1.852	1.900	1.950	131	93	90	11.0	46	250	257	48	250	95.9
B14	7:29:00*	84.00	564.241	564.220	1.902	1.950	2.000	130	93	90	11.0	44	250	257	43	250	95.2
B15	7:35:00	90.00	568.998	568.980	1.907	2.000	2.000	129	94	90	11.0	45	248	257	43	250	96.1
B16	7:41:00	96.00	573.755	573.750	1.907	2.000	2.000	129	94	90	11.0	46	250	257	43	250	96.3
B17	7:47:00	102.00	578.637	578.580	2.006	2.100	2.100	128	94	91	11.0	47	248	257	43	250	95.0
B18	7:53:00	108.00	583.461	583.440	1.957	2.050	2.050	129	95	91	11.0	49	249	258	43	250	96.7
B19	7:59:00	114.00	588.274	588.220	1.948	2.000	2.050	132	95	91	11.0	49	248	257	44	250	95.4
B20	8:05:00	120.00	593.103	593.031	1.958	2.000	2.050	130	96	92	11.0	51	251	257	44	250	95.6
INITIAL	8:30:00	120.00		593.246													
A1	8:36:00	126.00	596.857	596.830	1.055	1.100	1.100	128	92	92	8.0	59	250	264	53	*	97.2
A2	8:42:00	132.00	600.518	600.570	1.130	1.200	1.200	138	92	91	8.0	42	250	263	45		98.1
A3	8:48:00	138.00	604.690	604.710	1.464	1.500	1.550	137	94	92	9.0	43	250	257	45		95.3
A4	8:54:00	144.00	609.076	609.130	1.616	1.700	1.700	133	95	92	10.0	46	249	257	45		96.8
A5	9:00:00	150.00	613.611	613.670	1.723	1.800	1.800	131	97	94	10.0	48	250	256	45		96.1
A6	9:06:00	156.00	618.217	618.270	1.775	1.850	1.850	130	98	94	10.0	51	251	257	46		95.9
A7	9:12:00	162.00	622.897	622.950	1.828	1.900	1.900	129	99	95	11.0	53	250	257	46		96.0
A8	9:18:00	168.00	627.581	627.630	1.832	1.900	1.900	128	99	95	11.0	49	249	257	46		95.9
A9	9:24:00	174.00	632.269	632.330	1.832	1.900	1.900	129	100	96	11.0	48	249	257	45		96.3
A10	9:30:00	180.00	637.026	637.070	1.883	1.950	1.950	129	101	97	11.0	49	250	257	45		95.7
A11	9:36:00	186.00	641.792	641.820	1.886	1.950	1.950	129	102	98	11.0	49	250	257	45		95.7
A12	9:42:00	192.00	646.557	646.570	1.886	1.950	1.950	129	102	98	11.0	49	248	257	45		95.7

Remarks: Note: Any DGM reading above that is flagged with an asterisk was not taken at the precise time. Operator(s): Dave Griffin

* Sample trouble line not used; probe connected directly to hot box.

Signature/Date 9-26-03

9/11/03

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Test Run Field Data Sheet - PCDD/PCDF

Project no. 110249.2.001.05 Emission measurement location: Stack Outlet

Test run no. 5 Date(s): August 19, 2003 Train no. M23-1

Traverse Port-Point Number	Clock Time 24-hr	Cumulative Sampling Time, minutes	Dry Gas Meter Reading, (V_m), ft^3		Orifice Pressure Differential (ΔH), inches H_2O		Velocity Head, (Δp), inches H_2O	Gas Stream Temp., (t_s), °F	Dry Gas Meter Temperature (t_m), °F		Pump Vacuum, in. Hg	Impinger Outlet Temp., °F	Probe Outlet Temp., °F	Filter Holder Temp., °F	XAD Inlet Temp., °F	STL Outlet Temp., °F	Isokinetic Sampling Variation, percent
			Desired	Actual	Desired	Actual			Inlet	Outlet							
A13	9:48:00	198.00	651.392	651.350	1.937	2.000	2.000	129	103	99	11.0	49	250	257	46		94.9
A14	9:54:00	204.00	656.235	656.160	1.941	2.000	2.000	129	104	100	11.0	51	250	257	46		95.4
A15	10:00:00	210.00	661.010	660.940	1.886	1.950	1.950	131	104	100	11.0	52	250	257	46		96.1
A16	10:06:00	216.00	665.853	665.750	1.938	2.000	2.000	131	105	101	11.0	53	251	257	46		95.3
A17	10:12:00	222.00	670.628	670.580	1.882	2.000	1.950	134	106	101	11.0	52	249	257	46		97.1
A18	10:18:00	228.00	675.408	675.370	1.882	1.950	1.950	135	107	102	11.0	53	250	257	46		96.2
A19	10:24:00	234.00	680.200	680.140	1.890	1.950	1.950	133	107	103	11.0	53	251	257	47		95.6
A20	10:30:00	240.00	684.932	684.859	1.839	1.900	1.900	135	108	104	11.0	53	251	257	48		95.8

Remarks: Note: Any DGM reading above that is flagged with an asterisk was not taken at the precise time. Operator(s): Dave Griffin

8-26-03
Signature/Date

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Emission Measurements Data Summary
Measurement Equipment Information and Leak Check Data

PCDD/PCDF

Project no. 110249.2.001.05
Client EPA/ESD/RTI
Facility CBI
Facility location [redacted]
Source tested Dryer Stack [redacted]
Emission measurement location Stack Outlet
Test run no. 6
Sampling train no. M23-2
Operator(s) Dave Griffin

Test run date(s) August 20, 2003
Run start time 06:10 AM
Run stop time 10:35 AM

8-26-03
Signature/Date

Measurement Equipment Identification and Specifications

Metering console no.	N7	
Dry gas meter (DGM) calibration factor (Y)	1.002	
Orifice meter factor (ΔH@)	1.794 in. H_2O	
DGM calibration factor (Y_{qa}) from sampling data	1.023	
Comparison of Y_{qa} to Y (must be within ±5% of Y)	within ±5%	
Temperature controller* no.	N/A	
Temperature meter* no.	N/A	
Additional thermocouple no.	N/A	
Sample transfer line no.	N/A	
Umbilical cable no(s).	N-16-2	
Sample box no.	012003	
Impinger outlet connector no.	UH-12	
Filter no(s).	23-8	
Probe no.	3-5	
Effective probe length	3.0 feet	0.91 m
Probe liner	Heated glass tubing	
Gas stream temperature thermocouple no.	36-12	
Pitot tube no.	M-104	
Pitot tube coefficient	0.840	
Sampling nozzle no.	N12	
Sampling nozzle type	Nichol button-hook	
Sampling nozzle inside diameter at inlet tip	0.187 inches	4.75 mm
Barometer no.	X-4029	
Altitude difference from emission measurement location to barometer or reference point at the test site	-29 feet	-8.8 m
Altitude difference from metering console location to barometer or reference point at the test site	-20 feet	-6.1 m

* Not part of console; or used with peripheral equipment.

Sampling Train Leak Check Data

Gas stream pressure measurement system - Leak check from pitot tube tip

	Time	Result
Initial	05:25 AM	Pass
Final	08:13 AM	PASS
Initial	08:30 AM	PASS
Final	10:39 AM	PASS

Sampling system - Leak check from nozzle

	Time	Pump Vacuum, in. Hg	Leak Rate, dcfm
Initial	05:27 AM	15.0	0.003
Final	08:12 AM	12.0	0.007
Initial	06:05 AM	15.0	0.001
Final	10:37 AM	12.0	0.005
Initial	08:29 AM	15.0	0.006

9/11/03

Emission Measurements Data Summary
Source and Sampling Data

PCDD/PCDF

Project no.	110249.2.001.05		
Client	EPA/ESD/RTI		
Facility	CBI		
Facility location	[redacted]		
Source tested	Dryer Stack [redacted]		
Emission measurement location	Stack Outlet		
Test run no.	6	**Test run date(s)**	August 20, 2003
Sampling train no.	M23-2	**Run start time**	06:10 AM
Total sampling time	240.00 minutes	**Run stop time**	10:35 AM

Gas Stream Measurement Results

Volumetric flow rate at dry standard conditions	11,898 dscfm	336.90	dscm/min.
Volumetric flow rate at dry standard conditions	713,855 dscf/hr	20,214.1	dscm/hr
Volumetric flow rate at standard conditions	13,125 scfm	371.67	scm/min.
Standard Conditions are	**68 °F and**	**760**	**mm Hg**
Volumetric flow rate at actual conditions	14,709 acfm	416.51	acm/min.
Volumetric flow rate at actual conditions	882,526 acf/hr	24,990.4	acm/hr
Average velocity	78.03 ft./sec.	23.784	m/sec.
Average velocity	4,682 ft./min.	1,427.1	m/min.
Square root of velocity head	1.3401 $(\text{in. } H_2O)^{0.5}$	6.754	$(\text{mm } H_2O)^{0.5}$
Velocity head	1.796 in. H_2O	45.62	mm H_2O
Absolute temperature	585.4 °R	325.2	K
Temperature	125.7 °F	52.1	°C
Absolute pressure	29.62 in. Hg	752.4	mm Hg
Static pressure	0.00 in. H_2O	0.0	mm H_2O
Barometric pressure at start of run	29.62 in. Hg	752.4	mm Hg
Barometric pressure at end of run	N/A in. Hg	N/A	mm Hg
Moisture (as water vapor) content	9.35 % by volume	9.35	% by volume
Wet gas molecular weight	30.06 lb/lb-mole	30.06	g/g-mole
Dry gas molecular weight	31.30 lb/lb-mole	31.30	g/g-mole
Carbon dioxide concentration, dry-basis	19.8 % by volume	19.8	% by volume
Oxygen concentration, dry-basis	0.2 % by volume	0.2	% by volume
Carbon monoxide concentration, dry-basis	% by volume		% by volume

Gas Stream Cross-Sectional Area at Emission Measurement Location

Stack or duct type	Circular		
First diameter	24.000 inches	0.6096	m
Second diameter	24.000 inches	0.6096	m
Gas stream cross-sectional area	3.1416 ft.²	0.29186	m²

Gas Sampling Results

Gas sample volume, corrected, at standard conditions	172.515 dscf	4.8851	dscm
Gas sample volume as read on dry gas meter	181.473 ft.³	5.1387	m³
Volume correction for failed leak checks	0.000 ft.³	0.0000	m³
Gas sample volume corrected for leakage	181.473 ft.³	5.1387	m³
Absolute dry gas meter temperature	553.3 °R	307.4	K
Dry gas meter temperature	93.6 °F	34.2	°C
Absolute dry gas meter pressure	29.77 in. Hg	756.0	mm Hg
Orifice meter differential pressure (ΔH)	1.973 in. H_2O	50.12	mm H_2O
Barometric pressure at start of run	29.63 in. Hg	752.6	mm Hg
Barometric pressure at end of run	N/A in. Hg	N/A	mm Hg
Condensate collected in sampling train	377.5 grams	377.5	grams
Isokinetic sampling variation	99.52 %		

Other Supporting Data

Barometric pressure at test site at start of run	29.65 in. Hg	753.1	mm Hg
Barometric pressure at test site at end of run	N/A in. Hg	N/A	mm Hg
Cross-sectional area of sampling nozzle inlet	1.907E-04 ft.²	1.772E-05	m²
Pitot tube coefficient	0.840		

Dry gas meter calibration factor (Y)	1.002
Dry gas meter calibration factor (Y_{qa}) from sampling data	1.023
Comparison of Y_{qa} to Y (difference must be within ±5% of Y)	within ±5%
Orifice meter factor (ΔH@)	1.794 in. H_2O
Potential moisture (as water vapor) content based on condensate collected	9.35 % by volume
Potential moisture (as water vapor) content based on gas stream parameters	N/A % by volume

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Test Run Field Data Sheet - PCDD/PCDF

Project no. 110249.2.001.05 — Emission measurement location: Stack Outlet

Test run no. 6 — Date(s): August 20, 2003 — Train no. M23-2 —

Traverse Port-Point Number	Clock Time 24-hr	Cumulative Sampling Time, minutes	Dry Gas Meter Reading, (V_m), ft.³		Orifice Pressure Differential (ΔH), inches H_2O		Velocity Head, (Δp), inches H_2O	Gas Stream Temp., (t_s), °F	Dry Gas Meter Temperature (t_m), °F		Pump Vacuum, in. Hg	Impinger Outlet Temp., °F	Probe Outlet Temp., °F	Filter Holder Temp., °F	XAD Inlet Temp., °F	STL Outlet Temp., °F	Isokinetic Sampling Variation, percent
			Desired	Actual	Desired	Actual			Inlet	Outlet							
STRT	6:10:00	0.00		685.232													
B1	6:16:00	6.00	687.954	688.030	0.637	0.640	0.690	139	80	81	6.0	59	251	257	48	250	102.3
B2	6:22:00	12.00	691.253	691.290	0.935	0.940	1.000	132	81	82	8.0	51	249	256	41	250	98.3
B3	6:28:00	18.00	695.242	695.190	1.364	1.400	1.450	128	83	82	9.0	50	250	256	49	250	97.2
B4	6:34:00	24.00	699.442	699.400	1.510	1.600	1.600	127	85	82	10.0	51	250	257	40	250	99.7
B5	6:40:00	30.00	703.782	703.720	1.609	1.700	1.700	126	86	83	10.0	52	251	257	41	250	99.0
B6	6:46:00	36.00	708.122	708.100	1.608	1.700	1.700	127	87	83	10.0	53	251	257	41	250	100.4
B7	6:52:00	42.00	712.536	712.530	1.661	1.750	1.750	126	88	84	11.0	54	250	257	41	250	99.8
B8	6:58:00	48.00	717.086	717.090	1.761	1.850	1.850	125	89	85	11.0	54	249	256	41	250	99.7
B9	7:04:00	54.00	721.701	721.700	1.811	1.900	1.900	124	89	85	11.0	55	251	257	41	250	99.4
B10	7:10:00	60.00	726.323	726.320	1.814	1.900	1.900	124	90	86	11.0	56	247	257	42	250	99.4
B11	7:16:00	66.00	730.942	730.960	1.813	1.900	1.900	124	89	86	11.0	44	248	257	42	250	99.9
B12	7:22:00	72.00	735.629	735.700	1.863	1.950	1.950	124	90	87	11.0	44	247	257	43	250	100.6
B13	7:28:00	78.00	740.375	740.450	1.912	2.000	2.000	123	90	86	12.0	44	251	257	43	250	99.6
B14	7:34:00	84.00	745.125	745.220	1.914	2.000	2.000	123	90	87	12.0	47	250	257	44	250	99.9
B15	7:40:00	90.00	749.880	749.980	1.916	2.000	2.000	123	91	87	12.0	48	248	257	44	250	99.6
B16	7:46:00	96.00	754.701	754.820	1.968	2.050	2.050	122	91	88	12.0	51	249	257	44	250	99.8
B17	7:52:00	102.00	759.581	759.630	2.016	2.050	2.100	122	91	88	12.0	55	251	258	45	250	98.0
B18	7:58:00	108.00	764.407	764.460	1.968	2.050	2.050	123	92	89	12.0	56	248	257	46	250	99.5
B19	8:04:00	114.00	769.225	769.290	1.962	2.050	2.050	125	92	89	12.0	57	250	257	47	250	99.7
B20	8:10:00	120.00	774.048	774.053	1.960	2.050	2.050	127	94	90	12.0	58	250	257	48	250	98.2
INITIAL	8:35:00	120.00		774.286													
A1	8:41:00	126.00	777.900	778.030	1.108	1.150	1.150	123	90	90	9.0	57	250	261	48	*	102.9
A2	8:47:00	132.00	781.962	781.990	1.394	1.450	1.450	124	91	90	9.0	55	249	259	45		97.0
A3	8:53:00	138.00	786.297	786.310	1.584	1.650	1.650	126	93	91	10.0	56	250	257	44		99.1
A4	8:59:00	144.00	790.776	790.770	1.686	1.750	1.750	125	95	92	11.0	56	250	257	44		99.0
A5	9:05:00	150.00	795.330	795.300	1.739	1.800	1.800	125	97	93	11.0	57	251	257	44		98.9
A6	9:11:00	156.00	799.955	799.880	1.790	1.850	1.850	125	98	94	11.0	57	252	258	45		98.5
A7	9:17:00	162.00	804.646	804.500	1.839	1.900	1.900	125	99	94	11.0	57	250	257	46		98.0
A8	9:23:00	168.00	809.341	809.180	1.839	1.900	1.900	126	100	95	11.0	57	251	257	47		99.1
A9	9:29:00	174.00	814.043	813.920	1.843	2.000	1.900	126	101	96	11.0	58	250	258	49		100.3
A10	9:35:00	180.00	818.754	818.670	1.846	2.000	1.900	126	102	97	11.0	58	250	257	51		100.3
A11	9:41:00	186.00	823.535	823.480	1.897	2.000	1.950	126	103	98	12.0	57	250	257	49		100.1
A12	9:47:00	192.00	828.255	828.320	1.848	2.000	1.900	127	103	99	12.0	59	248	257	47		102.0

Remarks: Note: Any DGM reading above that is flagged with an asterisk was not taken at the precise time. Operator(s): Dave Griffin

* sample transfer line not heated; probe connected directly to cyclone

James N Neal 8-26-03
Signature/Date

9/11/03

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Test Run Field Data Sheet - PCDD/PCDF

Project no. 110249.2.001.05 Emission measurement location: Stack Outlet

Test run no. 6 Date(s): August 20, 2003 Train no. M23-2

Traverse Port-Point Number	Clock Time 24-hr	Cumulative Sampling Time, minutes	Dry Gas Meter Reading, (V_m), ft.³		Orifice Pressure Differential (ΔH), inches H_2O		Velocity Head, (Δp), inches H_2O	Gas Stream Temp., (t_s), °F	Dry Gas Meter Temperature (t_m), °F		Pump Vacuum, in. Hg	Impinger Outlet Temp., °F	Probe Outlet Temp., °F	Filter Holder Temp., °F	XAD Inlet Temp., °F	STL Outlet Temp., °F	Isokinetic Sampling Variation, percent
			Desired	Actual	Desired	Actual			Inlet	Outlet							
A13	9:53:00	198.00	833.044	833.170	1.899	2.000	1.950	127	104	100	12.0	57	249	257	48		100.7
A14	9:59:00	204.00	837.838	837.990	1.899	2.000	1.950	128	105	101	12.0	57	251	257	47		100.0
A15	10:05:00	210.00	842.706	842.860	1.954	2.000	2.000	127	106	102	12.0	58	251	257	46		99.5
A16	10:11:00	216.00	847.521	847.690	1.909	1.950	1.950	127	107	103	12.0	58	29	257	46		99.8
A17	10:17:00	222.00	852.406	852.490	1.961	2.000	2.000	127	108	104	12.0	57	251	257	45		97.7
A18	10:23:00	228.00	857.234	857.330	1.914	2.000	1.950	127	109	104	12.0	56	250	257	45		99.7
A19	10:29:00	234.00	862.070	862.170	1.918	2.000	1.950	127	110	105	12.0	56	249	257	45		99.5
A20	10:35:00	240.00	866.841	866.938	1.866	1.900	1.900	128	110	105	11.0	59	251	257	45		99.4

Remarks: Note: Any DGM reading above that is flagged with an asterisk was not taken at the precise time. Operator(s): Dave Griffin

9/11/03

8-26-03
Signature/Date

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Appendix B-2

Emissions Sample Recovery

40 *CFR* 60, APPENDIX A-7, METHOD 23 -
MODIFIED SEMIVOLATILE ORGANICS TRAIN (M23) FOR PCDDs/PCDFs
FIELD LABORATORY TRAIN SET-UP DATA

MRI Project No.: 110249.2.001
Client/Source: EPA / Ball Clay
Source Location: CBI
Sampling Location: Mill [redacted]

Run No. 1 Retest Sampling Train No. M23-1 Sample Box No. 1028
Set-up person(s): A. Sanders Date: 8/13/03

Transfer to Sampler
Relinquished By A. Sanders Received By M. Turner/J. Rosenfeld Date/Time 8/13/03 /04:40

TRAIN COMPONENT*	LOADING DATA
Sampling Nozzle (Quartz/Nickel)	N 7 0.249"
Heated Coupling and Teflon STL**	N/A
Filter Type/No. Whatman QM-A	23-1RE and 23-4 and 23-7
Condenser Thermocouple No.	XAD-1
XAD-2 Resin Cartridge spike date	8/8/03
XAD-2 Resin Cartridge Lab ID***	P3166-0007
Impinger Outlet Connector	OH-1

	Initial Weights (grams)**** Empty	Loaded
1st Impinger (500-mL or 2-L* KO), Empty	1237.6	XAD 413.7
1st Impinger Replacement** (KO), Empty	N/A	
2nd Impinger (MGBS), 100 mLs ASTM Type II Water	484.6	592.9
3rd Impinger (GBS), 100 mLs ASTM Type II Water	473.9	580.3
4th Impinger (MGBS), Empty	466.5	N/A
5th Impinger (MGBS), Si Gel	485.2	671.1
6th Impinger** (MGBS), Si Gel	510.2	714.4

COMMENTS:

Init Cal Ver
400 @ 400.2
500 @ 500.4
800 @ 800.4

Cont Cal Ver
500 @ 500.4

681.3 (3rd Si Gel)
692.9 (4th Si Gel)

* Before and after sampling: Nozzle openings covered with Teflon or pre-rinsed aluminum foil, and nozzle placed in Ziploc bag. Probe liner outlet sealed with glass female blank-off, and union sealed with Teflon plug. Cyclone/Bypass inlet covered (not sealed) with Teflon or pre-rinsed aluminum foil. Vertical traverse adapter (VTA) openings, filter holder outlet, and condenser inlet sealed with Teflon or glass blank-offs. Sample transfer line (STL) openings joined with glass/Teflon coupling used at filter holder outlet during sampling.

** Optional for moisture gas streams and/or special situations as applicable.

*** Cartridge weighed with blank-offs in place; then, cartridge covered with aluminum foil to seal out light during storage and sampling. Documentation of standards injection is separate. Cartridges are maintained at near 4° until use.

**** Initial weights of additional components exchanged during the run also entered here. All exchange component openings covered with Teflon or pre-rinsed aluminum foil or as described above.

9/11/03

40 *CFR* 60, APPENDIX A-7, METHOD 23 -
MODIFIED SEMIVOLATILE ORGANICS TRAIN (M23) FOR PCDDs/PCDFs
FIELD LABORATORY TRAIN SET-UP DATA

MRI Project No.: 110249.2.001
Client/Source: EPA / Ball Clay
Source Location: CBI
Sampling Location: Mill [redacted]

Run No. 2 Sampling Train No. M23-2 Sample Box No. 012003
Set-up person(s): A. Sanders Date: 8/14/03

Transfer to Sampler:
Relinquished By J. Hosenfeld Received By D. Griffin/D. Neal Date/Time 8/14/03 05:00

TRAIN COMPONENT*	LOADING DATA
Sampling Nozzle (Quartz/Nickel)	~~N13~~ N12 ~~0.183~~ 0.187
Heated Coupling and Teflon STL**	N/A
Filter Type/N, Whatman QM-A/Z	3-2
Condenser Thermocouple No.	XAD-2
XAD-2 Resin Cartridge spike date	8/8/03
XAD-2 Resin Cartridge Lab ID***	P3166-001
Impinger Outlet Connector	OH-12

	Initial Weights (grams)**** Empty	Loaded
1st Impinger (500-mL or 2-L** KO), Empty (XAD Cartridge)	879.3	XAD 406.9
1st Impinger Replacement** (KO), Empty	N/A	
2nd Impinger (MGBS), 100 mLs ASTM Type II Water	454.2	557.7
3rd Impinger (GBS), 100 mLs ASTM Type II Water	483.8	593.4
4th Impinger (MGBS), Empty	472.3	N/A
5th Impinger (MGBS), Si Gel	486.6	gd ~~676.9~~ 682.0
6th Impinger** (MGBS), Si Gel	488.4	676.9

COMMENTS:

Int Cal Wt
500 @ 500.5
400 @ 400.4
1000 @ 1001.0

Post Cal Wt
500 @ 500.4
400 @ 400.3
1000.0 @ 1000.8

* Before and after sampling: Nozzle openings covered with Teflon or pre-rinsed aluminum foil, and nozzle placed in Ziploc bag. Probe liner outlet sealed with glass female blank-off, and union sealed with Teflon plug. Cyclone/Bypass inlet covered (not sealed) with Teflon or pre-rinsed aluminum foil. Vertical traverse adapter (VTA) openings, filter holder outlet, and condenser inlet sealed with Teflon or glass blank-offs. Sample transfer line (STL) openings joined with glass/Teflon coupling used at filter holder outlet during sampling.

** Optional for moisture gas streams and/or special situations as applicable.

*** Cartridge weighed with blank-offs in place; then, cartridge covered with aluminum foil to seal out light during storage and sampling. Documentation of standards injection is separate. Cartridges are maintained at near 4° until use.

**** Initial weights of additional components exchanged during the run also entered here. All exchange component openings covered with Teflon or pre-rinsed aluminum foil or as described above.

8/11/03

40 *CFR* 60, APPENDIX A-7, METHOD 23 -
MODIFIED SEMIVOLATILE ORGANICS TRAIN (M23) FOR PCDDs/PCDFs
FIELD LABORATORY TRAIN SET-UP DATA

MRI Project No.: 110249.2.001
Client/Source: EPA / Ball Clay
Source Location: CBI
Sampling Location: Mill [redacted]

Run No. 3 Sampling Train No. M23-1 Sample Box No. 10288
Set-up person(s): Horsfield Date: 8/14/03 & 8/15/03

Transfer to Sampler:
Relinquished By Horsfield Received By Kuffel/Neal Date/Time 8/15/03 0530

TRAIN COMPONENT*	LOADING DATA	
Sampling Nozzle (Quartz/Nickel)	N12 ~~0.183~~ DA 0.187	
Heated Coupling and Teflon STL**	N/A	
Filter Type	Whatman QM-A / 23-6	
Condenser Thermocouple No.	XAD1	
XAD-2 Resin Cartridge spike date	8/8/03	
XAD-2 Resin Cartridge Lab ID***	P3166-004	
Impinger Outlet Connector	UH-1	
XAD cartridge	Initial Weights (grams)**** Empty	Loaded
		XAD 356.9
1st Impinger (500-mL or 2-L* KO), Empty	1246.3	
1st Impinger Replacement** (KO), Empty	NA	
2nd Impinger (MGBS), 100 mLs ASTM Type II Water	484.6	594.3
3rd Impinger (GBS), 100 mLs ASTM Type II Water	473.8	587.6
4th Impinger (MGBS), Empty	469.8	N/A
5th Impinger (MGBS), Si Gel	485.2	680.4
6th Impinger** (MGBS), Si Gel	490.0	703.7

COMMENTS:

Init Cal Ck
500 @ 500.3
400 @ 400.3
1000 @ 1000.7
200 @ 200.1

8/15/03 Check
500 @ 500.49
400 @ 400.39
200 @ 200.19

* Before and after sampling: Nozzle openings covered with Teflon or pre-rinsed aluminum foil, and nozzle placed in Ziploc bag. Probe liner outlet sealed with glass female blank-off, and union sealed with Teflon plug. Cyclone/Bypass inlet covered (not sealed) with Teflon or pre-rinsed aluminum foil. Vertical traverse adapter (VTA) openings, filter holder outlet, and condenser inlet sealed with Teflon or glass blank-offs. Sample transfer line (STL) openings joined with glass/Teflon coupling used at filter holder outlet during sampling.

** Optional for moisture gas streams and/or special situations as applicable.

*** Cartridge weighed with blank-offs in place; then, cartridge covered with aluminum foil to seal out light during storage and sampling. Documentation of standards injection is separate. Cartridges are maintained at near 4° until use.

**** Initial weights of additional components exchanged during the run also entered here. All exchange component openings covered with Teflon or pre-rinsed aluminum foil or as described above.

DA 9/11/03

40 *CFR* 60, APPENDIX A-7, METHOD 23 -
MODIFIED SEMIVOLATILE ORGANICS TRAIN (M23) FOR PCDDs/PCDFs
FIELD LABORATORY TRAIN SET-UP DATA

MRI Project No.: 110249.2.001
Client/Source: EPA / Ball Clay
Source Location: CBI
Sampling Location: Dryer [redacted]
Run No. ~~23~~ 4 Sampling Train No. 23-1 Sample Box No. 10288
Set-up person(s): A. Sanders Date:

Transfer to Sampler:
Relinquished By A. Sanders Received By D. Griffin Date/Time 8/18/03 05:40

TRAIN COMPONENT*	LOADING DATA
Sampling Nozzle (Quartz/Nickel)	N12 0.187"
Heated Coupling and Teflon STL**	~~0B N/A~~ 1104
Filter Type	Whatman QM-A 23-10
Condenser Thermocouple No.	XAD-1
XAD-2 Resin Cartridge spike date	8/8/03
XAD-2 Resin Cartridge Lab ID***	P3166-012
Impinger Outlet Connector	UH-1

	Initial Weights (grams)**** Empty	Loaded
XAD Cartridge 1st Impinger (500-mL or 2-L KO), Empty	1246.3	344.8
1st Impinger Replacement** (KO), Empty	N/A	
2nd Impinger (MGBS), 100 mLs ASTM Type II Water	484.6	596.4
3rd Impinger (GBS), 100 mLs ASTM Type II Water	473.8	582.4
4th Impinger (MGBS), Empty	469.8	N/A
5th Impinger (MGBS), Si Gel	485.2	706.3
6th Impinger** (MGBS), Si Gel	490.0	690.9

COMMENTS:

Init Cal Wts (g)	Post Cal Wts (g)
400 @ 400.3	400.3
500 @ 500.3	500.4
1000 @ 1000.6	1000.6

* Before and after sampling: Nozzle openings covered with Teflon or pre-rinsed aluminum foil, and nozzle placed in Ziploc bag. Probe liner outlet sealed with glass female blank-off, and union sealed with Teflon plug. Cyclone/Bypass inlet covered (not sealed) with Teflon or pre-rinsed aluminum foil. Vertical traverse adapter (VTA) openings, filter holder outlet, and condenser inlet sealed with Teflon or glass blank-offs. Sample transfer line (STL) openings joined with glass/Teflon coupling used at filter holder outlet during sampling.

** Optional for moisture gas streams and/or special situations as applicable.

*** Cartridge weighed with blank-offs in place; then, cartridge covered with aluminum foil to seal out light during storage and sampling. Documentation of standards injection is separate. Cartridges are maintained at near 4° until use.

**** Initial weights of additional components exchanged during the run also entered here. All exchange component openings covered with Teflon or pre-rinsed aluminum foil or as described above.

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40 *CFR* 60, APPENDIX A-7, METHOD 23 -
MODIFIED SEMIVOLATILE ORGANICS TRAIN (M23) FOR PCDDs/PCDFs
FIELD LABORATORY TRAIN SET-UP DATA

MRI Project No.: 110249.2.001
Client/Source: EPA / Ball Clay
Source Location: CBI
Sampling Location: Dryer [redacted]

Run No. 5 Sampling Train No. 23-1 Sample Box No. 10288
Set-up person(s): A. Sanders Date: 8/19/03

Transfer to Sampler:
Relinquished By A. Sanders Received By D. Griffin Date/Time 8/19/03 05:00

TRAIN COMPONENT*	LOADING DATA	
Sampling Nozzle (Quartz/Nickel)	012 0.187"	
Heated Coupling and Teflon STL**	1104	
Filter Type	Whatman QM-A/23-9	
Condenser Thermocouple No.	XAD-1	
XAD-2 Resin Cartridge spike date	8/8/03	
XAD-2 Resin Cartridge Lab ID***	P3166-010	
Impinger Outlet Connector	UH-1	
	Initial Weights (grams)**** Empty	Loaded
XAD Cartridge 1st Impinger (500-mL or 2-L KO), Empty	1246.3	1346.8
1st Impinger Replacement** (KO), Empty	N/A	
2nd Impinger (MGBS), 100 mLs ASTM Type II Water	484.6	596.3
3rd Impinger (GBS), 100 mLs ASTM Type II Water	473.8	581.9
4th Impinger (MGBS), Empty	468.2	N/A
5th Impinger (MGBS), Si Gel	485.2	711.4
6th Impinger** (MGBS), Si Gel	484.4	693.6

COMMENTS:

Imt	Cal Wts (g)	Post Cal Wts (g)
400 @	400.3	400.3
500 @	500.4	500.3
1,000 @	1000.8	1000.7

* Before and after sampling: Nozzle openings covered with Teflon or pre-rinsed aluminum foil, and nozzle placed in Ziploc bag. Probe liner outlet sealed with glass female blank-off, and union sealed with Teflon plug. Cyclone/Bypass inlet covered (not sealed) with Teflon or pre-rinsed aluminum foil. Vertical traverse adapter (VTA) openings, filter holder outlet, and condenser inlet sealed with Teflon or glass blank-offs. Sample transfer line (STL) openings joined with glass/Teflon coupling used at filter holder outlet during sampling.

** Optional for moisture gas streams and/or special situations as applicable.

*** Cartridge weighed with blank-offs in place; then, cartridge covered with aluminum foil to seal out light during storage and sampling. Documentation of standards injection is separate. Cartridges are maintained at near 4° until use.

**** Initial weights of additional components exchanged during the run also entered here. All exchange component openings covered with Teflon or pre-rinsed aluminum foil or as described above.

DST 9/11/03

40 *CFR* 60, APPENDIX A-7, METHOD 23 -
MODIFIED SEMIVOLATILE ORGANICS TRAIN (M23) FOR PCDDs/PCDFs
FIELD LABORATORY TRAIN SET-UP DATA

MRI Project No.: 110249.2.001
Client/Source: EPA / Ball Clay
Source Location: CBI
Sampling Location: Dryer [redacted]

Run No. 6 Sampling Train No. 23-2 Sample Box No. 012003
Set-up person(s): A. Sanders Date: 8/20/03

Transfer to Sampler:
Relinquished By A. Sanders Received By D. Griffin Date/Time 05:40 8/21/03

TRAIN COMPONENT*	LOADING DATA	
Sampling Nozzle (Quartz/Nickel)	N12 0.187"	
Heated Coupling and Teflon STL**	1104	
Filter Type	Whatman QM-A 23-8	
Condenser Thermocouple No.	XAD-1	
XAD-2 Resin Cartridge spike date	8/8/03	
XAD-2 Resin Cartridge Lab ID***	P3166-003	
Impinger Outlet Connector	UH-12	
	Initial Weights (grams)**** Empty	Loaded
XAD Cartridge 1st Impinger (500-mL or 2-L* KO), Empty	879.8	351.0
1st Impinger Replacement** (KO), Empty	N/A	
2nd Impinger (MGBS), 100 mLs ASTM Type II Water	471.8	571.9
3rd Impinger (GBS), 100 mLs ASTM Type II Water	483.9	583.5
4th Impinger (MGBS), Empty	483.8	N/A
5th Impinger (MGBS), Si Gel	480.6	697.5
6th Impinger** (MGBS), Si Gel	486.1	712.6

COMMENTS:

Init Cal Wts (g)	Post Cal Wts (g)
400 @ 400.1	400.3
500 @ 500.1	500.3
1000 @ 1000.5	1000.7

* Before and after sampling: Nozzle openings covered with Teflon or pre-rinsed aluminum foil, and nozzle placed in Ziploc bag. Probe liner outlet sealed with glass female blank-off, and union sealed with Teflon plug. Cyclone/Bypass inlet covered (not sealed) with Teflon or pre-rinsed aluminum foil. Vertical traverse adapter (VTA) openings, filter holder outlet, and condenser inlet sealed with Teflon or glass blank-offs. Sample transfer line (STL) openings joined with glass/Teflon coupling used at filter holder outlet during sampling.

** Optional for moisture gas streams and/or special situations as applicable.

*** Cartridge weighed with blank-offs in place; then, cartridge covered with aluminum foil to seal out light during storage and sampling. Documentation of standards injection is separate. Cartridges are maintained at near 4° until use.

**** Initial weights of additional components exchanged during the run also entered here. All exchange component openings covered with Teflon or pre-rinsed aluminum foil or as described above.

9/11/03

40 *CFR* 60, APPENDIX A-7, METHOD 23 -
MODIFIED SEMIVOLATILE ORGANICS TRAIN (M23) FOR PCDDs/PCDFs
FIELD LABORATORY TRAIN SET-UP DATA

MRI Project No.: 110249.2.001
Client/Source: EPA / Ball Clay
Source Location: CBI
Sampling Location: Dryer [redacted]

Run No. 05 & Blank Sampling Train No. M 23-2 Sample Box No. 012003
Set-up person(s): D Hoxsie Date: 8/15/03

Transfer to Sampler:
Relinquished By A. Sanders Received By D. Griffin Date/Time 8/18/03 05:10

TRAIN COMPONENT*	LOADING DATA	
Sampling Nozzle (Quartz/Nickel)	N7	
Heated Coupling and Teflon STL**	N/A	
Filter Type/No. Whatman QM-A/	23-7	
Condenser Thermocouple No.	XAD-2	
XAD-2 Resin Cartridge spike date	8/8/03	
XAD-2 Resin Cartridge Lab ID***	P3166-005	
Impinger Outlet Connector	UH-12	
	Initial Weights (grams)**** Empty	Loaded
XAD cartridge 1st Impinger (500-mL or 2-L** KO), Empty	879.8	XAD 347.4
1st Impinger Replacement** (KO), Empty	NA	
2nd Impinger (MGBS), 100 mLs ASTM Type II Water	471.8	571.9
3rd Impinger (GBS), 100 mLs ASTM Type II Water	483.9	583.6
4th Impinger (MGBS), Empty	454.1	N/A
5th Impinger (MGBS), Si Gel	480.6	697.2
6th Impinger** (MGBS), Si Gel	486.1	712.7

COMMENTS:

Initial Cal Wt	Post Cal Wt
500g @ 500.4	500.4
400g @ 400.3	400.3
1000g @ 1000.7	1000.7

* Before and after sampling: Nozzle openings covered with Teflon or pre-rinsed aluminum foil, and nozzle placed in Ziploc bag. Probe liner outlet sealed with glass female blank-off, and union sealed with Teflon plug. Cyclone/Bypass inlet covered (not sealed) with Teflon or pre-rinsed aluminum foil. Vertical traverse adapter (VTA) openings, filter holder outlet, and condenser inlet sealed with Teflon or glass blank-offs. Sample transfer line (STL) openings joined with glass/Teflon coupling used at filter holder outlet during sampling.

** Optional for moisture gas streams and/or special situations as applicable.

*** Cartridge weighed with blank-offs in place; then, cartridge covered with aluminum foil to seal out light during storage and sampling. Documentation of standards injection is separate. Cartridges are maintained at near 4° until use.

**** Initial weights of additional components exchanged during the run also entered here. All exchange component openings covered with Teflon or pre-rinsed aluminum foil or as described above.

9/1/03

40 *CFR* 60, APPENDIX A, METHOD 23 -
MODIFIED SEMIVOLATILE ORGANICS TRAIN (M23) FOR PCDDs/PCDFs
FIELD LABORATORY SAMPLE RECOVERY DATA

MRI Project No. 110249.2.001
Client/Source: EPA EMC OAQPS/EMAD/ Ball Clay Emissions
Source Location: CBI
Sampling Location: Mill [redacted]

Run No. Retest Sampling Train No. M23-1 Sample Box No. 10288
Transfer for Recovery:
Relinquished By DAlbritty Received By A. Sanders Date/Time 8/13/03 11:09
Sample box recovery person(s): A. Sanders / J. Rosenfeld Date: 8/13/03
Probe/STL recovery person(s): D. Griffin / D. Albritty Date: 8/13/03
Weights below are in grams.

RESIN CARTRIDGE AND IMPINGERS RECOVERY

Impinger:	XAD-2 Cartridge*	1st	~~Replacement~~ ~~of 1st~~ 2nd	3rd ~~2nd add~~	4th ~~3rd add~~	5th ~~4th add~~	6th ~~5th add~~	2nd Replacement 6th	
Final Wt.	419.1	1730.7	593.9	574.1	475.7	705.4	731.6	695.1	705.5
Initial Wt.	413.7	1239.6	592.9	580.3	466.5	671.1	714.4	681.3	692.9
Net Wt.	5.4	491.1	1.0	-6.2	9.2	34.3	16.6	13.8	12.6

[Total Condensate Collected: 577.8 grams]

Description and/or color: clear clear clear clear clear clear solid 10% 20%

⇒ ⇒ ⇒ ⇒ ⇒ ⇒ ⇒ Dispose of properly ⇐ ⇐ ⇐ ⇐ ⇐ ⇐ ⇐ ⇐ ⇐ %Blue % Blue

Cartridge* Sample Number: 1009

FILTER RECOVERY AND TRAIN RINSES

CYCLONE/FLASK ASSEMBLY:
Description/Color: N/A **

FILTER:
Sample Number: 1007 Description/Color: intact/white 3 Filters recovered

TRAIN RINSES:	ACETONE RINSES	QA RINSES
Sample Number:	1006	1010
Sample Bottle Tare Wt.	498.3	499.4
Sample Bottle Final Wt.	691.0	959.7
Net Sample Wt.	192.7	460.3

Components Rinsed***: Front -- nozzle, union, probe liner, cyclone/flask assembly or bypass, filter holder front;
Back -- filter support, filter holder back, 45/90° connector or short 90° connector, condenser

COMMENTS:

Int Cal Wt	Post Cal Wt
400 @ 400.3	
500 @ 500.4	500.4
1000 @ 1000.5	1000.6

9/11/03

* Replace blank-offs and remove aluminum foil, then weigh the cartridge; replace aluminum foil to cover the entire cartridge.
** If the particulate matter catch in the cyclone/flask assembly is large, transfer particulate matter to the filter container before performing rinses.
*** For ACETONE RINSES: Acetone rinses with brushing of front components 3 times or more until perceivably clean, and acetone rinses of back components 3 times, ~~and include 5-minute soaks of underlined components 3 times.~~
For QA RINSES: Follow with toluene rinses and soaks in the same manner as above for the acetone rinses.

M23RCV.WD, December 8, 1999 (rev. August 8, 2003)

40 *CFR* 60, APPENDIX A, METHOD 23 -
MODIFIED SEMIVOLATILE ORGANICS TRAIN (M23) FOR PCDDs/PCDFs
FIELD LABORATORY SAMPLE RECOVERY DATA

MRI Project No. 110249.2.001
Client/Source: EPA EMC OAQPS/EMAD/ Ball Clay Emissions
Source Location: CBI
Sampling Location: Mill [redacted]

Run No. 2 Sampling Train No. M23-2 Sample Box No. 012003
Transfer for Recovery:
Relinquished By Neal/Griffin Received By J. Stokesfield Date/Time 8/14/03 1030
Sample box recovery person(s): Griffin Turner for J. Stokesfield Date: 8/14/03
Probe/STL recovery person(s): Griffin Turner Date: 8/14/03
Weights below are in grams.

RESIN CARTRIDGE AND IMPINGERS RECOVERY

Impinger:	XAD-2 Cartridge*	1st	Replacement 1st	2nd	3rd	4th	5th	6th
Final Wt.	414.3	1168.1		557.6	594.9	475.4	701.9	686.1
Initial Wt.	406.9	879.3	NA	557.7	593.4	472.3	682.0	676.9
Net Wt.	7.4*	288.8		-0.1	1.5	3.1	19.9	9.2

* -1g H2O media leaked check

[Total Condensate Collected: ~~329.8~~ 328.8* grams]

Description and/or color: clear/cream clear ____ clear clear clear tot'd tot'd

⇒ ⇒ ⇒ ⇒ ⇒ ⇒ ⇒ Dispose of properly ⇐ ⇐ ⇐ ⇐ ⇐ ⇐ ⇐ ⇐ ⇐ 0%Blue 2% Blue

Cartridge* Sample Number: 2009

FILTER RECOVERY AND TRAIN RINSES

CYCLONE/FLASK ASSEMBLY:
Description/Color: N/A **

FILTER:
Sample Number: 2007 Description/Color: white/intact

TRAIN RINSES:	ACETONE RINSES	QA RINSES
Sample Number:	2006	** 2010
Sample Bottle Tare Wt.	~~500.3~~ 169.8	~~3499.5~~ 258.2 *
Sample Bottle Final Wt.	~~547.8~~ * see QA	~~3808.9~~ 579.3
Net Sample Wt.	~~47.5~~ 74 grams	~~309.4~~ 321.1

~ 60ml probe rinse added by suitable 8/14/03 acetone

Components Rinsed***: Front -- nozzle, union, probe liner, cyclone/flask assembly or bypass, filter holder front;
Back -- filter support, filter holder back, 45/90° connector or short 90° connector, condenser

COMMENTS:

Lab Wts (tested)
500g @ 500.4g
400g @ 400.3g
1000g @ 1000.8

Post Lab check
500g @ 500.5g
400g @ 400.4g

** Transferred sample to smaller bottle

* Replace blank-offs and remove aluminum foil, then weigh the cartridge; replace aluminum foil to cover the entire cartridge.
** If the particulate matter catch in the cyclone/flask assembly is large, transfer particulate matter to the filter container before performing rinses.
*** For ACETONE RINSES: Acetone rinses with brushing of front components 3 times or more until perceivably clean, and acetone rinses of back components 3 times, ~~and include 5-minute soaks of underlined components 3 times~~.
For QA RINSES: Follow with toluene rinses and soaks in the same manner as above for the acetone rinses.

9/11/03

M23RCV.WD, December 8, 1999 (rev. August 8, 2003)

40 *CFR* 60, APPENDIX A, METHOD 23 -
MODIFIED SEMIVOLATILE ORGANICS TRAIN (M23) FOR PCDDs/PCDFs
FIELD LABORATORY SAMPLE RECOVERY DATA

MRI Project No. 110248.2.001
Client/Source: EPA/ERD/OAQPS/BALL CLAY
Source Location: CRF
Sampling Location: MILL [redacted]

Run No. 3 Sampling Train No. M23-1 Sample Box No. 10288
Transfer for Recovery: ~~Griffin/Neal~~ 8/14/03
Relinquished By ~~Griffin/Neal~~ Received By ~~Griffin/Neal~~ A. Sanders Date/Time 8/14/03 ~~0550~~ 11:20
Sample box recovery person(s): A. Sanders Date: 8/15/03
Probe/STL recovery person(s): Griffin/Neal Date: 9/11/03
Weights below are in grams.

RESIN CARTRIDGE AND IMPINGERS RECOVERY

Impinger:	XAD-2 Cartridge*	1st	Replacement 1st	2nd	3rd	4th	5th	6th
Final Wt.	357.7	1513.1	—	603.2	582.4	473.9	709.8	715.0
Initial Wt.	356.9	1246.3	NA	~~594.3~~	~~581.6~~	① ~~N/A~~ ops	680.4	703.7
Net Wt.	0.8	266.8	—	8.9	0.8	4.1	29.4	11.3

[Total Condensate Collected: 322.1 grams]

Description and/or color: clear clear clear clear clear clear 1% 50%

Sample Recovery: Cartridge* → → → → → → → → Dispose of properly ← ← ← ← ← ← ← ← % Blue

Sample Number: 3009

FILTER RECOVERY AND TRAIN RINSES

CYCLONE/FLASK ASSEMBLY:
Sample Number: N/A Description/Color: N/A Gross Wt. N/A **

FILTER:
Sample Number: 3007 Description/Color: light grey / intact

TRAIN RINSES: FRONT/BACK QA RINSES

Sample Number: 3006 3010
Sample Bottle Tare Wt. ~~(**) 499.9~~ 255.7 497.8
Components Rinsed***: Front -- nozzle, union, probe liner, cyclone/flask assembly or bypass, filter holder front;
Back -- filter support, filter holder back, 45/90° connector or short 90° connector, condenser

Sample Bottle Final Wt. ~~(**) 740.0~~ 513.5 ~~955.6~~ ops 904.3
Net Sample Wt. 242.1 ~~357.8~~ ops 406.5

* Replace blank-offs and remove aluminum foil, then weigh the cartridge; replace aluminum foil to cover the entire cartridge.
** If the particulate matter catch in the cyclone/flask assembly is large, the sample may be left intact for transfer to the analytical laboratory for recovery. If the sample is not recovered in the field, weight the assembly before shipment.
*** For TRAIN FRONT/BACK RINSES: Acetone rinses with brushing of front components 3 times or more until perceivably clean, and acetone rinses of back components 3 times, ~~and include 5-minute soaks of underlined components 3 times~~.
For QA RINSES: Follow with toluene rinses and soaks in the same manner as above for the acetone rinses.

COMMENTS:
Init Cal Wt Post Cal
500 @ 500.4 500.4
700 @ 700.5 700.5
① 469.8
(**) Transferred to smaller sample bottle
9/11/03

M23RCV.WD, December 8, 1999 (rev. August 7, 2003)

40 *CFR* 60, APPENDIX A, METHOD 23 -
MODIFIED SEMIVOLATILE ORGANICS TRAIN (M23) FOR PCDDs/PCDFs
FIELD LABORATORY SAMPLE RECOVERY DATA

MRI Project No. 110249.2.001
Client/Source: EPA EMC/RTI/Ball Clay Facility
Source Location: CBI
Sampling Location: Dryer [redacted]

Run No. 4 Sampling Train No. 23-1 Sample Box No. 10288
Transfer for Recovery:
Relinquished By D. Griffin Received By A. Sanders Date/Time 8/18/03 13:00
Sample box recovery person(s): A. Sanders Date: 8/18/03
Probe/STL recovery person(s): D. Neal / D. Griffin Date: 8/18/03
Weights below are in grams.

RESIN CARTRIDGE AND IMPINGERS RECOVERY

Impinger:	XAD-2 Cartridge*	1st	Replacement 1st	2nd	3rd	4th	5th	6th
Final Wt.	349.3	1595.0	N/A	601.6	581.9	470.6	736.5	707.6
Initial Wt.	344.8	1246.3	N/A	596.4	582.4	469.8	706.3	690.9
Net Wt.	4.5	348.7	N/A	5.2	-0.5	0.8	30.2	16.7

[Total Condensate Collected: 405.6 grams]

Description and/or color: clear clear clear clear clear clear Sat'd (0%) 1%

Sample Recovery: Cartridge* → → → → → → → → Dispose of properly ← ← ← ← ← ← ← ← % Blue

Sample Number: 4004 (Lab ID P3166-012)

FILTER RECOVERY AND TRAIN RINSES

CYCLONE/FLASK ASSEMBLY:
Sample Number: N/A Description/Color: N/A Gross Wt. N/A **

FILTER: 4002
Sample Number: 4002 Description/Color: intact/white

TRAIN RINSES:	FRONT/BACK	QA RINSES
Sample Number:	4001	4005
Sample Bottle Tare Wt.	261.3	498.2
Sample Bottle Final Wt.	613.8	1015.0
Net Sample Wt.	352.5	516.8

Components Rinsed***: Front -- nozzle, union, probe liner, cyclone/flask assembly or bypass, filter holder front; Back -- filter support, filter holder back, 45/90° connector or short 90° connector, condenser

* Replace blank-offs and remove aluminum foil, then weigh the cartridge; replace aluminum foil to cover the entire cartridge.
** If the particulate matter catch in the cyclone/flask assembly is large, the sample may be left intact for transfer to the analytical laboratory for recovery. If the sample is not recovered in the field, weight the assembly before shipment.
*** For TRAIN FRONT/BACK RINSES: Acetone rinses with brushing of front components 3 times or more until perceivably clean, and acetone rinses of back components 3 times, ~~and include 5-minute soaks of underlined components 3 times.~~ SS
For QA RINSES: Follow with toluene rinses and soaks in the same manner as above for the acetone rinses.

COMMENTS: Init Cal CR (g)
500 @ 500.3
400 @ 400.1
1,000 @ 1,000.4

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40 *CFR* 60, APPENDIX A, METHOD 23 -
MODIFIED SEMIVOLATILE ORGANICS TRAIN (M23) FOR PCDDs/PCDFs
FIELD LABORATORY SAMPLE RECOVERY DATA

MRI Project No. 110299.2.001
Client/Source: EPA EMC/RTI/Ball Clay Facility
Source Location: CBI
Sampling Location: Dryer [redacted]

Run No. 5 Sampling Train No. 23-1 Sample Box No. 10288
Transfer for Recovery:
Relinquished By D. Griffin Received By A. Sanders Date/Time 8/19/03 10:55
Sample box recovery person(s): A. Sanders Date: 8/19/03
Probe/STL recovery person(s): D. Griffin/D. Neal Date: 8/19/03
Weights below are in grams.

RESIN CARTRIDGE AND IMPINGERS RECOVERY

Impinger:	XAD-2 Cartridge*	1st	Replacement 1st	2nd (*)	3rd (*)	4th	5th	6th
Final Wt.	351.8	1662.4	N/A	559.4	528.4	471.1	740.9	709.8
Initial Wt.	346.8	1246.3	N/A	596.3	581.9	468.2	711.4	693.6
Net Wt.	5.0	416.1	N/A	-36.9	-53.5	2.9	29.5	16.2

[Total Condensate Collected: 379.3 grams]

Description and/or color: clear clear clear clear clear clear 0% 10%

Sample Recovery: Cartridge* → → → → → → → → Dispose of properly ← ← ← ← ← ← ← ← % Blue

Sample Number: 5004

FILTER RECOVERY AND TRAIN RINSES

CYCLONE/FLASK ASSEMBLY:
Sample Number: N/A Description/Color: N/A Gross Wt. N/A **

FILTER:
Sample Number: 5002 Description/Color: intact/white w/few black specs

TRAIN RINSES:	FRONT/BACK	QA RINSES
Sample Number:	5001	5005
Sample Bottle Tare Wt.	259.3	500.5
Sample Bottle Final Wt.	620.1	1075.0
Net Sample Wt.	360.8	574.5

Components Rinsed***: Front -- nozzle, union, probe liner, cyclone/flask assembly or bypass, filter holder front; Back -- filter support, filter holder back, 45/90° connector or short 90° connector, condenser

* Replace blank-offs and remove aluminum foil, then weigh the cartridge; replace aluminum foil to cover the entire cartridge.
** If the particulate matter catch in the cyclone/flask assembly is large, the sample may be left intact for transfer to the analytical laboratory for recovery. If the sample is not recovered in the field, weight the assembly before shipment.
*** For TRAIN FRONT/BACK RINSES: Acetone rinses with brushing of front components 3 times or more until perceivably clean, and acetone rinses of back components 3 times, ~~and include 5-minute soaks of underlined components 3 times~~.
For QA RINSES: Follow with toluene rinses and soaks in the same manner as above for the acetone rinses.

COMMENTS: Init Cal Wt
400 @ 400.3
500 @ 500.3
1,000 @ 1000.7

(*) Not recovered in 2nd Imp as 73 mL and in 3rd Imp as 54 mL in graduated cylinder

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40 *CFR* 60, APPENDIX A, METHOD 23 -
MODIFIED SEMIVOLATILE ORGANICS TRAIN (M23) FOR PCDDs/PCDFs
FIELD LABORATORY SAMPLE RECOVERY DATA

MRI Project No. 110249.2.001
Client/Source: EPA EMC/RTI/Ball Clay Facility
Source Location: CBI
Sampling Location: Dryer [redacted]

Run No. 6 Sampling Train No. 23-2 Sample Box No. 012003
Transfer for Recovery:
Relinquished By D. Griffin Received By A. Sanders Date/Time 8/20/03 10:55
Sample box recovery person(s): A. Sanders Date: 8/20/03
Probe/STL recovery person(s): D. Griffin/G. Riley Date: 8/21/03
Weights below are in grams.

RESIN CARTRIDGE AND IMPINGERS RECOVERY

Impinger:	XAD-2 Cartridge*	1st	Replacement 1st	2nd	3rd	4th	5th	6th
Final Wt.	354.9	1202.5	N/A	571.1	586.0	487.6	728.5	727.0
Initial Wt.	351.0	879.8	N/A	571.9	583.5	483.8	697.5	712.6
Net Wt.	3.9	322.7	N/A	−0.8	2.5	3.8	31.0	14.4

[Total Condensate Collected: 377.5 grams]

Description and/or color: clear clear clear clear clear clear 0% 10%

Sample Recovery: Cartridge* → → → → → → → → Dispose of properly ← ← ← ← ← ← ← ← % Blue

Sample Number: 6004

FILTER RECOVERY AND TRAIN RINSES

CYCLONE/FLASK ASSEMBLY:
Sample Number: N/A Description/Color: N/A Gross Wt. N/A **

FILTER:
Sample Number: 6002 Description/Color: intact/white w/few black specs

TRAIN RINSES:	FRONT/BACK	QA RINSES
Sample Number:	6001	6005
Sample Bottle Tare Wt.	259.3	500.0
Components Rinsed***:	Front -- nozzle, union, probe liner, cyclone/flask assembly or bypass, filter holder front; Back -- filter support, filter holder back, 45/90° connector or short 90° connector, condenser	
Sample Bottle Final Wt.	613.9	1103.5 ~~1034.9~~
Net Sample Wt.	354.6	603.5

* Replace blank-offs and remove aluminum foil, then weigh the cartridge; replace aluminum foil to cover the entire cartridge.
** If the particulate matter catch in the cyclone/flask assembly is large, the sample may be left intact for transfer to the analytical laboratory for recovery. If the sample is not recovered in the field, weight the assembly before shipment.
*** For TRAIN FRONT/BACK RINSES: Acetone rinses with brushing of front components 3 times or more until perceivably clean, and acetone rinses of back components 3 times, ~~and include 5-minute soaks of underlined components 3 times.~~ SDS
For QA RINSES: Follow with toluene rinses and soaks in the same manner as above for the acetone rinses.

COMMENTS:

	Init Cal Ck	Post Calck
400	400.3	400.2
500	500.3	500.3
1000	1000.7	1000.6

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40 *CFR* 60, APPENDIX A, METHOD 23 -
MODIFIED SEMIVOLATILE ORGANICS TRAIN (M23) FOR PCDDs/PCDFs
FIELD LABORATORY SAMPLE RECOVERY DATA

MRI Project No. 110249.2.001
Client/Source: EPA EMC/RTI / Ball Clay Facility
Source Location: CBI
Sampling Location: Dryer [redacted]

Run No. Blank Sampling Train No. 23-2 Sample Box No. 012003
Transfer for Recovery:
Relinquished By D. Griffin Received By A. Sanders Date/Time 8/18/03 05:40
Sample box recovery person(s): A. Sanders Date: 8/18/03
Probe/STL recovery person(s): N/A Date: N/A
Weights below are in grams.

RESIN CARTRIDGE AND IMPINGERS RECOVERY

Impinger:	XAD-2 Cartridge*	1st	Replacement 1st	2nd	3rd	4th	5th	6th
Final Wt.	347.4	879.8	N/A	571.9	583.5	454.1	697.5	712.6
Initial Wt.	347.4	879.8	N/A	571.9	583.6	454.1	697.2	712.7
Net Wt.	0.0	0.0	N/A	0.0	-0.1	0.0	0.3	-0.1

[Total Condensate Collected: 0.1 grams]

Description and/or color:	clear	clear	clear	clear	clear	clear	100%	100%

Sample Recovery: Cartridge* → → → → → → → → → Dispose of properly ← ← ← ← ← ← ← ← % Blue

Sample Number: 1015 (P3166-005)

FILTER RECOVERY AND TRAIN RINSES

CYCLONE/FLASK ASSEMBLY:
Sample Number: N/A Description/Color: N/A Gross Wt. N/A **

FILTER:
Sample Number: 1014 Description/Color: intact/white

TRAIN RINSES:	FRONT/BACK	QA RINSES
Sample Number:	1011	1013
Sample Bottle Tare Wt.	258.3	499.9
Components Rinsed***:	Front -- nozzle, union, probe liner, cyclone/flask assembly or bypass, filter holder front; Back -- filter support, filter holder back, 45/90° connector or short 90° connector, condenser	
Sample Bottle Final Wt.	488.6	957.5
Net Sample Wt.	230.3	457.6

* Replace blank-offs and remove aluminum foil, then weigh the cartridge; replace aluminum foil to cover the entire cartridge.
** If the particulate matter catch in the cyclone/flask assembly is large, the sample may be left intact for transfer to the analytical laboratory for recovery. If the sample is not recovered in the field, weight the assembly before shipment.
*** For TRAIN FRONT/BACK RINSES: Acetone rinses with brushing of front components 3 times or more until perceivably clean, and acetone rinses of back components 3 times, ~~and include 5-minute soaks of underlined components 3 times.~~
For QA RINSES: Follow with toluene rinses and soaks in the same manner as above for the acetone rinses.

COMMENTS:
Init Cal Ck (g)
500 @ 500.3
1000 @ 1000.5
400 @ 400.2

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40 *CFR* 60, APPENDIX A-7, METHOD 23 -
MODIFIED SEMIVOLATILE ORGANICS TRAIN (M23) FOR PCDDs/PCDFs
FIELD REAGENT BLANK PREPARATION DATA

MRI Project No. 110249.2.001
Client/Source: EPA / Ball Clay
Source Location: CBI
Sampling Location:

Blank(s) Prepared By: A. Sanders Date: 8/18/03

Weights below are in grams.

Reagent Blank Description	Sample Number	Bottle Tare Weight	Bottle Gross Weight	Net Sample Weight
Acetone to be archived Volume needed: 400 mLs Lot Number: BV113	2011	260.9	551.8 ~~450.0~~ WB	290.9 ~~189.1~~ WB
Methylene chloride to be archived Volume needed: N/A mLs Lot Number: N/A	N/A	N/A	N/A	N/A
Toluene to be archived Volume needed: 200 mLs Lot Number: BN253	2013	260.3	495.0	234.7
Filter to be archived (1 Ea) Type: Whatman QM-A Lot Number:	2014	NA		
XAD Cartridge to be archived (1 Ea) Cartridge Number: 8316B-008	~~2015~~ WE 551.6g			
Vol needed: 200 mLs Milli-Q Water HPLC Lab 7/8/03	2016	260.1	513.0	252.9

NOTE: Lots may be identified above by a manufacturer's lot number or by the date of reagent preparation. If different lots of a particular reagent are used, indicate the applicable test and/or run number(s) and sampling location(s) where the train(s) loaded and/or recovered with that reagent are used (i.e., list each reagent blank sample number with the applicable test and/or run number(s) and sampling location(s) below).

Sample Number	For Test and/or Run Number(s)	For Sampling Location(s)

COMMENTS:
Samples are to be archived

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M23BLK.WPD December 9, 1999 (rev. August 5, 2003)

SAMPLE CONDITION AT FIELD LABORATORY

MRI Project No. :110249.2.001

Cooler Number	Cooler Temperature (°C)	Comments or Observations	Date	Time	Checked By:
XAD SU 1	4.5	- intact	8/11/03	0900	A Sanders
XAD SU 2	4.4	- intact	8/11/03	0905	A. Sanders
XAD SU1	4.7	OK	8/11/03	1840	A. Sanders
XAD SU2	4.6	OK	8/11/03	1840	A Sanders
XAD SU1	5.2	OK	8/12/03	0500	A Sanders
XAD SU2	6.5	OK	8/12/03	0500	A Sanders
XAD SU1	4.4	OK	8/12/03	1340	A Sanders
XAD SU2	5.7	OK	8/12/03	1340	A Sanders
XAD SU1	5.2	OK	8/13/03	0400	A Sanders
XAD SU2 (*)	~~4.3~~ 4.2	OK	8/13/03	0400	A Sanders
XAD SU3 (*)	4.4	OK	8/13/03	0630	A. Sanders
XAD SU1	4.3	OK	8/13/03	1320	A. Sanders
XAD SU3	4.1	OK	8/13/03	1320	A Sanders
XAD SU3	4.9	OK	8/14/03	0740	A. Sanders
XAD SU1	4.3	OK	8/14/03	0750	A. Sanders
XAD SU1	6.7	OK	8/14/03	1600	A. Sanders
XAD SU3	6.8	OK	8/14/03	1610	A. Sanders
XAD SU1	7.0	OK	8/14/03	0515	A. Sanders
(**) XAD SU3	3.5	OK	8/15/03	11:25	A Sanders
Rinses	2.6	OK	8/15/03	16:00	A Sanders
Filters	1.6	OK	8/15/03	16:10	A Sanders
XAD-1	5.7	OK	8/15/03	16:15	A Sanders
XAD SU 3	5.3	OK	8/15/03	16:20	A Sanders
Filters	5.9	OK	8/16/03	1025	A Sanders
XAD SU3	4.8	OK	8/16/03	10:30	A Sanders
XAD-1	3.6	OK	8/16/03	10:35	A Sanders
Rinses	~~5.~~ 4.9	OK	8/16/03	10:55	A Sanders
Rinses	4.1	OK	8/16/03	16:30	A Sanders
XAD SU3	5.3	OK	8/16/03	16:40	A Sanders
XAD ~~SU1~~ SU3	4.7	OK	8/16/03	16:50	A Sanders
Filters	4.3	OK	8/16/03	17:00	A Sanders
Rinses	5.2	OK	8/17/03	0930	A Sanders
XAD SU3	3.4		8/17/03	0935	A Sanders
XAD 1	4.6		8/17/03	0940	A Sanders

(*) Transferred 4 remaining XAD cartridges from XAD SU2 to new cooler, XAD SU3 8/13/03 at 0630

(**) Transferred all remaining cartridges from XAD SU1 to XAD SU3

8/11/03

SAMPLE CONDITION AT FIELD LABORATORY

MRI Project No. :110249.2.001

Cooler Number	Cooler Temperature (°C)	Comments or Observations	Date	Time	Checked By:
Filters	5.9	OK	8/17/03	0950	A Sanders
Filters	3.6	OK	8/17/03	1420	A Sanders
XAD-1	4.6	OK	8/17/03	1430	A Sanders
XADSU3	3.5	OK	8/17/03	1440	A Sanders
Rinses	4.3	OK	8/17/03	1450	A Sanders
BL1	5.5	OK	8/18/03	0800	A Sanders
Filters	5.8	OK	8/18/03	0805	A Sanders
XAD-1	7.5	OK	8/18/03	0810	A Sanders
XADSU3	3.9	OK	8/18/03	0815	A Sanders
Rinses	5.7	OK	8/18/03	0820	A Sanders
RGBL1	17.2	OK	8/18/03	11:30	A Sanders
Filters	2.9	OK	8/18/03	1455	A Sanders
XAD-1	4.2	OK	8/19/03	1500	A Sanders
XADSU3	3.4	OK	8/18/03	1505	A Sanders
BL1	5.1	OK	8/18/03	1510	A Sanders
Rinses	4.4	OK	8/18/03	1515	A Sanders
RGBL1	25.1	OK	8/18/03	15:20	A Sanders
RGBL1	21.6	OK	8/19/03	0605	A Sanders
Filters	4.8	OK	8/19/03	0610	A Sanders
XAD1	2.8	OK	8/19/03	0615	A Sanders
XADSU3	~~3.3~~ 5.7	OK	8/19/03	0620	A Sanders
BL1	4.4	OK	8/19/03	0625	A Sanders
Rinses	4.2	OK	8/19/03	0630	A Sanders
Filters	5.6	OK	8/19/03	1330	A Sanders
XAD-1	1.7	OK	8/19/03	1335	A Sanders
XADSU3	5.6	OK	8/19/03	1340	A Sanders
BL1	4.9	OK	8/19/03	1350	A Sanders
Rinses	2.3	OK	8/19/03	1400	A Sanders
RGBL1	20.5	OK	8/19/03	1405	A Sanders
RGBL1	22.1	OK	8/20/03	0900	A Sanders
Filters	4.3	OK	8/20/03	0905	A Sanders
XAD-1	2.7	OK	8/20/03	0920	A Sanders
XADSU3	1.0	OK	8/20/03	0925	A Sanders
BL1	4.0	OK	8/20/03	0935	A Sanders

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Sample Condition at Field Laboratory

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Cooler No.	Cooler Temp (°C)	Comments or Observations	Date	Time	Checked By:
Rinses	1.7	OK	8/20/03	0945	A Sanders
N/A	N/A	N/A	N/A	N/A	N/A
BL1	4.3	OK	8/20/03	1545	A Sanders
Rinses	4.5	OK	8/20/03	1550	A Sanders
XAD-1	1.7	OK	8/20/03	1555	A Sanders
Filters	4.3	OK	8/20/03	1600	A Sanders

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Appendix B-3

Ball Clay Sample Collection

Ball Clay Sample Collection Data Sheet
Process Sampling During Emission Test
MRI Project 110249.1.003

Source: [redacted]

Process: 1 = Mill

2 =

Sampling Location(s):
1 = Feed
2 = Product
3 =

Sample collection person(s):

SAMPLE NUMBER	Collection Date	Collection Time	COMMENTS
1111	8/13/03	11:25	
1112	8/13/03	11:25	
1121	8/13/03	11:45	
1122	8/13/03	11:45	
2111	8/14/03	10:40	
2112	8/14/03	10:40	
2121	8/14/03	10:53	
2122	8/14/03	10:53	
3111	8/15/03	10:55	
3112	8/15/03	10:55	
3121	8/15/03	11:05	
3122	8/15/03	11:05	

Duplicate samples were taken. Samples ending in "1" were retained by MRI, samples ending in "2" were given to Markus Cooke. Mark B. Turner

Ball Clay Sample Collection Data Sheet
Process Sampling During Emission Test
MRI Project 110249.1.003

Source: [redacted]

Process: 1 =

2 = Dryer

Sampling Location(s):
1 = Feed
2 = Product
3 =

Sample collection person(s):

SAMPLE NUMBER	Collection Date	Collection Time	COMMENTS
4211	8/18/03	1:00 pm	
4212	8/18/03	1:00 pm	
4221	8/18/03	1:05 pm	
4222	8/18/03	1:05 pm	
5211	8/19/03	11:10 am	
5212	8/19/03	11:10 am	
5221	8/19/03	11:15 am	
5222	8/19/03	11:15 am	
6211	8/20/03	11:10 am	
6212	8/20/03	11:10 am	
6221	8/20/03	11:17 am	
6222	8/20/03	11:17 am	

Duplicate samples were taken. Samples ending in "1" were retained by MRI, samples ending in "2" were given to Marcus Cooke. Mark B. Turner

Type & No. of Apparatus

No. XAD Module: 12
Resin Batch No.: 680

No. PUF: N/A
PUF Batch No.: N/A

Filter Size: 4.9 in.
No. Filters: sending box
Filter Batch No.: MRI Filters

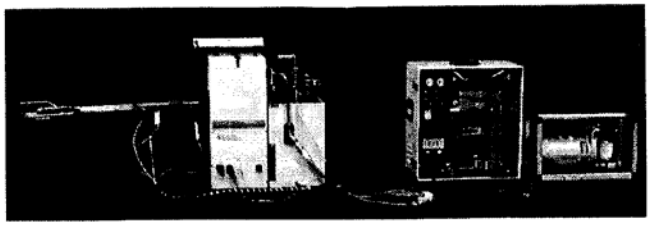
Spike Profile

Vol. PCDD/F: 20 µL (4 ng)
Solution ID: SID 2-24-7 ; 200 pg/µL
1.2402K-55 exp 04/13/05
Vol. HR_PAH: N/A
Solution ID: N/A

Vol. HR_PCB: N/A
Solution ID: N/A

Vol. LR_PAH: N/A
Solution ID: N/A

Vol. SVOST: N/A
Solution ID: N/A



Air Apparatus Shipping Request

AAP Project ID: P3166

Following sample recovery, please return this form with the field samples to:

ALTA ANALYTICAL PERSPECTIVES

2714 Exchange Drive
Wilmington, NC 28405

Ph.: 910-794-1613
Fax: 910-794-3919

Spiked by: KW Witnessed by: JCF
Date: 08/08/03

Client Information

Name: MRI
Contact Name: John Hosenfeld
Date Requested: 16 JUL 2003
Project No.: 110249.2.001.04

Date Required: 11 AUG 2003

Ship to: Attn: John Hosenfeld
Briarwood Inn.
16180 Highland Drive
McKenzie, TN 38201

Ph.: 731-352-1083
Fax: 816-531-0315

Carrier: (Fed_Ex) / UPS

Special Requirements

HR_D/Fs
ALSO SEND 30-8 OUNCE JARS
for Saturday delivery
add blue ice

Air Bill No.: _____

Date Shipped: _____

Note: 40 g of the same resin is spiked and stored at 4°C at Alta. This sample will serve as the method blank upon return of the field samples.

Appendix B-4

O_2 and CO_2 Analysis

O_2 Measurement System Calibration Data By Method 3A

Job No. 110249.2.001.04
Client: EPA / Ball clay
Plant: CBI
Location: Mill [redacted]

Operator: Daniel Neal
Date: August 13, 2003

Daniel Neal 9-9-03
Signature/Date

Analyzer Type: Magnetopneumatic
Analyzer Span: 25 %O_2 by volume
Zero Gas: Prepurified nitrogen
Cal. Gas Mixture: Oxygen in nitrogen

Analyzer Mfgr.: Servomex
Model No. 01440CISTD
Serial No. 1391

Analyzer Calibration Error Determination

Run No. 1-RE Test Condition:

Run Time: Start 5:30 End 10:48

Calibration Ending Time	Calibration Gas Concentration Level	Calibration Gas Value, %O_2	Calibration Gas Cylinder ID Number	Analyzer Response Value Following Calibration, %O_2	Gas Value - Analyzer Response Difference As % of Span	Cal. Error Check Result[a]
4:36	Zero Gas	0.00	3AA2400	-0.03	-0.12%	Pass
4:39	High-range	21.13	1L2234	21.24	0.44%	Pass
4:42	Mid-range	12.02	ALM036712	12.04	0.08%	Pass

a. Calibration error check must not exceed ±2% of the span value.

Measurement System Calibration Bias, Response Time, and Drift

Initial Bias and Response Time Determinations

Calibration Ending Time	Calibration Gas Concentration Level	Analyzer Response, %O_2	System Response, %O_2	Response Time[b], seconds	System Cal. Bias, % of Span	Bias Check Result[c]
4:46	Zero Gas	-0.03	-0.02	24	0.04%	Pass
4:49	Mid-range	12.04	12.07	24	0.12%	Pass

Final Bias and Drift Determinations

Calibration Ending Time	Calibration Gas Concentration Level	System Response, %O_2	System Cal. Bias, % of Span	Bias Check Result[c]	Drift, % of Span	Drift Check Result[d]
11:14	Zero Gas	-0.02	0.04%	Pass	0.00%	Pass
11:17	Mid-range	11.86	-0.72%	Pass	-0.84%	Pass

b. Response time check according to Method 3A. The longer time is used.

c. System bias check must not exceed ±5% of the span value.

d. Drift check must not exceed ±3% of the span value.

$$\text{System Calibration Bias} = \frac{\text{System Cal. Response - Analyzer Cal. Response}}{\text{Span}} \times 100$$

$$\text{Drift} = \frac{\text{Final System Cal. Response - Initial System Cal. Response}}{\text{Span}} \times 100$$

DN 9/11/03

Instrmds.xls [3A O2] 03/26/2001 (rev. Ball Clay Run 1Data Workbook.xls [3A O2] 9/9/2003 3:15 PM)

CO_2 Measurement System Calibration Data By Method 3A

Job No.	110249.2.001.04	Operator:	Daniel Neal
Client:	EPA / Ball clay	Date:	August 13, 2003
Plant:	CBI		
Location:	Mill[redacted]		James Neal 9-9-03 Signature/Date
Analyzer Type:	single beam, dual wavelength IR	Analyzer Mfgr.:	Servomex
Analyzer Span:	20 $\%CO_2$ by volume	Model No.	01440CISTD
Zero Gas:	Prepurified nitrogen	Serial No.	1382
Cal. Gas Mixture:	Carbon dioxide in nitrogen		

Analyzer Calibration Error Determination

Run No. 1-RE Test Condition:

Run Time: Start 5:30 End 10:48

Calibration Ending Time	Calibration Gas Concentration Level	Calibration Gas Value, $\%CO_2$	Calibration Gas Cylinder ID Number	Analyzer Response Value Following Calibration, $\%CO_2$	Gas Value - Analyzer Response Difference As % of Span	Cal. Error Check Result[a]
4:36	Zero Gas	0.00	3AA2400	-0.10	-0.50%	Pass
4:39	High-range	18.04	1L2234	17.81	-1.15%	Pass
4:42	Mid-range	10.05	ALM036712	10.29	1.20%	Pass

a. Calibration error check must not exceed ±2% of the span value.

Measurement System Calibration Bias, Response Time, and Drift

Initial Bias and Response Time Determinations

Calibration Ending Time	Calibration Gas Concentration Level	Analyzer Response, $\%CO_2$	System Response, $\%CO_2$	Response Time[b], seconds	System Cal. Bias, % of Span	Bias Check Result[c]
4:46	Zero Gas	-0.10	0.13	21	1.15%	Pass
4:49	Mid-range	10.29	10.05	20	-1.20%	Pass

Final Bias and Drift Determinations

Calibration Ending Time	Calibration Gas Concentration Level	System Response, $\%CO_2$	System Cal. Bias, % of Span	Bias Check Result[c]	Drift, % of Span	Drift Check Result[d]
11:14	Zero Gas	0.15	1.25%	Pass	0.10%	Pass
11:17	Mid-range	10.20	-0.45%	Pass	0.75%	Pass

b. Response time check according to Method 3A. The longer time is used.

c. System bias check must not exceed ±5% of the span value.

d. Drift check must not exceed ±3% of the span value.

$$\text{System Calibration Bias} = \frac{\text{System Cal. Response - Analyzer Cal. Response}}{\text{Span}} \times 100$$

$$\text{Drift} = \frac{\text{Final System Cal. Response - Initial System Cal. Response}}{\text{Span}} \times 100$$

9/11/03

CEMS Data - Dry Basis

Job No.	110249.1.001.04	**Operator:**	Daniel Neal D.N. 9-9-03
Client:	EPA / Ball Clay	**Date:**	August 13, 2003
Plant:	CBI	**Run No.**	1-RE
Location:	Mill [redacted]		

Time	O2 %	CO2 %	Time	O2 %	CO2 %
5:31	19.98	0.54	6:15	19.86	0.76
5:32	19.90	0.75	6:16	19.87	0.61
5:33	19.84	0.76	6:17	19.84	0.57
5:34	19.85	0.73	6:18	19.33	0.83
5:35	19.83	0.73	6:19	19.26	0.85
5:36	19.78	0.82	6:20	19.61	0.65
5:37	19.81	0.79	6:21	19.96	0.50
5:38	19.88	0.58	6:22	20.04	0.55
5:39	19.89	0.55	6:23	20.06	0.66
5:40	19.89	0.55	6:24	19.94	0.72
5:41	19.89	0.52	6:25	19.55	0.90
5:42	19.90	0.53	6:26	19.47	0.97
5:43	19.88	0.54	6:27	19.77	0.81
5:44	19.87	0.66	6:28	19.94	0.71
5:45	19.90	0.72	6:29	20.07	0.48
5:46	19.88	0.71	6:30	19.86	0.60
5:47	19.82	0.74	6:31	19.72	0.63
5:48	19.79	0.81	6:32	19.82	0.58
5:49	19.81	0.79	6:33	20.08	0.46
5:50	19.91	0.70	6:34	20.02	0.51
5:51	19.98	0.51	6:35	19.67	0.77
5:52	19.96	0.55	6:36	19.57	0.86
5:53	19.91	0.52	6:37	19.54	0.90
5:54	19.96	0.52	6:38	19.44	0.97
5:55	19.96	0.55	6:39	19.60	0.89
5:56	19.97	0.55	6:40	19.91	0.74
5:57	19.89	0.68	6:41	19.95	0.64
5:58	19.88	0.72	6:42	19.92	0.53
5:59	19.87	0.74	6:43	19.78	0.62
6:00	19.87	0.77	6:44	19.62	0.68
6:01	19.86	0.76	6:45	19.64	0.68
6:02	19.85	0.76	6:46	19.71	0.61
6:03	19.85	0.68	6:47	19.94	0.51
6:04	19.91	0.54	6:48	19.92	0.74
6:05	19.89	0.53	6:49	19.70	0.87
6:06	19.90	0.54	6:50	19.65	0.85
6:07	19.89	0.57	6:51	19.69	0.83
6:08	19.90	0.52	6:52	19.73	0.84
6:09	19.89	0.53	6:53	19.77	0.83
6:10	19.83	0.75	6:54	19.87	0.63
6:11	19.85	0.78	6:55	19.84	0.58
6:12	19.90	0.75	6:56	19.74	0.65
6:13	19.87	0.74	6:57	19.75	0.61
6:14	19.88	0.74	6:58	19.76	0.59

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CEMS Data - Dry Basis

Job No.	110249.1.001.04	**Operator:**	Daniel Neal D.N. 9-9-03
Client:	EPA / Ball Clay	**Date:**	August 13, 2003
Plant:	CBI	**Run No.**	1-RE
Location:	Mill [redacted]		

Time	O2 %	CO2 %
6:59	19.79	0.58
7:00	19.74	0.76
7:01	19.77	0.80
7:02	19.73	0.80
7:03	19.71	0.83
7:04	19.68	0.86
7:05	19.69	0.83
7:06	19.70	0.81
7:07	19.65	0.65
7:08	19.72	0.63
7:09	19.74	0.61
7:10	19.76	0.61
7:11	19.78	0.62
7:12	19.81	0.58
7:13	19.78	0.75
7:14	19.75	0.81
7:15	19.74	0.85
7:16	19.72	0.84
7:17	19.69	0.83
7:18	19.67	0.82
7:19	19.68	0.75
7:20	19.75	0.60
7:21	19.75	0.57
7:22	19.71	0.64
7:23	19.73	0.61
7:24	19.71	0.60
7:25	19.77	0.59
7:26	19.74	0.83
7:27	19.76	0.80
7:28	19.68	0.82
7:29	19.70	0.81
7:30	19.64	0.86
8:01	19.80	0.55
8:02	19.82	0.55
8:03	19.75	0.68
8:04	19.74	0.83
8:05	19.85	0.70
8:06	19.77	0.78
8:07	19.77	0.81
8:08	19.74	0.84
8:09	19.74	0.81
8:10	19.74	0.59
8:11	19.77	0.59
8:12	19.86	0.53
8:13	19.85	0.53
8:14	19.79	0.56
8:15	19.73	0.61
8:16	19.62	0.74
8:17	19.68	0.80
8:18	19.70	0.82
8:19	19.70	0.87
8:20	19.70	0.83
8:21	19.63	0.82
8:22	19.68	0.74
8:23	19.84	0.55
8:24	19.90	0.48
8:25	19.87	0.52
8:26	19.69	0.60
8:27	19.59	0.63
8:28	19.59	0.62
8:29	19.51	0.84
8:30	19.66	0.82
8:31	19.78	0.72
8:32	19.71	0.74
8:33	19.61	0.78
8:34	19.53	0.86
8:35	19.50	0.71
8:36	19.56	0.62
8:37	19.65	0.57
8:38	19.70	0.56
8:39	19.75	0.51
8:40	19.69	0.55
8:41	19.61	0.66
8:42	19.54	0.83
8:43	19.51	0.82
8:44	19.42	0.86
8:45	19.42	0.89
8:46	19.47	0.86
8:47	19.76	0.68
8:48	19.85	0.46
8:49	19.74	0.55
8:50	19.70	0.55
8:51	19.61	0.61
8:52	19.65	0.63
8:53	19.60	0.64
8:54	19.63	0.73
8:55	19.65	0.79
8:56	19.84	0.70

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CEMS Data - Dry Basis

Job No.	110249.1.001.04	**Operator:**	Daniel Neal D.N. 9-9-03
Client:	EPA / Ball Clay	**Date:**	August 13, 2003
Plant:	CBI	**Run No.**	1-RE
Location:	Mill [redacted]		

Time	O2 %	CO2 %
8:57	19.80	0.75
8:58	19.67	0.77
8:59	19.54	0.82
9:00	19.52	0.76
9:01	19.49	0.66
9:02	19.53	0.64
9:03	19.53	0.63
9:04	19.61	0.62
9:05	19.75	0.55
9:06	19.77	0.55
9:07	19.70	0.81
9:08	19.72	0.87
9:09	19.73	0.83
9:10	19.68	0.82
9:11	19.69	0.82
9:12	19.68	0.86
9:13	19.83	0.67
9:14	19.88	0.56
9:15	19.87	0.57
9:16	19.92	0.55
9:17	19.92	0.52
9:18	19.88	0.54
9:19	19.86	0.66
9:20	19.89	0.77
9:21	19.86	0.75
9:22	19.77	0.81
9:23	19.78	0.83
9:24	19.91	0.77
9:25	20.01	0.71
9:26	20.01	0.51
9:27	19.98	0.53
9:28	19.79	0.59
9:29	19.81	0.58
9:30	19.83	0.58
9:31	19.89	0.60
9:32	19.94	0.66
9:33	19.89	0.72
9:34	19.87	0.76
9:35	19.84	0.82
9:36	19.80	0.82
9:55	19.77	0.57
10:26	19.81	0.80
10:27	19.80	0.77
10:28	19.65	0.87
10:29	19.76	0.66
10:30	19.94	0.51
10:31	19.91	0.54
10:32	19.88	0.56
10:33	19.69	0.60
10:34	19.59	0.63
10:35	19.65	0.70
10:36	19.65	0.86
10:37	19.71	0.82
10:38	19.72	0.81
10:39	19.74	0.81
10:40	19.72	0.83
10:41	19.70	0.83
10:42	19.69	0.64
10:43	19.80	0.60
10:44	20.03	0.43
10:45	20.02	0.43
10:46	19.90	0.53
10:47	19.86	0.59
10:48	19.78	0.74
Average:	19.77	0.69
Minimum:	19.26	0.43
Maximum:	20.08	0.97

D* 9/11/03

O_2 Measurement System Calibration Data By Method 3A

Job No. 110249.2.001.04
Client: EPA / Ball clay
Plant: CBI
Location: Mill

Operator: Daniel Neal
Date: August 14, 2003
James Neal 9-9-03
Signature/Date

Analyzer Type: Magnetopneumatic
Analyzer Span: 25 $\%O_2$ by volume
Zero Gas: Prepurified nitrogen
Cal. Gas Mixture: Oxygen in nitrogen

Analyzer Mfgr.: Servomex
Model No. 01440CISTD
Serial No. 1391

Analyzer Calibration Error Determination

Run Time: Start 5:50 End 10:05

Run No. 2 Test Condition:

Calibration Ending Time	Calibration Gas Concentration Level	Calibration Gas Value, $\%O_2$	Calibration Gas Cylinder ID Number	Analyzer Response Value Following Calibration, $\%O_2$	Gas Value - Analyzer Response Difference As % of Span	Cal. Error Check Result[a]
4:23	Zero Gas	0.00	3AA2400	-0.04	-0.16%	Pass
4:28	High-range	21.13	1L2234	21.12	-0.04%	Pass
4:31	Mid-range	12.02	ALM036712	12.05	0.12%	Pass

a. Calibration error check must not exceed ±2% of the span value.

Measurement System Calibration Bias, Response Time, and Drift

Initial Bias and Response Time Determinations

Calibration Ending Time	Calibration Gas Concentration Level	Analyzer Response, $\%O_2$	System Response, $\%O_2$	Response Time[b], seconds	System Cal. Bias, % of Span	Bias Check Result[c]
4:34	Zero Gas	-0.04	0.03	24	0.28%	Pass
4:37	Mid-range	12.05	12.26	24	0.84%	Pass

Final Bias and Drift Determinations

Calibration Ending Time	Calibration Gas Concentration Level	System Response, $\%O_2$	System Cal. Bias, % of Span	Bias Check Result[c]	Drift, % of Span	Drift Check Result[d]
10:36	Zero Gas	-0.03	0.04%	Pass	-0.24%	Pass
10:39	Mid-range	12.10	0.20%	Pass	-0.64%	Pass

b. Response time check according to Method 3A. The longer time is used.
c. System bias check must not exceed ±5% of the span value.
d. Drift check must not exceed ±3% of the span value.

$$\text{System Calibration Bias} = \frac{\text{System Cal. Response - Analyzer Cal. Response}}{\text{Span}} \times 100$$

$$\text{Drift} = \frac{\text{Final System Cal. Response - Initial System Cal. Response}}{\text{Span}} \times 100$$

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CO_2 Measurement System Calibration Data By Method 3A

Job No. 110249.2.001.04
Client: EPA / Ball clay
Plant: CBI
Location: Mill [redacted]

Operator: Daniel Neal
Date: August 14, 2003
Signature/Date 9-9-03

Analyzer Type: single beam, dual wavelength IR
Analyzer Span: 20 $\%CO_2$ by volume
Zero Gas: Prepurified nitrogen
Cal. Gas Mixture: Carbon dioxide in nitrogen

Analyzer Mfgr.: Servomex
Model No. 01440CISTD
Serial No. 1382

Analyzer Calibration Error Determination

Run No. 2 Test Condition:

Run Time: Start 5:50 End 10:05

Calibration Ending Time	Calibration Gas Concentration Level	Calibration Gas Value, $\%CO_2$	Calibration Gas Cylinder ID Number	Analyzer Response Value Following Calibration, $\%CO_2$	Gas Value - Analyzer Response Difference As % of Span	Cal. Error Check Result[a]
4:23	Zero Gas	0.00	3AA2400	-0.02	-0.10%	Pass
4:28	High-range	18.04	1L2234	17.93	-0.55%	Pass
4:31	Mid-range	10.05	ALM036712	10.00	-0.25%	Pass

a. Calibration error check must not exceed ±2% of the span value.

Measurement System Calibration Bias, Response Time, and Drift

Initial Bias and Response Time Determinations

Calibration Ending Time	Calibration Gas Concentration Level	Analyzer Response, $\%CO_2$	System Response, $\%CO_2$	Response Time[b], seconds	System Cal. Bias, % of Span	Bias Check Result[c]
4:34	Zero Gas	-0.02	-0.15	21	-0.65%	Pass
4:37	Mid-range	10.00	9.82	20	-0.90%	Pass

Final Bias and Drift Determinations

Calibration Ending Time	Calibration Gas Concentration Level	System Response, $\%CO_2$	System Cal. Bias, % of Span	Bias Check Result[c]	Drift, % of Span	Drift Check Result[d]
10:36	Zero Gas	0.14	0.80%	Pass	1.45%	Pass
10:39	Mid-range	9.89	-0.55%	Pass	0.35%	Pass

b. Response time check according to Method 3A. The longer time is used.
c. System bias check must not exceed ±5% of the span value.
d. Drift check must not exceed ±3% of the span value.

$$\text{System Calibration Bias} = \frac{\text{System Cal. Response - Analyzer Cal. Response}}{\text{Span}} \times 100$$

$$\text{Drift} = \frac{\text{Final System Cal. Response - Initial System Cal. Response}}{\text{Span}} \times 100$$

9/11/03

CEMS Data - Dry Basis

Job No.	110249.1.001.04	**Operator:**	Daniel Neal D. N. 9-9-03
Client:	EPA / Ball Clay	**Date:**	August 14, 2003
Plant:	CBI	**Run No.**	2
Location:	Mill [redacted]		

Time	O2 %	CO2 %
5:51	19.64	0.63
5:52	19.61	0.63
5:53	19.56	0.69
5:54	19.51	0.87
5:55	19.55	0.88
5:56	19.67	0.81
5:57	19.74	0.78
5:58	19.78	0.75
5:59	19.72	0.84
6:00	19.73	0.63
6:01	19.65	0.61
6:02	19.58	0.63
6:03	19.65	0.61
6:04	19.70	0.59
6:05	19.84	0.54
6:06	19.83	0.64
6:07	19.75	0.75
6:08	19.70	0.78
6:09	19.56	0.82
6:10	19.54	0.87
6:11	19.57	0.85
6:12	19.66	0.80
6:13	19.83	0.54
6:14	19.81	0.54
6:15	19.79	0.52
6:16	19.77	0.55
6:17	19.74	0.56
6:18	19.67	0.64
6:19	19.63	0.74
6:20	19.62	0.81
6:21	19.74	0.79
6:22	19.80	0.79
6:23	19.82	0.74
6:24	19.73	0.78
6:25	19.69	0.73
6:26	19.63	0.64
6:27	19.65	0.62
6:28	19.77	0.56
6:29	19.81	0.57
6:30	19.85	0.54
6:31	19.90	0.50
6:32	19.72	0.76
6:33	19.62	0.83
6:34	19.49	0.93

Time	O2 %	CO2 %
6:35	19.59	0.83
6:36	19.60	0.83
6:37	19.74	0.80
6:38	19.78	0.65
6:39	19.84	0.54
6:40	19.79	0.55
6:41	19.75	0.61
6:42	19.59	0.62
6:43	19.61	0.61
6:44	19.62	0.66
6:45	19.69	0.83
6:46	19.78	0.77
6:47	19.81	0.74
6:48	19.81	0.72
6:49	19.65	0.84
6:50	19.40	0.93
6:51	19.59	0.69
6:52	19.71	0.62
6:53	19.77	0.59
6:54	19.79	0.54
6:55	19.73	0.57
6:56	19.69	0.60
6:57	19.58	0.77
6:58	19.54	0.86
6:59	19.50	0.88
7:00	19.60	0.84
7:01	19.63	0.83
7:02	19.68	0.82
7:03	19.73	0.77
7:04	19.76	0.59
7:05	19.74	0.57
7:06	19.70	0.58
7:07	19.63	0.61
7:08	19.62	0.65
7:09	19.67	0.64
7:10	19.69	0.77
7:11	19.64	0.82
7:12	19.66	0.83
7:13	19.69	0.82
7:14	19.70	0.81
7:15	19.64	0.84
7:16	19.67	0.76
7:17	19.69	0.60
7:18	19.70	0.59

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CEMS Data - Dry Basis

Job No.	110249.1.001.04	**Operator:**	Daniel Neal D.N. 9-9-03
Client:	EPA / Ball Clay	**Date:**	August 14, 2003
Plant:	CBI	**Run No.**	2
Location:	Mill [redacted]		

Time	O2 %	CO2 %
7:19	19.74	0.56
7:20	19.69	0.64
7:21	19.72	0.59
7:22	19.73	0.60
7:23	19.66	0.80
7:24	19.64	0.83
7:25	19.71	0.79
7:26	19.71	0.80
7:27	19.68	0.84
7:28	19.66	0.84
7:29	19.71	0.62
7:30	19.74	0.57
7:31	19.67	0.61
7:32	19.72	0.60
7:33	19.77	0.54
7:34	19.80	0.52
7:35	19.80	0.61
7:36	19.70	0.76
7:37	19.74	0.77
7:38	19.65	0.82
7:39	19.48	0.89
7:40	19.61	0.83
7:41	19.65	0.80
7:42	19.78	0.53
7:43	19.60	0.65
7:44	19.66	0.59
7:45	19.75	0.52
7:46	19.76	0.53
7:47	19.74	0.54
7:48	19.71	0.66
7:49	19.63	0.82
7:50	19.59	0.84
8:06	19.71	0.76
8:07	19.51	0.75
8:08	19.24	0.76
8:09	19.57	0.60
8:10	19.78	0.50
8:11	19.92	0.43
8:12	19.92	0.45
8:13	19.81	0.59
8:14	19.30	0.99
8:15	19.52	0.87
8:16	19.70	0.79
8:17	19.86	0.71

Time	O2 %	CO2 %
8:18	19.95	0.73
8:19	19.90	0.73
8:20	19.81	0.57
8:21	19.39	0.74
8:22	19.55	0.66
8:23	19.83	0.52
8:24	19.94	0.47
8:25	20.03	0.45
8:26	19.93	0.61
8:27	19.79	0.75
8:28	19.33	0.96
8:29	19.53	0.90
8:30	19.68	0.87
8:31	19.85	0.74
8:32	19.88	0.69
8:33	19.91	0.50
8:34	19.79	0.56
8:35	19.70	0.59
8:36	19.64	0.63
8:37	19.60	0.65
8:38	19.68	0.59
8:39	19.78	0.68
8:40	19.79	0.72
8:41	19.79	0.76
8:42	19.76	0.78
8:43	19.76	0.75
8:44	19.72	0.77
8:45	19.66	0.74
8:46	19.65	0.60
8:47	19.69	0.58
8:48	19.69	0.57
8:49	19.77	0.57
8:50	19.82	0.51
8:51	19.74	0.53
8:52	19.65	0.76
8:53	19.66	0.82
8:54	19.60	0.85
8:55	19.68	0.82
8:56	19.78	0.73
8:57	19.77	0.77
8:58	19.75	0.61
8:59	19.71	0.58
9:00	19.71	0.58
9:01	19.67	0.63

9/11/03

CEMS Data - Dry Basis

Job No.	110249.1.001.04	**Operator:**	Daniel Neal D.N. 9-9-03
Client:	EPA / Ball Clay	**Date:**	August 14, 2003
Plant:	CBI	**Run No.**	2
Location:	Mill [redacted]		

Time	O2 %	CO2 %
9:02	19.73	0.54
9:03	19.66	0.56
9:04	19.81	0.55
9:05	19.84	0.71
9:06	19.81	0.73
9:07	19.58	0.82
9:08	19.22	0.97
9:09	19.57	0.84
9:10	19.62	0.79
9:11	19.75	0.55
9:12	19.85	0.48
9:13	19.77	0.55
9:14	19.55	0.60
9:15	19.52	0.61
9:16	19.51	0.62
9:17	19.54	0.75
9:18	19.57	0.82
9:19	19.72	0.74
9:20	19.61	0.82
9:21	19.59	0.83
9:22	19.70	0.75
9:23	19.60	0.80
9:24	19.38	0.74
9:25	19.64	0.61
9:26	19.69	0.55
9:27	19.77	0.52
9:28	19.69	0.52
9:29	19.64	0.58
9:30	19.53	0.79
9:31	19.55	0.83
9:32	19.59	0.83
9:33	19.56	0.83
9:34	19.59	0.81
9:35	19.56	0.82
9:36	19.54	0.76
9:37	19.55	0.65
9:38	19.55	0.61
9:39	19.59	0.57
9:40	19.57	0.57
9:41	19.61	0.56
9:42	19.59	0.57
9:43	19.55	0.81
9:44	19.49	0.85
9:45	19.45	0.84
9:46	19.48	0.82
9:47	19.40	0.85
9:48	19.49	0.83
9:49	19.49	0.73
9:50	19.56	0.57
9:51	19.55	0.59
9:52	19.51	0.61
9:53	19.42	0.63
9:54	19.52	0.59
9:55	19.53	0.63
9:56	19.62	0.82
9:57	19.67	0.82
9:58	19.68	0.78
9:59	19.61	0.81
10:00	19.54	0.84
10:01	19.58	0.85
10:02	19.64	0.65
10:03	19.66	0.57
10:04	19.70	0.56
10:05	19.64	0.57
Average:	19.67	0.69
Minimum:	19.22	0.43
Maximum:	20.03	0.99

9/11/03

O_2 Measurement System Calibration Data By Method 3A

Job No.	110249.2.001.04	Operator:	Daniel Neal
Client:	EPA / Ball clay	Date:	August 15, 2003
Plant:	CBI		
Location:	Mill [redacted]		Signature/Date 9-9-03
Analyzer Type:	Magnetopneumatic	Analyzer Mfgr.:	Servomex
Analyzer Span:	25 $\%O_2$ by volume	Model No.	01440CISTD
Zero Gas:	Prepurified nitrogen	Serial No.	1391
Cal. Gas Mixture:	Oxygen in nitrogen		

Analyzer Calibration Error Determination

Run No. 3 Test Condition:

Run Time: Start 6:10 End 10:20

Calibration Ending Time	Calibration Gas Concentration Level	Calibration Gas Value, $\%O_2$	Calibration Gas Cylinder ID Number	Analyzer Response Value Following Calibration, $\%O_2$	Gas Value - Analyzer Response Difference As % of Span	Cal. Error Check Result[a]
5:03	Zero Gas	0.00	3AA2400	-0.13	-0.52%	Pass
5:07	High-range	21.13	1L2234	21.18	0.20%	Pass
5:10	Mid-range	12.02	ALM036712	12.04	0.08%	Pass

a. Calibration error check must not exceed ±2% of the span value.

Measurement System Calibration Bias, Response Time, and Drift

Initial Bias and Response Time Determinations

Calibration Ending Time	Calibration Gas Concentration Level	Analyzer Response, $\%O_2$	System Response, $\%O_2$	Response Time[b], seconds	System Cal. Bias, % of Span	Bias Check Result[c]
5:14	Zero Gas	-0.13	-0.04	24	0.36%	Pass
5:20	Mid-range	12.04	12.06	24	0.08%	Pass

Final Bias and Drift Determinations

Calibration Ending Time	Calibration Gas Concentration Level	System Response, $\%O_2$	System Cal. Bias, % of Span	Bias Check Result[c]	Drift, % of Span	Drift Check Result[d]
10:44	Zero Gas	-0.11	0.08%	Pass	-0.28%	Pass
10:47	Mid-range	11.88	-0.64%	Pass	-0.72%	Pass

b. Response time check according to Method 3A. The longer time is used.

c. System bias check must not exceed ±5% of the span value.

d. Drift check must not exceed ±3% of the span value.

$$\text{System Calibration Bias} = \frac{\text{System Cal. Response - Analyzer Cal. Response}}{\text{Span}} \times 100$$

$$\text{Drift} = \frac{\text{Final System Cal. Response - Initial System Cal. Response}}{\text{Span}} \times 100$$

9/11/03

CO_2 Measurement System Calibration Data By Method 3A

Job No. 110249.2.001.04
Client: EPA / Ball clay
Plant: CBI
Location: Mill [redacted]

Operator: Daniel Neal
Date: August 15, 2003
Signature/Date

Analyzer Type: single beam, dual wavelength IR
Analyzer Span: 20 $\%CO_2$ by volume
Zero Gas: Prepurified nitrogen
Cal. Gas Mixture: Carbon dioxide in nitrogen

Analyzer Mfgr.: Servomex
Model No. 01440CISTD
Serial No. 1382

Analyzer Calibration Error Determination

Run No. 3 Test Condition:

Run Time: Start 6:10 End 10:20

Calibration Ending Time	Calibration Gas Concentration Level	Calibration Gas Value, $\%CO_2$	Calibration Gas Cylinder ID Number	Analyzer Response Value Following Calibration, $\%CO_2$	Gas Value - Analyzer Response Difference As % of Span	Cal. Error Check Result[a]
5:03	Zero Gas	0.00	3AA2400	0.15	0.75%	Pass
5:07	High-range	18.04	1L2234	17.80	-1.20%	Pass
5:10	Mid-range	10.05	ALM036712	10.03	-0.10%	Pass

a. Calibration error check must not exceed ±2% of the span value.

Measurement System Calibration Bias, Response Time, and Drift

Initial Bias and Response Time Determinations

Calibration Ending Time	Calibration Gas Concentration Level	Analyzer Response, $\%CO_2$	System Response, $\%CO_2$	Response Time[b], seconds	System Cal. Bias, % of Span	Bias Check Result[c]
5:14	Zero Gas	0.15	0.13	21	-0.10%	Pass
5:20	Mid-range	10.03	9.90	20	-0.65%	Pass

Final Bias and Drift Determinations

Calibration Ending Time	Calibration Gas Concentration Level	System Response, $\%CO_2$	System Cal. Bias, % of Span	Bias Check Result[c]	Drift, % of Span	Drift Check Result[d]
10:44	Zero Gas	0.16	0.05%	Pass	0.15%	Pass
10:47	Mid-range	10.09	0.30%	Pass	0.95%	Pass

b. Response time check according to Method 3A. The longer time is used.
c. System bias check must not exceed ±5% of the span value.
d. Drift check must not exceed ±3% of the span value.

$$\text{System Calibration Bias} = \frac{\text{System Cal. Response - Analyzer Cal. Response}}{\text{Span}} \times 100$$

$$\text{Drift} = \frac{\text{Final System Cal. Response - Initial System Cal. Response}}{\text{Span}} \times 100$$

9/11/03

CEMS Data - Dry Basis

Job No.	110249.1.001.04	**Operator:**	Daniel Neal D. N. 9-9-03
Client:	EPA / Ball Clay	**Date:**	August 15, 2003
Plant:	CBI	**Run No.**	3
Location:	Mill [redacted]		

Time	O2 %	CO2 %	Time	O2 %	CO2 %
6:11	19.82	0.54	6:55	19.75	0.76
6:12	19.56	0.63	6:56	19.91	0.69
6:13	19.72	0.58	6:57	19.66	0.85
6:14	20.01	0.44	6:58	19.64	0.83
6:15	19.73	0.69	6:59	19.68	0.74
6:16	19.50	0.85	7:00	19.72	0.59
6:17	19.54	0.84	7:01	19.78	0.54
6:18	20.00	0.63	7:02	19.98	0.44
6:19	19.66	0.83	7:03	19.90	0.49
6:20	19.50	0.88	7:04	19.72	0.58
6:21	19.58	0.78	7:05	19.79	0.52
6:22	19.90	0.52	7:06	20.01	0.58
6:23	19.86	0.51	7:07	19.68	0.80
6:24	19.63	0.62	7:08	19.59	0.86
6:25	19.62	0.62	7:09	19.60	0.81
6:26	19.83	0.53	7:10	20.03	0.59
6:27	19.96	0.45	7:11	19.95	0.67
6:28	19.65	0.76	7:12	19.67	0.72
6:29	19.62	0.82	7:13	19.69	0.60
6:30	19.82	0.77	7:14	19.66	0.60
6:31	20.05	0.61	7:15	20.02	0.42
6:32	19.76	0.75	7:16	20.08	0.37
6:33	19.57	0.83	7:17	19.74	0.53
6:34	19.78	0.67	7:18	19.64	0.66
6:35	20.09	0.39	7:19	19.69	0.80
6:36	19.75	0.57	7:20	20.04	0.59
6:37	19.66	0.60	7:21	19.98	0.61
6:38	19.71	0.58	7:22	19.69	0.79
6:39	20.04	0.40	7:23	19.75	0.79
6:40	19.95	0.50	7:24	20.00	0.63
6:41	19.66	0.82	7:25	20.00	0.43
6:42	19.63	0.83	7:26	19.58	0.62
6:43	19.60	0.82	7:27	19.91	0.47
6:44	19.79	0.73	7:28	19.98	0.43
6:45	20.00	0.67	7:29	19.76	0.54
6:46	19.69	0.80	7:30	19.77	0.55
6:47	19.66	0.63	7:31	19.84	0.60
6:48	19.66	0.62	7:32	19.93	0.61
6:49	19.61	0.63	7:33	19.73	0.73
6:50	19.76	0.55	7:34	19.61	0.84
6:51	20.08	0.40	7:35	19.59	0.81
6:52	19.80	0.55	7:36	19.79	0.70
6:53	19.63	0.74	7:37	20.00	0.56
6:54	19.59	0.81	7:38	19.72	0.59

9/11/03

CEMS Data - Dry Basis

Job No.	110249.1.001.04	**Operator:**	Daniel Neal D.N. 9.9.03
Client:	EPA / Ball Clay	**Date:**	August 15, 2003
Plant:	CBI	**Run No.**	3
Location:	Mill [redacted]		

Time	O2 %	CO2 %	Time	O2 %	CO2 %
7:39	19.71	0.57	8:33	19.71	0.57
7:40	19.89	0.47	8:34	19.99	0.56
7:41	19.96	0.43	8:35	20.09	0.54
7:42	19.89	0.47	8:36	20.07	0.58
7:43	20.18	0.33	8:37	19.78	0.76
7:44	20.11	0.54	8:38	19.37	0.96
7:45	20.07	0.62	8:39	19.79	0.73
7:46	19.72	0.74	8:40	19.99	0.58
7:47	19.39	0.89	8:41	20.18	0.35
7:48	19.94	0.64	8:42	20.21	0.35
7:49	20.05	0.62	8:43	20.09	0.38
7:50	20.17	0.41	8:44	19.57	0.63
7:51	20.01	0.41	8:45	19.59	0.63
7:52	19.39	0.72	8:46	20.05	0.39
7:53	19.83	0.52	8:47	20.15	0.51
7:54	20.12	0.35	8:48	20.20	0.54
7:55	20.17	0.34	8:49	20.00	0.65
7:56	20.13	0.45	8:50	19.66	0.78
7:57	19.40	0.88	8:51	19.57	0.83
7:58	19.72	0.75	8:52	19.62	0.81
7:59	19.94	0.64	8:53	19.95	0.61
8:00	20.00	0.68	8:54	20.18	0.35
8:01	20.02	0.63	8:55	20.14	0.33
8:02	19.81	0.69	8:56	20.00	0.41
8:03	19.58	0.62	8:57	19.55	0.64
8:04	19.74	0.58	8:58	19.68	0.58
8:05	19.94	0.46	8:59	19.99	0.49
8:06	19.99	0.44	9:00	19.99	0.63
8:07	19.98	0.44	9:01	20.08	0.57
8:08	19.78	0.55	9:02	19.95	0.62
8:09	19.81	0.65	9:03	19.42	0.90
8:10	19.87	0.68	9:04	19.71	0.80
8:21	19.86	0.51	9:05	19.98	0.62
8:22	19.67	0.80	9:06	20.14	0.35
8:23	19.68	0.80	9:07	20.14	0.33
8:24	19.87	0.68	9:08	19.79	0.55
8:25	19.97	0.63	9:09	19.60	0.62
8:26	19.95	0.66	9:10	20.01	0.41
8:27	19.82	0.75	9:11	20.09	0.37
8:28	19.62	0.65	9:12	20.03	0.51
8:29	19.99	0.44	9:13	19.66	0.76
8:30	20.00	0.44	9:14	19.65	0.80
8:31	20.03	0.43	9:15	19.89	0.69
8:32	19.90	0.47	9:16	19.98	0.62

9/11/03

CEMS Data - Dry Basis

Job No.	110249.1.001.04
Client:	EPA / Ball Clay
Plant:	CBI
Location:	Mill [redacted]

Operator:	Daniel Neal D. N. 9-9-03
Date:	August 15, 2003
Run No.	3

Time	O2 %	CO2 %
9:17	20.05	0.57
9:18	19.95	0.59
9:19	19.70	0.60
9:20	19.94	0.47
9:21	20.08	0.36
9:22	20.04	0.40
9:23	19.82	0.50
9:24	19.75	0.52
9:25	19.96	0.61
9:26	20.00	0.61
9:27	19.81	0.71
9:28	19.53	0.81
9:29	19.69	0.74
9:30	19.85	0.68
9:31	20.00	0.51
9:32	19.96	0.43
9:33	19.80	0.50
9:34	19.67	0.57
9:35	19.93	0.45
9:36	20.00	0.41
9:37	19.94	0.49
9:38	19.76	0.73
9:39	19.83	0.69
9:40	19.91	0.63
9:41	19.90	0.66
9:42	19.83	0.74
9:43	19.79	0.72
9:44	19.93	0.45
9:45	20.03	0.41
9:46	20.02	0.43
9:47	19.80	0.51
9:48	19.80	0.53
9:49	19.93	0.44
9:50	19.97	0.54
9:51	19.90	0.64
9:52	19.60	0.82
9:53	19.70	0.79
9:54	19.80	0.71
9:55	19.85	0.66
9:56	19.84	0.62
9:57	19.81	0.55
9:58	19.80	0.53
9:59	19.96	0.44
10:00	19.98	0.42

Time	O2 %	CO2 %
10:01	19.93	0.47
10:02	19.76	0.52
10:03	19.66	0.76
10:04	19.79	0.72
10:05	19.94	0.65
10:06	20.00	0.61
10:07	19.76	0.71
10:08	19.78	0.73
10:09	19.78	0.63
10:10	19.92	0.47
10:11	19.98	0.43
10:12	19.98	0.44
10:13	20.06	0.35
10:14	20.03	0.39
10:15	19.82	0.55
10:16	19.74	0.76
10:17	19.88	0.65
10:18	19.96	0.62
10:19	20.00	0.61
10:20	19.95	0.64
Average:	19.84	0.60
Minimum:	19.37	0.33
Maximum:	20.21	0.96

9/11/03

ORSAT ANALYSIS DATA SHEET
(Dry Molecular Weight Determination)

Plant	CBI	Sampling Location	DRYER STACK
Date	8-18-03	Run Number	4
Operator	DANIEL NEAL	Analytical Method (fyrite, orsat, monitor)	
Sampling Time	13:06	Sample Type (bag, integrated, continuous)	

Sorbing Reagents: _____ (CO_2) _____ (O_2) _____ (CO)

GAS \ RUN	Run 1 Actual Reading	Run 1 Net	Run 2 Actual Reading	Run 2 Net	Run 3 Actual Reading	Run 3 Net	Average Net Volume	Multiplier	Molecular Weight Fraction of Stack Gas (Dry Basis) lb/lb-mole
CO_2	.3	.3	.3	.3	.3	.3	.3	0.44	0.132
O_2 (Net is actual O_2 reading minus actual CO_2 reading)	20.0	19.7	20.0	19.7	20.0	19.7	19.7	0.32	6.304
CO (Net is actual CO reading minus actual O_2 reading)								0.28	
N_2 (Net is 100 minus actual CO reading)								0.28	

TOTAL = 6.436

Comments: _____

9/11/03

ORSAT ANALYSIS DATA SHEET
(Dry Molecular Weight Determination)

Plant	CBI	Sampling Location	DRYER STACK
Date	8-19-03	Run Number	5
Operator	DANIEL NEAL	Analytical Method (fyrite, orsat, monitor)	
Sampling Time	11:04	Sample Type (bag, integrated, continuous)	

Sorbing Reagents: _____ (CO_2) _____ (O_2) _____ (CO)

GAS / RUN	Run 1 Actual Reading	Run 1 Net	Run 2 Actual Reading	Run 2 Net	Run 3 Actual Reading	Run 3 Net	Average Net Volume	Multiplier	Molecular Weight Fraction of Stack Gas (Dry Basis) lb/lb-mole
CO_2	.2	.2	.2	.2	.2	.2	.2	0.44	0.088
O_2 (Net is actual O_2 reading minus actual CO_2 reading)	19.7	19.7	19.9	19.7	19.9	19.7	19.7	0.32	6.304
CO (Net is actual CO reading minus actual O_2 reading)								0.28	
N_2 (Net is 100 minus actual CO reading)								0.28	

TOTAL =

Comments: _____

9/11/03

ORSAT ANALYSIS DATA SHEET
(Dry Molecular Weight Determination)

Plant	CBI	Sampling Location	Dryer 2 Stack
Date	8-20-03	Run Number	6
Operator	Daniel Neal	Analytical Method (fyrite, orsat, monitor)	
Sampling Time	10:55	Sample Type (bag, integrated, continuous)	

Sorbing Reagents: _____ (CO_2) _____ (O_2) _____ (CO)

RUN / GAS	Run 1 Actual Reading	Run 1 Net	Run 2 Actual Reading	Run 2 Net	Run 3 Actual Reading	Run 3 Net	Average Net Volume	Multiplier	Molecular Weight Fraction of Stack Gas (Dry Basis) lb/lb-mole
CO_2	.2	.2	.2	.2	.2	.2	.2	0.44	0.088
O_2 (Net is actual O_2 reading minus actual CO_2 reading)	20.0	19.8	20.0	19.8	~~19.8~~ 20.0	19.8	19.8	0.32	6.336
CO (Net is actual CO reading minus actual O_2 reading)								0.28	
N_2 (Net is 100 minus actual CO reading)								0.28	

TOTAL =

Comments: _____

9/11/03

OXYGEN AND CARBON DIOXIDE BY ORSAT

PROJECT NO. 110249.2.001.05 RUN NO. N/A Field Calibration

SAMPLE NO. N/A DATE 8-18-03

PLANT SAMPLING LOCATION Dryer Stack

ANALYSIS TIME (24hr-CLOCK) 0820

SAMPLE TYPE (BAG, GRAB) Lab Room Air

OPERATOR D. Neal

ORSAT LEAK CHECK BEFORE ANALYSIS:

BURETTE Pass CHANGE IN 4 MIN.

PIPETTES Pass CHANGE IN 4 MIN.

ORSAT LEAK CHECK AFTER ANALYSIS:

BURETTE Pass CHANGE IN 4 MIN.

PIPETTES Pass CHANGE IN 4 MIN.

RUN / GAS	1		2		3		AVERAGE NET VOLUME
	ACTUAL READING	NET	ACTUAL READING	NET	ACTUAL READING	NET	
CO_2	1 2 N/A 3		1 2 3		1 2 3		
O_2 (NET IS SECOND READING MINUS ACTUAL CO_2 READING)	1 20.3 2 20.8 3 20.8	20.8	1 20.8 2 20.8 3 20.8	20.3	1 20.8 2 20.3 3 20.8	20.8	20.8

91-16 SEV SURMAN wksht 052191

Acceptance Criteria

CO_2	> 4%	.3% by Volume	O_2	≥ 15%	.2% by Volume
	≤ 4%	.2% by Volume		< 15%	.3% by Volume

Comments:

Appendix C

Field Sampling Equipment Calibration Records

Appendix C-1

Pre-Test Calibration Records

M5 Console Pre-Calibration Checklist

Job No. 110249.2.001.04 Date August 6, 2003

Console No. N7 Performed By Darrel Sprague

(Place an "X" in the space provided after the required checks are performed.)

1. X Perform positive leak check of Delta H manometer.

Procedure for positive leak check Delta H manometer:

1. Pump **must not** be run prior to this test. Pump needs to be cool in order to get an accurate reading.
2. Pump pressure and vacuum lines must be connected to console.
3. Null switch on console must be in the down position so solenoid valve is open to the sampling stream as it is during testing.
4. Plug meter exhaust and clamp off bottom tube from exhaust which goes to the Orsat pump.
5. Plug sample orifice.
6. Close main flow control valve.
7. Open fine control valve.
8. Disconnect right side Delta H manometer tube on front of console.
9. Blow into tubing until manometer reads 5 to 7 inches of water, and clamp off. There should be no change in manometer reading.
10. **Be certain to remove plug and clamp from meter exhaust immediately after this test to avoid damage to the meter pump when pump is started up!**

2. X Leak check Delta P manometer.
3. N/A Clean pump
4. X Clean muffler jar(s).
5. X Inspect/refill oiler jar.
6. X Calibrate DGM thermocouples:

		Reference Pyrometer °F	Console Pyrometer °F
(Note: Reading must be within +/-2.5°F	DGM Inlet:	79.4	80.0
	DGM Outlet:	79.4	80.0

7. X Digital clock/timer in place and functional.
8. X Vacuum check. (Leak check at 25 in. Hg. Vacuum. Leak rate should be zero)
9. x Check indicator lights
10. X Check thermocouple switches.
11. X Check fan.
12. X Check pump heater.
13. X check heat controllers.
14. X Check Orsat pump and rotameter.

If any of the above items were replaced or repaired, please document that information below:

Signature: Darrel Sprague Date: 8-6-03

ANEROID BAROMETER CALIBRATION CHECK

Location:	Kansas City, Missouri
Altitude Above Sea Level:	850 feet
Latitude:	39° 05.8' north
Meteorological Gravity:	32.1525 feet/second^2
Mercury Barometer Description:	Sargent Welch, Cat. S-4519, Lot 791802000

MRI Project No.	110249.2.001.04	
Date:	37840	
Time:	10:21	
Readings Obtained By:	Daniel Neal	Daniel Neal 8-7-03
Observed Barometer Reading:	29.33	in. Hg
Mercury Column Temperature:	81	°F
Correction For Temperature:	-0.14	in. Hg
Correction For Gravity:	-0.02	in. Hg
Corrected Barometric Pressure:	29.17	in. Hg

Aneroid Barometer I.D. No.:	X-4029	
Reading Before Adjustment:	29.18	in. Hg
Calibration Check Result:	within 0.1 in. Hg	
Reading After Adjustment:	29.18	in. Hg

Remarks:

MERCURY BAROMETER PRESSURE READING CORRE

Location:	Kansas City, Missouri
Altitude Above Sea Level:	850 feet
Latitude:	39° 05.8' north
Meteorological Gravity:	32.1525 feet/second²
Mercury Barometer Description:	Sargent Welch, Cat. S-4519, Lc

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MRI Project No.	110249.2.001.04	
Date:	August 6, 2003	
Time:	0.647916667	
Readings Obtained By:	Darrel Sprague	
Observed Barometer Reading:	29.24	in. Hg
Mercury Column Temperature:	81	°F
Correction For Temperature:	-0.14	in. Hg
Correction For Gravity:	-0.02	in. Hg
Corrected Barometric Pressure:	29.08	in. Hg

Remarks:

Signature: Darrel Sprague Date: 8-6-03

BAROMETR.xls 10/27/99 (rev. N7 Pretest Calibration Workbook.xls 8/7/2003 3:14 PM)

M5 Console Calibration Worksheet

Job No.	110249.2.001.04	Metering Console No.	N7
Date	August 6, 2003	Previous Dry Gas Meter Factor (Y):	1.002
Operator	Darrel Sprague	Calibrated Critical Orifice No.	D24
Barometer	29.08 in. Hg.	Critical Orifice Coefficient in English Units (K'):	0.6417
		Ambient Temperature Meter No.	81.0

Note: Prior to running calibration, connect mercury manometer to sample orifice. Turn on pump and bring mercury manometer up to 18.0 in. Hg. Record mercury manometer and console vacuum gauge readings below. Insert critical orifice into console sample orifice. Set console vacuum gauge at 18.0 in. Hg. +/- the console vacuum gauge correction factor calculated below.

Mercury manometer readings: 8.4 + 8.6 = 18.00 in. Hg.

Console vacuum gauge reading: 17.00 in. Hg.

console vacuum gauge correction factor: 1.00 in. Hg.

		RUN # 1	RUN # 2	RUN # 3
DGM Initial Volume:	Initial:	678.798	687.172	695.573
	Final:	687.172	695.573	703.965
DGM Inlet Temperature:	Initial:	83	84	87
	Final:	83	86	87
DGM Outlet Temperature:	Initial:	81	81	83
	Final:	81	82	82
Time of run (In seconds):		600	600	600
Orifice Delta H (in. H_2O):		2.15	2.15	2.15
Room Temperature:	Initial:	80.8	81.2	81.8
	Final:	81.4	81.4	82.4
Pump Vacuum (in. Hg.):		18.0	18.0	18.0

Signature: Darrel Sprague Date: 8-6-03

METHOD 5 METERING CONSOLE CALIBRATION WITH CRITICAL ORIFICE

MRI Project No.	110249.2.001.04	Metering Console No.	N7
Date:	August 6, 2003	Previous Dry Gas Meter Factor (Y):	1.002
Operator:	Darrel Sprague	Calibrated Critical Orifice No.	D24
		Critical Orifice Coefficient in English Units (K'):	0.64170
		Ambient Temperature Meter No.	81.0

	Run 1	Run 2	Run 3
CALIBRATION GAS VOLUME DATA			
Initial Dry Gas Meter Gas Volume, ft.³	678.798	687.172	695.573
Final Dry Gas Meter Gas Volume, ft.³	687.172	695.573	703.965
Net Dry Gas Meter Gas Volume (V_m), ft.³	8.374	8.401	8.392
CALIBRATION CONDITIONS DATA			
Dry Gas Meter Temperature, °F:			
Initial Inlet Temperature, °F	83.0	84.0	87.0
Final Inlet Temperature, °F	83.0	86.0	87.0
Initial Outlet Temperature, °F	81.0	81.0	83.0
Final Outlet Temperature, °F	81.0	82.0	82.0
Average Dry Gas Meter Temperature (t_m), °F	82.0	83.3	84.8
Time, seconds	600	600	600
Orifice Meter ΔH, inches H_2O	2.15	2.15	2.15
Barometric Pressure, in. Hg	29.08	29.08	29.08
Critical Orifice Inlet (Ambient) Temperature, °F:			
Initial Ambient Temperature, °F	80.8	81.2	81.8
Final Ambient Temperature, °F	81.4	81.4	82.4
Avg. Critical Orifice Inlet Temperature (t_{amb}), °F	81.1	81.3	82.1
Pump Vacuum, in. Hg	18.0	18.0	18.0
COMPUTED CALIBRATION RESULTS			
Critical Orifice Gas Volume ($V_{cr\ (std)}$), standard ft.³	8.025	8.023	8.017
Dry Gas Meter Gas Volume ($V_{m\ (std)}$), standard ft.³	7.971	7.979	7.948
Dry Gas Meter Calibration Factor (Y)	1.007	1.006	1.009
Orifice Meter ΔH@	1.798	1.794	1.792
AVERAGE CALIBRATION RESULTS			
Average Dry Gas Meter Calibration Factor (Y)	**1.007**		
Average Orifice Meter ΔH@	**1.794**		
CALIBRATION RESULTS COMPARISON			
Criterion: Y Must Be Within 2% Of Average Y			
Percent Difference Of Y From Average Y	0.03%	0.14%	0.17%
Tolerance Result	**PASS**	**PASS**	**PASS**
COMPARISON WITH PRETEST RESULTS			
Criterion: Y Must Be Within 5% Of Previous Y			
% Difference Of Average Y From Previous Y	0.50%		
Tolerance Result	**PASS**		

Y = 1.006970645564950

Remarks:

Signature: Darrel Sprague Date: 8-6-03

CRORCALB.xls 10/29/99 (rev. N7 Console Calibration Workbook.xls 8/7/2003 3:11 PM)

M5 Console Critical Orifice Bracketing Worksheet

MRI Project No.	110249.2.001.04	Critical Orifice Being Evaluated	**D24**
Date:	August 6, 2003	First Critical Orifice No.	**D30**
Operator:	Darrel Sprague	Coefficient (K'):	0.8202
Metering Console No.	N7	Second Critical Orifice No.	**D21**
Dry Gas Meter Factor (Y):	1.006970646	Coefficient (K'):	0.5693
Orifice Used for the Calibration:	D24	**Note: Critical orifice coefficients are in English units.**	
Ambient Temperature Meter No.	81.0		

Note: Prior to running calibration, connect mercury manometer to sample orifice. Turn on pump and bring mercury manometer up to 18.0 in. Hg. Record mercury manometer and console vacuum gauge readings below. Insert critical orifice into console sample orifice. Set console vacuum gauge at 18.0 in. Hg. +/- the console vacuum gauge correction factor calculated below.

Mercury manometer readings: 8.4 + 8.6 = 18.00 in. Hg.

Console vacuum gauge reading: 17.00 in. Hg.

console vacuum gauge correction factor: 1.00 in. Hg.

		RUN # 1	RUN # 2
DGM Initial Volume:	Initial:	709.302	720.400
	Final:	720.057	727.855
DGM Inlet Temperature:	Initial:	88	88
	Final:	90	89
DGM Outlet Temperature:	Initial:	84	85
	Final:	84	86
Time of run (In seconds):		600	600
Orifice Delta H (in. H_2O):		3.50	1.70
Room Temperature:	Initial:	82.0	83.0
	Final:	82.8	82.6
Pump Vacuum (in. Hg.):		18.0	18.0

Signature: Darrel Sprague Date: 8-6-03

METHOD 5 METERING CONSOLE CALIBRATION
CRITICAL ORIFICE BRACKETING DATA

MRI Project No.	110249.2.001.04
Date:	August 6, 2003
Operator:	Darrel Sprague
Metering Console No.	N7
Dry Gas Meter Factor (Y):	1.007
Orifice Used for the Calibration:	D24
Ambient Temperature Meter No.	81.0

Note: Critical orifice coefficients are in English units.

Critical Orifice Being Evaluated	
Critical Orifice No.	**D24**
Critical Orifices Used For Bracketing	
First Orifice	
Critical Orifice No.	**D30**
Coefficient (K'):	0.82020
Second Orifice	
Critical Orifice No.	**D21**
Coefficient (K'):	0.56930

	First Orifice	Second Orifice
CALIBRATION GAS VOLUME DATA		
Initial Dry Gas Meter Gas Volume, ft^3	709.302	720.400
Final Dry Gas Meter Gas Volume, ft^3	720.057	727.855
Net Dry Gas Meter Gas Volume (V_m), ft^3	10.755	7.455
CALIBRATION CONDITIONS DATA		
Dry Gas Meter Temperature, °F:		
Initial Inlet Temperature, °F	88.000	88.000
Final Inlet Temperature, °F	90.000	89.000
Initial Outlet Temperature, °F	84.000	85.000
Final Outlet Temperature, °F	84.000	86.000
Average Dry Gas Meter Temperature (t_m), °F	86.5	87.0
Time, seconds	600.000	600.000
Orifice Meter ΔH, inches H_2O	3.500	1.700
Barometric Pressure, in. Hg	29.08	29.08
Critical Orifice Inlet (Ambient) Temperature, °F:		
Initial Ambient Temperature, °F	82.000	83.000
Final Ambient Temperature, °F	82.800	82.600
Average Critical Orifice Inlet Temperature (t_{amb}), °F	82.4	82.8
Pump Vacuum, in. Hg	18.000	18.000
COMPUTED CALIBRATION RESULTS		
Critical Orifice Gas Volume ($V_{cr\,(std)}$), standard ft^3	10.244	7.108
Dry Gas Meter Gas Volume ($V_{m\,(std)}$), standard ft^3	10.188	7.024
Factor (Y) Obtained With Bracketing Orifice	1.006	1.012
CRITICAL ORIFICE ACCEPTABILITY		
Criterion: All Ys Must Be Within 2% Of All Other Ys		
Larger % Difference Between Dry Gas Meter Factor (Y)		
And Factor (Y) Obtained With The Bracketing Orifice	0.14%	0.50%
Larger % Difference Between Factors (Ys)		
Obtained With Bracketing Orifices	0.64%	
Acceptability Result	**All Orifices Are Acceptable**	

Remarks:

Signature: Darrel Sprague Date: 8-6-03

M5 Console Pre-Calibration Checklist

Job No. 110249.2.001.04 Date August 7, 2003

Console No. N12 Performed By Darrel Sprague

(Place an "X" in the space provided after the required checks are performed.)

1. X Perform positive leak check of Delta H manometer.

Procedure for positive leak check Delta H manometer:

1. Pump **must not** be run prior to this test. Pump needs to be cool in order to get an accurate reading.
2. Pump pressure and vacuum lines must be connected to console.
3. Null switch on console must be in the down position so solenoid valve is open to the sampling stream as it is during testing.
4. Plug meter exhaust and clamp off bottom tube from exhaust which goes to the Orsat pump.
5. Plug sample orifice.
6. Close main flow control valve.
7. Open fine control valve.
8. Disconnect right side Delta H manometer tube on front of console.
9. Blow into tubing until manometer reads 5 to 7 inches of water, and clamp off. There should be no change in manometer reading.
10. **Be certain to remove plug and clamp from meter exhaust immediately after this test to avoid damage to the meter pump when pump is started up!**

2. X Leak check Delta P manometer.
3. N/A Clean pump
4. X Clean muffler jar(s).
5. X Inspect/refill oiler jar.
6. X Calibrate DGM thermocouples:

		Reference Pyrometer °F	Console Pyrometer °F
(Note: Reading must be within +/-2.5°F	DGM Inlet:	78.4	78.0
	DGM Outlet:	78.8	78.0

7. X Digital clock/timer in place and functional.
8. X Vacuum check. (Leak check at 25 in. Hg. Vacuum. Leak rate should be zero)
9. x Check indicator lights
10. X Check thermocouple switches.
11. X Check fan.
12. X Check pump heater.
13. X check heat controllers.
14. X Check Orsat pump and rotameter.

If any of the above items were replaced or repaired, please document that information below:

Signature: Darrel Sprague Date: 8-7-03

MERCURY BAROMETER PRESSURE READING CORRE

Location:	Kansas City, Missouri
Altitude Above Sea Level:	850 feet
Latitude:	39° 05.8' north
Meteorological Gravity:	32.1525 feet/second²
Mercury Barometer Description:	Sargent Welch, Cat. S-4519, Lc

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MRI Project No.	110249.2.001.04	
Date:	August 7, 2003	
Time:	13:14	
Readings Obtained By:	Darrel Sprague	
Observed Barometer Reading:	29.30	in. Hg
Mercury Column Temperature:	81	°F
Correction For Temperature:	-0.14	in. Hg
Correction For Gravity:	-0.02	in. Hg
Corrected Barometric Pressure:	29.14	in. Hg

Remarks:

Signature: Darrel Sprague Date: 8-7-03

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M5 Console Calibration Worksheet

Job No.	110249.2.001.04	Metering Console No.	N12
Date	August 7, 2003	Previous Dry Gas Meter Factor (Y):	0.987
Operator	Darrel Sprague	Calibrated Critical Orifice No.	D24
Barometer	29.14 in. Hg.	Critical Orifice Coefficient in English Units (K'):	0.6417
		Ambient Temperature Meter No.	81.0

Note: Prior to running calibration, connect mercury manometer to sample orifice. Turn on pump and bring mercury manometer up to 18.0 in. Hg. Record mercury manometer and console vacuum gauge readings below. Insert critical orifice into console sample orifice. Set console vacuum gauge at 18.0 in. Hg. +/- the console vacuum gauge correction factor calculated below.

Mercury manometer readings: 9.0 + 9.2 = 18.00 in. Hg.

Console vacuum gauge reading: 18.20 in. Hg.

console vacuum gauge correction factor: -0.20 in. Hg.

		RUN # 1	RUN # 2	RUN # 3
DGM Initial Volume:	Initial:	692.500	701.076	709.459
	Final:	701.076	709.459	718.028
DGM Inlet Temperature:	Initial:	79	81	93
	Final:	80	82	84
DGM Outlet Temperature:	Initial:	78	82	79
	Final:	78	79	80
Time of run (In seconds):		600	600	600
Orifice Delta H (in. H_2O):		2.15	2.15	2.15
Room Temperature:	Initial:	80.8	82.1	82.0
	Final:	81.6	81.8	81.6
Pump Vacuum (in. Hg.):		18.0	18.0	18.0

Signature: Darrel Sprague Date: 8-7-03

METHOD 5 METERING CONSOLE CALIBRATION WITH CRITICAL ORIFICE

MRI Project No.	110249.2.001.04	Metering Console No.	**N12**
Date:	August 7, 2003	Previous Dry Gas Meter Factor (Y):	0.987
Operator:	Darrel Sprague	Calibrated Critical Orifice No.	D24
		Critical Orifice Coefficient in English Units (K'):	0.64170
		Ambient Temperature Meter No.	81.0

	Run 1	Run 2	Run 3
CALIBRATION GAS VOLUME DATA			
Initial Dry Gas Meter Gas Volume, ft.³	692.500	701.076	709.459
Final Dry Gas Meter Gas Volume, ft.³	701.076	709.459	718.028
Net Dry Gas Meter Gas Volume (V_m), ft.³	8.576	8.383	8.569
CALIBRATION CONDITIONS DATA			
Dry Gas Meter Temperature, °F:			
Initial Inlet Temperature, °F	79.0	81.0	93.0
Final Inlet Temperature, °F	80.0	82.0	84.0
Initial Outlet Temperature, °F	78.0	82.0	79.0
Final Outlet Temperature, °F	78.0	79.0	80.0
Average Dry Gas Meter Temperature (t_m), °F	78.8	81.0	84.0
Time, seconds	600	600	600
Orifice Meter ΔH, inches H_2O	2.15	2.15	2.15
Barometric Pressure, in. Hg	29.14	29.14	29.14
Critical Orifice Inlet (Ambient) Temperature, °F:			
Initial Ambient Temperature, °F	80.8	82.1	82.0
Final Ambient Temperature, °F	81.6	81.8	81.6
Avg. Critical Orifice Inlet Temperature (t_{amb}), °F	81.2	82.0	81.8
Pump Vacuum, in. Hg	18.0	18.0	18.0
COMPUTED CALIBRATION RESULTS			
Critical Orifice Gas Volume ($V_{cr\,(std)}$), standard ft.³	8.040	8.035	8.036
Dry Gas Meter Gas Volume ($V_{m\,(std)}$), standard ft.³	8.230	8.011	8.144
Dry Gas Meter Calibration Factor (Y)	0.977	1.003	0.987
Orifice Meter ΔH@	1.805	1.800	1.790
AVERAGE CALIBRATION RESULTS			
Average Dry Gas Meter Calibration Factor (Y)	**0.989**		
Average Orifice Meter ΔH@	**1.798**		
CALIBRATION RESULTS COMPARISON			
Criterion: Y Must Be Within 2% Of Average Y			
Percent Difference Of Y From Average Y	1.21%	1.42%	0.22%
Tolerance Result	**PASS**	**PASS**	**PASS**
COMPARISON WITH PRETEST RESULTS			
Criterion: Y Must Be Within 5% Of Previous Y			
% Difference Of Average Y From Previous Y	0.19%		
Tolerance Result	**PASS**		

Y = 0.988901187083774

Remarks:

Signature: Darrel Sprague Date: 8-7-03

CRORCALB.xls 10/29/99 (rev. N12_Console Calibration Workbook.xls 8/7/2003 3:10 PM)

M5 Console Pre-Calibration Checklist

Job No. 110249.2.001.04 Date August 7, 2003

Console No. N13 Performed By Darrel Sprague

(Place an "X" in the space provided after the required checks are performed.)

1. X Perform positive leak check of Delta H manometer.

Procedure for positive leak check Delta H manometer:

1. Pump **must not** be run prior to this test. Pump needs to be cool in order to get an accurate reading.
2. Pump pressure and vacuum lines must be connected to console.
3. Null switch on console must be in the down position so solenoid valve is open to the sampling stream as it is during testing.
4. Plug meter exhaust and clamp off bottom tube from exhaust which goes to the Orsat pump.
5. Plug sample orifice.
6. Close main flow control valve.
7. Open fine control valve.
8. Disconnect right side Delta H manometer tube on front of console.
9. Blow into tubing until manometer reads 5 to 7 inches of water, and clamp off. There should be no change in manometer reading.
10. **Be certain to remove plug and clamp from meter exhaust immediately after this test to avoid damage to the meter pump when pump is started up!**

2. X Leak check Delta P manometer.
3. N/A Clean pump
4. X Clean muffler jar(s).
5. X Inspect/refill oiler jar.
6. X Calibrate DGM thermocouples:

		Reference Pyrometer °F	Console Pyrometer °F
(Note: Reading must be within +/-2.5°F	DGM Inlet:	78.8	80.0
	DGM Outlet:	78.8	80.0

7. NO Digital clock/timer in place and functional.
8. X Vacuum check. (Leak check at 25 in. Hg. Vacuum. Leak rate should be zero)
9. x Check indicator lights
10. X Check thermocouple switches.
11. X Check fan.
12. X Check pump heater.
13. X check heat controllers.
14. X Check Orsat pump and rotameter.

If any of the above items were replaced or repaired, please document that information below:

Signature: Darrel Sprague Date: 8-7-03

MERCURY BAROMETER PRESSURE READING CORRE

Location:	Kansas City, Missouri
Altitude Above Sea Level:	850 feet
Latitude:	39° 05.8' north
Meteorological Gravity:	32.1525 feet/second²
Mercury Barometer Description:	Sargent Welch, Cat. S-4519, Lc

MRI Project No.	110249.2.001.04	
Date:	August 7, 2003	
Time:	14:53	
Readings Obtained By:	Darrel Sprague	
Observed Barometer Reading:	29.30	in. Hg
Mercury Column Temperature:	81	°F
Correction For Temperature:	-0.14	in. Hg
Correction For Gravity:	-0.02	in. Hg
Corrected Barometric Pressure:	29.14	in. Hg

Remarks:

Signature: Darrel Sprague Date: 8-07-03

BAROMETR.xls 10/27/99 (rev. N13 Pretest Calibration Workbook.xls 8/7/2003 3:07 PM)

M5 Console Calibration Worksheet

Job No.	110249.2.001.04	Metering Console No.	N13
Date	August 7, 2003	Previous Dry Gas Meter Factor (Y):	0.987
Operator	Darrel Sprague	Calibrated Critical Orifice No.	D24
Barometer	29.14 in. Hg.	Critical Orifice Coefficient in English Units (K'):	0.6417
		Ambient Temperature Meter No.	81.0

Note: Prior to running calibration, connect mercury manometer to sample orifice. Turn on pump and bring mercury manometer up to 18.0 in. Hg. Record mercury manometer and console vacuum gauge readings below. Insert critical orifice into console sample orifice. Set console vacuum gauge at 18.0 in. Hg. +/- the console vacuum gauge correction factor calculated below.

Mercury manometer readings: 8.8 + 8.9 = 18.00 in. Hg.

Console vacuum gauge reading: 17.70 in. Hg.

console vacuum gauge correction factor: 0.30 in. Hg.

		RUN # 1	RUN # 2	RUN # 3
DGM Initial Volume:	Initial:	337.000	345.523	353.207
	Final:	345.523	353.207	361.765
DGM Inlet Temperature:	Initial:	80	83	85
	Final:	82	84	87
DGM Outlet Temperature:	Initial:	79	80	81
	Final:	80	80	81
Time of run (In seconds):		600	540	600
Orifice Delta H (in. H_2O):		2.15	2.15	2.15
Room Temperature:	Initial:	80.6	82.2	82.8
	Final:	81.4	82.4	83.8
Pump Vacuum (in. Hg.):		18.0	18.0	18.0

Signature: Darrel Sprague Date: 8-7-03

METHOD 5 METERING CONSOLE CALIBRATION WITH CRITICAL ORIFICE

MRI Project No.	110249.2.001.04	Metering Console No.	N13
Date:	August 7, 2003	Previous Dry Gas Meter Factor (Y):	0.987
Operator:	Darrel Sprague	Calibrated Critical Orifice No.	D24
		Critical Orifice Coefficient in English Units (K'):	0.64170
		Ambient Temperature Meter No.	81.0

	Run 1	Run 2	Run 3
CALIBRATION GAS VOLUME DATA			
Initial Dry Gas Meter Gas Volume, ft^3	337.000	345.523	353.207
Final Dry Gas Meter Gas Volume, ft^3	345.523	353.207	361.765
Net Dry Gas Meter Gas Volume (V_m), ft^3	8.523	7.684	8.558
CALIBRATION CONDITIONS DATA			
Dry Gas Meter Temperature, °F:			
Initial Inlet Temperature, °F	80.0	83.0	85.0
Final Inlet Temperature, °F	82.0	84.0	87.0
Initial Outlet Temperature, °F	79.0	80.0	81.0
Final Outlet Temperature, °F	80.0	80.0	81.0
Average Dry Gas Meter Temperature (t_m), °F	80.3	81.8	83.5
Time, seconds	600	540	600
Orifice Meter ΔH, inches H_2O	2.15	2.15	2.15
Barometric Pressure, in. Hg	29.14	29.14	29.14
Critical Orifice Inlet (Ambient) Temperature, °F:			
Initial Ambient Temperature, °F	80.6	82.2	82.8
Final Ambient Temperature, °F	81.4	82.4	83.8
Avg. Critical Orifice Inlet Temperature (t_{amb}), °F	81.0	82.3	83.3
Pump Vacuum, in. Hg	18.0	18.0	18.0
COMPUTED CALIBRATION RESULTS			
Critical Orifice Gas Volume ($V_{cr\,(std)}$), standard ft^3	8.042	7.229	8.025
Dry Gas Meter Gas Volume ($V_{m\,(std)}$), standard ft^3	8.156	7.333	8.141
Dry Gas Meter Calibration Factor (Y)	0.986	0.986	0.986
Orifice Meter ΔH@	1.799	1.799	1.796
AVERAGE CALIBRATION RESULTS			
Average Dry Gas Meter Calibration Factor (Y)	**0.986**		
Average Orifice Meter ΔH@	**1.798**		
CALIBRATION RESULTS COMPARISON			
Criterion: Y Must Be Within 2% Of Average Y			
Percent Difference Of Y From Average Y	0.01%	0.00%	0.01%
Tolerance Result	**PASS**	**PASS**	**PASS**
COMPARISON WITH PRETEST RESULTS			
Criterion: Y Must Be Within 5% Of Previous Y			
% Difference Of Average Y From Previous Y	0.12%		
Tolerance Result	**PASS**		

Y = 0.985853517146527

Remarks:

Signature: Darrel Sprague Date: 8-7-03

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Stack Thermocouple Calibration Data

Job.No: 110249.2.001.04
Date: 8-7-03
Ambient Temp. (°F) 72
Performed By: D. Neal / D. Griffin

Stack Thermocouple No:
Reference Pyrometer No: Y-0815
Probe Number: 3-5
Avg. Stack Temp. (°F)
Barometer: 0 in. Hg.

Reference Instrument: Hart Scientific Model Number 9100A, Serial Number 84414 Dry-well, HDRC handheld Block A. This Instrument is calibrated in accordance with ITS-90 and ANSI/NCSL Z540-1.

Reference Instrument Temp. (°F)	Reference Pyrometer Temp. (°F)	Temperature Difference (°F)	Temperature Difference (%)
~~23.930.1~~ (75°F)	85.6		
51.7 (125°F)	124.6	0.4	
79.4 (175°F)	175.4	0.4	
107.2 (225°F)	224.8	0.2	

$$\frac{\text{(Reference Instrument Temp. °F + 460) - (Reference Pyrometer Temp. °F + 460)}}{\text{(Reference Instrument Temp. °F + 460)}} \times 100 \text{ </= } 1.5\%$$

Signature: David C. Griffin
Date: 8-7-03

Stack Thermocouple Calibration Data

Job.No: 110249.2.001.04
Date: 8-7-02
Ambient Temp. (°F) 72
Performed By: D. Neal / D. Griffin

Stack Thermocouple No:
Reference Pyrometer No: 4-0815
Probe Number: 3-2
Avg. Stack Temp. (°F)
Barometer: 0 in. Hg.

Reference Instrument: Hart Scientific Model Number 9100A, Serial Number 84414 Dry-well, HDRC handheld Block A. This Instrument is calibrated in accordance with ITS-90 and ANSI/NCSL Z540-1.

Reference Instrument Temp. (°F)	Reference Pyrometer Temp. (°F)	Temperature Difference (°F)	Temperature Difference (%)
~~23.9~~ 26.0 (~~75°F~~)	79.0		
51.7 (125°F)	124.2	0.8	
79.4 (175°F)	175.2	0.2	
107.2 (225°F)	225.4	0.4	

$$\frac{\text{(Reference Instrument Temp. °F + 460)} - \text{(Reference Pyrometer Temp. °F + 460)}}{\text{(Reference Instrument Temp. °F + 460)}} \times 100 \leq 1.5\%$$

Signature: [signature]
Date: 8-7-03

Stack Thermocouple Calibration Data

Job.No: 110130.004-05.03
Date: 8-7-03
Ambient Temp. (°F) 72
Performed By: D. Neal / D. Griffin

Stack Thermocouple No:
Reference Pyrometer No: 7-085
Probe Number: 8-2
Avg. Stack Temp. (°F) 175
Barometer: 0 in. Hg.

Reference Instrument: Hart Scientific Model Number 9100A, Serial Number 84414 Dry-well, HDRC handheld Block A. This Instrument is calibrated in accordance with ITS-90 and ANSI/NCSL Z540-1.

Reference Instrument Temp. (°F)	Reference Pyrometer Temp. (°F)	Temperature Difference (°F)	Temperature Difference (%)
~~23.9 26.0~~ (75°F)	EE ~~76.6~~ 78.8		
51.7 (125°F)	124.8	0.2	
79.4 (175°F)	174.8	0.2	
107.2 (225°F)	225.2	0.2	

(Reference Instrument Temp. °F + 460) - (Reference Pyrometer Temp. °F + 460) / (Reference Instrument Temp. °F + 460) x 100 </= 1.5%

Signature: [signature]
Date: 8-7-03

Stack Thermocouple Calibration Data

Job.No: 110130.7.004.05.03
Date: 8-7-03
Ambient Temp. (°F) 72
Performed By: D. Neal / D. Griffin

Stack Thermocouple No: U
Reference Pyrometer No: Y-0815
Probe Number: 8-3
Avg. Stack Temp. (°F) 175
Barometer: 0 in. Hg.

Reference Instrument: Hart Scientific Model Number 9100A, Serial Number 84414 Dry-well, HDRC handheld Block A. This Instrument is calibrated in accordance with ITS-90 and ANSI/NCSL Z540-1.

Reference Instrument Temp. (°F)	Reference Pyrometer Temp. (°F)	Temperature Difference (°F)	Temperature Difference (%)
~~26.2~~ ~~23.9~~ °C (75°F)	77.4		
51.7°C (125°F)	123.4	1.6	
79.4°C (175°F)	173.6	1.4	
107.2°C (225°F)	222.8	2.2	

$$\frac{(\text{Reference Instrument Temp. }^{\circ}\text{F} + 460) - (\text{Reference Pyrometer Temp. }^{\circ}\text{F} + 460)}{(\text{Reference Instrument Temp. }^{\circ}\text{F} + 460)} \times 100 \leq 1.5\%$$

Signature: [signature] Date: 8-7-03

XAD Thermocouple Calibration Data

Job.No: 110249.2.001.04
Date: August 7, 2003
Ambient Temp. (°F) 81
Performed By: Dave Griffin

Pyrometer No: Y-0815
Reference Thermometer: ASTM 63F
Serial Number: 1979299
Barometer: 29.17 in. Hg.

Calibration Method: Water bath with ASTM thermometer at ambient temperature.

XAD Thermocouple Number	Reference Thermometer Temp. (°F)	Reference Pyrometer Temp. (°F)	Temperature Difference Tolerance: +/- 2°F
XAD-1	79.1	81.2	1.5
XAD-2	79.1	EE DG ~~81.4~~ 81.2	1.5

Comments:

Signature: Date:

Gooseneck Thermocouple Calibration Data

Job.No: 110130.3.004.05.03
Date: 8-7-03
Ambient Temp. (°F) 77
Performed By: D. Neal

Pyrometer No: Y-0815
Reference Thermometer: ASTM 63F
Serial Number: 1979299
Barometer: 0 in. Hg.

Calibration Method: Water bath with ASTM thermometer at ambient temperature.

Gooseneck T.C. No.	Leak Check & Check Valve Pass/No Pass	Reference Thermometer Temp. (°F)	Reference Pyrometer Temp. (°F)	Temperature Difference Tolerance: +/- 2°F
UH1	Pass	77.0	76.6	0.4
UH6	Pass	77.0	76.4	0.6
UH12	Pass	77.0	76.2	0.8
UH35	Pass	77.0	76.2	0.8
UH37	Pass	77.0	76.0	1.0

Comments: UH 12 was never used @ Hawthorne

Signature: [signature]
Date: 8-7-03

Request For Post Test Calibrations

Job No: 110130.3.004.05.03 Date: 8-7-03

Job Name: Hawthorne Requested By: D. Neal

M5 Console Number	Average Delta H	Pyrometer Number	XAD Thermocouple Number	Sample Box Number

Probe Number	Stack Thermocouple Number	Average Stack Temperature	Pitot Number	Gooseneck Number
8-2		175	M 120	uH35
8-3		175	M 127	uH37
				uH 6
				uH 12
				uH-1

VOST Console Number	VOST Train Number	VOST Thermocouple Number	Barometer Number

List other equipment to be calibrated:

Type S Pitot Tube Inspection Data Form

Pitot Tube #: M-120 Date: 8-7-03 Performed By: D. Griffith

Probe #: 8-2 Job #: 110130.3.004.05.03

Pitot tube assembly level? ✓ Yes _____ No

Pitot tube openings damaged? _____ Yes (explain below) ✓ No

α_1 = 0 ° (<10 °), α_2 = 0 ° (<10 °)

β_1 = 2 ° (<5 °), β_2 = 1 ° (<5 °)

γ = 1 °, θ = 0 °, A = .746 (in)

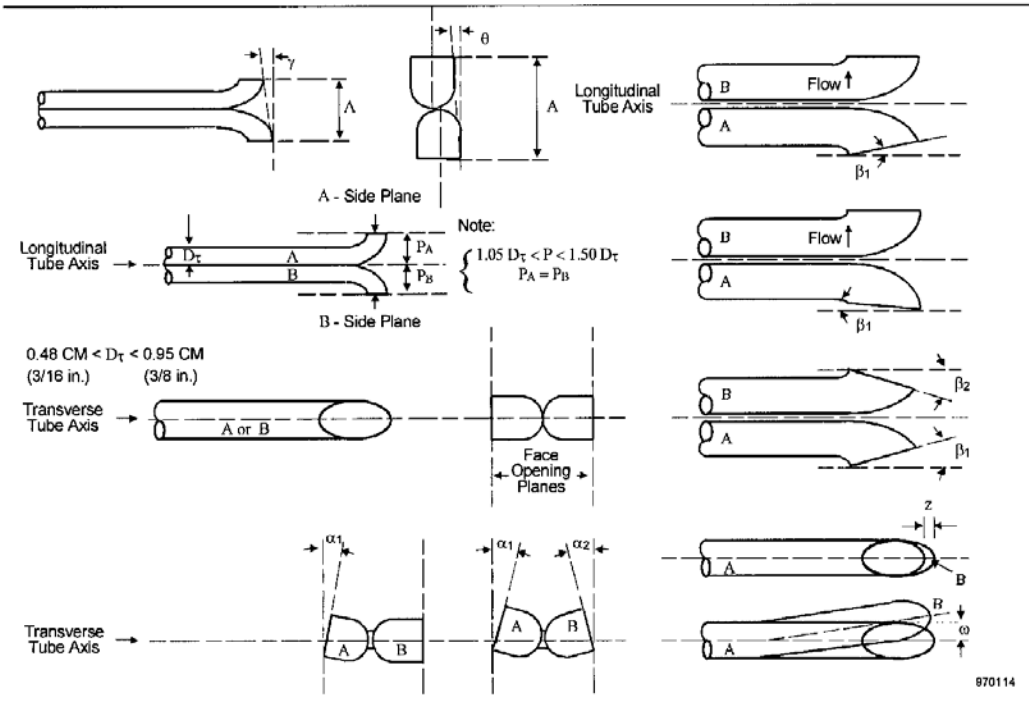
$z = A \sin \gamma$ _____ (in); (< 0.125 in)

$w = A \sin \theta$ _____ (in); (< 0.03125 in)

P_A = .373 (in), P_B = .373 (in), D_t = .250 (in)

Calibration required? _____ Yes ✓ No

Comments: _____



Type S Pitot Tube Inspection Data Form

Pitot Tube #: M127 Date: 8-7-03 Performed By: D. Griffin

Probe #: 8-3 Job #: 110130.3.004.05.03

Pitot tube assembly level? ✓ Yes _____ No

Pitot tube openings damaged? _____ Yes (explain below) ✓ No

α_1 = 1 ° (<10 °), α_2 = 1 ° (<10 °)

β_1 = 1 ° (<5 °), β_2 = 1 ° (<5 °)

γ = 1 °, θ = 2 °, A = .1465 (in)

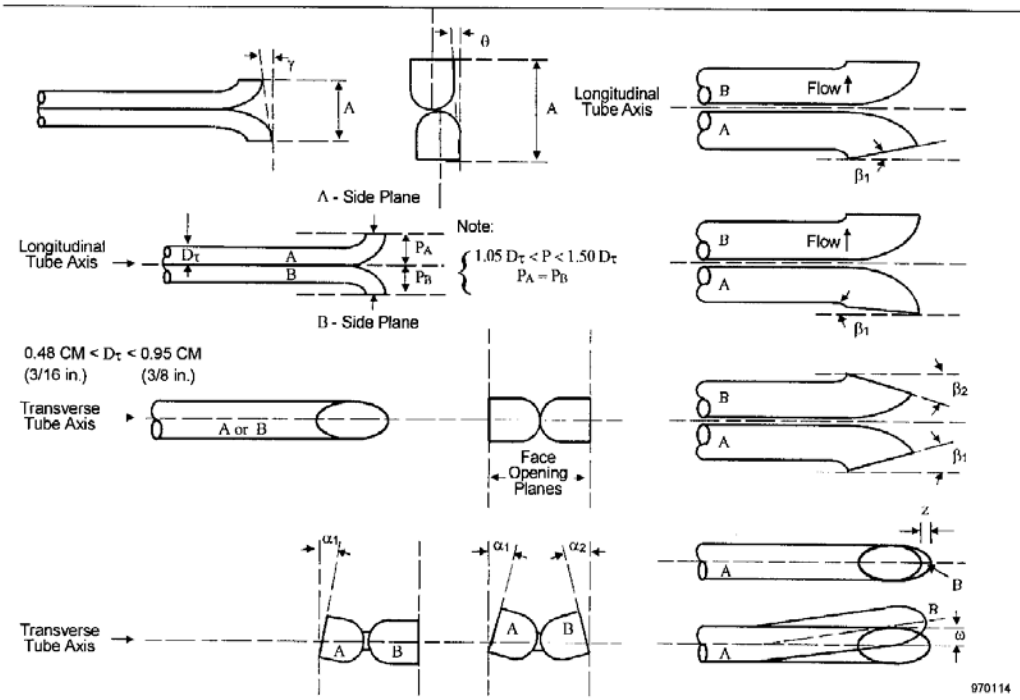
$z = A \sin \gamma$ _____ (in); (< 0.125 in)

$w = A \sin \theta$ _____ (in); (< 0.03125 in)

P_A = .313 (in), P_B = .374 (in), D_t = .250 (in)

Calibration required? _____ Yes ✓ No

Comments: _____



Type S Pitot Tube Inspection Data Form

Pitot Tube #: M126 Date: 8-7-03 Performed By: D. Griffin

Probe #: 3-2 Job #: 160249.2.001.04

Pitot tube assembly level? ✓ Yes _____ No

Pitot tube openings damaged? _____ Yes (explain below) ✓ No

α_1 = 0 ° (<10 °), α_2 = 0 ° (<10 °)

β_1 = 0 ° (<5 °), β_2 = 0 ° (<5 °)

γ = 1 °, θ = 1 °, A = .750 (in)

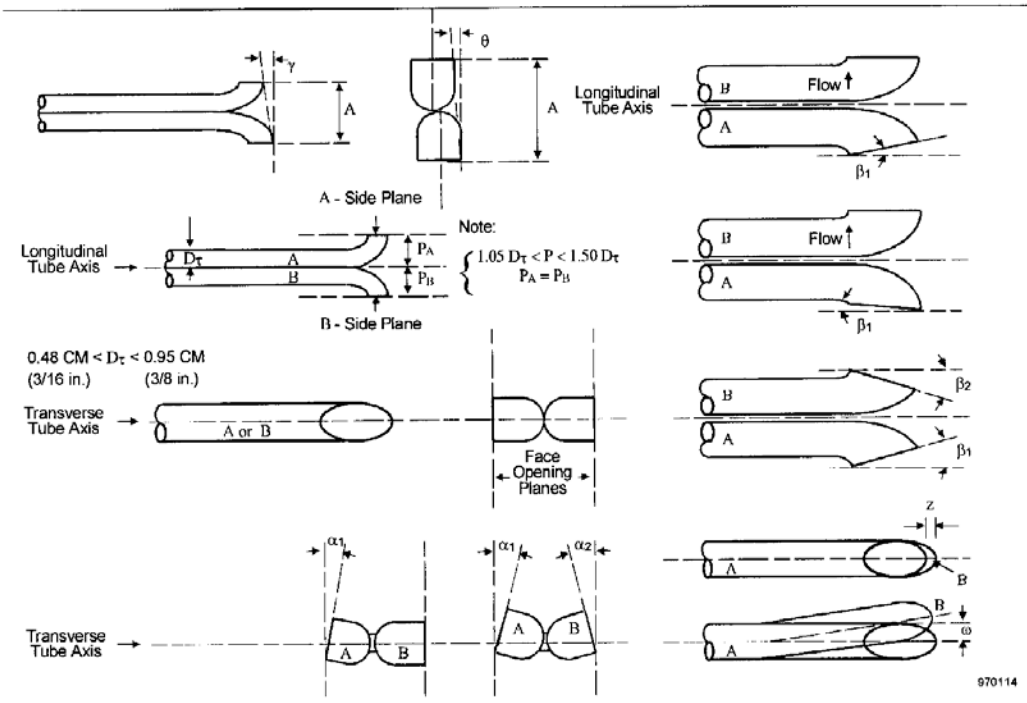
$z = A \sin \gamma$ _____ (in); (< 0.125 in)

$w = A \sin \theta$ _____ (in); (< 0.03125 in)

P_A = .375 (in), P_B = .375 (in), D_t = .250 (in)

Calibration required? _____ Yes ✓ No

Comments: _____



Type S Pitot Tube Inspection Data Form

Pitot Tube #: M101 Date: 8-7-03 Performed By: D. Griffin

Probe #: 3-5 Job #: 110249.2.001.04

Pitot tube assembly level? ✓ Yes _____ No

Pitot tube openings damaged? _____ Yes (explain below) ✓ No

α_1 = 5 ° (<10 °), α_2 = 5 ° (<10 °)

β_1 = 1 ° (<5 °), β_2 = 0 ° (<5 °)

γ = 3 °, θ = 3 °, A = .734 (in)

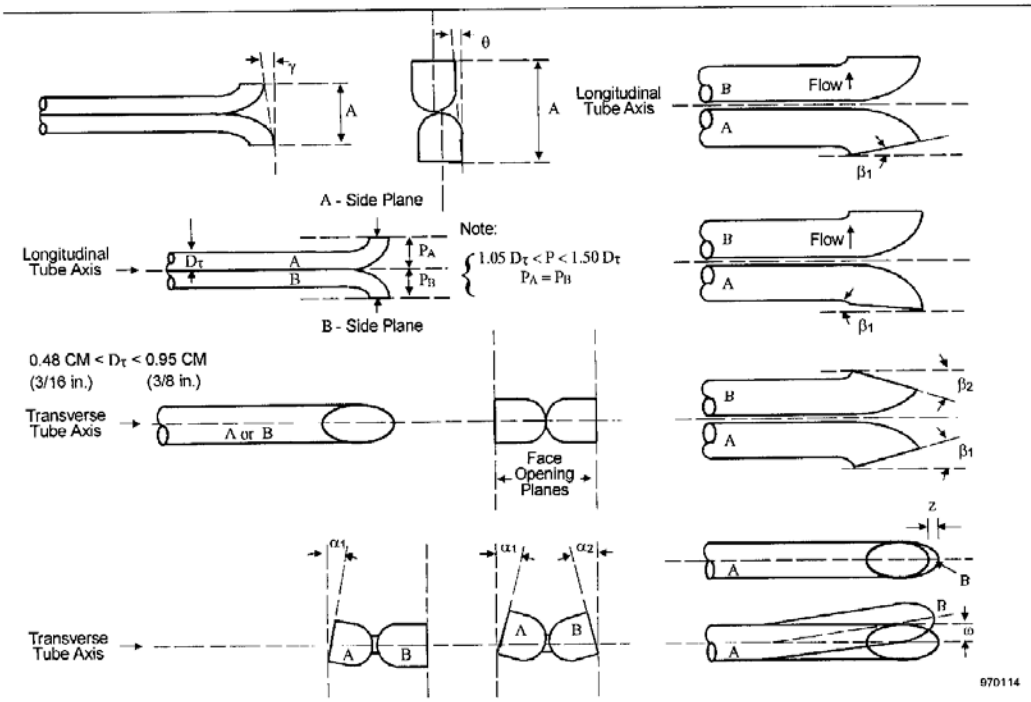
$z = A \sin \gamma$ _____ (in); (< 0.125 in)

$w = A \sin \theta$ _____ (in); (< 0.03125 in)

P_A = .367 (in), P_B = .367 (in), D_t = .250 (in)

Calibration required? _____ Yes ✓ No

Comments: _____



Appendix C-2

Post-Test Calibration Records

Request For Post Test Calibrations

Job No: 110249.2.001.05 Date: August 27, 2003

Job Name: Characterization of Dioxin in Ball Clay Requested By: D. Neal

M5 Console Number	Average Delta H	Pyrometer Number	XAD Thermocouple Number	Sample Box Number
N7	1.35	Y-0815	XAD-1	10288
			XAD-2	12003

Probe Number	Stack Thermocouple Number	Average Stack Temperature	Pitot Number	Gooseneck Number
3-2	36-2	144	M-126	UH-1
3-5	36-12	129	M-104	UH-12

VOST Console Number	VOST Train Number	VOST Thermocouple Number	Barometer Number
			X-4029

List other equipment to be calibrated:

9/11/03

M5 Console Pre-Calibration Checklist

Job No. 110249.2.001.05 Date August 27, 2003

Console No. N7 Performed By Daniel Neal

(Place an "X" in the space provided after the required checks are performed.)

1. X Perform positive leak check of Delta H manometer.

Procedure for positive leak check Delta H manometer:

1. Pump **must not** be run prior to this test. Pump needs to be cool in order to get an accurate reading.
2. Pump pressure and vacuum lines must be connected to console.
3. Null switch on console must be in the down position so solenoid valve is open to the sampling stream as it is during testing.
4. Plug meter exhaust and clamp off bottom tube from exhaust which goes to the Orsat pump.
5. Plug sample orifice.
6. Close main flow control valve.
7. Open fine control valve.
8. Disconnect right side Delta H manometer tube on front of console.
9. Blow into tubing until manometer reads 5 to 7 inches of water, and clamp off. There should be no change in manometer reading.
10. **Be certain to remove plug and clamp from meter exhaust immediately after this test to avoid damage to the meter pump when pump is started up!**

2. X Leak check Delta P manometer.
3. N/A Clean pump
4. X Clean muffler jar(s).
5. X Inspect/refill oiler jar.
6. X Calibrate DGM thermocouples:

		Reference Pyrometer °F	Console Pyrometer °F
(Note: Reading must be within +/-2.5°F	DGM Inlet:	78.4	79.0
	DGM Outlet:	78.4	79.0

7. X Digital clock/timer in place and functional.
8. X Vacuum check. (Leak check at 25 in. Hg. Vacuum. Leak rate should be zero)
9. X Check indicator lights
10. X Check thermocouple switches.
11. X Check fan.
12. X Check pump heater.
13. X check heat controllers.
14. X Check Orsat pump and rotameter.

If any of the above items were replaced or repaired, please document that information below:

Signature: Daniel Neal Date: 8-27-03

9/11/03

M5 Console Calibration Worksheet

Job No.	110249.2.001.05	Metering Console No.	N7
Date	August 27, 2003	Previous Dry Gas Meter Factor (Y):	1.002
Operator	Daniel Neal	Calibrated Critical Orifice No.	E15
Barometer	29.13 in. Hg.	Critical Orifice Coefficient in English Units (K'):	0.4146
		Ambient Temperature Meter No.	Y-0815

Note: Prior to running calibration, connect mercury manometer to sample orifice. Turn on pump and bring mercury manometer up to 18.0 in. Hg. Record mercury manometer and console vacuum gauge readings below. Insert critical orifice into console sample orifice. Set console vacuum gauge at 18.0 in. Hg. +/- the console vacuum gauge correction factor calculated below.

Mercury manometer readings: 8.9 + 9.1 = 18.00 in. Hg.

Console vacuum gauge reading: 19.00 in. Hg.

console vacuum gauge correction factor: -1.00 in. Hg.

		RUN # 1	RUN # 2	RUN # 3
DGM Initial Volume:	Initial:	884.700	890.157	895.607
	Final:	890.157	895.607	901.082
DGM Inlet Temperature:	Initial:	83	85	86
	Final:	84	85	87
DGM Outlet Temperature:	Initial:	81	82	83
	Final:	81	82	83
Time of run (In seconds):		600	600	600
Orifice Delta H (in. H_2O):		0.90	0.90	0.90
Room Temperature:	Initial:	80.6	80.0	82.0
	Final:	82.2	83.4	82.8
Pump Vacuum (in. Hg.):		18.0	18.0	18.0

Signature: Daniel Neal Date: 8-27-03

9/11/03

METHOD 5 METERING CONSOLE CALIBRATION WITH CRITICAL ORIFICE

MRI Project No.	110249.2.001.05	Metering Console No.	N7
Date:	August 27, 2003	Previous Dry Gas Meter Factor (Y):	1.002
Operator:	Daniel Neal	Calibrated Critical Orifice No.	E15
		Critical Orifice Coefficient in English Units (K'):	0.41460
		Ambient Temperature Meter No.	Y-0815

	Run 1	Run 2	Run 3
CALIBRATION GAS VOLUME DATA			
Initial Dry Gas Meter Gas Volume, ft.³	884.700	890.157	895.607
Final Dry Gas Meter Gas Volume, ft.³	890.157	895.607	901.082
Net Dry Gas Meter Gas Volume (V_m), ft.³	5.457	5.450	5.475
CALIBRATION CONDITIONS DATA			
Dry Gas Meter Temperature, °F:			
Initial Inlet Temperature, °F	83.0	85.0	86.0
Final Inlet Temperature, °F	84.0	85.0	87.0
Initial Outlet Temperature, °F	81.0	82.0	83.0
Final Outlet Temperature, °F	81.0	82.0	83.0
Average Dry Gas Meter Temperature (t_m), °F	82.3	83.5	84.8
Time, seconds	600	600	600
Orifice Meter ΔH, inches H_2O	0.90	0.90	0.90
Barometric Pressure, in. Hg	29.13	29.13	29.13
Critical Orifice Inlet (Ambient) Temperature, °F:			
Initial Ambient Temperature, °F	80.6	80.0	82.0
Final Ambient Temperature, °F	82.2	83.4	82.8
Avg. Critical Orifice Inlet Temperature (t_{amb}), °F	81.4	81.7	82.4
Pump Vacuum, in. Hg	18.0	18.0	18.0
COMPUTED CALIBRATION RESULTS			
Critical Orifice Gas Volume ($V_{cr\,(std)}$), standard ft.³	5.192	5.191	5.187
Dry Gas Meter Gas Volume ($V_{m\,(std)}$), standard ft.³	5.185	5.166	5.178
Dry Gas Meter Calibration Factor (Y)	1.001	1.005	1.002
Orifice Meter ΔH@	1.788	1.785	1.783
AVERAGE CALIBRATION RESULTS			
Average Dry Gas Meter Calibration Factor (Y)	**1.003**		
Average Orifice Meter ΔH@	**1.786**		
CALIBRATION RESULTS COMPARISON			
Criterion: Y Must Be Within 2% Of Average Y			
Percent Difference Of Y From Average Y	0.12%	0.21%	0.08%
Tolerance Result	**PASS**	**PASS**	**PASS**
COMPARISON WITH PRETEST RESULTS			
Criterion: Y Must Be Within 5% Of Previous Y			
% Difference Of Average Y From Previous Y	0.07%		
Tolerance Result	**PASS**		

Y = 1.002651356453850

Remarks:

Signature: Daniel Neal Date: 8-27-03

7/11/03

CRORCALB.xls 10/29/99 (rev. N7 Console Calibration Workbook.xls 8/27/2003 9:58 AM)

M5 Console Critical Orifice Bracketing Worksheet

MRI Project No.	110249.2.001.05
Date:	August 27, 2003
Operator:	Daniel Neal
Metering Console No.	N7
Dry Gas Meter Factor (Y):	1.002651356
Orifice Used for the Calibration:	E15
Ambient Temperature Meter No.	Y-0815

Critical Orifice Being Evaluated	**E15**
First Critical Orifice No.	**E12**
Coefficient (K'):	0.3264
Second Critical Orifice No.	**E21**
Coefficient (K'):	0.5693

Note: Critical orifice coefficients are in English units.

Note: Prior to running calibration, connect mercury manometer to sample orifice. Turn on pump and bring mercury manometer up to 18.0 in. Hg. Record mercury manometer and console vacuum gauge readings below. Insert critical orifice into console sample orifice. Set console vacuum gauge at 18.0 in. Hg. +/- the console vacuum gauge correction factor calculated below.

Mercury manometer readings: 8.9 + 9.1 = 18.00 in. Hg.

Console vacuum gauge reading: 19.00 in. Hg.

console vacuum gauge correction factor: -1.00 in. Hg.

		RUN # 1	RUN # 2
DGM Initial Volume:	Initial:	903.100	908.002
	Final:	907.444	915.560
DGM Inlet Temperature:	Initial:	86	88
	Final:	86	89
DGM Outlet Temperature:	Initial:	84	84
	Final:	84	85
Time of run (In seconds):		600	600
Orifice Delta H (in. H_2O):		0.55	
Room Temperature:	Initial:	82.6	82.6
	Final:	82.2	82.4
Pump Vacuum (in. Hg.):		18.0	18.0

Signature: Daniel Neal Date: 8-27-03

9/11/03

METHOD 5 METERING CONSOLE CALIBRATION
CRITICAL ORIFICE BRACKETING DATA

MRI Project No.	110249.2.001.05	Critical Orifice Being Evaluated	
Date:	August 27, 2003	Critical Orifice No.	**E15**
Operator:	Daniel Neal	Critical Orifices Used For Bracketing	
Metering Console No.	N7	First Orifice	
Dry Gas Meter Factor (Y):	1.003	Critical Orifice No.	**E12**
Orifice Used for the Calibration:	E15	Coefficient (K'):	0.32640
Ambient Temperature Meter No.	Y-0815	Second Orifice	
		Critical Orifice No.	**E21**
		Coefficient (K'):	0.56930

Note: Critical orifice coefficients are in English units.

	First Orifice	Second Orifice
CALIBRATION GAS VOLUME DATA		
Initial Dry Gas Meter Gas Volume, $ft.^3$	903.100	908.002
Final Dry Gas Meter Gas Volume, $ft.^3$	907.444	915.560
Net Dry Gas Meter Gas Volume (V_m), $ft.^3$	4.344	7.558
CALIBRATION CONDITIONS DATA		
Dry Gas Meter Temperature, °F:		
Initial Inlet Temperature, °F	86.000	88.000
Final Inlet Temperature, °F	86.000	89.000
Initial Outlet Temperature, °F	84.000	84.000
Final Outlet Temperature, °F	84.000	85.000
Average Dry Gas Meter Temperature (t_m), °F	85.0	86.5
Time, seconds	600.000	600.000
Orifice Meter ΔH, inches H_2O	0.550	
Barometric Pressure, in. Hg	29.13	29.13
Critical Orifice Inlet (Ambient) Temperature, °F:		
Initial Ambient Temperature, °F	82.600	82.600
Final Ambient Temperature, °F	82.200	82.400
Average Critical Orifice Inlet Temperature (t_{amb}), °F	82.4	82.5
Pump Vacuum, in. Hg	18.000	18.000
COMPUTED CALIBRATION RESULTS		
Critical Orifice Gas Volume ($V_{cr\,(std)}$), standard $ft.^3$	4.084	7.122
Dry Gas Meter Gas Volume ($V_{m\,(std)}$), standard $ft.^3$	4.103	7.109
Factor (Y) Obtained With Bracketing Orifice	0.995	1.002
CRITICAL ORIFICE ACCEPTABILITY		
Criterion: All Ys Must Be Within 2% Of All Other Ys		
Larger % Difference Between Dry Gas Meter Factor (Y) And Factor (Y) Obtained With The Bracketing Orifice	0.73%	0.08%
Larger % Difference Between Factors (Ys) Obtained With Bracketing Orifices	0.65%	
Acceptability Result	**All Orifices Are Acceptable**	

Remarks:

Signature: Daniel Neal Date: 8-27-03

9/11/03

XAD Thermocouple Calibration Data

Job.No: 110249.2.001.05
Date: August 27, 2003
Ambient Temp. (°F) 79
Performed By: D. Neal

Pyrometer No: Y-0815
Reference Thermometer: ASTM 63F
Serial Number: 1979299
Barometer: 29.13 in. Hg.

Calibration Method: Water bath with ASTM thermometer at ambient temperature.

XAD Thermocouple Number	Reference Thermometer Temp. (°F)	Reference Pyrometer Temp. (°F)	Temperature Difference Tolerance: +/- 2°F
XAD-1	79.7	81.2	-1.5
XAD-2	79.7	81.4	-1.7

Comments:

Signature: [signature] Date: 8-27-03

9/11/03

Sample Box Filter Thermocouple Calibration Data

Job.No: 110249.2.001.05
Date: August 27, 2003
Ambient Temp. (°F) 79
Performed By: D. Neal

Console Pyrometer No: N7
Reference Pyrometer No: Y-0815
Reference Thermocouple Number:
Barometer: 29.13 in. Hg.

Calibration Method: Heat sample box to 250°F with M5 console. After temperature has stabilized, check filter box temperature by comparing M5 console temperature meter against calibrated pyrometer and thermocouple.

Sample Box Number	Console Pyrometer Temp. (°F)	Reference Pyrometer Temp. (°F)	Temperature Difference Tolerance: +/-5.4°F
10288	245	245.2	-0.2
12003	250	251	-1.0

Comments:

Signature: James Neal Date: 8-27-03

9/11/03

Stack Thermocouple Calibration Data

Job.No: 110249.2.001.05
Date: August 27, 2003
Ambient Temp. (°F) 79
Performed By: D. Neal

Stack Thermocouple No: 36-2
Reference Pyrometer No: Y-0815
Probe Number: 3-2
Avg. Stack Temp. (°F) 144
Barometer: 29.13 in. Hg.

Reference Instrument: Hart Scientific Model Number 9100A, Serial Number 84414 Dry-well, HDRC handheld Block A. This Instrument is calibrated in accordance with ITS-90 and ANSI/NCSL Z540-1.

Reference Instrument Temp. (°F)	Reference Pyrometer Temp. (°F)	Temperature Difference (°F)	Temperature Difference (%)
81.0	80.4	0.60	0.11%
150.8	150.4	0.40	0.07%
199.9	200.2	-0.30	-0.05%

$$\frac{(\text{Reference Instrument Temp. }^{\circ}\text{F} + 460) - (\text{Reference Pyrometer Temp. }^{\circ}\text{F} + 460)}{(\text{Reference Instrument Temp. }^{\circ}\text{F} + 460)} \times 100 \leq 1.5\%$$

Signature: James Neal Date: 8-27-03 9/11/03

Stack Thermocouple Calibration Data

Job.No: 110249.2.001.05
Date: August 27, 2003
Ambient Temp. (^{O}F) 79
Performed By: D. Neal

Stack Thermocouple No: 36-12
Reference Pyrometer No: Y-0815
Probe Number: 3-5
Avg. Stack Temp. (^{O}F) 129
Barometer: 29.13 in. Hg.

Reference Instrument: Hart Scientific Model Number 9100A, Serial Number 84414 Dry-well, HDRC handheld Block A. This instrument is calibrated in accordance with ITS-90 and ANSI/NCSL Z540-1.

Reference Instrument Temp. (^{O}F)	Reference Pyrometer Temp. (^{O}F)	Temperature Difference (^{O}F)	Temperature Difference (%)
81.0	80.6	0.40	0.07%
150.8	150.4	0.40	0.07%
199.9	200.6	-0.70	-0.11%

$$\frac{(\text{Reference Instrument Temp. } ^{O}\text{F} + 460) - (\text{Reference Pyrometer Temp. } ^{O}\text{F} + 460)}{(\text{Reference Instrument Temp. } ^{O}\text{F} + 460)} \times 100 \leq 1.5\%$$

Signature: James Neal Date: 8-27-03 9/11/03

Gooseneck Thermocouple Calibration Data

Job.No: 110249.2.001.05
Date: August 27, 2003
Ambient Temp. (^{O}F) 79
Performed By: D. Neal

Pyrometer No: Y-0815
Reference Thermometer: ASTM 63F
Serial Number: 1979299
Barometer: 29.13 in. Hg.

Calibration Method: Water bath with ASTM thermometer at ambient temperature.

Gooseneck T.C. No.	Leak Check & Check Valve Pass/No Pass	Reference Thermometer Temp. (^{O}F)	Reference Pyrometer Temp. (^{O}F)	Temperature Difference Tolerance: +/- 2^{O}F
UH-1	Pass	72.6	73.4	-0.8
UH-12	Pass	72.6	73.2	-0.6

Comments:

Signature: James Neal Date: 8-27-03

9/11/03

MERCURY BAROMETER PRESSURE READING CORRE

Location:	Kansas City, Missouri
Altitude Above Sea Level:	850 feet
Latitude:	39° 05.8' north
Meteorological Gravity:	32.1525 feet/second²
Mercury Barometer Description:	Sargent Welch, Cat. S-4519, Lot

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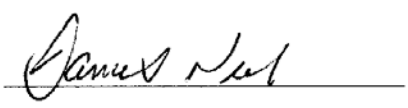
MRI Project No.	110249.2.001.05	
Date:	August 27, 2003	
Time:	8:17	
Readings Obtained By:	Daniel Neal	
Observed Barometer Reading:	29.28	in. Hg
Mercury Column Temperature:	79	°F
Correction For Temperature:	-0.13	in. Hg
Correction For Gravity:	-0.02	in. Hg
Corrected Barometric Pressure:	29.13	in. Hg

Remarks:

9/11/03

Signature:  Date: 8-27-03

BAROMETR.xls 10/27/99 (rev. N7 Console Calibration Workbook.xls 8/27/2003 9:58 AM)

ANEROID BAROMETER CALIBRATION CHECK

Location: Kansas City, Missouri

Altitude Above Sea Level: 850 feet

Latitude: 39° 05.8' north

Meteorological Gravity: 32.1525 feet/second²

Mercury Barometer Description: Sargent Welch, Cat. S-4519, Lot 791802000

MRI Project No. 110249.2.001.05

Date: August 27, 2003

Time: 8:17

Readings Obtained By: D. Neal Daniel Neal 8-27-03

Observed Barometer Reading:	29.28	in. Hg
Mercury Column Temperature:	79	°F
Correction For Temperature:	-0.13	in. Hg
Correction For Gravity:	-0.02	in. Hg
Corrected Barometric Pressure:	29.13	in. Hg

Aneroid Barometer I.D. No.: X-4029

Reading Before Adjustment:	29.14	in. Hg
Calibration Check Result:	within 0.1 in. Hg	
Reading After Adjustment:	29.14	in. Hg

Remarks:

9/11/03

BAROMETR.xls 10/27/99 (rev. Equipment Calibration Workbook.xls 8/27/2003 10:12 AM)

SAMPLING NOZZLE CALIBRATION CHECK DATA

MRI Project No. 110249.2.001
Client/Source: EPA EMC OAQPS/EMAD / Ball Clay Emissions
Source Location: CBI
Sampling Location: Mill [redacted] and Dryer [redacted]

Nozzle I.D. Number or Dedicated Sampling Train Number	Nozzle Type (Shape and Material of Construction)	Three Measured Diameters, inches D1	D2	D3	Average Diameter, inches	Measured By	Date
N3 (Set #1)	Nickel	0.274	0.274	0.274	0.274	A. Sanders	8/12/03
N13 (Set #2	Nickel	0.272	0.272	0.272	0.272	A. Sanders	8/12/03
N-7 (SET #1)	NICKEL	0.252	0.245	0.249	0.249	[illegible]	8/12/03
N-8 (SET #2)	NICKEL	0.245	0.250	0.252	0.249	[illegible]	8/12/03
N-12 (Spare set)	Nickel	0.187	0.187	0.187	0.187	A Sanders	8/12/03
N-7 (Set #1)	Nickel	0.247	0.250	0.251	0.249	A. Sanders	Re Check 8/12/03
N-8 (Set #2)	Nickel	0.250	0.250	0.246	0.249	A Sanders	Re Check 8/12/03

COMMENTS:

7/11/03

NOZZLCAX.WPD April 29, 1996 (rev. NOZZLCX.WPD August 8, 2003)

Balance Calabration Data Sheet

MRI# 011165 Manufacturer AFD Model FX6000 S/N 5405685

Balance Characteristics

Coarse Range: 6000g Readability: 0.1g

Fine Range: ——— Readability: ———

Accuracy Test

Test Wt.	As Found	As Left
5000g	5001.9g	5000.0g
Tolerance	☐ Pass	☒ Pass
0.2g	☒ Fail	☐ Fail

Corner Load Test

Test Wt. 2000g

Tolerance 0.2g

1 / 4 2 / 3

	As Found	As Left
1.	0.1 g	0.0g
2.	0.0 g	0.0g
3.	-0.2 g	0.1g
4.	0.1 g	-0.2g
	☒ Pass	☒ Pass
	☐ Fail	☐ Fail

Linearity Test

Test Sequence	As Found		As Left	
Fine Range	Fine	Coarse	Fine	Coarse
X		2001.1g		2000.0g
Tolerance		2001.0g		2000.0g
		2001.2g		2000.0g
Coarse Range				
3 ~~EE~~ DN 2000g				
Tolerance				
0.2g				
	☐	☒ Pass	☐	☒
	☐	☐ Fail	☐	☐

Repeatability Test

Test Wt. 2000g

Tolerance 0.1g

Std. Dev. .03

1.	2000.0 g
2.	2000.0 g
3.	2000.0g
4.	2000.1g
5.	2000.0g
6.	2000.0g
7.	2000.0g
8.	2000.0g
9.	2000.0g
10.	2000.0g

Pass ☒ Fail ☐

Weight ID 185

Wt. Cal Date 6-10-02

NIST# 822/265236-01

Notes/Remarks ———

Calibrated by: Jeff Hamilton Date: 7 March 2003

Reviewed by: DLptw ✓ Date: 3-10-03

3/11/03

Type S Pitot Tube Inspection Data Form

Pitot Tube #: M-104 Date: 9-16-03 Performed By: Daniel Neal

Daniel Neal 9-16-03

Probe #: 3-5 Job #: 110249.2.001.05

Pitot tube assembly level? X Yes _____ No

Pitot tube openings damaged? _____ Yes (explain below) X No

α_1 = 0 ° (<10 °), α_2 = 2 ° (<10 °)

β_1 = 0 ° (<5 °), β_2 = 2 ° (<5 °)

γ = 2 °, θ = 1 °, A = .75 (in)

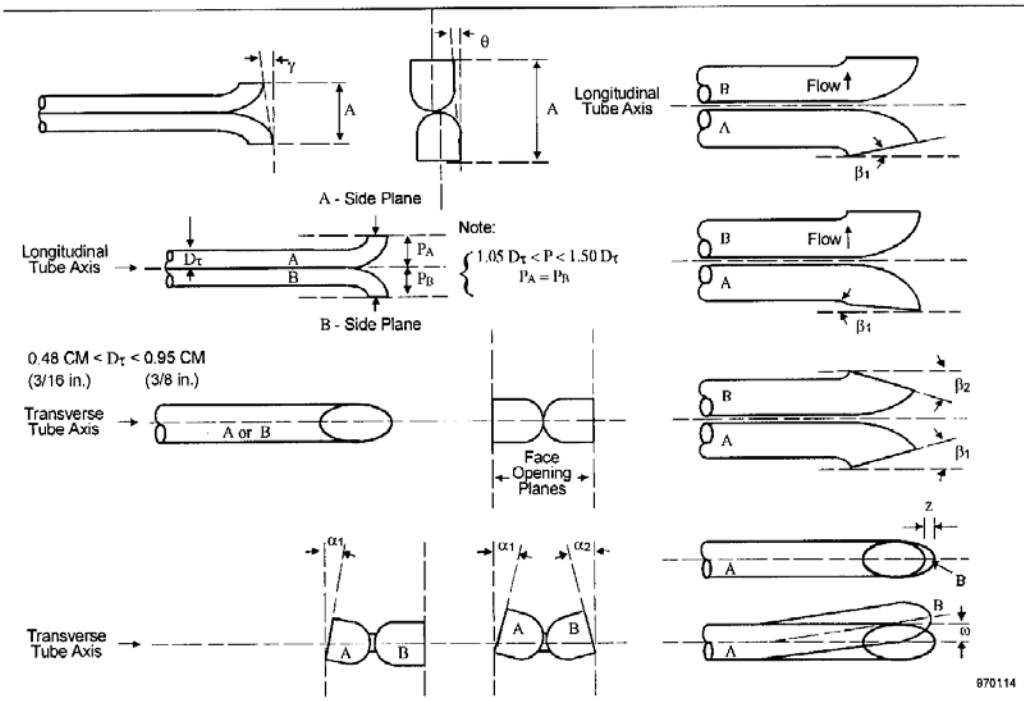
$z = A \sin \gamma$ 0.026 (in); (< 0.125 in)

$w = A \sin \theta$ 0.013 (in); (< 0.03125 in)

P_A = .41 (in), P_B = .34 (in), D_t = .24 (in)

Calibration required? _____ Yes X No

Comments: _____



Type S Pitot Tube Inspection Data Form

Pitot Tube #: M-126 Date: 9-16-03 Performed By: Daniel Neal

Daniel Neal 9-16-03

Probe #: 3-2 Job #: 110249.2.001.05

Pitot tube assembly level? X Yes ____ No

Pitot tube openings damaged? ____ Yes (explain below) X No

α_1 = 0 ° (<10 °), α_2 = 0 ° (<10 °)

β_1 = 1 ° (<5 °), β_2 = 0 ° (<5 °)

γ = 2 °, θ = 0 °, A = .75 (in)

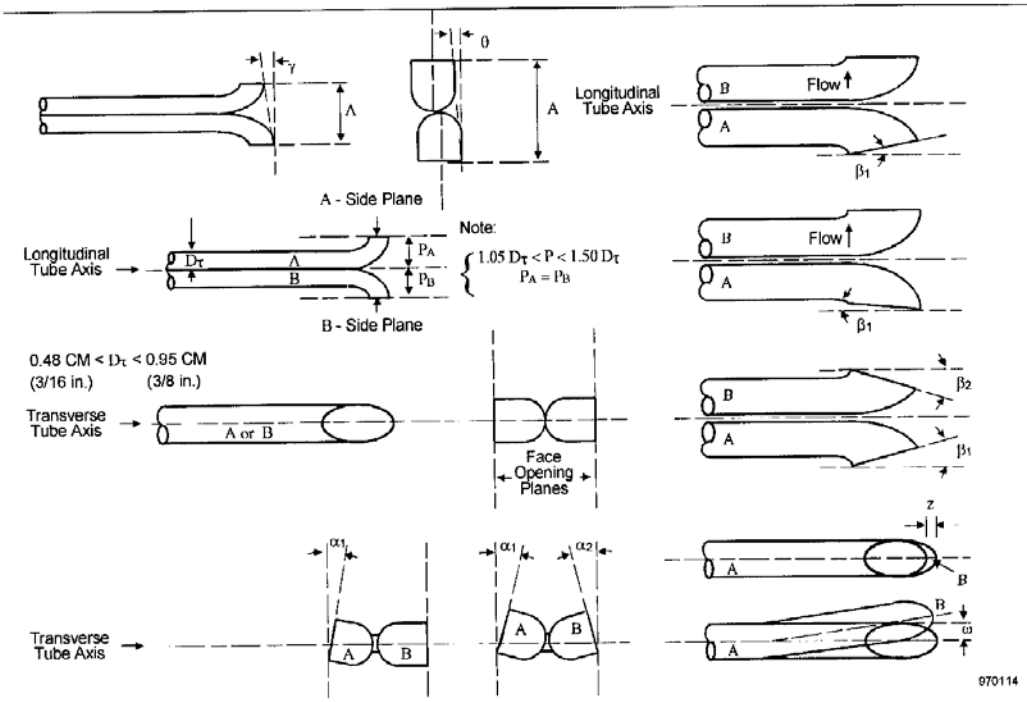
$z = A \sin \gamma$ 0.026 (in); (< 0.125 in)

$w = A \sin \theta$ 0.000 (in); (< 0.03125 in)

P_A = .37 (in), P_B = .38 (in), D_t = .25 (in)

Calibration required? ____ Yes X No

Comments: _____



Appendix D

Summary Analytical Reports and Data

Appendix D-1

Run 1 Retest Emission Samples

16 AUG 2003

John Hosenfeld
Midwest Research Institute
425 Volker Blvd.
Kansas City, MO 64110

Ph.: 816-753-7600 x1336
Fax: 816-531-0315

Subject: Certificate of Results

Dear John;

Attached to this narrative are the analytical results you requested on the rapid turn-around time sample submitted for the determination of polychlorinated dibenzo-*p*-dioxins and dibenzofurans. The insert below summarizes the relevant information pertaining to your project. In particular, the QC annotations bring to your attention specific analytical observations and assessments made during the sample handling and data interpretation phases.

Project Information Summary	When applicable, see QC Annotations for details
Client Project No.	110249.2.001.4
AAP Project No.	**P3265**
Analytical Protocol	23
No. Samples Submitted	1
No. Samples Analyzed	1
No. Laboratory Method Blanks	1
No. OPRs / Batch CS3	1
No. Outstanding Samples	0
Date Received	14-Aug-2003
Condition Received	good
Temperature upon Receipt (C)	16, 17
Extraction within Holding Time	yes
Analysis within Holding Time	yes
Data meet QA/QC Requirements	yes
Exceptions	high extraction standards recoveries
Analytical Difficulties	none

QC Annotations:

1. The new ratio – [Ra] -- for 2,3,7,8-TCDD following the $^{37}Cl_4$-2,3,7,8-TCDD correction is shown between squared brackets in the DL column.

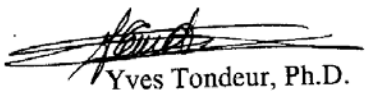
2. An "A" data qualifier is used for analytes with a concentration below the reporting limit.

3. The recoveries of the extraction standards in the field sample exceed the normal acceptance limits of 130 percent. A close examination of the data points to the addition of the extraction standards as a possible source for the observation (extremely rare). The accompanying lab method blank and BCS_3 are entirely normal. Using information from the BCS_3 and the recoveries of the sampling standards, we determined that the bias results in an underestimation of the analyte concentrations by 25 percent; i.e., within the experimental error allowed by Method 23.

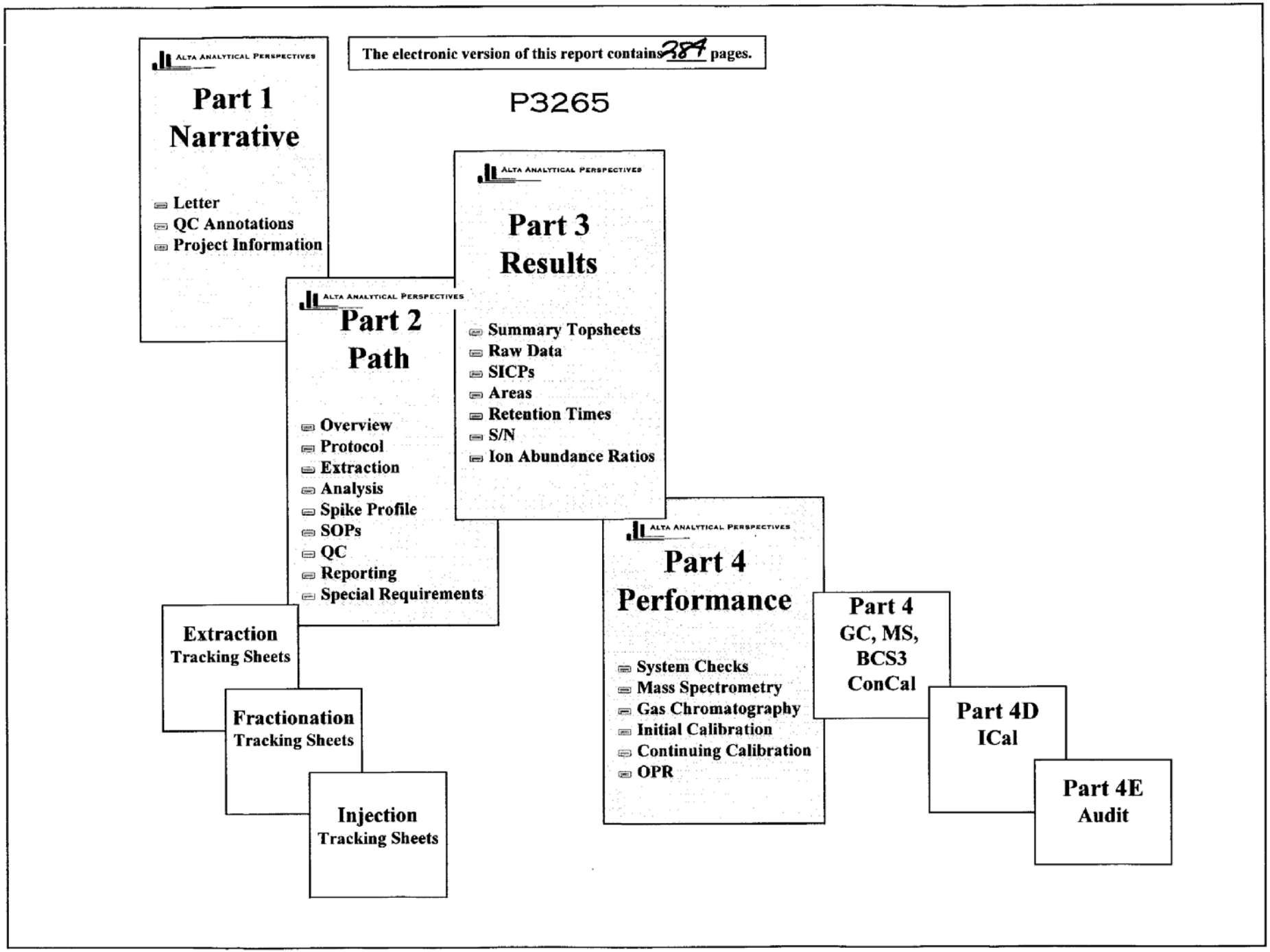
4. The lab method blank prepared with this rapid TAT sample was obtained using purified sand in lieu of XAD-2 resin. Normally, our procedures call for the use of the resin prepared alongside the sampling modules before sampling. This substitution was necessary in order to keep the actual lab method blank for the batch of samples returning from the field. Therefore, the lab method blank does not contain the sampling standards.

Alta Analytical Perspectives remains committed to serving you in the most effective manner. Should you have any questions or need additional information and technical support, please, do not hesitate to contact us. We wanted to thank you for choosing Alta Analytical Perspectives as part of your analytical support team.

Sincerely,



Yves Tondeur, Ph.D.
President & CEO


ALTA ANALYTICAL PERSPECTIVES
The electronic version of this report contains 384 pages.
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Continuing Calibration
OPR
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BCS3
ConCal
Part 4D
ICal
Part 4E
Audit
Extraction
Tracking Sheets
Fractionation
Tracking Sheets
Injection
Tracking Sheets

P3265 - TEQ

Project ID: MRI

Sample Summary - Part 1 — Alta Analytical Perspectives — Method 23		
Analyte	**0_1529_MB001**	**1009**
	pg	pg
2,3,7,8-TCDD	(0.993)	11.6
1,2,3,7,8-PeCDD	(0.459)	5.75
1,2,3,4,7,8-HxCDD	(2.04)	(3.32)
1,2,3,6,7,8-HxCDD	(1.74)	(<5)
1,2,3,7,8,9-HxCDD	(1.83)	5.44
1,2,3,4,6,7,8-HpCDD	(<5)	32.3
OCDD	(3.2)	302
2,3,7,8-TCDF	(0.965)	2.68
1,2,3,7,8-PeCDF	(1.98)	(0.938)
2,3,4,7,8-PeCDF	(1.83)	(<5)
1,2,3,4,7,8-HxCDF	(0.581)	(<5)
1,2,3,6,7,8-HxCDF	(0.521)	(<5)
2,3,4,6,7,8-HxCDF	(0.599)	(<5)
1,2,3,7,8,9-HxCDF	(0.693)	(1.19)
1,2,3,4,6,7,8-HpCDF	(<5)	10.6
1,2,3,4,7,8,9-HpCDF	(1.37)	(1.58)
OCDF	(6.63)	12.8
ITEF TEQ (ND=0; EMPC=0)	**0.00**	**16.1**
ITEF TEQ (ND=0; EMPC=EMPC)	**0.00**	**16.1**
ITEF TEQ (ND=DL/2; EMPC=0)	**1.63**	**18.6**
ITEF TEQ (ND=DL/2; EMPC=EMPC)	**1.63**	**18.6**
ITEF TEQ (ND=DL; EMPC=EMPC)	**3.26**	**21.1**

( ) = DL
[ ] = EMPC

Reviewer GAG
Date 16Aug03

P3265 - Totals

Project ID: MRI

Sample Summary - Part 2	Alta Analytical Perspectives	Method 23
Analyte	**0_1529_MB001**	**1009**
	pg	pg
Totals		
TCDDs	0	161
PeCDDs	0	98.7
HxCDDs	0	63.5
HpCDDs	4.71	71.9
OCDD	0	302
TCDFs	0	28.9
PeCDFs	0	17.7
HxCDFs	0	21.1
HpCDFs	3.91	16.3
OCDF	0	12.8
Total PCDD/Fs (ND=0; EMPC=0)	**8.62**	**794**
Total PCDD/Fs (ND=0; EMPC=EMPC)	**14.8**	**823**
Total PCDD/Fs (2378-X ND=DL; EMPC=EMPC)	**40.2**	**830**
Total 2378s (ND=0; EMPC=0)	**0.00**	**383**
Total 2378s (ND=0.5; EMPC=0)	**17.7**	**399**
Total 2378s (ND=1; EMPC=0)	**35.4**	**415**
Total 2378s (ND=0; EMPC=1)	**0.00**	**383**
Total 2378s (ND=0.5; EMPC=1)	**17.7**	**399**
Total 2378s (ND=1; EMPC=1)	**35.4**	**415**

Total 2378s = Sum of 17 2378-substituted PCDD/PCDF congeners (SARA 313)

( ) = DL
[ ] = EMPC

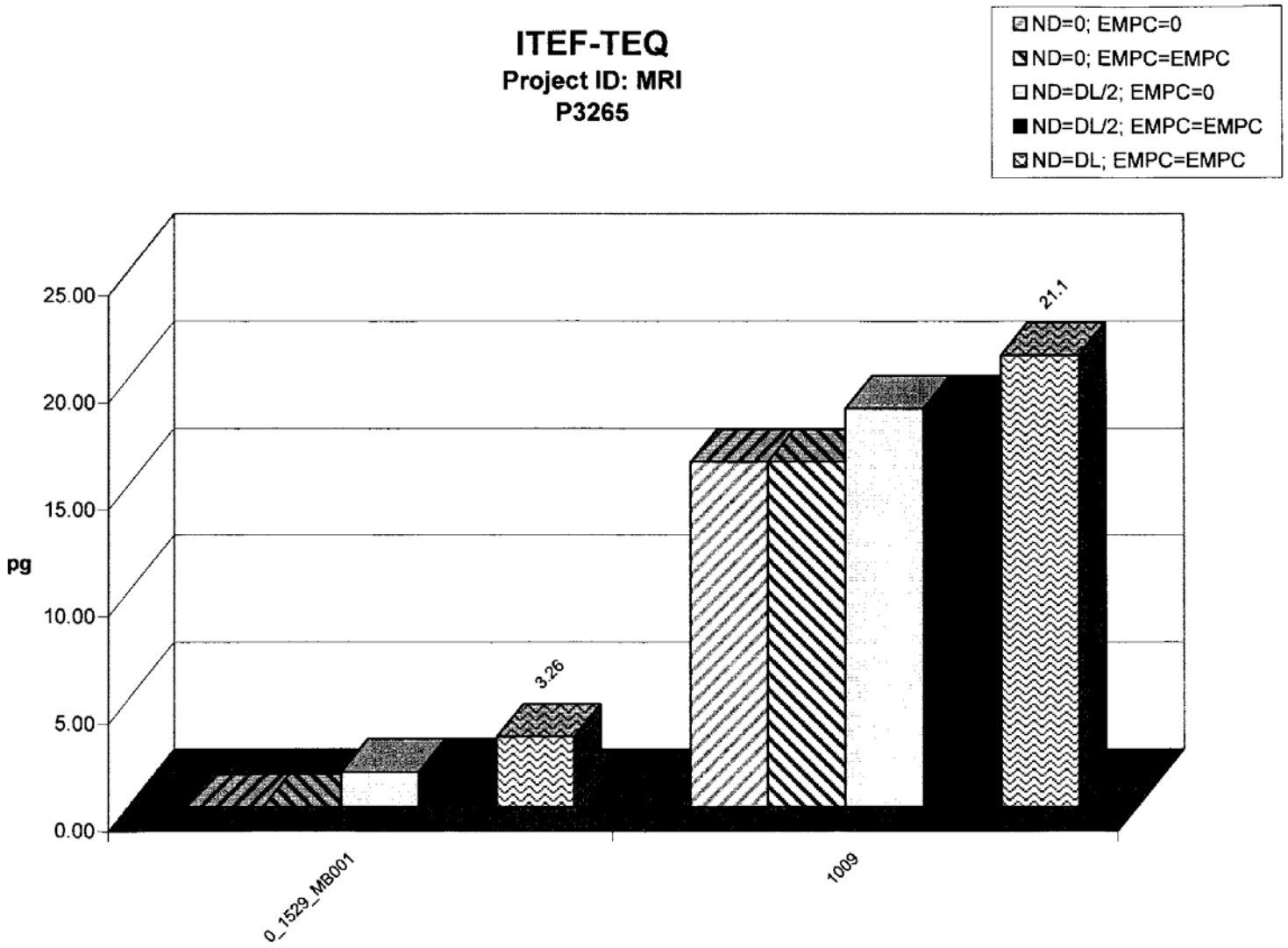
Reviewer GAS
Date 16Aug03

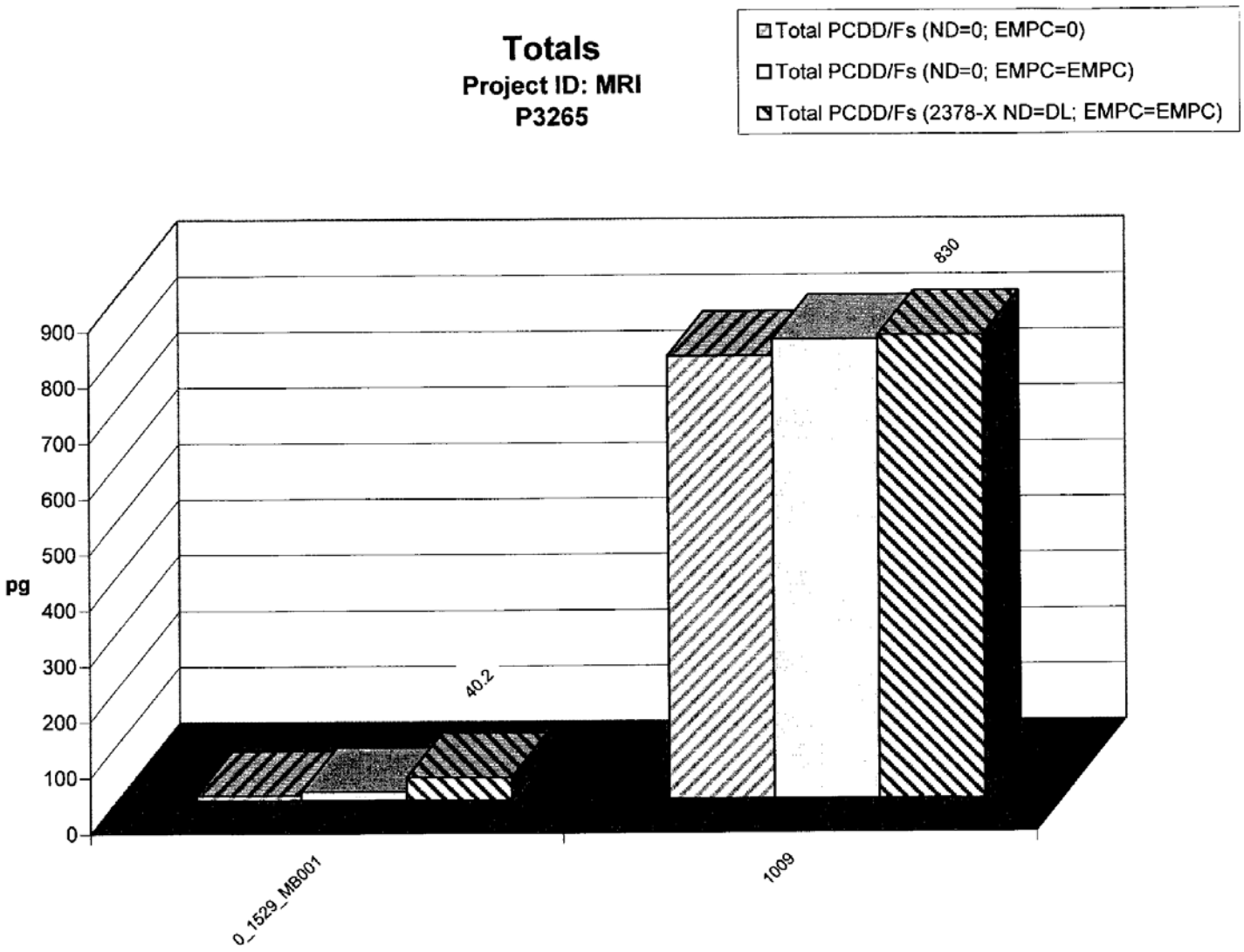
P3265 - Others
Project ID: MRI

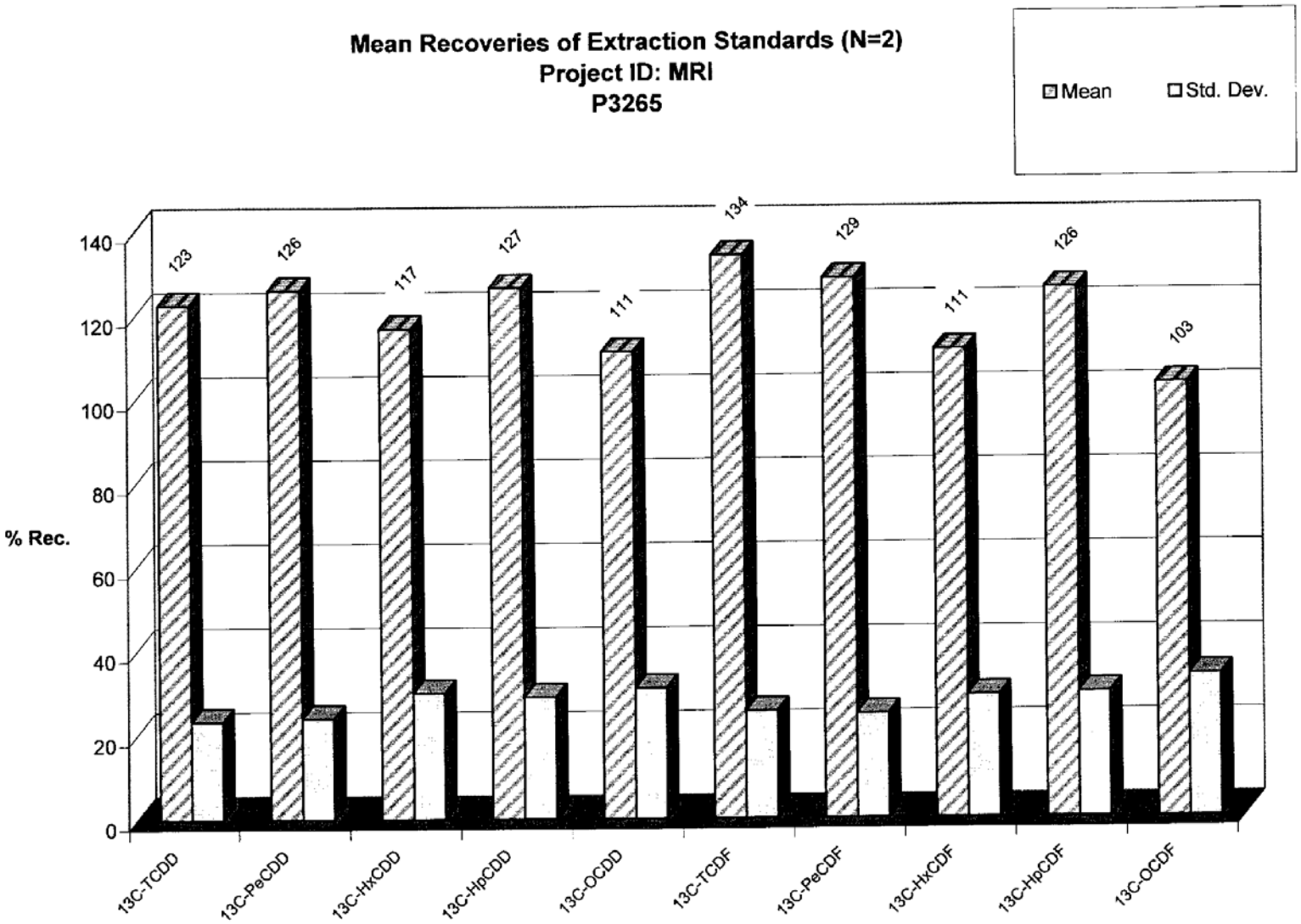
Sample Summary - Part 3 ALTA ANALYTICAL PERSPECTIVES		Method 23
Analyte	**0_1529_MB001**	**1009**
	pg	pg
Other PCDD/Fs (ND=0, EMPC=0)		
Other TCDD	0	150
Other PeCDD	0	92.9
Other HxCDD	0	55.1
Other HpCDD	0	39.6
Other TCDF	0	26.2
Other PeCDF	0	14.5
Other HxCDF	0	10.8
Other HpCDF	0	5.71
Other PCDD/Fs (ND=0, EMPC=EMPC)		
Other TCDD	0	177
Other PeCDD	0	92.9
Other HxCDD	0	55.1
Other HpCDD	3.6	39.6
Other TCDF	0	26.2
Other PeCDF	0	14.5
Other HxCDF	2.53	13.1
Other HpCDF	0	5.71

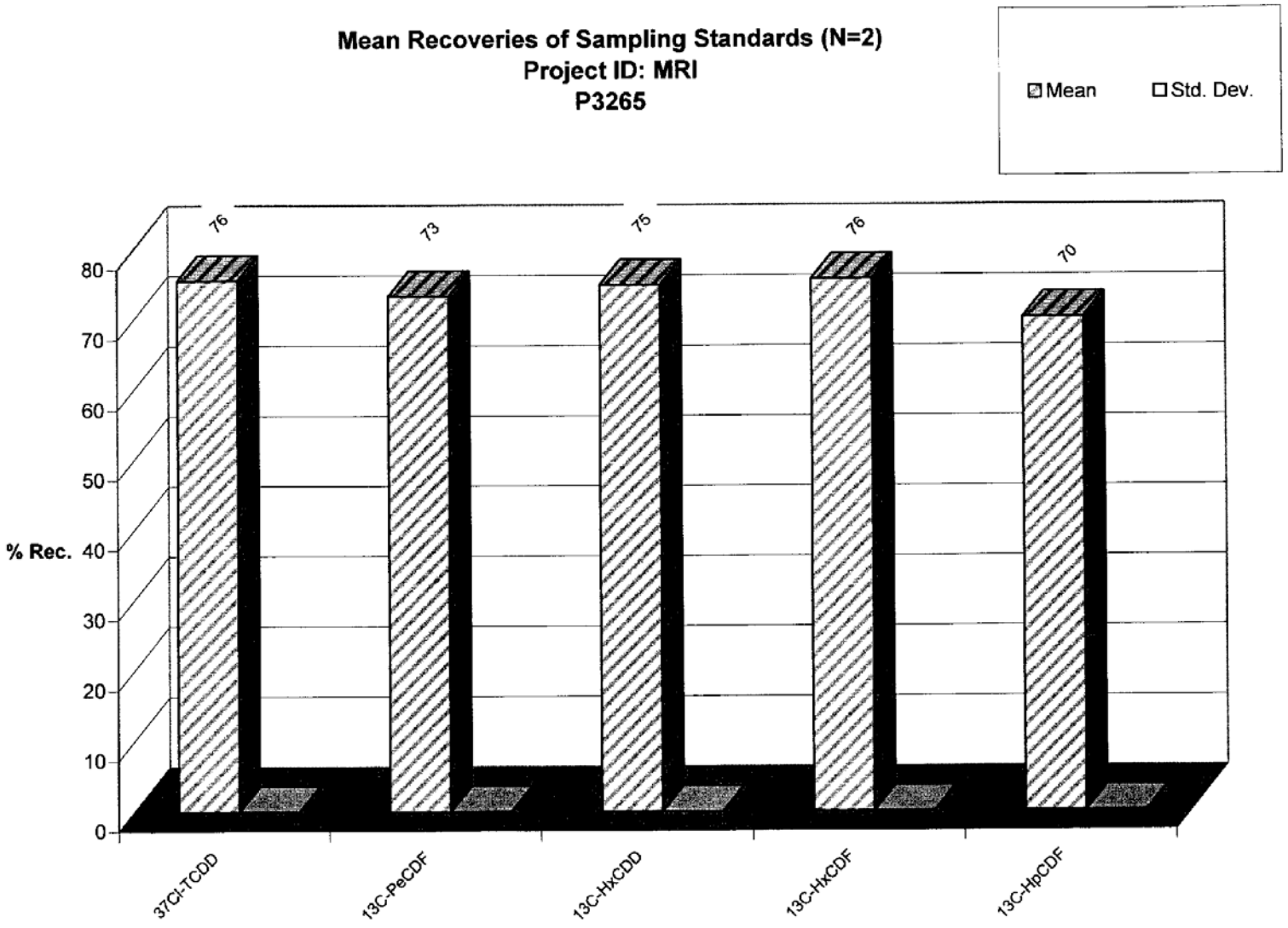
( ) = DL
[ ] = EMPC

Reviewer GAG
Date 16Aug03


ITEF-TEQ
Project ID: MRI
P3265
ND=0; EMPC=0
ND=0; EMPC=EMPC
ND=DL/2; EMPC=0
ND=DL/2; EMPC=EMPC
ND=DL; EMPC=EMPC
pg
25.00
20.00
15.00
10.00
5.00
0.00
3.26
21.1
0_1529_MB001
1009


Totals
Project ID: MRI
P3265
Total PCDD/Fs (ND=0; EMPC=0)
Total PCDD/Fs (ND=0; EMPC=EMPC)
Total PCDD/Fs (2378-X ND=DL; EMPC=EMPC)
pg
900
800
700
600
500
400
300
200
100
0
830
40.2
0_1529_MB001
1009


Mean Recoveries of Extraction Standards (N=2)
Project ID: MRI
P3265
Mean
Std. Dev.
% Rec.
140
120
100
80
60
40
20
0
123
126
117
127
111
134
129
111
126
103
13C-TCDD
13C-PeCDD
13C-HxCDD
13C-HpCDD
13C-OCDD
13C-TCDF
13C-PeCDF
13C-HxCDF
13C-HpCDF
13C-OCDF


Mean Recoveries of Sampling Standards (N=2)
Project ID: MRI
P3265
Mean
Std. Dev.
% Rec.
80
70
60
50
40
30
20
10
0
76
73
75
76
70
37Cl-TCDD
13C-PeCDF
13C-HxCDD
13C-HxCDF
13C-HpCDF

Sample ID: 0_1529_MB001

Method 23

Client Data		Sample Data		Laboratory Data			
Name:	MRI	Matrix:	Air	Project No.:	P3265	Date Received:	n/a
Project ID:	MRI	Weight/Volume:	1	Sample ID:	0_1529_MB001	Date Extracted:	14 Aug 03
Date Collected:	n/a			QC Batch No.:	1529	Date Analyzed:	15 Aug 03

Analyte	Conc.	DL	EMPC	Qualifier	Recoveries		
					ES	SS	AS
	pg	pg	pg				
2,3,7,8-TCDD	ND	0.993			106		107
1,2,3,7,8-PeCDD	ND	0.459			109		107
1,2,3,4,7,8-HxCDD	ND	2.04			95.6		107
1,2,3,6,7,8-HxCDD	ND	1.74			95.6		107
1,2,3,7,8,9-HxCDD	ND	1.83			95.6		107
1,2,3,4,6,7,8-HpCDD	ND	<5			106		107
OCDD	ND	3.2			89.2		107
2,3,7,8-TCDF	ND	0.965			116		107
1,2,3,7,8-PeCDF	ND	1.98			111		107
2,3,4,7,8-PeCDF	ND	1.83			111		107
1,2,3,4,7,8-HxCDF	ND	0.581			90.9		107
1,2,3,6,7,8-HxCDF	ND	0.521			90.9		107
2,3,4,6,7,8-HxCDF	ND	0.599			90.9		107
1,2,3,7,8,9-HxCDF	ND	0.693			90.9		107
1,2,3,4,6,7,8-HpCDF	ND	<5			105		107
1,2,3,4,7,8,9-HpCDF	ND	1.37			105		107
OCDF	ND	6.63			79.3		107
Totals & TEQs							
TCDDs	ND	0.993					
PeCDDs	ND	0.459					
HxCDDs	ND	1.86					
HpCDDs	4.71		8.31				
TCDFs	ND	0.965					
PeCDFs	ND	1.9					
HxCDFs	ND		2.53				
HpCDFs	3.91						
Total PCDD/Fs	**8.62**		**14.8**				
TEQ (ND=0)	**0.00**		**0.00**	**ITEF**			
TEQ (ND=DL/2)	**1.63**		**1.63**	**ITEF**			

ALTA ANALYTICAL PERSPECTIVES

2714 Exchange Drive
Wilmington
North Carolina 28405
USA

Tel: 910 794-1613
Fax: 910 794-3919
e-mail: yt@ultratrace.com
web: www.ultratrace.com

Checkcode: 1489

Reviewer GAG
Date 16Aug03

Appendix D-2

Runs 2 Through 6 Emission Samples

11 SEP 2003

John Hosenfeld
Midwest Research Institute
425 Volker Blvd.
Kansas City, MO 64110

Ph.: 816-753-7600 x1336
Fax: 816-531-0315

Subject: Certificate of Results

Dear John;

Attached to this narrative are the analytical results you requested on the samples submitted for the determination of polychlorinated dibenzo-*p*-dioxins and dibenzofurans. The insert below summarizes the relevant information pertaining to your project. In particular, the QC annotations bring to your attention specific analytical observations and assessments made during the sample handling and data interpretation phases.

Project Information Summary	When applicable, see QC Annotations for details
Client Project No.	110249.2.001.4
AAP Project No.	**P3290**
Analytical Protocol	23
No. Samples Submitted	6
No. Samples Analyzed	6
No. Laboratory Method Blanks	1
No. OPRs / Batch CS3	1
No. Outstanding Samples	0
Date Received	22-Aug-2003
Condition Received	good
Temperature upon Receipt (C)	8, 10, 11, 19, 23
Extraction within Holding Time	yes
Analysis within Holding Time	yes
Data meet QA/QC Requirements	yes
Exceptions	none
Analytical Difficulties	none

QC Annotations:

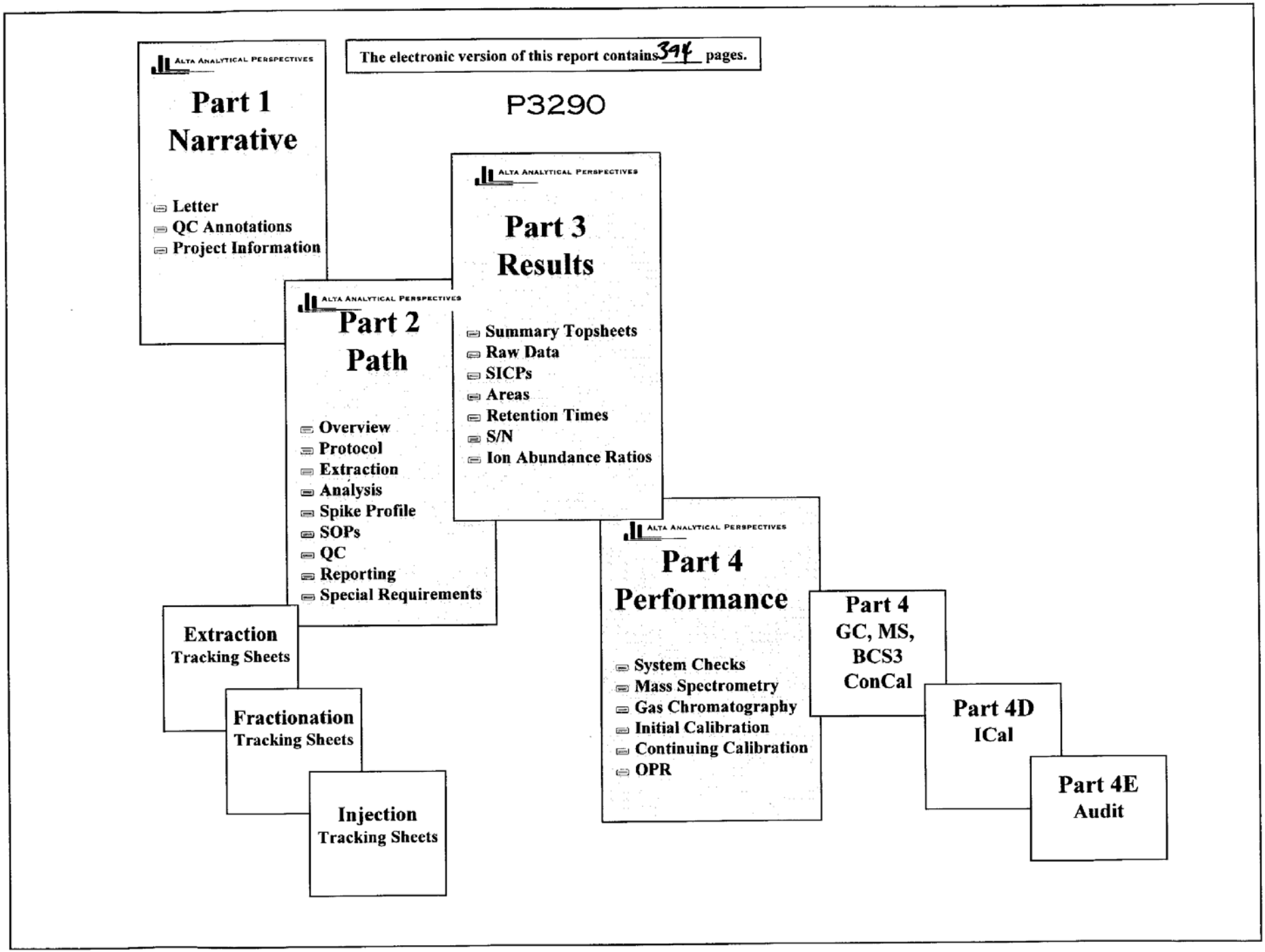
1. The new ratio – [Ra] -- for 2,3,7,8-TCDD following the $^{37}Cl_4$-2,3,7,8-TCDD correction is shown between squared brackets in the DL column.

2. An "A" data qualifier is used for analytes with a concentration below the reporting limit.

Alta Analytical Perspectives remains committed to serving you in the most effective manner. Should you have any questions or need additional information and technical support, please, do not hesitate to contact us. We wanted to thank you for choosing Alta Analytical Perspectives as part of your analytical support team.

Sincerely,

Yves Tondeur, Ph.D.
President & CEO


ALTA ANALYTICAL PERSPECTIVES
The electronic version of this report contains 394 pages.
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BCS3
ConCal
Part 4D
ICal
Part 4E
Audit
Extraction
Tracking Sheets
Fractionation
Tracking Sheets
Injection
Tracking Sheets

P3290 - TEQ

Project ID: 110249.2.001.04

Sample Summary - Part 1

ALTA ANALYTICAL PERSPECTIVES

Method 23

Analyte	0_1551_MB001	1015 BLANK	2009	3009	4004	5004	6004
	pg	pg	pg	pg	pg	pg	pg
2,3,7,8-TCDD	(1.82)	(1.78)	8.17	6.39	5.78	[4.36]	5.51
1,2,3,7,8-PeCDD	(4.38)	(3.05)	5.24	(<5)	6.1	6.78	7.43
1,2,3,4,7,8-HxCDD	(4.7)	(3.09)	(3.02)	(3.84)	(3.49)	(3.83)	(2.81)
1,2,3,6,7,8-HxCDD	(4.31)	(2.83)	(<5)	(<5)	(<5)	8.89	5.86
1,2,3,7,8,9-HxCDD	(4.3)	(2.82)	6.1	(<5)	13.2	[15.4]	12.3
1,2,3,4,6,7,8-HpCDD	(2.8)	11.5	28	23.9	58.9	77.1	64.6
OCDD	12.1	90.5	164	172	811	1220	1350
2,3,7,8-TCDF	(1.37)	(1.59)	4.21	9.11	[3.89]	5.3	(2.34)
1,2,3,7,8-PeCDF	(2.11)	(2.6)	[6.02]	(<5)	5.59	(4.45)	(5.08)
2,3,4,7,8-PeCDF	(1.95)	(2.39)	8.18	10.3	8.85	7	(4.68)
1,2,3,4,7,8-HxCDF	(0.64)	(<5)	9.91	9.58	9.47	[6.32]	(<5)
1,2,3,6,7,8-HxCDF	(0.562)	(<5)	8.89	8.01	8.41	(<5)	(<5)
2,3,4,6,7,8-HxCDF	(0.591)	(<5)	[8.95]	8.18	8.38	[5.41]	(<5)
1,2,3,7,8,9-HxCDF	(0.725)	(0.934)	(0.627)	(0.733)	(<5)	(1.16)	(1.49)
1,2,3,4,6,7,8-HpCDF	(1.02)	9.92	26.6	24.9	24.4	12.9	7.56
1,2,3,4,7,8,9-HpCDF	(1.27)	(0.924)	(1.27)	5.12	5.91	(2.78)	(1.36)
OCDF	(3.19)	(<10)	11.2	18.7	18.5	(<10)	(<10)
ITEF TEQ (ND=0; EMPC=0)	**0.0121**	**0.305**	**18.5**	**15.7**	**19.2**	**10.4**	**13.1**
ITEF TEQ (ND=0; EMPC=EMPC)	**0.0121**	**0.305**	**19.7**	**15.7**	**19.6**	**17.5**	**13.1**
ITEF TEQ (ND=DL/2; EMPC=0)	**3.44**	**3.94**	**19.0**	**17.8**	**19.9**	**11.1**	**15.5**
ITEF TEQ (ND=DL/2; EMPC=EMPC)	**3.44**	**3.94**	**20.1**	**17.8**	**20.3**	**18.1**	**15.5**
ITEF TEQ (ND=DL; EMPC=EMPC)	**6.88**	**7.58**	**20.6**	**19.9**	**20.9**	**18.8**	**17.9**

( ) = DL
[ ] = EMPC

Reviewer .....
Date 9/14/05

P3290 - Totals

Project ID: 110249.2.001.04

Sample Summary - Part 2

ALTA ANALYTICAL PERSPECTIVES

Method 23

Analyte	0_1551_MB001	1015 BLANK	2009	3009	4004	5004	6004
	pg	pg	pg	pg	pg	pg	pg
Totals							
TCDDs	0	0	149	104	103	62.5	88
PeCDDs	0	0	104	54.5	83.6	99.3	94.6
HxCDDs	0	9.52	90.3	29.3	116	136	117
HpCDDs	0	23.5	60.3	53.5	137	179	160
OCDD	12.1	90.5	164	172	811	1220	1350
TCDFs	0	0	83.8	61.2	55.6	44.6	0
PeCDFs	0	0	69.5	60.8	57.9	34.8	0
HxCDFs	0	27.6	59.9	59.6	60.6	19.2	21.6
HpCDFs	0	9.92	38.9	42.9	44.6	12.9	7.56
OCDF	0	5.83	11.2	18.7	18.5	9.05	7.74
Total PCDD/Fs (ND=0; EMPC=0)	**12.1**	**167**	**831**	**657**	**1490**	**1820**	**1840**
Total PCDD/Fs (ND=0; EMPC=EMPC)	**12.1**	**171**	**876**	**728**	**1540**	**1890**	**1870**
Total PCDD/Fs (2378-X ND=DL; EMPC=EMPC)	**47.9**	**193**	**880**	**733**	**1540**	**1900**	**1880**
Total 2378s (ND=0; EMPC=0)	**12.1**	**112**	**280**	**296**	**985**	**1340**	**1450**
Total 2378s (ND=0.5; EMPC=0)	**30.0**	**135**	**285**	**309**	**991**	**1350**	**1470**
Total 2378s (ND=1; EMPC=0)	**47.9**	**159**	**290**	**321**	**998**	**1360**	**1490**
Total 2378s (ND=0; EMPC=1)	**12.1**	**112**	**295**	**296**	**988**	**1370**	**1450**
Total 2378s (ND=0.5; EMPC=1)	**30.0**	**135**	**300**	**309**	**995**	**1380**	**1470**
Total 2378s (ND=1; EMPC=1)	**47.9**	**159**	**305**	**321**	**1000**	**1400**	**1490**

Total 2378s = Sum of 17 2378-substituted PCDD/PCDF congeners (SARA 313)

( ) = DL
[ ] = EMPC

Reviewer .....
Date 9/11/03

P3290 - Others

Project ID: 110249.2.001.04

Sample Summary - Part 3

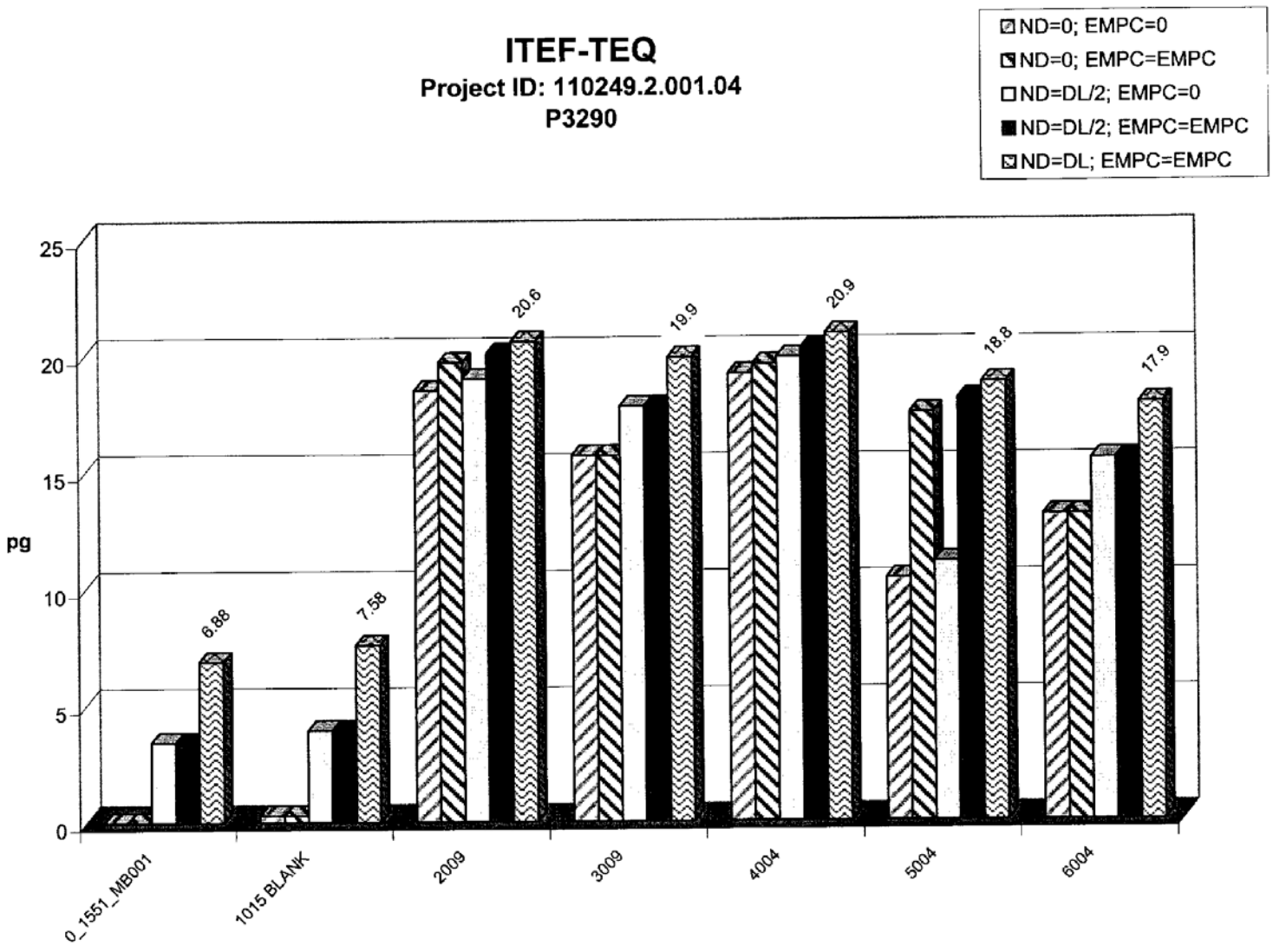
ALTA ANALYTICAL PERSPECTIVES

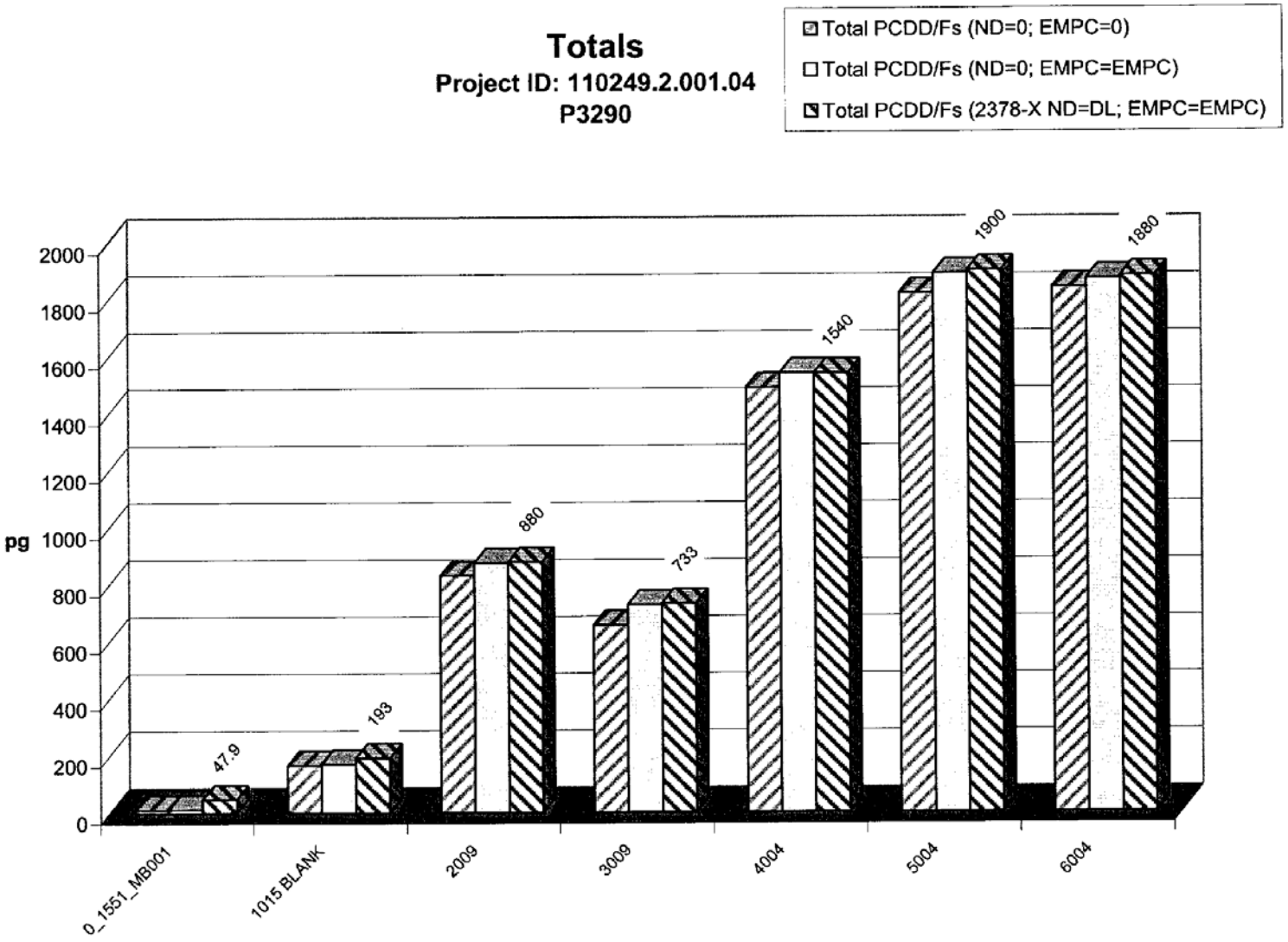
Method 23

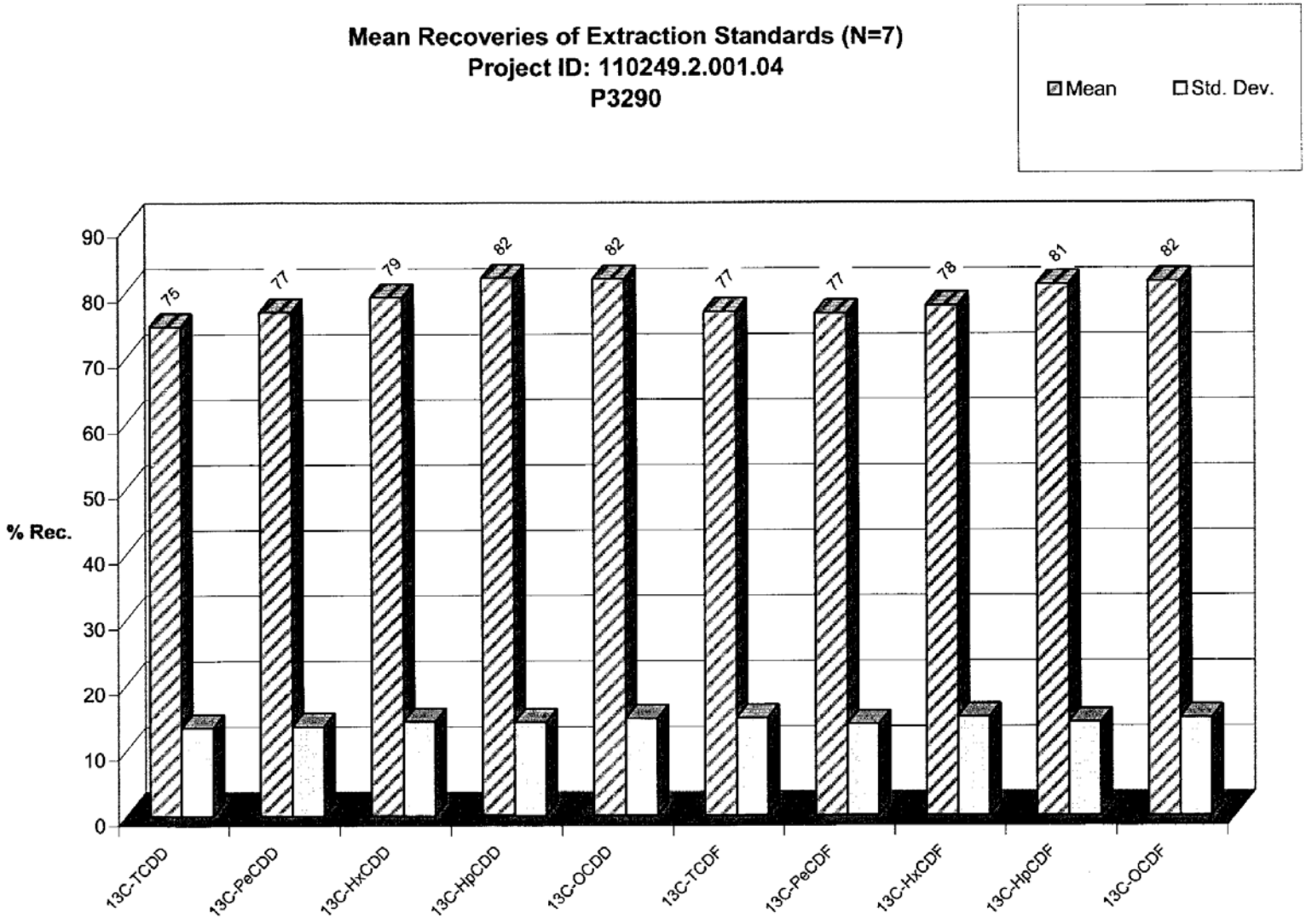
Analyte	0_1551_MB001	1015 BLANK	2009	3009	4004	5004	6004
	pg	pg	pg	pg	pg	pg	pg
Other PCDD/Fs (ND=0, EMPC=0)							
Other TCDD	0	0	141	97.6	97.2	62.5	82.5
Other PeCDD	0	0	98.8	50.6	77.5	92.5	87.2
Other HxCDD	0	9.52	79.5	22	98.4	127	99.3
Other HpCDD	0	12.1	32.4	29.6	78.4	101	95.2
Other TCDF	0	0	79.6	52	55.6	39.3	0
Other PeCDF	0	0	61.3	50.5	43.4	27.8	0
Other HxCDF	0	14.8	41.1	33.8	31.2	14.7	10.2
Other HpCDF	0	0	12.4	12.9	14.3	0	0
Other PCDD/Fs (ND=0, EMPC=EMPC)							
Other TCDD	0	0	148	106	114	84.8	101
Other PeCDD	0	0	103	62.2	81.8	96.2	91.2
Other HxCDD	0	13.1	79.5	41.9	98.4	127	99.3
Other HpCDD	0	12.1	32.4	29.6	78.4	101	95.2
Other TCDF	0	0	84.8	71.3	62.6	42.8	0
Other PeCDF	0	0	71.3	56.4	55.5	34.2	0
Other HxCDF	0	14.8	44.1	35.9	35.2	19.3	10.2
Other HpCDF	0	0	12.4	12.9	14.3	0	0

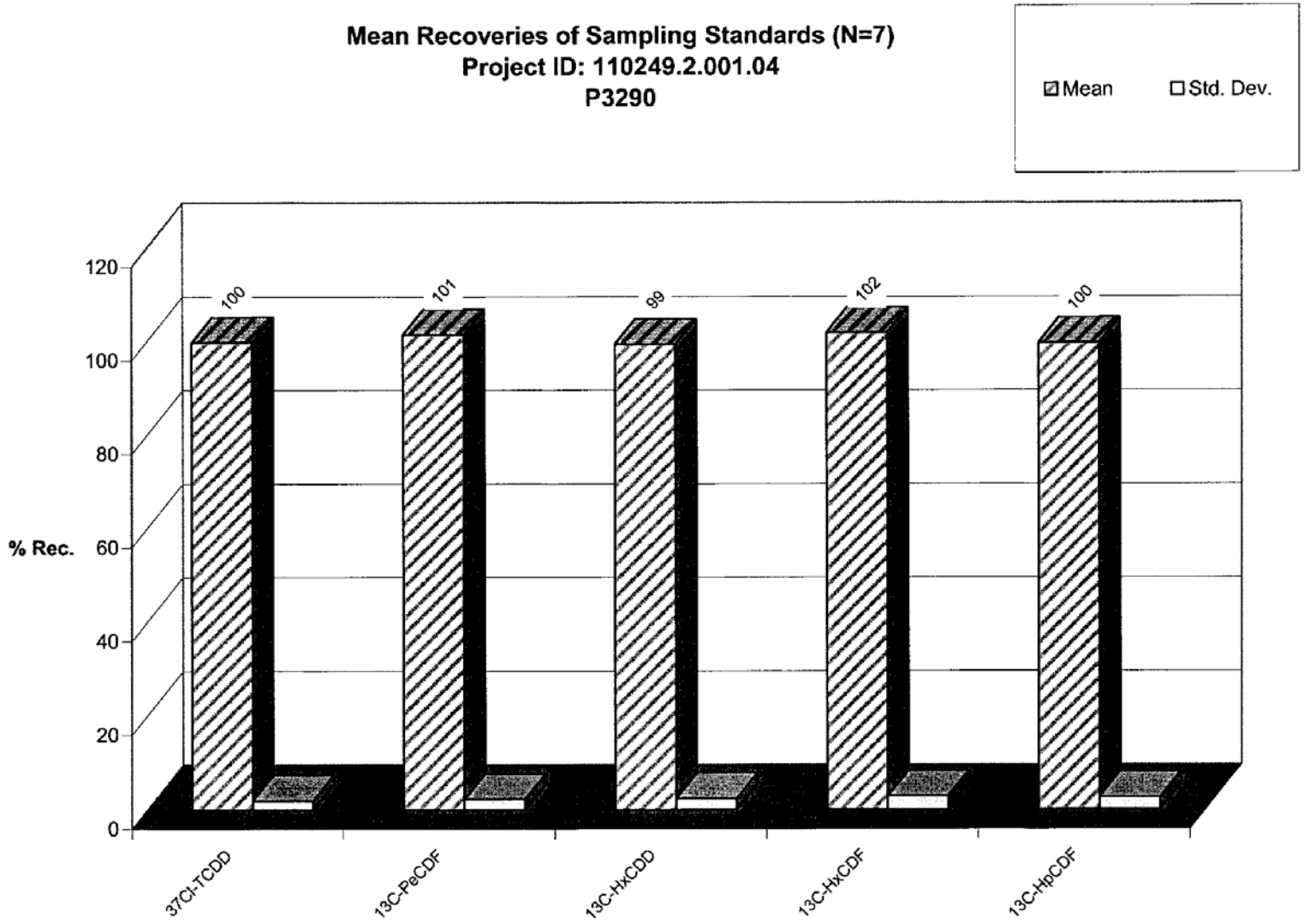
( ) = DL
[ ] = EMPC

Reviewer .....
Date 9/18/03


ITEF-TEQ
Project ID: 110249.2.001.04
P3290
ND=0; EMPC=0
ND=0; EMPC=EMPC
ND=DL/2; EMPC=0
ND=DL/2; EMPC=EMPC
ND=DL; EMPC=EMPC
pg
25
20
15
10
5
0
6.88
7.58
20.6
19.9
20.9
18.8
17.9
0_1551_MB001
1015 BLANK
2009
3009
4004
5004
6004


Totals
Project ID: 110249.2.001.04
P3290
Total PCDD/Fs (ND=0; EMPC=0)
Total PCDD/Fs (ND=0; EMPC=EMPC)
Total PCDD/Fs (2378-X ND=DL; EMPC=EMPC)
pg
2000
1800
1600
1400
1200
1000
800
600
400
200
0
47.9
193
880
733
1540
1900
1880
0_1551_MB001
1015 BLANK
2009
3009
4004
5004
6004


Mean Recoveries of Extraction Standards (N=7)
Project ID: 110249.2.001.04
P3290
Mean
Std. Dev.
% Rec.
90
80
70
60
50
40
30
20
10
0
75
77
79
82
82
77
77
78
81
82
13C-TCDD
13C-PeCDD
13C-HxCDD
13C-HpCDD
13C-OCDD
13C-TCDF
13C-PeCDF
13C-HxCDF
13C-HpCDF
13C-OCDF


Mean Recoveries of Sampling Standards (N=7)
Project ID: 110249.2.001.04
P3290
Mean
Std. Dev.
% Rec.
120
100
80
60
40
20
0
100
101
99
102
100
37Cl-TCDD
13C-PeCDF
13C-HxCDD
13C-HxCDF
13C-HpCDF

Sample ID: 0_1551_MB001 — Method 23

Client Data		Sample Data		Laboratory Data			
Name:	MRI	Matrix:	Air	Project No.:	P3290	Date Received:	n/a
Project ID:	110249.2.001.04	Weight/Volume:	1	Sample ID:	0_1551_MB001	Date Extracted:	28 Aug 03
Date Collected:	n/a			QC Batch No.:	1551	Date Analyzed:	08 Sep 03

Analyte	Conc.	DL	EMPC	Qualifier	Recoveries		
	pg	pg	pg		ES	SS	AS
2,3,7,8-TCDD	ND	1.82			74.1	98.8	79.9
1,2,3,7,8-PeCDD	ND	4.38			75.4	101	79.9
1,2,3,4,7,8-HxCDD	ND	4.7			79.2	98.2	79.9
1,2,3,6,7,8-HxCDD	ND	4.31			79.2	98.2	79.9
1,2,3,7,8,9-HxCDD	ND	4.3			79.2	98.2	79.9
1,2,3,4,6,7,8-HpCDD	ND	2.8			82.3	98	79.9
OCDD	12.1			A	79.6	98	79.9
2,3,7,8-TCDF	ND	1.37			87.2	98.8	79.9
1,2,3,7,8-PeCDF	ND	2.11			76.2	101	79.9
2,3,4,7,8-PeCDF	ND	1.95			76.2	101	79.9
1,2,3,4,7,8-HxCDF	ND	0.64			76.7	102	79.9
1,2,3,6,7,8-HxCDF	ND	0.562			76.7	102	79.9
2,3,4,6,7,8-HxCDF	ND	0.591			76.7	102	79.9
1,2,3,7,8,9-HxCDF	ND	0.725			76.7	102	79.9
1,2,3,4,6,7,8-HpCDF	ND	1.02			81.7	98	79.9
1,2,3,4,7,8,9-HpCDF	ND	1.27			81.7	98	79.9
OCDF	ND	3.19			80.8	98	79.9
Totals & TEQs							
TCDDs	ND	1.82					
PeCDDs	ND	4.38					
HxCDDs	ND	4.43					
HpCDDs	ND	2.8					
TCDFs	ND	1.37					
PeCDFs	ND	2.03					
HxCDFs	ND	0.624					
HpCDFs	ND	1.13					
Total PCDD/Fs	**12.1**		**12.1**				
TEQ (ND=0)	**0.0121**		**0.0121**	**ITEF**			
TEQ (ND=DL/2)	**3.44**		**3.44**	**ITEF**			

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Checkcode: 3357

Reviewer .....
Date 9/11/03

Sample ID: 1015 BLANK — Method 23

Client Data		Sample Data		Laboratory Data			
Name:	MRI	Matrix:	Air	Project No.:	P3290	Date Received:	22 Aug 03
Project ID:	110249.2.001.04	Weight/Volume:	1	Sample ID:	P3290_1551_001	Date Extracted:	28 Aug 03
Date Collected:	20 Aug 03			QC Batch No.:	1551	Date Analyzed:	08 Sep 03

Analyte	Conc.	DL	EMPC	Qualifier	Recoveries		
	pg	pg	pg		ES	SS	AS
2,3,7,8-TCDD	ND	1.78			82.2	99.1	87.8
1,2,3,7,8-PeCDD	ND	3.05			85.8	100	87.8
1,2,3,4,7,8-HxCDD	ND	3.09			88.7	96.7	87.8
1,2,3,6,7,8-HxCDD	ND	2.83			88.7	96.7	87.8
1,2,3,7,8,9-HxCDD	ND	2.82			88.7	96.7	87.8
1,2,3,4,6,7,8-HpCDD	11.5			A	88.3	97.7	87.8
OCDD	90.5			A	87.7	97.7	87.8
2,3,7,8-TCDF	ND	1.59			82.1	99.1	87.8
1,2,3,7,8-PeCDF	ND	2.6			86.1	100	87.8
2,3,4,7,8-PeCDF	ND	2.39			86.1	100	87.8
1,2,3,4,7,8-HxCDF	ND	<5			88.4	98.9	87.8
1,2,3,6,7,8-HxCDF	ND	<5			88.4	98.9	87.8
2,3,4,6,7,8-HxCDF	ND	<5			88.4	98.9	87.8
1,2,3,7,8,9-HxCDF	ND	0.934			88.4	98.9	87.8
1,2,3,4,6,7,8-HpCDF	9.92			A	87.2	97.7	87.8
1,2,3,4,7,8,9-HpCDF	ND	0.924			87.2	97.7	87.8
OCDF	ND	<10			88.6	97.7	87.8
Totals & TEQs							
TCDDs	ND	1.78					
PeCDDs	ND	3.05					
HxCDDs	9.52		13.1				
HpCDDs	23.5						
TCDFs	ND	1.59					
PeCDFs	ND	2.49					
HxCDFs	27.6						
HpCDFs	9.92						
Total PCDD/Fs	**167**		**171**				
TEQ (ND=0)	**0.305**		**0.305**	**ITEF**			
TEQ (ND=DL/2)	**3.94**		**3.94**	**ITEF**			

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Reviewer .....
Date 9/11/03

Sample ID: 2009 — Method 23

Client Data		Sample Data		Laboratory Data			
Name:	MRI	Matrix:	Air	Project No.:	P3290	Date Received:	22 Aug 03
Project ID:	110249.2.001.04	Weight/Volume:	1	Sample ID:	P3290_1551_002	Date Extracted:	28 Aug 03
Date Collected:	14 Aug 03			QC Batch No.:	1551	Date Analyzed:	08 Sep 03

Analyte	Conc.	DL	EMPC	Qualifier	Recoveries		
	pg	pg	pg		ES	SS	AS
2,3,7,8-TCDD	8.17	[Ra=0.864]		A	84.7	97.9	90.3
1,2,3,7,8-PeCDD	5.24			A	87.5	99.7	90.3
1,2,3,4,7,8-HxCDD	ND	3.02			88.6	97	90.3
1,2,3,6,7,8-HxCDD	ND	<5			88.6	97	90.3
1,2,3,7,8,9-HxCDD	6.1			A	88.6	97	90.3
1,2,3,4,6,7,8-HpCDD	28			A	90.9	98.1	90.3
OCDD	164				90.6	98.1	90.3
2,3,7,8-TCDF	4.21			A	86.2	97.9	90.3
1,2,3,7,8-PeCDF	EMPC		6.02	A	86.3	99.7	90.3
2,3,4,7,8-PeCDF	8.18			A	86.3	99.7	90.3
1,2,3,4,7,8-HxCDF	9.91			A	88.2	98.7	90.3
1,2,3,6,7,8-HxCDF	8.89			A	88.2	98.7	90.3
2,3,4,6,7,8-HxCDF	EMPC		8.95	A	88.2	98.7	90.3
1,2,3,7,8,9-HxCDF	ND	0.627			88.2	98.7	90.3
1,2,3,4,6,7,8-HpCDF	26.6			A	89.6	98.1	90.3
1,2,3,4,7,8,9-HpCDF	ND	1.27			89.6	98.1	90.3
OCDF	11.2			A	89.3	98.1	90.3
Totals & TEQs							
TCDDs	149		156				
PeCDDs	104		109				
HxCDDs	90.3						
HpCDDs	60.3						
TCDFs	83.8		89				
PeCDFs	69.5		85.5				
HxCDFs	59.9		71.9				
HpCDFs	38.9						
Total PCDD/Fs	**831**		**876**				
TEQ (ND=0)	**18.5**		**19.7**	**ITEF**			
TEQ (ND=DL/2)	**19**		**20.1**	**ITEF**			

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Reviewer .....TV.....
Date .....9/11/03.....

Sample ID: 1009 — Method 23

Client Data		Sample Data		Laboratory Data			
Name:	MRI	Matrix:	Air	Project No.:	P3265	Date Received:	14 Aug 03
Project ID:	MRI	Weight/Volume:	1	Sample ID:	P3265_1529_001	Date Extracted:	14 Aug 03
Date Collected:	n/a			QC Batch No.:	1529	Date Analyzed:	15 Aug 03

Analyte	Conc.	DL	EMPC	Qualifier	Recoveries		
	pg	pg	pg		ES	SS	AS
2,3,7,8-TCDD	11.6	[Ra=0.831]			139	75.7	112
1,2,3,7,8-PeCDD	5.75			A	143	73.4	112
1,2,3,4,7,8-HxCDD	ND	3.32			138	75	112
1,2,3,6,7,8-HxCDD	ND	<5			138	75	112
1,2,3,7,8,9-HxCDD	5.44			A	138	75	112
1,2,3,4,6,7,8-HpCDD	32.3			A	147	70.3	112
OCDD	302				133	70.3	112
2,3,7,8-TCDF	2.68			A	152	75.7	112
1,2,3,7,8-PeCDF	ND	0.938			146	73.4	112
2,3,4,7,8-PeCDF	ND	<5			146	73.4	112
1,2,3,4,7,8-HxCDF	ND	<5			132	75.8	112
1,2,3,6,7,8-HxCDF	ND	<5			132	75.8	112
2,3,4,6,7,8-HxCDF	ND	<5			132	75.8	112
1,2,3,7,8,9-HxCDF	ND	1.19			132	75.8	112
1,2,3,4,6,7,8-HpCDF	10.6			A	147	70.3	112
1,2,3,4,7,8,9-HpCDF	ND	1.58			147	70.3	112
OCDF	12.8			A	127	70.3	112
Totals & TEQs							
TCDDs	161		188				
PeCDDs	98.7						
HxCDDs	63.5						
HpCDDs	71.9						
TCDFs	28.9						
PeCDFs	17.7						
HxCDFs	21.1		23.3				
HpCDFs	16.3						
Total PCDD/Fs	**794**		**823**				
TEQ (ND=0)	**16.1**		**16.1**	**ITEF**			
TEQ (ND=DL/2)	**18.6**		**18.6**	**ITEF**			

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Reviewer GAG
Date 16Aug03

Sample ID: 3009 — Method 23

Client Data		Sample Data		Laboratory Data			
Name:	MRI	Matrix:	Air	Project No.:	P3290	Date Received:	22 Aug 03
Project ID:	110249.2.001.04	Weight/Volume:	1	Sample ID:	P3290_1551_003	Date Extracted:	28 Aug 03
Date Collected:	15 Aug 03			QC Batch No.:	1551	Date Analyzed:	08 Sep 03

Analyte	Conc.	DL	EMPC	Qualifier	Recoveries		
	pg	pg	pg		ES	SS	AS
2,3,7,8-TCDD	6.39	[Ra=0.787]		A	82.4	102	87.3
1,2,3,7,8-PeCDD	ND	<5			82.9	106	87.3
1,2,3,4,7,8-HxCDD	ND	3.84			86.9	100	87.3
1,2,3,6,7,8-HxCDD	ND	<5			86.9	100	87.3
1,2,3,7,8,9-HxCDD	ND	<5			86.9	100	87.3
1,2,3,4,6,7,8-HpCDD	23.9			A	91.9	103	87.3
OCDD	172				90.9	103	87.3
2,3,7,8-TCDF	9.11			A	83.9	102	87.3
1,2,3,7,8-PeCDF	ND	<5			83.6	106	87.3
2,3,4,7,8-PeCDF	10.3			A	83.6	106	87.3
1,2,3,4,7,8-HxCDF	9.58			A	84.7	104	87.3
1,2,3,6,7,8-HxCDF	8.01			A	84.7	104	87.3
2,3,4,6,7,8-HxCDF	8.18			A	84.7	104	87.3
1,2,3,7,8,9-HxCDF	ND	0.733			84.7	104	87.3
1,2,3,4,6,7,8-HpCDF	24.9			A	90.3	103	87.3
1,2,3,4,7,8,9-HpCDF	5.12			A	90.3	103	87.3
OCDF	18.7			A	90.1	103	87.3
Totals & TEQs							
TCDDs	104		113				
PeCDDs	54.5		66.1				
HxCDDs	29.3		49.2				
HpCDDs	53.5						
TCDFs	61.2		80.4				
PeCDFs	60.8		71.1				
HxCDFs	59.6		61.6				
HpCDFs	42.9						
Total PCDD/Fs	**657**		**728**				
TEQ (ND=0)	**15.7**		**15.7**	**ITEF**			
TEQ (ND=DL/2)	**17.8**		**17.8**	**ITEF**			

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Reviewer .....
Date 9/11/03

Sample ID: 4004 — Method 23

Client Data		Sample Data		Laboratory Data			
Name:	MRI	Matrix:	Air	Project No.:	P3290	Date Received:	22 Aug 03
Project ID:	110249.2.001.04	Weight/Volume:	1	Sample ID:	P3290_1551_004	Date Extracted:	28 Aug 03
Date Collected:	18 Aug 03			QC Batch No.:	1551	Date Analyzed:	08 Sep 03

Analyte	Conc.	DL	EMPC	Qualifier	Recoveries		
	pg	pg	pg		ES	SS	AS
2,3,7,8-TCDD	5.78	[Ra=0.691]		A	87	97.9	91.8
1,2,3,7,8-PeCDD	6.1			A	90	99.4	91.8
1,2,3,4,7,8-HxCDD	ND	3.49			92.2	98.9	91.8
1,2,3,6,7,8-HxCDD	ND	<5			92.2	98.9	91.8
1,2,3,7,8,9-HxCDD	13.2			A	92.2	98.9	91.8
1,2,3,4,6,7,8-HpCDD	58.9				96.3	97.7	91.8
OCDD	811				99.9	97.7	91.8
2,3,7,8-TCDF	EMPC		3.89	A	87.6	97.9	91.8
1,2,3,7,8-PeCDF	5.59			A	89.1	99.4	91.8
2,3,4,7,8-PeCDF	8.85			A	89.1	99.4	91.8
1,2,3,4,7,8-HxCDF	9.47			A	92.2	99.4	91.8
1,2,3,6,7,8-HxCDF	8.41			A	92.2	99.4	91.8
2,3,4,6,7,8-HxCDF	8.38			A	92.2	99.4	91.8
1,2,3,7,8,9-HxCDF	ND	<5			92.2	99.4	91.8
1,2,3,4,6,7,8-HpCDF	24.4			A	95.5	97.7	91.8
1,2,3,4,7,8,9-HpCDF	5.91			A	95.5	97.7	91.8
OCDF	18.5			A	98.9	97.7	91.8
Totals & TEQs							
TCDDs	103		120				
PeCDDs	83.6		87.9				
HxCDDs	116						
HpCDDs	137						
TCDFs	55.6		66.5				
PeCDFs	57.9		69.9				
HxCDFs	60.6		64.6				
HpCDFs	44.6						
Total PCDD/Fs	**1,490**		**1,540**				
TEQ (ND=0)	**19.2**		**19.6**	**ITEF**			
TEQ (ND=DL/2)	**19.9**		**20.3**	**ITEF**			

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Date 9/11/03

Sample ID: 5004 — Method 23

Client Data		Sample Data		Laboratory Data			
Name:	MRI	Matrix:	Air	Project No.:	P3290	Date Received:	22 Aug 03
Project ID:	110249.2.001.04	Weight/Volume:	1	Sample ID:	P3290_1551_005	Date Extracted:	28 Aug 03
Date Collected:	19 Aug 03			QC Batch No.:	1551	Date Analyzed:	09 Sep 03

Analyte	Conc.	DL	EMPC	Qualifier	Recoveries		
	pg	pg	pg		ES	SS	AS
2,3,7,8-TCDD	EMPC	[Ra=0.97]	4.36	A	60.8	100	65.8
1,2,3,7,8-PeCDD	6.78			A	63.5	102	65.8
1,2,3,4,7,8-HxCDD	ND	3.83			64.5	102	65.8
1,2,3,6,7,8-HxCDD	8.89			A	64.5	102	65.8
1,2,3,7,8,9-HxCDD	EMPC		15.4	A	64.5	102	65.8
1,2,3,4,6,7,8-HpCDD	77.1				67.6	99.2	65.8
OCDD	1,220				68	99.2	65.8
2,3,7,8-TCDF	5.3			A	62.2	100	65.8
1,2,3,7,8-PeCDF	ND	4.45			63.7	102	65.8
2,3,4,7,8-PeCDF	7			A	63.7	102	65.8
1,2,3,4,7,8-HxCDF	EMPC		6.32	A	62.9	104	65.8
1,2,3,6,7,8-HxCDF	ND	<5			62.9	104	65.8
2,3,4,6,7,8-HxCDF	EMPC		5.41	A	62.9	104	65.8
1,2,3,7,8,9-HxCDF	ND	1.16			62.9	104	65.8
1,2,3,4,6,7,8-HpCDF	12.9			A	66.9	99.2	65.8
1,2,3,4,7,8,9-HpCDF	ND	2.78			66.9	99.2	65.8
OCDF	ND	<10			67.4	99.2	65.8
Totals & TEQs							
TCDDs	62.5		89.2				
PeCDDs	99.3		103				
HxCDDs	136		151				
HpCDDs	179						
TCDFs	44.6		48.1				
PeCDFs	34.8		41.2				
HxCDFs	19.2		35.6				
HpCDFs	12.9						
Total PCDD/Fs	**1,820**		**1,890**				
TEQ (ND=0)	**10.4**		**17.5**	**ITEF**			
TEQ (ND=DL/2)	**11.1**		**18.1**	**ITEF**			

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Reviewer .....
Date 9/11/03

Sample ID: 6004

Method 23

Client Data		Sample Data		Laboratory Data			
Name:	MRI	Matrix:	Air	Project No.:	P3290	Date Received:	22 Aug 03
Project ID:	110249.2.001.04	Weight/Volume:	1	Sample ID:	P3290_1551_006	Date Extracted:	28 Aug 03
Date Collected:	20 Aug 03			QC Batch No.:	1551	Date Analyzed:	09 Sep 03

Analyte	Conc.	DL	EMPC	Qualifier	Recoveries		
	pg	pg	pg		ES	SS	AS
2,3,7,8-TCDD	5.51	[Ra=0.858]		A	51.9	103	51.7
1,2,3,7,8-PeCDD	7.43			A	53.8	102	51.7
1,2,3,4,7,8-HxCDD	ND	2.81			54.4	103	51.7
1,2,3,6,7,8-HxCDD	5.86			A	54.4	103	51.7
1,2,3,7,8,9-HxCDD	12.3			A	54.4	103	51.7
1,2,3,4,6,7,8-HpCDD	64.6				57.8	104	51.7
OCDD	1,350				57.4	104	51.7
2,3,7,8-TCDF	ND	2.34			49.9	103	51.7
1,2,3,7,8-PeCDF	ND	5.08			52	102	51.7
2,3,4,7,8-PeCDF	ND	4.68			52	102	51.7
1,2,3,4,7,8-HxCDF	ND	<5			52.3	106	51.7
1,2,3,6,7,8-HxCDF	ND	<5			52.3	106	51.7
2,3,4,6,7,8-HxCDF	ND	<5			52.3	106	51.7
1,2,3,7,8,9-HxCDF	ND	1.49			52.3	106	51.7
1,2,3,4,6,7,8-HpCDF	7.56			A	56.6	104	51.7
1,2,3,4,7,8,9-HpCDF	ND	1.36			56.6	104	51.7
OCDF	ND	<10			56.2	104	51.7
Totals & TEQs							
TCDDs	88		107				
PeCDDs	94.6		98.7				
HxCDDs	117						
HpCDDs	160						
TCDFs	ND	2.34					
PeCDFs	ND	4.87					
HxCDFs	21.6						
HpCDFs	7.56						
Total PCDD/Fs	**1,840**		**1,870**				
TEQ (ND=0)	**13.1**		**13.1**	**ITEF**			
TEQ (ND=DL/2)	**15.5**		**15.5**	**ITEF**			

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Date 9/11/03

Appendix D-3

Runs 1 Through 6 Clay Feed and Product Samples

(CBI data removed. See confidential version of document.)

Appendix E

Batch Control Spikes (BCS_3)

9.3.1 Batch CS3

9.3.1.1 Definition:

- A QC sample used for true-stable isotope-dilution GC/MS methodologies to ensure the reliability and accuracy (bias and precision) of the determinations.
- It is a new concept introduced to, not only, enhance the accuracy of the measurements, but to provide a basis for assigning an uncertainty to each measurements (NOTE: this is limited to the measurement step because it does not directly address the sampling errors), and abridge the level of effort involved in the documentation of the system's performance (i.e., what used to require three separate analyses are now combined into one).
- It is prepared—inside the same type of vial used for the GC/MS analysis—in stages at the same time as the batch of field samples; i.e., at each phase involving the addition of the ES, CS, JS to the samples. For air matrices, the Batch CS3 is initiated at the same instant as the XAD/PUF cartridges are prepared for sampling.

One Batch CS3 per batch of 20 samples or less—regardless of the matrix type—is going through the same spiking scheme with the same spiking solutions, same analyst, same delivery system, and at the same time as the field samples. It is the laboratory's responsibility to ensure sufficient Batch CS3's are prepared to provide front- and back-end calibration verifications for all the samples as well as reinjections when necessary. The Batch CS3 is then analyzed at the beginning and at the end of a 12-H analytical sequence during which samples are analyzed. For an example of BCS_3 (M8290B), click here.

- In order to use the front- and back-end Batch CS3s averaged RRFs to process the samples, the individual front- and back-end RRFs need to meet a number of requirements (independent verification, RPD, and PD or bias):

9.3.1.1.1 The NS solution should be verified against an independent source. The maximum allowable difference for the "intra-source product area" ratios (*vide infra*) for the unlabeled compound's RRFs is ±20 percent (from the laboratory normal source) relative to the ES (from an independent source). This verification should be performed every time a new set of ICAL solutions and new sets of spiking solutions

(ES, CS/SS, JS, NS) are prepared from new primary stock standards with a minimum of one verification per year.

9.3.1.1.2 The ES solution should be verified against an independent source. The maximum allowable difference for the "intra-source product area" ratios (*vide infra*) for the unlabeled compound's RRFs is ±20 percent (from an independent source) relative to the ES (from the laboratory normal source). This verification should be performed every time a new set of ICAL solutions and new sets of spiking solutions (ES, CS/SS, JS, NS) are prepared from new primary stock standards with a minimum of one verification per year.

9.3.1.1.3 More specifically, it is necessary for the "intra-source product area" ratio below to range from 0.8 to 1.20.

$$\alpha \times \frac{A_x^{ls} \times A_{ES}^{ls}}{A_x^{is} \times A_{ES}^{is}}$$

$\longleftarrow$ laboratory source

$\longleftarrow$ independent

where:

A_x^{ls} = the area of the unlabeled analyte from the laboratory source

A_{ES}^{ls} = the area of the labeled extraction standard from the laboratory source

A_x^{is} = the area of the unlabeled analyte from the independent source

A_{ES}^{is} = the area of the labeled extraction standard from the independent source

α is equal to 1 when the concentrations of the respective analytes are the same between the independent and laboratory sources; the appropriate factor should be applied for situations whereby the concentrations of the respective analytes are different.

NOTE: It is highly recommended that the above mixtures be prepared in the same solvent and analyzed under the same GC/MS conditions.

NOTE: Intra-source product area ratios only apply to analytes for which matching standards are available between the laboratory and independent sources.

9.3.1.1.4 Similarly, for air samples, it is necessary for the "intra-source product area" ratio below to range from 0.7 to 1.30.

$$\alpha \times \frac{A_{SS}^{ls} \times A_{ES}^{ls}}{A_{SS}^{is} \times A_{ES}^{is}}$$

$\longleftarrow$ laboratory source

$\longleftarrow$ independent

where:

A_{SS}^{ls} = the area of the sampling standard from the laboratory source

A_{ES}^{ls} = the area of the labeled extraction standard from the laboratory source

A_{SS}^{is} = the area of the sampling standard from the independent source

A_{ES}^{is} = the area of the labeled extraction standard from the independent source

α is equal to 1 when the concentrations of the respective analytes are the same between the independent and laboratory sources; the appropriate factor should be applied for situations whereby the concentrations of the respective analytes are different.

NOTE: When the SS are used as cleanup standards for non-air matrices, replace SS by CS and ES by JS in the expression above.

9.3.1.1.5 The RPDs between the front- and back-end Batch CS3s should remain within

9.3.1.1.5.1 Ten percent for the unlabeled compounds
9.3.1.1.5.2 Twenty percent for the labeled compounds

9.3.1.1.6 The RRFs Percent Differences (PD) relative to the ICAL should remain within

9.3.1.1.6.1 Twenty percent for the unlabeled compounds
9.3.1.1.6.2 Thirty-five percent for the non-air matrices labeled ES compounds
9.3.1.1.6.3 Fifty percent for air matrices labeled ES compounds
9.3.1.1.6.4 Twenty percent for air's labeled SS, and
9.3.1.1.6.5 Thirty percent for non air's labeled CS compounds
9.3.1.1.6.6 Other requirements are shown in Table Insert 1 and Table Insert 2.

9.3.1.1.7 The addition of both NS and ES should be performed using the same technique and the same volume. That way, any systematic error (within acceptable limits as defined herein) will "ratio out" when the two Batch CS3 calibration analyses are used to compute the analyte concentrations in the samples. By using this approach, the accuracy of the measurements is superior to the traditional approaches. It is also a benefit that flows directly from true stable isotope-dilution GC/MS, which until now was regrettably ignored.

9.3.1.1.8 For air samples where a split factor is involved, i.e., the sample extract is split and a portion is archived as backup, the Batch CS3 is not subjected to an actual physical division. The latter is simulated by the addition of an appropriate volume of the same solvent as for the ICAL and the samples (e.g., if the split factor is 2, then, the Batch CS3 needs to be diluted two fold before analysis to allow the analytes to be at the same concentration as for the ICAL CS3).

9.3.1.1.9 For air samples, the Batch CS3 is initiated at the same time as the preparation of the air sampling modules before the sampling session. To that effect, the same amount of the Sampling Standards is added to a vial, which is kept in the laboratory at room temperature and away from light. The corresponding Lab Method Blank prepared with the same batch of sorbent and spiking solution (i.e., 40 g XAD-2 resin, or PUF) is kept refrigerated.

9.3.1.2 At the beginning and end of each 12-hour period during which samples are analyzed, an aliquot of the Batch CS3 is analyzed to demonstrate adequate GC resolution and sensitivity, response factor reproducibility, to establish the PCDD/PCDF retention time windows and isomer-specificities, and to validate the ES standards and the spiking technique.

9.3.1.3 As defined above, the criteria for an acceptable Batch CS3 are summarized in the table inserts below. When the Batch CS3 fails, it is important to discern the following:

9.3.1.3.1 The fundamental objective of the Batch CS3 is to "validate" the ES and the RRFs used to quantitatively characterize the analytes in the samples **at the time** the standards are used to prepare and analyze the samples. They are four types of standards involved in the preparation of the Batch CS3 that provide various probes into assessing this "validation" procedure. They are the NS (symbolized as A_x in expressions or tables), ES, SS or CS, and JS. The question becomes how can one "extract" the information needed to complete the validation, or how does one "filter" out the irrelevant information to help with the distinction between a critical error and a minor one. A critical error means erroneous data resulting from a seriously flawed spiking technique (e.g., wrong amount of ES added) while other minor errors can provide useful information or feedback on the measurement step (e.g., instrumentation variation). The interpretation of the information obtained from the analysis of the Batch CS3 is best handled when done contextually. This analytical protocol does not claim that it offers a comprehensive analysis but merely puts forward guidelines to help the analyst in assessing the quality and reliability of the data.

9.3.1.3.2 A failure on the "**PD**" requirements may be indicative of an instrumentation difficulty or spiking error. The latter can be of Level PD-1 (i.e., at the standard solution level) or Level PD-2 (i.e., at the spiking operation level). A third Level PD-3 is associated with instrumentation. An error at the standard solution level (Level PD-1) constitutes the most serious failure and requires that a new set of standard solutions be prepared, independently validated (*vide infra*, intra-source ratio study) before repeating the sample extraction and analysis. A new initial calibration is required before analyzing the Batch CS3 and the samples. However, if the error is a Level PD-2 error, a re-extraction and analysis is the most suitable action after correcting the flawed spiking technique. As customarily done, a new Batch CS3 is prepared with a Level PD-2 error. Distinction between Levels PD-1 and PD-2 can be accomplished contextually by examination of the initial

independent validation study and control charts (showing for instance a trend suggesting a degradation of the ES solution), and using the matrices shown in Table Inserts 3 or 4. The Level PD-3 error is associated with instrumentation when an out-of-calibration situation is present or a temporary or localized instrumentation variation is operative. Depending on the severity of the Level PD-3 error, a new calibration (either ICAL or rerunning the Batch CS3 and all the affected samples) following a new "tuning" of the instrumentation may be required.

9.3.1.3.3 A failure on the "**RPD**" requirements may be indicative of instrumentation instability or inability to sustain the instrumentation's performance over a 12-H period. Again, two levels are possible. Level RPD-1 is strictly associated with instrumentation difficulties that are unrelated to the samples under analysis. A re-analysis (i.e., re-injection) of the Batch CS3 **and** of the samples can be considered as a corrective action after correction of the source of the instrumentation's shortfall. If however, the re-analysis of the Batch CS3 fails again, and there are indications that the spiking procedure is questionable (Level PD-1 or PD-2), the associated extraction batch must undergo re-extraction and analysis with the preparation of a new associated Batch CS3 as discussed above for the Batch CS3 PD deviations. A Level RPD-2 Batch CS3 failure may be found with the analysis of samples presenting special challenges (i.e., highly complex matrices that do not cleanup well under the various options offered by this protocol). Depending on the severity of the deviation, additional cleanup or other appropriate actions may be required before re-analysis of the samples and associated Batch CS3. If such action proves to be ineffective, the data should be qualified accordingly.

9.3.1.3.4 A "**PD**" failure for 2,3,7,8-TCDD and/or 2,3,7,8-TCDF results in the inability to reliably quantify 2,3,7,8-TCDD/F until proper corrective action is implemented (e.g., following GC column maintenance). When the corrective action involves a different liquid phase, the **correct** Batch CS3 is used to demonstrate adequate performance. Note that the laboratory is encouraged to adopt a similar stance for 1,2,3,7,8-PeCDD and 2,3,4,7,8-PeCDF (or any other 2,3,7,8-substituted congeners, which significantly contributes to the TEQ).

9.3.1.3.5 The Batch CS3 "PD Requirements" are summarized in the four table inserts below. In addition to the traditional RRFs, another set of "pseudo-RRFs" is computed from the Batch CS3 data to help with the validation of the ES and

RRFs used to report the sample analytes. The pseudo-RRFs are used to further differentiate the various "A" to "C" types PD Requirements. Use Table Insert 3 (non air) or Table Insert 4 (air) for departing-from-the-norm groups of analytes (e.g., all 17 A_x or the five SS show a deviation similar in "sign" and "amplitude"). It is also recommended to examine the data contextually (e.g., using QC charts).

Table Insert 1:
Batch CS_3 PD Requirements
Based on Traditional RRFs
("A" to "C" Types)

Type	Analytes	Requirement	Failure Possible Cause[a,b]	Failure Level	Suggested Corrective Action
A	$\mathbf{A_x}$ vs **ES**	±20%	1. Calibration out 2. Spiking error	1. PD-3 2. PD-1/PD -2	1. New Calibration 2. New Standards/New Extraction
B	**ES** vs. **JS**	±35% non air ±50% for air[c]	1. Calibration out 2. Spiking error	1. PD-3 2. PD-1/PD-2	1. New Calibration 2. New Standards/New Extraction
$\mathbf{C_1}$	**CS** vs. **JS** (non air)	±35%	1. Calibration out 2. Spiking error	1. PD-3 2. -	1. New Calibration 2. Affects other Types
$\mathbf{C_2}$	**SS** vs. **ES** (air)	±20%	1. Calibration out 2. Spiking error	1. PD-3 2. PD-1/PD -2	1. New Calibration 2. New Standards/New Extraction/New Sampling[d]

a) Calibration out = usually when one (localized) or several/all analytes are affected; instrumental source.

b) Spiking error = when all analytes are affected with the same "sign" and "amplitude"; must be considered contextually; i.e., using historical data or other information on the set of standards such as the "pseudo-RRFs". Situations when selected analytes degrade are rare but should not be excluded from consideration.

c) This wider tolerance recognizes the fact that, by design for air matrices, the amounts of ES and JS added during the preparation of the Batch CS3 are different. Thus, an additional error is introduced, which can deceive the analyst's interpretation. In this case, the QC emphasis is shifted towards the "C2" type PD requirement.

d) Because of the nature of an "air" sample, there is no additional sample volume available to repeat the extraction. The laboratory is required to qualify the data by estimating and documenting accordingly the "error" associated with the reported measurements. If such documentation is not possible, and/or the information points toward a seriously flawed ES addition (as opposed to a spiking error associated with the SS), the data can be rejected and re-sampling efforts may be necessary. See the "Air Spiking Related Error Matrix" tables for an alternative approach whereby the A_x vs. SS RRFs are used to determine the analyte's concentrations (Table Insert 4).

Table Insert 2:
Batch CS3 PD Requirements
Based on Pseudo-RRFs
("D" to "G" Types)

Type	Analytes[a]	Requirement
D	**A_x** vs. **CS/SS**	±25%
E_1	**A_x** vs. **JS** (non air)	±35%
E_2	**A_x** vs. **JS** (air)	±50%
F_1	**ES** vs. **CS** (non air)	±20%
G_2	**SS** vs. **JS** (air)	±50%

a) Pseudo-RRFs are limited to analytes, for which an analogous/homologous standard is available:

- 2,3,7,8-TCDD (A_x) vs. $^{13}C_{12}$-1,2,3,4-TCDD (JS)
- 2,3,4,7,8-PeCDF (A_x) vs. $^{13}C_{12}$-1,2,3,4,6-PeCDF (CS)
- $^{13}C_{12}$-1,2,3,7,8-PeCDD (ES) vs. $^{13}C_{12}$-1,2,3,4,7-PeCDD (CS)
- Do not consider pairs such as OCDD (A_x) vs. $^{13}C_{12}$-1,2,3,4,6,8,9-HpCDF (SS) or $^{13}C_{12}$-1,2,3,4,7-PeCDD (CS or SS) vs. $^{13}C_{12}$-1,2,3,4,6,7-HxCDD (JS)

Table Insert 3:
"Non-Air" Spiking Related PD Errors
(departing-from-the-norm group of analytes)

"PD Requirements Decision Matrix"—Normal Configuration
(use BCS_3 RRFs)

	A_x	ES	CS	JS
A_x	–	Y	Y	Y
ES	–	–	Y	Y
CS	–	–	–	Y

"PD Requirements Decision Matrix"—Defective A_x Spiking
(use ICAL RRFs)

	A_x	ES	CS	JS
A_x	–	N	N	N
ES	–	–	Y	Y
CS	–	–	–	Y

"PD Requirements Decision Matrix" – Defective JS Spiking
(use BCS_3 RRFs)
percent recovery measurements for CS & ES affected, not the analytes

	A_x	ES	CS	JS
A_x	–	Y	Y	N
ES	–	–	Y	N
CS	–	–	–	N

"PD Requirements Decision Matrix"—Defective CS Spiking
(use BCS_3 RRFs)
percent recovery measurements for CS affected, not the analytes

	A_x	ES	CS	JS
A_x	–	Y	N	Y
ES	–	–	N	Y
CS	–	–	–	N

"PD Requirements Decision Matrix"—Defective ES Spiking
(Levels PD-1 or PD-2)

	A_x	ES	CS	JS
A_x	–	N	Y	Y
ES	–	–	N	N
CS	–	–	–	Y

Table Insert 4:
"Air" Spiking Related PD Errors
(departing-from-the-norm group of analytes)

"PD Requirements Decision Matrix"—Normal Configuration
(use BCS_3 RRFs)

	A_x	ES	SS	JS
A_x	–	Y	Y	Y
ES	–	–	Y	Y
SS	–	–	–	Y

"PD Requirements Decision Matrix"—Defective A_x Spiking
(use ICAL RRFs)

	A_x	ES	SS	JS
A_x	–	N	N	N
ES	–	–	Y	Y
SS	–	–	–	Y

"PD Requirements Decision Matrix"—Defective JS Spiking
(use BCS_3 RRFs)
percent recovery measurements for ES affected, not the analytes or the SS

	A_x	ES	SS	JS
A_x	–	Y	Y	N
ES	–	–	Y	N
SS	–	–	–	N

"PD Requirements Decision Matrix"—Defective SS Spiking
(use BCS_3 RRFs)
percent recovery measurements for SS affected, not the analytes

	A_x	ES	SS	JS
A_x	–	Y	N	Y
ES	–	–	N	Y
SS	–	–	–	N

"PD Requirements Decision Matrix"—Defective ES Spiking
(Levels PD-1 or PD-2; for air samples only, consider using the A_x vs. SS RRFs)

	A_x	ES	SS	JS
A_x	–	N	Y	Y
ES	–	–	N	N
SS	–	–	–	Y

Appendix F

BCS_3 Performance Criteria

ALTA ANALYTICAL PERSPECTIVES

PRIMARY HIGH-RESOLUTION CONCENTRATION CALIBRATION SOLUTIONS

(Regular Initial Calibration for 8290B)

Concentrations in pg / µL	CS0	CS1	CS2	CS3	CS4	CS5	CS6
Unlabeled Analytes							
2,3,7,8-TCDD	0.25	0.5	2	10	40	200	500
2,3,7,8-TCDF	0.25	0.5	2	10	40	200	500
1,2,3,7,8-PeCDD	1.25	2.5	10	50	200	1000	2500
1,2,3,7,8-PeCDF	1.25	2.5	10	50	200	1000	2500
2,3,4,7,8-PeCDF	1.25	2.5	10	50	200	1000	2500
1,2,3,4,7,8-HxCDD	1.25	2.5	10	50	200	1000	2500
1,2,3,6,7,8-HxCDD	1.25	2.5	10	50	200	1000	2500
1,2,3,7,8,9-HxCDD	1.25	2.5	10	50	200	1000	2500
1,2,3,4,7,8-HxCDF	1.25	2.5	10	50	200	1000	2500
1,2,3,6,7,8-HxCDF	1.25	2.5	10	50	200	1000	2500
1,2,3,7,8,9-HxCDF	1.25	2.5	10	50	200	1000	2500
2,3,4,6,7,8-HxCDF	1.25	2.5	10	50	200	1000	2500
1,2,3,4,6,7,8-HpCDD	1.25	2.5	10	50	200	1000	2500
1,2,3,4,6,7,8-HpCDF	1.25	2.5	10	50	200	1000	2500
1,2,3,4,7,8,9-HpCDF	1.25	2.5	10	50	200	1000	2500
OCDD	2.5	5	20	100	400	2000	5000
OCDF	2.5	5	20	100	400	2000	5000
Extraction Standards							
$^{13}C_{12}$-2,3,7,8-TCDD	100	100	100	100	100	100	100
$^{13}C_{12}$-2,3,7,8-TCDF	100	100	100	100	100	100	100
$^{13}C_{12}$-1,2,3,7,8-PeCDD	100	100	100	100	100	100	100
$^{13}C_{12}$-1,2,3,7,8-PeCDF	100	100	100	100	100	100	100
$^{13}C_{12}$-2,3,4,7,8-PeCDF	100	100	100	100	100	100	100
$^{13}C_{12}$-1,2,3,4,7,8-HxCDD	100	100	100	100	100	100	100
$^{13}C_{12}$-1,2,3,6,7,8-HxCDD	100	100	100	100	100	100	100
$^{13}C_{12}$-1,2,3,7,8,9-HxCDD	100	100	100	100	100	100	100
$^{13}C_{12}$-1,2,3,4,7,8-HxCDF	100	100	100	100	100	100	100
$^{13}C_{12}$-1,2,3,6,7,8-HxCDF	100	100	100	100	100	100	100
$^{13}C_{12}$-2,3,4,6,7,8-HxCDF	100	100	100	100	100	100	100
$^{13}C_{12}$-1,2,3,7,8,9-HxCDF	100	100	100	100	100	100	100
$^{13}C_{12}$-1,2,3,4,6,7,8-HpCDD	100	100	100	100	100	100	100
$^{13}C_{12}$-1,2,3,4,6,7,8-HpCDF	100	100	100	100	100	100	100
$^{13}C_{12}$-1,2,3,4,7,8,9-HpCDF	100	100	100	100	100	100	100
$^{13}C_{12}$-OCDD	200	200	200	200	200	200	200
$^{13}C_{12}$-OCDF	200	200	200	200	200	200	200
Cleanup/Sampling Standards							
$^{37}Cl_4$-2,3,7,8-TCDD	-	0.5	2	10	40	200	-
$^{13}C_{12}$-1,2,3,4,7-PeCDD	100	100	100	100	100	100	100
$^{13}C_{12}$-1,2,3,4,6-PeCDF	100	100	100	100	100	100	100
$^{13}C_{12}$-1,2,3,4,6,9-HxCDF	100	100	100	100	100	100	100
$^{13}C_{12}$-1,2,3,4,6,8,9-HpCDF	100	100	100	100	100	100	100
Injection Standards							
$^{13}C_{12}$-1,2,3,4-TCDD	100	100	100	100	100	100	100
$^{13}C_{12}$-1,2,3,4-TCDF	100	100	100	100	100	100	100
$^{13}C_{12}$-1,2,3,4,6,7-HxCDD	100	100	100	100	100	100	100

ALTA ANALYTICAL PERSPECTIVES

Calibration Solutions for Method 23

Compound PCDD/PCDF	Calibration Solutions (pg/uL)						
Calibration Standards	CS0	CS1	CS2	CS3*	CS4	CS5	CS6
2,3,7,8-TCDD	0.25	0.50	1.0	5.0	50	100	500
2,3,7,8-TCDF	0.25	0.50	1.0	5.0	50	100	500
1,2,3,7,8-PeCDD	1.25	2.5	5.0	25	250	500	2500
1,2,3,7,8-PeCDF	1.25	2.5	5.0	25	250	500	2500
2,3,4,7,8-PeCDF	1.25	2.5	5.0	25	250	500	2500
1,2,3,4,7,8-HxCDD	1.25	2.5	5.0	25	250	500	2500
1,2,3,6,7,8-HxCDD	1.25	2.5	5.0	25	250	500	2500
1,2,3,7,8,9-HxCDD	1.25	2.5	5.0	25	250	500	2500
1,2,3,4,7,8-HxCDF	1.25	2.5	5.0	25	250	500	2500
1,2,3,6,7,8-HxCDF	1.25	2.5	5.0	25	250	500	2500
1,2,3,7,8,9-HxCDF	1.25	2.5	5.0	25	250	500	2500
2,3,4,6,7,8-HxCDF	1.25	2.5	5.0	25	250	500	2500
1,2,3,4,6,7,8-HpCDD	1.25	2.5	5.0	25	250	500	2500
1,2,3,4,6,7,8-HpCDF	1.25	2.5	5.0	25	250	500	2500
1,2,3,4,7,8,9-HpCDF	1.25	2.5	5.0	25	250	500	2500
OCDD	2.5	5.0	10	50	500	1000	5000
OCDF	2.5	5.0	10	50	500	1000	5000
Internal Standards							
$^{13}C_{12}$-2,3,7,8-TCDD	100	100	100	100	100	100	100
$^{13}C_{12}$-2,3,7,8-TCDF	100	100	100	100	100	100	100
$^{13}C_{12}$-1,2,3,7,8-PeCDD	100	100	100	100	100	100	100
$^{13}C_{12}$-1,2,3,7,8-PeCDF	100	100	100	100	100	100	100
$^{13}C_{12}$-1,2,3,6,7,8-HxCDD	100	100	100	100	100	100	100
$^{13}C_{12}$-1,2,3,6,7,8-HxCDF	100	100	100	100	100	100	100
$^{13}C_{12}$-1,2,3,4,6,7,8-HpCDD	100	100	100	100	100	100	100
$^{13}C_{12}$-1,2,3,4,6,7,8-HpCDF	100	100	100	100	100	100	100
$^{13}C_{12}$-OCDD	100	100	100	100	100	100	100
$^{13}C_{12}$-OCDF	100	100	100	100	100	100	100
Surrogate Standards							
$^{37}Cl_4$-2,3,7,8-TCDD	60	60	80	100	120	140	160
$^{13}C_{12}$-2,3,4,7,8-PeCDF	60	60	80	100	120	140	160
$^{13}C_{12}$-1,2,3,4,7,8-HxCDD	60	60	80	100	120	140	160
$^{13}C_{12}$-1,2,3,4,7,8-HxCDF	60	60	80	100	120	140	160
$^{13}C_{12}$-1,2,3,4,7,8,9-HpCDF	60	60	80	100	120	140	160
Recovery Standards							
$^{13}C_{12}$-1,2,3,4-TCDD	100	100	100	100	100	100	100
$^{13}C_{12}$-1,2,3,4-TCDF	100	100	100	100	100	100	100
$^{13}C_{12}$-1,2,3,4,7,8,9-HxCDD	100	100	100	100	100	100	100
Alternate Standard							
$^{13}C_{12}$-1,2,3,7,8,9-HxCDF	100	100	100	100	100	100	100

ALTA ANALYTICAL PERSPECTIVES

List of First & Last Eluters present in the BCS3

OPUSquan on MM1 27-JUN-2003 09:33

PCDD/PCDF RT Window & Isomer Specificity Standards Alta Analytical Perspectives (Form: CPSN)

Client ID: 0_1393_BCS3_A Filename: 030627P1 S: 1 Vial: 31 Acq: 27-JUN-03 10:14:38
Lab ID: 0_1393_BCS3_A GC Column ID: db-5 ICal: MM1_M23_31802_16APR* Wt/Vol: 1.000
Sample text: 0_1393_BCS3_A

Window Defining Standards Results

Reviewer: RM

Date: 27Jun03

First Eluting Isomer	RT	Last Eluting Isomer	RT
1,3,6,8-TCDD	23:57	1,2,8,9-TCDD	28:40
1,2,4,7,9-PeCDD	30:36	1,2,3,8,9-PeCDD	33:36
1,2,4,6,7,9-HxCDD	35:22	1,2,3,7,8,9-HxCDD	37:30
1,2,3,4,6,7,9-HpCDD	40:18	1,2,3,4,6,7,8-HpCDD	41:30
1,3,6,8-TCDF	21:42	1,2,8,9-TCDF	28:51
1,3,4,6,8-PeCDF	28:46	1,2,3,8,9-PeCDF	33:56
1,2,3,4,6,8-HxCDF	34:42	1,2,3,7,8,9-HxCDF	37:54
1,2,3,4,6,7,8-HpCDF	39:51	1,2,3,4,7,8,9-HpCDF	42:20

Isomer Specificity Test Standard Results

2,3,7,8 Isomer	RT	Closest Isomer	RT	
2,3,7,8-TCDD	27:39	1,2,3,9-TCDD	27:18	% Valley <= 10%
2,3,7,8-TCDF	26:46	2,3,4,8-TCDF	26:38	% Valley <= 40%

Analyst: MM

Date: 27Jun03

Appendix G

Process Data and Material Sampling Log Sheets

(CBI data removed. See confidential version of document.)

TECHNICAL REPORT DATA

(Please read Instructions on reverse before completing)

1. REPORT NO.	2.	3. RECIPIENT'S ACCESSION NO.
EPA-		

4. TITLE AND SUBTITLE	5. REPORT DATE
Characterization of Dioxin Emissions From Sources That Use Ball Clays Emission Test Report: Unimin Corporation, Gleason, TN	March 2010
	6. PERFORMING ORGANIZATION CODE

7. AUTHOR(S)		8. PERFORMING ORGANIZATION REPORT NO.
Clyde E. Riley, USEPA	Mark B. Turner, RTI International	
Mary Johnson, USEPA	John Hosenfeld, Midwest Research Institute	
Brian Shrager, USEPA		
Robin Segall, USEAP		

9. PERFORMING ORGANIZATION NAME AND ADDRESS	10. PROGRAM ELEMENT NO.
U.S. Environmental Protection Agency Office of Air Quality Planning and Standards Research Triangle Park, NC 27711	11. CONTRACT/GRANT NO. 68-D-01-079

12. SPONSORING AGENCY NAME AND ADDRESS	13. TYPE OF REPORT AND PERIOD COVERED
Director Office of Air Quality Planning and Standards Office of Air and Radiation U.S. Environmental Protection Agency Research Triangle Park, North Carolina 27711	Final; March 2010
	14. SPONSORING AGENCY CODE EPA/200/04

15. SUPPLEMENTARY NOTES

16. ABSTRACT

This test report is part of a study designed to determine the magnitude of emissions of dibenzo-p-dioxins and dibenzofurans released from thermal processing of ball clay. In this test program, a heated ball clay mill and a dryer at a ball clay manufacturing facility were tested on consecutive weeks during the time period from August 21 through August 20, 2003.

17. KEY WORDS AND DOCUMENT ANALYSIS

a. DESCRIPTORS	b. IDENTIFIERS/OPEN ENDED TERMS	c. COSATI Field/Group
Dioxins/furans Ball Clay	Air pollution control Ball Clay	

18. DISTRIBUTION STATEMENT	19. SECURITY CLASS *(Report)*	21. NO. OF PAGES
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