Note: This is a reference cited in *AP 42, Compilation of Air Pollutant Emission Factors, Volume I Stationary Point and Area Sources.* AP42 is located on the EPA web site at www.epa.gov/ttn/chief/ap42/

The file name refers to the reference number, the AP42 chapter and section. The file name "ref02_c01s02.pdf" would mean the reference is from AP42 chapter 1 section 2. The reference may be from a previous version of the section and no longer cited. The primary source should always be checked.

AP42 Section:	2.1
Background Ch	4
Reference:	115
Title:	York Services Corporation. Final Report for an Emissions Compliance Test Program on Boilers A & B at Adirondack Resource Recovery Facility, Hudson Falls, New York. Prepared for Foster Wheeler Enviresponse, Inc. March 9, 1992.

2.1/4.0/115

FOSTER WHEELER ENVIRONMENTAL SERVICES

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March 10, 1993

Mr. Ronald E. Myers
Environmental Engineer
Technical Support Division (MD-14)
Office of Air Quality and Standards
EPA
Research Triangle Park, NC 27711

Dear Mr. Myers:

Per our discussion via conference call between EPA and IWSA on March 8, 1993, Mr. Mike Cooper promised to send Foster Wheeler's RRF (with dry-scrubber-ESP) compliance test results.

Please find enclosed stack test results for Charleston (SC), Camden (NJ) and Adirondack (NJ) RRF for your review and inclusion for AP-42 emission factors.

If you have any questions or supplied stack test results, please call me at (908) 735-5077.

Sincerely,

Narayan Dave

ND/klk
Enclosure

York Services Corporation

One Research Drive
Stamford, CT 06906
(203) 325-1371
Fax (203) 357-0166

FINAL REPORT

FOR AN

EMISSION COMPLIANCE TEST PROGRAM

ON

BOILER A & B

AT

ADIRONDACK RESOURCE RECOVERY FACILITY
61 RIVER STREET
HUDSON FALLS, NEW YORK 12839-0191

PREPARED FOR

FOSTER WHEELER ENVIRESPONSE, INC.
PERRYVILLE CORPORATE PARK
CLINTON, NEW JERSEY 08809-4000

YORK PROJECT NO. 4942-02
MARCH 9, 1992

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VOLUME II- HCl Data, Hexavalent Chromium, PCB Data

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1.0 EXECUTIVE SUMMARY

York Services Corporation (York) was retained by Foster Wheeler Enviresponse, Inc. (FWEI) to conduct an Emission Compliance Test Program at the Adirondack Resource Recovery Facility (ARRF) located in Hudson Falls, New York. The test program was conducted from January 28, 1992 to February 8, 1992. The testing was conducted under the supervision of
Mr. Roger A. Kniskern; Principal, Air Testing Services.
Mr. Michael J. Cooper, Environmental Compliance Group Manager for FWEI and Mr. Roy Moyer ARRF Plant Manager were our contacts during the test program.

The purpose of the Emission Compliance Test Program was to obtain emission data to submit to the New York State Department of Environmental Conservation (NYSDEC) in support of FWEI's application for a Certificate to Operate. The test program involved sampling and analysis for particulate matter, heavy metals, mercury, sulfur dioxide, oxides of nitrogen, carbon monoxide, volatile organic compounds, sulfuric acid, hydrogen chloride, hydrogen fluoride, formaldehyde, PCDD/PCDF, PCB, PAH and hexavalent chromium. Table 1-1 details the sequence of testing activities.

Table 1-2 summarizes the results of the test program. The results show that the facility meets the permit requirements for all compounds. Detailed results for each test are presented in Section 2.0.

2.0 SUMMARY AND DISCUSSION OF TEST RESULTS

2.1 INTRODUCTION

All test data and results are discussed and summarized in this section. Detailed calculations and back up documentation are included in the Appendices to this report.

2.2 PARTICULATE

Tables 2-1 and 2-2 summarize the particulate emission test results for Boilers A and B, respectively. A soot blowing cycle was conducted during Test No. 4 for each boiler. At the completion of Boiler A inlet test #1 the leak check did not meet the required limit of 0.02 cfm. This leak occurred sometime during the second half of the test since the leak check at the test midpoint was acceptable. The emission data are comparable to the remaining tests which indicates that the leak most likely occurred after the test was completed while handling the sampling equipment. No problems were encountered during the outlet testing.

Table 1-1

Sequence of Testing Activities

	Boiler A	Boiler B
January 28, 1992		
Particulate/Metals #1	----	1215-1436
Particulate/Metals #2	----	1548-1810
Particulate/Metals #3	----	1910-2140
Particulate/Metals #4	----	2226-0050
January 29, 1992		
Particulate/Metals #1	1015-1241	----
Particulate/Metals #2	1402-1625	----
Particulate/Metals #3	1710-1938	----
Particulate/Metals #4	2018-2241	
January 30, 1992		
SO_2 #1	----	0930-1030
HCl #1	----	1009-1109
HCl #2	----	1258-1358
HCl #3	----	1450-1550
January 31, 1992		
SO_2 #1	0931-1031	----
HCl #1	0935-1035	----
HC1 #2	1315-1415	----
HC1 #3	1441-1541	----
February 1, 1992		
SO_2 #2	1648-1748	----
NO_x, CO & THC #1	1648-1748	----
NO_x, CO & THC #2	1900-2000	----
THC #3	2337-0037	----
February 2, 1992		
SO_2, NO_x, CO #3	1110-1210	----
Formaldehyde, NO_x, CO #1,	----	1452-1556
Formaldehyde, NO_x, CO, SO_2 #2	----	1825-1925
Formaldehyde, SO_2 #3	----	2119-2219

Table 1-1 Continued

Sequence of Testing Activities

	Boiler A	Boiler B
February 3, 1992		
CO, NO_x, #3	----	0823-0923
Mercury #1	1210-1430	----
Mercury #2	1537-1752	----
Mercury #4	2113-2327	----
February 4, 1992		
Hydrogen Fluoride #1	1032-1149	----
Hydrogen Fluoride #2	1257-1620	----
Hydrogen Fluoride #3	1702-1814	----
Sulfuric Acid	2025-2135	----
February 5, 1992		
PCDD/PCDF, PCB, PAH #1	1030-1755	----
PCDD/PCDF, PCB, PAH #2	1950-2310	----
Chromium +6 #1	----	1255-1507
Chromium +6 #2	----	1727-2034
Chromium +6, #2	----	2200-0005
February 6, 1992		
PCDD/PCDF, PCB, PAH #3	1000-1330	----
Chromium +6 #1	1308-1522	-----
Chromium +6 #2	1657-1922	-----
Chromium +6 #3	2045-2250	----
February 7, 1992		
Mercury #1	----	1350-1605
Mercury #2	----	1655-1909
Mercury #3	----	1953-2205
February 8, 1992		
Sulfuric Acid #1	----	0933-1043
Sulfuric Acid #2	----	1113-1243
Sulfuric Acid #3	----	1325-1435
Sulfuric Acid #2	1525-1636	----
Sulfuric Acid #3	1728-1837	----

Table 1-2

SUMMARY OF TEST RESULTS

Parameter	Permit Limit	Boiler A	Boiler B
Particulate	6.62 lbs/hr	0.65	0.58
Particulate	0.025 gr/scfd @ 12% CO_2	0.0030	0.0027
Sulfur Dioxide	20.85 lbs/hr / 70% Removal	3.56 / 79.86	4.69/88.07
Nitrogen Dioxide	50 lbs/hr	29.52	27.31
Carbon Monoxide	40.6 lbs/hr	6.99	7.82
Volatile Organic Compounds	4.5 lbs/hr	0.063	NA
Lead	0.875 lbs/hr	2.61×10^{-3}	2.83×10^{-3}
Beryllium	4.65×10^{-6} lbs/hr	$< 1.31 \times 10^{-6}$	$< 1.27 \times 10^{-6}$
Mercury	0.16 lbs/hr	5.19×10^{-3}	6.51×10^{-3}
Hydrogen Fluoride	0.40 lbs/hr	< 0.006	NA
Sulfuric Acid	1.42 lbs/hr	< 0.32	< 0.33
PCDD	0.02×10^{-3} lbs/hr	7.09×10^{-7}	NA
PCDF	0.047×10^{-3} lbs/hr	1.59×10^{-6}	NA
Hydrochloric Acid	11.9 lbs/hr / 90% Removal	3.96 / 95.71	< 2.62 / > 96.99
PAH	8.5×10^{-3} lbs/hr	$< 5.95 \times 10^{-3}$	NA
TCDD	1.25×10^{-6} lbs/hr	3.45×10^{-8}	NA
Arsenic	1.25×10^{-3} lbs/hr	$< 2.99 \times 10^{-5}$	$< 2.89 \times 10^{-5}$
Barium	5.0×10^{-3} lbs/hr	$< 9.55 \times 10^{-4}$	$< 9.22 \times 10^{-4}$
Cadmium	9.0×10^{-3} lbs/hr	3.85×10^{-4}	5.13×10^{-4}
Cobalt	2.9×10^{-3} lbs/hr	$< 2.36 \times 10^{-4}$	$< 3.77 \times 10^{-4}$
Chromium (Total)	6.5×10^{-2} lbs/hr	4.79×10^{-4}	1.01×10^{-3}
Copper	8.5×10^{-3} lbs/hr	2.01×10^{-3}	1.42×10^{-3}
Nickel	0.115 lbs/hr	2.21×10^{-3}	1.43×10^{-2}
Selenium	1.0×10^{-3} lbs/hr	$< 5.97 \times 10^{-5}$	$< 5.77 \times 10^{-5}$
Zinc	0.75 lbs/hr	1.33×10^{-2}	1.83×10^{-2}

Ta ?-1

Summary of Particulate Emission Test Results
Boiler A - ARRF Hudson Falls, NY

Test No.	1 In	1 Out	2 In	2 Out	3 In	3 Out	4 In	4 Out	Avg. In	Avg. Out
General Data										
Date	1/29	1/29	1/29	1/29	1/29	1/29	1/29	1/29	--	--
Time	1015-1240	1016-1241	1402-1620	1406-1625	1710-1936	1712-1938	2018-2230	2023-2241	--	--
Isokinetic Ratio(%)	100.50	96.92	102.58	98.18	101.79	97.82	96.90	99.18	100.44	98.03
Gas Data										
Gas Velocity (fps)	48.0	52.1	47.5	52.2	49.1	52.6	49.7	55.2	48.6	53.0
Gas Temperature(°F)	424	260	435	260	445	258	433	260	434	260
Gas Flow Rate (acfm)	56553	55381	55962	55546	57811	55883	58596	58650	57231	56365
Gas Flow Rate (scfmd)	29097	33217	27419	33275	28601	33535	28673	34843	28448	33718
CO_2 (% v/v)	8.9	9.0	9.8	9.1	10.0	9.0	9.5	8.1	9.6	8.8
O_2 (% v/v)	10.5	10.3	9.6	10.4	9.3	10.6	10.1	11.6	9.9	10.8
H_2O (% v/v)	13.1	17.8	15.7	17.9	14.7	17.9	16.6	18.6	15.0	18.1
Particulate Emissions										
Concentration (gr/scfd)	1.373	0.0030	0.942	0.0026	1.395	0.0018	3.250	0.0016	1.740	0.0023
Concentration (gr/scfd @ 12% CO_2)	1.851	0.0040	1.153	0.0034	1.674	0.0024	4.105	0.0023	2.196	0.0030
Concentration (gr/scfd @ 7% O_2)	1.835	0.0040	1.158	0.0034	1.672	0.0025	4.183	0.0023	2.212	0.0031
Emission Rate (lbs/hr)	342.29	0.86	221.25	0.74	341.97	0.52	798.60	0.47	426.03	0.65
Allowable Particulate Concentration (gr/scfd @ 12% CO_2)	--	0.025	--	0.025	--	0.025	--	0.025	--	0.025
Air Pollution Control System Removal Efficiency (%)	--	99.75	--	99.67	--	99.85	--	99.94	--	99.85

Table 2-2

Summary of Particulate Emission Test Results
Boiler B - ARRF Hudson Falls, NY

Test No.	1 In	1 Out	2 In	2 Out	3 In	3 Out	4 In	4 Out	Avg. In	Avg. Out
General Data										
Date	1/28	1/28	1/28	1/28	1/28	1/28	1/28	1/28	--	--
Time	1040-1436	1217-1433	1548-1805	1550-1810	1910-2135	1916-2140	2226-0038	2232-0050	--	--
Isokinetic Ratio (%)	104.99	106.15	99.80	99.41	98.35	98.02	100.57	100.11	100.93	100.92
Gas Data										
Gas Velocity (fps)	53.6	55.4	49.3	52.5	47.2	51.3	40.6	44.3	47.7	50.9
Gas Temperature (°F)	407	251	405	250	400	252	412	247	406	250
Gas Flow Rate (acfm)	63148	58903	58119	55841	55627	54555	47797	47048	56173	54086
Gas Flow Rate(scfmd)	31898	35580	29270	33780	28935	33409	24375	28741	28620	32878
CO_2 (% v/v)	9.2	9.1	9.7	9.0	9.2	8.7	8.7	10.0	9.2	9.2
O_2 (% v/v)	9.9	10.1	9.6	10.3	10.0	10.7	10.3	8.9	10.0	10.0
H_2O (% v/v)	17.1	18.9	17.3	19.0	15.2	17.8	15.6	18.5	16.3	18.6
Particulate Emissions										
Concentration (gr/scfd)	2.344	0.0028	1.973	0.0014	1.821	0.0022	1.032	0.0016	1.793	0.0020
Concentration (gr/scfd @ 12% CO_2)	3.057	0.0037	2.440	0.0019	2.376	0.0031	1.443	0.0020	2.329	0.0027
Concentration (gr/scfd @ 7% O_2)	2.962	0.0036	2.427	0.0019	2.323	0.0030	1.353	0.0019	2.266	0.0026
Emission Rate (lbs/hr)	640.80	0.86	494.85	0.42	451.64	0.64	215.49	0.40	450.70	0.58
Allowable Particulate Concentration (gr/scfd @ 12% CO_2)	--	0.025	--	0.025	--	0.025	--	0.025	--	0.025
Air Pollution Control System Removal Efficiency (%)	--	99.87	--	99.92	--	99.86	--	99.81	--	99.87

2.3 METALS

Samples for heavy metals were collected at only the stack location for each boiler. These samples were collected in the same sampling train as the particulate. Tables 2-3 and 2-4 summarize the heavy metals emissions for Boilers A and B, respectively. The general test data and gas data for each test are summarized in Tables 2-1 and 2-2.

The cobalt emission for Boiler A, Test 1, was significantly higher than the results for the other two tests, in which cobalt was essentially non-detectable. No obvious explanation for this result was determined. Since the other two test results were non-detectable, along with Test No. 4 which occured during soot blowing, the result for Test No. 1 was not included when determining the average cobalt emissions. It should be noted that if all four test runs are averaged, the result is less than the permit value.

Based upon the usual regulatory requirement of an average of three tests to demonstrate compliance, the test results for the soot blowing event were not included in the average of the test data.

2.4 MERCURY

Samples for mercury were collected at the inlet and outlet for each boiler. Tables 2-5 and 2-6 summarize the results of the mercury emissions for Boilers A and B, respectively. All emission data has been corrected for the mercury found in the blank train. Test #3 for Boiler A was aborted due to glassware breakage during the test.

2.5 SO_2, NO_x, CO AND VOC

Measurements for SO_2 were conducted at the inlet and outlet for each boiler, while CO measurements were made only at the inlet and NO_x was measured at the outlet for each boiler. VOC measurments were conducted only at the Outlet of Boiler A.

Tables 2-7 and 2-8 summarize the emission results for each boiler, respectively. Measurements for velocity, moisture and gas composition were conducted simultaneously with each test.

2.6 SULFURIC ACID

Samples for sulfuric acid were only collected at the stack location for each boiler. Tables 2-9 and 2-10 summarize the sulfuric acid emission results for each boiler, respectively.

2.7 HCl

Measurements for HCl were made at the inlet and outlet for each boiler. Concurrently measurements for velocity, moisture and gas composition were conducted. Tables 2-11 and 2-12 summarize

Table 2-3

Summary of Heavy Metals Emission Test Results
Boiler A - ARRF Hudson Falls, NY

Test No.	1	2	3	Average
Arsenic				
Concentration (ug/dscm)	<0.25	<0.24	<0.24	<0.24
Concentration (ug/dscm @ 7% O_2)	<0.32	<0.32	<0.32	<0.32
Emission Rate (lbs/hr)	$<3.01X10^{-5}$	$<2.97X10^{-5}$	$<2.98x10^{-5}$	$<2.99x10^{-5}$
Allowable Emissions Rate (lbs/hr)	0.00125	0.00125	0.00125	0.00125
Barium				
Concentration (ug/dscm)	<7.73	<7.62	<7.59	<7.65
Concentration (ug/dscm @ 7% O_2)	<10.14	<10.09	<10.24	<10.16
Emission Rate (lbs/hr)	$<9.63x10^{-4}$	$<9.49x10^{-4}$	$<9.53x10^{-4}$	$<9.55x10^{-4}$
Allowable Emissions Rate (lbs/hr)	0.005	0.005	0.005	0.005
Beryllium				
Concentration (ug/dscm)	<0.011	<0.011	<0.011	<0.011
Concentration (ug/dscm @ 7% O_2)	<0.014	<0.014	<0.015	<0.014
Emission Rate (lbs/hr)	$<1.33x10^{-6}$	$<1.31x10^{-6}$	$<1.32x10^{-6}$	$<1.31x10^{-6}$
Allowable Emissions Rate (lbs/hr)	$4.65x10^{-6}$	$4.65x10^{-6}$	$4.65x10^{-6}$	$4.65x10^{-6}$
Cadmium				
Concentration (ug/dscm)	2.42	1.43	0.47	1.44
Concentration (ug/dscm @ 7% O_2)	3.17	1.89	0.64	1.90
Emission Rate (lbs/hr)	$3.01x10^{-4}$	$1.78x10^{-4}$	$5.96x10^{-5}$	$3.58x10^{-4}$
Allowable Emissions Rate (lbs/hr)	0.009	0.009	0.009	0.009
Chromium (Total)				
Concentration (ug/dscm)	3.87	4.29	3.79	3.98
Concentration (ug/dscm @ 7% O_2)	5.07	5.67	5.12	5.29
Emission Rate (lbs/hr)	$4.81x10^{-4}$	$5.34x10^{-4}$	$4.76x10^{-4}$	$4.79x10^{-4}$
Allowable Emissions Rate (lbs/hr)	0.065	0.065	0.065	0.065
Cobalt				
Concentration (ug/dscm)	80.21	<1.91	<1.90	<1.91
Concentration (ug/dscm @ 7% O_2)	105.18	<2.53	<2.56	<2.55
Emission Rate (lbs/hr)	$9.99X10^{-3}$	$<2.34X10^{-4}$	$<2.38X10^{-4}$	$<2.36x10^{-4}$
Allowable Emissions Rate (lbs/hr)	0.0029	0.0029	0.0029	0.0029

Table 2-3 Continued

Summary of Heavy Metals Emission Test Results
Boiler A - ARRF Hudson Falls, NY

Test No.	1	2	3	Average
Copper				
Concentration (ug/dscm)	21.74	20.47	6.17	16.13
Concentration (ug/dscm @ 7% O_2)	28.51	27.10	8.32	21.31
Emission Rate (lbs/hr)	2.71×10^{-3}	2.55×10^{-3}	7.74×10^{-4}	2.01×10^{-3}
Allowable Emissions Rate (lbs/hr)	0.0085	0.0085	0.0085	0.0085
Lead				
Concentration (ug/dscm)	26.58	16.67	19.44	20.90
Concentration (ug/dscm @ 7% O_2)	34.85	22.06	26.24	27.72
Emission Rate (lbs/hr)	3.31×10^{-3}	2.08×10^{-3}	2.44×10^{-3}	2.61×10^{-3}
Allowable Emissions Rate (lbs/hr)	0.875	0.875	0.875	0.875
Manganese				
Concentration (ug/dscm)	3.87	2.86	1.90	2.88
Concentration (ug/dscm @ 7% O_2)	5.07	3.78	2.56	3.80
Emission Rate (lbs/hr)	4.81×10^{-4}	3.56×10^{-4}	2.38×10^{-4}	3.58×10^{-4}
Allowable Emissions Rate (lbs/hr)	NA	NA	NA	NA
Nickel				
Concentration (ug/dscm)	32.86	11.43	9.01	17.77
Concentration (ug/dscm @ 7% O_2)	43.09	15.12	12.16	23.46
Emission Rate (lbs/hr)	4.09×10^{-3}	1.42×10^{-3}	1.13×10^{-3}	2.21×10^{-3}
Allowable Emissions Rate (lbs/hr)	0.115	0.115	0.115	0.115
Selenium				
Concentration (ug/dscm)	<0.49	<0.48	<0.48	<0.48
Concentration (ug/dscm @ 7% O_2)	<0.64	<0.64	<0.64	<0.64
Emission Rate (lbs/hr)	$<6.02 \times 10^{-5}$	$<5.94 \times 10^{-5}$	$<5.96 \times 10^{-5}$	$<5.97 \times 10^{-5}$
Allowable Emissions Rate (lbs/hr)	0.0010	0.0010	0.0010	0.0010
Vanadium				
Concentration (ug/dscm)	<0.48	<0.48	<0.48	<0.48
Concentration (ug/dscm @ 7% O_2)	<0.63	<0.64	<0.64	<0.64
Emission Rate (lbs/hr)	$<6.02 \times 10^{-5}$	$<5.94 \times 10^{-5}$	$<5.96 \times 10^{-5}$	$<5.97 \times 10^{-5}$
Allowable Emissions Rate (lbs/hr)	NA	NA	NA	NA
Zinc				
Concentration (ug/dscm)	136.74	158.56	24.19	106.50
Concentration (ug/dscm @ 7% O_2)	179.31	209.90	32.64	140.62
Emission Rate (lbs/hr)	1.70×10^{-2}	1.98×10^{-2}	3.04×10^{-3}	1.33×10^{-2}
Allowable Emissions Rate (lbs/hr)	0.75	0.75	0.75	0.75

Table 2-4

Summary of Heavy Metals Emission Test Results
Boiler B - ARRF Hudson Falls, NY

Test No.	1	2	3	Average
Arsenic				
Concentration (ug/dscm)	<0.21	<0.24	<0.24	<0.23
Concentration (ug/dscm @7% O_2)	<0.27	<0.31	<0.33	<0.30
Emission Rate (lbs/hr)	$<2.75x10^{-5}$	$<2.93x10^{-5}$	$<2.98x10^{-5}$	$<2.89x10^{-5}$
Allowable Emissions Rate (lbs/hr)	0.00125	0.00125	0.00125	0.00125
Barium				
Concentration (ug/dscm)	<6.60	<7.41	<7.61	<7.21
Concentration (ug/dscm @ 7% O_2)	<8.49	<9.72	<10.36	<9.52
Emission Rate (lbs/hr)	$<8.79x10^{-4}$	$<9.38x10^{-4}$	$<9.51x10^{-4}$	$<9.22x10^{-4}$
Allowable Emissions Rate (lbs/hr)	0.005	0.005	0.005	0.005
Beryllium				
Concentration (ug/dscm)	<0.010	<0.011	<0.011	<0.011
Concentration (ug/dscm @ 7% O_2)	<0.012	<0.014	<0.015	<0.014
Emission Rate (lbs/hr)	$<1.21x10^{-6}$	$<1.29x10^{-6}$	$<1.31x10^{-6}$	$<1.27x10^{-6}$
Allowable Emissions Rate (lbs/hr)	$4.65X10^{-6}$	$4.65X10^{-6}$	$4.65X10^{-6}$	$4.65X10^{-6}$
Cadimum				
Concentration (ug/dscm)	5.35	3.71	2.85	3.97
Concentration (ug/dscm @ 7% O_2)	6.89	4.86	3.88	5.21
Emission Rate (lbs/hr)	$7.14x10^{-4}$	$4.69x10^{-4}$	$3.57x10^{-4}$	$5.13x10^{-4}$
Allowable Emissions Rate (lbs/hr)	0.009	0.009	0.009	0.009
Chromium (Total)				
Concentration (ug/dscm)	14.42	3.71	5.23	7.79
Concentration (ug/dscm @ 7% O_2)	18.55	4.86	7.12	10.17
Emission Rate (lbs/hr)	$1.92X10^{-3}$	$4.69X10^{-4}$	$6.54X10^{-4}$	$1.01X10^{-3}$
Allowable Emissions Rate (lbs/hr)	0.065	0.065	0.065	0.065
Cobalt				
Concentration (ug/dscm)	4.94	<1.85	<1.90	<2.89
Concentration (ug/dscm @ 7% O_2)	6.37	<2.43	<2.59	< 3.80
Emission Rate (lbs/hr)	$6.59X10^{-4}$	$<2.34X10^{-4}$	$<2.37X10^{-4}$	$<3.77X10^{-4}$
Allowable Emissions Rate (lbs/hr)	0.0029	0.0029	0.0029.	0.0029

Table 2-4 Continued

Summary of Heavy Metals Emission Test Results
Boiler B - ARRF Hudson Falls, NY

Test No.	1	2	3	Average
Copper				
Concentration (ug/dscm)	10.71	11.12	11.40	11.08
Concentration (ug/dscm @ 7% O_2)	13.78	14.58	15.54	14.63
Emission Rate (lbs/hr)	1.43×10^{-3}	1.41×10^{-3}	1.43×10^{-3}	1.42×10^{-3}
Allowable Emissions Rate (lbs/hr)	0.0085	0.0085	0.0085	0.0085
Lead				
Concentration (ug/dscm)	23.07	23.16	19.95	22.06
Concentration (ug/dscm @ 7% O_2)	29.67	30.48	27.19	29.12
Emission Rate (lbs/hr)	3.07×10^{-3}	2.93×10^{-3}	2.50×10^{-3}	2.83×10^{-3}
Allowable Emissions Rate (lbs/hr)	0.875	0.875	0.875	0.875
Manganese				
Concentration (ug/dscm)	54.37	3.24	7.13	28.58
Concentration (ug/dscm @ 7% O_2)	69.977	4.25	9.71	27.98
Emission Rate (lbs/hr)	7.24×10^{-3}	4.10×10^{-4}	8.92×10^{-4}	6.75×10^{-4}
Allowable Emissions Rate (lbs/hr)	NA	NA	NA	NA
Nickel				
Concentration (ug/dscm)	275.96	12.51	35.63	108.03
Concentration (ug/dscm @ 7% O_2)	355.17	16.40	48.53	140.03
Emission Rate (lbs/hr)	3.68×10^{-2}	1.58×10^{-3}	4.46×10^{-3}	1.43×10^{-2}
Allowable Emissions Rate (lbs/hr)	0.115	0.115	0.115	0.115
Selenium				
Concentration (ug/dscm)	<0.42	<0.47	<0.48	<0.46
Concentration (ug/dscm @ 7% O_2)	<0.54	<0.61	<0.65	<0.60
Emission Rate (lbs/hr)	$<5.49 \times 10^{-5}$	$<5.87 \times 10^{-5}$	$<5.95 \times 10^{-5}$	$<5.77 \times 10^{-5}$
Allowable Emissions Rate (lbs/hr)	0.0010	0.0010	0.0010	0.0010
Vanadium				
Concentration (ug/dscm)	<0.42	<0.46	<0.48	<0.45
Concentration (ug/dscm @ 7% O_2)	<0.54	<0.61	<0.65	<0.60
Emission Rate (lbs/hr)	$<5.49 \times 10^{-5}$	$<5.86 \times 10^{-5}$	$<5.95 \times 10^{-5}$	$<5.76 \times 10^{-5}$
Allowable Emissions Rate (lbs/hr)	NA	NA	NA	NA
Zinc				
Concentration (ug/dscm)	105.85	108.87	216.15	143.62
Concentration (ug/dscm @ 7% O_2)	136.24	142.76	294.56	191.19
Emission Rate (lbs/hr)	1.41×10^{-2}	1.38×10^{-2}	2.70×10^{-2}	1.83×10^{-2}
Allowable Emissions Rate (lbs/hr)	0.75	0.75	0.75	0.75

Ta. 2-5

Summary of Mercury Emission Test Results
Boiler A - ARRF Hudson Falls, NY

Test No.	1 In	1 Out	2 In	2 Out	4 In*	4 Out*	Avg. In	Avg. Out
General Data								
Date	2/3	2/3	2/3	2/3	2/3	2/3	--	--
Time	1210-1430	1210-1430	1542-1752	1537-1752	2118-2327	2113-2327	--	--
Isokinetic Ratio (%)	106.78	100.64	106.46	99.45	108.14	106.20	107.13	102.10
Gas Data								
Gas Velocity (fps)	50.6	51.5	47.4	49.8	45.4	48.4	47.8	49.9
Gas Temperature (°F)	424	260	421	251	455	251	433	254
Gas Flow Rate (acfm)	53752	54755	55838	52946	53425	51500	54338	53067
Gas Flow Rate (scfmd)	26997	32036	27579	31691	25642	30401	26739	31376
CO_2 (% v/v)	9.8	9.5	9.7	9.2	10.1	9.8	9.9	9.5
O_2 (% v/v)	10.0	10.4	10.0	10.3	9.6	10.5	9.9	10.4
H_2O (% v/v)	14.9	19.2	16.5	18.6	15.8	19.8	15.7	19.2
Mercury Emissions								
Concentration (ug/dscm)	129.6	25.95	514.2	101.7	132.2	3.39	258.7	43.68
Concentration (ug/dscm @ 7% O_2)	165.2	34.35	655.7	133.4	162.6	4.54	327.8	57.43
Emission Rate (lbs/hr)	0.013100	0.003113	0.053102	0.012075	0.012695	0.000386	0.026299	0.005191
Allowable Mercury Emission Rate (lbs/hr)		0.16		0.16		0.16		0.16
Air Pollution Control System Removal Efficiency (%)		76.24		77.26		96.96		80.26

* Test 3 aborted due to nozzle breakage

Ta. 2-6

Summary of Mercury Emission Test Results
Boiler B - ARRF Hudson Falls, NY

Test No.	1 In	1 Out	2 In	2 Out	3 In	3 Out	Avg. In	Avg. Out
General Data								
Date	2/7	2/7	2/7	2/7	2/7	2/7	--	--
Time	1350-1605	1350-1605	1655-1909	1655-1909	1953-2205	1953-2205	--	--
Isokinetic Ratio (%)	102.90	103.55	100.09	103.69	102.40	104.94	101.80	104.06
Gas Data								
Gas Velocity (fps)	44.7	47.6	43.1	48.6	44.9	47.2	44.2	47.8
Gas Temperature (°F)	426	251	408	252	405	251	413	251
Gas Flow Rate (acfm)	52621	50604	50745	51708	52860	50142	52075	50818
Gas Flow Rate (scfmd)	26518	30603	26054	30937	26270	29727	26281	30422
CO_2 (% v/v)	10.4	9.3	10.1	9.5	10.2	9.6	10.2	9.5
O_2 (% v/v)	9.4	10.4	9.6	10.3	9.4	10.1	9.5	10.3
H_2O (% v/v)	14.9	18.3	15.1	19.1	18.1	19.9	16.0	19.1
Mercury Emissions								
Concentration (ug/dscm)	332.3	87.03	671.7	62.74	620.1	20.63	541.4	56.80
Concentration (ug/dscm @ 7% O_2)	401.7	115.21	826.3	82.28	749.5	26.55	659.2	74.78
Emission Rate (lbs/hr)	0.033002	0.009974	0.065541	0.007269	0.061001	0.002296	0.053181	0.006513
Allowable Mercury Emission Rate (lbs/hr)		0.16		0.16		0.16		0.16
Air Pollution Control System Removal Efficiency (%)		69.78		88.91		96.24		87.75

Table 2-7
Summary of SO_2, NO_x, CO and VOC Emission Test Results
Boiler A - ARRF Hudson Falls, NY

Test No.	1 In	1 Out	2 In	2 Out	3 In	3 Out	Avg. In	Avg. Out
SO_2								
Date	1/31	1/31	2/1	2/1	2/2	2/2	--	--
Time	0931-1031	0931-1031	1648-1748	1648-1748	1110-1210	1110-1210	--	--
Concentration (ppmv)	17.4	7.1	69.6	5.8	117.4	21.7	68.1	11.5
Concentration (ppmv @ 7% O_2)	26.5	10.9	108.6	9.5	148.4	28.2	94.5	16.2
Emission Rate (lbs/hr)	4.99	2.64	21.24	2.05	26.81	5.98	17.68	3.56
Removal Efficiency (%)	--	47.09	--	90.37	--	77.71	--	79.86
Allowable Removal Efficiency (%)	--	70	--	70	--	70	--	70
NO_x								
Date		2/1		2/1		2/2	--	--
Time		1648-1748		1900-2000		1110-1210		
Concentration (ppmv)		136.1		148.5		113.0		132.5
Concentration (ppmv @ 7% O_2)		222.6		206.5		146.8		192.0
Emission Rate (lbs/hr)		34.40		31.85		22.31		29.52
Allowable Emission Rate (lbs/hr)		50		50		50		50
CO								
Date	2/1		2/1		2/2			
Time	1648-1748		1900-2000		1110-1210			
Concentration (ppmv)	60.2		31.3		95.4		62.3	
Concentration (ppmv @ 7% O_2)	94.0		37.2		120.6		83.9	
Emission Rate (lbs/hr)	8.00		3.48		9.48		6.99	
Allowable Emission Rate (lbs/hr)	40.6		40.6		40.6		40.6	
VOC (as Methane)								
Date		2/1		2/1		2/1		
Time		1648-1748		1900-2000		2337-0037		
Concentration (ppmv)		1.1		0.2		1.2		0.8
Concentration (ppmv @ 7% O_2)		1.8		0.3		1.6		1.2
Emission Rate (lbs/hr)		0.096		0.015		0.080		0.063
Allowable Emission Rate (lbs/hr)		4.5		4.5		4.5		4.5

Table 2-8

Summary of SO_2, NO_x, CO and VOC Emission Test Results
Boiler B - ARRF Hudson Falls, NY

No.	1 In	1 Out	2 In	2 Out	3 In	3 Out	Avg. In	Avg. Out
SO_2								
Date	1/30	1/30	2/2	2/2	2/2	2/2	--	--
Time	0930-1030	0930-1030	1824-1924	1824-1924	2118-2218	2118-2218	--	--
Concentration (ppmv)	150.6	35.6	181.7	4.9	133.0	4.0	155.1	14.8
Concentration (ppmv @ 7% O_2)	190.3	45.0	200.4	6.4	151.5	5.4	180.7	18.9
Emission Rate (lbs/hr)	41.68	11.39	42.41	1.45	33.81	1.22	39.30	4.69
Removal Efficiency (%)		72.67		96.58		96.40		88.07
Allowable Removal Efficiency (%)		70		70		70		70
NO_x								
Date		2/2		2/2		2/3		
Time		1453-1553		1824-1924		0823-0923		
Concentration (ppmv)		128.1		130.9		116.9		125.3
Concentration (ppmv @ 7% O_2)		163.3		170.0		149.1		160.8
Emission Rate (lbs/hr)		27.02		27.76		27.14		27.31
Allowable Emission Rate (lbs/hr)		50		50		50		50
CO								
Date	2/2		2/2		2/3			
Time	1453-1533		1824-1924		0823-0923			
Concentration (ppmv)	33.0		89.7		95.2		72.6	
Concentration (ppmv @ 7% O_2)	36.7		99.0		119.2		85.0	
Emission Rate (lbs/hr)	3.60		9.12		10.73		7.82	
Allowable Emission Rate (lbs/hr)	40.6		40.6		40.6		40.6	

Ta' 2-9

Summary of Sulfuric Acid Emission Test Results
Boiler A - ARRF Hudson Falls, NY

Test No.	1 Out	2 Out	3 Out	Avg. Out
General Data				
Date	2/4	2/8	2/8	--
Time	2025-2135	1525-1636	1728-1837	--
Isokinetic Ratio (%)	94.63	98.01	98.54	97.06
Gas Data				
Gas Velocity (fps)	48.3	46.5	49.6	48.1
Gas Temperature (°F)	251	261	260	257
Gas Flow Rate (acfm)	51364	49410	52721	51165
Gas Flow Rate (scfmd)	32974	29899	31794	31556
CO_2 (% v/v)	9.3	8.8	8.6	8.9
O_2 (% v/v)	10.3	11.1	11.2	10.9
H_2O (% v/v)	11.1	17.0	17.4	15.2
Sulfuric Acid Emissions				
Concentration (ppmv)	<0.57	<0.71	<0.67	<0.65
Concentration (ppmv @ 7% O_2)	<0.75	<1.01	<0.96	<0.91
Emission Rate (lbs/hr)	<0.30	<0.33	<0.33	<0.32
Allowable Sulfuric Acid Emission Rate (lbs/hr)	1.42	1.42	1.42	1.42

Tal `-10

Summary of Sulfuric Acid Emission Test Results
Boiler B - ARRF Hudson Falls, NY

Test No.	1 Out	2 Out	3 Out	Avg. Out
General Data				
Date	2/8	2/8	2/8	--
Time	0931-1043	1113-1243	1325-1435	--
Isokinetic Ratio (%)	97.33	99.60	100.62	99.18
Gas Data				
Gas Velocity (fps)	45.6	47.6	49.6	47.6
Gas Temperature (°F)	249	256	261	255
Gas Flow Rate (acfm)	48453	50616	52708	50592
Gas Flow Rate (scfmd)	30091	30249	30664	30335
CO_2 (% v/v)	8.3	9.0	8.8	8.7
O_2 (% v/v)	9.33	10.3	11.0	10.2
H_2O (% v/v)	16.2	18.6	20.2	18.3
Sulfuric Acid Emissions				
Concentration (ppmv)	<0.71	<0.69	<0.68	<0.70
Concentration (ppmv @ 7% O_2)	<0.85	<0.91	<0.95	<0.91
Emission Rate (lbs/hr)	<0.34	<0.33	<0.32	<0.33
Allowable Sulfuric Acid Emission Rate (lbs/hr)	1.42	1.42	1.42	1.42

Table 2-11

Summary of HCl Emission Test Results
Boiler A - ARRF Hudson Falls, NY

Test No.	1 In	1 Out	2 In	2 Out	3 In	3 Out	Avg. In	Avg. Out
General Data								
Date	1/31	1/31	1/31	1/31	1/31	1/31	--	--
Time	0935-1035	0935-1035	1315-1415	1315-1415	1441-1541-	1441-1451	--	--
Gas Data								
Gas Velocity (fps)	50.8	57.6	46.7	50.7	47.1	53.0	48.2	53.8
Gas Temperature (°F)	457	264	446	263	418	265	440	264
Gas Flow Rate (acfm)	59895	61281	55011	53929	55429	56328	56778	57179
Gas Flow Rate (scfmd)	28633	37074	26141	30574	27506	32065	27427	33238
CO_2 (% v/v)	7.4	7.5	9.6	9.8	9.6	9.4	8.9	8.9
O_2 (% v/v)	11.8	11.9	10.0	9.5	10.1	10.4	10.6	10.6
H_2O (% v/v)	14.7	15.1	16.2	20.5	15.3	19.8	15.4	18.5
HCl Emissions								
Concentration (pmv)	407.1	21.5	1110.7	23.8	437.2	17.0	651.7	20.8
Concentration (ppmv 7% O_2)	621.8	33.3	1416.4	29.0	562.7	22.5	867.0	28.3
Emission Rate (lbs/hr)	61.29	4.58	152.66	4.17	63.23	3.12	92.39	3.96
Allowable HCl Emission Rate (lbs/hr)		11.9		11.9		11.9		11.9
Air Pollution Control System Removal Efficiency (%)		92.53		97.27		95.07		95.71
Required Air Pollution Control System Removal Efficiency (%)		90		90		90		90

Tal -12

Summary of HCl Emission Test Results
Boiler B - ARRF Hudson Falls, NY

Test No.	1 In	1 Out	2 In	2 Out	3 In	3 Out	Avg. In	Avg. Out
General Data								
Date	1/30	1/30	1/30	1/30	1/30	1/30	--	--
Time	1009-1109	1009-1109	1258-1358	1258-1358	1450-1550-	1443-1542	--	--
Gas Data								
Gas Velocity (fps)	46.7	50.9	46.4	48.4	47.5	52.4	46.9	50.6
Gas Temperature (°F)	435	256	440	256	425	254	433	255
Gas Flow Rate (acfm)	55059	54159	54663	51412	56001	55710	55241	53760
Gas Flow Rate (scfmd)	27612	31923	28225	30211	26828	34017	27555	32050
CO_2 (% v/v)	10.0	8.9	9.0	9.2	10.8	10.1	9.9	9.4
O_2 (% v/v)	9.5	10.7	10.6	10.3	8.5	9.3	9.5	10.1
H_2O (% v/v)	13.5	19.2	10.9	19.4	17.4	16.5	13.9	18.4
HCl Emissions								
Concentration (pmv)	498.3	<0.77	492.0	14.98	754.5	26.26	581.6	<14.00
Concentration (ppmv 7% O_2)	607.5	<1.06	664.0	19.64	845.7	31.46	705.7	<17.39
Emission Rate (lbs/hr)	81.30	<0.14	73.01	2.59	106.42	5.12	86.91	<2.62
Allowable HCl Emission Rate (lbs/hr)		11.9		11.9		11.9		11.9
Air Pollution Control System Removal Efficiency (%)		>99.83		96.45		95.19		>96.99
Required Air Pollution Control System Removal Efficiency (%)		90		90		90		90

Tal .-13

Summary of Hydrogen Fluoride Emission Test Results
Boiler A - ARRF Hudson Falls, NY

Test No.	1 Out	2 Out	3 Out	Avg. Out
General Data				
Date	2/4	2/4	2/4	--
Time	1032-1149	1257-1620	1702-1814	--
Isokinetic Ratio (%)	100.05	108.20	98.91	102.39
Gas Data				
Gas Velocity (fps)	53.3	51.0	51.9	52.1
Gas Temperature (°F)	253	250	253	252
Gas Flow Rate (acfm)	56694	54252	55213	55386
Gas Flow Rate (scfmd)	33299	33045	32654	32999
CO_2 (% v/v)	9.2	8.8	9.3	9.1
O_2 (% v/v)	9.0	10.7	10.3	10.0
H_2O (% v/v)	19.2	16.2	17.9	17.8
Hydrogen Fluoride Emissions				
Concentration (ppmv)	<0.02	<0.01	<0.01	<0.02
Concentration (ppmv @ 7% O_2)	<0.02	<0.02	<0.02	<0.02
Emission Rate (lbs/hr)	<0.007	<0.005	<0.005	<0.006
Allowable Hydrogen Fluoride Emission Rate (lbs/hr)	0.40	0.40	0.40	0.40

Ta 2-14

Summary of Formaldehyde Emission Test Results
Boiler B - ARRF Hudson Falls, NY

Test No.	1 Out	2 Out	3 Out	Avg. Out
General Data				
Date	2/2	2/2	2/4	--
Time	1452-1556	1825-1925	2119-2219	--
Gas Data				
Gas Velocity (fps)	47.4	45.6	48.4	47.1
Gas Temperature (°F)	258	247	254	253
Gas Flow Rate (acfm)	50378	48496	51503	50126
Gas Flow Rate (scfmd)	29362	29526	30151	29746
CO_2 (% v/v)	9.2	9.2	9.6	9.3
O_2 (% v/v)	10.0	10.2	10.5	10.2
H_2O (% v/v)	19.4	17.4	19.4	18.7
Formaldehyde Emissions				
Concentration (ug/dscm)	< 361	< 331	< 328	< 340
Concentration (ppmv)	<0.24	<0.21	<0.21	<0.22
Concentration (ppmv @ 7% O_2)	<0.30	<0.28	<0.29	<0.29
Emission Rate (lbs/hr)	<0.04	<0.04	<0.04	<0.04

2.8 HYDROGEN FLUORIDE

Hydrogen Fluoride samples were collected from the outlet of Boiler A only. Table 2-13 summarizes the hydrogen fluoride emission test results.

2.9 FORMALDEHYDE

Formaldehyde samples were collected from the outlet of Boiler B only. Table 2-14 summarizes the formaldehyde emission test results.

2.10 PCDD/PCDF, PCB and PAH

PCDD/PCDF, PCB and PAH samples were collected at the outlet of Boiler A only. Table 2-15 summarizes the emission test results for these compounds. The results have been corrected for train blank contribution where applicable.

To compare Dioxin emissions to the permit conditions, only tetrachloro-dibenzodioxin (TCDD) is required. The results presented in Table 1-2 for TCDD include only these isomers.

In order to compare PCDD/PCDF emissions to current NYSDEC standards, the emissions have been calculated as TCDD toxic equivalents based upon the toxic equivalency factors issued by the NYSDEC. These calculations can be found in Section 6.16 of this report.

2.13 HEXAVALENT CHROMIUM

Samples for hexavalent chromium were collected from the outlet of each boiler. Tables 2-16 and 2-17 summarize the hexavalent chromium emission test results for each boiler, respectively.

Ta[illegible] 2-15

Summary of PCDD/PCDF, P[illegible] nd PAH Emission Test Results

Boiler A - ARK [illegible] Hudson Falls, NY

Test No.	1 Out	2 Out	3 Out	Avg. Out
General Data				
Date	2/5	2/5	2/5	--
Time	1300-1755	1950-2310	1000-1330	--
Isokinetic Ratio (%)	99.24	99.32	98.85	99.14
Gas Data				
Gas Velocity (fps)	50.1	48.2	49.0	49.1
Gas Temperature (°F)	251	249	256	252
Gas Flow Rate (acfm)	53219	51267	52089	52192
Gas Flow Rate (scfmd)	31657	30396	31155	31069
CO_2 (% v/v)	8.2	8.7	9.0	8.6
O_2 (% v/v)	10.9	10.9	10.5	10.8
H_2O (% v/v)	18.4	19.4	18.0	18.6
PCDD Emissions (Actual)				
Concentration (ng/dscm)	8.98	3.81	5.44	6.08
Emission Rate (lbs/hr)	10.6×10^{-7}	4.33×10^{-7}	6.34×10^{-7}	7.09×10^{-7}
Allowable Emission Rate (lbs/hr)	2×10^{-5}	2×10^{-5}	2×10^{-5}	2×10^{-5}
PCDF Emissions (Actual)				
Concentration (ng/dscm)	14.81	14.01	14.41	14.41
Emission Rate (lbs/hr)	1.67×10^{-6}	1.51×10^{-6}	1.60×10^{-6}	1.59×10^{-6}
Allowable Emission Rate (lbs/hr)	4.65×10^{-5}	4.65×10^{-5}	4.65×10^{-5}	4.65×10^{-5}
TCDD Total Emission				
Concentration (ng/dscm)	0.8116	0.5962	0.4800	0.6293
Emission Rate (lbs/hr)	9.62×10^{-8}	0.39×10^{-8}	~~0.34×10^{-8}~~	3.45×10^{-8}
Allowable Emission Rate (lbs/hr)	1.25×10^{-6}	1.25×10^{-6}	1.25×10^{-6}	1.25×10^{-6}
PCB Emission Total				
Concentration (ug/dscm)	0.3221	0.0605	0.0499	0.1442
Emission Rate (lbs/hr)	3.82×10^{-5}	0.69×10^{-5}	0.58×10^{-5}	1.70×10^{-5}
PAH Emission Total				
Concentration (ug/dscm)	<4.09	<151.40	<1.00	<53.76
Emission Rate (lbs/hr)	$<0.49 \times 10^{-3}$	$<17.23 \times 10^{-3}$	$<0.12 \times 10^{-3}$	$<5.95 \times 10^{-3}$
Allowable Emission Rate (lbs/hr)	8.5×10^{-3}	8.5×10^{-3}	8.5×10^{-3}	8.5×10^{-3}

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Tai 2-16

Summary of Hexavalent Chromium Emission Test Results
Boiler A - ARRF Hudson Falls, NY

Test No.	1 Out	2 Out	3 Out	Avg. Out
General Data				
Date	2/6	2/6	2/6	--
Time	1308-1522	1657-1922	2045-2250	--
Isokinetic Ratio (%)	96.29	102.02	96.02	98.11
Gas Data				
Gas Velocity (fps)	43.8	43.9	47.4	45.0
Gas Temperature (•F)	253	253	254	253
Gas Flow Rate (acfm)	46587	46650	50340	47859
Gas Flow Rate (scfmd)	28866	28170	31240	29425
CO_2 (% v/v)	8.5	9.0	8.7	8.7
O_2 (% v/v)	11.1	10.6	11.0	10.9
H_2O (% v/v)	15.4	17.3	14.8	15.8
Hexavalent Chromium Emissions				
Concentration (ug/dscm)	<1.90	<1.82	<2.45	<2.06
Concentration (ug/dscm @ 7% O_2)	<2.69	<2.46	<3.44	<2.87
Emission Rate (lbs/hr)	<0.00021	<0.00020	<0.00029	<0.00024

Revised

Ta 2-17

Summary of Hexavalent Chromium Emission Test Results
Boiler B - ARRF Hudson Falls, NY

Test No.	1 Out	2 Out	3 Out	Avg. Out
General Data				
Date	2/5	2/5	2/5	--
Time	1255-1507	1727-2034	2200-0005	--
Isokinetic Ratio (%)	94.40	95.47	98.74	96.20
Gas Data				
Gas Velocity (fps)	49.3	44.6	45.9	46.6
Gas Temperature (·F)	256	249	247	251
Gas Flow Rate (acfm)	52409	47463	48752	49541
Gas Flow Rate (scfmd)	33067	29390	29673	30710
CO_2 (% v/v)	8.5	9.5	9.1	9.0
O_2 (% v/v)	10.9	10.1	10.4	10.5
H_2O (% v/v)	12.8	14.9	17.0	14.9
Hexavalent Chromium Emissions				
Concentration (ug/dscm)	<1.94	<1.27	<1.26	<1.49
Concentration (ug/dscm @ 7% O_2)	<2.69	<1.63	<1.66	<2.00
Emission Rate (lbs/hr)	<0.00025	<0.00014	<0.00014	<0.00018

Revised

COMPLIANCE TEST REPORT

FOR

FOSTER WHEELER RESOURCE RECOVERY FACILITY

CHARLESTON, SC

VOLUME II - PCDD/PCDF AND METALS EMISSIONS

TEST DATES: OCTOBER, 1989

REPORT DATE: DECEMBER, 1989

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1.0 INTRODUCTION

1.1 Background: An emissions compliance test program was conducted at the Foster Wheeler Resource Recovery Facility in Charleston, South Carolina on October 17 through October 20, 1989. The testing was performed by Gene Craft, Richard Mutzabaugh and Laurie Graves, all of ETS, Inc. Plant supervision was provided by Jerry Hall and Roy Moyer. All compliance testing was observed by Joe Tallon of the South Carolina Department of Health and Environmental Control (SCDHEC).

Two incinerator units are in service at the facility. These units are designated as "Unit A" and "Unit B" in this report.

1.2 Objective: The purpose of the agency-witnessed tests was to evaluate the emission performance of the facility with respect to the following pollutants:

Total Solid Particulate (TSP)

Hydrogen Fluoride (HF)

2378-Tetrachlorinated Dibenzo-p-Dioxin (2378-TCDD)

Lead (Pb)

Mercury (Hg)

Beryllium (Be)

In addition to the compliance demonstration, the test program was also designed to provide additional emissions information for the following pollutants:

All Tetra- through Octa-chlorinated Dibenzo Dioxins and Furans (PCDD/PCDF)
Arsenic (As)
Antimony (Sb)
Selenium (Se)
Cadmium (Cd)
Total Chromium (Cr)
Cobalt (Co)
Copper (Cu)
Nickel (Ni)
Zinc (Zn)

Data and results for the TSP and HF emissions are contained in Volume I of the compliance report, which was issued on November 17, 1989. Volume I also contains details concerning the facility and overall program specifics.

This report, Volume II, contains the data and results for the PCDD/PCDF and metals emissions.

1.3 Tests Performed: The overall test program is described in Volume I of the compliance report.

The PCDD/PCDF testing was performed only on the outlet stack of the Unit B incinerator. Three tests were performed. The testing was performed in accordance with Modified EPA Method 5 procedures.

Metals testing was performed at the outlets of both the Unit A and the Unit B incinerators. Three tests were performed at each location. These tests were performed in conjunction with the particulate tests, and are described in Volume I of the compliance report.

2.0 SUMMARY OF RESULTS

Table I summarizes the emissions results for all of the regulated pollutants tested during the test program.

More detailed results for the PCDD/PCDF and metals emissions are contained in Tables II through IV, as well as in the Appendices.

2.1 PCDD/PCDF Emissions: Table II summarizes the result of the PCDD/PCDF testing performed on the Unit B incinerator.

Mass emissions of 2378-TCDD, the only regulated isomer for the facility, showed a wide range of values, varying from 4.26×10^{-10} lb/hr for the first test run to 3.72×10^{-9} lb/hr for the third test run. The average of the three tests was 2.07×10^{-9} lb/hr, which is equivalent to 1.67×10^{-11} lb/MMBtu. These values are well below the permitted maximum of 7.5×10^{-6} lb/hr (2.9×10^{-8} lb/MMBtu).

2.2 Metals Emissions: Tables III and IV summarize the results of the metals tests performed on Units A and B, respectively. More detailed data and results may be found in Appendix B.

The emissions of the regulated pollutants (Lead, Mercury and Beryllium) were all below the permitted maximum levels.

The highest level of any of the 12 metals tested was

obtained for zinc. Unit A averaged 0.11 lb/hr zinc, while Unit B had an average zinc emissions of 0.37 lb/hr.

3.0 SAMPLING AND ANALYTICAL PROCEDURES

All sampling and analytical procedures were those recommended by the United States Environmental Protection Agency.

3.1 Field Testing:

3.1.1 Particulate and Multi-Metals Sampling: Sampling for particulate and metals was performed in a single test train. The sampling procedure for this testing can be found in Volume I.

3.1.2 Organic Sampling: A modified Method 5 (MM5) sampling train was used to sample the flue gases to determine the concentrations of PCDD/PCDF. The detailed protocol for collecting emissions using the MM5 sampling train was derived from Method 0010 of SW-846, and is basically similar to the protocol outlined in the ASME draft 1984 protocol.

3.1.2.1 Sampling Train Description: Figure 1 illustrates the modified Method 5 sampling train.

The train employed a quartz nozzle and heated glass probe for sample withdrawal. The probe had an effective length of seven feet. The nozzle was attached to the probe with stainless steel unions and Teflon compression rings.

Particulate matter was removed from the gas stream by means of a heated glass filter supported on a Teflon frit. The filter temperature was maintained at 248 ± 25° F.

After particulate removal, the gases passed into a water-cooled glass condenser and entered an XAD resin sorbent trap. Coolant water maintained at wet-ice temperature was continuously recirculated into the condenser/sorbent trap assembly using a submersible water pump.

The sorbent trap was packed with 20-30 grams of pre-cleaned, quality control checked amberlite XAD-2 resin.

The condenser cooled the sample gases and condensed part of the moisture. The cooled gases and condensate flowed down through the XAD-2 resin which retained the organic constituents.

After passing through the sorbent trap, the sample gases entered a chilled impinger train to remove the remaining moisture. The impinger train consisted of five glass impingers packed in ice water. The first impinger was left blank to facilitate collection of the condensate which passed through the XAD-2 sorbent trap. The second and third impingers each contained 100 ml of distilled water. The fourth impinger was left blank, and the fifth impinger contained approximately 200 gms of silica gel.

All fittings and connectors from the nozzle to the fourth impinger were made of either glass or Teflon. Glass-to-glass connections between the probe and the exit stem of the second impinger were externally sealed by wetting each surface with hexane. Sealing grease was used on connections between the third and fifth impingers.

3.1.2.2 Pre-test Preparation: All glass and Teflon components of the MM5 train were precleaned before use. The following cleaning procedures were used:

1) Wash with hot water and detergent.
2) Rinse with tap water three times.
3) Rinse with deionized, distilled water three times.
4) Rinse with pesticide grade hexane three times.
5) Bake at 400°F for three hours.
6) Cap glassware with hexane-rinsed aluminum foil, wrapped externally with Teflon tape.

The sorbent traps were pre-cleaned according to the above methodology, and packed with 20-30 gms of quality control checked XAD-2 resin by Triangle Labs located in Research Triangle Park, NC. The laboratory also spiked the traps with a known amount of labelled organic compounds in order to facilitate determination of retention and recovery efficiency of the XAD-2 resin. The packed traps were maintained at or below room temperature to prevent resin decomposition. Two traps were retained at the laboratory as method blanks.

filter holder were rinsed three times with pesticide grade acetone followed by three rinses with pesticide grade toluene. All rinsings were collected in pre-cleaned amber glass bottles fitted with Teflon lined screw caps.

2) Particulate Catch: The filter was removed from the housing with Teflon tweezers and placed into a precleaned glass petri dish. The dish was sealed externally with Teflon wrapping tape.

3) Back-half Rinse: The back half of the filter holder and all connecting lines from the filter to the sorbent tube were rinsed and treated as in (1) above.

4) Sorbent Cartridge: The sorbent trap assembly was capped with hexane-rinsed aluminum foil and sealed externally with Teflon tape.

5) First Impinger Catch: Any condensate collected in the first impinger was transferred to a graduated cylinder and the volume recorded. The impinger was rinsed and treated as in (1) above.

6) Second Impinger Catch: Same procedure as in (5) above.

3.1.2.6 Sample Storage and Transport: Immediately upon recovery, all samples including liquid rinses, filters and sorbent

traps were placed into insulated coolers packed with ice, thus protecting the samples from light and heat.

The samples remained inside the coolers during transport to the analytical laboratory. While in the custody of ETS, the temperatures inside the coolers were periodically measured to insure that the samples did not exceed 32°F.

All samples were express mailed directly to the analytical lab for analysis. While at the lab, the samples were kept in a refrigerated compartment until analyzed.

Raw field data for the MM5 sampling can be found in Appendix D.

3.2 Laboratory Analysis

3.2.1 Multi-Metals Analysis: Analysis of the multi-metals sample train components was performed in accordance with EPA Method 200.7 (40 CFR 136, Appendix C) and Method 303F of standards for water and waste-water analysis.

Arsenic, antimony, beryllium and selenium employed graphite furnace atomic absorption for the analysis. Cadmium, chromium cobalt, copper, lead, nickel and zinc were analyzed using ICAP. Mercury was analyzed by cold vapor atomic absorption. All metals analyses were conducted by Research Triangle Institute (Research

Triangle Park, NC). Appendix E contains the laboratory report for the analysis.

3.2.2 TCDD/TCDF Analysis: Analysis of the modified Method 5 sample train components for dioxins and furans was performed in accordance to the procedures outlined in Method 8280 of SW-846, with several modifications required to achieve suitable method detection limits. The analysis was performed with high resolution gas chromotography/mass spectrometry. All analyses were performed by Triangle Laboratories (Durham, NC). Appendix F contains raw laboratory data for the TCDD/TCDF analysis.

3.3 Data Analysis:

3.3.1 Metals and Organics: Calculations for converting the laboratory data for metals and organics into actual gaseous emissions are shown in Appendix D. General sampling and volumetric calculations may be found in Volume I of the Compliance Report.

4.0 QUALITY ASSURANCE

One blank sample train was used to establish background and method contamination levels for the PCDD/PCDF sampling. In addition, one blank sorbent trap was analyzed as a trip blank, while two additional traps were retained at the lab and analyzed as laboratory blanks. All blanks indicated negligible or no background contamination. The laboratory data for the blanks is included in Appendix F.

A blank sample train was used at each of the two incinerators to determine background and method contamination levels for the multiple-metals sampling and analytical procedures. A substantial background level of several of the metals was obtained at each incinerator. Most notably, cadmium, chromium, copper, cobalt and zinc background levels were quite high. In several cases, the blank levels for these metals exceeded the allowable compensation value of 5% of the sample value. In such cases, the limiting value of 5% of the sample value was used to compensate the sample for the background contamination.

TABLE I

SUMMARY OF EMISSIONS FOR REGULATED POLLUTANTS

POLLUTANT	UNITS	PERMITTED EMISSION LIMIT FOR EACH UNIT	ACTUAL EMISSIONS UNIT A	UNIT B
TSP	gr/dscf corr.to 12% CO2	0.015	0.0027	0.0024
	lb/MMBtu	0.032	0.0061	0.0052
HF	lb/hr	0.6		0.017
	lb/MMBtu	0.0022		0.00013
2378-TCDD	lb/hr	7.5x10-6		2.07x10-9
	lb/MMBtu	2.9x10-8		1.67x10-11
Lead	lb/hr	0.53	0.012	0.007
	lb/MMBtu	0.00203	0.00009	0.00005
Mercury	lb/hr	0.12	0.056	0.061
	lb/MMBtu	0.00047	0.00041	0.00045
Beryllium	lb/hr	6.8x10-5	4.06x10-6	6.4x10-6
	lb/MMBtu	2.6x10-7	2.97x10-8	4.88x10-8

@ 130 MMBTU/HR

TABLE II
SUMMARY OF PCDD/PCDF EMISSIONS

	CONCENTRATION (ng/Nm3, adjusted to 7 percent O2)				2378-TCDD TOXIC EQUIVALENCY FACTOR	2378-TCDD TOXIC EQUIVALENCIES CONCENTRATION (ng/Nm3, adjusted to 7 percent O2)			
	RUN 1	RUN 2	RUN 3	AVERAGE		RUN 1	RUN 2	RUN 3	AVERAGE
DIOXINS									
2378-TCDD	0.004 ND	0.021 ND	0.034	0.020	1	0.0045	0.0210	0.0341	0.019
Other TCDD	0.000 ND	0.926	0.171	0.366	0.01	0.0000	0.0093	0.0017	0.003
12378-PCDD	0.006 ND	0.021 ND	0.039	0.022	0.5	0.0028	0.0105	0.0195	0.010
Other PCDD	0.073	2.031	0.161	0.755	0.005	0.0004	0.0102	0.0008	0.003
123478-HxCDD	0.006 ND	0.342	0.020	0.122	0.04	0.0002	0.0137	0.0008	0.004
123678-HxCDD	0.006 ND	1.368	0.088	0.487	0.04	0.0002	0.0547	0.0035	0.019
123789-HxCDD	0.006 ND	1.315	0.102	0.474	0.04	0.0002	0.0526	0.0041	0.019
Other HxCDD	0.151	9.286	0.668	3.368	0.0004	0.0001	0.0037	0.0003	0.001
1234678-HpCDD	0.342	22.623	0.634	7.866	0.001	0.0003	0.0226	0.0006	0.007
Other HpCDD	0.275	18.519	0.780	6.525	0.00001	0.0000	0.0002	0.0000	0.000
OCDD	0.617	38.459	1.121	13.399	0	0.0000	0.0000	0.0000	0.000
TOTAL PCDD	1.484	94.911	3.817	33.404		0.0087	0.1985	0.0654	0.090
FURANS									
2378-TCDF	0.123	0.284	0.215	0.207	0.1	0.0123	0.0284	0.0215	0.020
Other TCDF	0.331	8.818	1.979	3.709	0.001	0.0003	0.0088	0.0020	0.003
12378-PCDF	0.028	0.510	0.195	0.244	0.1	0.0028	0.0510	0.0195	0.024
23478-PCDF	0.050	0.737	0.229	0.339	0.1	0.0050	0.0737	0.0229	0.033
Other PCDF	0.006	4.961	2.452	2.473	0.001	0.0000	0.0050	0.0025	0.002
123478-HxCDF	0.067	1.368	0.288	0.574	0.01	0.0007	0.0137	0.0029	0.005
123678-HxCDF	0.039	0.789	0.171	0.333	0.01	0.0004	0.0079	0.0017	0.003
234678-HxCDF	0.073	2.368	0.200	0.880	0.01	0.0007	0.0237	0.0020	0.008
123789-HxCDF	0.006 ND	0.026 ND	0.005 ND	0.012	0.01	0.0001	0.0003	0.0000	0.000
Other HxCDF	0.135	3.341	0.995	1.490	0.0001	0.0000	0.0003	0.0001	0.000
1234678-HpCDF	0.151	4.104	0.536	1.597	0.001	0.0002	0.0041	0.0005	0.001
1234789-HpCDF	0.011 ND	0.458	0.010 ND	0.160	0.001	0.0000	0.0005	0.0000	0.000
Other HpCDF	0.022	3.067	0.137	1.075	0.00001	0.0000	0.0000	0.0000	0.000
OCDF	0.022 ND	2.683	0.244	0.983	0	0.0000	0.0000	0.0000	0.000
TOTAL PCDF	1.065	33.514	7.654	14.078		0.023	0.217	0.076	0.105
TOTAL PCDD+PCD	2.549	128.425	11.471	47.482		0.0313	0.4158	0.1410	0.196

MASS EMISSIONS RATES

	LB/HR				LB/MMBtu			
	RUN 1	RUN 2	RUN 3	AVERAGE	RUN 1	RUN 2	RUN 3	AVERAGE
2378-TCDD	4.26E-10	2.07E-09	3.72E-09	2.07E-09	3.76E-12	1.76E-11	2.86E-11	1.67E-11
TOTAL TCDD	3.18E-08	8.68E-07	2.19E-07	3.73E-07	2.81E-10	7.41E-09	1.69E-09	3.13E-09
TOTAL TCDD AS 2378-TCDD EQUIVALENT	4.26E-10	2.98E-09	3.90E-09	2.44E-09	3.76E-12	2.54E-11	3.00E-11	1.97E-11

ND = Not Detected - indicated value represents detection limit.

TABLE III

Summary of Metals Emissions - Unit A

COMPONENT		RUN 5 lb/hr	RUN 5 lb/MMBtu	RUN 6 lb/hr	RUN 6 lb/MMBtu	RUN 7 lb/hr	RUN 7 lb/MMBtu	AVERAGE lb/hr	AVERAGE lb/MMBtu
Antimony	Sb	1.05E-03	7.29E-06	2.19E-03	1.51E-05	1.16E-03	1.05E-05	1.47E-03	1.10E-0
Arsenic	As	1.57E-04	1.09E-06	1.93E-04	1.33E-06	1.45E-04	1.31E-06	1.65E-04	1.25E-0
Beryllium	Be	4.64E-06	3.23E-08	5.29E-06	3.65E-08	2.24E-06	2.03E-08	4.06E-06	2.97E-0
Cadmium	Cd	6.03E-04	4.19E-06	8.72E-04	6.02E-06	6.11E-04	5.52E-06	6.95E-04	5.24E-0
Chromium	Cr	2.34E-03	1.63E-05	1.99E-03	1.38E-05	1.80E-03	1.63E-05	2.04E-03	1.54E-0
Cobalt	Co	7.05E-05	4.90E-07	1.20E-03	8.30E-06	1.13E-04	1.02E-06	4.62E-04	3.27E-0
Copper	Cu	2.64E-03	1.84E-05	2.90E-03	2.01E-05	1.84E-03	1.66E-05	2.46E-03	1.84E-0
Lead	Pb	1.10E-02	7.62E-05	1.47E-02	1.02E-04	1.11E-02	1.00E-04	1.23E-02	9.27E-0
Mercury	Hg	7.57E-02	5.26E-04	5.92E-02	4.08E-04	3.31E-02	2.99E-04	5.60E-02	4.11E-0
Nickel	Ni	3.34E-03	2.32E-05	1.60E-03	1.10E-05	9.52E-04	8.60E-06	1.96E-03	1.43E-0
Selenium	Se	(2.35E-05)	(1.63E-07)	(2.36E-05)	(1.63E-07)	(2.38E-05)	(2.15E-07)	(2.36E-05)	(1.80E-0
Zinc	Zn	1.12E-01	7.75E-04	1.64E-01	1.13E-03	4.10E-02	3.70E-04	1.06E-01	7.60E-0

() INDICATES DETECTION LIMIT

TABLE IV

Summary of Metals Emissions - Unit B

COMPONENT		RUN 2 lb/hr	RUN 2 lb/MMBtu	RUN 3 lb/hr	RUN 3 lb/MMBtu	RUN 4 lb/hr	RUN 4 lb/MMBtu	AVERAGE lb/hr	AVERAGE lb/MMBtu
Antimony	Sb	4.97E-04	3.23E-06	6.14E-04	4.13E-06	1.24E-03	1.14E-05	7.82E-04	6.29E-06
Arsenic	As	1.62E-04	1.05E-06	7.95E-05	5.42E-07	6.23E-05	5.76E-07	1.01E-04	7.23E-07
Beryllium	Be	4.17E-06	2.72E-08	8.17E-06	5.57E-08	6.86E-06	6.35E-08	6.40E-06	4.88E-08
Cadmium	Cd	8.99E-04	5.85E-06	2.98E-04	2.03E-06	6.09E-04	5.64E-06	6.02E-04	4.51E-06
Chromium	Cr	1.12E-02	7.29E-05	7.40E-04	5.04E-06	1.76E-03	1.63E-05	4.57E-03	3.14E-05
Cobalt	Co	3.53E-04	2.30E-06	(1.41E-04)	(9.63E-07)	1.29E-03	1.19E-05	5.93E-04	5.05E-06
Copper	Cu	5.60E-03	3.64E-05	7.73E-04	5.27E-06	1.47E-03	1.36E-05	2.61E-03	1.84E-05
Lead	Pb	1.01E-02	6.57E-05	4.94E-03	3.37E-05	6.90E-03	6.38E-05	7.31E-03	5.44E-05
Mercury	Hg	5.43E-02	3.54E-04	8.26E-02	5.63E-04	4.56E-02	4.22E-04	6.09E-02	4.46E-04
Nickel	Ni	1.04E-02	6.80E-05	8.99E-04	6.13E-06	1.97E-03	1.82E-05	4.44E-03	3.08E-05
Selenium	Se	(2.41E-05)	(1.57E-07)	(2.36E-05)	(1.61E-07)	(2.37E-05)	(2.19E-07)	(2.38E-05)	(1.79E-07)
Zinc	Zn	1.04E+00	6.76E-03	2.81E-02	1.91E-04	3.17E-02	2.93E-04	3.66E-01	2.41E-03

() INDICATES DETECTION LIMIT

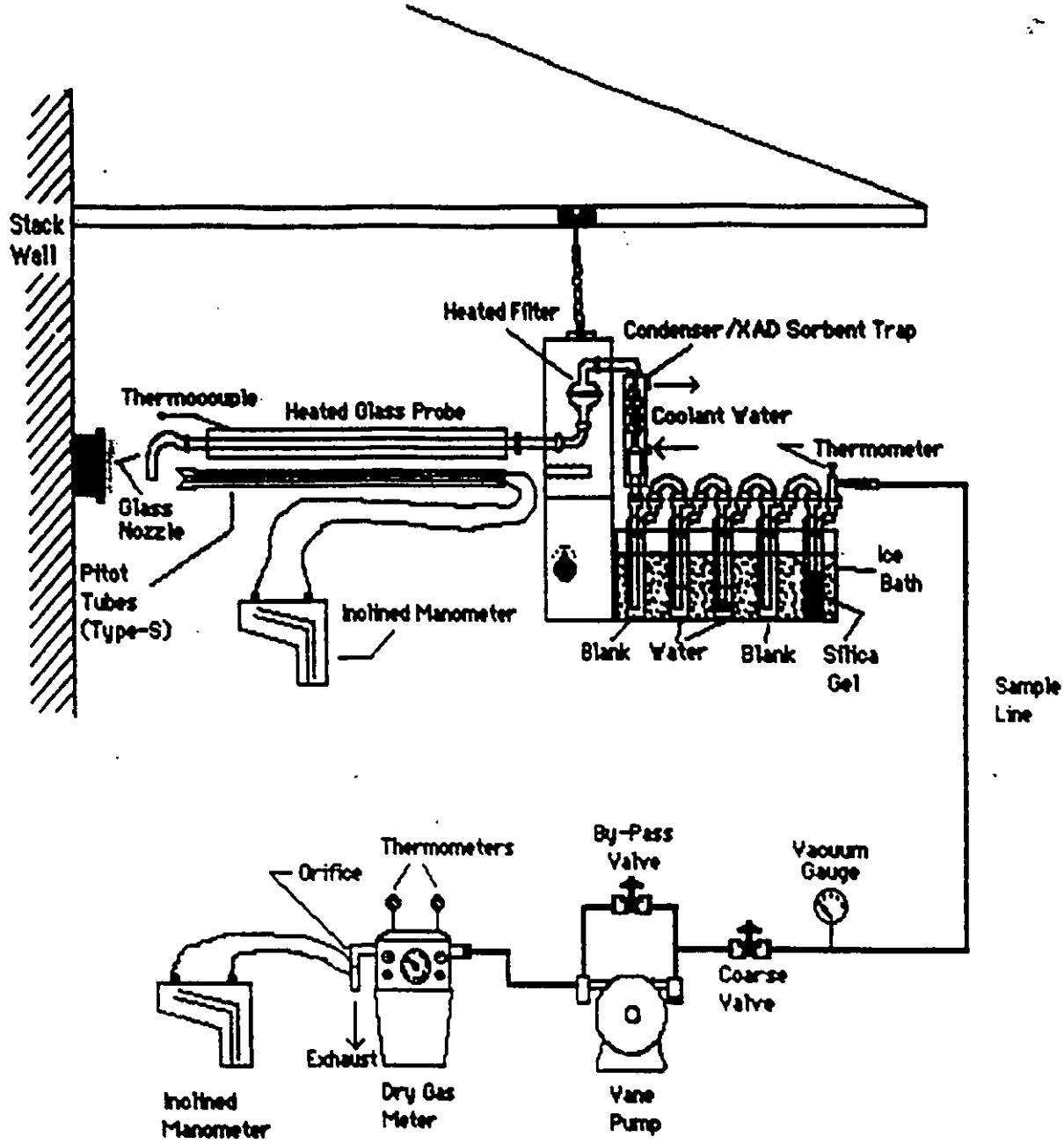

Figure 1 - Semivolatile Organics Sampling Train (Modified Method 5)

APPENDIX A

SAMPLING DATA AND RESULTS FOR MODIFIED METHOD 5 TESTS

GAS FLOWRATES AND PARAMETERS
FOR MM5 SAMPLING

FOSTER WHEELER
UNIT B: DIOXINS/FURANS

Run No.	1	2	3	Avg
Date	10/19/89	10/20/89	10/20/89	
Time Started	15:36	08:23	13:03	
Time Ended	18:50	11:34	16:19	
SAMPLING PARAMETERS				
Metered Volume - dcf	103.793	97.793	104.740	102.109
Corrected Volume - dscf	99.986	96.277	101.939	99.401
Total Test Time - min	180	180	180	180
% Isokinetics	93	96	94	94
GAS PARAMETERS				
Stack Temperature - F	304	298	292	298
% O2	11.5	10.5	10.3	10.8
% CO2	9.0	9.5	10.0	9.5
% CO	0.0	0.0	0.0	0.0
% Water	17.9	18.2	16.8	17.7
% Excess Air	121.2	98.9	94.9	105.0
Fo	1.04	1.09	1.07	1.07
GAS FLOWRATE				
Velocity ft/s	51.09	47.56	50.48	49.71
Actual Volume - ACFM	70643	65760	69795	68733
Standard Volume - DSCFM	40221	37618	40938	39592

Data & Results of Method 5 Calculations

Run 1

ETS Test of:
FOSTER WHEELER
Location: UNIT B: DIOXINS/FURANS
Date: 10/19/89 - 10/20/89
Condition: COMPLIANCE
Operator: CRAFT

Diameter of Stack (in) = 65
Dia. Upstream (ft) = N.A.
Eq. Dia. Downstream (ft) = N.A.
Area of Stack (ft²) = 23.04384

% O2	= 11.5	No. of Ports	= 2
% CO2	= 9.0	Points per Port	= 6
% CO	= 0	Time/Point (min)	= 15
% N2	= 79.5	Impinger 1 Gain (ml)	= 380
% H2O	= 17.89711	Impinger 2 Gain (ml)	= 49
Fo	= 1.044444	Impinger 3 Gain (ml)	= 5
Md Mole. Wt. Dry	= 29.9	Impinger 4 Gain (ml)	= 0
Ms Mole. Wt. Gas	= 27.77024		
Vm acf	= 103.793	STD Temp. (F)	= 68
DP (in. H2O)	= .5524281	STD Pressure (in. Hg)	= 29.92
Sqr. (DP) Avg.	= .7432551	Barometric Pres. (in.Hg)	= 30.04
DH Avg. (in. W.C.)	= 1.16	Meter Cal. (Y)	= 0.973
Tm (F)	= 77.29167	Meter (delta Ha)	= 1.962
Pm (in. Hg)	= 30.12529	Static Pres. (in. H2O)	= -.37
Vmstd dscf	= 99.98647	Pitot Coeff.	= .84
Stack Temp. (F)	= 304.0833		
Press. Stack (in. Hg)	= 30.01279		
Vimpstd dscf	= 20.42838		
Vsgstd dscf	= 1.36706	Vacuum @ Leak Check	= 10.0
Total Test Time (min)	= 180	Leak Rate (ft3/min)	= .008
Nozzle Dia. (in)	= .25	Area of Nozzle (ft3)	= 3.408846E-04
% EA	= 121.2057	Filter Gain (gram)	=
% Isokinetics	= 93.35983		
		Silica Gel (gram)	= 29
vs (Velocity) ft/sec	= 51.09354		
Qs dscfm	= 40221.3		
Qa acfm	= 70643.48		

Data & Results of Method 5 Calculations

Run 2

ETS Test of:
FOSTER WHEELER
Location: UNIT B: DIOXINS/FURANS
Date: 10/19/89 - 10/20/89
Condition: COMPLIANCE
Operator: CRAFT

Diameter of Stack (in) = 65
Eq. Dia. Upstream (ft) = N.A.
Eq. Dia. Downstream (ft) = N.A.
Area of Stack (ft²) = 23.04384

% O2	= 10.5	No. of Ports	= 2
% CO2	= 9.5	Points per Port	= 6
% CO	= 0	Time/Point (min)	= 15
N2	= 80	Impinger 1 Gain (ml)	= 426
% H2O	= 18.2312	Impinger 2 Gain (ml)	= 0
Fo	= 1.094737	Impinger 3 Gain (ml)	= 0
Md Mole. Wt. Dry	= 29.94	Impinger 4 Gain (ml)	= 0
Ms Mole. Wt. Gas	= 27.7632		
Vm acf	= 97.793	STD Temp. (F)	= 68
DP (in. H2O)	= .4827963	STD Pressure (in. Hg)	= 29.92
Sqr. (DP) Avg.	= .6948354	Barometric Pres. (in.Hg)	= 30.05
DH Avg. (in. W.C.)	= .9974999	Meter Cal. (Y)	= 0.973
Tm (F)	= 65.70834	Meter (delta Ha)	= 1.962
Pm (in. Hg)	= 30.12335	Static Pres. (in. H2O)	= -.40
vmstd dscf	= 96.27732	Pitot Coeff.	= .84
Ts Stack Temp. (F)	= 297.5833		
Press. Stack (in. Hg)	= 30.02059		
vimpstd dscf	= 20.05182		
vsgstd dscf	= 1.4142	Vacuum @ Leak Check	= 11.0
Total Test Time (min)	= 180	Leak Rate (ft3/min)	= .011
Nozzle Dia. (in)	= .25	Area of Nozzle (ft3)	= 3.408846E-04
% EA	= 98.87006	Filter Gain (gram)	=
% Isokinetics	= 96.11742		
		Silica Gel (gram)	= 30
vs (Velocity) ft/sec	= 47.5612		
Qs dscfm	= 37618.1		
Qa acfm	= 65759.55		

Data & Results of Method 5 Calculations

Run 3

ETS Test of:
FOSTER WHEELER
Location: UNIT B: DIOXINS/FURANS
Date: 10/19/89 - 10/20/89
Condition: COMPLIANCE
Operator: CRAFT

Diameter of Stack (in) = 65
Eq. Dia. Upstream (ft) = N.A.
Eq. Dia. Downstream (ft) = N.A.
Area of Stack (ft^2) = 23.04384

% O2	= 10.25	No. of Ports	= 2
% CO2	= 10	Points per Port	= 6
% CO	= 0	Time/Point (min)	= 15
N2	= 79.75	Impinger 1 Gain (ml)	= 387
% H2O	= 16.82396	Impinger 2 Gain (ml)	= 17
Fo	= 1.065	Impinger 3 Gain (ml)	= 0
Md Mole. Wt. Dry	= 30.01	Impinger 4 Gain (ml)	= 0
Ms Mole. Wt. Gas	= 27.98944		
Vm acf	= 104.74	STD Temp. (F)	= 68
DP (in. H2O)	= .5526748	STD Pressure (in. Hg)	= 29.92
Sqr. (DP) Avg.	= .743421	Barometric Pres.(in.Hg)	= 30.05
DH Avg. (in. W.C.)	= 1.167083	Meter Cal. (Y)	= 0.973
Tm (F)	= 72	Meter (delta Ha)	= 1.962
Pm (in. Hg)	= 30.13581	Static Pres. (in. H2O)	= -.40
Vmstd dscf	= 101.9386	Pitot Coeff.	= .84
Ts Stack Temp. (F)	= 291.5833		
Press. Stack (in. Hg)	= 30.02059		
Vwimpstd dscf	= 19.01628		
Vwsgstd dscf	= 1.60276	Vacuum @ Leak Check	= 11.0
Total Test Time (min)	= 180	Leak Rate (ft3/min)	= .016
Nozzle Dia. (in)	= .25	Area of Nozzle (ft3)	= 3.408846E-04
% EA	= 94.87227	Filter Gain (gram)	=
% Isokinetics	= 93.51647		
		Silica Gel (gram)	= 34
vs (Velocity) ft/sec	= 50.4796		
Qs dscfm	= 40937.88		
Qa acfm	= 69794.63		

APPENDIX B

MULTI-METALS DATA AND RESULTS

SUMMARY OF METAL EMISSIONS

RUN NUMBER = UB R2
SAMPLE VOLUME = 75.888 dscf
TOTAL GAS FLOWRATE = 45999 dscfm
CARBON DIOXIDE % = 8.25
OXYGEN % = 9.75

		LABORATORY DATA SAMPLE CATCH - micrograms					GAS EMISSIONS			
		FRONT HALF:		BACK HALF:			CONCENTRATION		MASS	MASS
COMPONENT		SAMPLE	BLANK	SAMPLE	BLANK	TOTAL	ACTUAL gr/DSCF	@ 12% CO2 gr/DSCF	RATE LB/HR	RATE LB/MMBtu
Antimony	Sb	5.56	0	0.63	0	6.19	1.26E-06	1.83E-06	4.97E-04	3.23E-06
Arsenic	As	1.34	0	0.67	0	2.01	4.10E-07	5.96E-07	1.62E-04	1.05E-06
Beryllium	Be	0.14	0.091	0.00	0	0.05	1.06E-08	1.54E-08	4.17E-06	2.72E-08
Cadmium	Cd	8.80	0	2.40	0	11.20	2.28E-06	3.32E-06	8.99E-04	5.85E-06
Chromium	Cr	96.60	1.5	44.50	0	139.60	2.84E-05	4.13E-05	1.12E-02	7.29E-05
Cobalt	Co	4.40	0	0.00	0	4.40	8.96E-07	1.30E-06	3.53E-04	2.30E-06
Copper	Cu	33.90	1.6	38.80	1.4	69.70	1.42E-05	2.06E-05	5.60E-03	3.64E-05
Lead	Pb	118.00	0	7.81	0	125.81	2.56E-05	3.73E-05	1.01E-02	6.57E-05
Mercury	Hg	82.50	0	594.80	0.459	676.84	1.38E-04	2.00E-04	5.43E-02	3.54E-04
Nickel	Ni	126.00	0	4.09	0	130.09	2.65E-05	3.85E-05	1.04E-02	6.80E-05
Selenium	Se	0.00	0	0.00	0	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Zinc	Zn	12950.00	31.9	13.46	0	12931.6	2.63E-03	3.83E-03	1.04E+00	6.76E-03

Front Half - Probe Wash and Filter
Back Half - Impinger Catches
Blank - Field Blank
Fuel Factor of 9584 dscf/MMBtu used in Mass Rate Calculations
@ 0 % O2

DETECTION LIMITS

		LABORATORY DETECTION LIMITS			EQUIVALENT GASEOUS DETECTION LIMITS			
					CONCENTRATION		MASS	MASS
COMPONENT		FRONT HALF	BACK HALF	TOTAL	ACTUAL gr/DSCF	@ 12% CO2 gr/DSCF	RATE LB/HR	RATE LB/MMBtu
Antimony	Sb	0.24	0.24	0.48	9.77E-08	1.42E-07	3.85E-05	2.51E-07
Arsenic	As	0.18	0.18	0.36	7.33E-08	1.07E-07	2.89E-05	1.88E-07
Beryllium	Be	0.03	0.03	0.06	1.22E-08	1.78E-08	4.82E-06	3.13E-08
Cadmium	Cd	0.30	0.30	0.60	1.22E-07	1.78E-07	4.82E-05	3.13E-07
Chromium	Cr	0.50	0.50	1.00	2.04E-07	2.96E-07	8.03E-05	5.22E-07
Cobalt	Co	0.90	0.90	1.80	3.66E-07	5.33E-07	1.44E-04	9.40E-07
Copper	Cu	0.60	0.60	1.20	2.44E-07	3.55E-07	9.63E-05	6.27E-07
Lead	Pb	1.80	1.80	3.60	7.33E-07	1.07E-06	2.89E-04	1.88E-06
Mercury	Hg	0.0002	0.0004	0.0006	1.22E-10	1.78E-10	4.82E-08	3.13E-10
Nickel	Ni	1.20	1.20	2.40	4.89E-07	7.11E-07	1.93E-04	1.25E-06
Selenium	Se	0.15	0.15	0.30	6.11E-08	8.88E-08	2.41E-05	1.57E-07
Zinc	Zn	8.10	8.10	16.20	3.30E-06	4.80E-06	1.30E-03	8.46E-06

SUMMARY OF METAL EMISSIONS

RUN NUMBER = UB R3
SAMPLE VOLUME = 75.691 dscf
TOTAL GAS FLOWRATE = 44926 dscfm
CARBON DIOXIDE % = 11.0
OXYGEN % = 10.0

		LABORATORY DATA SAMPLE CATCH - micrograms					GAS EMISSIONS CONCENTRATION		MASS	MASS
		FRONT HALF:		BACK HALF:			ACTUAL	@ 12% CO2	RATE	RATE
COMPONENT		SAMPLE	BLANK	SAMPLE	BLANK	TOTAL	gr/DSCF	gr/DSCF	LB/HR	LB/MMBtu
Antimony	Sb	7.04	0	0.78	0	7.82	1.59E-06	1.74E-06	6.14E-04	4.18E-06
Arsenic	As	0.80	0	0.21	0	1.01	2.06E-07	2.25E-07	7.95E-05	5.42E-07
Beryllium	Be	0.11	0.006	0.00	0	0.10	2.12E-08	2.31E-08	8.17E-06	5.57E-08
Cadmium	Cd	3.80	0	0.00	0	3.80	7.75E-07	8.45E-07	2.98E-04	2.03E-06
Chromium	Cr	4.10	0.2	5.52	0	9.42	1.92E-06	2.10E-06	7.40E-04	5.04E-06
Cobalt	Co	0.00	0	0.00	0	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Copper	Cu	7.30	0.36	3.06	0.15	9.85	2.01E-06	2.19E-06	7.73E-04	5.27E-06
Lead	Pb	56.10	0	6.82	0	62.92	1.28E-05	1.40E-05	4.94E-03	3.37E-05
Mercury	Hg	11.60	0	1041.20	0.459	1052.34	2.15E-04	2.34E-04	8.26E-02	5.63E-04
Nickel	Ni	9.80	0	1.65	0	11.45	2.33E-06	2.55E-06	8.99E-04	6.13E-06
Selenium	Se	0.00	0	0.00	0	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Zinc	Zn	362.00	18.1	13.87	0	357.8	7.29E-05	7.96E-05	2.81E-02	1.91E-04

Front Half - Probe Wash and Filter
Back Half - Impinger Catches
Blank - Field Blank
Fuel Factor of 9584 dscf/MMBtu used in Mass Rate Calculations

DETECTION LIMITS

		LABORATORY DETECTION LIMITS			EQUIVALENT GASEOUS DETECTION LIMITS CONCENTRATION		MASS	MASS
		FRONT	BACK		ACTUAL	@ 12% CO2	RATE	RATE
COMPONENT		HALF	HALF	TOTAL	gr/DSCF	gr/DSCF	LB/HR	LB/MMBtu
Antimony	Sb	0.24	0.24	0.48	9.79E-08	1.07E-07	3.77E-05	2.57E-07
Arsenic	As	0.18	0.18	0.36	7.34E-08	8.01E-08	2.83E-05	1.93E-07
Beryllium	Be	0.03	0.03	0.06	1.22E-08	1.33E-08	4.71E-06	3.21E-08
Cadmium	Cd	0.30	0.30	0.60	1.22E-07	1.33E-07	4.71E-05	3.21E-07
Chromium	Cr	0.50	0.50	1.00	2.04E-07	2.22E-07	7.85E-05	5.35E-07
Cobalt	Co	0.90	0.90	1.80	3.67E-07	4.00E-07	1.41E-04	9.63E-07
Copper	Cu	0.60	0.60	1.20	2.45E-07	2.67E-07	9.42E-05	6.42E-07
Lead	Pb	1.80	1.80	3.60	7.34E-07	8.01E-07	2.83E-04	1.93E-06
Mercury	Hg	0.0002	0.0004	0.0006	1.22E-10	1.33E-10	4.71E-08	3.21E-10
Nickel	Ni	1.20	1.20	2.40	4.89E-07	5.34E-07	1.88E-04	1.28E-06
Selenium	Se	0.15	0.15	0.30	6.12E-08	6.67E-08	2.36E-05	1.61E-07
Zinc	Zn	8.10	8.10	16.20	3.30E-06	3.60E-06	1.27E-03	8.67E-06

SUMMARY OF METAL EMISSIONS

RUN NUMBER = UB R4
SAMPLE VOLUME = 76.624 dscf
TOTAL GAS FLOWRATE = 45664 dscfm
CARBON DIOXIDE % = 8.0
OXYGEN % = 13.0

COMPONENT		LABORATORY DATA SAMPLE CATCH - micrograms FRONT HALF: SAMPLE	FRONT HALF: BLANK	BACK HALF: SAMPLE	BACK HALF: BLANK	TOTAL	GAS EMISSIONS CONCENTRATION ACTUAL gr/DSCF	CONCENTRATION @ 12% CO2 gr/DSCF	MASS RATE LB/HR	MASS RATE LB/MMBtu
Antimony	Sb	15.20	0	0.49	0	15.69	3.16E-06	4.74E-06	1.24E-03	1.14E-05
Arsenic	As	0.79	0	0.00	0	0.79	1.59E-07	2.39E-07	6.23E-05	5.76E-07
Beryllium	Be	0.09	0.004	0.00	0	0.09	1.75E-08	2.63E-08	6.86E-06	6.35E-08
Cadmium	Cd	5.70	0	2.03	0	7.73	1.56E-06	2.34E-06	6.09E-04	5.64E-06
Chromium	Cr	12.30	0.62	10.60	0	22.28	4.49E-06	6.73E-06	1.76E-03	1.63E-05
Cobalt	Co	0.00	0	16.30	0	16.30	3.28E-06	4.92E-06	1.29E-03	1.19E-05
Copper	Cu	15.90	0.8	3.70	0.18	18.62	3.75E-06	5.63E-06	1.47E-03	1.36E-05
Lead	Pb	79.40	0	8.11	0	87.51	1.76E-05	2.64E-05	6.90E-03	6.38E-05
Mercury	Hg	38.40	0	540.80	0.459	578.74	1.17E-04	1.75E-04	4.56E-02	4.22E-04
Nickel	Ni	22.20	0	2.74	0	24.94	5.02E-06	7.53E-06	1.97E-03	1.82E-05
Selenium	Se	0.00	0	0.00	0	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Zinc	Zn	402.00	20.1	19.91	0	401.8	8.09E-05	1.21E-04	3.17E-02	2.93E-04

Front Half - Probe Wash and Filter
Back Half - Impinger Catches
Blank - Field Blank
Fuel Factor of 9584 dscf/MMBtu used in Mass Rate Calculations

DETECTION LIMITS

COMPONENT		LABORATORY DETECTION LIMITS FRONT HALF	BACK HALF	TOTAL	EQUIVALENT GASEOUS DETECTION LIMITS CONCENTRATION ACTUAL gr/DSCF	CONCENTRATION @ 12% CO2 gr/DSCF	MASS RATE LB/HR	MASS RATE LB/MMBtu
Antimony	Sb	0.24	0.24	0.48	9.67E-08	1.45E-07	3.78E-05	3.50E-07
Arsenic	As	0.18	0.18	0.36	7.25E-08	1.09E-07	2.84E-05	2.63E-07
Beryllium	Be	0.03	0.03	0.06	1.21E-08	1.81E-08	4.73E-06	4.38E-08
Cadmium	Cd	0.30	0.30	0.60	1.21E-07	1.81E-07	4.73E-05	4.38E-07
Chromium	Cr	0.50	0.50	1.00	2.01E-07	3.02E-07	7.88E-05	7.30E-07
Cobalt	Co	0.90	0.90	1.80	3.63E-07	5.44E-07	1.42E-04	1.31E-06
Copper	Cu	0.60	0.60	1.20	2.42E-07	3.63E-07	9.46E-05	8.75E-07
Lead	Pb	1.80	1.80	3.60	7.25E-07	1.09E-06	2.84E-04	2.63E-06
Mercury	Hg	0.0002	0.0002	0.0004	8.06E-11	1.21E-10	3.15E-08	2.92E-10
Nickel	Ni	1.20	1.20	2.40	4.83E-07	7.25E-07	1.89E-04	1.75E-06
Selenium	Se	0.15	0.15	0.30	6.04E-08	9.06E-08	2.37E-05	2.19E-07
Zinc	Zn	8.10	8.10	16.20	3.26E-06	4.89E-06	1.28E-03	1.18E-05

SUMMARY OF METAL EMISSIONS

RUN NUMBER = UA R5
SAMPLE VOLUME = 75.835 dscf
TOTAL GAS FLOWRATE = 44891 dscfm
CARBON DIOXIDE % = 10.0
OXYGEN % = 10.2

		LABORATORY DATA SAMPLE CATCH - micrograms					GAS EMISSIONS			
		FRONT HALF:		BACK HALF:			CONCENTRATION		MASS	MASS
COMPONENT		SAMPLE	BLANK	SAMPLE	BLANK	TOTAL	ACTUAL gr/DSCF	@ 12% CO2 gr/DSCF	RATE LB/HR	RATE LB/MMBtu
Antimony	Sb	13.40	0	0.00	0	13.40	2.73E-06	3.27E-06	1.05E-03	7.29E-06
Arsenic	As	2.00	0	0.00	0	2.00	4.07E-07	4.88E-07	1.57E-04	1.09E-06
Beryllium	Be	0.16	0.0987	0.00	0	0.06	1.21E-08	1.45E-08	4.64E-06	3.23E-08
Cadmium	Cd	7.70	0	0.00	0	7.70	1.57E-06	1.88E-06	6.03E-04	4.19E-06
Chromium	Cr	24.40	1.2	7.01	0.35	29.86	6.08E-06	7.29E-06	2.34E-03	1.63E-05
Cobalt	Co	0.90	0	0.00	0	0.90	1.83E-07	2.20E-07	7.05E-05	4.90E-07
Copper	Cu	34.20	1.7	1.26	0	33.76	6.87E-06	8.24E-06	2.64E-03	1.84E-05
Lead	Pb	140.00	3.5	3.79	0.19	140.10	2.85E-05	3.42E-05	1.10E-02	7.62E-05
Mercury	Hg	21.10	0	946.28	0.747	966.63	1.97E-04	2.36E-04	7.57E-02	5.26E-04
Nickel	Ni	40.40	0	2.30	0	42.70	8.69E-06	1.04E-05	3.34E-03	2.32E-05
Selenium	Se	0.00	0	0.00	0	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Zinc	Zn	1445.00	20.4	0.00	0	1424.6	2.90E-04	3.48E-04	1.12E-01	7.75E-04

Front Half - Probe Wash and Filter
Back Half - Impinger Catches
Blank - Field Blank
Fuel Factor of 9584 dscf/MMBtu used in Mass Rate Calculations

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DETECTION LIMITS

		LABORATORY DETECTION LIMITS			EQUIVALENT GASEOUS DETECTION LIMITS			
					CONCENTRATION		MASS	MASS
COMPONENT		FRONT HALF	BACK HALF	TOTAL	ACTUAL gr/DSCF	@ 12% CO2 gr/DSCF	RATE LB/HR	RATE LB/MMBtu
Antimony	Sb	0.24	0.24	0.48	9.77E-08	1.17E-07	3.76E-05	2.61E-07
Arsenic	As	0.18	0.18	0.36	7.33E-08	8.79E-08	2.82E-05	1.96E-07
Beryllium	Be	0.03	0.03	0.06	1.22E-08	1.47E-08	4.70E-06	3.27E-08
Cadmium	Cd	0.30	0.30	0.60	1.22E-07	1.47E-07	4.70E-05	3.27E-07
Chromium	Cr	0.50	0.50	1.00	2.03E-07	2.44E-07	7.83E-05	5.44E-07
Cobalt	Co	0.90	0.90	1.80	3.66E-07	4.40E-07	1.41E-04	9.80E-07
Copper	Cu	0.60	0.60	1.20	2.44E-07	2.93E-07	9.40E-05	6.53E-07
Lead	Pb	1.80	1.80	3.60	7.33E-07	8.79E-07	2.82E-04	1.96E-06
Mercury	Hg	0.0002	0.0004	0.0006	1.22E-10	1.47E-10	4.70E-08	3.27E-10
Nickel	Ni	1.20	1.20	2.40	4.88E-07	5.86E-07	1.88E-04	1.31E-06
Selenium	Se	0.15	0.15	0.30	6.10E-08	7.33E-08	2.35E-05	1.63E-07
Zinc	Zn	8.10	8.10	16.20	3.30E-06	3.96E-06	1.27E-03	8.82E-06

SUMMARY OF METAL EMISSIONS

RUN NUMBER = UA R6
SAMPLE VOLUME = 63.094 dscf
TOTAL GAS FLOWRATE = 37476 dscfm
CARBON DIOXIDE % = 13.0
OXYGEN % = 8.0

		LABORATORY DATA SAMPLE CATCH - micrograms					GAS EMISSIONS			
		FRONT HALF:		BACK HALF:			CONCENTRATION		MASS	MASS
COMPONENT		SAMPLE	BLANK	SAMPLE	BLANK	TOTAL	ACTUAL gr/DSCF	@ 12% CO2 gr/DSCF	RATE LB/HR	RATE LB/MMBtu
Antimony	Sb	27.90	0	0.00	0	27.90	6.82E-06	6.30E-06	2.19E-03	1.51E-05
Arsenic	As	2.46	0	0.00	0	2.46	6.02E-07	5.55E-07	1.93E-04	1.33E-06
Beryllium	Be	0.17	0.0987	0.00	0	0.07	1.65E-08	1.52E-08	5.29E-06	3.65E-08
Cadmium	Cd	11.10	0	0.00	0	11.10	2.71E-06	2.51E-06	8.72E-04	6.02E-06
Chromium	Cr	15.90	0.8	10.80	0.54	25.36	6.20E-06	5.73E-06	1.99E-03	1.38E-05
Cobalt	Co	14.30	0	1.05	0.05	15.30	3.74E-06	3.45E-06	1.20E-03	8.30E-06
Copper	Cu	36.30	1.8	2.46	0	36.96	9.04E-06	8.34E-06	2.90E-03	2.01E-05
Lead	Pb	188.00	3.5	3.05	0.15	187.40	4.58E-05	4.23E-05	1.47E-02	1.02E-04
Mercury	Hg	6.39	0	747.10	0.747	752.74	1.84E-04	1.70E-04	5.92E-02	4.08E-04
Nickel	Ni	20.30	0	0.00	0	20.30	4.97E-06	4.58E-06	1.60E-03	1.10E-05
Selenium	Se	0.00	0	0.00	0	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Zinc	Zn	2110.00	20.4	0.00	0	2089.6	5.11E-04	4.72E-04	1.64E-01	1.13E-03

Front Half - Probe Wash and Filter
Back Half - Impinger Catches
Blank - Field Blank
Fuel Factor of 9584 dscf/MMBtu used in Mass Rate Calculations

DETECTION LIMITS

		LABORATORY DETECTION LIMITS			EQUIVALENT GASEOUS DETECTION LIMITS			
					CONCENTRATION		MASS	MASS
COMPONENT		FRONT HALF	BACK HALF	TOTAL	ACTUAL gr/DSCF	@ 12% CO2 gr/DSCF	RATE LB/HR	RATE LB/MMBtu
Antimony	Sb	0.24	0.24	0.48	1.17E-07	1.08E-07	3.77E-05	2.60E-07
Arsenic	As	0.18	0.18	0.36	8.81E-08	8.13E-08	2.83E-05	1.95E-07
Beryllium	Be	0.03	0.03	0.06	1.47E-08	1.35E-08	4.71E-06	3.26E-08
Cadmium	Cd	0.30	0.30	0.60	1.47E-07	1.35E-07	4.71E-05	3.26E-07
Chromium	Cr	0.50	0.50	1.00	2.45E-07	2.26E-07	7.86E-05	5.43E-07
Cobalt	Co	0.90	0.90	1.80	4.40E-07	4.06E-07	1.41E-04	9.77E-07
Copper	Cu	0.60	0.60	1.20	2.94E-07	2.71E-07	9.43E-05	6.51E-07
Lead	Pb	1.80	1.80	3.60	8.81E-07	8.13E-07	2.83E-04	1.95E-06
Mercury	Hg	0.0002	0.0004	0.0006	1.47E-10	1.35E-10	4.71E-08	3.26E-10
Nickel	Ni	1.20	1.20	2.40	5.87E-07	5.42E-07	1.89E-04	1.30E-06
Selenium	Se	0.15	0.15	0.30	7.34E-08	6.77E-08	2.36E-05	1.63E-07
Zinc	Zn	8.10	8.10	16.20	3.96E-06	3.66E-06	1.27E-03	8.79E-06

SUMMARY OF METAL EMISSIONS

RUN NUMBER = UA R7
SAMPLE VOLUME = 65.578 dscf
TOTAL GAS FLOWRATE = 39314 dscfm
CARBON DIOXIDE % = 9.0
OXYGEN % = 11.5

		LABORATORY DATA SAMPLE CATCH - micrograms					GAS EMISSIONS CONCENTRATION		MASS	MASS
		FRONT HALF:		BACK HALF:			ACTUAL	@ 12% CO2	RATE	RATE
COMPONENT		SAMPLE	BLANK	SAMPLE	BLANK	TOTAL	gr/DSCF	gr/DSCF	LB/HR	LB/MMBtu
Antimony	Sb	14.60	0	0.00	0	14.60	3.44E-06	4.58E-06	1.16E-03	1.05E-05
Arsenic	As	1.83	0	0.00	0	1.83	4.31E-07	5.74E-07	1.45E-04	1.31E-06
Beryllium	Be	0.13	0.0987	0.00	0	0.03	6.66E-09	8.88E-09	2.24E-06	2.03E-08
Cadmium	Cd	7.70	0	0.00	0	7.70	1.81E-06	2.42E-06	6.11E-04	5.52E-06
Chromium	Cr	19.50	0.98	4.37	0.2	22.69	5.34E-06	7.13E-06	1.80E-03	1.63E-05
Cobalt	Co	0.00	0	1.50	0.08	1.42	3.34E-07	4.46E-07	1.13E-04	1.02E-06
Copper	Cu	21.10	1.7	3.80	0	23.20	5.46E-06	7.28E-06	1.84E-03	1.66E-05
Lead	Pb	141.00	3.5	2.42	0.12	139.80	3.29E-05	4.39E-05	1.11E-02	1.00E-04
Mercury	Hg	1.03	0	416.50	0.747	416.78	9.81E-05	1.31E-04	3.31E-02	2.99E-04
Nickel	Ni	12.00	0	0.00	0	12.00	2.82E-06	3.77E-06	9.52E-04	8.60E-06
Selenium	Se	0.00	0	0.00	0	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Zinc	Zn	524.00	20.4	13.90	0.7	516.8	1.22E-04	1.62E-04	4.10E-02	3.70E-04

Front Half - Probe Wash and Filter
Back Half - Impinger Catches
Blank - Field Blank
Fuel Factor of 9584 dscf/MMBtu used in Mass Rate Calculations

DETECTION LIMITS

		LABORATORY DETECTION LIMITS			EQUIVALENT GASEOUS DETECTION LIMITS CONCENTRATION		MASS	MASS
		FRONT	BACK		ACTUAL	@ 12% CO2	RATE	RATE
COMPONENT		HALF	HALF	TOTAL	gr/DSCF	gr/DSCF	LB/HR	LB/MMBtu
Antimony	Sb	0.24	0.24	0.48	1.13E-07	1.51E-07	3.81E-05	3.44E-07
Arsenic	As	0.18	0.18	0.36	8.47E-08	1.13E-07	2.86E-05	2.58E-07
Beryllium	Be	0.03	0.03	0.06	1.41E-08	1.88E-08	4.76E-06	4.30E-08
Cadmium	Cd	0.30	0.30	0.60	1.41E-07	1.88E-07	4.76E-05	4.30E-07
Chromium	Cr	0.50	0.50	1.00	2.35E-07	3.14E-07	7.93E-05	7.16E-07
Cobalt	Co	0.90	0.90	1.80	4.24E-07	5.65E-07	1.43E-04	1.29E-06
Copper	Cu	0.60	0.60	1.20	2.82E-07	3.77E-07	9.52E-05	8.60E-07
Lead	Pb	1.80	1.80	3.60	8.47E-07	1.13E-06	2.86E-04	2.58E-06
Mercury	Hg	0.0002	0.0004	0.0006	1.41E-10	1.88E-10	4.76E-08	4.30E-10
Nickel	Ni	1.20	1.20	2.40	5.65E-07	7.53E-07	1.90E-04	1.72E-06
Selenium	Se	0.15	0.15	0.30	7.06E-08	9.41E-08	2.38E-05	2.15E-07
Zinc	Zn	8.10	8.10	16.20	3.81E-06	5.08E-06	1.28E-03	1.16E-05

York Services Corporation

25 Years of Service

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Final Report

for an

Emission Compliance Test Program

on

Boilers A & B

at

Adirondack Resource Recovery Facility
61 River Street
Hudson Falls, New York 12839-0191

prepared for

Foster Wheeler Enviresponse, Inc
Perryville Corporate Park
Clinton, New Jersey 08809-4000

York Project No. 4942-03
May 22, 1992

Environmental Consulting & Air Quality Services

• Emissions Measurement • Dispersion Modeling • Indoor Air Evaluations • CEM Mobile Van Capabilities •

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1.0 EXECUTIVE SUMMARY

York Services Corporation (York) was retained by Foster Wheeler Enviresponse, Inc. (FWEI) to conduct an Emission Compliance Test Program at the Adirondack Resource Recovery Facility (ARRF) located in Hudson Falls, New York. The test program was conducted from April 21, 1992 to April 30, 1992. The testing was conducted under the supervision of Mr. Roger A. Kniskern; Principal, Air Testing Services. Mr. Narayan Dave and Mr. William Foley of FWEI and Mr. Roy Moyer ARRF Plant Manager were our contacts during the test program.

The purpose of the Emission Compliance Test Program was to obtain emission data to submit to the New York State Department of Environmental Conservation (NYSDEC) in support of FWEI's application for a Certificate to Operate. The test program involved sampling and analysis for particulate matter, heavy metals, mercury, sulfur dioxide, oxides of nitrogen, carbon monoxide, volatile organic compounds, sulfuric acid, hydrogen chloride, hydrogen fluoride, formaldehyde, PCDD/PCDF, PCB, PAH and hexavalent chromium. Table 1-1 details the sequence of testing activities.

Table 1-2 summarizes the results of the test program. The results show that the facility meets the permit requirements for all compounds. Detailed results for each test are presented in Section 2.0.

2.0 SUMMARY AND DISCUSSION OF TEST RESULTS

2.1 INTRODUCTION

All test data and results are discussed and summarized in this section. Detailed calculations and back up documentation are included in the Appendices to this report.

2.2 PARTICULATE

Tables 2-1 summarizes the particulate emission test results for Boilers B. A soot blowing cycle was conducted during the period 1900-1930 for Test 4. During Test #1 the turbine generator was lost at 1130. Sampling was suspended at this time. Once the process operation was restored to normal, sampling was restarted at 1147.

2.3 METALS

Samples for heavy metals were collected at only the stack location for Boiler B. These samples were collected in the same sampling train as the particulate. Table 2-2 summarizes the

Table 1-1

Sequence of Testing Activities

	Boiler A	Boiler B
April 21, 1992		
PCDD/PCDF, PAH, PCB #1	----	0845-1202
PCDD/PCDF, PAH, PCB #2	----	1315-1631
April 22, 1992		
PCDD/PCDF, PAH, PCB #3	----	0810-1125
PCDD/PCDF, PAH, PCB #4	----	1250-1612
April 23, 1992		
SO_2, NO_x, CO, O_2, VOC, HCl #1	----	1118-1218
SO_2, NO_x, CO, O_2, VOC, HCl #2	----	1318-1418
SO_2, NO_x, CO, O_2, VOC, HCl #3	----	1506-1606
April 24, 1992		
Hydrogen Fluoride #1	----	0755-0907
Hydrogen Fluoride #2	----	1015-1141
Hydrogen Fluoride #3	----	1230-1343
H_2SO_4 #1	----	1422-1534
H_2SO_4 #2	----	1632-1745
April 25, 1992		
H_2SO_4 #3	----	0740-0850
Cr^{+6} #1	----	1131-1342
April 27, 1992		
Cr^{+6} #2	----	0800-1010
Cr^{+6} #3	----	1145-1355
April 28, 1992		
Particulate/Metals #1	----	0930-1205
Particulate/Metals #2	----	1245-1500
Particulate/Metals #3	----	1535-1752
Particulate/Metals #4	----	1825-2103

Table 1-1 Continued

Sequence of Testing Activities

	Boiler A	Boiler B
April 29, 1992		
Mercury #1	----	1015-1227
Mercury #2	----	1350-1600
Mercury #3	----	1702-1920
April 30, 1992		
Formaldehyde #1	----	0800-0900
Formaldehyde #2	----	0920-1020
Formaldehyde #3	----	1045-1145
Formaldehyde #1	1235-1335	----
Formaldehyde #2	1400-1500	----
Formaldehyde #3	1523-1623	----

Table 1-2

SUMMARY OF TEST RESULTS

Parameter	Permit Limit	Boiler B
Particulate	6.62 lbs/hr	0.96
Particulate	0.025 gr/scfd @ 12% CO_2	0.0048
Particulate	99.39% Removal	99.80
Sulfur Dioxide	20.85 lbs/hr / 70% Removal	1.84 / 85.24
Nitrogen Dioxide	50 lbs/hr	29.4
Carbon Monoxide	40.6 lbs/hr	3.6
Volatile Organic Compounds	4.5 lbs/hr	0.21
Lead	0.875 lbs/hr	$<1.38 \times 10^{-3}$
Beryllium	4.65×10^{-6} lbs/hr	$<1.12 \times 10^{-6}$
Mercury	0.16 lbs/hr	0.0132
Hydrogen Fluoride	0.40 lbs/hr	<.0056
Sulfuric Acid	1.42 lbs/hr	0.86
PCDD	0.02×10^{-3} lbs/hr	2.51×10^{-7}
PCDF	0.047×10^{-3} lbs/hr	2.95×10^{-6}
Hydrochloric Acid	11.9 lbs/hr / 90% Removal	1.69 / 97.22
PAH	8.5×10^{-3} lbs/hr	$<5.72 \times 10^{-4}$
TCDD	1.25×10^{-6} lbs/hr	8.41×10^{-8}
Arsenic	1.25×10^{-3} lbs/hr	$<5.61 \times 10^{-5}$
Barium	5.0×10^{-3} lbs/hr	$<7.29 \times 10^{-4}$
Cadmium	9.0×10^{-3} lbs/hr	9.35×10^{-5}
Cobalt	2.9×10^{-3} lbs/hr	$<1.86 \times 10^{-4}$
Chromium (Total)	6.5×10^{-2} lbs/hr	$<2.24 \times 10^{-4}$
Copper	8.5×10^{-3} lbs/hr	8.75×10^{-4}
Nickel	0.115 lbs/hr	8.02×10^{-4}
Selenium	1.0×10^{-3} lbs/hr	$<5.61 \times 10^{-5}$
Zinc	0.75 lbs/hr	9.45×10^{-3}

Tab .-1

Summary of Particulate Emission Test Results
Boiler B - ARRF Hudson Falls, NY

Test No.	1 In	1 Out	2 In	2 Out	3 In	3 Out	4 In	4 Out	Avg. In	Avg. Out
General Data										
Date	4/28	4/28	4/28	4/28	4/28	4/28	4/28	4/28	--	--
Time	0930-1205	0931-1204	1245-1500	1245-1500	1535-1752	1535-1752	1852-2103	1852-2103	--	--
Isokinetic Ratio(%)	104.38	94.52	104.46	96.99	104.42	98.59	105.10	97.69	104.59	96.95
Gas Data										
Gas Velocity (fps)	45.2	50.4	43.7	49.1	46.3	50.1	47.9	52.1	45.8	50.4
Gas Temperature (·F)	412	264	422	258	428	259	435	261	424	261
Gas Flow Rate (acfm)	53281	53551	51497	52158	54492	53265	56423	55430	53923	53601
Gas Flow Rate (scfmd)	26762	31549	25517	30582	26338	30806	27533	32302	26538	31310
CO_2 (% v/v)	9.2	9.0	9.0	8.8	9.6	9.0	9.8	9.1	9.4	9.0
O_2 (% v/v)	8.4	10.1	9.9	10.2	9.0	9.8	8.8	10.0	9.0	10.0
H_2O (% v/v)	16.1	18.7	16.3	19.8	17.8	20.8	16.4	20.0	16.7	19.8
Particulate Emissions										
Concentration (gr/scfd)	1.4022	0.0081	1.8402	0.0018	1.4855	0.0026	3.6435	0.0017	2.0929	0.0036
Concentration (gr/scfd @ 12% CO_2)	1.8289	0.0108	2.4535	0.0025	1.8569	0.0035	4.4614	0.0023	2.6502	0.0048
Concentration (gr/scfd @ 7% O_2)	1.5592	0.0104	2.3253	0.0024	1.7352	0.0033	4.1855	0.0022	2.4513	0.0046
Emission Rate (lbs/hr)	321.58	2.19	402.41	0.48	335.31	0.69	859.71	0.48	479.75	0.96
Allowable Particulate Concentration (gr/scfd @ 12% CO_2)	--	0.025	--	0.025	--	0.025	--	0.025	--	0.025
Allowable Particulate Emission (lbs/hr)	--	6.62	--	6.62	--	6.62	--	6.62	--	6.62
Air Pollution Control System Removal Efficiency (%)	--	99.32	--	99.88	--	99.79	--	99.94	--	99.80
Minimum Expected Pollution Control System Removal Efficiency (%)	--	99.39	--	99.39	--	99.39	--	99.39	--	99.39

Table 2-2

Summary of Heavy Metals Emission Test Results
Boiler B - ARRF Hudson Falls, NY

Test No.	1	2	3	Average
Arsenic				
Concentration (ug/dscm)	<0.4858	<0.4883	<0.4770	<0.4837
Concentration (ug/dscm @7% O_2)	<0.6252	<0.6344	<0.5973	<0.6190
Emission Rate (lbs/hr)	$<5.727 \times 10^{-5}$	$<5.593 \times 10^{-5}$	$<5.503 \times 10^{-5}$	$<5.608 \times 10^{-5}$
Allowable Emissions Rate (lbs/hr)	0.00125	0.00125	0.00125	0.00125
Barium				
Concentration (ug/dscm)	<6.3150	<6.3482	<6.2007	<6.2880
Concentration (ug/dscm @ 7% O_2)	<8.1277	<8.2468	<7.7649	<8.0448
Emission Rate (lbs/hr)	$<7.445 \times 10^{-4}$	$<7.270 \times 10^{-4}$	$<7.154 \times 10^{-4}$	$<7.290 \times 10^{-4}$
Allowable Emissions Rate (lbs/hr)	0.005	0.005	0.005	0.005
Beryllium				
Concentration (ug/dscm)	<0.0097	<0.0098	<0.0095	<0.0097
Concentration (ug/dscm @ 7% O_2)	<0.0125	<0.0127	<0.0120	<0.0124
Emission Rate (lbs/hr)	$<1.146 \times 10^{-6}$	$<1.119 \times 10^{-6}$	$<1.101 \times 10^{-6}$	$<1.122 \times 10^{-6}$
Allowable Emissions Rate (lbs/hr)	4.65×10^{-6}	4.65×10^{-6}	4.65×10^{-6}	4.65×10^{-6}
Cadimum				
Concentration (ug/dscm)	0.9715	0.4883	0.9540	0.8046
Concentration (ug/dscm @ 7% O_2)	1.2504	0.6344	1.1946	1.0265
Emission Rate (lbs/hr)	1.146×10^{-4}	5.593×10^{-5}	1.101×10^{-4}	9.354×10^{-5}
Allowable Emissions Rate (lbs/hr)	0.009	0.009	0.009	0.009
Chromium (Total)				
Concentration (ug/dscm)	<1.9431	<1.9533	<1.9079	<1.9348
Concentration (ug/dscm @ 7% O_2)	<2.5001	<2.5375	<2.3892	<2.4723
Emission Rate (lbs/hr)	$<2.291 \times 10^{-4}$	$<2.237 \times 10^{-4}$	$<2.201 \times 10^{-4}$	$<2.243 \times 10^{-4}$
Allowable Emissions Rate (lbs/hr)	0.065	0.065	0.065	0.065
Cobalt				
Concentration (ug/dscm)	0.9715	2.4416	1.4309	1.6147
Concentration (ug/dscm @ 7% O_2)	1.2504	3.1718	1.7919	2.0714
Emission Rate (lbs/hr)	1.146×10^{-4}	2.796×10^{-4}	1.651×10^{-4}	1.864×10^{-4}
Allowable Emissions Rate (lbs/hr)	0.0029	0.0029	0.0029	0.0029

Table 2-2 Continued

Summary of Heavy Metals Emission Test Results
Boiler B - ARRF Hudson Falls, NY

Test No.	1	2	3	Average
Copper				
Concentration (ug/dscm)	7.2866	2.9300	12.402	7.5395
Concentration (ug/dscm @ 7% O_2)	9.3781	3.8062	15.5300	9.5714
Emission Rate (lbs/hr)	8.591×10^{-4}	3.356×10^{-4}	1.431×10^{-3}	8.752×10^{-4}
Allowable Emissions Rate (lbs/hr)	0.0085	0.0085	0.0085	0.0085
Lead				
Concentration (ug/dscm)	<6.3150	15.1381	14.3094	<11.9208
Concentration (ug/dscm @ 7% O_2)	<8.1277	19.6653	17.9189	<15.2373
Emission Rate (lbs/hr)	$<7.446 \times 10^{-4}$	1.734×10^{-3}	1.651×10^{-3}	$<1.377 \times 10^{-3}$
Allowable Emissions Rate (lbs/hr)	0.875	0.875	0.875	0.875
Manganese				
Concentration (ug/dscm)	<1.9431	<1.9533	1.9079	<1.9348
Concentration (ug/dscm @ 7% O_2)	<2.5008	<2.5375	2.3892	<2.4758
Emission Rate (lbs/hr)	$<2.291 \times 10^{-4}$	$<2.237 \times 10^{-4}$	2.201×10^{-4}	$<2.243 \times 10^{-4}$
Allowable Emissions Rate (lbs/hr)	NA	NA	NA	NA
Nickel				
Concentration (ug/dscm)	5.8293	5.8599	9.0626	6.9173
Concentration (ug/dscm @ 7% O_2)	7.5025	7.6124	11.3487	8.8212
Emission Rate (lbs/hr)	6.873×10^{-4}	6.711×10^{-4}	1.046×10^{-3}	8.015×10^{-4}
Allowable Emissions Rate (lbs/hr)	0.115	0.115	0.115	0.115
Selenium				
Concentration (ug/dscm)	<0.4858	<0.4883	<0.4770	<0.4837
Concentration (ug/dscm @ 7% O_2)	<0.6252	<0.6344	<0.5973	<0.6190
Emission Rate (lbs/hr)	$<5.727 \times 10^{-5}$	$<5.593 \times 10^{-5}$	$<5.503 \times 10^{-5}$	$<5.608 \times 10^{-5}$
Allowable Emissions Rate (lbs/hr)	0.0010	0.0010	0.0010	0.0010
Vanadium				
Concentration (ug/dscm)	<0.4858	<0.4883	<0.4770	<0.4837
Concentration (ug/dscm @ 7% O_2)	<0.6252	<0.6344	<0.5973	<0.6190
Emission Rate (lbs/hr)	$<5.727 \times 10^{-5}$	$<5.593 \times 10^{-5}$	$<5.503 \times 10^{-5}$	$<5.608 \times 10^{-5}$
Allowable Emissions Rate (lbs/hr)	NA	NA	NA	NA
Zinc				
Concentration (ug/dscm)	157.39	59.58	25.76	80.91
Concentration (ug/dscm @ 7% O_2)	202.57	77.39	32.25	104.07
Emission Rate (lbs/hr)	1.856×10^{-2}	6.823×10^{-3}	2.972×10^{-3}	9.452×10^{-3}
Allowable Emissions Rate (lbs/hr)	0.75	0.75	0.75	0.75

heavy metals emissions for Boiler B. The general test data and gas data for each test are summarized in Table 2-1.

2.4 MERCURY

Samples for mercury were collected at the inlet and outlet for Boiler B. Table 2-3 summarizes the results of the mercury emissions for Boiler B. All emission data has been corrected for the mercury found in the blank train.

2.5 SO_2, NO_x, CO, O_2 AND VOC

Measurements for SO_2 and O_2 were conducted at the inlet and outlet for Boiler B, while CO measurements were made only at the inlet and NO_x and VOC were measured at the outlet.

Tables 2-4 summarizes the emission results for Boiler B. Measurements for HCl, velocity, moisture and gas composition were conducted simultaneously with each test.

2.6 SULFURIC ACID

Samples for sulfuric acid were only collected at the stack location for Boiler B. Tables 2-5 summarizes the sulfuric acid emission results for Boiler B.

2.7 HCl

Measurements for HCl were made at the inlet and outlet for Boiler B. Concurrently measurements for SO_2, velocity, moisture and gas composition were conducted. Tables 2-6 summarizes the HCl emission test results from Boiler B.

During the test program conducted in January/February 1992, HCl and SO_2 samples were collected on Boiler A concurrently while the system was being operated at lime slurry rates to produce an SO_2 removal as close to 70% as possible. Table 2-7 summarizes the results of these tests.

2.8 HYDROGEN FLUORIDE

Hydrogen Fluoride samples were collected from the outlet of Boiler B only. Table 2-8 summarizes the hydrogen fluoride emission test results.

2.9 FORMALDEHYDE

Formaldehyde samples were collected from the inlet and outlet of Boilers A and B, respectively. Tables 2-9 and 2-10 summarize the formaldehyde emission test results for each boiler.

Table 2-3

Summary of Mercury Emission Test Results
Boiler B - ARRF Hudson Falls, NY

Test No.	1 In	1 Out	2 In	2 Out	3 In	3 Out	Avg. In	Avg. Out
General Data								
Date	4/29	4/29	4/29	4/29	4/29	4/29	--	--
Time	1015-1227	1015-1227	1350-1600	1350-1600	1706-1920	1702-1920	--	--
Isokinetic Ratio (%)	103.96	96.24	102.36	95.10	99.06	96.09	101.79	95.81
Gas Data								
Gas Velocity (fps)	45.1	50.3	42.1	46.9	43.8	48.2	43.7	48.5
Gas Temperature (·F)	409	259	414	257	417	256	413	257
Gas Flow Rate (acfm)	53080	53460	49578	49864	51570	51234	51409	51519
Gas Flow Rate (scfmd)	26597	31624	24537	30237	25148	30573	25427	30811
CO_2 (% v/v)	9.6	9.0	9.7	9.2	9.7	9.2	9.7	9.1
O_2 (% v/v)	8.0	8.8	8.4	8.8	8.2	8.9	8.2	8.8
H_2O (% v/v)	16.8	19.1	14.9	17.5	16.4	19.2	16.0	18.6
Mercury Emissions								
Concentration (ug/dscm)	394.7	147.0	323.5	120.9	484.9	73.5	401.0	113.8
Concentration (ug/dscm @ 7% O_2)	425.2	168.8	359.7	138.9	530.7	85.2	438.5	131.0
Emission Rate (lbs/hr)	0.0393	0.0174	0.0297	0.0137	0.0457	0.0084	0.0382	0.0132
Allowable Mercury Emission Rate (lbs/hr)	--	0.16	--	0.16	--	0.16	--	0.16
Air Pollution Control System Removal Efficiency (%)	--	60.30	--	61.38	--	83.95	--	70.13

Table 2-4

Summary of SO_2, NO_x, CO, O_2 and VOC Emission Test Results
Boiler B - ARRF Hudson Falls, NY

Test No.	1 In	1 Out	2 In	2 Out	3 In	3 Out	Avg. In	Avg. Out
General Data								
Date	4/23	4/23	4/23	4/23	4/23	4/23	--	--
Time	1118-1218	1118-1218	1318-1418	1318-1418	1506-1606	1506-1606	--	--
O_2 (%, dry)	9.6	10.7	9.9	11.5	7.5	9.5	9.0	10.6
SO_2								
Concentration (ppmv)	39.2	2.1	22.1	0.4	111.8	16.9	57.7	6.5
Concentration (ppmv @ 7% O_2)	47.2	2.9	27.9	0.7	116.0	20.6	63.7	8.1
Emission Rate (lbs/hr)	9.33	0.71	5.12	0.13	22.95	4.68	12.47	1.84
Removal Efficiency (%)	--	92.39	--	97.46	--	79.65	--	85.24
Allowable Removal Efficiency (%)	--	70	--	70	--	70	--	70
NO_x								
Concentration (ppmv)	--	124.7	--	136.7	--	132.4	--	131.3
Concentration (ppmv @ 7% O_2)	--	169.9	--	202.1	--	161.4	--	177.8
Emission Rate (lbs/hr)	--	30.1	--	31.9	--	26.3	--	29.4
Allowable Emission Rate (lbs/hr)	--	50	--	50	--	50	--	50
CO								
Concentration (ppmv)	37.2	--	45.3	--	26.4	--	36.3	--
Concentration (ppmv @ 7% O_2)	45.8	--	57.2	--	27.3	--	43.4	--
Emission Rate (lbs/hr)	3.9	--	4.6	--	2.4	--	3.6	--
Allowable Emission Rate (lbs/hr)	40.6	--	40.6	--	40.6	--	40.6	--
VOC (as Methane)								
Concentration (ppmv)	--	0.9	--	1.4	--	0.4	--	0.9
Concentration (ppmv @ 7% O_2)	--	1.2	--	2.1	--	0.5	--	1.3
Emission Rate (lbs/hr)	--	0.22	--	0.33	--	0.08	--	0.21
Allowable Emission Rate (lbs/hr)	--	4.5	--	4.5	--	4.5	--	4.5

Ta 2-5

Summary of Sulfuric Acid Emission Test Results
Boiler B - ARRF Hudson Falls, NY

Test No.	1 Out	2 Out	3 Out	Avg. Out
General Data				
Date	4/24	4/24	4/25	--
Time	1422-1534	1632-1745	0740-0850	--
Isokinetic Ratio (%)	97.83	98.10	99.99	98.64
Gas Data				
Gas Velocity (fps)	47.8	50.6	48.5	49.0
Gas Temperature (•F)	268	266	258	264
Gas Flow Rate (acfm)	50867	53743	51597	52069
Gas Flow Rate (scfmd)	28571	30324	29890	29595
CO_2 (% v/v)	9.7	9.6	9.8	9.7
O_2 (% v/v)	9.5	9.7	9.4	9.5
H_2O (% v/v)	21.5	21.2	20.1	20.9
Sulfuric Acid Emissions				
Concentration (ppmv)	1.97	1.57	2.26	1.93
Concentration (ppmv @ 7% O_2)	2.41	1.94	2.73	2.36
Emission Rate (lbs/hr)	0.85	0.72	1.02	0.86
Allowable Sulfuric Acid Emission Rate (lbs/hr)	1.42	1.42	1.42	1.42

Table 2-6

Summary of HCl Emission Test Results
Boiler B - ARRF Hudson Falls, NY

Test No.	1 In	1 Out	2 In	2 Out	3 In	3 Out	Avg. In	Avg. Out
General Data								
Date	4/23	4/23	4/23	4/23	4/23	4/23	--	--
Time	1118-1218	1118-1218	1318-1418	1318-1418	1506-1606-	1506-1606	--	--
Gas Data								
Gas Velocity (fps)	39.4	52.9	40.4	51.6	36.2	43.5	38.7	49.3
Gas Temperature (·F)	424	269	433	271	433	262	430	267
Gas Flow Rate (acfm)	46382	56229	47596	54892	42695	46240	45558	52454
Gas Flow Rate (scfmd)	23750	33679	23098	32469	20483	27620	22444	31256
CO_2 (% v/v)	8.8	8.8	8.7	8.6	10.1	9.4	9.2	8.9
O_2 (% v/v)	11.0	11.0	9.9	10.8	8.3	10.2	9.7	10.7
H_2O (% v/v)	13.6	17.0	17.2	17.7	18.4	18.0	16.4	17.6
HCl Emissions								
Concentration (pmv)	423	9.1	464	8.0	626	11.0	504	9.4
Concentration (ppmv 7% O_2)	594	12.7	586	11.0	691	14.3	624	12.7
Emission Rate (lbs/hr)	54.58	1.77	58.19	1.51	69.64	1.77	60.80	1.69
Allowable HCl Emission Rate (lbs/hr)	---	11.9	--	11.9	--	11.9	--	11.9
Air Pollution Control System Removal Efficiency (%)	--	96.76	--	97.41	--	97.46	--	97.22
Required Air Pollution Control System Removal Efficiency (%)	--	90	--	90	--	90	--	90

$\frac{V_1}{T_1} = \frac{V_2}{T_2}$

Table 2-7

Summary of Special HCl and SO_2 Emission Test Results
Boiler A - ARRF Hudson Falls, NY

Test No.	Time	Inlet HCl (lbs/hr)	Inlet SO_2 (lbs/hr)	Outlet HCl (lbs/hr)	Outlet SO_2 (lbs/hr)	HCl Removal Efficiency (%)	SO_2 Removal Efficiency (%)
4	1855-1955	50.00	15.46	3.28	3.75	93.44	75.74
5	2025-2125	62.20	11.07	9.66	5.65	84.47	48.96
6	2152-2252	75.24	13.25	9.86	6.34	86.90	52.15
7	0025-0125	80.34	32.79	5.05	8.06	93.71	75.42
8	0146-0246	68.87	27.90	5.20	4.93	92.45	82.33
9	0311-0411	67.83	33.01	8.35	11.18	87.69	66.13
Avg.	--	67.41	22.25	6.90	6.65	89.76	70.11

Note: Tests conducted 1/31/92 to 2/1/92

Table 2-8

Summary of Hydrogen Fluoride Emission Test Results
Boiler B - ARRF Hudson Falls, NY

Test No.	1 Out	2 Out	3 Out	Avg. Out
General Data				
Date	4/24	4/24	4/24	--
Time	0755-0907	1015-1141	1230-1343	--
Isokinetic Ratio (%)	99.94	99.44	99.25	99.54
Gas Data				
Gas Velocity (fps)	50.0	44.8	52.2	49.0
Gas Temperature (°F)	267	260	269	265
Gas Flow Rate (acfm)	53133	47638	55451	52074
Gas Flow Rate (scfmd)	30396	27245	31472	29704
CO_2 (% v/v)	8.8	8.3	9.6	8.9
O_2 (% v/v)	11.0	9.7	9.5	10.1
H_2O (% v/v)	20.4	21.0	20.6	20.7
Hydrogen Fluoride Emissions				
Concentration (ppmv)	<0.060	<0.067	<0.058	<0.062
Concentration (ppmv @ 7% O_2)	<0.084	<0.083	<0.071	<0.079
Emission Rate (lbs/hr)	<0.0056	<0.0056	<0.0056	<0.0056
Allowable Hydrogen Fluoride Emission Rate (lbs/hr)	0.40	0.40	0.40	0.40

Tal 2-9

Summary of Formaldehyde Emission Test Results
Boiler A - ARRF Hudson Falls, NY

Test No.	1 In	1 Out	2 In	2 Out	3 In	3 Out	Avg. In	Avg. Out
General Data								
Date	4/30	4/30	4/30	4/30	4/30	4/30	--	--
Time	1235-1335	1235-1335	1402-1502	1402-1502	1523-1623	1523-1623	--	--
Gas Data								
Gas Velocity (fps)	52.2	52.5	49.6	50.4	51.9	54.9	51.2	52.6
Gas Temperature (°F)	481	261	485	263	485	267	484	264
Gas Flow Rate (acfm)	61488	55824	58468	53568	61129	58352	60362	55915
Gas Flow Rate (scfmd)	27980	34345	27211	31812	28953	34423	28048	33527
CO_2 (% v/v)	8.6	8.0	9.0	8.6	8.8	8.0	8.8	8.2
O_2 (% v/v)	8.4	11.2	8.2	10.8	8.5	11.2	8.4	11.1
H_2O (% v/v)	17.1	15.2	15.2	17.8	13.3	17.8	15.2	16.9
Formaldehyde Emissions								
Concentration (ug/dscm)	<1119	<981	<1032	<908	<930	<1156	<1027	<1015
Concentration (ppmv)	<0.94	<0.77	<0.86	<0.71	<0.78	<0.91	<0.86	<0.80
Concentration (ppmv @ 7% O_2)	<1.04	<1.10	<0.95	<0.98	<0.88	<1.30	<0.96	<1.13
Emission Rate (lbs/hr)	<0.12	<0.13	<0.11	<0.11	<0.11	<0.15	<0.12	<0.13

Table 2-10

Summary of Formaldehyde Emission Test Results
Boiler B - ARRF Hudson Falls, NY

Test No.	1 In	1 Out	2 In	2 Out	3 In	3 Out	Avg. In	Avg. Out
General Data								
Date	4/30	4/30	4/30	4/30	4/30	4/30	--	--
Time	0800-0900	0800-0900	0920-1020	0920-1020	1045-1145	1045-1145	--	--
Gas Data								
Gas Velocity (fps)	45.0	50.3	45.5	47.9	53.4	49.4	48.0	49.2
Gas Temperature (°F)	447	255	450	262	444	260	447	259
Gas Flow Rate (acfm)	52965	53522	53558	50913	56520	52503	54348	52313
Gas Flow Rate (scfmd)	26932	32351	25302	30653	28158	31275	26797	31426
CO_2 (% v/v)	8.8	8.0	10.0	9.3	9.6	9.0	9.5	8.8
O_2 (% v/v)	8.8	11.6	8.1	10.1	8.4	10.6	8.4	10.8
H_2O (% v/v)	11.4	17.4	17.4	17.0	13.4	17.9	14.1	17.4
Formaldehyde Emissions								
Concentration (ug/dscm)	<1339	<1057	<1475	<1102	<1514	<1047	<1443	<1069
Concentration (ppmv)	<1.12	<0.83	<1.23	<0.87	<1.27	<0.82	<1.21	<0.84
Concentration (ppmv @ 7% O_2)	<1.29	<1.23	<1.34	<1.12	<1.41	<1.11	<1.35	<1.15
Emission Rate (lbs/hr)	<0.14	<0.13	<0.14	<0.13	<0.16	<0.13	<0.15	<0.13

2.10 PCDD/PCDF, PCB AND PAH

PCDD/PCDF, PCB and PAH samples were collected at the outlet of Boiler B only. During Test No. 1 a field in the precipitator was out of service. Since this condition is not representative of normal operations, an additional test was run with all precipitator fields in service. Table 2-11 summarizes the emission test results for these compounds for the three tests with all precipitator fields in service. Table 2-12 summarizes the results of Test No. 1 for comparison purposes. The results have been corrected for train blank contribution where applicable.

Revised 7/5/92

To compare Dioxin and Furan emissions to the permit conditions, actual emission rates are required. The results presented in Table 1-2 for PCDD and PCDF are the total of all isomers while the TCDD include only these specific isomers.

In order to compare PCDD/PCDF emissions to current NYSDEC standards, the emissions have been calculated as TCDD toxic equivalents based upon the toxic equivalency factors issued by the NYSDEC. These calculations can be found in Section 6.11 of this report.

2.11 HEXAVALENT CHROMIUM

Samples for hexavalent chromium were collected from the outlet of Boiler B. Table 2-13 summarizes the hexavalent chromium emission test results for Boiler B.

3.0 PROCESS DESCRIPTION

The Adirondack Resource Recovery Facility is a two train 432 ton per day (216 tons per train) MSW mass burn with two independent pollution control equipment trains and two flues in a single stack. The pollution control equipment consists of a dry scrubber and an ESP.

Trucks deliver waste to the facility where they dump their loads into a refuse storage pit designed to store 1,200 tons of waste. Overhead craves are used to charge waste into the charging hoppers of the boilers.

The facility is equipped with two refuse fired boilers designed to produce steam at a temperature of 750°F and a pressure of 650 psig. Each boiler is designed to produce 63,500 pounds per hour of steam when combusting 225 tons per day of refuse. Refuse is fed to the boilers through a charging hopper which leads to a feed chute. At the bottom of the feed chute a hydraulic ram feeder pushes the refuse into the furnace. The refuse then falls onto a grate. The grate moves the refuse through the furnace, provides agitation for proper combustion and provides for the introduction of combustion air under the refuse. The ash remaining on the

Revised 7/5/92

Tab -11

Summary of PCDD/PCDF, PCB and PAH Emission Test Results
Boiler B - ARRF Hudson Falls, NY

Test No.	2 Out	3 Out	4 Out	Avg. Out
General Data				
Date	4/21	4/22	4/22	--
Time	1315-1631	0810-1125	1250-1612	--
Isokinetic Ratio (%)	98.45	97.72	96.91	97.69
Gas Data				
Gas Velocity (fps)	48.4	48.6	51.3	49.4
Gas Temperature (°F)	273	268	275	272
Gas Flow Rate (acfm)	51470	51628	54503	52534
Gas Flow Rate (scfmd)	29103	29877	31502	30161
CO_2 (% v/v)	9.0	7.6	9.3	8.6
O_2 (% v/v)	10.1	11.6	10.4	10.7
H_2O (% v/v)	21.0	19.5	19.1	19.9
PCDD Emissions (Actual)				
Concentration (ng/dscm)	1.2422	3.9279	1.5512	2.2404
Emission Rate (lbs/hr)	1.35×10^{-7}	4.34×10^{-7}	1.83×10^{-7}	2.51×10^{-7}
Allowable Emission Rate (lbs/hr)	2×10^{-5}	2×10^{-5}	2×10^{-5}	2×10^{-5}
PCDF Emissions (Actual)				
Concentration (ng/dscm)	16.2596	44.8393	17.4870	26.1953
Emission Rate (lbs/hr)	1.77×10^{-6}	5.02×10^{-6}	2.06×10^{-6}	2.95×10^{-6}
Allowable Emission Rate (lbs/hr)	4.65×10^{-5}	4.65×10^{-5}	4.65×10^{-5}	4.65×10^{-5}
TCDD Total Emission				
Concentration (ng/dscm)	0.3313	1.4222	0.4858	0.7464
Emission Rate (lbs/hr)	3.61×10^{-8}	15.89×10^{-8}	5.73×10^{-8}	8.41×10^{-8}
Allowable Emission Rate (lbs/hr)	1.25×10^{-6}	1.25×10^{-6}	1.25×10^{-6}	1.25×10^{-6}
PCB Emission Total				
Concentration (ug/dscm)	<0.0228	<0.0121	<0.0244	<.00198
Emission Rate (lbs/hr)	$<2.49 \times 10^{-6}$	$<1.35 \times 10^{-6}$	$<2.87 \times 10^{-6}$	$<2.24 \times 10^{-6}$
PAH Emission Total				
Concentration (ug/dscm)	<4.9207	<6.1018	<4.1969	<5.0731
Emission Rate (lbs/hr)	$<5.37 \times 10^{-4}$	$<6.83 \times 10^{-4}$	$<4.96 \times 10^{-4}$	$<5.72 \times 10^{-4}$
Allowable Emission Rate (lbs/hr)	8.5×10^{-3}	8.5×10^{-3}	8.5×10^{-3}	8.5×10^{-3}

Total dioxin/furans (@7% O_2) 22-53 72-88 25-20 40-20

Tab ?-12

Summary of PCDD/PCDF, PCB and PAH Emission Test Results (ESP Field Out)
Boiler B - ARRF Hudson Falls, NY

Test No.	1 Out
General Data	
Date	4/21
Time	0845-1202
Isokinetic Ratio (%)	99.46
Gas Data	
Gas Velocity (fps)	46.0
Gas Temperature (°F)	268
Gas Flow Rate (acfm)	48949
Gas Flow Rate (scfmd)	28436
CO_2 (% v/v)	9.4
O_2 (% v/v)	8.4
H_2O (% v/v)	19.6
PCDD Emissions (Actual)	
Concentration (ng/dscm)	1.4261
Emission Rate (lbs/hr)	1.52×10^{-7}
Allowable Emission Rate (lbs/hr)	2×10^{-5}
PCDF Emissions (Actual)	
Concentration (ng/dscm)	17.3478
Emission Rate (lbs/hr)	1.85×10^{-6}
Allowable Emission Rate (lbs/hr)	4.65×10^{-5}
TCDD Total Emission	
Concentration (ng/dscm)	0.4195
Emission Rate (lbs/hr)	4.47×10^{-8}
Allowable Emission Rate (lbs/hr)	1.25×10^{-6}
PCB Emission Total	
Concentration (ug/dscm)	<0.0335
Emission Rate (lbs/hr)	$<3.56 \times 10^{-6}$
PAH Emission Total	
Concentration (ug/dscm)	<2.8767
Emission Rate (lbs/hr)	$<3.07 \times 10^{-4}$
Allowable Emission Rate (lbs/hr)	8.5×10^{-3}

Tal 2-13

Summary of Hexavalent Chromium Emission Test Results
Boiler B - ARRF Hudson Falls, NY

Test No.	1 Out	2 Out	3 Out	Avg. Out
General Data				
Date	4/25	4/27	4/27	--
Time	1131-1342	0800-1010	1145-1355	--
Isokinetic Ratio (%)	100.53	100.06	98.60	99.73
Gas Data				
Gas Velocity (fps)	46.4	48.2	50.5	48.4
Gas Temperature (·F)	264	262	267	264
Gas Flow Rate (acfm)	49306	51279	53690	51425
Gas Flow Rate (scfmd)	28426	30524	31941	30297
CO_2 (% v/v)	10.0	8.8	8.7	9.2
O_2 (% v/v)	9.0	9.1	9.4	9.2
H_2O (% v/v)	19.8	17.9	17.4	18.4
Hexavalent Chromium Emissions				
Concentration (ug/dscm)	<3.55	<3.08	<2.88	<3.17
Concentration (ug/dscm @ 7% O_2)	<4.15	<3.63	<3.48	<3.75
Emission Rate (lbs/hr)	<0.00038	<0.00035	<0.00034	<0.00036

ENTROPY
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VOLUME I
TEXT AND APPENDICES

STATIONARY SOURCE SAMPLING REPORT
REFERENCE NO. 10183

CAMDEN COUNTY RESOURCE RECOVERY FACILITY
CAMDEN, NEW JERSEY

EMISSIONS TESTING FOR:
- Carbon Monoxide
- Hydrogen Chloride
- Hydrogen Fluoride
- Methane
- Mercury
- Metals
- Nitrogen Oxides
- PAHs
- Particulate
- Particulate Matter ≤ 10 Microns
- PCDD/PCDF
- Sulfur Dioxide
- Sulfur Trioxide
- Sulfuric Acid Mist
- Total Hydrocarbons

UNIT NOS. 1, 2, AND 3

PERFORMED FOR: FOSTER WHEELER ENVIRESPONSE, INC.

JUNE 17 THROUGH 21, 1991

REPORT CERTIFICATION

SUBMITTAL DATE

August 1, 1991

The project was carried out under my direction and supervision. To the best of my knowledge, the data presented in this report is accurate and complete.

Signature Allan F. Lowe

Allan F. Lowe

Project Manager

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INTRODUCTION

1.1 Background. Foster Wheeler Enviresponse, Inc. has conducted a testing program to quantify specific emissions from Unit Nos. 1, 2, and 3 of the Camden County Resource Recovery facility in Camden, New Jersey.

The facility consists of three mass-fired municipal refuse burning furnaces which produce electricity for sale to a local utility company. Each of the mass-fired boilers is equipped with a spray dryer adsorber (SDA) for acid gas removal, an electrostatic precipitator (ESP) for the control of suspended particulate emissions.

1.2 Outline of Test Program. This report covers stationary source sampling performed on June 17 through 21, 1991 at the Unit Nos. 1, 2, and 3 SDA inlets and stacks. Table 1-1 is a test log which presents the sampling locations, sampling parameters, sampling methods, test dates, and run numbers. Several runs utilized volumetric air flow rates and/or flues gas composition data from other runs; refer to Table 1-2 for a listing.

1.3 Test Participants. Table 1-3 lists the personnel involved in the test program.

TABLE 1-1
TEST LOG

Sampling Location	Emissions Measured	Sampling Method	Test Date	Run Numbers		
Unit No. 1 SDA Inlet	CO_2, O_2	EPA 3	6/17	1-I-M3/MMTL-1,	1-I-M3/MMTL-2,	1-I-M3/MMTL-3
	Metals	EPA MMTL	6/17	1-I-MMTL-1,	1-I-MMTL-2,	1-I-MMTL-3
	CO_2, O_2	EPA 3	6/18	1-I-M3/M101A-1,	1-I-M3/M101A-2,	1-I-M3/M101A-3
	Mercury	EPA.101A	6/18	1-I-M101A-1,	1-I-M101A-2,	1-I-M101A-3
	CO_2, O_2	EPA 3	6/19	1-I-M3/M4-1,	1-I-M3/M4-2,	1-I-M3/M4-3
	Volumetric Air Flow Rate	EPA 4	6/19	1-I-M4-1,	1-I-M4-2,	1-I-M4-3
	Sulfur Dioxide	EPA 6C	6/19	1-I-CEM-1,	1-I-CEM-2,	1-I-CEM-3
	Hydrogen Chloride	EPA 26	6/19	1-I-M26-1,	1-I-M26-2,	1-I-M26-3
Unit No. 1 Stack	CO_2, O_2	EPA 3	6/17	1-S-M3/MMTL-1,	1-S-M3/MMTL-2,	1-S-M3/MMTL-3
	Metals	EPA MMTL	6/17	1-S-MMTL-1,	1-S-MMTL-2,	1-S-MMTL-3
	CO_2, O_2	EPA 3	6/17 6/18	1-S-M3/M23-1, 1-S-M3/M23-3	1-S-M3/M23-2,	
	PCDD/PCDF, PAHs	EPA 23	6/17 6/18	1-S-M23-1, 1-S-M23-3	1-S-M23-2,	
	CO_2, O_2	EPA 3	6/18	1-S-M3/M13B-1,	1-S-M3/M13B-2,	1-S-M13B-3
	Hydrogen Fluoride	EPA 13B	6/18	1-S-M13B-1,	1-S-M13B-2,	1-S-M13B-3
	CO_2, O_2	EPA 3	6/18	1-S-M3/M101A-1,	1-S-M3/M101A-2,	1-S-M3/M101A-3
	Mercury	EPA 101A	6/18	1-S-M101A-1,	1-S-M101A-2,	1-S-M101A-3
	Methane	EPA 18	6/19	1-S-M18-1,	1-S-M18-2,	1-S-M18-3
	CO_2, O_2	EPA 3	6/19	1-S-M3/NJM5-2, 1-S-M3/NJM5-5	1-S-M3/NJM5-3,	1-S-M3/NJM5-4,
	Particulate	NJM5	6/19	1-S-NJM5-2SB, 1-S-NJM5-5	1-S-NJM5-3,	1-S-NJM5-4,
	CO, NOX, SO_2, THC	EPA 10, 7E, 6C, 25A	6/19	1-S-CEM-2,	1-S-CEM-3,	1-S-CEM-4
	SO_3, H_2SO_4	EPA 8	6/19	1-S-M8-1,	1-S-M8-2,	1-S-M8-3
	Hydrogen Chloride	EPA 26	6/19	1-S-M26-1,	1-S-M26-2,	1-S-M26-3
	CO_2, O_2	EPA 3	6/20	1-S-M3/M201A-1		
	Particulate ≤ 10 Microns	EPA 201A	6/20	1-S-M201A-1		

* arsenic, beryllium, cadmium, chromium, nickel, and lead

(continued next page)

TABLE 1-1 (continued)
TEST LOG

Sampling Location	Emissions Measured	Sampling Method	Test Date	Run Numbers		
Unit No. 2 SDA Inlet	CO_2, O_2	EPA 3	6/21	2-I-M3/M4-1,	2-I-M3/M4-2,	2-I-M3/M4-3
	Volumetric Air Flow Rate	EPA 4	6/21	2-I-M4-1,	2-I-M4-2,	2-I-M4-3
	Sulfur Dioxide	EPA 6C	6/21	2-I-CEM-1,	2-I-CEM-2,	2-I-CEM-3
	Hydrogen Chloride	EPA 26	6/21	2-I-M26-1,	2-I-M26-2,	2-I-M26-3
Unit No. 2 Stack	CO_2, O_2	EPA 3	6/21	2-S-M3/NJM5-1, 2-S-M3/NJM5-4	2-S-M3/NJM5-2,	2-S-M3/NJM5-3,
	Particulate	NJM5	6/21	2-S-NJM5-1, 2-S-NJM5-4	2-S-NJM5-2SB,	2-S-NJM5-3,
	Hydrogen Chloride	EPA 26	6/21	2-S-M26-1,	2-S-M26-2,	2-S-M26-3
	CO, NOX, SO_2, THC	EPA 10, 7E, 6C, 25A	6/21	2-S-CEM-1,	2-S-CEM-2,	2-S-CEM-3
	O_2, CO_2	EPA 3	6/21	2-S-M3/M201A-1		
	Particulate ≤ 10 Microns	EPA 201A	6/21	2-S-M201A-1		
Unit No. 3 SDA Inlet	CO_2, O_2	EPA 3	6/20	3-I-M3/M4-1, 3-I-M3/M4-4	3-I-M3/M4-2,	3-I-M3/M4-3,
	Volumetric Air Flow Rate	EPA 4	6/20	3-I-M4-1, 3-I-M4-4	3-I-M4-2,	3-I-M4-3,
	Sulfur Dioxide	EPA 6C	6/20	3-I-CEM-1,	3-I-CEM-2,	3-I-CEM-3
	Hydrogen Chloride	EPA 26	6/20	3-I-M26-2,	3-I-M26-3,	3-I-M26-4
Unit No. 3 Stack	CO_2, O_2	EPA 3	6/20	3-S-M3/NJM5-1SB, 3-S-M3/NJM5-4	3-S-M3/NJM5-2,	3-S-M3/NJM5-3,
	Particulate	NJ M5	6/20	3-S-NJM5-1, 3-S-NJM5-4	3-S-NJM5-2,	3-S-NJM5-3,
	Hydrogen Chloride	EPA 26	6/20	3-S-M26-2,	3-S-M26-3,	3-S-M26-4
	CO, NOX, SO_2, THC	EPA 10, 7E, 6C, 25A	6/20	3-S-CEM-1	3-S-CEM-2	3-S-CEM-3
	CO_2, O_2	EPA 3	6/20	3-S-M3/M201A-1		
	Particulate ≤ 10 Microns	EPA 201A	6/20	3-S-M201A-1		

TABLE 1-2

EPA METHODS 2 AND 3 USAGE

Runs Requiring Volumetric Air Flow Rate and/or Flue Gas Composition Data	- - - - - Concurrent Runs - - - - - Volumetric Air Flow Rate	Flue Gas Composition
1-I-M26-1	1-I-M4-1	1-I-M3/M4-1
1-I-M26-2	1-I-M4-2	1-I-M3/M4-2
1-I-M26-3	1-I-M4-3	1-I-M3/M4-3
1-I-CEM-1	1-I-M4-1	1-I-M3/M4-1
1-I-CEM-2	1-I-M4-2	1-I-M3/M4-2
1-I-CEM-3	1-I-M4-3	1-I-M3/M4-3
1-S-M26-1	1-S-NJM5-2SB	1-S-M3/NJM5-2
1-S-M26-2	1-S-NJM5-3	1-S-M3/NJM5-3
1-S-M26-3	1-S-NJM5-4	1-S-M3/NJM5-4
1-S-CEM-1	1-S-NJM5-2SB	1-S-M3/NJM5-2
1-S-CEM-2	1-S-NJM5-3	1-S-M3/NJM5-3
1-S-CEM-3	1-S-NJM5-4	1-S-M3/NJM5-4
2-I-M26-1	2-I-M4-1	2-I-M3/M4-1
2-I-M26-2	2-I-M4-2	2-I-M3/M4-2
2-I-M26-3	2-I-M4-3	2-I-M3/M4-3
2-I-CEM-1	2-I-M4-1	2-I-M3/M4-1
2-I-CEM-2	2-I-M4-2	2-I-M3/M4-2
2-I-CEM-3	2-I-M4-3	2-I-M3/M4-3
2-S-M26-1	2-S-NJM5-1	2-S-M3/NJM5-1
2-S-M26-2	2-S-NJM5-2SB	2-S-M3/NJM5-2
2-S-M26-3	2-S-NJM5-3	2-S-M3/NJM5-3
2-S-CEM-1	2-S-NJM5-1	2-S-M3/NJM5-1
2-S-CEM-2	2-S-NJM5-2SB	2-S-M3/NJM5-2
2-S-CEM-3	2-S-NJM5-3	2-S-M3/NJM5-3
3-I-M26-1	3-I-M4-2	3-I-M3/M4-2
3-I-M26-2	3-I-M4-3	3-I-M3/M4-3
3-I-M26-3	3-I-M4-4	3-I-M3/M4-4
3-I-CEM-1	3-I-M4-2	3-I-M3/M4-2
3-I-CEM-2	3-I-M4-3	3-I-M3/M4-3
3-I-CEM-3	3-I-M4-4	3-I-M3/M4-4
3-S-M26-1	3-S-NJM5-2	3-S-M3/NJM5-2
3-S-M26-2	3-S-NJM5-3	3-S-M3/NJM5-3
3-S-M26-3	3-S-NJM5-4	3-S-M3/NJM5-4
3-S-CEM-1	3-S-NJM5-2	3-S-M3/NJM5-2
3-S-CEM-2	3-S-NJM5-3	3-S-M3/NJM5-3
3-S-CEM-3	3-S-NJM5-4	3-S-M3/NJM5-4

TABLE 1-3

TEST PARTICIPANTS

Foster Wheeler Enviresponse, Inc.	Bruce C. Studley Test Coordinator
Camden County Energy Recovery Associates	Newton G. Wattis Test Coordinator
	Steven B. Warlick Test Coordinator
New Jersey State Department of Environmental Protection	Frederick Ballay Test Observer
	Richelle S. Burkeen Test Observer
	K.B. Bhandutia Test Observer
Cemtech Associates	John F. Van Woy Test Observer
	C. Stephen Krivanck III Test Observer
Entropy Environmentalists Inc.	Allan F. Lowe Project Manager
	Barry F. Rudd Project Supervisor
	Christopher M. Wrenn Project Supervisor
	Herbert T. Dixon Sampling Team Leader
	Matthew L. Hamilton Sampling Team Leader
	Richard L. Moreno Sampling Team Leader
	David A. Stone Sampling Team Leader
	Mark P. Winter Sampling Team Leader

(continued next page)

TABLE 1-3 (continued)

TEST PARTICIPANTS

Entropy Environmentalists Inc.	Kevin B. Baird Engineering Technician
	John M. Carpenter Engineering Technician
	Ken Davis Engineering Technician
	Reginald F. Holt Engineering Technician
	Jesus Grave de Peralta Laboratory Technician
	Lauren A. Sherwood Laboratory Technician

SUMMARY OF RESULTS

2.1 Presentation. Table 2-1 presents the emissions results for the compounds having specific emissions limits stated in the permit. Tables 2-2 and 2-3 are PCDD/PCDF emissions summaries. Tables 2-4 and 2-5 are PAH summaries. Tables 2-6 through 2-33 are run-by-run tests summaries; refer to the "List of Tables and Figures" on page vii of the "Table of Contents" for a cross-reference. Detailed test results are presented in Volume I, Appendix A; field and analytical data is provided in Volume I, Appendix B. The PCDD/PCDF and PAHs chromatograms are presented in Volumes I and II, respectively.

2.2 Discussion

2.2.1 Particulate ≤ 10 Microns. For the particulate ≤ 10 microns testing, delta p and stack temperature readings were taken from a preliminary traverse. For run 2-S-M201A-1 the delta p and stack temperature averages were taken from run 2-S-NJM5-1.

2.2.2 Duplicate Analyses. Whenever duplicate analyses were performed, the average of the two analytical results was used in emissions calculations.

2.2.3 PCDD/PCDF Analytical Results Prefixes. Two symbols are used in the presentation of the analytical results. The symbols indicate results that have special significance and require different procedures in calculations and data interpretation. The less than (<) symbol is used to indicate that a compound was not detected and that the reported catch value is a detection limit. The estimation symbol (¯) indicates values that are either an estimated maximum possible concentration (EMPC) or a positive result that is below the quantitation limit assigned to the compound.

2.2.4 PAHs Analytical Results. Due to matrix interferences, reliable internal standard amounts and percent recoveries could not be determined, as noted in further detail in the Case Narrative in Appendix B.1.b.9.

2.2.5 Aborted Runs. Runs 1-S-NJATM5-1 and 3-S-M26-1 were aborted. No data on these aborted runs are presented in the report.

2.2.6. Air Flow Rates. Inlet air flow rates differ from the stack air flow rates. This may suggest inlet pounds per hour for HCl may be different than those reported. Note, the inlet HCl pounds per hour is not used in permit compliance.

TABLE 2-1

COMPLIANCE EMISSIONS SUMMARY

	Repetition 1	2	3	4	Average	Permitted Compliance Emissions Limits
Unit No. 1						

SDA Inlet						
Concen., ppmvd @ 7% O2						
Hydrogen Chloride	223	95.7	665	- -	328	- -
Sulfur Dioxide	394	121	116	- -	210	- -
Stack						
Concen., ppmvd @ 7% O2					15.03	
Carbon Monoxide	17.1	14.4	13.6	- -	- -	400
Hydrogen Chloride	5.23	1.49	14.3	- -	7.01	50
Nitrogen Oxides	210	209	207	- -	208	300
Sulfur Dioxide	58.5	1.17	8.43	- -	22.7	50
Total Gaseous Nonmethane Organics as Methane*	2.61	< 1.77	< 1.66	- -	< 2.01	70
Emission Rate, lb/hr						
Carbon Monoxide	2.51	2.13	1.97	- -	- -	60.2
Hydrogen Fluoride	< 0.0798	0.212	< 0.0695	- -	- -	0.38
Mercury	0.00736	0.0394	0.0398	- -	0.0289	0.08
Metals						
Arsenic	2.97E-04	8.47E-05	< 7.97E-05	- -	< 1.54E-04	5.25E-04
Beryllium	< 7.82E-06	< 7.85E-06	< 7.97E-06	- -	< 7.88E-06	1.31E-05
Cadmium	< 7.82E-04	< 7.85E-04	< 7.97E-04	- -	< 7.88E-04	0.0035
Chromium	< 0.00156	0.00188	0.00542	- -	< 0.00295	0.0215
Lead	0.0177	< 0.00157	0.00239	- -	< 0.00722	0.08
Nickel	< 0.00156	0.00173	0.00303	- -	< 0.00211	0.018
Nitrogen Oxides	50.8	50.6	49.2	- -	50.2	74.1
Filterable Particulate	- -	0.738	1.22	0.841	0.933	4.38
Sulfur Dioxide	19.7	0.394	2.80	- -	7.63	34.4
Sulfuric Acid Mist (incl. SO3)	0.897	0.343	2.58	- -	1.27	2.6
Total Gaseous Nonmethane Organics as Methane*	0.220	< 0.149	< 0.138	- -	< 0.169	6.0
2,3,7,8 TCDD	8.36E-09	8.43E-09	1.09E-08	- -	9.24E-09	9.3E-07
Total PAHs	- -	- -	- -	- -	3.12E-06	0.0145
Concen., gr/DSCF @ 7% O2						
Filterable Particulate	- -	0.00255	0.00429	0.00279	0.00321	0.015
Filterable Particulate, SB**	0.00254	- -	- -	- -	0.00254	0.03
Particulate ≤ 10 Microns	0.000595	- -	- -	- -	0.000597	0.013
Concen., gr/DSCF @ 12% CO2						
Total Particulate	- -	0.00580	0.00983	0.00627	0.00730	0.1
Removal Efficiency, %***						
Hydrogen Chloride	97.6	98.4	97.8	- -	98.0	90
Sulfur Dioxide	85.1	99.0	92.7	- -	92.3	80

* Since methane was not detected, this number is the same as the total hydrocarbon number.

** Performed during boiler tube rapping.

*** Based on ppmvd @ 7% O2

(continued next page)

TABLE 2-1 (continued)

COMPLIANCE EMISSIONS SUMMARY

	Repetition 1	2	3	4	Average	Permitted Compliance Emissions Limits
Unit No. 2						
SDA Inlet						
Concen., ppmvd @ 7% O2						
Hydrogen Chloride	134	151	139	- -	141	- -
Sulfur Dioxide	113	103	98.9	- -	105	- -
Stack						
Concen., ppmvd @ 7% O2						
Carbon Monoxide	57.1	38.9	29.4	- -	41.8	400
Hydrogen Chloride	1.58	3.98	2.90	- -	2.82	50
Nitrogen Oxides	200	225	200	- -	208	300
Sulfur Dioxide	7.40	16.2	8.75	- -	10.8	50
Total Gaseous Nonmethane Organics as Methane*	< 1.93	< 2.05	< 1.90	- -	< 1.96	70
Emission Rate, lb/hr						
Carbon Monoxide	8.18	5.28	4.06	- -	5.84	60.2
Nitrogen Oxides	47.0	50.2	45.5	- -	47.5	74.1
Filterable Particulate	1.61	- -	1.49	0.686	1.26	4.38
Sulfur Dioxide	2.43	5.03	2.76	- -	3.41	34.4
Total Gaseous Nonmethane Hydrocarbons as Methane*	< 0.159	< 0.159	< 0.150	- -	< 0.156	6.0
Concen., gr/DSCF @ 7% O2						
Filterable Particulate	0.00413	- -	0.00553	0.00232	0.00399	0.015
Filterable.Particulate, SB**	- -	0.00581	- -	- -	0.00581	0.03
Particulate ≤ 10 Microns	0.00128	- -	- -	- -	0.00128	0.013
Concen., gr/DSCF @ 12% CO2						
Total Partarticulate	0.00825	- -	0.0107	0.00836	0.00910	0.1
Removal Efficiency, %***						
Hydrogen Chloride	99.8	97.3	97.9	- -	98.3	90
Sulfur Dioxide	93.4	84.2	91.1	- -	89.6	80
Unit No. 3						
SDA Inlet						
Concen., ppmvd @ 7% O2						
Hydrogen Chloride	112	47.4	4.75	- -	54.7	- -
Sulfur Dioxide	142	104	239	- -	162	- -
Stack						
Concen., ppmvd @ 7% O2						
Carbon Monoxide	12.8	16.4	21.3	- -	16.8	400
Hydrogen Chloride	3.09	3.81	2.79	- -	3.23	50
Nitrogen Oxides	202	211	241	- -	218	300
Sulfur Dioxide	3.83	3.39	45.7	- -	17.7	50
Total Gaseous Nonmethane Organics as Methane*	< 1.79	< 1.83	< 1.92	- -	< 1.85	70

* Since methane was not detected, this number is the same as the total hydrocarbon number.

** Performed during boiler tube rapping.

*** Based on ppmvd @ 7% O2

(continued next page)

TABLE 2-1 (continued)

COMPLIANCE EMISSIONS SUMMARY

	Repetition 1	2	3	4	Average	Permitted Compliance Emissions Limits
Unit No. 3						
Stack						
Emission Rate, lb/hr						
Carbon Monoxide	2.00	2.42	3.05	- -	2.49	60.2
Nitrogen Oxides	51.8	51.2	56.7	- -	53.2	74.1
Filterable Particulate	- -	1.93	2.94	1.05	1.97	4.38
Sulfur Dioxide	1.37	1.15	15.0	- -	5.83	34.4
Total Gaseous Nonmethane Organics as Methane*	< 0.120	< 0.116	< 0.118	- -	< 0.118	6.0
Concen., gr/DSCF @ 7% O2						
Filterable Particulate	- -	0.00666	0.0105	0.00476	0.00731	0.015
Filterable Particulate, SB**	0.00548	- -	- -	- -	0.00548	0.03
Particulate ≤ 10 Microns	0.00130	- -	- -	- -	0.00130	0.013
Concen., gr/DSCF @ 12% CO2						
Total Particulate	- -	0.0129	0.0252	0.0199	0.0193	0.1
Removal Efficiency, %***						
Hydrogen Chloride	97.2	91.9	41.2	- -	76.8	90
Sulfur Dioxide	97.3	96.7	80.8	- -	91.6	80

* Since methane was not detected, this number is the same as the total hydrocarbon number.

** Performed during boiler tube rapping.

*** Based on ppmvd @ 7% O2

TABLE 2-2

PCDD/PCDF EMISSIONS SUMMARY

Unit No. 1 Stack

	--------Concentration, ng/DSCM *-------		
	1-S-M23-1	1-S-M23-2	1-S-M23-3
PCDD			
Total TriCDD	1.27E+000	8.84E-001	1.21E+000
2378-TCDD	4.92E-002	5.02E-002	6.46E-002
Other TCDD	8.78E-001	7.51E-001	9.48E-001
12378-PeCDD	7.47E-002	6.75E-002	ND
Other PeCDD	4.01E-001	5.03E-001	3.41E-001
123478-HxCDD	5.72E-002	4.40E-002	5.46E-002
123678-HxCDD	ND	4.60E-002	5.06E-002
123789-HxCDD	9.37E-002	7.58E-002	ND
Other HxCDD	7.02E-001	4.83E-001	5.42E-001
1234678-HpCDD	3.75E-001	2.35E-001	2.41E-001
Other HpCDD	4.10E-001	2.19E-001	2.31E-001
OCDD	8.72E-001	5.84E-001	5.56E-001
Total PCDD	5.18E+000	3.94E+000	4.24E+000
PCDF			
Total TriCDF	2.41E+001	1.68E+001	2.87E+001
2378-TCDF	4.79E-001	5.09E-001	5.92E-001
Other TCDF	1.45E+001	1.41E+001	1.70E+001
12378-PeCDF	5.18E-001	5.85E-001	6.98E-001
23478-PeCDF	4.61E-001	5.11E-001	6.08E-001
Other PeCDF	5.66E+000	5.44E+000	7.12E+000
123478-HxCDF	6.65E-001	8.28E-001	8.88E-001
123678-HxCDF	3.12E-001	3.86E-001	4.21E-001
123789-HxCDF	ND	3.43E-002	4.16E-002
234678-HxCDF	2.28E-001	3.94E-001	3.22E-001
Other HxCDF	1.93E+000	2.18E+000	2.84E+000
1234678-HpCDF	4.75E-001	4.55E-001	5.05E-001
1234789-HpCDF	6.80E-002	9.59E-002	9.36E-002
Other HpCDF	3.27E-001	2.19E-001	4.13E-001
OCDF	ND	1.79E-001	2.50E-001
Total PCDF	4.97E+001	4.27E+001	6.05E+001
Total PCDD/PCDF	5.49E+001	4.66E+001	6.47E+001

* 32° F (0° C) -- 29.92 Inches of Mercury (Hg)
ND Not detected or EMPC catches; used as zero (0)

TABLE 2-3

PCDD/PCDF EMISSIONS SUMMARY

THREE-RUN AVERAGES

Unit No. 1 Stack

	Concentration			Emission Rate	
	ng/DSCM *	ng/DSCM at 12% CO2	ng/DSCM at 7% O2	lb/hr	grams/second
PCDD					
Total TriCDD	1.12E+000	1.53E+000	1.62E+000	1.89E-007	2.39E-008
2378-TCDD	5.47E-002	7.51E-002	7.95E-002	9.23E-009	1.16E-009
Other TCDD	8.59E-001	1.18E+000	1.25E+000	1.45E-007	1.83E-008
12378-PeCDD	4.74E-002	6.53E-002	6.93E-002	8.00E-009	1.01E-009
Other PeCDD	4.15E-001	5.73E-001	6.07E-001	7.01E-008	8.82E-009
123478-HxCDD	5.19E-002	7.12E-002	7.53E-002	8.78E-009	1.11E-009
123678-HxCDD	3.22E-002	4.49E-002	4.77E-002	5.42E-009	6.85E-010
123789-HxCDD	5.65E-002	7.77E-002	8.20E-002	9.53E-009	1.20E-009
Other HxCDD	5.76E-001	7.88E-001	8.34E-001	9.72E-008	1.23E-008
1234678-HpCDD	2.84E-001	3.88E-001	4.10E-001	4.80E-008	6.05E-009
Other HpCDD	2.87E-001	3.92E-001	4.14E-001	4.86E-008	6.12E-009
OCDD	6.71E-001	9.17E-001	9.71E-001	1.13E-007	1.43E-008
Total PCDD	4.45E+000	6.10E+000	6.46E+000	7.52E-007	9.50E-008
PCDF					
Total TriCDF	2.32E+001	3.17E+001	3.35E+001	3.92E-006	4.94E-007
2378-TCDF	5.27E-001	7.24E-001	7.66E-001	8.89E-008	1.12E-008
Other TCDF	1.52E+001	2.09E+001	2.21E+001	2.57E-006	3.24E-007
12378-PeCDF	6.00E-001	8.26E-001	8.75E-001	1.01E-007	1.28E-008
23478-PeCDF	5.27E-001	7.24E-001	7.66E-001	8.90E-008	1.12E-008
Other PeCDF	6.07E+000	8.35E+000	8.84E+000	1.03E-006	1.29E-007
123478-HxCDF	7.94E-001	1.09E+000	1.16E+000	1.34E-007	1.69E-008
123678-HxCDF	3.73E-001	5.14E-001	5.44E-001	6.30E-008	7.94E-009
123789-HxCDF	2.53E-002	3.53E-002	3.74E-002	4.26E-009	5.37E-010
234678-HxCDF	3.15E-001	4.35E-001	4.61E-001	5.31E-008	6.69E-009
Other HxCDF	2.32E+000	3.18E+000	3.37E+000	3.91E-007	4.92E-008
1234678-HpCDF	4.78E-001	6.57E-001	6.95E-001	8.08E-008	1.02E-008
1234789-HpCDF	8.58E-002	1.19E-001	1.25E-001	1.45E-008	1.83E-009
Other HpCDF	3.20E-001	4.37E-001	4.62E-001	5.40E-008	6.81E-009
OCDF	1.43E-001	1.99E-001	2.11E-001	2.41E-008	3.03E-009
Total PCDF	5.10E+001	6.99E+001	7.39E+001	8.62E-006	1.09E-006
Total PCDD/PCDF	5.55E+001	7.60E+001	8.04E+001	9.37E-006	1.18E-006

* 32° F (0° C) -- 29.92 Inches of Mercury (Hg)

TABLE 2-4
PAHs EMISSIONS SUMMARY
Unit No. 1 Stack

	Concentration, ng/DSCM*		
	1-S-M23-1	1-S-M23-2	1-S-M23-3
Acenaphthene	NDB	NDB	NDB
Acenaphthylene	1.74E+00	4.15E-01	NDB
Anthracene	7.06E+00	1.38E+01	ND
Benzo(a)anthracene	ND	NDB	ND
Benzo(b)fluoranthene	3.85E+00	NDB	NDB
Benzo(k)fluoranthene	ND	NDB	NDB
Benzo(g,h,i)perylene	NDB	NDB	1.66E+01
Benzo(a)pyrene	ND	ND	4.03E+00
Benzo(e)pyrene	NDB	NDB	2.86E+00
2-Cloronaphthalene	ND	2.15E+00	NDB
Chrysene	NDB	NDB	NDB
Dibenz(a,h)anthracene	ND	ND	NDB
Fluoranthene	NDB	NDB	NDB
Fluorene	NDB	NDB	NDB
Indeno(1,2,3-cd)pyrene	NDB	NDB	NDB
2-Methylnaphthalene	NDB	NDB	NDB
Naphthalene	NDB	NDB	NDB
Perylene	ND	ND	2.86E+00
Phenanthrene	NDB	NDB	NDB
Pyrene	NDB	NDB	NDB

* 32 Deg. F (0 Deg. C) -- 29.92 inches Hg

ND - Not detected or EV catches; used as zero (0)

NDB - The compound was detected on the full screen analysis at a concentration that was indistinguishable from the TLI Laboratory Blank results. The catch is considered indistinguishable from the blank results if it is not at least five times greater than the blank value.

TABLE 2-5
PAHs EMISSIONS SUMMARY
THREE-RUN AVERAGES
Unit No. 1 Stack

	Concentration			Emission Rate	
	ng/DSCM *	ng/DSCM @ 12% CO2	ng/DSCM @ 7% O2	lbs/hr	g/sec
Acenaphthene	NDB	NDB	NDB	NDB	NDB
Acenaphthylene	7.18E-01	9.71E-01	1.03E+00	1.22E-07	1.54E-08
Anthracene	6.95E+00	9.70E+00	1.03E+01	1.17E-06	1.47E-07
Benzo(a)anthracene	NDB	NDB	NDB	NDB	NDB
Benzo(b)fluoranthene	1.28E+00	1.71E+00	1.80E+00	2.18E-07	2.74E-08
Benzo(k)fluoranthene	NDB	NDB	NDB	NDB	NDB
Benzo(g,h,i)perylene	5.53E+00	7.57E+00	8.03E+00	9.37E-07	1.18E-07
Benzo(a)pyrene	1.34E+00	1.83E+00	1.95E+00	2.27E-07	2.86E-08
Benzo(e)pyrene	9.53E-01	1.30E+00	1.38E+00	1.61E-07	2.03E-08
2-Chloronaphthalene	7.17E-01	1.02E+00	1.09E+00	1.20E-07	1.51E-08
Chrysene	NDB	NDB	NDB	NDB	NDB
Dibenz(a,h)anthracene	NDB	NDB	NDB	NDB	NDB
Fluoranthene	NDB	NDB	NDB	NDB	NDB
Fluorene	NDB	NDB	NDB	NDB	NDB
Indeno(1,2,3-cd)pyrene	NDB	NDB	NDB	NDB	NDB
2-Methylnaphthalene	NDB	NDB	NDB	NDB	NDB
Naphthalene	NDB	NDB	NDB	NDB	NDB
Perylene	9.53E-01	1.30E+00	1.38E+00	1.61E-07	2.03E-08
Phenanthrene	NDB	NDB	NDB	NDB	NDB
Pyrene	NDB	NDB	NDB	NDB	NDB

* 32 Deg. F -- 29.92 inches Hg

ND - Not detected or EV catches; used as zero (0)

NDB - The compound was detected on the full screen analysis at a concentration that was indistinguishable from the TLI Laboratory Blank results. The catch is considered indistinguishable from the blank results if it is not at least five times greater than the blank value.

TABLE 2-6

HYDROGEN CHLORIDE TESTS SUMMARY

Unit No. 1 SDA Inlet

	1-I-M26-1	1-I-M26-2	1-I-M26-3	Average
Test Date	6/19/91	6/19/91	6/19/91	
Run Start Time	1225	1715	1930	
Run Finish Time	1340	1822	2040	
Volume of Dry Gas Sample, DSL*	119.253	120.157	117.920	
Flue Gas Parameters**				
CO_2, Percent By Volume, Dry	9.0	8.6	10.3	9.3
O_2, Percent By Volume, Dry	11.0	11.4	9.4	10.6
Air Flow Rate, Dry SCFM	48,490	47,550	45,116	47,052
Hydrogen Chloride				
Concentration, ppmvd	159	65.6	551	259
Concentration, ppmvd @ 12% CO_2	213	91.5	642	315
Concentration, ppmvd @ 7% O_2	223	95.7	665	328
Emission Rate, lb/hr	43.7	17.6	141	67.3

* 70° F (21° C) -- 29.92 Inches Of Mercury (Hg)

** From runs 1-I-M4-1, 1-I-M4-2, and 1-I-M4-3, respectively.

TABLE 2-7

MERCURY TESTS SUMMARY

Unit No. 1 SDA Inlet

	1-I-M101A-1	1-I-M101A-2	1-I-M101A-3	Average
Run Date	6/18/91	6/18/91	6/18/91	
Run Start Time	0810	1100	1445	
Run Finish Time	1025	1345	1715	
Test Train Parameters:				
Volume Of Dry Gas Sample, SCF *	65.098	69.691	65.288	
Percent Isokinetic:	100.8	100.6	99.0	
Flue Gas Parameters:				
CO_2, Percent By Volume, Dry	10.0	9.7	10.0	9.9
O_2, Percent By Volume, Dry	9.8	10.1	10.0	10.0
Temperature, °F	418	430	427	425
Air Flow Rate, Dry SCFM * 36145	45,263	38017 48,929	36269 46,242	46,811
Air Flow Rate, Wet ACFM	87,373	94,957	88,892	90,407
Excess Air, Percent	86	91	90	89
Mercury:				
Concentration, ug/DSCM *	439	598	638	558
Concentration, ug/DSCM @ 12% CO2	527	740	766	678
Concentration, ug/DSCM @ 7% O2	549	768	812	710
Concentration, grains/DSCF *	1.92E-004	2.61E-004	2.79E-004	2.44E-004
Concentration, gr/DSCF @ 12% CO2	2.30E-004	3.23E-004	3.35E-004	2.96E-004
Concentration, gr/DSCF @ 7% O2	2.40E-004	3.36E-004	3.55E-004	3.10E-004
Emission Rate, lb/hr	0.0744	0.110	0.111	0.0985

* 70° F (21° C) -- 29.92 Inches of Mercury (Hg)

TABLE 2-8

METALS TESTS SUMMARY

Unit No. 1 SDA Inlet

	1-I-MMTL-1	1-I-MMTL-2	1-I-MMTL-3	Average
Run Date	6/17/91	6/17/91	6/17/91	
Run Start Time	1030	1435	1800	
Run Finish Time	1253	1707	2028	
Test Train Parameters:				
Volume Of Dry Gas Sample, SCF *	87.881	86.200	88.831	
Percent Isokinetic:	97.0	96.6	95.2	
Flue Gas Parameters:				
CO_2, Percent By Volume, Dry	9.2	8.8	8.9	9.0
O_2, Percent By Volume, Dry	10.7	11.4	11.1	11.1
Temperature, °F	421	431	434	429
Air Flow Rate, Dry SCFM *	46,588	45,859	47,949	46,799
Air Flow Rate, Wet ACFM	91,441	90,190	92,863	91,498
Excess Air, Percent	102	118	111	110
Arsenic:				
Concentration, ug/DSCM *	1,125	1,167	914	1,069
Concentration, ug/DSCM @ 12% CO2	1,467	1,592	1,233	1,431
Concentration, ug/DSCM @ 7% O2	1,529	1,703	1,293	1,508
Concentration, grains/DSCF *	4.92E-004	5.10E-004	4.00E-004	4.67E-004
Concentration, gr/DSCF @ 12% CO2	6.41E-004	6.96E-004	5.39E-004	6.25E-004
Concentration, gr/DSCF @ 7% O2	6.68E-004	7.44E-004	5.65E-004	6.59E-004
Emission Rate, lb/hr	0.196	0.201	0.164	0.187

* 70° F (21° C) -- 29.92 Inches of Mercury (Hg)

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TABLE 2-8 (Continued)

METALS TESTS SUMMARY

Unit No. 1 SDA Inlet

	1-I-MMTL-1	1-I-MMTL-2	1-I-MMTL-3	Average
Beryllium:				
Concentration, ug/DSCM *	3.28	5.45	1.77	3.50
Concentration, ug/DSCM @ 12% CO2	4.28	7.43	2.39	4.70
Concentration, ug/DSCM @ 7% O2	4.46	7.95	2.50	4.97
Concentration, grains/DSCF *	1.43E-006	2.38E-006	7.73E-007	1.53E-006
Concentration, gr/DSCF @ 12% CO2	1.87E-006	3.25E-006	1.04E-006	2.05E-006
Concentration, gr/DSCF @ 7% O2	1.95E-006	3.47E-006	1.09E-006	2.17E-006
Emission Rate, lb/hr	5.72E-004	9.36E-004	3.18E-004	6.09E-004
Cadmium:				
Concentration, ug/DSCM *	1,221	1,360	1,240	1,274
Concentration, ug/DSCM @ 12% CO2	1,593	1,855	1,672	1,707
Concentration, ug/DSCM @ 7% O2	1,660	1,983	1,754	1,799
Concentration, grains/DSCF *	5.34E-004	5.94E-004	5.42E-004	5.57E-004
Concentration, gr/DSCF @ 12% CO2	6.96E-004	8.11E-004	7.31E-004	7.46E-004
Concentration, gr/DSCF @ 7% O2	7.26E-004	8.67E-004	7.67E-004	7.87E-004
Emission Rate, lb/hr	0.213	0.234	0.223	0.223

* 70° F (21° C) -- 29.92 Inches of Mercury (Hg)

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TABLE 2-8 (Continued)

METALS TESTS SUMMARY

Unit No. 1 SDA Inlet

	1-I-MMTL-1	1-I-MMTL-2	1-I-MMTL-3	Average
Chromium:				
Concentration, ug/DSCM *	840	848	811	833
Concentration, ug/DSCM @ 12% CO2	1,095	1,156	1,093	1,115
Concentration, ug/DSCM @ 7% O2	1,141	1,237	1,147	1,175
Concentration, grains/DSCF *	3.67E-004	3.71E-004	3.54E-004	3.64E-004
Concentration, gr/DSCF @ 12% CO2	4.79E-004	5.05E-004	4.78E-004	4.87E-004
Concentration, gr/DSCF @ 7% O2	4.99E-004	5.40E-004	5.01E-004	5.13E-004
Emission Rate, lb/hr	0.147	0.146	0.146	0.146
Lead:				
Concentration, ug/DSCM *	22,420	22,243	25,520	23,394
Concentration, ug/DSCM @ 12% CO2	29,244	30,332	34,409	31,328
Concentration, ug/DSCM @ 7% O2	30,474	32,438	36,089	33,000
Concentration, grains/DSCF *	0.00980	0.00972	0.0112	0.0102
Concentration, gr/DSCF @ 12% CO2	0.0128	0.0133	0.0150	0.0137
Concentration, gr/DSCF @ 7% O2	0.0133	0.0142	0.0158	0.0144
Emission Rate, lb/hr	3.91	3.82	4.58	4.10

* 70° F (21° C) -- 29.92 Inches of Mercury (Hg)

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TABLE 2-8 (Continued)

METALS TESTS SUMMARY

Unit No. 1 SDA Inlet

	1-I-MMTL-1	1-I-MMTL-2	1-I-MMTL-3	Average
Nickel:				
Concentration, ug/DSCM *	317	307	297	307
Concentration, ug/DSCM @ 12% CO2	414	418	400	411
Concentration, ug/DSCM @ 7% O2	431	447	419	432
Concentration, grains/DSCF *	1.39E-004	1.34E-004	1.30E-004	1.34E-004
Concentration, gr/DSCF @ 12% CO2	1.81E-004	1.83E-004	1.75E-004	1.80E-004
Concentration, gr/DSCF @ 7% O2	1.89E-004	1.96E-004	1.83E-004	1.89E-004
Emission Rate, lb/hr	0.0554	0.0527	0.0533	0.0538

* 70° F (21° C) -- 29.92 Inches of Mercury (Hg)

TABLE 2-9

SULFUR DIOXIDE TESTS SUMMARY

Unit No. 1 SDA Inlet

	1-I-CEM-1	1-I-CEM-2	1-I-CEM-3	Average
Test Date	6/19/91	6/19/91	6/19/91	
Run Start Time	1225	1710	1930	
Run Finish Time	1325	1810	2030	
Flue Gas Parameters				
CO_2, Percent By Volume, Dry	9.0	8.6	10.3	9.3
O_2, Percent By Volume, Dry	11.0	11.4	9.4	10.6
Air Flow Rate, Dry SCFM*	48,490	47,550	45,116	47,052
Sulfur Dioxide				
Concentration, ppmvd	281	82.7	96.4	153
Concentration, ppmvd @ 12% CO_2	375	115	112	201
Concentration, ppmvd @ 7% O_2	394	121	116	210
Emission Rate, lb/hr	136	39.4	43.6	73.1

* From runs 1-I-M4-1, 1-I-M4-2, and 1-I-M4-3, respectively.

TABLE 2-10

VOLUMETRIC AIR FLOW RATES TESTS SUMMARY

Unit No. 1 SDA Inlet

	1-I-M4-1	1-I-M4-2	1-I-M4-3	Average
Run Date	6/19/91	6/19/91	6/19/91	
Run Start Time	1225	1715	1930	
Run Finish Time	1340	1822	2040	
Test Train Parameters:				
Volume Of Dry Gas Sample, SCF *	26.820	27.499	27.111	
Flue Gas Parameters:				
CO_2, Percent By Volume, Dry	9.0	8.6	10.3	9.3
O_2, Percent By Volume, Dry	11.0	11.4	9.4	10.6
Temperature, °F	430	427	417	425
Air Flow Rate, Dry SCFM *	48,490	47,550	45,116	47,052
Air Flow Rate, Wet ACFM	95,429	92,371	87,992	91,931

TABLE 2-11

CARBON MONOXIDE, NITROGEN OXIDES, SULFUR DIOXIDE AND TOTAL HYDROCARBONS TESTS SUMMARY

Unit No. 1 Stack

	1-S-CEM-1	1-S-CEM-2	1-S-CEM-3	Average
Test Date	6/19/91	6/19/91	6/19/91	
Run Start Time	1225	1710	1930	
Run Finish Time	1325	1810	2030	
Flue Gas Parameters				
CO2, Percent By Volume, Dry	9.0	8.8	9.0	8.9
O2, Percent By Volume, Dry	11.0	11.4	10.7	11.0
Air Flow Rate, Dry SCFM*	47,071	49,239	45,035	47,115
Carbon Monoxide				
Concentration, ppmvd	12.2	9.9	10.0	10.7
Concentration, ppmvd @ 12% CO2	16.3	13.5	13.3	14.4
Concentration, ppmvd @ 7% O2	17.1	14.4	13.6	15.0
Emission Rate, lb/hr	2.51	2.13	1.97	2.21
Nitrogen Oxides as NO2				
Concentration, ppmvd	150	143	152	148
Concentration, ppmvd @ 12% CO2	200	195	203	199
Concentration, ppmvd @ 7% O2	210	209	207	208
Emission Rate, lb/hr	50.8	50.6	49.2	50.2
Sulfur Dioxide				
Concentration, ppmvd	41.8	0.800	6.20	16.3
Concentration, ppmvd @ 12% CO2	55.7	1.09	8.27	21.7
Concentration, ppmvd @ 7% O2	58.5	1.17	8.43	22.7
Emission Rate, lb/hr	19.7	0.394	2.80	7.63
Total Hydrocarbons				
Concentration, ppmvd	1.86 <	1.21 <	1.22 <	1.43
Concentration, ppmvd @ 12% CO2	2.48 <	1.65 <	1.63 <	1.92
Concentration, ppmvd @ 7% O2	2.61 <	1.77 <	1.66 <	2.01
Emission Rate, lb/hr	0.220 <	0.149 <	0.138 <	0.169

* From runs 1-S-NJM5-2SB, 1-S-NJM5-3, and 1-S-NJM5-4, respectively.

TABLE 2-12

HYDROGEN CHLORIDE TESTS SUMMARY

Unit No. 1 Stack

	1-S-M26-1	1-S-M26-2	1-S-M26-3	Average
Test Date	6/19/91	6/19/91	6/19/91	
Run Start Time	1225	1710	1930	
Run Finish Time	1325	1820	2040	
Volume of Dry Gas Sample, DSL*	116.322	116.569	116.777	
Flue Gas Parameters**				
CO_2, Percent By Volume, Dry	9.0	8.8	9.0	8.9
O_2, Percent By Volume, Dry	11.0	11.4	10.7	11.0
Air Flow Rate, Dry SCFM	47,071	49,239	45,035	47,115
Hydrogen Chloride				
Concentration, ppmvd	3.74	1.02	10.5	5.09
Concentration, ppmvd @ 12% CO_2	4.99	1.39	14.0	6.80
Concentration, ppmvd @ 7% O_2	5.23	1.49	14.3	7.00
Emission Rate, lb/hr	0.996	0.284	2.68	1.32

* 70° F (21° C) -- 29.92 Inches Of Mercury (Hg)

** From runs 1-S-NJM5-2SB, 1-S-NJM5-3, and 1-S-NJM5-4, respectively.

TABLE 2-13

HYDROGEN FLUORIDE TESTS SUMMARY

Unit No. 1 Stack

	1-S-M13B-1	1-S-M13B-2	1-S-M13B-3	Average
Run Date	6/18/91	6/18/91	6/18/91	
Run Start Time	1410	1700	1905	
Run Finish Time	1520	1810	2020	
Test Train Parameters:				
Volume Of Dry Gas Sample, SCF *	38.916	35.206	36.148	
Percent Isokinetic:	101.2	102.8	103.2	
Flue Gas Parameters:				
CO_2, Percent By Volume, Dry	8.4	9.4	8.6	8.8
O_2, Percent By Volume, Dry	11.9	10.6	11.5	11.3
Temperature, °F	264	262	261	262
Air Flow Rate, Dry SCFM *	49,521	44,808	45,118	46,482
Air Flow Rate, Wet ACFM	81,258	73,806	74,059	76,374
Excess Air, Percent	130	101	120	117
Hydrogen Fluoride:				
Concentration, ppmvd	< 0.519	1.52	< 0.497	< 0.845
Concentration, ppmvd @ 12% CO2	< 0.741	1.94	< 0.693	< 1.12
Concentration, ppmvd @ 7% O2	< 0.798	2.05	< 0.732	< 1.19
Emission Rate, lb/hr	< 0.0798	0.212	< 0.0695	< 0.120

* 70° F (21° C) -- 29.92 Inches of Mercury (Hg)

< Indicates the value is below the detection limit.

TABLE 2-14

MERCURY TESTS SUMMARY

Unit No. 1 Stack

	1-S-M101A-1	1-S-M101A-2	1-S-M101A-3	Average
Run Date	6/18/91	6/18/91	6/18/91	
Run Start Time	0810	1100	1446	
Run Finish Time	1025	1345	1715	
Test Train Parameters:				
Volume Of Dry Gas Sample, SCF *	73.841	92.403	72.202	
Percent Isokinetic:	100.0	98.3	99.7	
Flue Gas Parameters:				
CO_2, Percent By Volume, Dry	9.1	8.6	9.2	9.0
O_2, Percent By Volume, Dry	10.9	11.4	10.9	11.1
Temperature, °F	260	258	259	259
Air Flow Rate, Dry SCFM * 35838	49,815	35417 51,821	35162 48,875	50,170
Air Flow Rate, Wet ACFM	81,853	84,027	79,742	81,874
Excess Air, Percent	107	117	107	110
Mercury:				
Concentration, ug/DSCM *	39.5	203	217	153
Concentration, ug/DSCM @ 12% CO2	52.0	283	283	206
Concentration, ug/DSCM @ 7% O2	54.7	296	301	217
Concentration, grains/DSCF *	1.72E-005	8.87E-005	9.49E-005	6.69E-005
Concentration, gr/DSCF @ 12% CO2	2.27E-005	1.24E-004	1.24E-004	9.02E-005
Concentration, gr/DSCF @ 7% O2	2.39E-005	1.29E-004	1.32E-004	9.50E-005
Emission Rate, lb/hr	0.00736	0.0394	0.0398	0.0289

* 70° F (21° C) -- 29.92 Inches of Mercury (Hg)

TABLE 2-15

METALS TESTS SUMMARY

Unit No. 1 Stack

	1-S-MMTL-1	1-S-MMTL-2	1-S-MMTL-3	Average
Run Date	6/17/91	6/17/91	6/17/91	
Run Start Time	1030	1435	1800	
Run Finish Time	1255	1705	2028	
Test Train Parameters:				
Volume Of Dry Gas Sample, SCF *	83.076	82.046	86.262	
Percent Isokinetic:	99.5	98.4	97.7	
Flue Gas Parameters:				
CO_2, Percent By Volume, Dry	9.0	8.8	7.9	8.6
O_2, Percent By Volume, Dry	11.0	11.2	12.1	11.4
Temperature, °F	266	268	264	266
Air Flow Rate, Dry SCFM *	49,107	48,670	51,957	49,911
Air Flow Rate, Wet ACFM	82,603	81,069	85,740	83,137
Excess Air, Percent	109	113	134	119
Arsenic:				
Concentration, ug/DSCM *	1.62	0.465	< 0.409	< 0.831
Concentration, ug/DSCM @ 12% CO2	2.15	0.634	< 0.622	< 1.14
Concentration, ug/DSCM @ 7% O2	2.26	0.664	< 0.644	< 1.19
Concentration, grains/DSCF *	7.06E-007	2.03E-007	< 1.79E-007	< 3.63E-007
Concentration, gr/DSCF @ 12% CO2	9.41E-007	2.77E-007	< 2.72E-007	< 4.97E-007
Concentration, gr/DSCF @ 7% O2	9.88E-007	2.90E-007	< 2.81E-007	< 5.20E-007
Emission Rate, lb/hr	2.97E-004	8.47E-005	< 7.97E-005	< 1.54E-004

* 70° F (21° C) -- 29.92 Inches of Mercury (Hg)

< Indicates the value is below the detection limit.

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TABLE 2-15 (Continued)

METALS TESTS SUMMARY

Unit No. 1 Stack

	1-S-MMTL-1	1-S-MMTL-2	1-S-MMTL-3	Average
Beryllium:				
Concentration, ug/DSCM *	< 0.0425	< 0.0430	< 0.0409	< 0.0421
Concentration, ug/DSCM @ 12% CO2	< 0.0567	< 0.0587	< 0.0622	< 0.0592
Concentration, ug/DSCM @ 7% O2	< 0.0595	< 0.0615	< 0.0644	< 0.0618
Concentration, grains/DSCF *	< 1.86E-008	< 1.88E-008	< 1.79E-008	< 1.84E-008
Concentration, gr/DSCF @ 12% CO2	< 2.48E-008	< 2.56E-008	< 2.72E-008	< 2.59E-008
Concentration, gr/DSCF @ 7% O2	< 2.60E-008	< 2.69E-008	< 2.81E-008	< 2.70E-008
Emission Rate, lb/hr	< 7.82E-006	< 7.85E-006	< 7.97E-006	< 7.88E-006
Cadmium:				
Concentration, ug/DSCM *	< 4.25	< 4.30	< 4.09	< 4.21
Concentration, ug/DSCM @ 12% CO2	< 5.67	< 5.87	< 6.22	< 5.92
Concentration, ug/DSCM @ 7% O2	< 5.95	< 6.15	< 6.44	< 6.18
Concentration, grains/DSCF *	< 1.86E-006	< 1.88E-006	< 1.79E-006	< 1.84E-006
Concentration, gr/DSCF @ 12% CO2	< 2.48E-006	< 2.56E-006	< 2.72E-006	< 2.59E-006
Concentration, gr/DSCF @ 7% O2	< 2.60E-006	< 2.69E-006	< 2.81E-006	< 2.70E-006
Emission Rate, lb/hr	< 7.82E-004	< 7.85E-004	< 7.97E-004	< 7.88E-004

* 70° F (21° C) -- 29.92 Inches of Mercury (Hg)

< Indicates the value is below the detection limit.

(Continued next page)

TABLE 2-15 (Continued)

METALS TESTS SUMMARY

Unit No. 1 Stack

	1-S-MMTL-1	1-S-MMTL-2	1-S-MMTL-3	Average
Chromium:				
Concentration, ug/DSCM *	< 8.50	10.3	27.8	< 15.5
Concentration, ug/DSCM @ 12% CO2	< 11.3	14.1	42.3	< 22.6
Concentration, ug/DSCM @ 7% O2	< 11.9	14.8	43.8	< 23.5
Concentration, grains/DSCF *	< 3.72E-006	4.51E-006	1.22E-005	< 6.81E-006
Concentration, gr/DSCF @ 12% CO2	< 4.95E-006	6.16E-006	1.85E-005	< 9.87E-006
Concentration, gr/DSCF @ 7% O2	< 5.20E-006	6.45E-006	1.91E-005	< 1.03E-005
Emission Rate, lb/hr	< 0.00156	0.00188	0.00542	< 0.00295
Lead:				
Concentration, ug/DSCM *	96.1	< 8.61	12.3	< 39.0
Concentration, ug/DSCM @ 12% CO2	128	< 11.7	18.7	< 52.8
Concentration, ug/DSCM @ 7% O2	134	< 12.3	19.3	< 55.2
Concentration, grains/DSCF *	4.20E-005	< 3.76E-006	5.37E-006	< 1.70E-005
Concentration, gr/DSCF @ 12% CO2	5.60E-005	< 5.13E-006	8.15E-006	< 2.31E-005
Concentration, gr/DSCF @ 7% O2	5.88E-005	< 5.37E-006	8.44E-006	< 2.42E-005
Emission Rate, lb/hr	0.0177	< 0.00157	0.00239	< 0.00722

* 70° F (21° C) -- 29.92 Inches of Mercury (Hg)

< Indicates the value is below the detection limit.

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TABLE 2-15 (Continued)

METALS TESTS SUMMARY

Unit No. 1 Stack

		1-S-MMTL-1	1-S-MMTL-2	1-S-MMTL-3		Average
Nickel:						
Concentration, ug/DSCM *	<	8.50	9.47	15.6	<	11.2
Concentration, ug/DSCM @ 12% CO2	<	11.3	12.9	23.6	<	15.9
Concentration, ug/DSCM @ 7% O2	<	11.9	13.5	24.5	<	16.6
Concentration, grains/DSCF *	<	3.72E-006	4.14E-006	6.80E-006	<	4.89E-006
Concentration, gr/DSCF @ 12% CO2	<	4.95E-006	5.64E-006	1.03E-005	<	6.96E-006
Concentration, gr/DSCF @ 7% O2	<	5.20E-006	5.91E-006	1.07E-005	<	7.27E-006
Emission Rate, lb/hr	<	0.00156	0.00173	0.00303	<	0.00211

* 70° F (21° C) -- 29.92 Inches of Mercury (Hg)

< Indicates the value is below the detection limit.

TABLE 2-16

METHANE TESTS SUMMARY

Unit No. 1 Stack

	1-S-M18-1	1-S-M18-2	1-S-M18-3	Average
Test Date	6/19/91	6/19/91	6/19/91	
Run Start Time	1225	1710	1930	
Run Finish Time	1340	1825	2045	
Volume Of Gas Sampled, DSL*	4.228	4.256	4.238	
Air Flow Rate, Dry SCFM**	47,071	49,239	45,035	47,115
Methane				
Concentration, ppmvd	< 1.61	< 1.61	< 1.61	< 1.61
Emission Rate, lb/hr	< 0.190	< 0.199	< 0.182	< 0.190

* 70° F (21° C) -- 29.92 Inches of Mercury (Hg)

** From runs 1-S-NJM5-2SB, 1-S-NJM5-3, and 1-S-NJM5-4.

TABLE 2-17

PARTICULATE TESTS SUMMARY

Unit No. 1 Stack

	1-S-NJM5-2SB	1-S-NJM5-3	1-S-NJM5-4	1-S-NJM5-5	Average
Run Date	6/19/91	6/19/91	6/19/91	6/19/91	
Run Start Time	1225	1710	1930	2115	
Run Finish Time	1340	1820	2040	2222	
Test Train Parameters:					
Volume Of Dry Gas Sample, SCF •	35.665	38.822	33.714	41.639	
Percent Isokinetic:	102.3	100.0	101.1	99.7	
Flue Gas Parameters:					
CO_2, Percent By Volume, Dry	9.0	8.8	9.0	8.3	8.8
O_2, Percent By Volume, Dry	11.0	11.4	10.7	11.7	11.2
Temperature, °F	262	266	263	264	264
Air Flow Rate, Dry SCFM •	47,071	49,239	45,035	52,978	48,581
Air Flow Rate, Wet ACFM	79,561	81,483	75,065	88,204	81,078
Excess Air, Percent	109	118	102	124	113
Filterable Particulate:					
Concentration, mg/DSCM •	4.16	4.00	7.23	4.24	4.91
Concentration, mg/DSCM @ 12% CO2	5.54	5.46	9.64	6.13	6.69
Concentration, mg/DSCM @ 7% O2	5.82	5.84	9.82	6.38	6.97
Concentration, grains/DSCF •	0.00182	0.00175	0.00316	0.00185	0.00215
Concentration, gr/DSCF @ 12% CO2	0.00242	0.00239	0.00421	0.00268	0.00293
Concentration, gr/DSCF @ 7% O2	0.00254	0.00255	0.00429	0.00279	0.00304
Emission Rate, lb/hr	0.733	0.738	1.22	0.841	0.883

• 70° F (21° C) -- 29.92 Inches of Mercury (Hg)

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TABLE 2-17 (Continued)

PARTICULATE TESTS SUMMARY

Unit No. 1 Stack

	1-S-NJM5-2SB	1-S-NJM5-3	1-S-NJM5-4	1-S-NJM5-5	Average
Condensable Particulate:					
Concentration, mg/DSCM *	32.4	5.73	9.64	5.68	13.4
Concentration, mg/DSCM @ 12% CO2	43.2	7.81	12.8	8.21	18.0
Concentration, mg/DSCM @ 7% O2	45.3	8.36	13.1	8.55	18.8
Concentration, grains/DSCF *	0.0141	0.00250	0.00421	0.00248	0.00582
Concentration, gr/DSCF @ 12% CO2	0.0189	0.00342	0.00561	0.00359	0.00788
Concentration, gr/DSCF @ 7% O2	0.0198	0.00365	0.00572	0.00374	0.00823
Emission Rate, lb/hr	5.71	1.06	1.63	1.13	2.38
Total Particulate:					
Concentration, mg/DSCM *	36.5	9.73	16.9	9.92	18.3
Concentration, mg/DSCM @ 12% CO2	48.7	13.3	22.5	14.3	24.7
Concentration, mg/DSCM @ 7% O2	51.1	14.2	22.9	14.9	25.8
Concentration, grains/DSCF *	0.0160	0.00425	0.00737	0.00434	0.00799
Concentration, gr/DSCF @ 12% CO2	0.0213	0.00580	0.00983	0.00627	0.0108
Concentration, gr/DSCF @ 7% O2	0.0224	0.00620	0.0100	0.00653	0.0113
Emission Rate, lb/hr	6.44	1.80	2.84	1.97	3.26

* 70° F (21° C) -- 29.92 Inches of Mercury (Hg)

TABLE 2-18

PARTICULATE ≤ 10 MICRONS TEST SUMMARY

Unit No. 1 Stack

	1-S-M201A-1
Run Date	6/20/91
Run Start Time	950
Run Finish Time	1313
Test Train Parameters	
Volume of Dry Gas Sampled, SCF*	64.724
Percent Isokinetic	112
Flue Gas Parameters	
CO2, Percent By Volume, Dry	9.1
O2, Percent By Volume, Dry	10.9
Temperature, °F	265
Air Flow Rate, SCFM, Dry*	43,674
Air Flow Rate, ACFM, Wet	73,092
PM10 Calculations	
Dia. In Cyclone, Microns	9.59
Particulate Catch,	
Total, Milligrams	3.7
< 10 Microns, Milligrams	1.8
> 10 Microns, Milligrams	1.9
Percent of total Particulate	
< 10 Microns, Milligrams	48.6
> 10 Microns, Milligrams	51.4
Particulate Emission Results for < 10 Microns	
Concentration, gr/DSCF*	0.000429
Concentration, gr/DSCF @ 12% CO2*	0.00124
Concentration, gr/DSCF @ 7% O2*	0.000595
Emission Rate, lb/hr	0.161

* 70° F (21° C) -- 29.92 Inches of Mercury (Hg).

TABLE 2-19

PCDD/PCDF AND PAHS SAMPLE TRAIN AND FLUE GAS PARAMETER SUMMARY

Unit No. 1 Stack

	1-S-M23-1	1-S-M23-2	1-S-M23-3	Average
Run Date	6/17/91	6/17/91	6/18/91	
Run Start Time	1000	1550	925	
Run Finish Time	1330	1908	1235	
Test Train Parameters				
Volume of Gas Sampled*				
Dry Stand. Cubic Feet	105.474	101.998	106.021	
Dry Stand. Cubic Meters	2.987	2.889	3.003	
Average Sampling Rate*				
Dry Stand. Cubic Feet/min	0.586	0.567	0.579	
Dry Stand. Cubic Meters/min	0.0166	0.0161	0.0164	
Percent Isokinetic	99.7	99.2	101.0	
Flue Gas Parameters				
Combustion Products				
CO2, Percent by Volume, Dry	9.0	8.4	8.8	8.7
O2, Percent by Volume, Dry	11.0	11.8	11.3	11.4
Moisture, Percent by Volume	17.9	16.9	17.5	17.4
Temperature				
Degrees Fahrenheit	268	269	261	266
Degrees Celsius	131	132	127	130
Volumetric Flow Rates				
Dry Stand. Cubic Ft/Min.*	45,414	44,819	45,057	45,097
Dry Stand. Cubic Meters/Min.*	1,286	1,269	1,276	1,277
Actual Cubic Ft/Min.	82,790	80,854	79,600	81,081
Actual Cubic Meters/Min.	2,345	2,290	2,254	2,296

* 32° F (0° C) -- 29.92 Inches Of Mercury (Hg)

TABLE 2-20

SULFURIC ACID MIST INCLUDING SULFUR TRIOXIDE TESTS SUMMARY

Unit No. 1 Stack

	1-S-M8-1	1-S-M8-2	1-S-M8-3	Average
Run Date	6/19/91	6/19/91	6/19/91	
Run Start Time	1225	1710	1930	
Run Finish Time	1340	1820	2040	
Test Train Parameters:				
Volume Of Dry Gas Sample, SCF *	39.185	38.555	35.573	
Percent Isokinetic:	98.7	97.2	99.8	
Flue Gas Parameters:				
CO_2, Percent By Volume, Dry	9.0	8.8	9.0	8.9
O_2, Percent By Volume, Dry	11.0	11.4	10.7	11.0
Temperature, °F	260	263	260	261
Air Flow Rate, Dry SCFM *	51,115	49,923	45,908	48,982
Air Flow Rate, Wet ACFM	84,684	80,981	76,005	80,557
Excess Air, Percent	109	118	102	110
Sulfuric Acid Mist (incl. SO3):				
Concentration, ppmvd	1.15	0.451	3.69	1.76
Concentration, ppmvd @ 12% CO2	1.54	0.615	4.92	2.36
Concentration, ppmvd @ 7% O2	1.62	0.658	5.02	2.43
Emission Rate, lb/hr	0.897	0.343	2.58	1.27

* 70° F (21° C) -- 29.92 Inches of Mercury (Hg)

TABLE 2-21

HYDROGEN CHLORIDE TESTS SUMMARY

Unit No. 2 SDA Inlet

	2-I-M26-1	2-I-M26-2	2-I-M26-3	Average
Test Date	6/21/91	6/21/91	6/21/91	
Run Start Time	1100	1310	1525	
Run Finish Time	1213	1430	1635	
Volume of Dry Gas Sample, DSL*	115.527	115.149	113.057	
Flue Gas Parameters**				
CO_2, Percent By Volume, Dry	9.0	8.8	9.3	9.0
O_2, Percent By Volume, Dry	11.0	11.3	10.6	11.0
Air Flow Rate, Dry SCFM	47,514	50,678	45,504	47,899
Hydrogen Chloride				
Concentration, ppmvd	95.7	105	103	101
Concentration, ppmvd @ 12% CO_2	128	143	133	134
Concentration, ppmvd @ 7% O_2	134	151	139	141
Emission Rate, lb/hr	25.7	30.0	26.5	27.4

* 70° F (21° C) -- 29.92 Inches Of Mercury (Hg)

** From runs 2-I-M4-1, 2-I-M4-2, and 2-I-M4-3, respectively.

TABLE 2-22

SULFUR DIOXIDE TESTS SUMMARY

Unit No. 2 SDA Inlet

	2-I-CEM-1	2-I-CEM-2	2-I-CEM-3	Average
Test Date	6/21/91	6/21/91	6/21/91	
Run Start Time	1100	1310	1525	
Run Finish Time	1200	1410	1655	
Flue Gas Parameters				
CO_2, Percent By Volume, Dry	9.0	8.8	9.3	9.0
O_2, Percent By Volume, Dry	11.0	11.3	10.6	11.0
Air Flow Rate, Dry SCFM*	47,514	50,678	45,504	47,899
Sulfur Dioxide				
Concentration, ppmvd	80.8	71.1	73.5	75.1
Concentration, ppmvd @ 12% CO_2	108	97.0	94.8	100
Concentration, ppmvd @ 7% O_2	113	103	98.9	105
Emission Rate, lb/hr	38.4	36.1	33.5	36.0

* From runs 2-I-M4-1, 2-I-M4-2, and 2-I-M4-3, respectively.

TABLE 2-23

VOLUMETRIC AIR FLOW RATES TESTS SUMMARY

Unit No. 2 SDA Inlet

	2-I-M4-1	2-I-M4-2	2-I-M4-3	Average
Run Date	6/21/91	6/21/91	6/21/91	
Run Start Time	1100	1310	1525	
Run Finish Time	1208	1430	1635	
Test Train Parameters:				
Volume Of Dry Gas Sample, SCF •	27.188	26.652	26.048	
Flue Gas Parameters:				
CO_2, Percent By Volume, Dry	9.0	8.8	9.3	9.0
O_2, Percent By Volume, Dry	11.0	11.3	10.6	11.0
Temperature, °F	432	428	424	428
Air Flow Rate, Dry SCFM •	47,514	50,678	45,504	47,899
Air Flow Rate, Wet ACFM	92,255	97,484	87,197	92,312

TABLE 2-24

CARBON MONOXIDE, NITROGEN OXIDES, SULFUR DIOXIDE, AND TOTAL HYDROCARBONS TESTS SUMMARY

Unit No. 2 Stack

	2-S-CEM-1	2-S-CEM-2	2-S-CEM-3	Average
Test Date	6/21/91	6/21/91	6/21/91	
Run Start Time	1100	1310	1525	
Run Finish Time	1200	1410	1655	
Flue Gas Parameters				
CO_2, Percent By Volume, Dry	8.0	7.5	8.0	7.8
O_2, Percent By Volume, Dry	12.3	12.8	12.2	12.4
Air Flow Rate, Dry SCFM*	52,650	52,858	50,161	51,890
Carbon Monoxide				
Concentration, ppmvd	35.5	22.8	18.5	25.6
Concentration, ppmvd @ 12% CO_2	53.3	36.5	27.8	39.2
Concentration, ppmvd @ 7% O_2	57.1	38.9	29.4	41.8
Emission Rate, lb/hr	8.18	5.28	4.06	5.84
Nitrogen Oxides as NO_2				
Concentration, ppmvd	124	132	126	127
Concentration, ppmvd @ 12% CO_2	186	211	189	195
Concentration, ppmvd @ 7% O_2	200	225	200	208
Emission Rate, lb/hr	47.0	50.2	45.5	47.5
Sulfur Dioxide				
Concentration, ppmvd	4.60	9.50	5.50	6.53
Concentration, ppmvd @ 12% CO_2	6.90	15.2	8.25	10.1
Concentration, ppmvd @ 7% O_2	7.40	16.2	8.75	10.8
Emission Rate, lb/hr	2.43	5.03	2.76	3.41
Total Hydrocarbons				
Concentration, ppmvd	< 1.20	< 1.20	< 1.19	< 1.20
Concentration, ppmvd @ 12% CO_2	< 1.80	< 1.92	< 1.79	< 1.84
Concentration, ppmvd @ 7% O_2	< 1.93	< 2.05	< 1.90	< 1.96
Emission Rate, lb/hr	< 0.159	< 0.159	< 0.150	< 0.156

* From runs 2-S-NJM5-1, 2-S-NJM5-2SB, and 2-S-NJM5-3, respectively.

TABLE 2-25

HYDROGEN CHLORIDE TESTS SUMMARY

Unit No. 2 Stack

	2-S-M26-1	2-S-M26-2	2-S-M26-3	Average
Test Date	6/21/91	6/21/91	6/21/91	
Run Start Time	1100	1310	1525	
Run Finish Time	1208	1430	1635	
Volume of Dry Gas Sample, DSL*	113.987	112.684	113.539	
Flue Gas Parameters**				
CO_2, Percent By Volume, Dry	8.0	7.5	8.0	7.8
O_2, Percent By Volume, Dry	12.3	12.8	12.2	12.4
Air Flow Rate, Dry SCFM	52,650	52,858	50,161	51,890
Hydrogen Chloride				
Concentration, ppmvd	0.980	2.33	1.82	1.71
Concentration, ppmvd @ 12% CO_2	1.47	3.73	2.74	2.65
Concentration, ppmvd @ 7% O_2	1.58	3.98	2.90	2.82
Emission Rate, lb/hr	0.292	0.697	0.518	0.502

* 70° F (21° C) -- 29.92 Inches Of Mercury (Hg)

** From runs 2-S-NJM5-1, 2-S-NJM5-2SB, and 2-S-NJM5-3, respectively.

TABLE 2-26

METHANE TESTS SUMMARY

Unit No. 2 Stack

	2-S-M18-1	2-S-M18-2	2-S-M18-3	Average
Test Date	6/21/91	6/21/91	6/21/91	
Run Start Time	1100	1310	1525	
Run Finish Time	1215	1425	1610	
Volume Of Gas Sampled, DSL*	4.275	4.228	4.247	
Air Flow Rate, Dry SCFM**	52,650	52,858	50,161	51,890
Methane				
Concentration, ppmvd	< 1.61	< 1.61	< 1.61	< 1.61
Emission Rate, lb/hr	< 0.213	< 0.213	< 0.202	< 0.209

* 70° F (21° C) -- 29.92 Inches of Mercury (Hg)

** From runs 2-S-NJM5-1, 2-S-NJM5-2SB, and 2-S-NJM5-3.

TABLE 2-27

PARTICULATE TESTS SUMMARY

Unit No. 2 Stack

	2-S-NJM5-1	2-S-NJM5-2SB	2-S-NJM5-3	2-S-NJM5-4	Average
Run Date	6/21/91	6/21/91	6/21/91	6/21/91	
Run Start Time	1100	1310	1525	1735	
Run Finish Time	1208	1430	1635	1842	
Test Train Parameters:					
Volume Of Dry Gas Sample, SCF *	38.438	41.286	36.401	41.124	
Percent Isokinetic:	98.5	99.1	98.0	100.3	
Flue Gas Parameters:					
CO_2, Percent By Volume, Dry	8.0	7.5	8.0	8.4	8.0
O_2, Percent By Volume, Dry	12.3	12.8	12.2	11.7	12.3
Temperature, °F	266	262	265	267	265
Air Flow Rate, Dry SCFM *	52,650	52,858	50,161	52,027	51,924
Air Flow Rate, Wet ACFM	86,486	86,382	81,713	86,563	85,286
Excess Air, Percent	141	155	138	125	140
Filterable Particulate:					
Concentration, mg/DSCM *	5.88	7.78	7.95	3.52	6.28
Concentration, mg/DSCM @ 12% CO2	8.82	12.5	11.9	5.03	9.56
Concentration, mg/DSCM @ 7% O2	9.46	13.3	12.7	5.30	10.2
Concentration, grains/DSCF *	0.00257	0.00340	0.00348	0.00154	0.00275
Concentration, gr/DSCF @ 12% CO2	0.00385	0.00544	0.00521	0.00220	0.00418
Concentration, gr/DSCF @ 7% O2	0.00413	0.00581	0.00553	0.00232	0.00445
Emission Rate, lb/hr	1.16	1.54	1.49	0.686	1.22

* 70° F (21° C) -- 29.92 Inches of Mercury (Hg)

(Continued next page)

TABLE 2-27 (Continued)

PARTICULATE TESTS SUMMARY

Unit No. 2 Stack

	2-S-NJM5-1	2-S-NJM5-2SB	2-S-NJM5-3	2-S-NJM5-4	Average
Condensable Particulate:					
Concentration, mg/DSCM •	6.71	14.4	8.44	9.87	9.86
Concentration, mg/DSCM @ 12% CO2	10.1	23.0	12.7	14.1	15.0
Concentration, mg/DSCM @ 7% O2	10.8	24.5	13.4	14.9	15.9
Concentration, grains/DSCF •	0.00293	0.00628	0.00369	0.00432	0.00431
Concentration, gr/DSCF @ 12% CO2	0.00440	0.0100	0.00553	0.00616	0.00652
Concentration, gr/DSCF @ 7% O2	0.00472	0.0107	0.00587	0.00650	0.00695
Emission Rate, lb/hr	1.32	2.85	1.59	1.92	1.92
Total Particulate:					
Concentration, mg/DSCM •	12.6	22.2	16.4	13.4	16.2
Concentration, mg/DSCM @ 12% CO2	18.9	35.4	24.6	19.1	24.5
Concentration, mg/DSCM @ 7% O2	20.3	37.8	26.1	20.2	26.1
Concentration, grains/DSCF •	0.00550	0.00968	0.00716	0.00585	0.00705
Concentration, gr/DSCF @ 12% CO2	0.00825	0.0155	0.0107	0.00836	0.0107
Concentration, gr/DSCF @ 7% O2	0.00885	0.0165	0.0114	0.00881	0.0114
Emission Rate, lb/hr	2.48	4.39	3.08	2.61	3.14

• 70° F (21° C) -- 29.92 Inches of Mercury (Hg)

TABLE 2-28

PARTICULATE ≤ 10 MICRONS TEST SUMMARY

Unit No. 2 Stack

	2-S-M201A-1
Run Date	6/21/91
Run Start Time	1405
Run Finish Time	1742
Test Train Parameters	
Volume of Dry Gas Sampled, SCF*	65.072
Percent Isokinetic	91
Flue Gas Parameters	
CO_2, Percent By Volume, Dry	8.0
O_2, Percent By Volume, Dry	12.2
Temperature, °F	110
Air Flow Rate, SCFM, Dry*	59,362
Air Flow Rate, ACFM, Wet	76,672
PM10 Calculations	
Dia. In Cyclone, Microns	9.52
Particulate Catch,	
Total, Milligrams	4.3
< 10 Microns, Milligrams	3.4
> 10 Microns, Milligrams	0.9
Percent of total Particulate	
< 10 Microns, Milligrams	79.1
> 10 Microns, Milligrams	20.9
Particulate Emission Results for < 10 Microns	
Concentration, gr/DSCF*	0.000806
Concentration, gr/DSCF @ 12% CO_2*	0.00323
Concentration, gr/DSCF @ 7% O_2*	0.00128
Emission Rate, lb/hr	0.410

* 70° F (20° C) -- 29.92 Inches of Mercury (Hg).

TABLE 2-29

HYDROGEN CHLORIDE TESTS SUMMARY

Unit No. 3 SDA Inlet

	3-I-M26-2	3-I-M26-3	3-I-M26-4	Average
Test Date	6/20/91	6/20/91	6/20/91	
Run Start Time	1135	1355	2150	
Run Finish Time	1248	1712	2315	
Volume of Dry Gas Sample, DSL*	116.345	115.655	117.506	
Flue Gas Parameters**				
CO2, Percent By Volume, Dry	9.0	8.9	7.4	8.4
O2, Percent By Volume, Dry	11.0	11.2	12.7	11.6
Air Flow Rate, Dry SCFM	44,826	48,698	57,032	50,185
Hydrogen Chloride				
Concentration, ppmvd	80.3	33.2	2.82	38.8
Concentration, ppmvd @ 12% CO2	107	44.8	4.57	52.1
Concentration, ppmvd @ 7% O2	112	47.4	4.75	54.9
Emission Rate, lb/hr	20.4	9.15	0.909	10.1

* 70° F (21° C) -- 29.92 Inches Of Mercury (Hg)

** From runs 3-I-M4-2, 3-I-M4-3, and 3-I-M4-4, respectively.

TABLE 2-30

SULFUR DIOXIDE TESTS SUMMARY

Unit No. 3 SDA Inlet

	3-I-CEM-1	3-I-CEM-2	3-I-CEM-3	Average
Test Date	6/20/91	6/20/91	6/20/91	
Run Start Time	925	1135	1510	
Run Finish Time	1025	1235	1710	
Flue Gas Parameters				
CO_2, Percent By Volume, Dry	9.4	9.0	8.9	9.1
O_2, Percent By Volume, Dry	10.7	11.0	11.2	11.0
Air Flow Rate, Dry SCFM*	45,759	44,826	48,698	46,428
Sulfur Dioxide				
Concentration, ppmvd	104.7	74.1	167.1	115
Concentration, ppmvd @ 12% CO_2	134	98.8	225	153
Concentration, ppmvd @ 7% O_2	142	104	239	162
Emission Rate, lb/hr	48.0	33.3	81.5	54.2

* From runs 3-I-M4-1, 3-I-M4-2, and 3-I-M4-3, respectively.

TABLE 2-31

VOLUMETRIC AIR FLOW RATES TESTS SUMMARY

Unit No. 3 SDA Inlet

	3-I-M4-1	3-I-M4-2	3-I-M4-3	3-I-M4-4	Average
Run Date	6/20/91	6/20/91	6/20/91	6/20/91	
Run Start Time	0925	1135	1355	2150	
Run Finish Time	1033	1248	1712	2315	
Test Train Parameters:					
Volume Of Dry Gas Sample, SCF *	26.880	27.191	27.212	27.613	
Flue Gas Parameters:					
CO_2, Percent By Volume, Dry	9.4	9.0	8.9	7.4	8.7
O_2, Percent By Volume, Dry	10.7	11.0	11.2	12.7	11.4
Temperature, °F	427	436	444	451	440
Air Flow Rate, Dry SCFM *	45,759	44,826	48,698	57,032	49,079
Air Flow Rate, Wet ACFM	90,874	90,476	98,467	113,164	98,245

TABLE 2-32

CARBON MONOXIDE, NITROGEN OXIDES, SULFUR DIOXIDE, AND TOTAL HYDROCARBONS TESTS SUMMARY

Unit No. 3 Stack

	3-S-CEM-1	3-S-CEM-2	3-S-CEM-3	Average
Test Date	6/20/91	6/20/91	6/20/91	
Run Start Time	925	1135	1510	
Run Finish Time	1025	1235	1710	
Flue Gas Parameters				
CO2, Percent By Volume, Dry	8.5	8.6	8.0	8.4
O2, Percent By Volume, Dry	11.5	11.5	12.0	11.7
Air Flow Rate, Dry SCFM*	52,568	49,777	50,854	51,066
Carbon Monoxide				
Concentration, ppmvd	8.7	11.1	13.7	11.2
Concentration, ppmvd @ 12% CO2	12.3	15.5	20.6	16.1
Concentration, ppmvd @ 7% O2	12.8	16.4	21.3	16.8
Emission Rate, lb/hr	2.00	2.42	3.05	2.49
Nitrogen Oxides as NO2				
Concentration, ppmvd	137	143	155	145
Concentration, ppmvd @ 12% CO2	193	200	233	208
Concentration, ppmvd @ 7% O2	202	211	241	218
Emission Rate, lb/hr	51.8	51.2	56.7	53.2
Sulfur Dioxide				
Concentration, ppmvd	2.60	2.30	29.40	11.43
Concentration, ppmvd @ 12% CO2	3.67	3.21	44.1	17.0
Concentration, ppmvd @ 7% O2	3.83	3.39	45.7	17.7
Emission Rate, lb/hr	1.37	1.15	15.0	5.83
Total Hydrocarbons				
Concentration, ppmvd	< 1.22	< 1.24	< 1.23	< 1.23
Concentration, ppmvd @ 12% CO2	< 1.72	< 1.73	< 1.85	< 1.77
Concentration, ppmvd @ 7% O2	< 1.79	< 1.83	< 1.92	< 1.85
Emission Rate, lb/hr	< 0.160	< 0.155	< 0.157	< 0.157

* From runs 3-S-NJM5-1SB, 3-S-NJM5-2, and 3-S-NJM5-3, respectively.

TABLE 2-33

HYDROGEN CHLORIDE TESTS SUMMARY

Unit No. 3 Stack

	3-S-M26-2	3-S-M26-3	3-S-M26-4	Average
Test Date	6/20/91	6/20/91	6/20/91	
Run Start Time	1135	1400	2150	
Run Finish Time	1248	1715	2315	
Volume of Dry Gas Sample, DSL*	114.248	113.811	113.839	
Flue Gas Parameters**				
CO_2, Percent By Volume, Dry	8.6	8.0	7.0	7.9
O_2, Percent By Volume, Dry	11.5	12.0	13.2	12.2
Air Flow Rate, Dry SCFM	49,777	50,854	46,299	48,977
Hydrogen Chloride				
Concentration, ppmvd	2.10	2.45	1.56	2.03
Concentration, ppmvd @ 12% CO_2	2.92	3.68	2.67	3.09
Concentration, ppmvd @ 7% O_2	3.09	3.81	2.79	3.23
Emission Rate, lb/hr	0.590	0.705	0.407	0.568

* 70° F (21° C) -- 29.92 Inches Of Mercury (Hg)

** From runs 3-S-NJM5-2, 3-S-NJM5-3, and 3-S-NJM5-4, respectively

TABLE 2-34

METHANE TESTS SUMMARY

Unit No. 3 Stack

	3-S-M18-1	3-S-M18-2	3-S-M18-3	Average
Test Date	6/20/91	6/20/91	6/20/91	
Run Start Time	925	1135	1510	
Run Finish Time	1040	1250	1725	
Volume Of Gas Sampled, DSL*	4.247	4.322	4.332	
Air Flow Rate, Dry SCFM**	52,568	49,777	50,854	51,066
Methane				
Concentration, ppmvd	< 1.61	< 1.61	< 1.61	< 1.61
Emission Rate, lb/hr	< 0.212	< 0.201	< 0.205	< 0.206

* 70° F (21° C) -- 29.92 Inches of Mercury (Hg)

** From runs 3-S-NJM5-1SB, 3-S-NJM5-2, and 3-S-NJM5-3.

TABLE 2-35

PARTICULATE TESTS SUMMARY

Unit No. 3 Stack

	3-S-NJM5-1SB	3-S-NJM5-2	3-S-NJM5-3	3-S-NJM5-4	Average
Run Date	6/20/91	6/20/91	6/20/91	6/20/91	
Run Start Time	0925	1135	1355	2150	
Run Finish Time	1033	1248	1715	2315	
Test Train Parameters:					
Volume Of Dry Gas Sample, SCF *	38.619	39.288	37.341	36.080	
Percent Isokinetic:	99.2	100.1	99.1	98.8	
Flue Gas Parameters:					
CO_2, Percent By Volume, Dry	8.5	8.6	8.0	7.0	8.0
O_2, Percent By Volume, Dry	11.5	11.5	12.0	13.2	12.1
Temperature, °F	263	263	266	274	267
Air Flow Rate, Dry SCFM *	52,568	49,777	50,854	46,299	49,875
Air Flow Rate, Wet ACFM	86,830	83,795	85,266	77,293	83,296
Excess Air, Percent	120	120	132	168	135
Filterable Particulate:					
Concentration, mg/DSCM *	8.50	10.3	15.4	6.07	10.1
Concentration, mg/DSCM @ 12% CO2	12.0	14.4	23.1	10.4	15.0
Concentration, mg/DSCM @ 7% O2	12.5	15.2	24.0	10.9	15.7
Concentration, grains/DSCF *	0.00372	0.00452	0.00674	0.00265	0.00441
Concentration, gr/DSCF @ 12% CO2	0.00525	0.00630	0.0101	0.00455	0.00655
Concentration, gr/DSCF @ 7% O2	0.00548	0.00666	0.0105	0.00476	0.00685
Emission Rate, lb/hr	1.67	1.93	2.94	1.05	1.90

* 70° F (21° C) -- 29.92 Inches of Mercury (Hg)

(Continued next page)

TABLE 2-35 (Continued)

PARTICULATE TESTS SUMMARY

Unit No. 3 Stack

	3-S-NJM5-1SB	3-S-NJM5-2	3-S-NJM5-3	3-S-NJM5-4	Average
Condensable Particulate:					
Concentration, mg/DSCM *	15.2	10.9	23.1	20.6	17.5
Concentration, mg/DSCM @ 12% CO2	21.4	15.2	34.6	35.2	26.6
Concentration, mg/DSCM @ 7% O2	22.4	16.0	35.9	36.9	27.8
Concentration, grains/DSCF *	0.00663	0.00475	0.0101	0.00898	0.00762
Concentration, gr/DSCF @ 12% CO2	0.00936	0.00663	0.0151	0.0154	0.0116
Concentration, gr/DSCF @ 7% O2	0.00978	0.00700	0.0157	0.0161	0.0121
Emission Rate, lb/hr	2.99	2.03	4.40	3.56	3.25
Total Particulate:					
Concentration, mg/DSCM *	23.7	21.2	38.5	26.6	27.5
Concentration, mg/DSCM @ 12% CO2	33.4	29.6	57.7	45.6	41.6
Concentration, mg/DSCM @ 7% O2	34.9	31.3	59.9	47.8	43.5
Concentration, grains/DSCF *	0.0103	0.00927	0.0168	0.0116	0.0120
Concentration, gr/DSCF @ 12% CO2	0.0146	0.0129	0.0252	0.0199	0.0182
Concentration, gr/DSCF @ 7% O2	0.0153	0.0137	0.0262	0.0209	0.0190
Emission Rate, lb/hr	4.66	3.96	7.33	4.62	5.14

* 70° F (21° C) -- 29.92 Inches of Mercury (Hg)

COMPLIANCE TEST REPORT

FOR

FOSTER WHEELER RESOURCE RECOVERY FACILITY

CHARLESTON, SC

VOLUME II - PCDD/PCDF AND METALS EMISSIONS

TEST DATES: OCTOBER, 1989

REPORT DATE: DECEMBER, 1989

ETS, INC.

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and

Pollution Control Consultants
Specializing In
Toxic Emission Measurement and Control

ETS CONTRACT NO: 89-217-T

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1.0 INTRODUCTION

1.1 Background: An emissions compliance test program was conducted at the Foster Wheeler Resource Recovery Facility in Charleston, South Carolina on October 17 through October 20, 1989. The testing was performed by Gene Craft, Richard Mutzabaugh and Laurie Graves, all of ETS, Inc. Plant supervision was provided by Jerry Hall and Roy Moyer. All compliance testing was observed by Joe Tallon of the South Carolina Department of Health and Environmental Control (SCDHEC).

. Two incinerator units are in service at the facility. These units are designated as "Unit A" and "Unit B" in this report.

1.2 Objective: The purpose of the agency-witnessed tests was to evaluate the emission performance of the facility with respect to the following pollutants:

Total Solid Particulate (TSP)

Hydrogen Fluoride (HF)

2378-Tetrachlorinated Dibenzo-p-Dioxin (2378-TCDD)

Lead (Pb)

Mercury (Hg)

Beryllium (Be)

In addition to the compliance demonstration, the test program was also designed to provide additional emissions information for the following pollutants:

All Tetra- through Octa-chlorinated Dibenzo Dioxins and Furans (PCDD/PCDF)
Arsenic (As)
Antimony (Sb)
Selenium (Se)
Cadmium (Cd)
Total Chromium (Cr)
Cobalt (Co)
Copper (Cu)
Nickel (Ni)
Zinc (Zn)

Data and results for the TSP and HF emissions are contained in Volume I of the compliance report, which was issued on November 17, 1989. Volume I also contains details concerning the facility and overall program specifics.

This report, Volume II, contains the data and results for the PCDD/PCDF and metals emissions.

1.3 Tests Performed: The overall test program is described in Volume I of the compliance report.

The PCDD/PCDF testing was performed only on the outlet stack of the Unit B incinerator. Three tests were performed. The testing was performed in accordance with Modified EPA Method 5 procedures.

Metals testing was performed at the outlets of both the Unit A and the Unit B incinerators. Three tests were performed at each location. These tests were performed in conjunction with the particulate tests, and are described in Volume I of the compliance report.

2.0 SUMMARY OF RESULTS

Table I summarizes the emissions results for all of the regulated pollutants tested during the test program.

More detailed results for the PCDD/PCDF and metals emissions are contained in Tables II through IV, as well as in the Appendices.

2.1 PCDD/PCDF Emissions: Table II summarizes the result of the PCDD/PCDF testing performed on the Unit B incinerator.

Mass emissions of 2378-TCDD, the only regulated isomer for the facility, showed a wide range of values, varying from 4.26 x 10^{-10} lb/hr for the first test run to 3.72 x 10^{-9} lb/hr for the third test run. The average of the three tests was 2.07 x 10^{-9} lb/hr, which is equivalent to 1.67 x 10^{-11} lb/MMBtu. These values are well below the permitted maximum of 7.5 x 10^{-6} lb/hr (2.9 x 10^{-8} lb/MMBtu).

2.2 Metals Emissions: Tables III and IV summarize the results of the metals tests performed on Units A and B, respectively. More detailed data and results may be found in Appendix B.

The emissions of the regulated pollutants (Lead, Mercury and Beryllium) were all below the permitted maximum levels.

The highest level of any of the 12 metals tested was

obtained for zinc. Unit A averaged 0.11 lb/hr zinc, while Unit B had an average zinc emissions of 0.37 lb/hr.

3.0 SAMPLING AND ANALYTICAL PROCEDURES

All sampling and analytical procedures were those recommended by the United States Environmental Protection Agency.

3.1 Field Testing:

3.1.1 Particulate and Multi-Metals Sampling: Sampling for particulate and metals was performed in a single test train. The sampling procedure for this testing can be found in Volume I.

3.1.2 Organic Sampling: A modified Method 5 (MM5) sampling train was used to sample the flue gases to determine the concentrations of PCDD/PCDF. The detailed protocol for collecting emissions using the MM5 sampling train was derived from Method 0010 of SW-846, and is basically similar to the protocol outlined in the ASME draft 1984 protocol.

3.1.2.1 Sampling Train Description: Figure 1 illustrates the modified Method 5 sampling train.

The train employed a quartz nozzle and heated glass probe for sample withdrawal. The probe had an effective length of seven feet. The nozzle was attached to the probe with stainless steel unions and Teflon compression rings.

Particulate matter was removed from the gas stream by means of a heated glass filter supported on a Teflon frit. The filter temperature was maintained at 248 ± 25°F.

After particulate removal, the gases passed into a water-cooled glass condenser and entered an XAD resin sorbent trap. Coolant water maintained at wet-ice temperature was continuously recirculated into the condenser/sorbent trap assembly using a submersible water pump.

The sorbent trap was packed with 20-30 grams of pre-cleaned, quality control checked amberlite XAD-2 resin.

The condenser cooled the sample gases and condensed part of the moisture. The cooled gases and condensate flowed down through the XAD-2 resin which retained the organic constituents.

After passing through the sorbent trap, the sample gases entered a chilled impinger train to remove the remaining moisture. The impinger train consisted of five glass impingers packed in ice water. The first impinger was left blank to facilitate collection of the condensate which passed through the XAD-2 sorbent trap. The second and third impingers each contained 100 ml of distilled water. The fourth impinger was left blank, and the fifth impinger contained approximately 200 gms of silica gel.

All fittings and connectors from the nozzle to the fourth impinger were made of either glass or Teflon. Glass-to-glass connections between the probe and the exit stem of the second impinger were externally sealed by wetting each surface with hexane. Sealing grease was used on connections between the third and fifth impingers.

3.1.2.2 Pre-test Preparation: All glass and Teflon components of the MM5 train were precleaned before use. The following cleaning procedures were used:

1) Wash with hot water and detergent.
2) Rinse with tap water three times.
3) Rinse with deionized, distilled water three times.
4) Rinse with pesticide grade hexane three times.
5) Bake at 400°F for three hours.
6) Cap glassware with hexane-rinsed aluminum foil, wrapped externally with Teflon tape.

The sorbent traps were pre-cleaned according to the above methodology, and packed with 20-30 gms of quality control checked XAD-2 resin by Triangle Labs located in Research Triangle Park, NC. The laboratory also spiked the traps with a known amount of labelled organic compounds in order to facilitate determination of retention and recovery efficiency of the XAD-2 resin. The packed traps were maintained at or below room temperature to prevent resin decomposition. Two traps were retained at the laboratory as method blanks.

filter holder were rinsed three times with pesticide grade acetone followed by three rinses with pesticide grade toluene. All rinsings were collected in pre-cleaned amber glass bottles fitted with Teflon lined screw caps.

2) Particulate Catch: The filter was removed from the housing with Teflon tweezers and placed into a precleaned glass petri dish. The dish was sealed externally with Teflon wrapping tape.

3) Back-half Rinse: The back half of the filter holder and all connecting lines from the filter to the sorbent tube were rinsed and treated as in (1) above.

4) Sorbent Cartridge: The sorbent trap assembly was capped with hexane-rinsed aluminum foil and sealed externally with Teflon tape.

5) First Impinger Catch: Any condensate collected in the first impinger was transferred to a graduated cylinder and the volume recorded. The impinger was rinsed and treated as in (1) above.

6) Second Impinger Catch: Same procedure as in (5) above.

3.1.2.6 Sample Storage and Transport: Immediately upon recovery, all samples including liquid rinses, filters and sorbent

traps were placed into insulated coolers packed with ice, thus protecting the samples from light and heat.

The samples remained inside the coolers during transport to the analytical laboratory. While in the custody of ETS, the temperatures inside the coolers were periodically measured to insure that the samples did not exceed 32°F.

All samples were express mailed directly to the analytical lab for analysis. While at the lab, the samples were kept in a refrigerated compartment until analyzed.

Raw field data for the MM5 sampling can be found in Appendix D.

3.2 Laboratory Analysis

3.2.1 Multi-Metals Analysis: Analysis of the multi-metals sample train components was performed in accordance with EPA Method 200.7 (40 CFR 136, Appendix C) and Method 303F of standards for water and waste-water analysis.

Arsenic, antimony, beryllium and selenium employed graphite furnace atomic absorption for the analysis. Cadmium, chromium cobalt, copper, lead, nickel and zinc were analyzed using ICAP. Mercury was analyzed by cold vapor atomic absorption. All metals analyses were conducted by Research Triangle Institute (Research

Triangle Park, NC). Appendix E contains the laboratory report for the analysis.

3.2.2 TCDD/TCDF Analysis: Analysis of the modified Method 5 sample train components for dioxins and furans was performed in accordance to the procedures outlined in Method 8280 of SW-846, with several modifications required to achieve suitable method detection limits. The analysis was performed with high resolution gas chromotography/mass spectrometry. All analyses were performed by Triangle Laboratories (Durham, NC). Appendix F contains raw laboratory data for the TCDD/TCDF analysis.

3.3 Data Analysis:

3.3.1 Metals and Organics: Calculations for converting the laboratory data for metals and organics into actual gaseous emissions are shown in Appendix D. General sampling and volumetric calculations may be found in Volume I of the Compliance Report.

4.0 QUALITY ASSURANCE

One blank sample train was used to establish background and method contamination levels for the PCDD/PCDF sampling. In addition, one blank sorbent trap was analyzed as a trip blank, while two additional traps were retained at the lab and analyzed as laboratory blanks. All blanks indicated negligible or no background contamination. The laboratory data for the blanks is included in Appendix F.

A blank sample train was used at each of the two incinerators to determine background and method contamination levels for the multiple-metals sampling and analytical procedures. A substantial background level of several of the metals was obtained at each incinerator. Most notably, cadmium, chromium, copper, cobalt and zinc background levels were quite high. In several cases, the blank levels for these metals exceeded the allowable compensation value of 5% of the sample value. In such cases, the limiting value of 5% of the sample value was used to compensate the sample for the background contamination.

TABLE I

SUMMARY OF EMISSIONS FOR REGULATED POLLUTANTS

POLLUTANT	UNITS	PERMITTED EMISSION LIMIT FOR EACH UNIT	ACTUAL EMISSIONS UNIT A	UNIT B
TSP	gr/dscf corr.to 12% CO2	0.015	0.0027	0.0024
	lb/MMBtu	0.032	0.0061	0.0052
HF	lb/hr	0.6		0.017
	lb/MMBtu	0.0022		0.00013
2378-TCDD	lb/hr	7.5x10-6		2.07x10-9
	lb/MMBtu	2.9x10-8		1.67x10-11
Lead	lb/hr	0.53	0.012	0.007
	lb/MMBtu	0.00203	0.00009	0.00005
Mercury	lb/hr	0.12	0.056	0.061
	lb/MMBtu	0.00047	0.00041	0.00045
Beryllium	lb/hr	6.8x10-5	4.06x10-6	6.4x10-6
	lb/MMBtu	2.6x10-7	2.97x10-8	4.88x10-8

@ 130 MMBTU/HR

TABLE II
SUMMARY OF PCDD/PCDF EMISSIONS

	CONCENTRATION (ng/Nm3, adjusted to 7 percent O2)				2378-TCDD TOXIC EQUIVALENCY FACTOR	2378-TCDD TOXIC EQUIVALENCIES CONCENTRATION (ng/Nm3, adjusted to 7 percent O2)			
	RUN 1	RUN 2	RUN 3	AVERAGE		RUN 1	RUN 2	RUN 3	AVERAGE
DIOXINS									
2378-TCDD	0.004 ND	0.021 ND	0.034	0.020	1	0.0045	0.0210	0.0341	0.019[illegible]
Other TCDD	0.000 ND	0.926	0.171	0.366	0.01	0.0000	0.0093	0.0017	0.003[illegible]
12378-PCDD	0.006 ND	0.021 ND	0.039	0.022	0.5	0.0028	0.0105	0.0195	0.010[illegible]
Other PCDD	0.073	2.031	0.161	0.755	0.005	0.0004	0.0102	0.0008	0.003[illegible]
123478-HxCDD	0.006 ND	0.342	0.020	0.122	0.04	0.0002	0.0137	0.0008	0.004[illegible]
123678-HxCDD	0.006 ND	1.368	0.088	0.487	0.04	0.0002	0.0547	0.0035	0.019[illegible]
123789-HxCDD	0.006 ND	1.315	0.102	0.474	0.04	0.0002	0.0526	0.0041	0.019[illegible]
Other HxCDD	0.151	9.286	0.668	3.368	0.0004	0.0001	0.0037	0.0003	0.001[illegible]
1234678-HpCDD	0.342	22.623	0.634	7.866	0.001	0.0003	0.0226	0.0006	0.007[illegible]
Other HpCDD	0.275	18.519	0.780	6.525	0.00001	0.0000	0.0002	0.0000	0.000[illegible]
OCDD	0.617	38.459	1.121	13.399	0	0.0000	0.0000	0.0000	0.000[illegible]
TOTAL PCDD	1.484	94.911	3.817	33.404		0.0087	0.1985	0.0654	0.090[illegible]
FURANS									
2378-TCDF	0.123	0.284	0.215	0.207	0.1	0.0123	0.0284	0.0215	0.020[illegible]
Other TCDF	0.331	8.818	1.979	3.709	0.001	0.0003	0.0088	0.0020	0.003[illegible]
12378-PCDF	0.028	0.510	0.195	0.244	0.1	0.0028	0.0510	0.0195	0.024[illegible]
23478-PCDF	0.050	0.737	0.229	0.339	0.1	0.0050	0.0737	0.0229	0.033[illegible]
Other PCDF	0.006	4.961	2.452	2.473	0.001	0.0000	0.0050	0.0025	0.002[illegible]
123478-HxCDF	0.067	1.368	0.288	0.574	0.01	0.0007	0.0137	0.0029	0.005[illegible]
123678-HxCDF	0.039	0.789	0.171	0.333	0.01	0.0004	0.0079	0.0017	0.003[illegible]
234678-HxCDF	0.073	2.368	0.200	0.880	0.01	0.0007	0.0237	0.0020	0.008[illegible]
123789-HxCDF	0.006 ND	0.026 ND	0.005 ND	0.012	0.01	0.0001	0.0003	0.0000	0.000[illegible]
Other HxCDF	0.135	3.341	0.995	1.490	0.0001	0.0000	0.0003	0.0001	0.000[illegible]
1234678-HpCDF	0.151	4.104	0.536	1.597	0.001	0.0002	0.0041	0.0005	0.001[illegible]
1234789-HpCDF	0.011 ND	0.458	0.010 ND	0.160	0.001	0.0000	0.0005	0.0000	0.000[illegible]
Other HpCDF	0.022	3.067	0.137	1.075	0.00001	0.0000	0.0000	0.0000	0.000[illegible]
OCDF	0.022 ND	2.683	0.244	0.983	0	0.0000	0.0000	0.0000	0.000[illegible]
TOTAL PCDF	1.065	33.514	7.654	14.078		0.023	0.217	0.076	0.105
TOTAL PCDD+PCD	2.549	128.425	11.471	47.482		0.0313	0.4158	0.1410	0.196[illegible]

MASS EMISSIONS RATES

	LB/HR				LB/MMBtu			
	RUN 1	RUN 2	RUN 3	AVERAGE	RUN 1	RUN 2	RUN 3	AVERAGE
2378-TCDD	4.26E-10	2.0[illegible]3-09	3.72E-09	2.07E-09	3.76E-12	1.76E-11	2.86E-11	1.67E-11
TOTAL TCDD	3.18E-08	8.68E-07	2.19E-07	3.73E-07	2.81E-10	7.41E-09	1.69E-09	3.13E-09
TOTAL TCDD AS 2378-TCDD EQUIVALENT	4.26E-10	2.98E-09	3.90E-09	2.44E-09	3.76E-12	2.54E-11	3.00E-11	1.97E-11

ND = Not Detected - indicated value represents detection limit.

TABLE III

Summary of Metals Emissions - Unit A

COMPONENT		RUN 5 lb/hr	RUN 5 lb/MMBtu	RUN 6 lb/hr	RUN 6 lb/MMBtu	RUN 7 lb/hr	RUN 7 lb/MMBtu	AVERAGE lb/hr	AVERAGE lb/MMBt
Antimony	Sb	1.05E-03	7.29E-06	2.19E-03	1.51E-05	1.16E-03	1.05E-05	1.47E-03	1.10E-0
Arsenic	As	1.57E-04	1.09E-06	1.93E-04	1.33E-06	1.45E-04	1.31E-06	1.65E-04	1.25E-0
Beryllium	Be	4.64E-06	3.23E-08	5.29E-06	3.65E-08	2.24E-06	2.03E-08	4.06E-06	2.97E-0
Cadmium	Cd	6.03E-04	4.19E-06	8.72E-04	6.02E-06	6.11E-04	5.52E-06	6.95E-04	5.24E-0
Chromium	Cr	2.34E-03	1.63E-05	1.99E-03	1.38E-05	1.80E-03	1.63E-05	2.04E-03	1.54E-0
Cobalt	Co	7.05E-05	4.90E-07	1.20E-03	8.30E-06	1.13E-04	1.02E-06	4.62E-04	3.27E-0
Copper	Cu	2.64E-03	1.84E-05	2.90E-03	2.01E-05	1.84E-03	1.66E-05	2.46E-03	1.84E-0
Lead	Pb	1.10E-02	7.62E-05	1.47E-02	1.02E-04	1.11E-02	1.00E-04	1.23E-02	9.27E-0
Mercury	Hg	7.57E-02	5.26E-04	5.92E-02	4.08E-04	3.31E-02	2.99E-04	5.60E-02	4.11E-0
Nickel	Ni	3.34E-03	2.32E-05	1.60E-03	1.10E-05	9.52E-04	8.60E-06	1.96E-03	1.43E-0
Selenium	Se	(2.35E-05)	(1.63E-07)	(2.36E-05)	(1.63E-07)	(2.38E-05)	(2.15E-07)	(2.36E-05)	(1.80E-0
Zinc	Zn	1.12E-01	7.75E-04	1.64E-01	1.13E-03	4.10E-02	3.70E-04	1.06E-01	7.60E-0

() INDICATES DETECTION LIMIT

TABLE IV

Summary of Metals Emissions - Unit B

COMPONENT		RUN 2 lb/hr	RUN 2 lb/MMBtu	RUN 3 lb/hr	RUN 3 lb/MMBtu	RUN 4 lb/hr	RUN 4 lb/MMBtu	AVERAGE lb/hr	AVERAGE lb/MMBtu
Antimony	Sb	4.97E-04	3.23E-06	6.14E-04	4.13E-06	1.24E-03	1.14E-05	7.82E-04	6.29E-06
Arsenic	As	1.62E-04	1.05E-06	7.95E-05	5.42E-07	6.23E-05	5.76E-07	1.01E-04	7.23E-07
Beryllium	Be	4.17E-06	2.72E-08	8.17E-06	5.57E-08	6.86E-06	6.35E-08	6.40E-06	4.88E-08
Cadmium	Cd	8.99E-04	5.85E-06	2.98E-04	2.03E-06	6.09E-04	5.64E-06	6.02E-04	4.51E-06
Chromium	Cr	1.12E-02	7.29E-05	7.40E-04	5.04E-06	1.76E-03	1.63E-05	4.57E-03	3.14E-05
Cobalt	Co	3.53E-04	2.30E-06	(1.41E-04)	(9.63E-07)	1.29E-03	1.19E-05	5.93E-04	5.05E-06
Copper	Cu	5.60E-03	3.64E-05	7.73E-04	5.27E-06	1.47E-03	1.36E-05	2.61E-03	1.84E-05
Lead	Pb	1.01E-02	6.57E-05	4.94E-03	3.37E-05	6.90E-03	6.38E-05	7.31E-03	5.44E-05
Mercury	Hg	5.43E-02	3.54E-04	8.26E-02	5.63E-04	4.56E-02	4.22E-04	6.09E-02	4.46E-04
Nickel	Ni	1.04E-02	6.80E-05	8.99E-04	6.13E-06	1.97E-03	1.82E-05	4.44E-03	3.08E-05
Selenium	Se	(2.41E-05)	(1.57E-07)	(2.36E-05)	(1.61E-07)	(2.37E-05)	(2.19E-07)	(2.38E-05)	(1.79E-07)
Zinc	Zn	1.04E+00	6.76E-03	2.81E-02	1.91E-04	3.17E-02	2.93E-04	3.66E-01	2.41E-03

() INDICATES DETECTION LIMIT

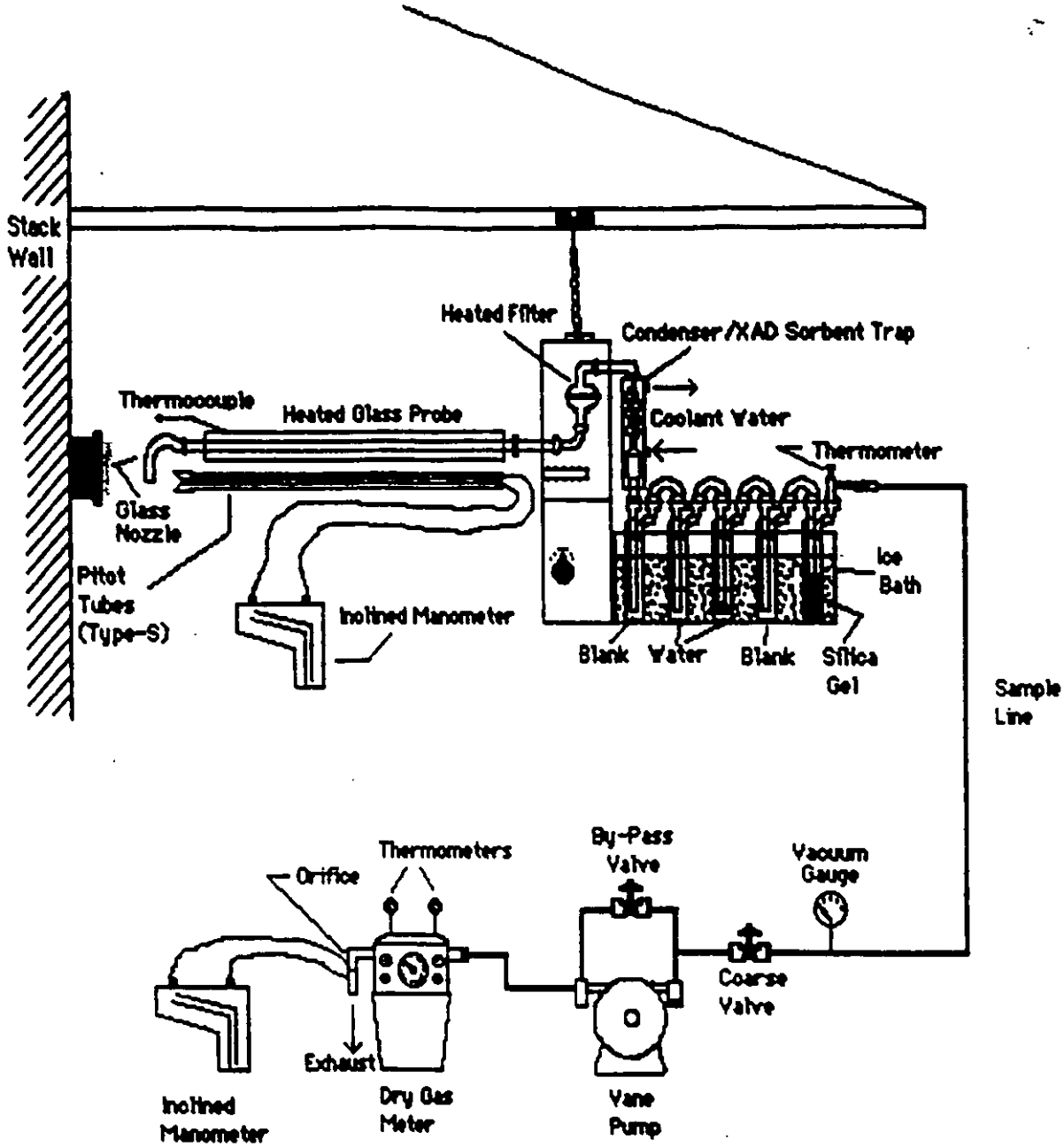

Figure 1 - Semivolatile Organics Sampling Train (Modified Method 5)

APPENDIX A

SAMPLING DATA AND RESULTS FOR MODIFIED METHOD 5 TESTS

GAS FLOWRATES AND PARAMETERS
FOR MM5 SAMPLING

FOSTER WHEELER
UNIT B: DIOXINS/FURANS

Run No.	1	2	3	Avg
Date	10/19/89	10/20/89	10/20/89	
Time Started	15:36	08:23	13:03	
Time Ended	18:50	11:34	16:19	
SAMPLING PARAMETERS				
Metered Volume - dcf	103.793	97.793	104.740	102.109
Corrected Volume - dscf	99.986	96.277	101.939	99.401
Total Test Time - min	180	180	180	180
% Isokinetics	93	96	94	94
GAS PARAMETERS				
Stack Temperature - F	304	298	292	298
% O2	11.5	10.5	10.3	10.8
% CO2	9.0	9.5	10.0	9.5
% CO	0.0	0.0	0.0	0.0
% Water	17.9	18.2	16.8	17.7
% Excess Air	121.2	98.9	94.9	105.0
Fo	1.04	1.09	1.07	1.07
GAS FLOWRATE				
Velocity ft/s	51.09	47.56	50.48	49.71
Actual Volume - ACFM	70643	65760	69795	68733
Standard Volume - DSCFM	40221	37618	40938	39592

Data & Results of Method 5 Calculations

Run 1

ETS Test of:
FOSTER WHEELER
Location: UNIT B: DIOXINS/FURANS
Date: 10/19/89 - 10/20/89
Condition: COMPLIANCE
Operator: CRAFT

Diameter of Stack (in) = 65
Dia. Upstream (ft) = N.A.
Eq. Dia. Downstream (ft) = N.A.
Area of Stack (ft²) = 23.04384

% O2	= 11.5	No. of Ports	= 2
% CO2	= 9.0	Points per Port	= 6
% CO	= 0	Time/Point (min)	= 15
% N2	= 79.5	Impinger 1 Gain (ml)	= 380
% H2O	= 17.89711	Impinger 2 Gain (ml)	= 49
Fo	= 1.044444	Impinger 3 Gain (ml)	= 5
Md Mole. Wt. Dry	= 29.9	Impinger 4 Gain (ml)	= 0
Ms Mole. Wt. Gas	= 27.77024		
Vm acf	= 103.793	STD Temp. (F)	= 68
DP (in. H2O)	= .5524281	STD Pressure (in. Hg)	= 29.92
Sqr. (DP) Avg.	= .7432551	Barometric Pres. (in.Hg)	= 30.04
DP Avg. (in. W.C.)	= 1.16	Meter Cal. (Y)	= 0.973
Tm (F)	= 77.29167	Meter (delta Ha)	= 1.962
Pm (in. Hg)	= 30.12529	Static Pres. (in. H2O)	= -.37
Vmstd dscf	= 99.98647	Pitot Coeff.	= .84
Stack Temp. (F)	= 304.0833		
Press. Stack (in. Hg)	= 30.01279		
Vimpstd dscf	= 20.42838		
Vsgstd dscf	= 1.36706	Vacuum @ Leak Check	= 10.0
Total Test Time (min)	= 180	Leak Rate (ft3/min)	= .008
Nozzle Dia. (in)	= .25	Area of Nozzle (ft3)	= 3.408846E-04
% EA	= 121.2057	Filter Gain (gram)	=
% Isokinetics	= 93.35983		
		Silica Gel (gram)	= 29
vs (Velocity) ft/sec	= 51.09354		
Qs dscfm	= 40221.3		
Qa acfm	= 70643.48		

Data & Results of Method 5 Calculations

Run 2

ETS Test of:
FOSTER WHEELER
Location: UNIT B: DIOXINS/FURANS
Date: 10/19/89 - 10/20/89
Condition: COMPLIANCE
Operator: CRAFT

Diameter of Stack (in) = 65
Eq. Dia. Upstream (ft) = N.A.
Eq. Dia. Downstream (ft) = N.A.
Area of Stack (ft²) = 23.04384

% O2	= 10.5	No. of Ports	= 2
% CO2	= 9.5	Points per Port	= 6
% CO	= 0	Time/Point (min)	= 15
N2	= 80	Impinger 1 Gain (ml)	= 426
% H2O	= 18.2312	Impinger 2 Gain (ml)	= 0
Fo	= 1.094737	Impinger 3 Gain (ml)	= 0
Md Mole. Wt. Dry	= 29.94	Impinger 4 Gain (ml)	= 0
Ms Mole. Wt. Gas	= 27.7632		
Vm acf	= 97.793	STD Temp. (F)	= 68
DP (in. H2O)	= .4827963	STD Pressure (in. Hg)	= 29.92
Sqr. (DP) Avg.	= .6948354	Barometric Pres. (in.Hg)	= 30.05
DH Avg. (in. W.C.)	= .9974999	Meter Cal. (Y)	= 0.973
Tm (F)	= 65.70834	Meter (delta Ha)	= 1.962
Pm (in. Hg)	= 30.12335	Static Pres. (in. H2O)	= -.40
Vmstd dscf	= 96.27732	Pitot Coeff.	= .84
Ts Stack Temp. (F)	= 297.5833		
Press. Stack (in. Hg)	= 30.02059		
Vimpstd dscf	= 20.05182		
Vsgstd dscf	= 1.4142	Vacuum @ Leak Check	= 11.0
Total Test Time (min)	= 180	Leak Rate (ft3/min)	= .011
Nozzle Dia. (in)	= .25	Area of Nozzle (ft3)	= 3.408846E-04
% EA	= 98.87006	Filter Gain (gram)	=
% Isokinetics	= 96.11742		
		Silica Gel (gram)	= 30
vs (Velocity) ft/sec	= 47.5612		
Qs dscfm	= 37618.1		
Qa acfm	= 65759.55		

Data & Results of Method 5 Calculations

Run 3

ETS Test of:
FOSTER WHEELER
Location: UNIT B: DIOXINS/FURANS
Date: 10/19/89 - 10/20/89
Condition: COMPLIANCE
Operator: CRAFT

Diameter of Stack (in) = 65
Eq. Dia. Upstream (ft) = N.A.
Eq. Dia. Downstream (ft) = N.A.
Area of Stack (ft^2) = 23.04384

% O2	= 10.25	No. of Ports	= 2
% CO2	= 10	Points per Port	= 6
% CO	= 0	Time/Point (min)	= 15
N2	= 79.75	Impinger 1 Gain (ml)	= 387
% H2O	= 16.82396	Impinger 2 Gain (ml)	= 17
Fo	= 1.065	Impinger 3 Gain (ml)	= 0
Md Mole. Wt. Dry	= 30.01	Impinger 4 Gain (ml)	= 0
Ms Mole. Wt. Gas	= 27.98944		
Vm acf	= 104.74	STD Temp. (F)	= 68
DP (in. H2O)	= .5526748	STD Pressure (in. Hg)	= 29.92
Sqr. (DP) Avg.	= .743421	Barometric Pres.(in.Hg)	= 30.05
DH Avg. (in. W.C.)	= 1.167083	Meter Cal. (Y)	= 0.973
Tm (F)	= 72	Meter (delta Ha)	= 1.962
Pm (in. Hg)	= 30.13581	Static Pres. (in. H2O)	= -.40
Vstd dscf	= 101.9386	Pitot Coeff.	= .84
Ts Stack Temp. (F)	= 291.5833		
Press. Stack (in. Hg)	= 30.02059		
Vimpstd dscf	= 19.01628		
Vsgstd dscf	= 1.60276	Vacuum @ Leak Check	= 11.0
Total Test Time (min)	= 180	Leak Rate (ft3/min)	= .016
Nozzle Dia. (in)	= .25	Area of Nozzle (ft3)	= 3.408846E-04
% EA	= 94.87227	Filter Gain (gram)	=
% Isokinetics	= 93.51647		
		Silica Gel (gram)	= 34
vs (Velocity) ft/sec	= 50.4796		
Qs dscfm	= 40937.88		
Qa acfm	= 69794.63		

APPENDIX B

MULTI-METALS DATA AND RESULTS

SUMMARY OF METAL EMISSIONS

RUN NUMBER = UB R2
SAMPLE VOLUME = 75.888 dscf
TOTAL GAS FLOWRATE = 45999 dscfm
CARBON DIOXIDE % = 8.25
OXYGEN % = 9.75

COMPONENT		LABORATORY DATA SAMPLE CATCH - micrograms FRONT HALF: SAMPLE	FRONT HALF: BLANK	BACK HALF: SAMPLE	BACK HALF: BLANK	TOTAL	GAS EMISSIONS CONCENTRATION ACTUAL gr/DSCF	CONCENTRATION @ 12% CO2 gr/DSCF	MASS RATE LB/HR	MASS RATE LB/MMBtu
Antimony	Sb	5.56	0	0.63	0	6.19	1.26E-06	1.83E-06	4.97E-04	3.23E-06
Arsenic	As	1.34	0	0.67	0	2.01	4.10E-07	5.96E-07	1.62E-04	1.05E-06
Beryllium	Be	0.14	0.091	0.00	0	0.05	1.06E-08	1.54E-08	4.17E-06	2.72E-08
Cadmium	Cd	8.80	0	2.40	0	11.20	2.28E-06	3.32E-06	8.99E-04	5.85E-06
Chromium	Cr	96.60	1.5	44.50	0	139.60	2.84E-05	4.13E-05	1.12E-02	7.29E-05
Cobalt	Co	4.40	0	0.00	0	4.40	8.96E-07	1.30E-06	3.53E-04	2.30E-06
Copper	Cu	33.90	1.6	38.80	1.4	69.70	1.42E-05	2.06E-05	5.60E-03	3.64E-05
Lead	Pb	118.00	0	7.81	0	125.81	2.56E-05	3.73E-05	1.01E-02	6.57E-05
Mercury	Hg	82.50	0	594.80	0.459	676.84	1.38E-04	2.00E-04	5.43E-02	3.54E-04
Nickel	Ni	126.00	0	4.09	0	130.09	2.65E-05	3.85E-05	1.04E-02	6.80E-05
Selenium	Se	0.00	0	0.00	0	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Zinc	Zn	12950.00	31.9	13.46	0	12931.6	2.63E-03	3.83E-03	1.04E+00	6.76E-03

Front Half - Probe Wash and Filter
Back Half - Impinger Catches
Blank - Field Blank
Fuel Factor of 9584 dscf/MMBtu used in Mass Rate Calculations

@ 0% O2

DETECTION LIMITS

COMPONENT		LABORATORY DETECTION LIMITS FRONT HALF	BACK HALF	TOTAL	EQUIVALENT GASEOUS DETECTION LIMITS CONCENTRATION ACTUAL gr/DSCF	CONCENTRATION @ 12% CO2 gr/DSCF	MASS RATE LB/HR	MASS RATE LB/MMBtu
Antimony	Sb	0.24	0.24	0.48	9.77E-08	1.42E-07	3.85E-05	2.51E-07
Arsenic	As	0.18	0.18	0.36	7.33E-08	1.07E-07	2.89E-05	1.88E-07
Beryllium	Be	0.03	0.03	0.06	1.22E-08	1.78E-08	4.82E-06	3.13E-08
Cadmium	Cd	0.30	0.30	0.60	1.22E-07	1.78E-07	4.82E-05	3.13E-07
Chromium	Cr	0.50	0.50	1.00	2.04E-07	2.96E-07	8.03E-05	5.22E-07
Cobalt	Co	0.90	0.90	1.80	3.66E-07	5.33E-07	1.44E-04	9.40E-07
Copper	Cu	0.60	0.60	1.20	2.44E-07	3.55E-07	9.63E-05	6.27E-07
Lead	Pb	1.80	1.80	3.60	7.33E-07	1.07E-06	2.89E-04	1.88E-06
Mercury	Hg	0.0002	0.0004	0.0006	1.22E-10	1.78E-10	4.82E-08	3.13E-10
Nickel	Ni	1.20	1.20	2.40	4.89E-07	7.11E-07	1.93E-04	1.25E-06
Selenium	Se	0.15	0.15	0.30	6.11E-08	8.88E-08	2.41E-05	1.57E-07
Zinc	Zn	8.10	8.10	16.20	3.30E-06	4.80E-06	1.30E-03	8.46E-06

SUMMARY OF METAL EMISSIONS

RUN NUMBER = UB R3
SAMPLE VOLUME = 75.691 dscf
TOTAL GAS FLOWRATE = 44926 dscfm
CARBON DIOXIDE % = 11.0
OXYGEN % = 10.0

		LABORATORY DATA SAMPLE CATCH - micrograms					GAS EMISSIONS CONCENTRATION		MASS	MASS
		FRONT HALF:		BACK HALF:			ACTUAL	@ 12% CO2	RATE	RATE
COMPONENT		SAMPLE	BLANK	SAMPLE	BLANK	TOTAL	gr/DSCF	gr/DSCF	LB/HR	LB/MMBtu
Antimony	Sb	7.04	0	0.78	0	7.82	1.59E-06	1.74E-06	6.14E-04	4.18E-06
Arsenic	As	0.80	0	0.21	0	1.01	2.06E-07	2.25E-07	7.95E-05	5.43E-07
Beryllium	Be	0.11	0.006	0.00	0	0.10	2.12E-08	2.31E-08	8.17E-06	5.57E-08
Cadmium	Cd	3.80	0	0.00	0	3.80	7.75E-07	8.45E-07	2.98E-04	2.03E-06
Chromium	Cr	4.10	0.2	5.52	0	9.42	1.92E-06	2.10E-06	7.40E-04	5.04E-06
Cobalt	Co	0.00	0	0.00	0	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Copper	Cu	7.30	0.36	3.06	0.15	9.85	2.01E-06	2.19E-06	7.73E-04	5.27E-06
Lead	Pb	56.10	0	6.82	0	62.92	1.28E-05	1.40E-05	4.94E-03	3.37E-05
Mercury	Hg	11.60	0	1041.20	0.459	1052.34	2.15E-04	2.34E-04	8.26E-02	5.63E-04
Nickel	Ni	9.80	0	1.65	0	11.45	2.33E-06	2.55E-06	8.99E-04	6.13E-06
Selenium	Se	0.00	0	0.00	0	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Zinc	Zn	362.00	18.1	13.87	0	357.8	7.29E-05	7.96E-05	2.81E-02	1.91E-04

Front Half - Probe Wash and Filter
Back Half - Impinger Catches
Blank - Field Blank
Fuel Factor of 9584 dscf/MMBtu used in Mass Rate Calculations

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DETECTION LIMITS

		LABORATORY DETECTION LIMITS			EQUIVALENT GASEOUS DETECTION LIMITS CONCENTRATION		MASS	MASS
		FRONT	BACK		ACTUAL	@ 12% CO2	RATE	RATE
COMPONENT		HALF	HALF	TOTAL	gr/DSCF	gr/DSCF	LB/HR	LB/MMBtu
Antimony	Sb	0.24	0.24	0.48	9.79E-08	1.07E-07	3.77E-05	2.57E-07
Arsenic	As	0.18	0.18	0.36	7.34E-08	8.01E-08	2.83E-05	1.93E-07
Beryllium	Be	0.03	0.03	0.06	1.22E-08	1.33E-08	4.71E-06	3.21E-08
Cadmium	Cd	0.30	0.30	0.60	1.22E-07	1.33E-07	4.71E-05	3.21E-07
Chromium	Cr	0.50	0.50	1.00	2.04E-07	2.22E-07	7.85E-05	5.35E-07
Cobalt	Co	0.90	0.90	1.80	3.67E-07	4.00E-07	1.41E-04	9.63E-07
Copper	Cu	0.60	0.60	1.20	2.45E-07	2.67E-07	9.42E-05	6.42E-07
Lead	Pb	1.80	1.80	3.60	7.34E-07	8.01E-07	2.83E-04	1.93E-06
Mercury	Hg	0.0002	0.0004	0.0006	1.22E-10	1.33E-10	4.71E-08	3.21E-10
Nickel	Ni	1.20	1.20	2.40	4.89E-07	5.34E-07	1.88E-04	1.28E-06
Selenium	Se	0.15	0.15	0.30	6.12E-08	6.67E-08	2.36E-05	1.61E-07
Zinc	Zn	8.10	8.10	16.20	3.30E-06	3.60E-06	1.27E-03	8.67E-06

SUMMARY OF METAL EMISSIONS

RUN NUMBER = UB R4
SAMPLE VOLUME = 76.624 dscf
TOTAL GAS FLOWRATE = 45664 dscfm
CARBON DIOXIDE % = 8.0
OXYGEN % = 13.0

COMPONENT		LABORATORY DATA SAMPLE CATCH - micrograms FRONT HALF: SAMPLE	FRONT HALF: BLANK	BACK HALF: SAMPLE	BACK HALF: BLANK	TOTAL	GAS EMISSIONS CONCENTRATION ACTUAL gr/DSCF	CONCENTRATION @ 12% CO2 gr/DSCF	MASS RATE LB/HR	MASS RATE LB/MMBtu
Antimony	Sb	15.20	0	0.49	0	15.69	3.16E-06	4.74E-06	1.24E-03	1.14E-05
Arsenic	As	0.79	0	0.00	0	0.79	1.59E-07	2.39E-07	6.23E-05	5.76E-07
Beryllium	Be	0.09	0.004	0.00	0	0.09	1.75E-08	2.63E-08	6.86E-06	6.35E-08
Cadmium	Cd	5.70	0	2.03	0	7.73	1.56E-06	2.34E-06	6.09E-04	5.64E-06
Chromium	Cr	12.30	0.62	10.60	0	22.28	4.49E-06	6.73E-06	1.76E-03	1.63E-05
Cobalt	Co	0.00	0	16.30	0	16.30	3.28E-06	4.92E-06	1.29E-03	1.19E-05
Copper	Cu	15.90	0.8	3.70	0.18	18.62	3.75E-06	5.63E-06	1.47E-03	1.36E-05
Lead	Pb	79.40	0	8.11	0	87.51	1.76E-05	2.64E-05	6.90E-03	6.38E-05
Mercury	Hg	38.40	0	540.80	0.459	578.74	1.17E-04	1.75E-04	4.56E-02	4.22E-04
Nickel	Ni	22.20	0	2.74	0	24.94	5.02E-06	7.53E-06	1.97E-03	1.82E-05
Selenium	Se	0.00	0	0.00	0	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Zinc	Zn	402.00	20.1	19.91	0	401.8	8.09E-05	1.21E-04	3.17E-02	2.93E-04

Front Half - Probe Wash and Filter
Back Half - Impinger Catches
Blank - Field Blank
Fuel Factor of 9584 dscf/MMBtu used in Mass Rate Calculations

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DETECTION LIMITS

COMPONENT		LABORATORY DETECTION LIMITS FRONT HALF	BACK HALF	TOTAL	EQUIVALENT GASEOUS DETECTION LIMITS CONCENTRATION ACTUAL gr/DSCF	CONCENTRATION @ 12% CO2 gr/DSCF	MASS RATE LB/HR	MASS RATE LB/MMBtu
Antimony	Sb	0.24	0.24	0.48	9.67E-08	1.45E-07	3.78E-05	3.50E-07
Arsenic	As	0.18	0.18	0.36	7.25E-08	1.09E-07	2.84E-05	2.63E-07
Beryllium	Be	0.03	0.03	0.06	1.21E-08	1.81E-08	4.73E-06	4.38E-08
Cadmium	Cd	0.30	0.30	0.60	1.21E-07	1.81E-07	4.73E-05	4.38E-07
Chromium	Cr	0.50	0.50	1.00	2.01E-07	3.02E-07	7.88E-05	7.30E-07
Cobalt	Co	0.90	0.90	1.80	3.63E-07	5.44E-07	1.42E-04	1.31E-06
Copper	Cu	0.60	0.60	1.20	2.42E-07	3.63E-07	9.46E-05	8.75E-07
Lead	Pb	1.80	1.80	3.60	7.25E-07	1.09E-06	2.84E-04	2.63E-06
Mercury	Hg	0.0002	0.0002	0.0004	8.06E-11	1.21E-10	3.15E-08	2.92E-10
Nickel	Ni	1.20	1.20	2.40	4.83E-07	7.25E-07	1.89E-04	1.75E-06
Selenium	Se	0.15	0.15	0.30	6.04E-08	9.06E-08	2.37E-05	2.19E-07
Zinc	Zn	8.10	8.10	16.20	3.26E-06	4.89E-06	1.28E-03	1.18E-05

SUMMARY OF METAL EMISSIONS

RUN NUMBER = UA R5
SAMPLE VOLUME = 75.835 dscf
TOTAL GAS FLOWRATE = 44891 dscfm
CARBON DIOXIDE % = 10.0
OXYGEN % = 10.2

		LABORATORY DATA SAMPLE CATCH - micrograms					GAS EMISSIONS			
		FRONT HALF:		BACK HALF:			CONCENTRATION		MASS	MASS
COMPONENT		SAMPLE	BLANK	SAMPLE	BLANK	TOTAL	ACTUAL gr/DSCF	@ 12% CO2 gr/DSCF	RATE LB/HR	RATE LB/MMBtu
Antimony	Sb	13.40	0	0.00	0	13.40	2.73E-06	3.27E-06	1.05E-03	7.29E-06
Arsenic	As	2.00	0	0.00	0	2.00	4.07E-07	4.88E-07	1.57E-04	1.09E-06
Beryllium	Be	0.16	0.0987	0.00	0	0.06	1.21E-08	1.45E-08	4.64E-06	3.23E-08
Cadmium	Cd	7.70	0	0.00	0	7.70	1.57E-06	1.88E-06	6.03E-04	4.19E-06
Chromium	Cr	24.40	1.2	7.01	0.35	29.86	6.08E-06	7.29E-06	2.34E-03	1.63E-05
Cobalt	Co	0.90	0	0.00	0	0.90	1.83E-07	2.20E-07	7.05E-05	4.90E-07
Copper	Cu	34.20	1.7	1.26	0	33.76	6.87E-06	8.24E-06	2.64E-03	1.84E-05
Lead	Pb	140.00	3.5	3.79	0.19	140.10	2.85E-05	3.42E-05	1.10E-02	7.62E-05
Mercury	Hg	21.10	0	946.28	0.747	966.63	1.97E-04	2.36E-04	7.57E-02	5.26E-04
Nickel	Ni	40.40	0	2.30	0	42.70	8.69E-06	1.04E-05	3.34E-03	2.32E-05
Selenium	Se	0.00	0	0.00	0	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Zinc	Zn	1445.00	20.4	0.00	0	1424.6	2.90E-04	3.48E-04	1.12E-01	7.75E-04

Front Half - Probe Wash and Filter
Back Half - Impinger Catches
Blank - Field Blank
Fuel Factor of 9584 dscf/MMBtu used in Mass Rate Calculations

DETECTION LIMITS

		LABORATORY DETECTION LIMITS			EQUIVALENT GASEOUS DETECTION LIMITS			
					CONCENTRATION		MASS	MASS
COMPONENT		FRONT HALF	BACK HALF	TOTAL	ACTUAL gr/DSCF	@ 12% CO2 gr/DSCF	RATE LB/HR	RATE LB/MMBtu
Antimony	Sb	0.24	0.24	0.48	9.77E-08	1.17E-07	3.76E-05	2.61E-07
Arsenic	As	0.18	0.18	0.36	7.33E-08	8.79E-08	2.82E-05	1.96E-07
Beryllium	Be	0.03	0.03	0.06	1.22E-08	1.47E-08	4.70E-06	3.27E-08
Cadmium	Cd	0.30	0.30	0.60	1.22E-07	1.47E-07	4.70E-05	3.27E-07
Chromium	Cr	0.50	0.50	1.00	2.03E-07	2.44E-07	7.83E-05	5.44E-07
Cobalt	Co	0.90	0.90	1.80	3.66E-07	4.40E-07	1.41E-04	9.80E-07
Copper	Cu	0.60	0.60	1.20	2.44E-07	2.93E-07	9.40E-05	6.53E-07
Lead	Pb	1.80	1.80	3.60	7.33E-07	8.79E-07	2.82E-04	1.96E-06
Mercury	Hg	0.0002	0.0004	0.0006	1.22E-10	1.47E-10	4.70E-08	3.27E-10
Nickel	Ni	1.20	1.20	2.40	4.88E-07	5.86E-07	1.88E-04	1.31E-06
Selenium	Se	0.15	0.15	0.30	6.10E-08	7.33E-08	2.35E-05	1.63E-07
Zinc	Zn	8.10	8.10	16.20	3.30E-06	3.96E-06	1.27E-03	8.82E-06

SUMMARY OF METAL EMISSIONS

RUN NUMBER = UA R6
SAMPLE VOLUME = 63.094 dscf
TOTAL GAS FLOWRATE = 37476 dscfm
CARBON DIOXIDE % = 13.0
OXYGEN % = 8.0

		LABORATORY DATA SAMPLE CATCH - micrograms					GAS EMISSIONS CONCENTRATION		MASS	MASS
		FRONT HALF:		BACK HALF:			ACTUAL	@ 12% CO2	RATE	RATE
COMPONENT		SAMPLE	BLANK	SAMPLE	BLANK	TOTAL	gr/DSCF	gr/DSCF	LB/HR	LB/MMBtu
Antimony	Sb	27.90	0	0.00	0	27.90	6.82E-06	6.30E-06	2.19E-03	1.51E-05
Arsenic	As	2.46	0	0.00	0	2.46	6.02E-07	5.55E-07	1.93E-04	1.33E-06
Beryllium	Be	0.17	0.0987	0.00	0	0.07	1.65E-08	1.52E-08	5.29E-06	3.65E-08
Cadmium	Cd	11.10	0	0.00	0	11.10	2.71E-06	2.51E-06	8.72E-04	6.02E-06
Chromium	Cr	15.90	0.8	10.80	0.54	25.36	6.20E-06	5.73E-06	1.99E-03	1.38E-05
Cobalt	Co	14.30	0	1.05	0.05	15.30	3.74E-06	3.45E-06	1.20E-03	8.30E-06
Copper	Cu	36.30	1.8	2.46	0	36.96	9.04E-06	8.34E-06	2.90E-03	2.01E-05
Lead	Pb	188.00	3.5	3.05	0.15	187.40	4.58E-05	4.23E-05	1.47E-02	1.02E-04
Mercury	Hg	6.39	0	747.10	0.747	752.74	1.84E-04	1.70E-04	5.92E-02	4.08E-04
Nickel	Ni	20.30	0	0.00	0	20.30	4.97E-06	4.58E-06	1.60E-03	1.10E-05
Selenium	Se	0.00	0	0.00	0	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Zinc	Zn	2110.00	20.4	0.00	0	2089.6	5.11E-04	4.72E-04	1.64E-01	1.13E-03

Front Half - Probe Wash and Filter
Back Half - Impinger Catches
Blank - Field Blank
Fuel Factor of 9584 dscf/MMBtu used in Mass Rate Calculations

DETECTION LIMITS

		LABORATORY DETECTION LIMITS			EQUIVALENT GASEOUS DETECTION LIMITS CONCENTRATION		MASS	MASS
		FRONT	BACK		ACTUAL	@ 12% CO2	RATE	RATE
COMPONENT		HALF	HALF	TOTAL	gr/DSCF	gr/DSCF	LB/HR	LB/MMBtu
Antimony	Sb	0.24	0.24	0.48	1.17E-07	1.08E-07	3.77E-05	2.60E-07
Arsenic	As	0.18	0.18	0.36	8.81E-08	8.13E-08	2.83E-05	1.95E-07
Beryllium	Be	0.03	0.03	0.06	1.47E-08	1.35E-08	4.71E-06	3.26E-08
Cadmium	Cd	0.30	0.30	0.60	1.47E-07	1.35E-07	4.71E-05	3.26E-07
Chromium	Cr	0.50	0.50	1.00	2.45E-07	2.26E-07	7.86E-05	5.43E-07
Cobalt	Co	0.90	0.90	1.80	4.40E-07	4.06E-07	1.41E-04	9.77E-07
Copper	Cu	0.60	0.60	1.20	2.94E-07	2.71E-07	9.43E-05	6.51E-07
Lead	Pb	1.80	1.80	3.60	8.81E-07	8.13E-07	2.83E-04	1.95E-06
Mercury	Hg	0.0002	0.0004	0.0006	1.47E-10	1.35E-10	4.71E-08	3.26E-10
Nickel	Ni	1.20	1.20	2.40	5.87E-07	5.42E-07	1.89E-04	1.30E-06
Selenium	Se	0.15	0.15	0.30	7.34E-08	6.77E-08	2.36E-05	1.63E-07
Zinc	Zn	8.10	8.10	16.20	3.96E-06	3.66E-06	1.27E-03	8.79E-06

SUMMARY OF METAL EMISSIONS

RUN NUMBER = UA R7
SAMPLE VOLUME = 65.578 dscf
TOTAL GAS FLOWRATE = 39314 dscfm
CARBON DIOXIDE % = 9.0
OXYGEN % = 11.5

		LABORATORY DATA SAMPLE CATCH - micrograms					GAS EMISSIONS			
		FRONT HALF:		BACK HALF:			CONCENTRATION		MASS	MASS
COMPONENT		SAMPLE	BLANK	SAMPLE	BLANK	TOTAL	ACTUAL gr/DSCF	@ 12% CO2 gr/DSCF	RATE LB/HR	RATE LB/MMBtu
Antimony	Sb	14.60	0	0.00	0	14.60	3.44E-06	4.58E-06	1.16E-03	1.05E-05
Arsenic	As	1.83	0	0.00	0	1.83	4.31E-07	5.74E-07	1.45E-04	1.31E-06
Beryllium	Be	0.13	0.0987	0.00	0	0.03	6.66E-09	8.88E-09	2.24E-06	2.03E-08
Cadmium	Cd	7.70	0	0.00	0	7.70	1.81E-06	2.42E-06	6.11E-04	5.52E-06
Chromium	Cr	19.50	0.98	4.37	0.2	22.69	5.34E-06	7.12E-06	1.80E-03	1.63E-05
Cobalt	Co	0.00	0	1.50	0.08	1.42	3.34E-07	4.46E-07	1.13E-04	1.02E-06
Copper	Cu	21.10	1.7	3.80	0	23.20	5.46E-06	7.28E-06	1.84E-03	1.66E-05
Lead	Pb	141.00	3.5	2.42	0.12	139.80	3.29E-05	4.39E-05	1.11E-02	1.00E-04
Mercury	Hg	1.03	0	416.50	0.747	416.78	9.81E-05	1.31E-04	3.31E-02	2.99E-04
Nickel	Ni	12.00	0	0.00	0	12.00	2.82E-06	3.77E-06	9.52E-04	8.60E-06
Selenium	Se	0.00	0	0.00	0	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Zinc	Zn	524.00	20.4	13.90	0.7	516.8	1.22E-04	1.62E-04	4.10E-02	3.70E-04

Front Half - Probe Wash and Filter
Back Half - Impinger Catches
Blank - Field Blank
Fuel Factor of 9584 dscf/MMBtu used in Mass Rate Calculations

DETECTION LIMITS

		LABORATORY DETECTION LIMITS			EQUIVALENT GASEOUS DETECTION LIMITS			
					CONCENTRATION		MASS	MASS
COMPONENT		FRONT HALF	BACK HALF	TOTAL	ACTUAL gr/DSCF	@ 12% CO2 gr/DSCF	RATE LB/HR	RATE LB/MMBtu
Antimony	Sb	0.24	0.24	0.48	1.13E-07	1.51E-07	3.81E-05	3.44E-07
Arsenic	As	0.18	0.18	0.36	8.47E-08	1.13E-07	2.86E-05	2.58E-07
Beryllium	Be	0.03	0.03	0.06	1.41E-08	1.88E-08	4.76E-06	4.30E-08
Cadmium	Cd	0.30	0.30	0.60	1.41E-07	1.88E-07	4.76E-05	4.30E-07
Chromium	Cr	0.50	0.50	1.00	2.35E-07	3.14E-07	7.93E-05	7.16E-07
Cobalt	Co	0.90	0.90	1.80	4.24E-07	5.65E-07	1.43E-04	1.29E-06
Copper	Cu	0.60	0.60	1.20	2.82E-07	3.77E-07	9.52E-05	8.60E-07
Lead	Pb	1.80	1.80	3.60	8.47E-07	1.13E-06	2.86E-04	2.58E-06
Mercury	Hg	0.0002	0.0004	0.0006	1.41E-10	1.88E-10	4.76E-08	4.30E-10
Nickel	Ni	1.20	1.20	2.40	5.65E-07	7.53E-07	1.90E-04	1.72E-06
Selenium	Se	0.15	0.15	0.30	7.06E-08	9.41E-08	2.38E-05	2.15E-07
Zinc	Zn	8.10	8.10	16.20	3.81E-06	5.08E-06	1.28E-03	1.16E-05