CleanAir Engineering
500 W. Wood Street
Palatine, IL 60067-4975
800-627-0033
www.cleanair.com

Wheelabrator South Broward, Inc.
4400 South State Road 7
Ft. Lauderdale, FL 33314

REPORT ON COMPLIANCE TESTING

Performed for:

WHEELABRATOR SOUTH BROWARD, INC.
UNITS 1, 2 AND 3 SDA INLETS, FF OUTLETS, ASH HANDLING SYSTEM AND LIME SILO VENT
FT. LAUDERDALE, FL
VOLUME I OF II

CleanAir Project No: 10955-4
Revision 0: May 5, 2010

To the best of our knowledge, the data presented in this report are accurate, complete, error free, legible and representative of the actual emissions during the test program.

Submitted by,

Scott Brown
Project Manager
sbrown@cleanair.com
(800) 627-0033 ext. 4544

Reviewed by,

Mark Roach, P.E.
Engineering Group Technical Leader
mroach@cleanair.com
(800) 627-0033 ext. 4599

Wheelabrator South Broward Inc.
A Waste Management Company
4400 South State Road 7
Ft. Lauderdale, FL 33314
(954) 581-6606
(954) 581-6705 Fax

May 6, 2010 UPS#70072680000087713974

Mr. Lennon Anderson
Air Program Administrator
Florida Department of Environmental Protection
Southeast District
400 North Congress Ave., Suite 200
West Palm Beach, FL 33401

RECEIVED
MAY 07 2010
BUREAU OF
AIR REGULATION

Re: Wheelabrator South Broward
2010 Annual Compliance Stack Test and RATA Reports

Dear Mr. Anderson:

Please find enclosed a copy of the final compliance stack test report and the continuous emissions monitoring system certification RATA report for testing conducted on March 22-24 of this year by Clean Air Engineering, Inc.

I, the undersigned, am a responsible official, as defined in Rule 62-210.200, F.A.C., of the Title V source addressed in this submittal. I hereby certify, based on information and belief formed after reasonable inquiry, that the statements and information in this document are true, accurate and complete.

If there are any questions, please contact this office at (954) 581-6606.

Sincerely,

Ganeesh Siewrattan
Operations Manager

cc: USEPA, Region IV, Pesticides and Toxics Management Division, Air & EPCRA Enforcement Branch, Air Enforcement Section (with) UPS#70072680000087713981
FDEP, Tallahassee, Bureau of Air Regulation, New Source Review Section, (with) UPS#70072680000087713998
Broward County Department of Planning and Environmental Protection, Air Quality Division (with) UPS#70072680000087714001
Chuck Faller (with)
Ram Tewari – BCWRS (without)
Tim Porter (without)
Rob French – MPI (with) UPS#70072680000087714018

WASTE MANAGEMENT

REVISION HISTORY

REPORT ON COMPLIANCE TESTING

DRAFT REPORT REVISION HISTORY

Revision:	Date	Pages	Comments
D0a	04/23/10	All	Draft version of original document.

FINAL REPORT REVISION HISTORY

Revision:	Date	Pages	Comments
0	05/05/10	All	Final version of original document.

CONTENTS

CONTENTS

PROJECT OVERVIEW

INTRODUCTION

Wheelabrator South Broward, Inc. operates a Refuse-to-Energy facility, located in Ft. Lauderdale, Florida. The facility's emission levels are regulated by the Florida Department of Environmental Protection (FDEP). Clean Air Engineering (CleanAir) was contracted to perform a compliance test program at its municipal waste combustor (MWC) facility, located in Ft. Lauderdale, Florida.

The visual emissions were determined by the facility's continuous opacity monitor system (COMS) data, as allowed under Title V Conditions B.53(6), B.76 and B.81. The lime silo fabric filter vent was observed for visual emissions (VEs) and the ash handling system was observed for fugitive emissions. Testing was conducted in accordance with the Wheelabrator North and South Broward Protocol on Compliance, dated February 8, 2010, 40 CFR 60 Subpart Cb, and applicable sections of the facility's Title V Permit No. 0112119-009-AV.

All testing was conducted in accordance with the regulations set-forth by the United States Environmental Protection Agency (EPA) and the FDEP.

Key Project Participants

Individuals responsible for coordinating and conducting the test program were:

C. Faller – Wheelabrator South Broward, Inc.
S. Brown – CleanAir

Lee Hoefert of the FDEP was present for portions of the test program.

The CleanAir test crew consisted of the following individuals:

B. Wiltse
R. Vicere
P. Bihun
N. Hitchins
A. Obuchowski
B. Arnold
D. Luckhard
A. Karony

Test Program Parameters

The sampling conducted at the Units 1, 2 and 3 Spray Dry Absorption (SDA) Inlet, Fabric Filter (FF) Outlets, Ash Handling System and Lime Silo Vent from March 22 through 24, 2010, included the following emissions measurements:

- beryllium (Be);
- cadmium (Cd);
- lead (Pb);
- mercury (Hg);
- polychlorinated dibenzo-p-dioxins and polychlorinated dibenzofurans (PCDD/PCDF), Unit 2 only;
- total filterable particulate (TFP);
- hydrogen chloride (HCl);
- total fluoride;
- fugitive emissions (FE);
- visual emissions (VE).

TEST PROGRAM SYNOPSIS

Test Schedule

The on-site schedule followed during the test program is outlined in Table 1-1.

Table 1-1:
Schedule of Activities

Run Number	Location	Method	Analyte	Date	Start Time	End Time
1	Unit 1 FF Outlet/SDA Inlet	USEPA Method 26A	HCl	03/22/10	08:31	09:31
1	Unit 3 FF Outlet	USEPA Method 5/29	Particulate/Metals	03/22/10	08:47	11:05
1	Unit 3 SDA Inlet	USEPA Method 29	Mercury	03/22/10	08:47	11:05
2	Unit 1 FF Outlet/SDA Inlet	USEPA Method 26A	HCl	03/22/10	09:58	10:58
1	Unit 2 FF Outlet	USEPA Method 23	PCDD/F	03/22/10	10:04	14:44
3	Unit 1 FF Outlet/SDA Inlet	USEPA Method 26A	HCl	03/22/10	11:30	12:47
2	Unit 3 FF Outlet	USEPA Method 5/29	Particulate/Metals	03/22/10	11:43	13:57
2	Unit 3 SDA Inlet	USEPA Method 29	Mercury	03/22/10	11:43	13:57
1	Unit 1 FF Outlet	USEPA Method 13B	Total Fluorides	03/22/10	13:19	14:34
3	Unit 3 FF Outlet	USEPA Method 5/29	Particulate/Metals	03/22/10	14:24	16:39
3	Unit 3 SDA Inlet	USEPA Method 29	Mercury	03/22/10	14:27	16:39
2	Unit 1 FF Outlet	USEPA Method 13B	Total Fluorides	03/22/10	15:07	16:21
3	Unit 1 FF Outlet	USEPA Method 13B	Total Fluorides	03/22/10	16:30	17:41
2	Unit 2 FF Outlet	USEPA Method 23	PCDD/F	03/23/10	07:36	12:10
1	Unit 1 FF Outlet	USEPA Method 5/29	Particulate/Metals	03/23/10	07:43	09:58
1	Unit 1 SDA Inlet	USEPA Method 29	Mercury	03/23/10	07:43	09:58
1	Unit 2 FF Outlet/SDA Inlet	USEPA Method 26A	HCl	03/23/10	07:55	08:55
2	Unit 2 FF Outlet/SDA Inlet	USEPA Method 26A	HCl	03/23/10	09:30	10:31
2	Unit 1 FF Outlet	USEPA Method 5/29	Particulate/Metals	03/23/10	10:31	12:45
2	Unit 1 SDA Inlet	USEPA Method 29	Mercury	03/23/10	10:31	12:45
3	Unit 2 FF Outlet/SDA Inlet	USEPA Method 26A	HCl	03/23/10	10:55	12:06
3	Unit 2 FF Outlet	USEPA Method 23	PCDD/F	03/23/10	12:32	17:02
1	Unit 3 FF Outlet	USEPA Method 13B	Total Fluorides	03/23/10	12:41	13:54
3	Unit 1 FF Outlet	USEPA Method 5/29	Particulate/Metals	03/23/10	13:32	15:46
3	Unit 1 SDA Inlet	USEPA Method 29	Mercury	03/23/10	13:32	15:46
2	Unit 3 FF Outlet	USEPA Method 13B	Total Fluorides	03/23/10	14:31	15:39
3	Unit 3 FF Outlet	USEPA Method 13B	Total Fluorides	03/23/10	15:54	17:02
1	Unit 3 FF Outlet/SDA Inlet	USEPA Method 26A	HCl	03/24/10	07:45	08:45
1	Ash Handling System	USEPA Method 22	Fugitive Emissions		07:52	14:05
1	Unit 2 FF Outlet	USEPA Method 13B	Total Fluorides	03/24/10	07:53	09:11
1	Unit 2 FF Outlet	USEPA Method 5/29	Particulate/Metals	03/24/10	07:53	10:06
1	Unit 2 SDA Inlet	USEPA Method 29	Mercury	03/24/10	07:53	10:06
2	Unit 3 FF Outlet/SDA Inlet	USEPA Method 26A	HCl	03/24/10	09:16	10:16
2	Unit 2 FF Outlet	USEPA Method 13B	Total Fluorides	03/24/10	09:37	10:54
1	Lime Silo	USEPA Method 9	Opacity	03/24/10	10:32	11:51
3	Unit 3 FF Outlet/SDA Inlet	USEPA Method 26A	HCl	03/24/10	10:54	11:54
2	Unit 2 FF Outlet	USEPA Method 5/29	Particulate/Metals	03/24/10	11:03	13:35
2	Unit 2 SDA Inlet	USEPA Method 29	Mercury	03/24/10	11:03	13:35
3	Unit 2 FF Outlet	USEPA Method 13B	Total Fluorides	03/24/10	11:24	12:46
3	Unit 2 FF Outlet	USEPA Method 5/29	Particulate/Metals	03/24/10	14:12	16:22
3	Unit 2 SDA Inlet	USEPA Method 29	Mercury	03/24/10	14:12	16:22

TEST PROGRAM SYNOPSIS (CONTINUED)

Results Summary

Table 1-2 summarizes the results of the test program. A more detailed presentation of the test conditions and results of analysis are shown in Tables 2-1 through 2-23 on pages 2-1 through 2-21. Subpart Cb required operating data is summarized in Table 1-3 and opacity and fugitive emission results are presented in Table 1-4, both on page 1-5.

Table 1-2:
Summary of Test Results

Source	Average Unit 1	Average Unit 2	Average Unit 3	Permit Limit[1]
Constituent				
Particulate (mg/dscm @7% O_2)	1.0	1.4	2.1	25
Visual Emissions (%, by COMS)[2]	1	0	0	10
Fluoride (lb/MMBtu as HF)[3]	<0.000039	<0.000039	<0.000043	0.0040
Total PCCD/PCDF (ng/dscm @ 7% O_2)	NA	4.0	NA	30
Hydrogen Chloride (ppmdv @ 7% O_2) or	8.7	13	20	29
Hydrogen Chloride Removal (%)[4]	98%	97%	96%	>95
Beryllium (mg/dscm @ 7% O_2)	<0.00003	<0.00003	<0.00003	0.001
Cadmium (mg/dscm @ 7% O_2)	<0.00011	0.00048	0.00045	0.035
Lead (mg/dscm @ 7% O_2)	0.00030	0.0034	0.0036	0.40
Mercury (µg/dscm @ 7% O_2)	2.7	1.9	2.1	50
Mercury Removal (%)[4]	95%	96%	96%	>85
Carbon Feed Rate (lbs/hr)[5]	6	6	6	NA
Average Steam Flow (Klbs/hr)[6]	184.0	184.0	184.1	192
Average FF Inlet Temperature (^{O}F)[6]	315	317	315	NA

[1] Limits obtained from facilities Title V Permit 0112119-009-AV. If a second limit is shown that limit is being implemented by the EPA as of April 28, 2009.
[2] Visual Emissions (opacity) was obtained from the facilities COMS data as allowed under Title V Conditions B.53(6), B.76 and B.81.
[3] lb/MMBtu calculations used Fd of 9,570 for MSW as per Method 19.
[4] Removal for mercury and hydrogen chloride calculated in the unit of its standard (ppmdv @ 7% O_2). The hydrogen chloride limit is 29 ppmdv @ 7% O2 or 95% removal and the mercury limit is 70/50 µg/dscm @ 7% O2 or 85% removal, whichever is less stringent.
[5] From 40CFR60.58b (m)(1)(i) an average mass carbon rate during mercury or dioxin testing. The minimum carbon feed rate is established as the lower of the average carbon feed rates measured during the mercury or dioxin testing.
[6] From all compliance test runs.

TEST PROGRAM SYNOPSIS (CONTINUED)

Table 1-3:
Subpart Cb Required Operating Data

Process Condition	
Unit 1 Maximum Demonstrated Combustor Load (Klbs/hr)[1]	184.2 [2]
Unit 2 Maximum Demonstrated Combustor Load (Klbs/hr)[1]	183.9
Unit 3 Maximum Demonstrated Combustor Load (Klbs/hr)[1]	184.1 [3]
Unit 1 Maximum Particulate Control Device Inlet Temperature (°F)[4]	320 [2]
Unit 2 Maximum Particulate Control Device Inlet Temperature (°F)[4]	315
Unit 3 Maximum Particulate Control Device Inlet Temperature (°F)[4]	319 [3]
Unit 1 Carbon Feed Rate (lbs/hr)[5]	6
Unit 2 Carbon Feed Rate (lbs/hr)[5]	6
Unit 3 Carbon Feed rate (Klbs/hr)[5]	6

[1] From 40CFR60.58b (i) (8) the maximum demonstrated load during PCDD/PCDF testing, four hour average.
[2] From CleanAir Cb test report dated April 28, 2009.
[3] From CleanAir Cb test report dated April 24, 2008.
[4] From 40CFR60.58b (i) (9) the highest four hour average during PCDD/PCDF testing.
[5] From 40CFR60.58b (m)(1)(i) an average mass carbon rate during mercury or dioxin testing. The minimum carbon fee rate is established as the lower of the average carbon feed rates measured during the mercury or dioxin testing.

Table 1-4:
Opacity and Fugitive Emission Test Results

Source / Constituent	Sampling Method	Results	Permit Limit[1]
Ash Handling System[2]			
Fugitive Emissions (%)	EPA M22	0	5% of observation time
Fugitive Emissions (minutes)		0	9 minutes
Lime Silo[3]			
Visual Emisssions (%)	EPA M9	0	5%

[1] Limits obtained from 40 Code of Federal Register part 60 Subpart Cb - Emission Guidelines and Compliance Times for Large Municipal Waste Combustors That Are Constructed on or Before September 20, 1994 published in Federal Register as 62 FR 45123 on December 19, 1995 as modifed on August 25, 1997, Florida's Rule 62-296.416, F.A.C. and PSD-FL-105.
[2] The Ash Handling System was observed at various locations for a total of 3 hours.
[3] The Lime Silo was observed for one complete truck unloading.

TEST PROGRAM SYNOPSIS (CONTINUED)

Discussion of Test Program

All test methods were done in triplicate. All data that is reported in the units of lb/MMBTU utilized the Fd of 9,570 as per EPA Method 19.

All equipment utilized for compliance testing was manufactured by Clean Air Engineering, except for the Servomex O_2/CO_2 analyzer utilized for all of the integrated gas sample bag analysis.

During compliance testing, all three (3) boilers were operated within 10% of the 192,000 lb/hr maximum steam flow rating. The results tables present each boiler's steam output for every test run.

Raina Vicere performed the fugitive emission readings (per EPA Method 22) on the ash handling system and the VE readings (per EPA Method 9) on the Lime Silo during one (1) entire truck unloading. Ms. Vicere's VE evaluation certificate is presented in Appendix J.

Any fractions of the mercury analysis that were reported as not detected were summed as zero if there was at least one (1) fraction detected in that run. The beryllium, cadmium and lead front- and back-half fractions were combined proportionately for analysis, per EPA Method 29, Section 5.4.

Field blanks were collected for the Method 23 and 29 testing by assembling a used set of glassware, taking the complete train to the outlet location and performing a leak-check. These samples were treated exactly as the other samples. The results for the method field blanks are presented in Table 2-22 on page 2-20, as well as Appendix I. The results of the Method 29 reagent blank analysis were used to correct any data, as outlined in Method 29.

All Method 23 samples were analyzed with the DB-5S column with modified calibration and additional quality assurance procedures as a direct substitute for the DB-5 and DB-225 columns. Confirmation of the 2,3,7,8 TCDF and TCDD 2,3,7,8 isomers was performed on the DB-5S column. The DB-5S column and modified calibration procedures meets the column separation requirement and can be used as a direct substitute for the DB-5 and DB-225 columns, in accordance with Method 23 as approved by the EPA. All QA/QC data (spikes and recoveries) for Method 23, as well as the EPA Audit Sample results, are presented in Appendix I.

TEST PROGRAM SYNOPSIS (CONTINUED)

The Method 23 results for all three (3) runs contained at least one (1) estimated maximum possible concentration (EMPC) value. EMPC results do not meet all the identification criteria required by Method 23 to be positively identified as a dioxin or furan. Specifically, the integrated ion abundance ratios were not within 15% of the theoretical value limits specified in Method 23 Section 5.3.2.5, Table 4. The laboratory reports EMPC results as zero and, for this reason, all EMPC results are enclosed in brackets and are considered zero when calculating total dioxin/furans.

For analytical results that are below the detection limit, values are reported as ND, with the detection limit in parenthesis and are considered zero for calculating total catch weights per Method 23, Section 9.9.

Chuck Faller of Wheelabrator South Broward Inc. provided the process (operating) data. This data is presented in its entirety in Appendix C. All process data and CleanAir run times are based on facility CEM time.

Integrated gas samples (IGS) were collected in a vinyl sample bag from every sample train. The contents of the bag were then analyzed for O_2 and CO_2 concentrations using an O_2/CO_2 continuous monitoring analyzer calibrated with EPA Protocol gases. A linearity and bias check was performed on the analyzers before each set of bags was analyzed, and then a post bias check was performed after each set of bags was analyzed. All data was recorded using CleanAir's data acquisition system. The results of the IGS bag analyses are presented in Appendix H.

Metals and particulate matter sampling were combined during this test program, per the Method 29 Section 1.2 Principle, "This method may be used to determine particulate emissions in addition to the metals emissions if the prescribed procedures and precautions are followed".

Additionally, 120-minute mercury measurements were conducted, using EPA Method 29 at the SDA Inlets simultaneously with the Method 5/29. The carbon injection rate is set for the following year based on the results of these tests. The carbon rates established are presented in Table 1-3 on page 1-5.

Sixty-minute Method 26A sample trains at the SDA Inlets and FF Outlets were utilized to exhibit compliance with each unit's HCl limit(s). The Method 26A was modified to a single-point constant sampling rate at all test locations.

The FDEP supplied audit samples for PCDD/PCDF, metals and HCl to CleanAir. The analytical results of these samples are presented in Appendix I, along with each respective lab report.

End of Section 1 – Project Overview

WHEELABRATOR SOUTH BROWARD, INC.
FT. LAUDERDALE, FL

CleanAir Project No: 10955-4

RESULTS

Table 2-1: Unit 1 FF Outlet – Particulate and Metals

Run No.		1	2	3	Average
Date (2010)		Mar 23	Mar 23	Mar 23	
Start Time (approx.)		07:43	10:31	13:32	
Stop Time (approx.)		09:58	12:45	15:46	
Process Conditions					
R_P	Steam Production Rate (Klbs/hr)	183.5	183.9	183.3	**183.6**
P_1	Fabric Filter Inlet Temperature (°F)	315	315	315	**315**
P_2	Carbon Feed Rate (lb/hr)	6	6	6	**6**
Gas Conditions					
O_2	Oxygen (dry volume %)	9.6	9.4	9.7	**9.6**
CO_2	Carbon dioxide (dry volume %)	9.7	9.9	9.8	**9.8**
T_s	Sample temperature (°F)	295	295	296	**296**
B_w	Actual water vapor in gas (% by volume)	22.0	22.3	21.8	**22.0**
Gas Flow Rate					
Q_a	Volumetric flow rate, actual (acfm)	177,014	179,820	181,627	**179,487**
Q_{std}	Volumetric flow rate, dry standard (dscfm)	94,473	95,658	97,155	**95,762**
Sampling Data					
V_{mstd}	Volume metered, standard (dscf)	77.17	77.39	77.61	**77.39**
%I	Isokinetic sampling (%)	105.2	104.2	102.9	**104.1**
Particulate Laboratory Data					
m_n	Net matter collected (g)	0.0011	0.0022	0.0022	
Filterable Particulate Results					
C_{sd}	Particulate Concentration (mg/dscm)	0.50	1.0	1.0	**0.84**
C_{sd7}	Particulate Concentration @7% O_2 (mg/dscm)	0.62	1.2	1.2	**1.0**
Beryllium Laboratory Data					
m_n	Total matter corrected for allowable blanks (µg)	<0.0500	<0.0500	<0.0500	
Beryllium Results - Total					
C_{sd}	Concentration (mg/dscm)	<0.000023	<0.000023	<0.000023	**<0.000023**
C_{sd7}	Concentration @7% O_2 (mg/dscm)	<0.000028	<0.000028	<0.000028	**<0.000028**
Cadmium Laboratory Data					
m_n	Total matter corrected for allowable blanks (µg)	<0.2000	<0.2000	<0.2000	
Cadmium Results - Total					
C_{sd}	Concentration (mg/dscm)	<0.000092	<0.000091	<0.000091	**<0.000091**
C_{sd7}	Concentration @7% O_2 (mg/dscm)	<0.00011	<0.00011	<0.00011	**<0.00011**
Lead Laboratory Data					
m_n	Total matter corrected for allowable blanks (µg)	0.3815	0.7111	0.5419	
Lead Results - Total					
C_{sd}	Concentration (mg/dscm)	0.00017	0.00032	0.00025	**0.00025**
C_{sd7}	Concentration @7% O_2 (mg/dscm)	0.00021	0.00039	0.00031	**0.00030**

Table 2-2:
Unit 1 SDA Inlet and FF Outlet – Mercury

Run No.		1	2	3	Average
Date (2010)		Mar 23	Mar 23	Mar 23	
Start Time (approx.)		07:43	10:31	13:32	
Stop Time (approx.)		09:58	12:45	15:46	
Process Conditions					
R_P	Steam Production Rate (Klbs/hr)	183.5	183.9	183.3	**183.6**
P_1	Fabric Filter Inlet Temperature (°F)	315	315	315	**315**
P_2	Carbon Feed Rate (lb/hr)	6	6	6	**6**
SDA Inlet Gas Conditions					
O_2	Oxygen (dry volume %)	8.1	8.3	8.5	**8.3**
CO_2	Carbon dioxide (dry volume %)	11.0	10.9	11.0	**10.9**
T_s	Sample temperature (°F)	499	505	507	**504**
B_w	Actual water vapor in gas (% by volume)	18.2	18.6	18.1	**18.3**
SDA Inlet Gas Flow Rate					
Q_a	Volumetric flow rate, actual (acfm)	192,331	188,096	188,581	**189,669**
Q_{std}	Volumetric flow rate, dry standard (dscfm)	86,810	84,006	84,525	**85,114**
SDA Inlet Sampling Data					
V_{mstd}	Volume metered, standard (dscf)	68.54	65.65	65.80	**66.66**
%I	Isokinetic sampling (%)	99.6	98.6	98.2	**98.8**
SDA Inlet Mercury Laboratory Data					
m_n	Total matter corrected for allowable blanks (µg)	78.0752	95.4417	86.1483	
SDA Inlet Mercury Results - Total					
C_{sd}	Concentration (µg/dscm)	40	51	46	**46**
C_{sd7}	Concentration @7% O_2 (µg/dscm)	44	57	52	**51**
FF Outlet Gas Conditions					
O_2	Oxygen (dry volume %)	9.6	9.4	9.7	**9.6**
CO_2	Carbon dioxide (dry volume %)	9.7	9.9	9.8	**9.8**
T_s	Sample temperature (°F)	295	295	296	**296**
B_w	Actual water vapor in gas (% by volume)	22.0	22.3	21.8	**22.0**
FF Outlet Gas Flow Rate					
Q_a	Volumetric flow rate, actual (acfm)	177,014	179,820	181,627	**179,487**
Q_{std}	Volumetric flow rate, dry standard (dscfm)	94,473	95,658	97,155	**95,762**
FF Outlet Sampling Data					
V_{mstd}	Volume metered, standard (dscf)	77.17	77.39	77.61	**77.39**
%I	Isokinetic sampling (%)	105.2	104.2	102.9	**104.1**
FF Outlet Mercury Laboratory Data					
m_n	Total matter corrected for allowable blanks (µg)	4.8386	4.5386	5.0072	
FF Outlet Mercury Results - Total					
C_{sd}	Concentration (µg/dscm)	2.2	2.1	2.3	**2.2**
C_{sd7}	Concentration @7% O_2 (µg/dscm)	2.7	2.5	2.8	**2.7**
RE	Removal Efficiency (µg/dscm @ 7% O_2 based)	94%	96%	95%	**95%**

Table 2-3:
Unit 1 FF Outlet - Fluorides

Run No.		1	2	3	Average
Date (2010)		Mar 22	Mar 22	Mar 22	
Start Time (approx.)		13:19	15:07	16:30	
Stop Time (approx.)		14:34	16:21	17:41	
Process Conditions					
R_P	Steam Production Rate (Klbs/hr)	183.9	184.2	184.8	**184.3**
P_1	Fabric Filter Inlet Temperature (°F)	315	315	315	**315**
Gas Conditions					
O_2	Oxygen (dry volume %)	9.2	9.3	9.2	**9.2**
CO_2	Carbon dioxide (dry volume %)	10.3	10.0	10.3	**10.2**
T_s	Sample temperature (°F)	293	293	293	**293**
B_w	Actual water vapor in gas (% by volume)	21.8	21.7	22.1	**21.9**
Gas Flow Rate					
Q_a	Volumetric flow rate, actual (acfm)	175,956	176,099	169,528	**173,861**
Q_{std}	Volumetric flow rate, dry standard (dscfm)	94,620	94,737	90,888	**93,415**
Sampling Data					
V_{mstd}	Volume metered, standard (dscf)	36.94	37.95	36.29	**37.06**
%I	Isokinetic sampling (%)	102.1	104.8	104.4	**103.8**
Laboratory Data					
m_n	Total HF collected (mg)	<0.03892	<0.03744	<0.03782	
Hydrogen Fluoride (HF) Results					
C_{sd}	HF Concentration (ppmdv)	<0.045	<0.042	<0.044	**<0.044**
C_{sd7}	HF Concentration @7% O_2 (ppmdv)	<0.053	<0.050	<0.052	**<0.052**
C_{sd}	HF Concentration (mg/dscm)	<0.037	<0.035	<0.037	**<0.036**
C_{sd7}	HF Concentration @7% O_2 (mg/dscm)	<0.044	<0.042	<0.044	**<0.043**
$E_{lb/hr}$	HF Rate (lb/hr)	<0.013	<0.012	<0.013	**<0.013**
E_{Fd}	HF Rate - Fd-based (lb/MMBtu)	<0.000040	<0.000038	<0.000039	**<0.000039**

Table 2-4:
Unit 1 FF Outlet and SDA Inlet - Hydrogen Chloride

Run No.		1	2	3	Average
Date (2010)		Mar 22	Mar 22	Mar 22	
Start Time (approx.)		08:31	09:58	11:30	
Stop Time (approx.)		09:31	10:58	12:47	
Process Conditions					
R_P	Steam Production Rate (Klbs/hr)	183.3	184.8	184.6	**184.2**
P_1	Fabric Filter Inlet Temperature (°F)	315	315	316	**315**
SDA Inlet Gas Conditions					
O_2	Oxygen (dry volume %)	8.5	8.6	7.9	**8.3**
CO_2	Carbon dioxide (dry volume %)	10.9	10.8	11.4	**11.0**
T_s	Sample temperature (°F)	495	497	494	**495**
B_w	Actual water vapor in gas (% by volume)	17.6	17.2	19.1	**17.9**
SDA Inlet Sampling Data					
V_{mstd}	Volume metered, standard (dscf)	35.19	36.04	35.52	**35.58**
SDA Inlet Laboratory Data					
m_n	Total HCl collected (mg)	592.5061	671.5237	1044.3603	
SDA Inlet Hydrogen Chloride (HCl) Results					
C_{sd}	HCl Concentration (ppmdv)	393	434	685	**504**
C_{sd7}	HCl Concentration @7% O_2 (ppmdv)	438	490	734	**554**
FF Outlet Gas Conditions					
O_2	Oxygen (dry volume %)	10.0	9.5	9.2	**9.6**
CO_2	Carbon dioxide (dry volume %)	9.2	10.0	10.2	**9.8**
T_s	Sample temperature (°F)	295	295	296	**295**
B_w	Actual water vapor in gas (% by volume)	21.8	21.1	21.9	**21.6**
FF Outlet Sampling Data					
V_{mstd}	Volume metered, standard (dscf)	41.76	41.69	41.49	**41.64**
FF Outlet Laboratory Data					
m_n	Total HCl collected (mg)	11.0981	11.4642	15.4584	
FF Outlet Hydrogen Chloride (HCl) Results					
C_{sd}	HCl Concentration (ppmdv)	6.2	6.4	8.7	7.1
C_{sd7}	HCl Concentration @7% O_2 (ppmdv)	7.9	7.8	10.3	**8.7**
RE	Reduction Efficiency (% Removal)	98%	98%	99%	**98%**

RESULTS

Table 2-5:
Unit 2 FF Outlet – Particulate and Metals

Run No.		1	2	3	Average
Date (2010)		Mar 24	Mar 24	Mar 24	
Start Time (approx.)		07:53	11:03	14:12	
Stop Time (approx.)		10:06	13:35	16:22	
Process Conditions					
R_P	Steam Production Rate (Klbs/hr)	183.9	183.7	183.3	**183.6**
P_1	Fabric Filter Inlet Temperature (°F)	315	315	315	**315**
P_2	Carbon Feed Rate (lb/hr)	6	6	6	**6**
Gas Conditions					
O_2	Oxygen (dry volume %)	9.5	9.4	9.8	**9.5**
CO_2	Carbon dioxide (dry volume %)	9.9	10.2	9.9	**10.0**
T_s	Sample temperature (°F)	295	298	297	**297**
B_w	Actual water vapor in gas (% by volume)	22.1	22.6	22.0	**22.2**
Gas Flow Rate					
Q_a	Volumetric flow rate, actual (acfm)	173,477	178,750	180,224	**177,484**
Q_{std}	Volumetric flow rate, dry standard (dscfm)	92,545	94,353	95,903	**94,267**
Sampling Data					
V_{mstd}	Volume metered, standard (dscf)	71.89	73.20	73.71	**72.93**
%I	Isokinetic sampling (%)	100.1	100.0	99.0	**99.7**
Particulate Laboratory Data					
m_n	Net matter collected (g)	0.0025	0.0030	0.0015	
Filterable Particulate Results					
C_{sd}	Particulate Concentration (mg/dscm)	1.2	1.4	0.72	**1.1**
C_{sd7}	Particulate Concentration @7% O_2 (mg/dscm)	1.5	1.7	0.90	**1.4**
Beryllium Laboratory Data					
m_n	Total matter corrected for allowable blanks (µg)	<0.0500	<0.0500	<0.0500	
Beryllium Results - Total					
C_{sd}	Concentration (mg/dscm)	<0.000025	<0.000024	<0.000024	**<0.000024**
C_{sd7}	Concentration @7% O_2 (mg/dscm)	<0.000030	<0.000029	<0.000030	**<0.000030**
Cadmium Laboratory Data					
m_n	Total matter corrected for allowable blanks (µg)	0.5113	0.9717	0.9525	
Cadmium Results - Total					
C_{sd}	Concentration (mg/dscm)	0.00025	0.00047	0.00046	**0.00039**
C_{sd7}	Concentration @7% O_2 (mg/dscm)	0.00030	0.00057	0.00057	**0.00048**
Lead Laboratory Data					
m_n	Total matter corrected for allowable blanks (µg)	5.3271	5.6541	6.3189	
Lead Results - Total					
C_{sd}	Concentration (mg/dscm)	0.0026	0.0027	0.0030	**0.0028**
C_{sd7}	Concentration @7% O_2 (mg/dscm)	0.0032	0.0033	0.0038	**0.0034**

Table 2-6:
Unit 2 SDA Inlet and FF Outlet – Mercury

Run No.		1	2	3	Average
Date (2010)		Mar 24	Mar 24	Mar 24	
Start Time (approx.)		07:53	11:03	14:12	
Stop Time (approx.)		10:06	13:35	16:22	
Process Conditions					
R_P	Steam Production Rate (Klbs/hr)	183.9	183.7	183.3	**183.6**
P_1	Fabric Filter Inlet Temperature (°F)	315	315	315	**315**
P_2	Process data - (units)	6	6	6	**6**
SDA Inlet Gas Conditions					
O_2	Oxygen (dry volume %)	7.8	8.0	8.2	**8.0**
CO_2	Carbon dioxide (dry volume %)	11.4	11.4	11.4	**11.4**
T_s	Sample temperature (°F)	483	488	495	**489**
B_w	Actual water vapor in gas (% by volume)	19.3	18.7	18.7	**18.9**
SDA Inlet Gas Flow Rate					
Q_a	Volumetric flow rate, actual (acfm)	180,110	178,599	187,722	**182,144**
Q_{std}	Volumetric flow rate, dry standard (dscfm)	81,557	81,021	84,568	**82,382**
SDA Inlet Sampling Data					
V_{mstd}	Volume metered, standard (dscf)	65.53	63.19	66.87	**65.20**
%I	Isokinetic sampling (%)	101.3	98.4	99.7	**99.8**
SDA Inlet Mercury Laboratory Data					
m_n	Total matter corrected for allowable blanks (µg)	59.4137	114.4267	80.9101	
SDA Inlet Mercury Results - Total					
C_{sd}	Concentration (µg/dscm)	32	64	43	**46**
C_{sd7}	Concentration @7% O_2 (µg/dscm)	34	69	47	**50**
FF Outlet Gas Conditions					
O_2	Oxygen (dry volume %)	9.5	9.4	9.8	**9.5**
CO_2	Carbon dioxide (dry volume %)	9.9	10.2	9.9	**10.0**
T_s	Sample temperature (°F)	295	298	297	**297**
B_w	Actual water vapor in gas (% by volume)	22.1	22.6	22.0	**22.2**
FF Outlet Gas Flow Rate					
Q_a	Volumetric flow rate, actual (acfm)	173,477	178,750	180,224	**177,484**
Q_{std}	Volumetric flow rate, dry standard (dscfm)	92,545	94,353	95,903	**94,267**
FF Outlet Sampling Data					
V_{mstd}	Volume metered, standard (dscf)	71.89	73.20	73.71	**72.93**
%I	Isokinetic sampling (%)	100.1	100.0	99.0	**99.7**
FF Outlet Mercury Laboratory Data					
m_n	Total matter corrected for allowable blanks (µg)	2.8801	3.2488	3.4006	
FF Outlet Mercury Results - Total					
C_{sd}	Concentration (µg/dscm)	1.4	1.6	1.6	**1.5**
C_{sd7}	Concentration @7% O_2 (µg/dscm)	1.7	1.9	2.0	**1.9**
RE	Removal Efficiency (µg/dscm @ 7% O_2 based)	95%	97%	96%	**96%**

Table 2-7:
Unit 2 FF Outlet - Fluorides

Run No.		1	2	3	Average
Date (2010)		Mar 24	Mar 24	Mar 24	
Start Time (approx.)		07:53	09:37	11:24	
Stop Time (approx.)		09:11	10:54	12:46	
Process Conditions					
R_P	Steam Production Rate (Klbs/hr)	184.3	183.8	183.6	**183.9**
P_1	Fabric Filter Inlet Temperature (°F)	315	315	315	**315**
Gas Conditions					
O_2	Oxygen (dry volume %)	9.4	9.3	9.4	**9.4**
CO_2	Carbon dioxide (dry volume %)	10.0	10.0	10.1	**10.0**
T_s	Sample temperature (°F)	292	292	293	**292**
B_w	Actual water vapor in gas (% by volume)	22.0	22.2	22.1	**22.1**
Gas Flow Rate					
Q_a	Volumetric flow rate, actual (acfm)	175,045	174,991	170,950	**173,662**
Q_{std}	Volumetric flow rate, dry standard (dscfm)	93,851	93,628	91,463	**92,981**
Sampling Data					
V_{mstd}	Volume metered, standard (dscf)	36.24	35.99	34.97	**35.74**
%I	Isokinetic sampling (%)	101.0	100.6	100.0	**100.5**
Laboratory Data					
m_n	Total HF collected (mg)	<0.03273	<0.03622	<0.03921	
Hydrogen Fluoride (HF) Results					
C_{sd}	HF Concentration (ppmdv)	<0.038	<0.043	<0.048	**<0.043**
C_{sd7}	HF Concentration @7% O_2 (ppmdv)	<0.046	<0.051	<0.057	**<0.052**
C_{sd}	HF Concentration (mg/dscm)	<0.032	<0.036	<0.040	**<0.036**
C_{sd7}	HF Concentration @7% O_2 (mg/dscm)	<0.038	<0.043	<0.048	**<0.043**
$E_{lb/hr}$	HF Rate (lb/hr)	<0.011	<0.012	<0.014	**<0.012**
E_{Fd}	HF Rate - Fd-based (lb/MMBtu)	<0.000035	<0.000038	<0.000043	**<0.000039**

RESULTS

Table 2-8: Unit 2 FF Outlet - PCDDs/PCDFs

Run No.		1	2	3	Average
Date (2010)		Mar 22	Mar 23	Mar 23	
Start Time (approx.)		10:04	07:36	12:32	
Stop Time (approx.)		14:44	12:10	17:02	
Process Conditions					
R_P	Steam Production Rate (Klbs/hr)	184.2	184.2	183.9	**184.1**
P_1	Fabric Filter Inlet Temperature (°F)	318	320	320	**319**
P_2	Carbon Feed Rate (lb/hr)	7	6	6	**6**
Gas Conditions					
O_2	Oxygen (dry volume %)	9.2	9.6	9.3	**9.4**
CO_2	Carbon dioxide (dry volume %)	10.2	9.7	10.2	**10.0**
T_s	Sample temperature (°F)	293	297	299	**296**
B_w	Actual water vapor in gas (% by volume)	21.6	21.5	22.4	**21.8**
Gas Flow Rate					
Q_a	Volumetric flow rate, actual (acfm)	173,437	178,662	177,895	**176,665**
Q_{std}	Volumetric flow rate, dry standard (dscfm)	93,381	95,811	94,124	**94,438**
Sampling Data					
V_{mstd}	Volume metered, standard (dscf)	139.50	142.83	141.78	**141.37**
%I	Isokinetic sampling (%)	100.7	100.5	101.5	**100.9**
Results (ND and EMPC = 0)					
Laboratory Data from USEPA Method 23					
m_n	Total PCDDs & PCDFs (ng)	12.1000	13.3000	14.4000	
m_{n_TEQ}	Total TEQ PCDDs & PCDFs (ng)	0.0907	0.0880	0.1110	
Total PCDD/F Results (TEF=1)					
C_{sd}	PCDD/F Concentration (ng/dscm)	3.1	3.3	3.6	**3.3**
C_{sd7}	PCDD/F Concentration @7% O_2 (ng/dscm)	3.6	4.0	4.3	**4.0**
$E_{lb/hr}$	PCDD/F Rate (lb/hr)	1.07E-06	1.18E-06	1.26E-06	**1.17E-06**
E_{Fd}	PCDD/F Rate - F_d-based (lb/MMBtu)	3.27E-09	3.62E-09	3.85E-09	**3.58E-09**
Total PCDD/F TEQ Results (using USEPA/INTL 1989 TEFs)					
C_{sdTEQ}	TEQ Concentration (ng/dscm)	0.023	0.022	0.028	**0.024**
C_{sd7TEQ}	TEQ Concentration @7% O_2 (ng/dscm)	0.027	0.027	0.033	**0.029**
$E_{lb/hrTEQ}$	TEQ Rate (lb/hr)	8.03E-09	7.81E-09	9.75E-09	**8.53E-09**
E_{FdTEQ}	TEQ Rate - F_d-based (lb/MMBtu)	2.45E-11	2.40E-11	2.97E-11	**2.61E-11**
Results (ND and EMPC = actual value)					
Laboratory Data from USEPA Method 23, including NDs and EMPCs					
m_n	Total PCDDs & PCDFs (ng)	12.1000	13.4000	14.6000	
m_{n_TEQ}	Total TEQ PCDDs & PCDFs (ng)	0.0960	0.1100	0.1210	
Total PCDD/F Results (TEF=1)					
C_{sd}	PCDD/F Concentration (ng/dscm)	3.1	3.3	3.6	**3.3**
C_{sd7}	PCDD/F Concentration @7% O_2 (ng/dscm)	3.6	4.1	4.3	**4.0**
$E_{lb/hr}$	PCDD/F Rate (lb/hr)	1.07E-06	1.19E-06	1.28E-06	**1.18E-06**
E_{Fd}	PCDD/F Rate - F_d-based (lb/MMBtu)	3.27E-09	3.65E-09	3.91E-09	**3.61E-09**
Total PCDD/F TEQ Results (using USEPA/INTL 1989 TEFs)					
C_{sdTEQ}	TEQ Concentration (ng/dscm)	0.024	0.027	0.030	**0.027**
C_{sd7TEQ}	TEQ Concentration @7% O_2 (ng/dscm)	0.029	0.033	0.036	**0.033**
$E_{lb/hrTEQ}$	TEQ Rate (lb/hr)	8.50E-09	9.76E-09	1.06E-08	**9.63E-09**
E_{FdTEQ}	TEQ Rate - F_d-based (lb/MMBtu)	2.60E-11	3.00E-11	3.24E-11	**2.94E-11**

RESULTS

Table 2-9:
Unit 2 FF Outlet and SDA Inlet - Hydrogen Chloride

Run No.		1	2	3	Average
Date (2010)		Mar 23	Mar 23	Mar 23	
Start Time (approx.)		07:55	09:30	10:55	
Stop Time (approx.)		08:55	10:31	12:06	
Process Conditions					
R_P	Steam Production Rate (Klbs/hr)	185.2	183.2	185.3	**184.6**
P_1	Fabric Filter Inlet Temperature (°F)	320	320	320	**320**
SDA Inlet Gas Conditions					
O_2	Oxygen (dry volume %)	8.1	8.7	7.6	**8.1**
CO_2	Carbon dioxide (dry volume %)	10.9	10.5	11.6	**11.0**
T_s	Sample temperature (°F)	490	495	494	**493**
B_w	Actual water vapor in gas (% by volume)	17.6	17.8	19.6	**18.3**
SDA Inlet Sampling Data					
V_{mstd}	Volume metered, standard (dscf)	34.60	34.43	34.04	**34.36**
SDA Inlet Laboratory Data					
m_n	Total HCl collected (mg)	542.6130	510.8841	606.2813	
SDA Inlet Hydrogen Chloride (HCl) Results					
C_{sd}	HCl Concentration (ppmdv)	366	346	415	**376**
C_{sd7}	HCl Concentration @7% O_2 (ppmdv)	398	394	434	**409**
FF Outlet Gas Conditions					
O_2	Oxygen (dry volume %)	9.5	10.1	9.3	**9.6**
CO_2	Carbon dioxide (dry volume %)	9.7	9.3	10.1	**9.7**
T_s	Sample temperature (°F)	301	301	300	**301**
B_w	Actual water vapor in gas (% by volume)	21.4	21.6	22.2	**21.7**
FF Outlet Sampling Data					
V_{mstd}	Volume metered, standard (dscf)	40.08	39.97	40.83	**40.29**
FF Outlet Laboratory Data					
m_n	Total HCl collected (mg)	21.2629	16.6326	16.8368	
FF Outlet Hydrogen Chloride (HCl) Results					
C_{sd}	HCl Concentration (ppmdv)	12	10	10	**11**
C_{sd7}	HCl Concentration @7% O_2 (ppmdv)	15	12	11	**13**
RE	Reduction Efficiency (% Removal)	96%	97%	97%	**97%**

Table 2-10:
Unit 3 FF Outlet – Particulate and Metals

Run No.		1	2	3	Average
Date (2010)		Mar 22	Mar 22	Mar 22	
Start Time (approx.)		08:47	11:43	14:24	
Stop Time (approx.)		11:05	13:57	16:39	
Process Conditions					
R_P	Steam Production Rate (Klbs/hr)	184.1	184.0	184.2	**184.1**
P_1	Fabric Filter Inlet Temperature (°F)	315	315	315	**315**
P_2	Carbon Feed Rate)lb/hr)	7	6	6	**6**
Gas Conditions					
O_2	Oxygen (dry volume %)	10.0	9.7	9.5	**9.7**
CO_2	Carbon dioxide (dry volume %)	9.4	9.8	10.0	**9.7**
T_s	Sample temperature (°F)	297	296	295	**296**
B_w	Actual water vapor in gas (% by volume)	21.1	20.7	20.6	**20.8**
Gas Flow Rate					
Q_a	Volumetric flow rate, actual (acfm)	184,927	170,489	173,572	**176,330**
Q_{std}	Volumetric flow rate, dry standard (dscfm)	99,875	92,737	94,492	**95,701**
Sampling Data					
V_{mstd}	Volume metered, standard (dscf)	77.68	72.10	73.91	**74.56**
%I	Isokinetic sampling (%)	100.2	100.2	100.8	**100.4**
Particulate Laboratory Data					
m_n	Net matter collected (g)	0.0039	0.0034	0.0033	
Filterable Particulate Results					
C_{sd}	Particulate Concentration (mg/dscm)	1.77	1.67	1.58	**1.67**
C_{sd7}	Particulate Concentration @7% O_2 (mg/dscm)	2.26	2.07	1.92	**2.08**
Beryllium Laboratory Data					
m_n	Total matter corrected for allowable blanks (µg)	<0.0500	<0.0500	<0.0500	
Beryllium Results - Total					
C_{sd}	Concentration (mg/dscm)	<0.000023	<0.000024	<0.000024	**<0.000024**
C_{sd7}	Concentration @7% O_2 (mg/dscm)	<0.000029	<0.000030	<0.000029	**<0.000030**
Cadmium Laboratory Data					
m_n	Total matter corrected for allowable blanks (µg)	0.7733	0.7704	0.7331	
Cadmium Results - Total					
C_{sd}	Concentration (mg/dscm)	0.00035	0.00038	0.00035	**0.00036**
C_{sd7}	Concentration @7% O_2 (mg/dscm)	0.00045	0.00047	0.00043	**0.00045**
Lead Laboratory Data					
m_n	Total matter corrected for allowable blanks (µg)	6.8716	5.5360	5.9671	
Lead Results - Total					
C_{sd}	Concentration (mg/dscm)	0.0031	0.0027	0.0029	**0.0029**
C_{sd7}	Concentration @7% O_2 (mg/dscm)	0.0040	0.0034	0.0035	**0.0036**

Table 2-11:
Unit 3 SDA Inlet and FF Outlet – Mercury

Run No.		1	2	3	Average
Date (2010)		Mar 22	Mar 22	Mar 22	
Start Time (approx.)		08:47	11:43	14:24	
Stop Time (approx.)		11:05	13:57	16:39	
Process Conditions					
R_P	Steam Production Rate (Klbs/hr)	184.1	184.0	184.2	**184.1**
P_1	Fabric Filter Inlet Temperature (°F)	315	315	315	**315**
P_2	Carbon Feed Rate (lb/hr)	7	6	6	**6**
SDA Inlet Gas Conditions					
O_2	Oxygen (dry volume %)	9.2	8.2	8.1	**8.5**
CO_2	Carbon dioxide (dry volume %)	10.5	11.1	11.2	**10.9**
T_s	Sample temperature (°F)	473	469	471	**471**
B_w	Actual water vapor in gas (% by volume)	18.2	18.2	17.7	**18.0**
SDA Inlet Gas Flow Rate					
Q_a	Volumetric flow rate, actual (acfm)	181,887	175,008	174,895	**177,264**
Q_{std}	Volumetric flow rate, dry standard (dscfm)	84,459	81,568	81,829	**82,619**
SDA Inlet Sampling Data					
V_{mstd}	Volume metered, standard (dscf)	67.57	65.07	64.93	**65.85**
%I	Isokinetic sampling (%)	100.9	100.6	100.1	**100.5**
SDA Inlet Mercury Laboratory Data					
m_n	Total matter corrected for allowable blanks (µg)	69.7807	118.2850	100.6553	
SDA Inlet Mercury Results - Total					
C_{sd}	Concentration (µg/dscm)	36	64	55	**52**
C_{sd7}	Concentration @7% O_2 (µg/dscm)	43	70	60	**58**
FF Outlet Gas Conditions					
O_2	Oxygen (dry volume %)	10.0	9.7	9.5	**9.7**
CO_2	Carbon dioxide (dry volume %)	9.4	9.8	10.0	**9.7**
T_s	Sample temperature (°F)	297	296	295	**296**
B_w	Actual water vapor in gas (% by volume)	21.1	20.7	20.6	**20.8**
FF Outlet Gas Flow Rate					
Q_a	Volumetric flow rate, actual (acfm)	184,927	170,489	173,572	**176,330**
Q_{std}	Volumetric flow rate, dry standard (dscfm)	99,875	92,737	94,492	**95,701**
FF Outlet Sampling Data					
V_{mstd}	Volume metered, standard (dscf)	77.68	72.10	73.91	**74.56**
%I	Isokinetic sampling (%)	100.2	100.2	100.8	**100.4**
FF Outlet Mercury Laboratory Data					
m_n	Total matter corrected for allowable blanks (µg)	3.6560	3.5329	3.2883	
FF Outlet Mercury Results - Total					
C_{sd}	Concentration (µg/dscm)	1.7	1.7	1.6	**1.7**
C_{sd7}	Concentration @7% O_2 (µg/dscm)	2.1	2.1	1.9	**2.1**
RE	Removal Efficiency (µg/dscm @ 7% O_2 based)	95%	97%	97%	**96%**

RESULTS

Table 2-12:
Unit 3 FF Outlet - Fluorides

Run No.		1	2	3	Average
Date (2010)		Mar 23	Mar 23	Mar 23	
Start Time (approx.)		12:41	14:31	15:54	
Stop Time (approx.)		13:54	15:39	17:02	
Process Conditions					
R_P	Steam Production Rate (Klbs/hr)	183.8	184.4	183.9	**184.0**
P_1	Fabric Filter Inlet Temperature (°F)	315	315	315	**315**
Gas Conditions					
O_2	Oxygen (dry volume %)	9.8	9.9	9.4	**9.7**
CO_2	Carbon dioxide (dry volume %)	9.6	9.6	10.2	**9.8**
T_s	Sample temperature (°F)	297	296	296	**297**
B_w	Actual water vapor in gas (% by volume)	22.3	21.5	21.8	**21.9**
Gas Flow Rate					
Q_a	Volumetric flow rate, actual (acfm)	174,143	179,138	166,090	**173,124**
Q_{std}	Volumetric flow rate, dry standard (dscfm)	92,603	96,238	88,943	**92,595**
Sampling Data					
V_{mstd}	Volume metered, standard (dscf)	35.65	37.18	35.41	**36.08**
%I	Isokinetic sampling (%)	100.7	101.0	104.1	**102.0**
Laboratory Data					
m_n	Total HF collected (mg)	<0.03972	<0.03985	<0.03778	
Hydrogen Fluoride (HF) Results					
C_{sd}	HF Concentration (ppmdv)	<0.047	<0.046	<0.045	**<0.046**
C_{sd7}	HF Concentration @7% O_2 (ppmdv)	<0.059	<0.058	<0.055	**<0.057**
C_{sd}	HF Concentration (mg/dscm)	<0.039	<0.038	<0.038	**<0.038**
C_{sd7}	HF Concentration @7% O_2 (mg/dscm)	<0.049	<0.048	<0.046	**<0.048**
$E_{lb/hr}$	HF Rate (lb/hr)	<0.014	<0.014	<0.013	**<0.013**
E_{Fd}	HF Rate - Fd-based (lb/MMBtu)	<0.000044	<0.000043	<0.000041	**<0.000043**

Table 2-13:
Unit 3 FF Outlet and SDA Inlet - Hydrogen Chloride

Run No.		1	2	3	Average
Date (2010)		Mar 24	Mar 24	Mar 24	
Start Time (approx.)		07:45	09:16	10:54	
Stop Time (approx.)		08:45	10:16	11:54	
Process Conditions					
R_P	Steam Production Rate (Klbs/hr)	184.1	184.2	184.1	**184.1**
P_1	Fabric Filter Inlet Temperature (°F)	315	315	315	**315**
SDA Inlet Gas Conditions					
O_2	Oxygen (dry volume %)	9.0	8.1	8.0	**8.4**
CO_2	Carbon dioxide (dry volume %)	10.4	11.2	11.3	**10.9**
T_s	Sample temperature (°F)	465	464	468	**466**
B_w	Actual water vapor in gas (% by volume)	17.8	18.2	18.7	**18.2**
SDA Inlet Sampling Data					
V_{mstd}	Volume metered, standard (dscf)	36.06	36.23	36.49	**36.26**
SDA Inlet Laboratory Data					
m_n	Total HCl collected (mg)	607.2973	714.3158	701.1579	
SDA Inlet Hydrogen Chloride (HCl) Results					
C_{sd}	HCl Concentration (ppmdv)	393	460	448	**433**
C_{sd7}	HCl Concentration @7% O_2 (ppmdv)	458	498	484	**480**
FF Outlet Gas Conditions					
O_2	Oxygen (dry volume %)	9.6	9.1	9.1	**9.3**
CO_2	Carbon dioxide (dry volume %)	9.8	10.3	10.3	**10.1**
T_s	Sample temperature (°F)	295	296	295	**295**
B_w	Actual water vapor in gas (% by volume)	21.7	21.5	22.4	**21.9**
FF Outlet Sampling Data					
V_{mstd}	Volume metered, standard (dscf)	40.21	40.73	39.98	**40.30**
FF Outlet Laboratory Data					
m_n	Total HCl collected (mg)	30.1359	28.8286	29.3329	
FF Outlet Hydrogen Chloride (HCl) Results					
C_{sd}	HCl Concentration (ppmdv)	17	17	17	**17**
C_{sd7}	HCl Concentration @7% O_2 (ppmdv)	22	19	20	**20**
RE	Reduction Efficiency (% Removal)	95%	96%	96%	**96%**

Table 2-14:
Units 1, 2 and 3 FF Outlets – Opacity by COMS

Run No.	1	2	3	Average
Unit 1				
Date (2010)	Mar 23	Mar 23	Mar 23	
Start Time (approx.)	07:43	10:31	13:32	
Stop Time (approx.)	09:58	12:45	15:46	
Visible Emissions (%)[1]				
Average Opacity	1	1	1	1
Maximum Reading	1	1	1	**1**
Minimum Reading	1	1	1	**1**
Unit 2				
Date (2010)	Mar 24	Mar 24	Mar 24	
Start Time (approx.)	07:53	11:03	14:12	
Stop Time (approx.)	10:06	13:35	16:22	
Visible Emissions (%)[1]				
Average Opacity	0	0	0	**0**
Maximum Reading	0	0	0	**0**
Minimum Reading	0	0	0	**0**
Unit 3				
Date (2010)	Mar 22	Mar 22	Mar 22	
Start Time (approx.)	08:47	11:43	14:24	
Stop Time (approx.)	11:05	13:57	16:39	
Visible Emissions (%)[1]				
Average Opacity	0	0	0	**0**
Maximum Reading	0	0	0	**0**
Minimum Reading	0	0	0	**0**

[1] Reading obtained from facility's continuous opacity monitoring system (COMS) as provided under 40 CFR 60.11(e) and Title V Conditions A.36(6), A.53 and A.54 and coincide with Method 5/29 test runs.

RESULTS

Table 2-15:
Ash Handling System - Fugitive Emissions

Source Constituent	Date (2010)	Start Time (approx.)	Stop Time (approx.)	Observation Duration (minutes)	Accumulated Emission Duration (seconds)	
Ash Unloading/Conveyor						
Visual Opacity (%)	March 24	7:52	9:02	60	0	
Ash Conveyor/Doors to Baghouse						
Visual Opacity (%)	March 24	9:07	10:17	60	0	
Rolling Door/Door to Baghouse						
Visual Opacity (%)	March 24	12:55	14:05	60	0	Permit Limit
				Total (% of observation time) = 0		< 5% of observation Time
				Total (minutes) = 0		< 9 minutes

Table 2-16:
Lime Silo Fabric Filter Outlet - Visible Emissions

Run No.	**1**
Date (2010)	Mar 24
Start Time (approx.)	10:32
Stop Time (approx.)	11:51
Process Conditions	
Total lime unloaded (tons)	25.63
Rate of unloading (tons/hr)	19.5
Visible Emissions	
Average (percent opacity)	0
Maximum reading (percent opacity)	0

RESULTS

Table 2-17: Air Flow Summary

Run Number	Run Date	Run Time	Steam Flow Klbs/hour	Flue Gas Temp Deg F	Air Flow ACFM	O_2 %	CO_2 %	CO_2 Sample Rate (lpm)[1]	Stack Flow 2RSD (%)	Air Flow, DSCFM	Air Flow, DSCFM@ 7%O_2
1-O-M5/29-1	3/23/2010	07:43-09:58	183.5	295	177,014	9.6	9.7	0.2	11.6%	94,473	77,005
1-O-M5/29-2	3/23/2010	10:31-12:45	183.9	295	179,820	9.4	9.9	0.2	12.2%	95,658	79,279
1-O-M5/29-3	3/23/2010	13:32-15:46	183.3	296	181,627	9.7	9.8	0.2	13.1%	97,155	78,073
1-O-M13B-1	3/22/2010	13:19-14:34	183.9	293	175,956	9.2	10.3	0.4	9.1%	94,620	79,848
1-O-M13B-2	3/22/2010	15:07-16:21	184.2	293	176,099	9.3	10.0	0.4	13.9%	94,737	78,993
1-O-M13B-3	3/22/2010	16:30-17:41	184.8	293	169,528	9.2	10.3	0.4	11.1%	90,888	76,829
		Average	**183.9**	**294**	**176,674**	**9.4**	**10.0**	**NA**	**11.8%**	**94,588**	**78,338**
2-O-M5/29-1	3/24/2010	07:53-10:06	183.9	295	173,477	9.5	9.9	0.2	9.3%	92,545	76,233
2-O-M5/29-2	3/24/2010	11:03-13:35	183.7	298	178,750	9.4	10.2	0.2	6.4%	94,353	78,130
2-O-M5/29-3	3/24/2010	14:12-16:22	183.3	297	180,224	9.8	9.9	0.2	10.0%	95,903	76,653
2-O-M13B-1	3/24/2010	07:53-09:11	184.3	292	175,045	9.4	10.0	0.4	6.9%	93,851	77,782
2-O-M13B-2	3/24/2010	09:37-10:54	183.8	292	174,991	9.3	10.0	0.4	9.6%	93,628	78,001
2-O-M13B-3	3/24/2010	11:24-12:46	183.6	293	170,950	9.4	10.1	0.4	11.0%	91,463	75,934
2-O-M23-1	3/22/2010	10:04-14:44	184.2	293	173,437	9.2	10.2	0.1	6.9%	93,381	78,534
2-O-M23-2	3/23/2010	07:36-12:10	184.2	297	178,662	9.6	9.7	0.1	8.9%	95,811	78,096
2-O-M23-3	3/23/2010	12:32-17:02	183.9	299	177,895	9.3	10.2	0.1	10.8%	94,124	78,685
		Average	**183.9**	**295**	**175,937**	**9.4**	**10.0**	**NA**	**8.9%**	**93,895**	**77,561**
3-O-M5/29-1	3/22/2010	08:47-11:05	184.1	297	184,927	10.0	9.4	0.2	11.7%	99,875	78,176
3-O-M5/29-2	3/22/2010	11:43-13:57	184.0	296	170,489	9.7	9.8	0.2	9.0%	92,737	74,723
3-O-M5/29-3	3/22/2010	14:24-16:39	184.2	295	173,572	9.5	10.0	0.2	9.1%	94,492	77,497
3-O-M13B-1	3/23/2010	12:41-13:54	183.8	297	174,143	9.8	9.6	0.4	10.7%	92,603	74,282
3-O-M13B-2	3/23/2010	14:31-15:39	184.4	296	179,138	9.9	9.6	0.4	12.3%	96,238	75,952
3-O-M13B-3	3/23/2010	15:54-17:02	183.9	296	166,090	9.4	10.2	0.4	6.5%	88,943	73,586
		Average	**184.1**	**296**	**174,727**	**9.7**	**9.8**	**NA**	**9.9%**	**94,148**	**75,703**
		Facility Average	**184.0**	**295**	**175,779**	**9.5**	**9.9**	**NA**	**10.2%**	**94,211**	**77,201**

[1] CO_2 gas sample flow rate was within 10% of initial flow rate throughout all test runs.

Table 2-18:
Quality Control and Quality Assurance
PCDD/PCDF - Extraction Standard Percent Recoveries

Sample Number	Extraction Standard Percent Recoveries, %							
	^{13}C-TCDD	^{13}C-PeCDD	^{13}C-HxCDD	^{13}C-HxCDD	^{13}C-HxCDD	^{13}C-HpCDD	^{13}C-OCDD	^{13}C-TCDF
0_7660_MB001	94.3	87.2	86.2	86.2	87.9	86.9	85.9	101
Field Blank	91.6	96	84.8	79.7	81.2	80.7	79.1	95.2
Unit 2 FF Outlet Run 1	88.9	85.6	85.3	85.7	90.8	87.2	84.6	90.9
Unit 2 FF Outlet Run 2	94.9	86.5	84.3	83.6	83.9	85.1	81.7	95.5
Unit 2 FF Outlet Run 3	79.8	84.9	79.6	79	80.7	83	82.4	84.1
Average	90	88	84	83	85	85	83	93
SD	6	5	3	3	4	3	3	6
Min	79.8	84.9	79.6	79	80.7	80.7	79.1	84.1
Max	94.9	96	86.2	86.2	90.8	87.2	85.9	101
Within M23 QC	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE

Sample Number	Extraction Standard Percent Recoveries, %								
	^{13}C-PeCDF	^{13}C-PeCDF	^{13}C-HxCDF	^{13}C-HxCDF	^{13}C-HxCDF	^{13}C-HxCDF	^{13}C-HpCDF	^{13}C-HpCDF	^{13}C-OCDF
0_7660_MB001	93.7	97.5	85.1	86.7	90.1	83.5	83.8	86.1	82
Field Blank	97.4	98.6	81.4	82.3	83.5	78.4	78.6	82.6	77
Unit 2 FF Outlet Run 1	90.1	89.4	87.3	87.7	88.5	82.9	84.4	85.7	80.9
Unit 2 FF Outlet Run 2	92.7	91.4	85.9	85.8	85.7	80.6	81.7	82.4	77.7
Unit 2 FF Outlet Run 3	87.8	87.8	80.6	79.6	81.9	75.8	78.5	80.4	77
Average	92	93	84	84	86	80	81	83	79
SD	4	5	3	3	3	3	3	2	2
Min	87.8	87.8	80.6	79.6	81.9	75.8	78.5	80.4	77
Max	97.4	98.6	87.3	87.7	90.1	83.5	84.4	86.1	82
Within M23 QC	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE

Table 2-19:
Quality Control and Quality Assurance
PCDD/PCDF – CS/SS Percent Recoveries

Sample Number	CS/SS Percent Recoveries, %				
	^{37}Cl-TCDD	^{13}C-PeCDD	^{13}C-PeCDF	^{13}C-HxCDF	^{13}C-HpCDF
0_7660_MB001	99.1	104	102	100	103
Field Blank	97.5	99.1	98.3	98.7	102
Unit 2 FF Outlet Run 1	99	104	99.3	99.6	101
Unit 2 FF Outlet Run 2	97.2	106	98.6	99.9	104
Unit 2 FF Outlet Run 3	99.1	106	95.3	98.9	103
Average	98	104	99	99	103
SD	1	3	2	1	1
Min	97.2	99.1	95.3	98.7	101
Max	99.1	106	102	100	104
Min within M23 QC	TRUE	TRUE	TRUE	TRUE	TRUE

Table 2-20:
Quality Control and Quality Assurance - Metals

RPD RESULTS

Run Number	FH Front Half	BH H_2O_2/HNO_4	A Empty Impinger	B $KMnO_4$	C HCl
U1-SDA-I-R1	0.1%	1.4%	NA	NA	0.9%
U1-SDA-I-R2	1.4%	1.4%	NA	NA	1.6%
U1-SDA-I-R3	1.6%	1.2%	NA	3.4%	1.8%
U1-FF-O-R1	NA	1.0%	NA	NA	NA
U1-FF-O-R2	NA	1.3%	NA	NA	NA
U1-FF-O-R3	NA	1.1%	NA	NA	NA
U2-SDA-I-R1	0.7%	9.6%	NA	NA	1.7%
U2-SDA-I-R2	1.2%	1.5%	NA	NA	1.9%
U2-SDA-I-R3	1.0%	5.7%	NA	NA	1.8%
U2-FF-O-R1	NA	0.9%	NA	NA	NA
U2-FF-O-R2	NA	0.2%	NA	NA	NA
U2-FF-O-R3	NA	0.1%	NA	NA	NA
U3-SDA-I-R1	1.1%	0.8%	NA	NA	0.1%
U3-SDA-I-R2	1.2%	3.2%	NA	NA	0.3%
U3-SDA-I-R3	1.1%	0.3%	NA	NA	1.3%
U3-FF-O-R1	NA	5.6%	NA	NA	NA
U3-FF-O-R2	NA	1.3%	NA	NA	NA
U3-FF-O-R3	NA	2.7%	NA	NA	NA
Field Blank	NA	NA	NA	NA	NA
Reagent Blank	NA	NA	NA	NA	NA
Reagent Blank 3/23/10				NA	

Element	U1-FF-O-R2 RPD	U2-FF-O-R2 RPD	U3-FF-O-R2 RPD
Beryllium	NA	NA	NA
Cadmium	NA	1.6%	13.5%
Lead	0.5%	0.3%	12.4%

Table 2-21:
Quality Control and Quality Assurance – Metals (Continued)

Sample Spike and Recovery

Run Number		FH Front Half	BH H_2O_2/HNO_4	A Empty Impinger	B $KMnO_4$	C HCl
U1-SDA-I-R3	#1	122%	104%	100%	86%	99%
	#2	118%	106%	101%	84%	97%
U1-FF-O-R3	#1	116%	104%	81%	82%	100%
	#2	113%	103%	83%	84%	98%
U2-SDA-I-R3	#1	106%	107%	99%	88%	103%
	#2	102%	107%	97%	85%	102%
U2-FF-O-R3	#1	123%	96%	102%	81%	104%
	#2	122%	96%	99%	76%	103%
U3-SDA-I-R3	#1	124%	116%	87%	100%	101%
	#2	122%	110%	87%	102%	101%
U3-FF-O-R3	#1	90%	99%	100%	91%	98%
	#2	93%	101%	102%	90%	97%

Element	U1-FF-O-R3 Recovery	U2-FF-O-R3 Recovery	U3-FF-O-R3 Recovery
Beryllium	86%	89%	87%
Cadmium	91%	89%	85%
Lead	98%	97%	97%

Second Source Calibration Verification

Element	.25 ppb	1 ppb	50 ppb	100 ppb	250 ppb
	QC Std 8	QC Std 2	QC Std 5	QC Std 4	QC Std 3
Beryllium	124%	100%	97%	99%	95%
Cadmium		100%	96%	100%	94%
Lead		92%	96%	99%	95%

Table 2-22:
Quality Control and Quality Assurance – Method and Field Blanks

Mercury		Average Total Catch ug	FH Front Half	BH H_2O_2/HNO_4	A Empty Impinger	B $KMnO_4$	C HCl
Field Blank	#1	< 0.5	< 0.1	< 0.3	< 0.2	< 0.5	< 0.4
	#2		< 0.1	< 0.3	< 0.2	< 0.5	< 0.4
Reagent Blank	#1	< 0.5	< 0.1	< 0.2	< 0.2	< 0.5	< 0.4
	#2		< 0.1	< 0.2	< 0.2	< 0.5	< 0.4
Reagent Blank 3/23/10	#1	< 0.5				< 0.5	

Element	Field Blank Total µg	Reagent Blank Total µg
Beryllium	< 0.05	< 0.05
Cadmium	< 0.2	< 0.2
Lead	0.308	0.207

Method 23	0_7660_MB001 pg	Field Blank pg
Totals		
TCDDs	2.27	3.98
PeCDDs	0	0
HxCDDs	0	7.15
HpCDDs	3.61	4.94
OCDD	7.89	16.8
TCDFs	0	0
PeCDFs	0	0
HxCDFs	0	4.2
HpCDFs	0	4.27
OCDF	0	0
Total PCDD/Fs (ND=0; EMPC=0)	5.88	24.5
Total PCDD/Fs (ND=0; EMPC=EMPC)	17.5	48.1
Total PCDD/Fs (2378-X ND=DL; EMPC=EMPC)	50.5	64.4
Total 2378s (ND=0; EMPC=0)	0.00	9.65
Total 2378s (ND=0.5; EMPC=0)	20.4	20.2
Total 2378s (ND=1; EMPC=0)	40.7	30.7
Total 2378s (ND=0; EMPC=1)	11.6	37.1
Total 2378s (ND=0.5; EMPC=1)	28.1	35.6
Total 2378s (ND=1; EMPC=1)	44.6	43.7

Table 2-23:
Quality Control and Quality Assurance - Miscellaneous

Blanks	Result	
Acetone (g)	<0.0001	
HCl DI H_2O (mg/l)	<0.099	
HCl 0.1 N H_2SO_4 (mg/l)	<0.099	
HF DI H_2O (mg/l)	<0.040	
Meters - Post Cal	**Result**	**Limit**
61-6	-0.6%	≤ ± 5%
61-8	-0.4%	≤ ± 5%
66-11	-0.2%	≤ ± 5%
66-14	0.3%	≤ ± 5%
66-22	-0.5%	≤ ± 5%
66-24	-0.4%	≤ ± 5%
85-2	1.2%	≤ ± 5%
85-4	-0.2%	≤ ± 5%

End of Section 2 – Results

DESCRIPTION OF INSTALLATION

PROCESS DESCRIPTION

The South Broward Resource Recovery facility operates three (3) 750-tons-per-day municipal refuse-fired, water-wall boiler trains. The trains were manufactured by Babcock and Wilcox to produce electricity for sale to a local utility company. The boilers are rated at a maximum steam flow of 192,000 lbs/hr. Each boiler is equipped with an SDA for acid gas removal, followed by an FF baghouse for the control of particulate emissions and selective non-catalytic reduction for NO_X control. The control equipment is manufactured by Wheelabrator Air Pollution Control, Inc.

A carbon injection system was recently installed at South Broward for mercury control. All pertinent equipment for the carbon injection system was supplied by Chemco Systems of Monongahela, Pennsylvania, with the carbon rate scales being supplied by Merrick Industries of Lynn Haven, Florida. Each FF baghouse is followed by an induced draft fan that directs the flue gas to a dedicated flue in a common stack.

Figure 3-1 shows a general schematic of the facility. The general sampling locations for the Units 1, 2 and 3 SDA Inlets and FF Outlets are shown in Figure 3-2 on page 3-2.

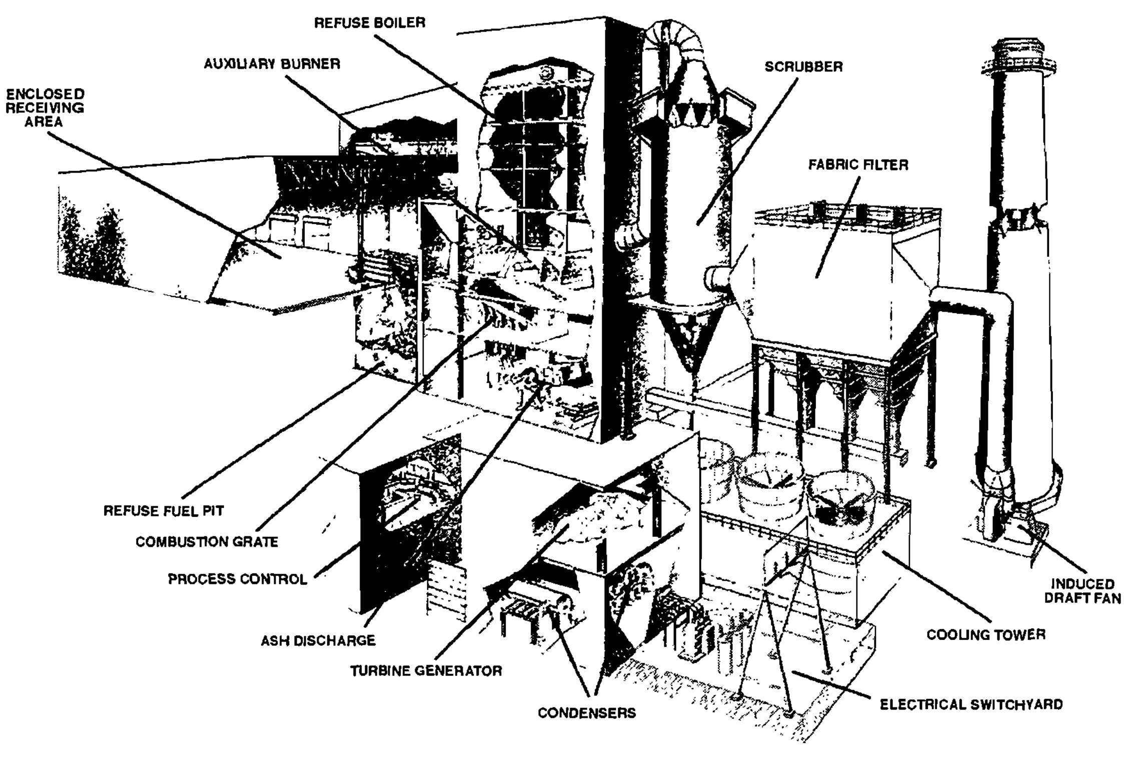


Figure 3-1: General Process Schematic

PROCESS DESCRIPTION (CONTINUED)

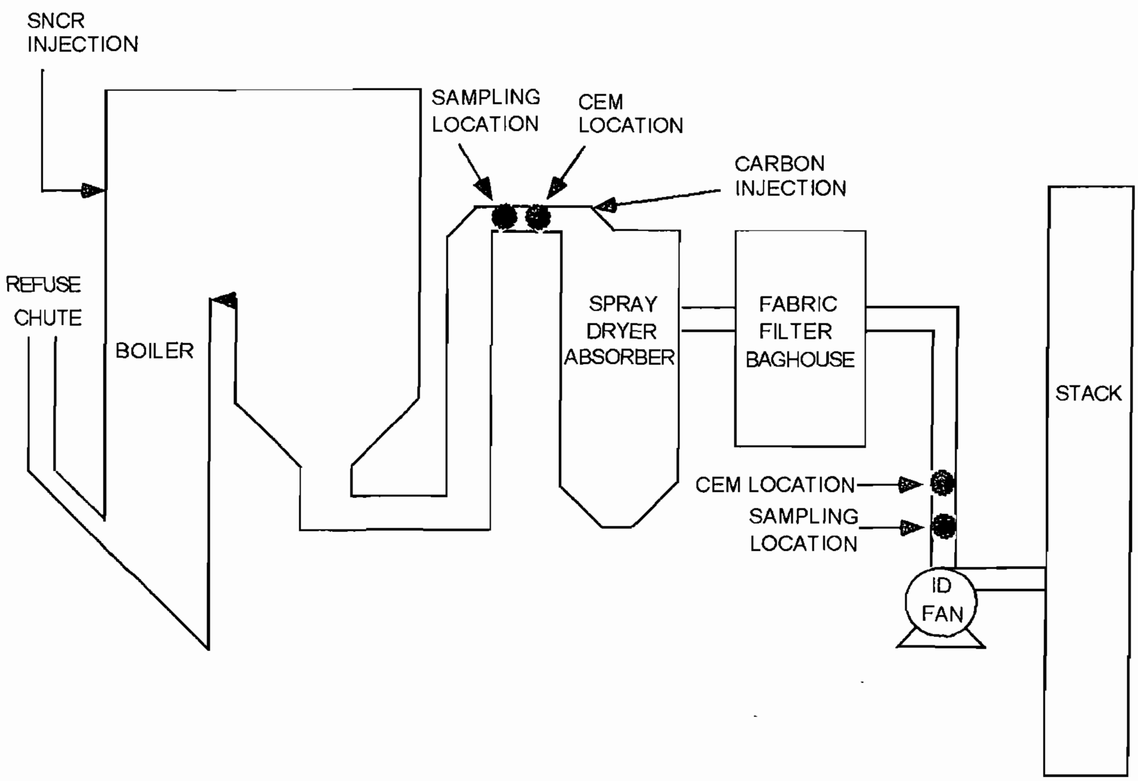


Figure 3-2: Process Schematic

Table 3-1:
Unit 1 Compliance Test Process Data

PLANT NAME: SOUTH BROWARD 2010						Data from DCS Printouts						Calculated		Lime Feed Rate			
Test	Unit No.	Run No.	Date	Time Start	Time Stop	Steam Flow klbs/hr	FF Inlet Temp deg F	Fabric Filter Delta In. H2O	SDA Inlet Temp deg F	Total SDA Flow gpm	Diluton H2O flow gpm	Slurry Flow gpm	Slurry Conc. %	Slurry Specific Gravity	Slurry CaO Density lb/gal	CaO Flow lbs/hr	Test Run Comments
M-26A	1	1	3/22/2010	08:31	09:31	183.3	315.0	6.5	507.4	37.1	27.7	9.5	25.7	1.071	0.738	418.4	All times based on CEMS time
HCl		2	3/22/2010	09:58	10:58	184.8	314.9	6.5	508.3	36.7	30.2	6.5	17.6	1.096	1.002	390.8	
		3	3/22/2010	11:30	12:36	184.6	316.5	6.3	505.4	35.8	18.5	17.3	20.4	1.093	0.970	1009.2	
					Avg	184.2	315.4	6.5	507.0	36.6	25.5	11.1	21.2	1.087	0.903	606.1	
M-29/5	1	1	3/23/2010	07:43	09:58	183.5	315.0	6.5	505.5	35.9	25.2	10.7	28.7	1.064	0.671	432.4	All times based on CEMS time
Metals		2	3/23/2010	10:31	12:45	183.9	315.1	6.6	512.1	37.9	28.5	9.4	28.7	1.060	0.624	350.8	
PM		3	3/23/2010	13:32	15:46	183.3	315.0	6.6	514.7	38.0	30.4	7.6	19.6	1.088	0.915	416.7	
					Avg	183.6	315.0	6.6	510.8	37.3	28.0	9.2	25.7	1.071	0.737	400.0	
M-13B	1	1	3/22/2010	13:19	14:34	183.9	315.0	6.5	503.2	34.8	23.2	11.6	19.8	1.092	0.966	669.4	All times based on CEMS time
HF		2	3/22/2010	15:07	16:21	184.2	314.9	6.4	508.3	35.9	28.7	7.2	17.0	1.090	0.942	406.9	
		3	3/22/2010	16:30	17:41	184.8	314.9	6.5	505.8	34.8	24.8	10.0	27.1	1.072	0.749	448.1	
					Avg	184.3	314.9	6.5	505.8	35.2	25.6	9.6	21.3	1.085	0.886	508.1	

Table 3-2:
Unit 2 Compliance Test Process Data

PLANT NAME: SOUTH BROWARD
2010

Test	Unit No.	Run No.	Date	Time Start	Time Stop	Data From DCS Printouts: Steam Flow klbs/hr	FF Inlet Temp deg F	Fabric Filter Delta In. H2O	SDA Inlet Temp deg F	Total SDA Flow gpm	Diluton H2O flow gpm	Calculated: Slurry Flow gpm	Slurry Conc. %	Lime Feed Rate: Slurry Specific Gravity	Slurry CaO Density lb/gal	CaO Flow lbs/hr	Test Run Comments
M-26A HCl	2	1	3/23/2010	07:55	08:55	185.2	319.8	6.5	492.3	31.0	19.3	11.7	33.2	1.064	0.673	472.0	All times based on CEMS time
		2	3/23/2010	09:30	10:30	183.2	320.2	6.7	496.5	32.5	22.1	10.5	32.2	1.063	0.659	413.6	
		3	3/23/2010	10:55	12:06	185.3	319.9	6.6	495.5	31.6	20.8	10.8	34.3	1.060	0.624	402.5	
					Avg	184.6	319.9	6.6	494.7	31.7	20.7	11.0	33.2	1.062	0.652	429.4	
M-29/5 Metals PM	2	1	3/24/2010	07:53	10:06	183.9	315.1	6.6	486.9	30.3	21.6	8.7	26.8	1.082	0.858	448.4	All times based on CEMS time
		2	3/24/2010	11:03	13:35	183.7	315.2	6.6	492.0	31.4	22.4	9.0	25.5	1.084	0.880	476.8	
		3	3/24/2010	14:12	16:22	183.3	315.1	6.7	498.9	33.6	24.2	9.5	18.1	1.099	1.044	591.9	
					Avg	183.6	315.1	6.6	492.6	31.8	22.7	9.1	23.5	1.088	0.927	505.7	
M-23 dioxins	2	1	3/22/2010	10:04	14:44	184.2	318.0	6.6	491.0	31.2	19.8	11.3	22.1	1.093	0.978	665.4	All times based on CEMS time
		2	3/23/2010	07:36	12:12	184.2	319.8	6.6	494.7	31.7	20.9	10.8	33.1	1.063	0.655	424.4	
		3	3/23/2010	12:32	17:02	183.9	320.0	6.7	503.2	33.8	23.1	10.7	23.3	1.084	0.881	565.6	
					Avg	184.1	319.3	6.6	496.3	32.2	21.3	10.9	26.1	1.080	0.838	551.8	
M-13B HF	2	1	3/24/2010	07:53	09:11	184.3	315.1	6.6	485.8	29.9	21.9	8.0	26.7	1.083	0.871	418.6	All times based on CEMS time
		2	3/24/2010	09:37	10:54	183.8	315.0	6.5	489.5	31.0	21.3	9.6	27.2	1.080	0.832	480.2	
		3	3/24/2010	11:24	12:46	183.6	315.1	6.6	490.5	30.9	21.9	9.0	29.0	1.076	0.789	425.6	
					Avg	183.9	315.0	6.6	488.6	30.6	21.7	8.9	27.6	1.080	0.831	441.5	

Table 3-3:
Unit 3 Compliance Test Process Data

PLANT NAME: SOUTH BROWARD 2010						Data From DCS Printouts						Calculated		Lime Feed Rate			
Test	Unit No.	Run No.	Date	Time Start	Time Stop	Steam Flow klbs/hr	FF Inlet Temp deg F	Fabric Filter Delta In. H2O	SDA Inlet Temp deg F	Total SDA Flow gpm	Diluton H2O flow gpm	Slurry Flow gpm	Slurry Conc. %	Slurry Specific Gravity	Slurry CaO Density lb/gal	CaO Flow lbs/hr	Test Run Comments
M-26A HCl	3	1	3/24/2010	07:45	08:45	184.1	315.0	6.8	464.8	31.7	22.5	9.2	25.8	1.084	0.879	483.6	All times based on CEMS time
		2	3/24/2010	09:16	10:16	184.2	315.1	6.7	462.8	30.8	19.4	11.4	27.6	1.081	0.840	573.0	
		3	3/24/2010	10:54	11:54	184.1	314.8	6.7	466.9	31.4	21.5	10.0	28.8	1.076	0.792	472.8	
					Avg	184.1	315.0	6.7	464.8	31.3	21.1	10.2	27.4	1.080	0.837	509.8	
M-29/5 Metals PM	3	1	3/22/2010	8:47	11:05	184.1	315.0	6.9	471.8	35.4	25.3	10.1	23.5	1.084	0.874	531.2	All times based on CEMS time
		2	3/22/2010	11:43	13:57	184.0	315.2	6.8	467.5	32.4	19.9	12.5	23.4	1.092	0.967	722.9	
		3	3/22/2010	14:24	16:39	184.2	314.9	6.7	470.4	33.0	21.4	11.5	23.6	1.089	0.927	641.3	
					Avg	184.1	315.0	6.8	469.9	33.6	22.2	11.4	23.5	1.088	0.923	631.8	
M-13B HF	3	1	3/23/2010	12:41	13:54	183.8	315.1	7.0	481.9	38.1	27.3	10.8	22.5	1.082	0.850	551.8	All times based on CEMS time
		2	3/23/2010	14:31	15:39	184.4	314.9	7.0	487.0	39.8	29.8	10.0	20.0	1.087	0.906	541.4	
		3	3/23/2010	15:54	17:02	183.9	315.0	6.9	479.5	36.7	25.6	11.1	21.9	1.086	0.898	598.1	
					Avg	184.0	315.0	7.0	482.8	38.2	27.6	10.6	21.4	1.085	0.885	563.8	

DESCRIPTION OF SAMPLING LOCATIONS

Sampling point locations were determined according to EPA Method 1.

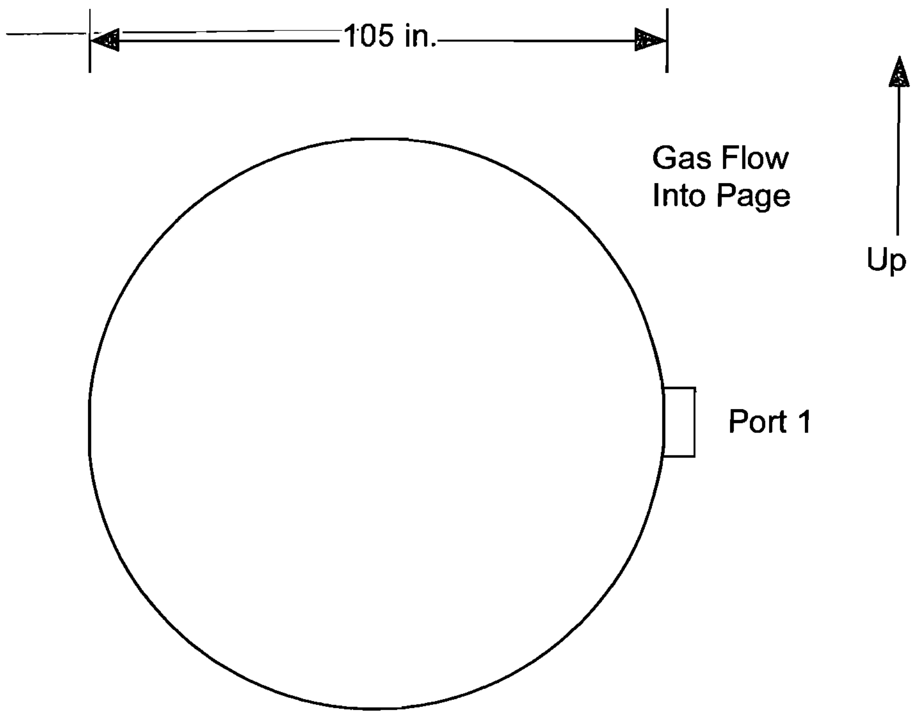
Table 3-4 outlines the sampling point configurations. Figures 3-3 through 3-5, on pages 3-7 through 3-9, illustrate the sampling points and orientation of sampling ports for each of the sources that were tested in the program.

Table 3-4:
Sampling Points

Location	Constituent	Method	Run No.	Ports	Points per Port	Minutes per Point	Total Minutes	Figure
Units 1, 2 and 3 SDA Inlets								
	Hydrogen Chloride	26A[1]	1-3	1	1	60	60	3-3
	Mercury	29	1-3	1	1	5	120	3-4
Units 1, 2 and 3 FF Outlets								
	Particulate, Be, Cd, Pb and Hg	5/29[2]	1-3	5	5	5	125	3-5
	Hydrogen Chloride	26A[1]	1-3	1	1	60	60	NA
	Fluorides	13B	1-3	5	5	2.5	62.5	3-5
	PCDDs/PCDFs (Unit 1 only)	23	1-3	5	5	10	250	3-5

[1] Hydrogen chloride Inlet testing utilized a modification of EPA Method 26A (single point constant sampling rate).
[2] FF Outlet metals testing was done in conjunction with EPA Method 5 particulate sampling.

DESCRIPTION OF SAMPLING LOCATIONS (CONTINUED)



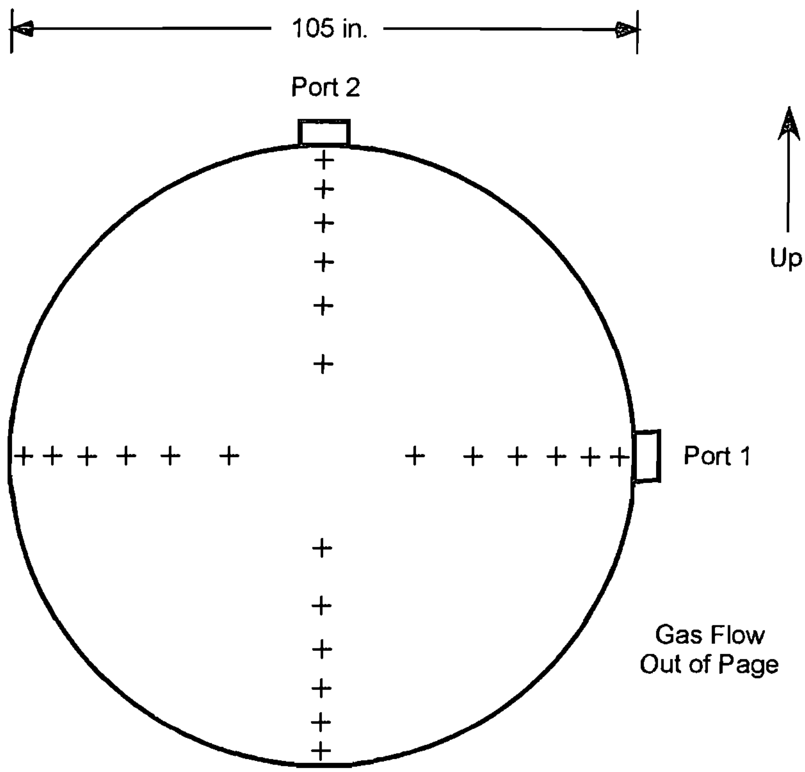
Sampling Point	Port to Point Distance (in.)
1	approximate center

Equivalent diameters to upstream disturbance: 2.0 Limit: 2.0
Equivalent diameters to downstream disturbance: 0.5 Limit: 0.5

Figure 3-3: SDA Inlets - Sampling Point Determination (HCl Sampling)
(Units 1, 2 and 3 are identical)

DESCRIPTION OF INSTALLATION

SAMPLING POINT DETERMINATION (CONTINUED)

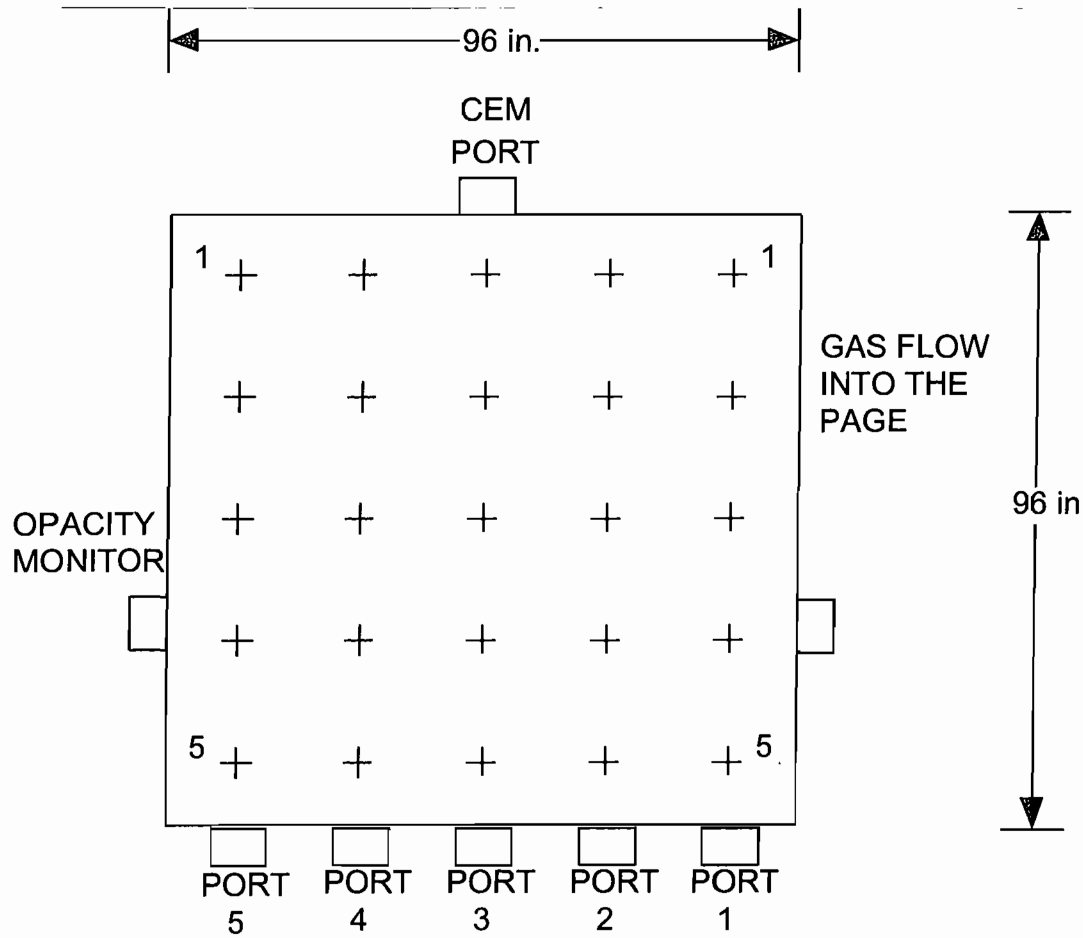


Sampling Point	Port to Point Distance (in.)
1	102.8
2	98.0
3	92.6
4	86.4
5	78.9
6	67.7
7	37.3
8	26.3
9	18.6
10	12.4
11	7.0
12	2.2

Diameters to upstream disturbance: >2.0 — Limit: 2.0
Diameters to downstream disturbance: >0.5 — Limit: 0.5

Figure 3-4: SDA Inlets - Sampling Point Determination (Hg Sampling)
(Units 1, 2 and 3 are identical)

DESCRIPTION OF SAMPLING LOCATIONS (CONTINUED)



Sampling Point	Port to Point Distance (in.)
1	86.4
2	67.2
3	48.0
4	28.8
5	9.6

Equivalent diameters to upstream disturbance: 2.0 Limit: 2.0
Equivalent diameters to downstream disturbance: 0.5 Limit: 0.5

Figure 3-5: FF Outlets - Sampling Point Determination (Units 1, 2 and 3 are identical)

End of Section 3 – Description of Installation

METHODOLOGY

Clean Air Engineering followed procedures as detailed in EPA Methods 1, 2, 3, 3A, 3B, 4, 5, 9, 13B, 22, 23, mod. 26A and 29. The following table summarizes the methods and their respective sources.

Table 4-1: Summary of Sampling Procedures

Title 40 CFR Part 60 Appendix A	
Method 1	"Sample and Velocity Traverses for Stationary Sources"
Method 2	"Determination of Stack Gas Velocity and Volumetric Flow Rate (Type S Pitot Tube)"
Method 3	"Gas Analysis for the Determination of Dry Molecular Weight"
Method 3A	"Determination of Oxygen and Carbon Dioxide Concentrations in Emissions from Stationary Sources (Instrumental Analyzer Procedure)"
Method 3B	"Gas Analysis for the Determination of Emission Rate Correction Factor or Excess Air"
Method 5	"Determination of Particulate Matter Emissions from Stationary Sources"
Method 9	"Visual Determination of the Opacity of Emissions from Stationary Sources"
Method 13B	"Determination of Total Fluoride Emissions from Stationary Sources (Specific Ion Electrode Method)"
Method 23	"Determination of Polychlorinated Dibenzo-p-Dioxins and Polychlorinated Dibenzofurans from Municipal Waste Conductors"
Method 22	"Visual Determination of Fugitive Emissions from Material Sources and Smoke Emissions from Flares"
Mod.Method 26A[1]	"Determination of Hydrogen Halide and Halogen Emissions from Stationary Sources Isokinetic Method"
Method 29	"Determination of Metals Emissions from Stationary Sources"

[1] Hydrogen chloride testing utilized a modification of EPA Method 26A (single point constant sampling rate) at the inlet and outlet sampling locations.

These methods appear in detail in Title 40 of the Code of Federal Regulations (CFR) and on the World Wide Web at http://www.cleanair.com.

Diagrams of the sampling apparatus and major specifications of the sampling, recovery and analytical procedures are summarized for each method in Appendix A.

CleanAir followed specific quality assurance and quality control (QA/QC) procedures as outlined in the individual methods and in EPA "Quality Assurance Handbook for Air Pollution Measurement Systems: Volume III Stationary Source-Specific Methods", EPA/600/R-94/038C. Additional QA/QC methods, as prescribed in CleanAir's internal Quality Manual, were also followed. Results of all QA/QC activities performed by CleanAir are summarized in Appendix E.

End of Section 4 – Methodology

APPENDIX

5-1

TEST METHOD SPECIFICATIONS

A

This Page Intentionally Left Blank

Specification Sheet for EPA Method 5/29

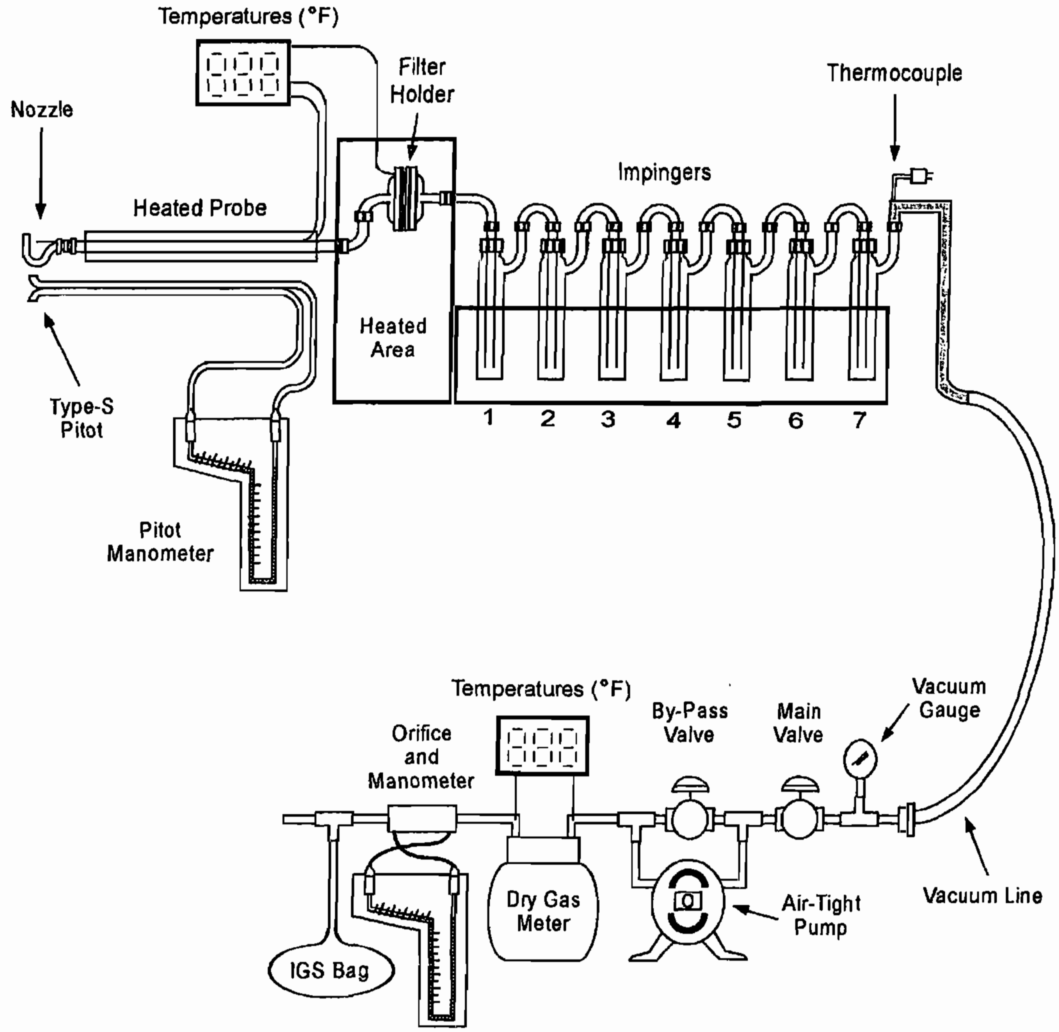
Source Location Name(s)	Units 1, 2 and 3 FF Outlets
Pollutant(s) to be Determined	Particulate Matter (PM) and Trace Metals (including Mercury)
Other Parameters to be Determined from Train	Gas Density, Moisture, Flow Rate

	Standard Method Specification	Actual Specification Used
Pollutant Sampling Information		
Duration of Run	N/A	125 minutes
No. of Sample Traverse Points	N/A	25
Sample Time per Point	N/A	5 minutes
Sampling Rate	Isokinetic (90-110%)	Isokinetic (90-110%)
Sampling Probe		
Nozzle Material	Borosilicate or Quartz Glass	Borosilicate Glass
Nozzle Design	Button-Hook or Elbow	Button-Hook
Probe Liner Material	Borosilicate or Quartz Glass	Borosilicate Glass
Effective Probe Length	N/A	8 feet
Probe Temperature Set-Point	248°F±25°F	248°F±25°F
Velocity Measuring Equipment		
Pitot Tube Design	Type S	Type S
Pitot Tube Coefficient	N/A	0.805
Pitot Tube Calibration by	Geometric or Wind Tunnel	Wind-Tunnel
Pitot Tube Attachment	Attached to Probe	Attached to Probe
Metering System Console		
Meter Type	Dry Gas Meter	Dry Gas Meter
Meter Accuracy	±2%	±1%
Meter Resolution	N/A	0.01 cubic feet
Meter Size	N/A	0.1 dcf/revolution
Meter Calibrated Against	Wet Test Meter or Standard DGM	Wet Test Meter
Pump Type	N/A	Rotary Vane
Temperature Measurements	N/A	Type K Thermocouple/Pyrometer
Temperature Resolution	5.4°F	1.0°F
ΔP Differential Pressure Gauge	Inclined Manometer or Equivalent	Inclined Manometer
ΔH Differential Pressure Gauge	Inclined Manometer or Equivalent	Inclined Manometer
Barometer	Mercury or Aneroid	Digital Barometer calibrated w/Mercury Aneroid
Filter Description		
Filter Location	After Probe	Exit of Probe
Filter Holder Material	Borosilicate Glass	Borosilicate Glass
Filter Support Material	Teflon (or other non-metallic material)	Teflon
Cyclone Material	N/A	None
Filter Heater Set-Point	248°F±25°F	248°F±25°F
Filter Material	Quartz or Fiberglass Fiber	Quartz Fiber
Other Components		
Description	N/A	N/A
Location	N/A	N/A
Operating Temperature	N/A	N/A

Specification Sheet for EPA Method 5/29

	Standard Method Specification	Actual Specification Used
Impinger Train Description		
Type of Glassware Connections	Ground Glass or Equivalent	Screw Joint with Silicone Gasket
Connection to Probe or Filter by	Direct Glass Connection	Direct Glass Connection
Number of Impingers	7	7
Impinger Stem Types		
Impinger 1	Modified Greenburg-Smith	Modified Greenburg-Smith
Impinger 2	Modified Greenburg-Smith	Modified Greenburg-Smith
Impinger 3	Greenburg-Smith	Greenburg-Smith
Impinger 4	Modified Greenburg-Smith	Modified Greenburg-Smith
Impinger 5	Modified Greenburg-Smith	Modified Greenburg-Smith
Impinger 6	Modified Greenburg-Smith	Modified Greenburg-Smith
Impinger 7	Modified Greenburg-Smith	Modified Greenburg-Smith
Impinger 8		
Gas Density Determination		
Sample Collection	Multi-point integrated	Multi-Point Integrated
Sample Collection Medium	Flexible Gas Bag	Vinyl Bag
Sample Analysis	Orsat or Fyrite Analyzer	CEM
Sample Recovery Information		
Probe Brush Material	Non-metallic swab or bristle	Teflon Mat
Probe Rinse Reagent	Acetone/0.1N Nitric Acid	Acetone/0.1N. Nitric Acid
Probe Rinse Wash Bottle Material	Glass or Teflon	Teflon
Probe Rinse Storage Container	See Method 29 Recovery Flow Chart	See Recovery Flow Chart
Filter Recovered?	Yes	Yes
Filter Storage Container	Petri Dish - Glass or Polystyrene	Glass
Impinger Contents Recovered?	Yes	Yes
Impinger Rinse Reagent	See Method 29 Recovery Flow Chart	See Recovery Flow Chart
Impinger Wash Bottle	Glass or Teflon	Teflon
Impinger Storage Container	See Recovery Flow Chart	See Recovery Flow Chart
Analytical Information		
Method 4 H_2O Determination by	Volumetric or Gravimetric	Gravimetric and Volumetric
Filter Preparation Conditions	See Method 29 Analytical Flow Chart	For Metals Analysis
Front-Half Rinse Preparation	See Method 29 Analytical Flow Chart	See Analytical Flow Chart
Back-Half Analysis	See Method 29 Analytical Flow Chart	See Analytical Flow Chart
Additional Analysis	Gravimetric (EPA Method 5)	Gravimetric (EPA Method 5)

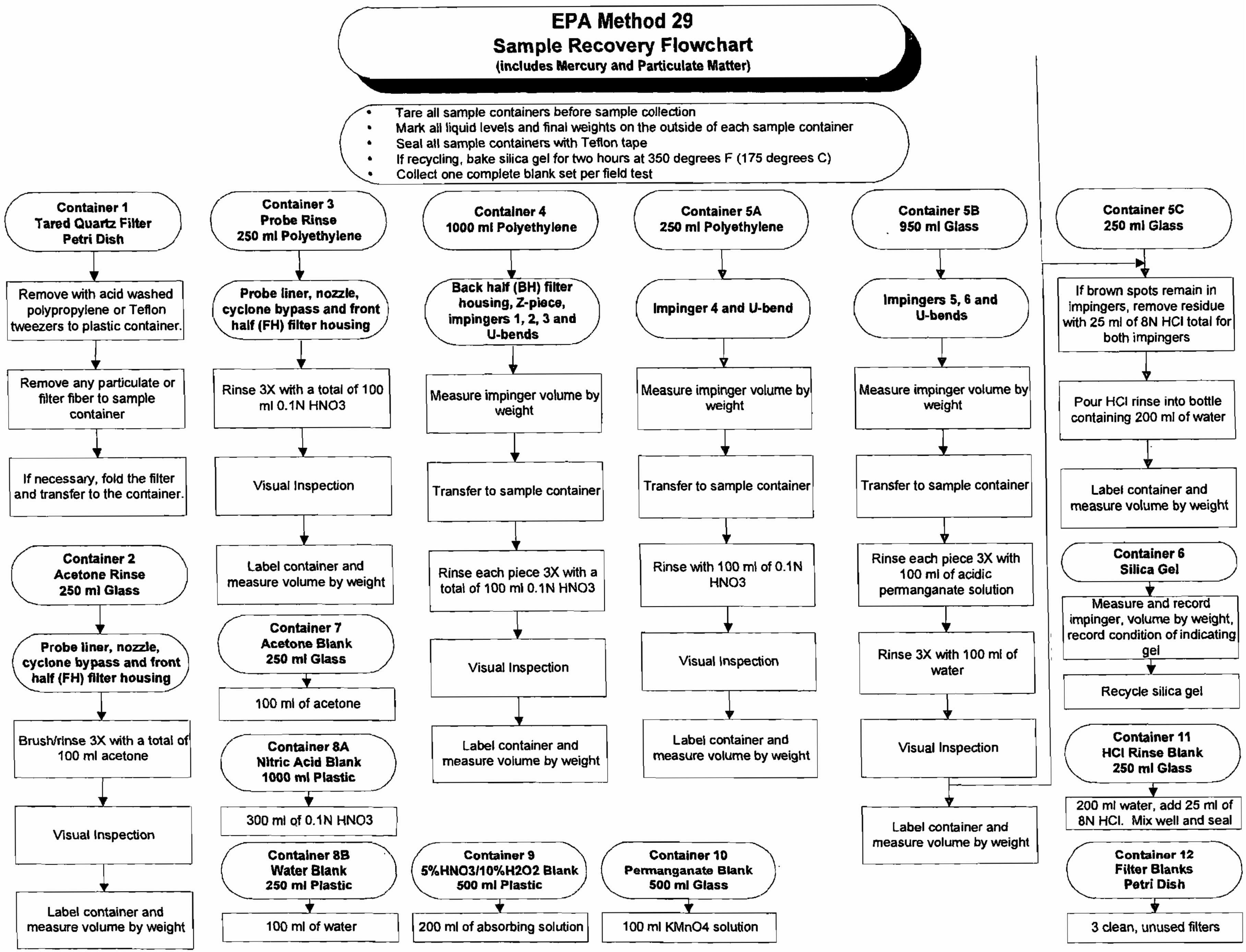
EPA Method 5/29
Sampling Train Configuration



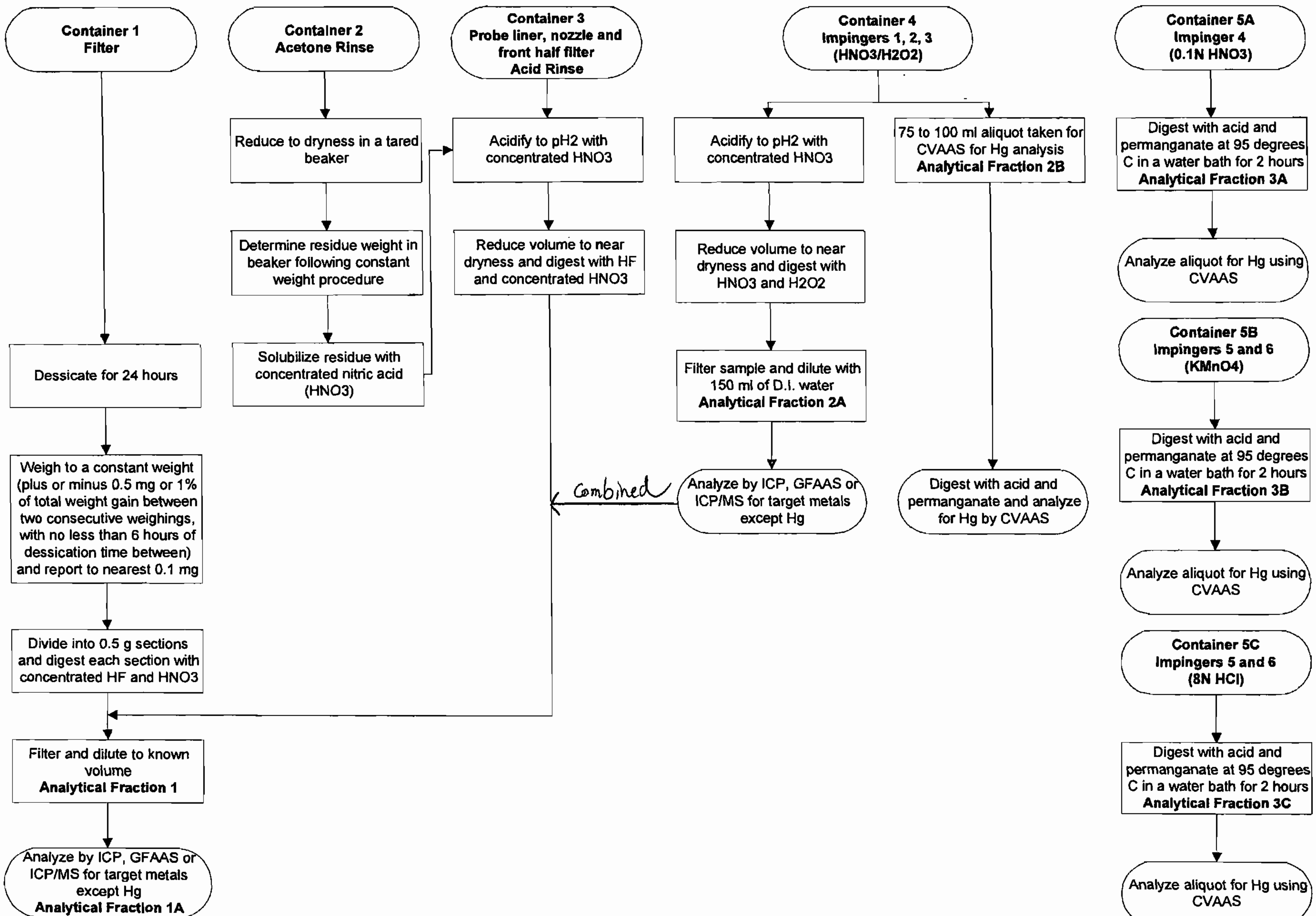
	Impinger Contents
Impinger 1	Empty
Impinger 2	100 ml 5% HNO_3 / 10% H_2O_2
Impinger 3	100 ml 5% HNO_3 / 10% H_2O_2
Impinger 4	Empty
Impinger 5	100 ml 4% $KMnO_4$ / 10% H_2SO_4
Impinger 6	100 ml 4% $KMnO_4$ / 10% H_2SO_4
Impinger 7	Silica Gel

EPA Method 29
Glassware Preparation Procedures

1. Wash with soap and hot tap water
2. Rinse 3X with hot tap water
3. Rinse 3X with D.I. water
4. Soak in 10% nitric acid bath for 4 hours
5. Rinse 3X with D.I. water
6. Rinse 3X with metals grade acetone
7. Allow to air dry
8. Cover all openings with parafilm


EPA Method 29
Sample Recovery Flowchart
(includes Mercury and Particulate Matter)
• Tare all sample containers before sample collection
• Mark all liquid levels and final weights on the outside of each sample container
• Seal all sample containers with Teflon tape
• If recycling, bake silica gel for two hours at 350 degrees F (175 degrees C)
• Collect one complete blank set per field test
Container 1 Tared Quartz Filter Petri Dish
Remove with acid washed polypropylene or Teflon tweezers to plastic container.
Remove any particulate or filter fiber to sample container
If necessary, fold the filter and transfer to the container.
Container 2 Acetone Rinse 250 ml Glass
Probe liner, nozzle, cyclone bypass and front half (FH) filter housing
Brush/rinse 3X with a total of 100 ml acetone
Visual Inspection
Label container and measure volume by weight
Container 3 Probe Rinse 250 ml Polyethylene
Probe liner, nozzle, cyclone bypass and front half (FH) filter housing
Rinse 3X with a total of 100 ml 0.1N HNO3
Visual Inspection
Label container and measure volume by weight
Container 7 Acetone Blank 250 ml Glass
100 ml of acetone
Container 8A Nitric Acid Blank 1000 ml Plastic
300 ml of 0.1N HNO3
Container 8B Water Blank 250 ml Plastic
100 ml of water
Container 4 1000 ml Polyethylene
Back half (BH) filter housing, Z-piece, impingers 1, 2, 3 and U-bends
Measure impinger volume by weight
Transfer to sample container
Rinse each piece 3X with a total of 100 ml 0.1N HNO3
Visual Inspection
Label container and measure volume by weight
Container 9 5%HNO3/10%H2O2 Blank 500 ml Plastic
200 ml of absorbing solution
Container 5A 250 ml Polyethylene
Impinger 4 and U-bend
Measure impinger volume by weight
Transfer to sample container
Rinse with 100 ml of 0.1N HNO3
Visual Inspection
Label container and measure volume by weight
Container 10 Permanganate Blank 500 ml Glass
100 ml KMnO4 solution
Container 5B 950 ml Glass
Impingers 5, 6 and U-bends
Measure impinger volume by weight
Transfer to sample container
Rinse each piece 3X with 100 ml of acidic permanganate solution
Rinse 3X with 100 ml of water
Visual Inspection
Label container and measure volume by weight
Container 5C 250 ml Glass
If brown spots remain in impingers, remove residue with 25 ml of 8N HCl total for both impingers
Pour HCl rinse into bottle containing 200 ml of water
Label container and measure volume by weight
Container 6 Silica Gel
Measure and record impinger, volume by weight, record condition of indicating gel
Recycle silica gel
Container 11 HCl Rinse Blank 250 ml Glass
200 ml water, add 25 ml of 8N HCl. Mix well and seal
Container 12 Filter Blanks Petri Dish
3 clean, unused filters

EPA Method 29
Analytical Flowchart
(includes Mercury and Particulate Matter)



Specification Sheet for EPA Method 29

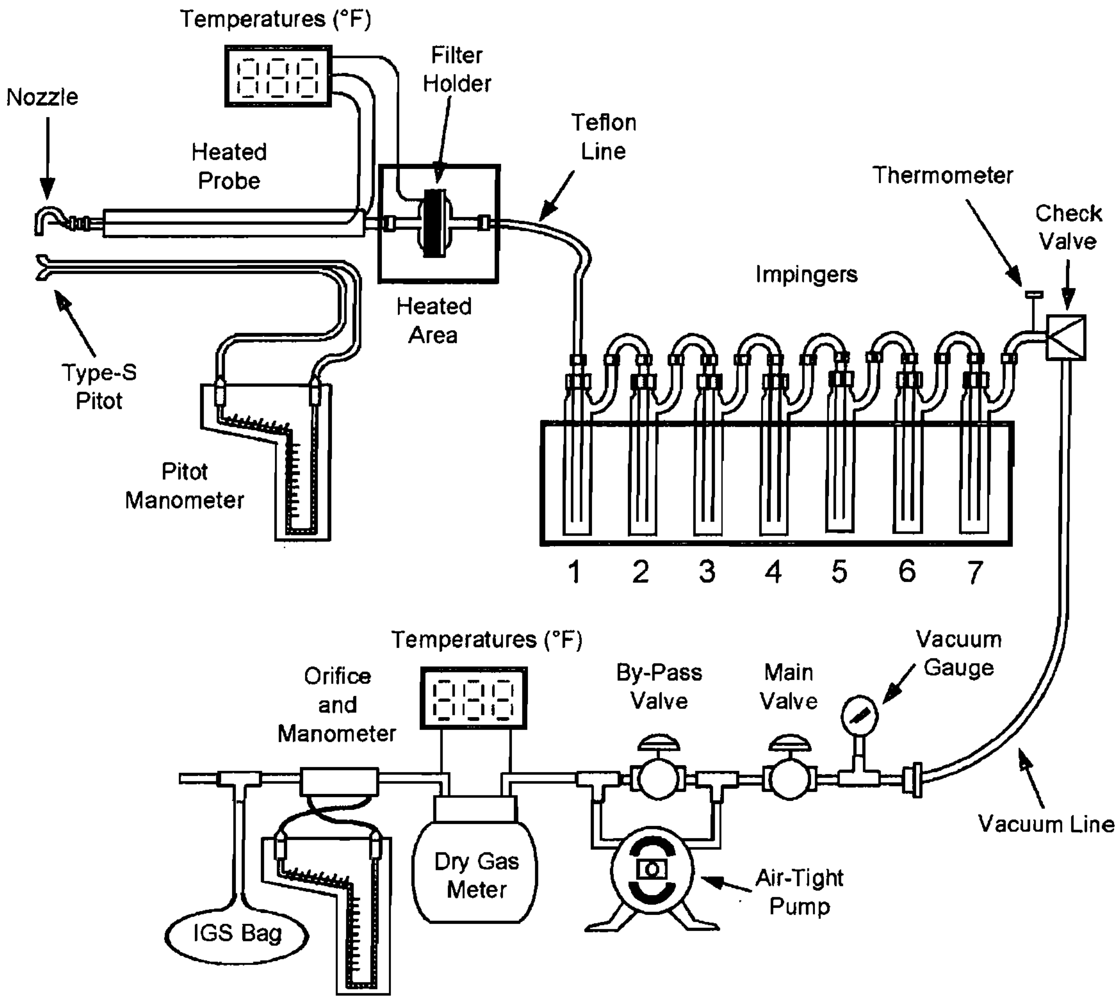
Source Location Name(s)	Units 1,2 and 3 SDA Inlets
Pollutant(s) to be Determined	Trace Metals (including Mercury)
Other Parameters to be Determined from Train	Gas Density, Moisture, Flow Rate

	Standard Method Specification	**Actual Specification Used**
Pollutant Sampling Information		
Duration of Run	N/A	120 minutes
No. of Sample Traverse Points	N/A	24
Sample Time per Point	N/A	5 minutes
Sampling Rate	Isokinetic (90-110%)	Isokinetic (90-110%)
Sampling Probe		
Nozzle Material	Borosilicate or Quartz Glass	Borosilicate Glass
Nozzle Design	Button-Hook or Elbow	Button-Hook
Probe Liner Material	Borosilicate or Quartz Glass	Borosilicate Glass
Effective Probe Length	N/A	10'
Probe Temperature Set-Point	248°F±25°F	248°F±25°F
Velocity Measuring Equipment		
Pitot Tube Design	Type S	Type S
Pitot Tube Coefficient	N/A	0.825
Pitot Tube Calibration by	Geometric or Wind Tunnel	Wind-Tunnel
Pitot Tube Attachment	Attached to Probe	Attached to Probe
Metering System Console		
Meter Type	Dry Gas Meter	Dry Gas Meter
Meter Accuracy	±2%	±1%
Meter Resolution	N/A	0.01 cubic feet
Meter Size	N/A	0.1 dcf/revolution
Meter Calibrated Against	Wet Test Meter or Standard DGM	Wet Test Meter
Pump Type	N/A	Rotary Vane
Temperature Measurements	N/A	Type K Thermocouple/Pyrometer
Temperature Resolution	5.4°F	1.0°F
ΔP Differential Pressure Gauge	Inclined Manometer or Equivalent	Inclined Manometer
ΔH Differential Pressure Gauge	Inclined Manometer or Equivalent	Inclined Manometer
Barometer	Mercury or Aneroid	Digital Barometer calibrated w/Mercury Aneroid
Filter Description		
Filter Location	After Probe	Exit of Probe
Filter Holder Material	Borosilicate Glass	Borosilicate Glass
Filter Support Material	Teflon (or other non-metallic)	Teflon
Cyclone Material	N/A	None
Filter Heater Set-Point	248°F±25°F	248°F±25°F
Filter Material	Quartz or Glass Fiber	Quartz Fiber
Other Components		
Description	N/A	N/A
Location	N/A	N/A
Operating Temperature	N/A	N/A

Specification Sheet for EPA Method 29

	Standard Method Specification	Actual Specification Used
Impinger Train Description		
Type of Glassware Connections	Ground Glass or Equivalent	Screw Joint with Silicone Gasket
Connection to Probe or Filter by	Direct Glass Connection	Direct Glass Connection
Number of Impingers	7	7
Impinger Stem Types		
Impinger 1	Modified Greenburg-Smith	Modified Greenburg-Smith
Impinger 2	Modified Greenburg-Smith	Modified Greenburg-Smith
Impinger 3	Greenburg-Smith	Greenburg-Smith
Impinger 4	Modified Greenburg-Smith	Modified Greenburg-Smith
Impinger 5	Modified Greenburg-Smith	Modified Greenburg-Smith
Impinger 6	Modified Greenburg-Smith	Modified Greenburg-Smith
Impinger 7	Modified Greenburg-Smith	Modified Greenburg-Smith
Impinger 8		
Gas Density Determination		
Sample Collection	Multi-point integrated	Multi-Point Integrated
Sample Collection Medium	Flexible Gas Bag	Vinyl Bag
Sample Analysis	Orsat or Fyrite Analyzer	CEM
Sample Recovery Information		
Probe Brush Material	Non-metallic swab or bristle	Teflon Mat
Probe Rinse Reagent	0.1N Nitric Acid	0.1 N Nitric Acid
Probe Rinse Wash Bottle Material	Glass or Teflon	Teflon
Probe Rinse Storage Container	Polyethylene or glass	Polyethylene
Filter Recovered?	Yes	Yes
Filter Storage Container	Petri Dish - Glass or Polystyrene	Polyethylene
Impinger Contents Recovered?	Yes	Yes
Impinger Rinse Reagent	See Method 29 Recovery Flow Chart	See Recovery Flow Chart
Impinger Wash Bottle	Glass or Teflon	Teflon
Impinger Storage Container	See Recovery Flow Chart	See Recovery Flow Chart
Analytical Information		
Method 4 H_2O Determination by	Volumetric or Gravimetric	Gravimetric and Volumetric
Filter Preparation Conditions	See Method 29 Analytical Flow Chart	For Metals Analysis
Front-Half Rinse Preparation	See Method 29 Analytical Flow Chart	See Analytical Flow Chart
Back-Half Analysis	See Method 29 Analytical Flow Chart	See Analytical Flow Chart
Additional Analysis	None	None

EPA Method 29 SDA Inlet Sampling Train Configuration



	Impinger Contents
Impinger 1	Empty
Impinger 2	100 ml 5% HNO_3 / 10% H_2O_2
Impinger 3	100 ml 5% HNO_3 / 10% H_2O_2
Impinger 4	Empty
Impinger 5	100 ml 4% $KMnO_4$ / 10% H_2SO_4
Impinger 6	100 ml 4% $KMnO_4$ / 10% H_2SO_4
Impinger 7	Silica Gel

EPA Method 29
Glassware Preparation Procedures

Wash with soap and hot tap water

↓

Rinse 3X with hot tap water

↓

Rinse 3X with D.I. water

↓

Soak in 10% nitric acid bath for 4 hours

↓

Rinse 3X with D.I. water

↓

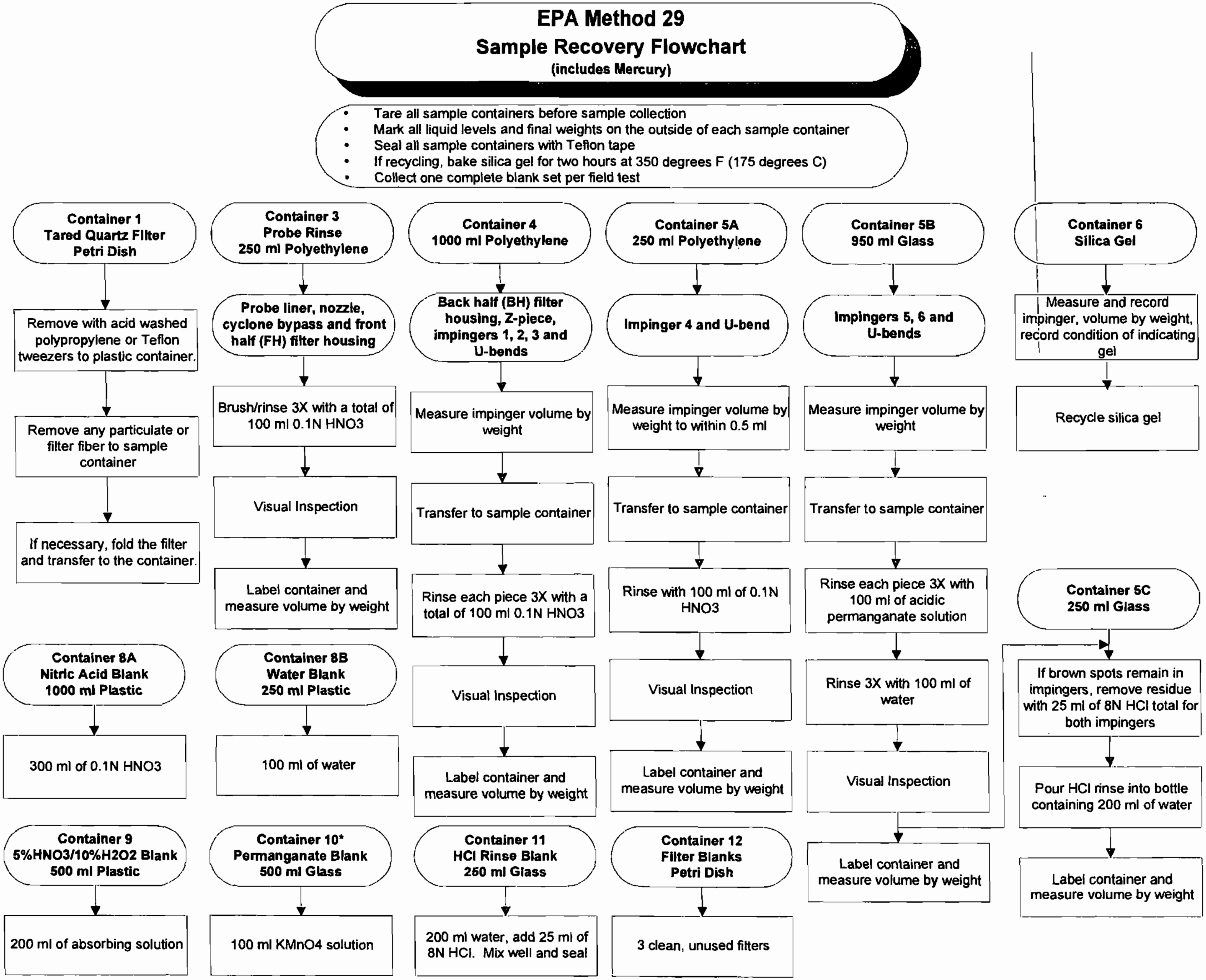
Rinse 3X with metals grade acetone

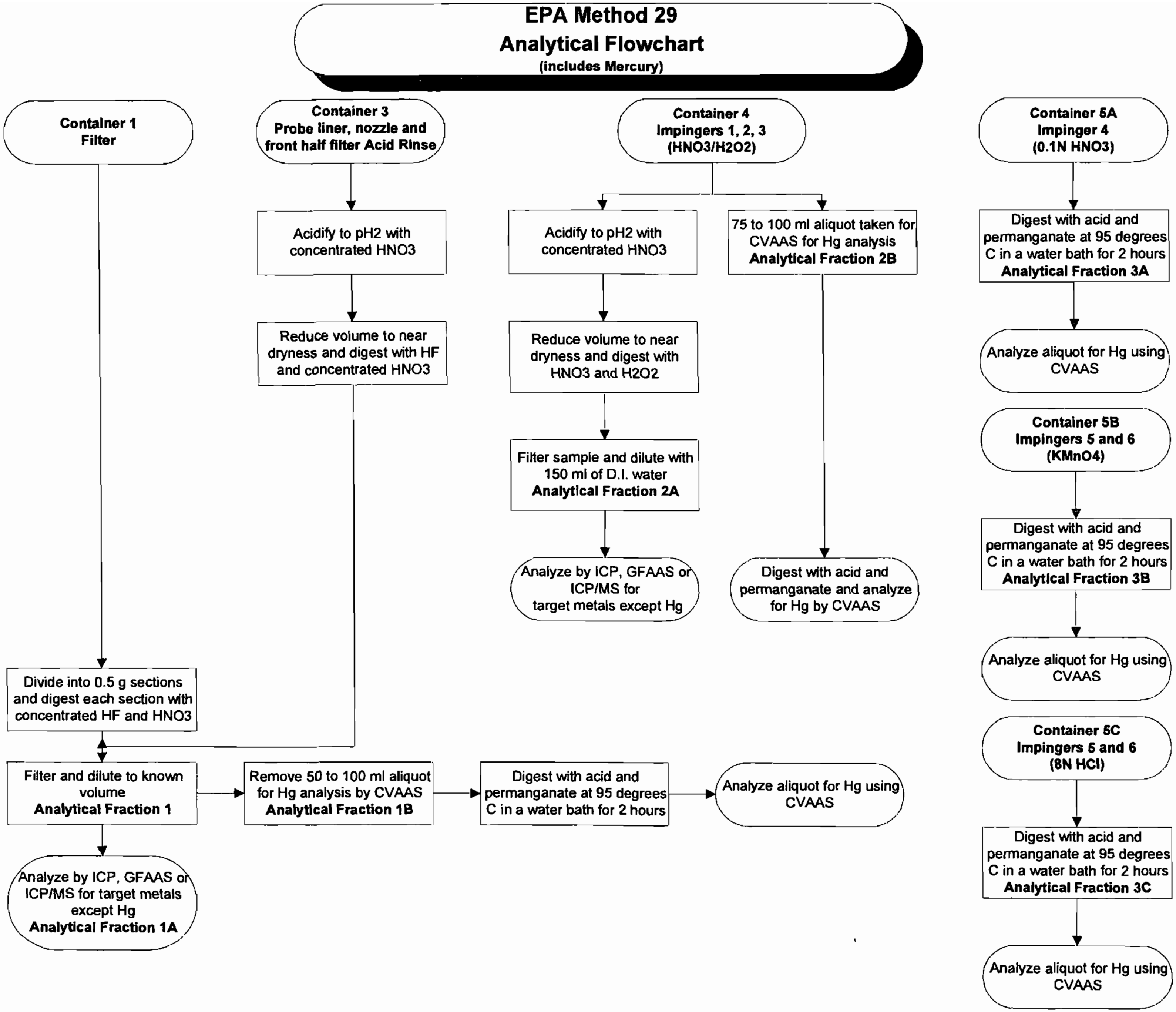
↓

Allow to air dry

↓

Cover all openings with parafilm


EPA Method 29
Sample Recovery Flowchart
(includes Mercury)
• Tare all sample containers before sample collection
• Mark all liquid levels and final weights on the outside of each sample container
• Seal all sample containers with Teflon tape
• If recycling, bake silica gel for two hours at 350 degrees F (175 degrees C)
• Collect one complete blank set per field test
Container 1 Tared Quartz Filter Petri Dish
Remove with acid washed polypropylene or Teflon tweezers to plastic container.
Remove any particulate or filter fiber to sample container
If necessary, fold the filter and transfer to the container.
Container 3 Probe Rinse 250 ml Polyethylene
Probe liner, nozzle, cyclone bypass and front half (FH) filter housing
Brush/rinse 3X with a total of 100 ml 0.1N HNO3
Visual Inspection
Label container and measure volume by weight
Container 4 1000 ml Polyethylene
Back half (BH) filter housing, Z-piece, impingers 1, 2, 3 and U-bends
Measure impinger volume by weight
Transfer to sample container
Rinse each piece 3X with a total of 100 ml 0.1N HNO3
Visual Inspection
Label container and measure volume by weight
Container 5A 250 ml Polyethylene
Impinger 4 and U-bend
Measure impinger volume by weight to within 0.5 ml
Transfer to sample container
Rinse with 100 ml of 0.1N HNO3
Visual Inspection
Label container and measure volume by weight
Container 5B 950 ml Glass
Impingers 5, 6 and U-bends
Measure impinger volume by weight
Transfer to sample container
Rinse each piece 3X with 100 ml of acidic permanganate solution
Rinse 3X with 100 ml of water
Visual Inspection
Label container and measure volume by weight
Container 6 Silica Gel
Measure and record impinger, volume by weight, record condition of indicating gel
Recycle silica gel
Container 5C 250 ml Glass
If brown spots remain in impingers, remove residue with 25 ml of 8N HCl total for both impingers
Pour HCl rinse into bottle containing 200 ml of water
Label container and measure volume by weight
Container 8A Nitric Acid Blank 1000 ml Plastic
300 ml of 0.1N HNO3
Container 8B Water Blank 250 ml Plastic
100 ml of water
Container 9 5%HNO3/10%H2O2 Blank 500 ml Plastic
200 ml of absorbing solution
Container 10* Permanganate Blank 500 ml Glass
100 ml KMnO4 solution
Container 11 HCl Rinse Blank 250 ml Glass
200 ml water, add 25 ml of 8N HCl. Mix well and seal
Container 12 Filter Blanks Petri Dish
3 clean, unused filters


EPA Method 29
Analytical Flowchart
(includes Mercury)
Container 1
Filter
Container 3
Probe liner, nozzle and front half filter Acid Rinse
Container 4
Impingers 1, 2, 3
(HNO3/H2O2)
Container 5A
Impinger 4
(0.1N HNO3)
Acidify to pH2 with concentrated HNO3
Acidify to pH2 with concentrated HNO3
75 to 100 ml aliquot taken for CVAAS for Hg analysis
Analytical Fraction 2B
Digest with acid and permanganate at 95 degrees C in a water bath for 2 hours
Analytical Fraction 3A
Reduce volume to near dryness and digest with HF and concentrated HNO3
Reduce volume to near dryness and digest with HNO3 and H2O2
Analyze aliquot for Hg using CVAAS
Container 5B
Impingers 5 and 6
(KMnO4)
Filter sample and dilute with 150 ml of D.I. water
Analytical Fraction 2A
Digest with acid and permanganate at 95 degrees C in a water bath for 2 hours
Analytical Fraction 3B
Analyze by ICP, GFAAS or ICP/MS for target metals except Hg
Digest with acid and permanganate and analyze for Hg by CVAAS
Analyze aliquot for Hg using CVAAS
Divide into 0.5 g sections and digest each section with concentrated HF and HNO3
Container 5C
Impingers 5 and 6
(8N HCl)
Filter and dilute to known volume
Analytical Fraction 1
Remove 50 to 100 ml aliquot for Hg analysis by CVAAS
Analytical Fraction 1B
Digest with acid and permanganate at 95 degrees C in a water bath for 2 hours
Analyze aliquot for Hg using CVAAS
Digest with acid and permanganate at 95 degrees C in a water bath for 2 hours
Analytical Fraction 3C
Analyze by ICP, GFAAS or ICP/MS for target metals except Hg
Analytical Fraction 1A
Analyze aliquot for Hg using CVAAS

Specification Sheet for EPA Method 13B

Source Location Name(s)	Units 1 ,2 and 3 FF Outlets
Pollutant(s) to be Determined	Total Fluoride (F)
Other Parameters to be Determined from Trai	Gas Density, Moisture, Flow Rate

	Standard Method Specification	Actual Specification Used
Pollutant Sampling Information		
Duration of Run	N/A	62.5 minutes
No. of Sample Traverse Points	N/A	25
Sample Time per Point	N/A	2.5 minutes
Sampling Rate	Isokinetic (90-110%) 1 cfm maximum	Isokinetic (90-110%) 1 cfm maximum
Sampling Probe		
Nozzle Material	Stainless Steel or Glass	Borosilicate Glass
Nozzle Design	Button-Hook or Elbow	Button-Hook
Probe Liner Material	Stainless Steel or Glass	Borosilicate Glass
Effective Probe Length	N/A	8 feet
Probe Temperature Set-Point	248°F±25°F (optional)	248°F±25°F
Velocity Measuring Equipment		
Pitot Tube Design	Type S	Type S
Pitot Tube Coefficient	N/A	0.812
Pitot Tube Calibration by	Geometric or Wind Tunnel	Wind-Tunnel
Pitot Tube Attachment	Attached to Probe	Attached to Probe
Metering System Console		
Meter Type	Dry Gas Meter	Dry Gas Meter
Meter Accuracy	±2%	±1%
Meter Resolution	N/A	0.01 cubic feet
Meter Size	N/A	0.1 dcf/revolution
Meter Calibrated Against	Wet Test Meter or Standard DGM	Wet Test Meter
Pump Type	N/A	Rotary Vane
Temperature Measurements	N/A	Type K Thermocouple/Pyrometer
Temperature Resolution	5.4°F	1.0°F
ΔP Differential Pressure Gauge	Inclined Manometer or Equivalent	Inclined Manometer
ΔH Differential Pressure Gauge	Inclined Manometer or Equivalent	Inclined Manometer
Barometer	Mercury or Aneroid	Digital Barometer calibrated w/Mercury Aneroid
Filter Description		
Filter Location	Exit of Probe or Between 3rd and 4th impingers	Exit of Probe
Filter Holder Material	Borosilicate Glass or Stainless Steel	Borosilicate Glass
Filter Support Material	Stainless Steel if filter at probe exit; Glass Frit if filter after 3rd impinger	Teflon
Cyclone Material	N/A	None
Filter Heater Set-Point	248°F±25°F if after probe, unheated if after 3rd imp.	248°F±25°F
Filter Material	Low F Quartz or Fiberglass if after probe, Whatman No. 1 if after 3rd impinger	Whatman No. 1 (Ashless)
Other Components		
Description	N/A	N/A
Location	N/A	N/A
Operating Temperature	N/A	N/A

Specification Sheet for EPA Method 13B

	Standard Method Specification	Actual Specification Used
Impinger Train Description		
Type of Glassware Connections	Ground Glass or Equivalent	Screw Joint with Silicone Gasket
Connection to Probe or Filter by	Direct Glass Connection	Direct Glass Connection
Number of Impingers	4	4
Impinger Stem Types		
Impinger 1	Modified Greenburg-Smith	Modified Greenburg-Smith
Impinger 2	Greenburg-Smith	Greenburg-Smith
Impinger 3	Modified Greenburg-Smith	Modified Greenburg-Smith
Impinger 4	Modified Greenburg-Smith	Modified Greenburg-Smith
Impinger 5		
Impinger 6		
Impinger 7		
Impinger 8		
Gas Density Determination		
Sample Collection	Multi-point integrated	Multi-Point Integrated
Sample Collection Medium	Flexible Gas Bag	Vinyl Bag
Sample Analysis	Orsat or Fyrite Analyzer	CEM
Sample Recovery Information		
Probe Brush Material	Nylon Bristle	Nylon Bristle
Probe Rinse Reagent	Deionized distilled water	Deionized Distilled Water
Probe Rinse Wash Bottle Material	Glass or Polyethylene	Teflon
Probe Rinse Storage Container	Polyethylene	Polyethylene
Filter Recovered?	Yes	Yes
Filter Storage Container	Polyethylene	Polyethylene
Impinger Contents Recovered?	Yes	Yes
Impinger Rinse Reagent	Deionized Distilled Water	Deionized Distilled Water
Impinger Wash Bottle	Glass or Polyethylene	Teflon
Impinger Storage Container	Polyethylene	Polyethylene
Analytical Information		
Method 4 H_2O Determination by	Volumetric or Gravimetric	Gravimetric and Volumetric
Filter Preparation Conditions	See analytical flow chart	See Analytical Flow Chart
Front-Half Rinse Preparation	See analytical flow chart	See Analytical Flow Chart
Back-Half Analysis	Ion Specific Electrode	Ion Chromatography
Additional Analysis	N/A	None

EPA Method 13B
Glassware Preparation Procedures

Wash with soap and hot tap water

↓

Rinse 3X with hot tap water

↓

Rinse 3X with D.I. water

↓

Rinse 3X with acetone

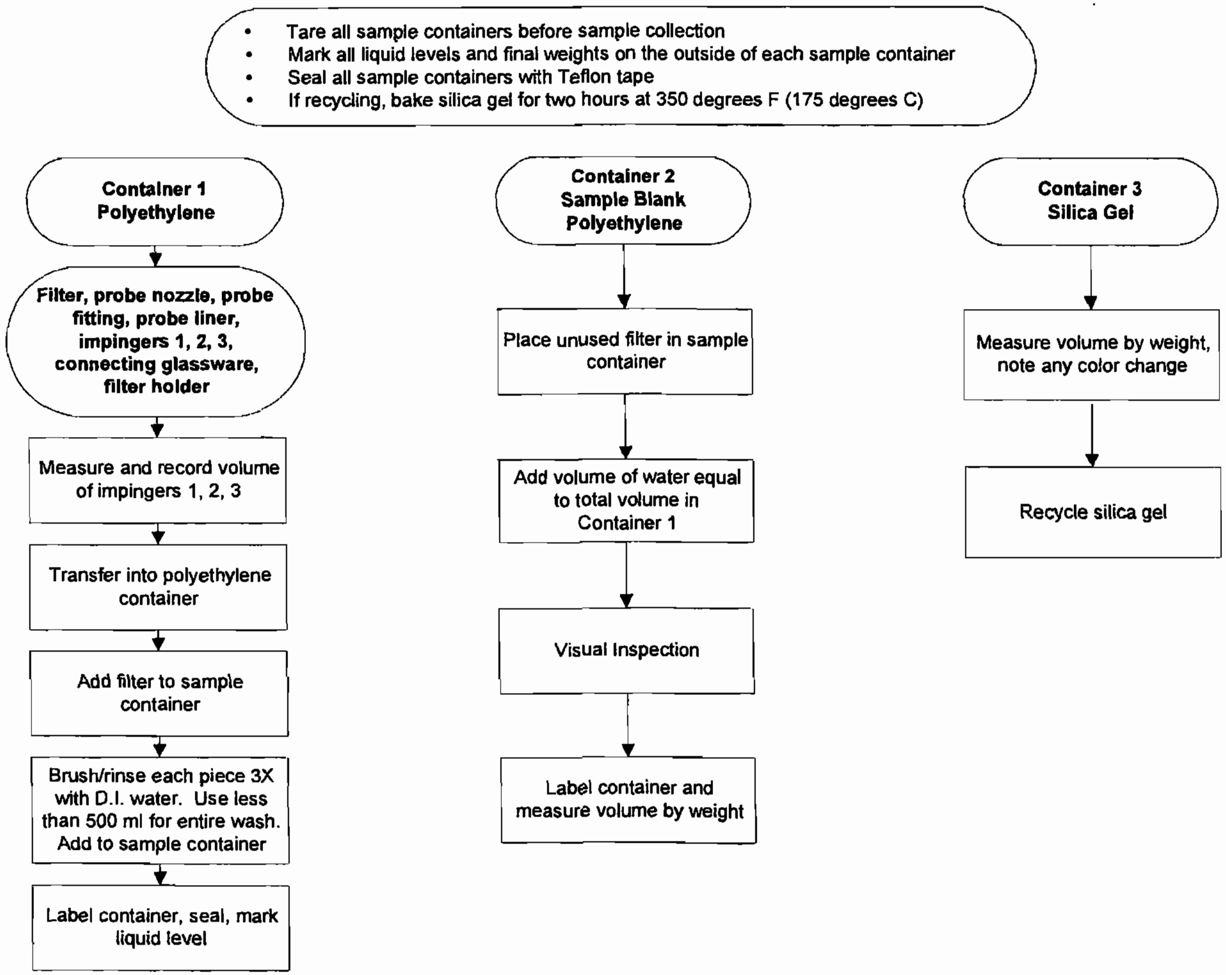
↓

Allow to air dry

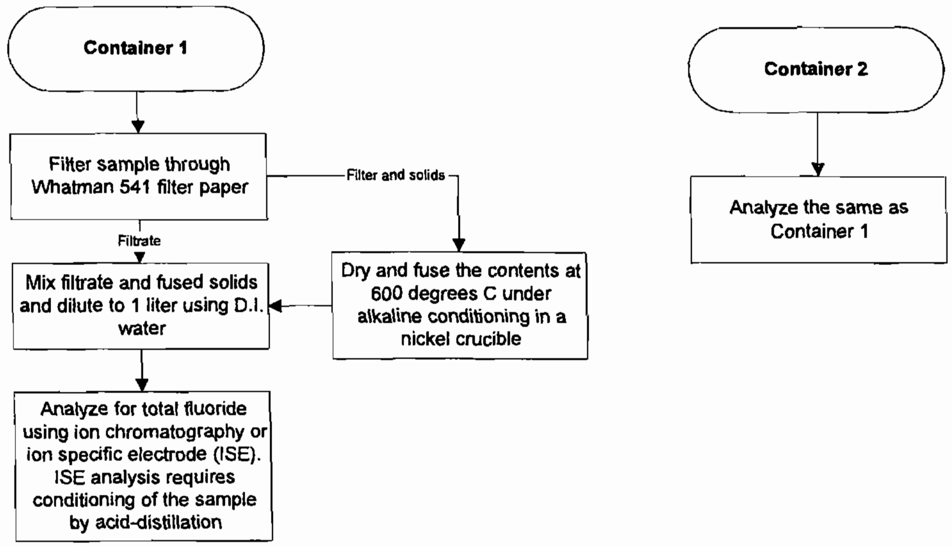
↓

Cap all openings with Kim Wipes

EPA Method 13B Sample Recovery Flowchart



EPA Method 13B
Analytical Flowchart



Specification Sheet for EPA Method 23

Source Location Name(s)	Unit 2 FF Outlet
Pollutant(s) to be Determined	Polychlorinated Dibenzo-p-Dioxins and Polychlorinated Dibenzofurans (PCDD/PCDF)
Other Parameters to be Determined from Train	Gas Density, Moisture, Flow Rate

	Standard Method Specification	Actual Specification Used
Pollutant Sampling Information		
Duration of Run	N/A	250 minutes
No. of Sample Traverse Points	N/A	25
Sample Time per Point	N/A	10 minutes
Sampling Rate	Isokinetic (90-110%)	Isokinetic (90-110%)
Sampling Probe		
Nozzle Material	Nickel, Quartz, Stainless Steel or Glass	Borosilicate Glass
Nozzle Design	Button-Hook or Elbow	Button-Hook
Probe Liner Material	Borosilicate or Quartz Glass	Borosilicate Glass
Effective Probe Length	N/A	8 feet
Probe Temperature Set-Point	248°F±25°F	248°F±25°F
Velocity Measuring Equipment		
Pitot Tube Design	Type S	Type S
Pitot Tube Coefficient	N/A	0.834
Pitot Tube Calibration by	Geometric or Wind Tunnel	Wind-Tunnel
Pitot Tube Attachment	Attached to Probe	Attached to Probe
Metering System Console		
Meter Type	Dry Gas Meter	Dry Gas Meter
Meter Accuracy	±2%	±1%
Meter Resolution	N/A	0.01 cubic feet
Meter Size	N/A	0.1 dcf/revolution
Meter Calibrated Against	Wet Test Meter or Standard DGM	Wet Test Meter
Pump Type	N/A	Rotary Vane
Temperature Measurements	N/A	Type K Thermocouple/Pyrometer
Temperature Resolution	5.4°F	1.0°F
ΔP Differential Pressure Gauge	Inclined Manometer or Equivalent	Inclined Manometer
ΔH Differential Pressure Gauge	Inclined Manometer or Equivalent	Inclined Manometer
Barometer	Mercury or Aneroid	Digital Barometer calibrated w/Mercury Aneroid
Filter Description		
Filter Location	After Probe	Exit of Probe
Filter Holder Material	Borosilicate Glass	Borosilicate Glass
Filter Support Material	Glass Frit	Teflon
Cyclone Material	N/A	None
Filter Heater Set-Point	248°F±25°F	248°F±25°F
Filter Material	Glass Fiber - Toluene Extracted	Glass Fiber - Toluene Extracted
Other Components		
Adsorbent Module	XAD-2 Trap	XAD-II Adsorbent Trap
Location	After filter and condenser	After filter and condenser
Operating Temperature	< 68°F	<68°F

Specification Sheet for EPA Method 23

	Standard Method Specification	Actual Specification Used
Impinger Train Description		
Type of Glassware Connections	Ground Glass or Equivalent	Screw Joint with Silicone Gasket
Connection to Probe or Filter by	Direct Glass Connection	Direct Glass Connection
Number of Impingers	5	5
Impinger Stem Types		
Impinger 1	Modified Greenburg-Smith	Shortened Stem (open tip)
Impinger 2	Modified Greenburg-Smith	Modified Greenburg-Smith
Impinger 3	Greenburg-Smith	Greenburg-Smith
Impinger 4	Modified Greenburg-Smith	Modified Greenburg-Smith
Impinger 5	Modified Greenburg-Smith	Modified Greenburg-Smith
Impinger 6		
Impinger 7		
Impinger 8		
Gas Density Determination		
Sample Collection	Multi-point integrated	Multi-Point Integrated
Sample Collection Medium	Flexible Gas Bag	Vinyl Bag
Sample Analysis	Orsat or Fyrite Analyzer	CEM
Sample Recovery Information		
Probe Brush Material	Inert Bristle	Teflon Mat
Probe Rinse Reagent	Acetone/Methylene Chloride/Toluene	Acetone/Toluene (see Appendix J)
Probe Rinse Wash Bottle Material	Glass or Teflon	Teflon
Probe Rinse Storage Container	Glass	Glass
Filter Recovered?	Yes	Yes
Filter Storage Container	Petri Dish - Glass or Polystyrene	Glass
Impinger Contents Recovered?	No	Archived
Impinger Rinse Reagent	N/A	HPLC Water
Impinger Wash Bottle	N/A	Teflon
Impinger Storage Container	N/A	Polyethylene
Analytical Information		
Method 4 H_2O Determination by	Volumetric or Gravimetric	Gravimetric
Filter Preparation Conditions	See Method 23 Analytical Flow Chart	For Organic Analysis
Front-Half Rinse Preparation	See Method 23 Analytical Flow Chart	Organic Analysis
Back-Half Analysis	N/A	Archive
Additional Analysis	None	None

EPA Method 23
Glassware Preparation Procedures

Wash with soap and hot tap water

↓

Rinse 3X with hot tap water

↓

Rinse 3X with D.I. water

↓

Oven dry at 450 degrees F for 2 hours

↓

Rinse 3X with acetone

↓

Rinse 3X with methylene chloride (MeCl2)

↓

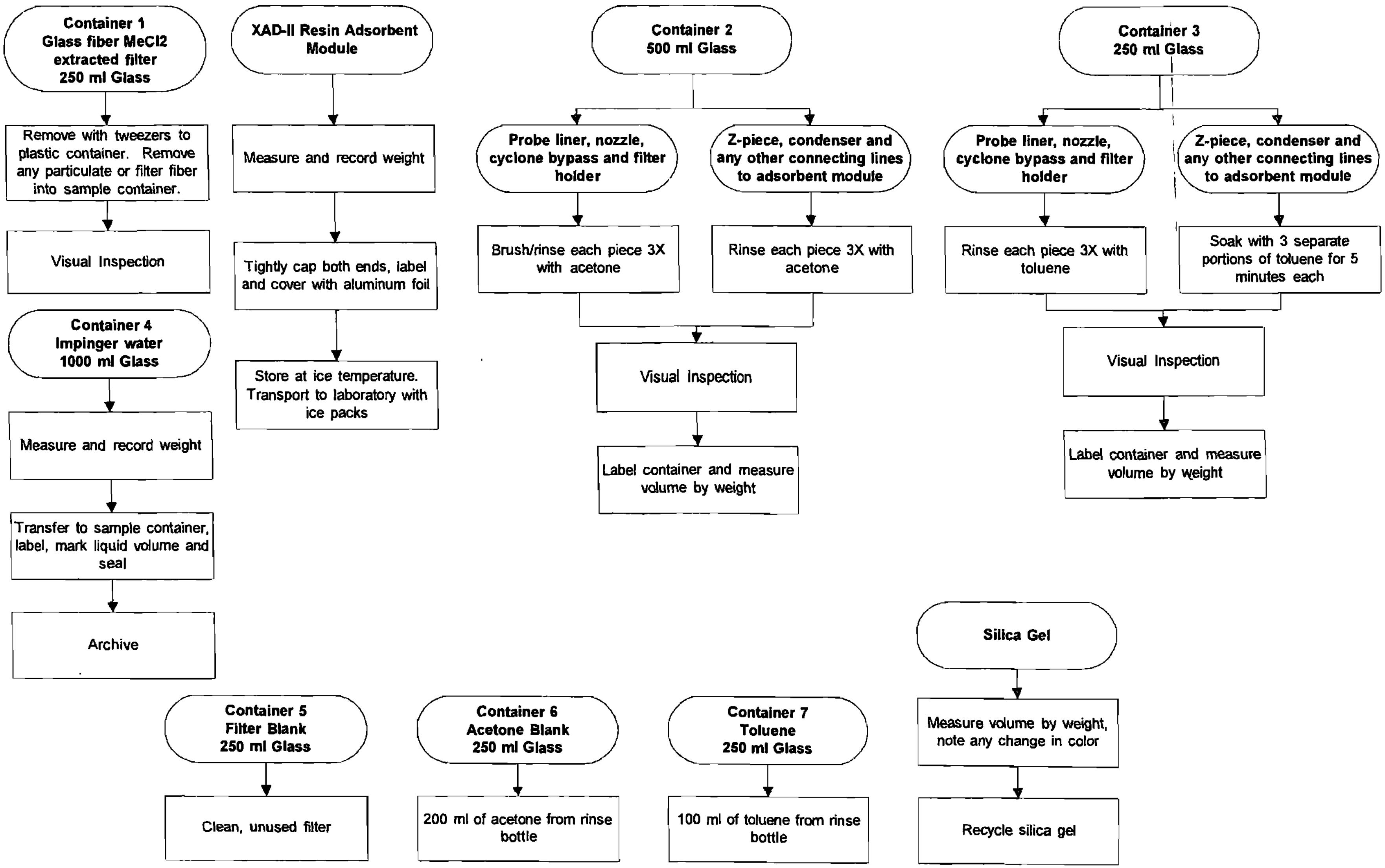
Allow to air dry

↓

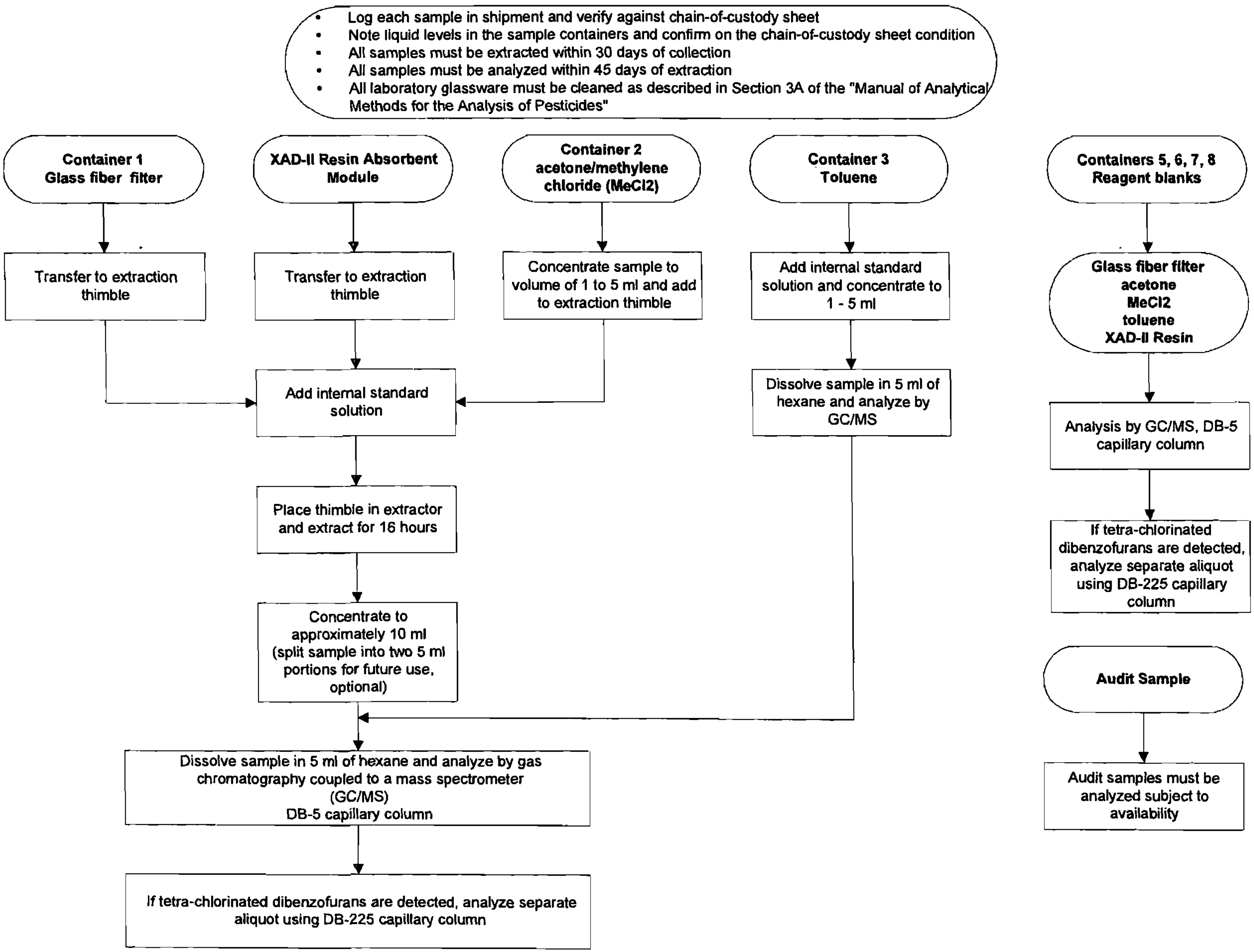
Cover all openings with MeCl2 cleaned aluminum foil

EPA Method 23
Sample Recovery Flowchart

- Tare all sample containers before sample collection
- Mark all liquid levels and final weights on the outside of each sample container
- Seal all sample containers with Teflon tape
- If recycling, bake silica gel for two hours at 350 degrees F (175 degrees C)



EPA Method 23
Analytical Flowchart



Specification Sheet for EPA Method 26A (modified)

Note: Modification includes the use of full-size impingers instead of midget impingers.

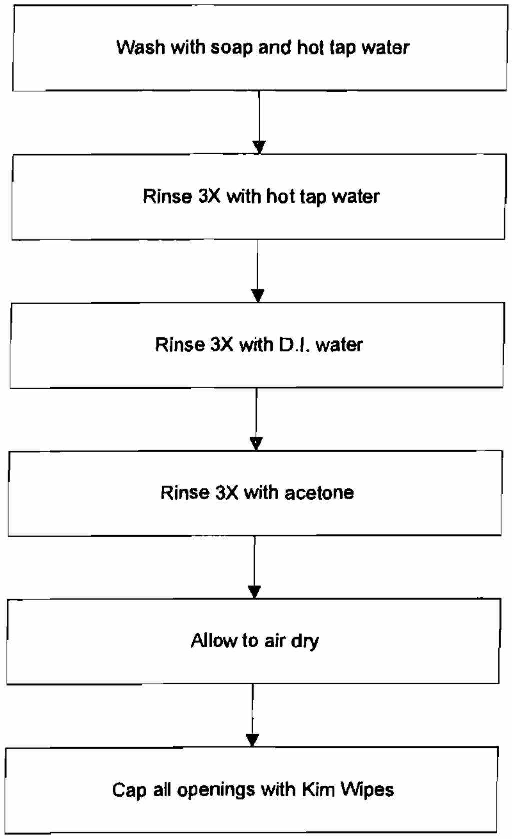
Source Location Name(s)	Units 1-3 SDA Inlets and Units 1-3 FF Outlets
Pollutant(s) to be Determined	Hydrogen Chloride (HCl)
Other Parameters to be Determined from Train	Gas Density, Moisture

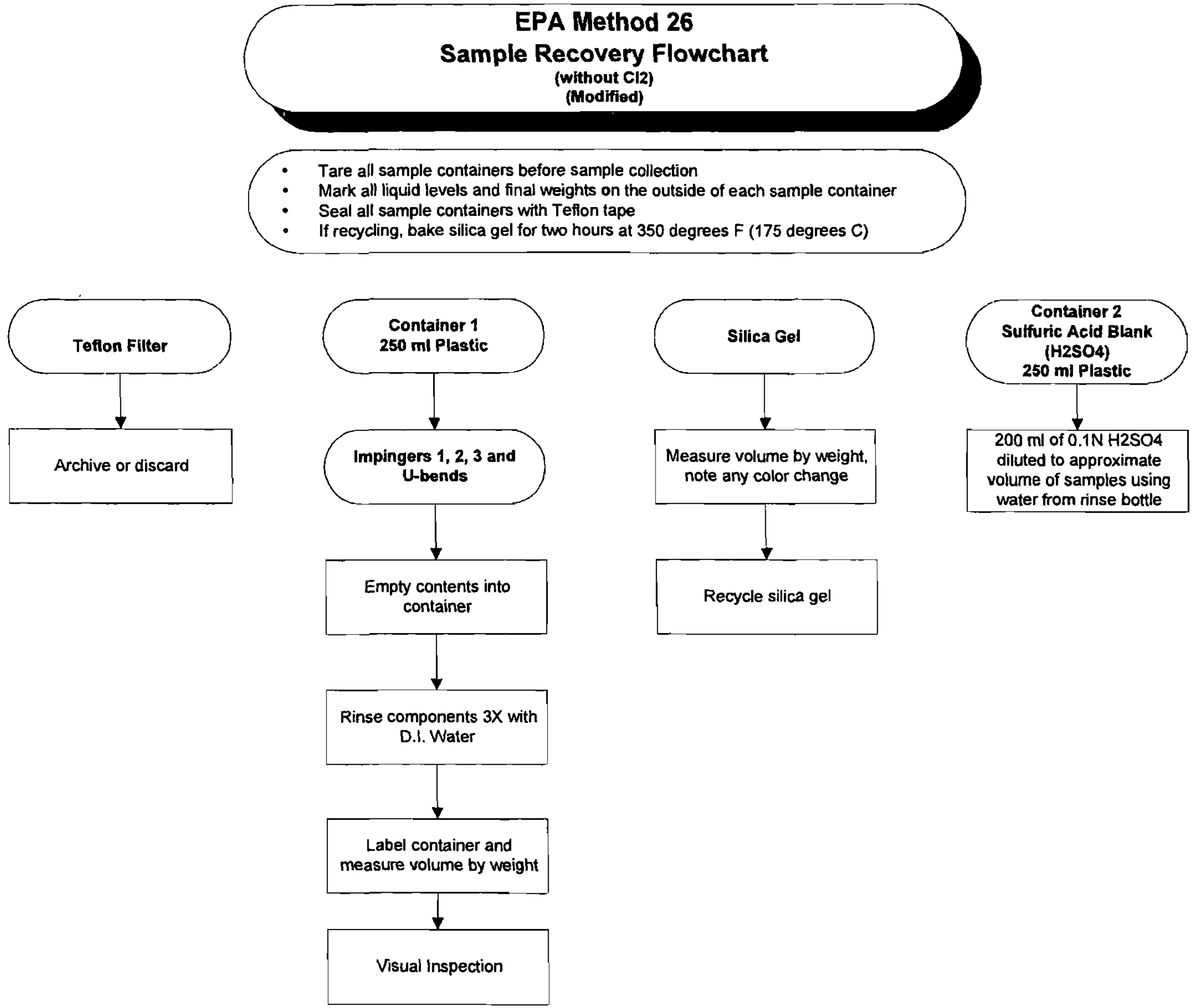
	Standard Method Specification	**Actual Specification Used**
Pollutant Sampling Information		
Duration of Run	N/A	60 minutes
No. of Sample Traverse Points	N/A	1
Sample Time per Point	N/A	60 minutes
Sampling Rate	Constant Rate (±10%)	Constant Rate (±10%)
Sampling Probe		
Nozzle Material	N/A	None
Nozzle Design	N/A	N/A
Probe Liner Material	Borosilicate Glass	Borosilicate Glass
Effective Probe Length	N/A	4 feet
Probe Temperature Set-Point	>248°F	350°F @ Inlet, Stack Temp @ FF Outlet
Velocity Measuring Equipment		
Pitot Tube Design	None	None
Pitot Tube Coefficient	N/A	N/A
Pitot Tube Calibration by	N/A	N/A
Pitot Tube Attachment	N/A	N/A
Metering System Console		
Meter Type	Dry Gas Meter or Critical Orifice	Dry Gas Meter
Meter Accuracy	±2%	±1%
Meter Resolution	N/A	0.01 cubic feet
Meter Size	2 liters/minute	0.1 dcf/revolution
Meter Calibrated Against	Wet Test Meter	Wet Test Meter
Pump Type	Diaphragm or equivalent	Rotary Vane
Temperature Measurements	Dial Thermometer or equivalent	Type K Thermocouple/Pyrometer
Temperature Resolution	2°F-5.4°F	1.0°F
ΔP Differential Pressure Gauge	N/A	N/A
ΔH Differential Pressure Gauge	N/A	Inclined Manometer
Barometer	Mercury, aneroid or other.	Digital Barometer calibrated w/Mercury Aneroid
Filter Description		
Filter Location	After Probe	Exit of Probe
Filter Holder Material	Teflon or Quartz	Borosilicate Glass
Filter Support Material	Teflon Frit	Teflon
Cyclone Material	N/A	None
Filter Heater Set-Point	>248°F	350°F @ Inlet, Stack Temp @ FF Outlet
Filter Material	Teflon/Glass Mat (Quartz, Optional High Temp>410F)	Quartz Fiber @ Inlet, Teflon on Glass @ Outlet
Other Components		
Description	N/A	N/A
Location	N/A	N/A
Operating Temperature	N/A	N/A

Specification Sheet for EPA Method 26A (modified)

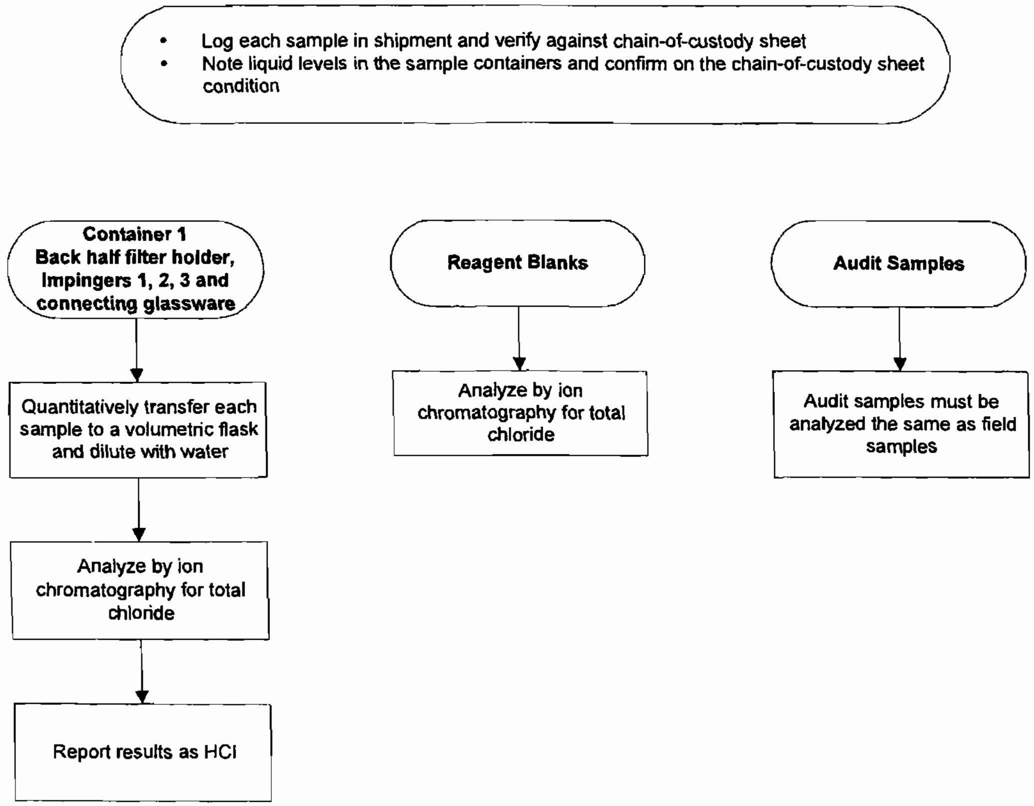
	Standard Method Specification	Actual Specification Used
Impinger Train Description		
Type of Glassware Connections	Ground Glass or Equivalent	Screw Joint with Silicone Gasket
Connection to Probe or Filter by	Direct Glass Connection	Direct Glass Connection
Number of Impingers	5 or 6 (Midget Impingers)	5
Impinger Stem Types		
Impinger 1	Midget Shortened Stem	Shortened Stem (open tip)
Impinger 2	Midget Bubbler	Greenburg-Smith
Impinger 3	Midget Bubbler	Greenburg-Smith
Impinger 4	Midget Bubbler	Modified Greenburg-Smith
Impinger 5	Midget Bubbler	Modified Greenburg-Smith
Impinger 6	Mae West	
Impinger 7		
Impinger 8		
Gas Density Determination		
Sample Collection	N/A	Single Point Integrated
Sample Collection Medium	N/A	Vinyl Bag
Sample Analysis	N/A	CEM
Sample Recovery Information		
Probe Brush Material	N/A	N/A
Probe Rinse Reagent	N/A	N/A
Probe Rinse Wash Bottle Material	N/A	N/A
Probe Rinse Storage Container	N/A	N/A
Filter Recovered?	No	No
Filter Storage Container	N/A	N/A
Impinger Contents Recovered?	Yes	Yes
Impinger Rinse Reagent	Deionized Distilled Water	Deionized Distilled Water
Impinger Wash Bottle	Polyethylene or glass	Polyethylene
Impinger Storage Container	Polyethylene	Polyethylene
Analytical Information		
Method 4 H_2O Determination by	N/A	Gravimetric
Filter Preparation Conditions	N/A	N/A
Front-Half Rinse Preparation	N/A	N/A
Back-Half Analysis	Ion Chromatography	Ion Chromatography
Additional Analysis	None	None

EPA Method 26A
Glassware Preparation Procedures




EPA Method 26
Sample Recovery Flowchart
(without Cl2)
(Modified)
Tare all sample containers before sample collection
Mark all liquid levels and final weights on the outside of each sample container
Seal all sample containers with Teflon tape
If recycling, bake silica gel for two hours at 350 degrees F (175 degrees C)
Teflon Filter
Archive or discard
Container 1
250 ml Plastic
Impingers 1, 2, 3 and U-bends
Empty contents into container
Rinse components 3X with D.I. Water
Label container and measure volume by weight
Visual Inspection
Silica Gel
Measure volume by weight, note any color change
Recycle silica gel
Container 2
Sulfuric Acid Blank
(H2SO4)
250 ml Plastic
200 ml of 0.1N H2SO4 diluted to approximate volume of samples using water from rinse bottle

EPA Method 26
Analytical Flowchart
(without Cl2)
(Modified)



This Page Intentionally Left Blank

SAMPLE CALCULATIONS

B

This Page Intentionally Left Blank

USEPA Method 5/29 (Particulate/Metals)
Sampling, Velocity and Moisture Sample Calculations

Sample data taken from Run 1

Note: The tables presenting the results are generated electronically from raw data. It may not be possible to exactly duplicate these results using a calculator. The reference method data, results, and all calculations are carried to sixteen decimal places throughout. The final table is formatted to an appropriate number of significant figures.

042010 103649
J

1. Volume of water collected (wscf)

$$V_{wstd} = (0.04706)(V_{lc})$$

Where:

V_{lc}	= total volume of liquid collected in impingers and silica gel (ml)	=	463.2	ml
0.04706	= ideal gas conversion factor (ft^3 water vapor/ml or gm)	=	0.04706	ft^3/ml
V_{wstd}	= volume of water vapor collected at standard conditions (ft^3)	=	21.80	ft^3

2. Volume of gas metered, standard conditions (dscf)

$$V_{mstd} = \frac{(17.64)(V_m)\left(P_{bar} + \frac{\Delta H}{13.6}\right)(Y_d)}{(460 + T_m)}$$

Where:

P_{bar}	= barometric pressure (in. Hg)	=	30.10	in. Hg
T_m	= average dry gas meter temperature (°F)	=	68.46	°F
V_m	= volume of gas sample through the dry gas meter at meter conditions (dcf)	=	76.55	dcf
Y_d	= gas meter correction factor (dimensionless)	=	1.0005	
ΔH	= average pressure drop across meter box orifice (in. H_2O)	=	1.19	in. H_2O
17.64	= standard temperature to pressure ratio (°R/in. Hg)	=	17.64	°R/in. Hg
13.6	= conversion factor (in. H_2O/in. Hg)	=	13.6	in.H_2O/in. Hg
460	= °F to °R conversion constant	=	460	
V_{mstd}	= volume of gas sampled through the dry gas meter at standard conditions (dscf)	=	77.169	dscf

3. Sample gas pressure (in. Hg)

$$P_s = P_{bar} + \left(\frac{P_g}{13.6}\right)$$

Where:

P_{bar}	= barometric pressure (in. Hg)	=	30.10	in. Hg
P_g	= sample gas static pressure (in. H_2O)	=	-11.00	in. H_2O
13.6	= conversion factor (in. H_2O/in. Hg)	=	13.6	in. H_2O/in. Hg
P_s	= absolute sample gas pressure (in. Hg)	=	29.29	in. Hg

Prepared by Clean Air Engineering Proprietary Software
SS ISOKINETIC Version 2006-13d

Copyright © 2006 Clean Air Engineering Inc.

QA/QC ________
Date ________

4. Actual water vapor pressure at sample gas temperature less than 212°F (in. Hg)

$$P_v = \frac{e^{\left(18.3036 - \frac{3816.44}{\frac{5}{9}(T_s - 32) + 273.15 - 46.13}\right)}}{25.4}$$

Where:

T_s	= average sample gas temperature (°F)	=	295.20	°F
18.3036	= Antoine coefficient	=	18.3036	°K
3816.44	= Antoine coefficient	=	3816.44	°K
273.15	= temperature conversion factor	=	273.15	°K
46.13	= Antoine coefficient	=	46.13	°K
25.4	= conversion factor	=	25.4	mm Hg/in. Hg
5/9	= Fahrenheit to Celsius conversion factor	=	5/9	°C/°F
32	= temperature conversion (°F)	=	32	°F
P_v	= vapor pressure, actual (in. Hg)	=	29.29	in. Hg

5. Water vapor pressure at gas temperature greater than 212°F (in. Hg)

$$P_v = P_s$$

Where:

P_s	= absolute sample gas pressure (in. Hg)	=	29.29	in. Hg
P_v	= water vapor pressure, actual (in. Hg)	=	29.29	in. Hg

6. Moisture measured in sample (% by volume)

$$B_{wo} = \frac{V_{wstd}}{(V_{mstd} + V_{wstd})}$$

Where:

V_{mstd}	= volume of gas sampled through the dry gas meter at standard conditions (dscf)	=	77.169	dscf
V_{wstd}	= volume of water collected at standard conditions (scf)	=	21.80	scf
B_{wo}	= proportion of water measured in the gas stream by volume	=	0.2203	
		=	22.03	%

7. Saturated moisture content (% by volume)

$$B_{ws} = \frac{P_v}{P_s}$$

Where:

P_s	= absolute sample gas pressure (in. Hg)	=	29.29	in. Hg
P_v	= water vapor pressure, actual (in. Hg)	=	29.29	in. Hg
B_{ws}	= proportion of water vapor in the gas stream by volume at		1.0000	
	saturated conditions	=	100.00	%

Copyright © 2006 Clean Air Engineering Inc.

QA/QC ________
Date ________

8. Actual water vapor in gas (% by volume)

$$B_w = MINIMUM \quad [B_{wo}, B_{ws}]$$

Where:

B_{ws}	= proportion of water vapor in the gas stream by volume at saturated conditions	=	1.0000	
B_{wo}	= proportion of water measured in the gas stream by volume	=	0.2203	
B_w	= actual water vapor in gas	=	0.2203	
		=	22.03	%

9. Nitrogen (plus carbon monoxide) in gas stream (% by volume, dry)

$$N_2 + CO = 100 - CO_2 - O_2$$

Where:

CO_2	= proportion of carbon dioxide in the gas stream by volume (%)	=	9.7	%
O_2	= proportion of oxygen in the gas stream by volume (%)	=	9.6	%
100	= conversion factor (%)	=	100	%
N_2+CO	= proportion of nitrogen and CO in the gas stream by volume (%)	=	80.74	%

10. Molecular weight of dry gas stream (lb/lb·mole)

$$M_d = (M_{CO_2})\frac{(CO_2)}{(100)} + (M_{O_2})\frac{(O_2)}{(100)} + (M_{N_2+CO})\frac{(N_2+CO)}{(100)}$$

Where:

M_{CO2}	= molecular weight of carbon dioxide (lb/lb·mole)	=	44.00	lb/lb·mole
M_{O2}	= molecular weight of oxygen (lb/lb·mole)	=	32.00	lb/lb·mole
M_{N2+CO}	= molecular weight of nitrogen and carbon monoxide (lb/lb·mole)	=	28.00	lb/lb·mole
CO_2	= proportion of carbon dioxide in the gas stream by volume (%)	=	9.7	%
O_2	= proportion of oxygen in the gas stream by volume (%)	=	9.6	%
N_2+CO	= proportion of nitrogen and CO in the gas stream by volume (%)	=	80.7	%
100	= conversion factor (%)	=	100	%
M_d	= dry molecular weight of sample gas (lb/lb·mole)	=	29.93	lb/lb·mole

11. Molecular weight of sample gas (lb/lb·mole)

$$M_s = (M_d)(1 - B_w) + (M_{H_2O})(B_w)$$

Where:

B_w	= proportion of water vapor in the gas stream by volume	=	0.2203	
M_d	= dry molecular weight of sample gas (lb/lb·mole)	=	29.93	lb/lb·mole
M_{H2O}	= molecular weight of water (lb/lb·mole)	=	18.00	lb/lb·mole
M_s	= molecular weight of sample gas, wet basis (lb/lb·mole)	=	27.30	lb/lb·mole

Copyright © 2006 Clean Air Engineering Inc.

QA/QC ________
Date ________

12. Velocity of sample gas (ft/sec)

$$V_s = (K_p)(C_P)\left(\sqrt{\Delta P}\right)\left(\sqrt{\frac{(T_s + 460)}{(M_s)(P_s)}}\right)$$

Where:

K_p	= velocity pressure constant	=	85.49	
C_p	= pitot tube coefficient	=	0.81	
M_s	= wet molecular weight of sample gas, wet basis (lb/lb·mole)	=	27.30	lb/lb·mole
P_s	= absolute sample gas pressure (in. Hg)	=	29.29	in. Hg
T_s	= average sample gas temperature (°F)	=	295.20	°F
$\sqrt{\Delta P}$	= average square roots of velocity heads of sample gas (in. H_2O)	=	0.689	$\sqrt{\text{in. } H_2O}$
460	= °F to °R conversion constant	=	460	
V_s	= sample gas velocity (ft/sec)	=	46.10	ft/sec

13. Volumetric flow rate of sample gas at actual gas conditions (acfm)

$$Q_a = (60)(A_s)(V_s)$$

Where:

A_s	= cross sectional area of sampling location (ft^2)	=	64.00	ft^2
V_s	= sample gas velocity (ft/sec)	=	46.10	ft/sec
60	conversion factor (sec/min)	=	60	sec/min
Q_a	= volumetric flow rate at actual conditions (acfm)	=	177,014	acfm

14. Total flow of sample gas (scfm)

$$Q_s = (Q_a)\left(\frac{P_s}{29.92}\right)\left(\frac{68 + 460}{T_s + 460}\right)$$

Where:

Q_a	= volumetric flow rate at actual conditions (acfm)	=	177,014	acfm
P_s	= absolute sample gas pressure (in. Hg)	=	29.29	in. Hg
29.92	= standard pressure (in. Hg)	=	29.92	in. Hg
T_s	= average sample gas temperature (°F)	=	295.2	°F
68	= standard temperature (°F)	=	68	°F
460	= °F to °R conversion constant	=	460	
Q_s	= volumetric flow rate at standard conditions, wet basis (scfm)	=	121,159	scfm

15. Dry flow of sample gas (dscfm)

$$Q_{std} = (Q_s)(1 - B_w)$$

Where:

B_w	= proportion of water vapor in the gas stream by volume	=	0.2203	
Q_s	= volumetric flow rate at standard conditions, wet basis (scfm)	=	121,159	scfm
Q_{std}	= volumetric flow rate at standard conditions, dry basis (dscfm)	=	94,473	dscfm

Copyright © 2006 Clean Air Engineering Inc.

QA/QC ________
Date ________

16. Dry flow of sample gas corrected to 7%O_2 (dscfm)

$$Q_{std7} = (Q_{std})\left(\frac{20.9 - O_2}{20.9 - 7}\right)$$

Where:

Q_{std}	= volumetric flow rate at standard conditions, dry basis (dscfm)	=	94,473	dscfm
O_2	= proportion of oxygen in the gas stream by volume (%)	=	9.6	%
20.9	= oxygen content of ambient air (%)	=	20.9	%
7	= oxygen content of corrected gas (%)	=	7.0	%
Q_{std7}	= volumetric flow rate at STP and 7%O_2, dry basis (dscfm)	=	77,005	dscfm

17. Hourly time basis conversion of volumetric flow rate (Q_{std} example)

$$Q_{std-hr} = (Q_{std-\min})(60)$$

Where

$Q_{std\text{-}min}$	= volumetric flow rate, english units (ft^3/min)	=	94,473	dscfm
60	= conversion factor (min/hr)	=	60	min/hr
$Q_{std\text{-}hr}$	= volumetric flow rate, hourly basis (dscf/hr)	=	5,668,358	dscf/hr

18. Metric Conversion of Gas Volumes (Q_{std} example)

$$Q_{std-metric} = (Q_{std-english})\left(\frac{60}{35.31}\right)$$

Where:

$Q_{std\text{-}english}$	= volumetric flow rate, english units (ft^3/min)	=	94,473	dscfm
35.31	= conversion factor (ft^3/m^3)	=	35.31	ft^3/m^3
60	= conversion factor (min/hr)	=	60	min/hr
$Q_{std\text{-}metric}$	= volumetric flow rate, metric units (m^3/hr)	=	160,531	dry std m^3/hr

19. Standard to Normal Conversion of Gas Volumes (Q_{std} example)

$$Q_{Normal} = (Q_{std-metric})\left(\frac{32 + 460}{68 + 460}\right)$$

Where:

$Q_{std\text{-}metric}$	= volumetric flow rate, metric units (dry std m^3/hr)	=	160,531	dry std m^3/hr
32	= normal temperature (°F)	=	32	°F
68	standard temperature (°F)	=	68	°F
460	= standard temperature in Rankine (68°F)	=	460	
Q_{Normal}	= volumetric flow rate, metric units (dry Nm^3/hr)	=	149,586	dry Nm^3/hr

Prepared by Clean Air Engineering Proprietary Software
SS ISOKINETIC Version 2006-13d

Copyright © 2006 Clean Air Engineering Inc.

QA/QC ________
Date ________

20. Percent isokinetic (%)

$$I = \frac{(0.09450)(T_s + 460)(V_{mstd})}{(P_s)(V_s)\left(\frac{(D_n)^2(\pi)}{(144)(4)}\right)(\Theta)(1 - B_w)}$$

Where:

D_n	= diameter of nozzle (in)	=	0.270	in.
B_w	= proportion of water vapor in the gas stream by volume	=	0.2203	
P_s	= absolute sample gas pressure (in. Hg)	=	29.29	in. Hg
T_s	= average sample gas temperature (°F)	=	295.2	°F
V_{mstd}	= volume of gas sample through the dry gas meter at standard conditions (dscf)	=	77.169	dscf
V_s	= sample gas velocity (ft/sec)	=	46.10	ft/sec
θ	= total sampling time (min)	=	125	min
0.0945	= conversion constant	=	0.0945	
460	= °F to °R conversion constant	=	460	
I	= percent of isokinetic sampling (%)	=	105.25	%

21. Alternative Method 5 Post-Test Meter Calibration Factor

$$Y_{qa} = \frac{\Theta}{V_m}\sqrt{\frac{(0.0319)(T_m + 460)(28.96)}{(\Delta H_@)(P_{bar} + \frac{\Delta H}{13.6})(M_d)}}(\sqrt{\Delta H})_{avg}$$

Where:

θ	= total sampling time (min)	=	125	min
V_m	= volume of gas sample through the dry gas meter at meter conditions (dcf)	=	76.55	dcf
T_m	= average dry gas meter temperature (°F)	=	68.46	°F
$\Delta H_@$	= dry gas meter orifice coefficient	=	1.8097	
P_{bar}	= barometric pressure (in. Hg)	=	30.10	in. Hg
ΔH	= average pressure drop across meter box orifice (in. H_2O)	=	1.185	in. H_2O
M_d	= dry molecular weight of sample gas (lb/lb·mole)	=	29.93	lb/lb·mole
$\sqrt{\Delta H}_{avg}$	= average of square root of pressure drop across meter orifice	=	1.085	$\sqrt{\text{in. } H_2O}$
0.0319	= conversion constant	=	0.0319	
28.96	= molecular weight of ambient air (lb/lb-mole)	=	28.96	lb/lb-mole
13.6	= conversion factor (in. H_2O/in. Hg)	=	13.6	in.H_2O/in. Hg
460	= °F to °R conversion constant	=	460	
Y_{qa}	= alternative Method 5 post-test meter calibration factor	=	0.9679	

Copyright © 2006 Clean Air Engineering Inc.

QA/QC ________
Date ________

USEPA Method 5/29
Filterable Particulate Gravimetric Analysis Calculations

Sample data taken from Run 1

Note: The tables presenting the results are generated electronically from raw data. It may not be possible to exactly duplicate these results using a calculator. The reference method data, results, and all calculations are carried to sixteen decimal places throughout. The final table is formatted to an appropriate number of significant figures.

042010 103649
N

1. Total residue from gravimetric analysis of filters (g)

$$m_{fr} = \sum_{i=1}^{n} m_{fi}$$

Where:

m_{f1}	= residual mass of filter "1" from gravimetric analysis (g)	=	0.00050	g
m_{f2}	= residual mass of filter "2" from gravimetric analysis (g)	=	0.00000	g
m_{f3}	= residual mass of filter "3" from gravimetric analysis (g)	=	0.00000	g
m_{f4}	= residual mass of filter "4" from gravimetric analysis (g)	=	0.00000	g
m_{fr}	= total filter residue from gravimetric analysis (g)	=	0.00050	g

2. Total particulate collected on filters (g)

$$m_{filter} = m_{fr} \text{ if } m_{fr} \geq 0$$
$$m_{filter} = 0 \quad \text{if } m_{fr} < 0$$

Where:

m_{fr}	= total filter residue from gravimetric analysis (g)	=	0.00050	g
m_{filter}	= total particulate collected on filters (g)	=	0.00050	g

3. Solvent rinse - sample residue mass (g)

$$r_{si} = (r_{ai})\left(\frac{v_{si}}{v_{ai}}\right)$$

Where:

			Acetone	
r_{ai}	= aliquot residue mass for solvent "i" (g)	=	0.00060	g
v_{si}	= sample liquid volume for solvent rinse "i" (ml)	=	76.0	ml
v_{ai}	= aliquot liquid volume for solvent rinse "i" (ml)	=	76.0	ml
r_{si}	= solvent rinse "i" - sample residue mass (g)	=	0.00060	g

4. Solvent rinse - blank residue (g)

$$m_{i-blank} = r_{ai-blank} \text{ if } r_{ai-blank} \geq 0$$
$$m_{i-blank} = 0 \quad \text{if } r_{ai-blank} < 0$$

Where:

			Acetone	
$r_{ai\text{-}blank}$	= blank residue for solvent "i" from gravimetric analysis (g)	=	0.00010	g
$m_{i\text{-}blank}$	= solvent rinse - blank residue (g)	=	0.00000	g

Copyright © 2006 Clean Air Engineering Inc.

QA/QC ________
Date ________

5. Solvent rinse - maximum allowable blank correction (g)

$$m_{bi} = MINIMUM\left[\left(\frac{(m_{i-blank})(v_{si})}{v_{ai-blank}}\right) \; or \; (0.00001)(\rho_i)(v_{si}) \; or \; (r_{si})\right] \text{if } r_{si} \geq 0$$

$$m_{bi} = 0 \qquad \text{if } r_{si} < 0$$

Where:

			Acetone	
$m_{i\text{-blank}}$	= solvent rinse - blank residue (g)	=	0.00000	g
v_{si}	= sample liquid volume for solvent rinse "i" (ml)	=	76.0	ml
$v_{ai\text{-blank}}$	= blank liquid volume for solvent rinse "i" (ml)	=	146.0	ml
0.00001	= EPA M5 fraction of total rinse that can be subtracted (g)	=	0.00001	g
ρ_i	= density of solvent rinse "i" (g/ml)	=	0.7845	g/ml
r_{si}	= solvent rinse "i" - sample residue mass (g)	=	0.00060	g
m_{bi}	= solvent rinse "i" - maximum allowable blank correction (g)	=	0.00000	g

6. Solvent rinse - net residue (g)

$$m_i = (r_{si} - m_{bi}) \text{if } r_{si} \geq m_{bi}$$

$$m_i = 0 \qquad \text{if } r_{si} < m_{bi}$$

Where:

			Acetone	
r_{si}	= solvent rinse "i" - sample residue mass (g)	=	0.00060	g
m_{bi}	= solvent rinse "i" - maximum allowable blank correction (g)	=	0.00000	g
m_i	= solvent rinse "i" - net residue (g)	=	0.00060	g

7. Total solvent residue - (g)

$$m_s = \sum_{i=1}^{n} m_i$$

Where:

m_1	= solvent rinse "1" - net residue (g)	=	0.00060	g
m_2	= solvent rinse "2" - net residue (g)	=	N/A	g
m_3	= solvent rinse "3" - net residue (g)	=	N/A	g
m_s	= total solvent residue (g)	=	0.00060	g

8. Total gravimetric result (g)

$$m_T = m_{filter} + m_s$$

Where:

m_{filter}	= total particulate collected on filters (g)	=	0.00050	g
m_s	= total solvent residue (g)	=	0.00060	g
m_T	= total gravimetric result (g)	=	0.00110	g

Copyright © 2006 Clean Air Engineering Inc.

QA/QC ________
Date ________

9. Total gravimetric detection limit (g)

$$m_D = (MDL_{filter})(n_f) + (MDL_{rinse})(n_r)$$

Where:

MDL_{filter}	= minimum detection limit for single filter analysis (g)	=	0.00050	g
n_f	= number of filters in analysis	=	1	
MDL_{rinse}	= minimum detection limit for single rinse analysis (g)	=	0.00050	g
n_r	= number of rinses in analysis	=	1	
m_D	= total gravimetric detection limit (g)	=	0.00020	g

10. Total particulate matter (g)

$$m_n = MAXIMUM[m_T \quad or \quad < m_D]$$

Where:

m_T	= total gravimetric result (g)	=	0.00110	g
m_D	= total gravimetric detection limit (g)	=	0.00020	g
m_n	= total particulate matter (g)	=	0.00110	g

Copyright © 2008 Clean Air Engineering Inc.

QA/QC ________
Date ________

USEPA Method 5/29
Filterable Particulate Sample Calculations

Sample data taken from Run 1

Note: The tables presenting the results are generated electronically from raw data. It may not be possible to exactly duplicate these results using a calculator. The reference method data, results, and all calculations are carried to sixteen decimal places throughout. The final table is formatted to an appropriate number of significant figures.

042010 103801
J_N

1. Particulate concentration (lb/dscf)

$$C_{sd} = \left(\frac{m_n}{V_{mstd}}\right)\left(2.205 \times 10^{-3}\right)$$

Where:

m_n	= total particulate matter (g)	=	0.00110	g
V_{mstd}	= volume metered, standard (dscf)	=	77.1689	dscf
2.205×10^{-3}	= conversion factor (lb/g)	=	2.205E-03	lb/g
C_{sd}	= particulate concentration (lb/dscf)	=	3.1431E-08	lb/dscf

2. Particulate concentration (gr/dscf)

$$C_{sd} = \left(\frac{m_n}{V_{mstd}}\right)(15.43)$$

Where:

m_n	= total particulate matter (g)	=	0.00110	g
V_{mstd}	= volume metered, standard (dscf)	=	77.1689	dscf
15.43	= conversion factor (gr/g)	=	15.43	gr/g
C_{sd}	= particulate concentration (gr/dscf)	=	0.00022	gr/dscf

3. Particulate concentration (mg/dscm)

$$C_{sd} = \left(\frac{m_n}{V_{mstd}}\right)(1000)(35.31)$$

Where:

m_n	= total particulate matter (g)	=	0.00110	g
V_{mstd}	= volume metered, standard (dscf)	=	77.1689	dscf
1,000	= conversion factor (mg/g)	=	1,000	mg/g
35.31	= conversion factor (dscf/dscm)	=	35.31	dscf/dscm
C_{sd}	= particulate concentration (mg/dscm)	=	0.50332	mg/dscm

Copyright © 2006 Clean Air Engineering Inc.

QA/QC ________
Date ________

4. Particulate concentration (mg/Nm^3 dry)

$$C_{sd} = \left(\frac{m_n}{V_{mstd}}\right)(1000)(35.31)\left(\frac{68+460}{32+460}\right)$$

Where:

m_n	= total particulate matter (g)	=	0.00110	g
V_{mstd}	= volume metered, standard (dscf)	=	77.1689	dscf
1,000	= conversion factor (mg/g)	=	1,000	mg/g
35.31	= conversion factor (dscf/dscm)	=	35.31	dscf/dscm
68	= standard temperature (°F)	=	68	°F
32	= normal temperature (°F)	=	32	°F
460	= °F to °R conversion constant	=	460	
C_{sd}	= particulate concentration (mg/Nm^3 dry)	=	0.54015	mg/Nm^3 dry

5. Particulate concentration corrected to x% O_2 (gr/dscf example)

$$C_{sdx} = C_{sd}\left(\frac{20.9-x}{20.9-O_2}\right)$$

Where:

C_{sd}	= particulate concentration (gr/dscf)	=	0.00022	gr/dscf
x	= oxygen content of corrected gas (%)	=	7.0	%
O_2	= proportion of oxygen in the gas stream by volume (%)	=	9.6	%
20.9	= oxygen content of ambient air (%)	=	20.9	%
C_{sdx}	= particulate concentration corrected to x%O_2 (gr/dscf)	=	0.00027	gr/dscf @ x%O_2

6. Particulate concentration corrected to y% CO_2 (gr/dscf example)

$$C_{sdy} = C_{sd}\left(\frac{y}{CO_2}\right)$$

Where:

C_{sd}	= particulate concentration (gr/dscf)	=	0.00022	gr/dscf
y	= carbon dioxide content of corrected gas (%)	=	12.0	%
CO_2	= proportion of carbon dioxide in the gas stream by volume (%)	=	9.7	%
C_{sdy}	= particulate concentration corrected to y%CO_2 (gr/dscf)	=	0.00027	gr/dscf @ y%CO_2

7. Particulate concentration at actual gas conditions (gr/acf example)

$$C_a = C_{sd}\left(\frac{Q_{std}}{Q_a}\right)$$

Where:

C_{sd}	= particulate concentration (gr/dscf)	=	0.00022	gr/dscf
Q_{std}	= volumetric flow rate at standard conditions, dry basis (dscfm)	=	94,473	dscfm
Q_a	= volumetric flow rate at actual conditions (acfm)	=	177,014	acfm
C_a	= particulate concentration at actual gas conditions (gr/acf)	=	0.00012	gr/acf

Copyright © 2008 Clean Air Engineering Inc.

QA/QC ________
Date ________

8. Particulate rate (lb/hr)

$$E_{lb/hr} = \left(\frac{m_n}{V_{mstd}}\right)\left(2.205\times10^{-3}\right)\left(Q_{std}\right)(60)$$

Where:

m_n	= total particulate matter (g)	=	0.00110	g
V_{mstd}	= volume metered, standard (dscf)	=	77.1689	dscf
2.205×10^{-3}	= conversion factor (lb/g)	=	2.205E-03	lb/g
Q_{std}	= volumetric flow rate at standard conditions, dry basis (dscfm)	=	94,473	dscfm
60	= conversion factor (min/hr)	=	60	min/hr
$E_{lb/hr}$	= particulate rate (lb/hr)	=	0.1782	lb/hr

9. Particulate rate (kg/hr)

$$E_{kg/hr} = \left(\frac{m_n}{V_{mstd}}\right)\left(\frac{\left(Q_{std}\right)(60)}{1000}\right)$$

Where:

m_n	= total particulate matter (g)	=	0.00110	g
V_{mstd}	= volume metered, standard (dscf)	=	77.1689	dscf
Q_{std}	= volumetric flow rate at standard conditions, dry basis (dscfm)	=	94,473	dscfm
60	= conversion factor (min/hr)	=	60	min/hr
1,000	= conversion factor (g/kg)	=	1,000	g/kg
$E_{kg/hr}$	= particulate rate (kg/hr)	=	0.0808	kg/hr

10. Particulate rate (Ton/yr)

$$E_{T/yr} = \left(\frac{m_n}{V_{mstd}}\right)\left(2.205\times10^{-3}\right)\left(Q_{std}\right)(60)\left(\frac{Cap}{2000}\right)$$

Where:

m_n	= total particulate matter (g)	=	0.00110	g
V_{mstd}	= volume metered, standard (dscf)	=	77.1689	dscf
2.205×10^{-3}	= conversion factor (lb/g)	=	2.205E-03	lb/g
Q_{std}	= volumetric flow rate at standard conditions, dry basis (dscfm)	=	94,473	dscfm
60	= conversion factor (min/hr)	=	60	min/hr
Cap	= capacity factor for process (hours operated/year)	=	8,760	hours/yr
2,000	= conversion factor (lb/Ton)	=	2,000	lb/Ton
$E_{T/yr}$	= particulate rate (Ton/yr)	=	0.7804	Ton/yr

Copyright © 2006 Clean Air Engineering Inc.

QA/QC ________
Date ________

11. Particulate rate - F_d-based (lb/MMBtu)

$$E_{Fd} = \left(\frac{m_n}{V_{mstd}}\right)\left(2.205 \times 10^{-3}\right)\left(F_d\right)\left(\frac{20.9}{20.9 - O_2}\right)$$

Where:

m_n	= total particulate matter (g)	=	0.00110	g
V_{mstd}	= volume metered, standard (dscf)	=	77.1689	dscf
2.205×10^{-3}	= conversion factor (lb/g)	=	2.205E-03	lb/g
F_d	= ratio of gas volume to heat content of fuel (dscf/MMBtu)	=	9,570	dscf/MMBtu
O_2	= proportion of oxygen in the gas stream by volume (%)	=	9.6	%
20.9	= oxygen content of ambient air (%)	=	20.9	%
E_{Fd}	= particulate rate - F_d - based (lb/MMBtu)	=	0.00055	lb/MMBtu

12. Particulate rate - F_c-based (lb/MMBtu)

$$E_{Fc} = \left(\frac{m_n}{V_{mstd}}\right)\left(2.205 \times 10^{-3}\right)\left(F_c\right)\left(\frac{100}{CO_2}\right)$$

Where:

m_n	= total particulate matter (g)	=	0.00110	g
V_{mstd}	= volume metered, standard (dscf)	=	77.1689	dscf
2.205×10^{-3}	= conversion factor (lb/g)	=	2.205E-03	lb/g
F_c	= ratio of gas volume to heat content of fuel (dscf/MMBtu)	=	1,820	dscf/MMBtu
CO_2	= proportion of oxygen in the gas stream by volume (%)	=	9.7	%
100	= conversion factor	=	100	
E_{Fc}	= particulate rate - F_c - based (lb/MMBtu)	=	0.00059	lb/MMBtu

Copyright © 2006 Clean Air Engineering Inc.

QA/QC ________
Date ________

LOGIC FOR TREATING DETECTION LIMITS

(mercury only)

1. Logic for Determining Total Blank ($m_{Total\text{-}B}$) from 5 Fractions

	CASE 1	CASE 2	CASE 3
	All 5 fractions are D.	1 to 4 fractions are ND	All 5 fractions are ND
Rule			
ND = 0	$m_{Total\text{-}B}$ = Sum D, 1-5	$m_{Total\text{-}B}$ = Sum D	$m_{Total\text{-}B}$ = < Sum ND
ND=1x	$m_{Total\text{-}B}$ = Sum D, 1-5	$m_{Total\text{-}B}$ = Sum D	$m_{Total\text{-}B}$ = < Sum ND
ND=0.5x	$m_{Total\text{-}B}$ = Sum D, 1-5	$m_{Total\text{-}B}$ = Sum D	$m_{Total\text{-}B}$ = < 0.5 Sum ND

2. Logic for Determining Total Sample ($m_{Total\text{-}S}$) from 5 Fractions

	CASE 1	CASE 2	CASE 3
	All 5 fractions are D.	1 to 4 fractions are ND	All 5 fractions are ND
Rule			
ND = 0	$m_{Total\text{-}S}$ = Sum D, 1-5	$m_{Total\text{-}S}$ = Sum D	$m_{Total\text{-}S}$ = < Sum ND
ND=1x	$m_{Total\text{-}S}$ = Sum D, 1-5	$m_{Total\text{-}S}$ = < [Sum D + Sum ND]	$m_{Total\text{-}S}$ = < Sum ND
ND=0.5x	$m_{Total\text{-}S}$ = Sum D, 1-5	$m_{Total\text{-}S}$ = < [SumD+0.5 SumND	$m_{Total\text{-}S}$ = < 0.5 Sum ND

3. Logic for Determining Maximum Allowable Blank Correction ($m_{T\text{-}B\text{-}allow}$)

	CASE 1	CASE 2	CASE 3	CASE 4
	All 5 fractions are D.	1 to 4 sample fractions are ND	All 5 fractions are ND	Any type of fractions
	$m_{Total\text{-}B}$ = D	$m_{Total\text{-}B}$ = D	$m_{Total\text{-}B}$ = D	$m_{Total\text{-}B}$ = ND
Rule				
ND = 0	$m_{T\text{-}B\text{-}allow}$ = M29 Rule	$m_{T\text{-}B\text{-}allow}$ = M29 Rule*	$m_{T\text{-}B\text{-}allow}$ = 0	$m_{T\text{-}B\text{-}allow}$ = 0
ND=1x	$m_{T\text{-}B\text{-}allow}$ = M29 Rule	$m_{T\text{-}B\text{-}allow}$ = M29 Rule*	$m_{T\text{-}B\text{-}allow}$ = 0	$m_{T\text{-}B\text{-}allow}$ = 0
ND=0.5x	$m_{T\text{-}B\text{-}allow}$ = M29 Rule	$m_{T\text{-}B\text{-}allow}$ = M29 Rule*	$m_{T\text{-}B\text{-}allow}$ = 0	$m_{T\text{-}B\text{-}allow}$ = 0

* M29 rule using only detected sample quantities for logical comparisons.

4. Logic for Determining Blank-Corrected Sample Amount (m_n)

	CASE 1	CASE 2	CASE 3	CASE 4
	All 5 fractions are D.	1 to 4 sample fractions are ND	All 5 fractions are ND	Any type of fractions
	$m_{Total\text{-}S} - m_{T\text{-}B\text{-}allow} \geq$ MIN(MDL)	$m_{Total\text{-}S} - m_{T\text{-}B\text{-}allow} \geq$ MIN(MDL)	$m_{Total\text{-}S}$ and $m_{T\text{-}B\text{-}allow}$ anything	$m_{Total\text{-}S} - m_{T\text{-}B\text{-}allow} <$ MIN(MDL)
Rule				
ND = 0	$m_n = m_{Total\text{-}S} - m_{T\text{-}B\text{-}allow}$	$m_n = m_{Total\text{-}S} - m_{T\text{-}B\text{-}allow}$	m_n = < $m_{Total\text{-}S}$	m_n = < MIN[MDL]
ND=1x	$m_n = m_{Total\text{-}S} - m_{T\text{-}B\text{-}allow}$	m_n = < [$m_{Total\text{-}S} - m_{T\text{-}B\text{-}allow}$]	m_n = < $m_{Total\text{-}S}$	m_n = < MIN[MDL]
ND=0.5x	$m_n = m_{Total\text{-}S} - m_{T\text{-}B\text{-}allow}$	m_n = < [$m_{Total\text{-}S} - m_{T\text{-}B\text{-}allow}$]	m_n = < $m_{Total\text{-}S}$	m_n = < MIN[MDL]

Laboratory Data

m_n	Net matter collected (g)

Filterable Particulate Results

C_{sd}	Particulate Concentration (mg/dscm)
C_{sd7}	Particulate Concentration @7% O_2 (mg/dscm)

__Definitions and Notes__

The term "Rule" refers to the rule being implemented for handling non-detectable quantities in summations.
MDL = minimum detection limit.
D = Detectable quantity reported as D.
ND = Non-Detectable quantity reported at a value of ND.
MIN[MDL] = lowest quantity of all detection limits for 5 fractions.

Prepared by Clean Air Engineering Proprietary Software
SS Metals-1 Version 2006-12a

Copyright © 2006 Clean Air Engineering Inc.

USEPA Method 5/29
Mercury Analyte Calculations

Sample data taken from Run 1

Note: The tables presenting the results are generated electronically from raw data. It may not be possible to exactly duplicate these results using a calculator. The reference method data, results, and all calculations are carried to sixteen decimal places throughout. The final table is formatted to an appropriate number of significant figures.

Note: Please see the preceding page concerning treatment of minimum detection limits and mathematical operations on values that are below minimum detection limits.

042010 103801
0

1. Total blank amount (µg)

$$m_{total-B} = \sum_{i=1}^{n} m_{i-B}$$

Where:

m_{1b-B}	= mercury amount in blank for Fraction 1b	=	<0.1000	µg
m_{2b-B}	= mercury amount in blank for Fraction 2b	=	<0.2000	µg
m_{3a-B}	= mercury amount in blank for Fraction 3a	=	<0.2000	µg
m_{3b-B}	= mercury amount in blank for Fraction 3b	=	<0.5000	µg
m_{3c-B}	= mercury amount in blank for Fraction 3c	=	<0.4000	µg
$m_{total-B}$	= total amount of mercury in blank	=	<1.4000	µg

2. Total sample amount (µg)

$$m_{total-S} = \sum_{i=1}^{n} m_{i-S}$$

Where:

m_{1b-S}	= mercury amount in sample for Fraction 1b	=	<0.1000	µg
m_{2b-S}	= mercury amount in sample for Fraction 2b	=	4.8386	µg
m_{3a-S}	= mercury amount in sample for Fraction 3a	=	<0.2000	µg
m_{3b-S}	= mercury amount in sample for Fraction 3b	=	<0.5000	µg
m_{3c-S}	= mercury amount in sample for Fraction 3c	=	<0.4000	µg
$m_{total-S}$	= total amount of mercury in sample	=	4.8386	µg

3. Allowable blank correction (µg)

$$m_{T-B-allow} = m_{total-B} \text{ if } m_{total-B} \leq 0.6$$

$$m_{T-B-allow} = MAX\left[0.6, \quad MIN\left(m_{total-B}, \quad 0.05 \times m_{total-S}\right)\right] \text{ if } m_{total-B} > 0.6$$

Laboratory Data

m Net matter collected (g)

Filterable Particulate Results

C Particulate Concentration (mg/dscm)

C Particulate Concentration @7% O_2 (mg/dscm)

Where:

$m_{total-B}$	= total amount of mercury in blank	=	<1.4000	µg
$m_{total-S}$	= total amount of mercury in sample	=	4.8386	µg
$0.05 \times m_{total-S}$	= 5% of $m_{total-S}$	=	0.2419	µg
MAX	= arithmetic operator that returns the maximum of two values			
MIN	= arithmetic operator that returns the minimum of two values			
$m_{T-B-allow}$	= total allowable blank correction	=	0.0000	µg

NOTE: In this case, the second criteria applies.

Copyright © 2006 Clean Air Engineering Inc.

QA/QC ________
Date ________

4. Sample corrected for allowable blank - Total (µg)

$$m_n = m_{total-S} - m_{T-B-allow}$$

Where:

$m_{total-S}$	= total amount of mercury in sample	=	4.8386	µg
$m_{T-B-allow}$	= total allowable blank correction	=	0.0000	µg
m_n	= total mercury in sample corrected for allowable blank	=	4.8386	µg

5. Sample corrected for allowable blank - Prorated for each fraction (µg)

$$m_{n-i} = \left(\frac{m_{i-S}}{m_{total-S}} \right) (m_n)$$

Where:

m_n	= total mercury in sample corrected for allowable blank	=	4.8386	µg
m_{1b-S}	= mercury amount in sample for Fraction 1b	=	<0.1000	µg
m_{2b-S}	= mercury amount in sample for Fraction 2b	=	4.8386	µg
m_{3a-S}	= mercury amount in sample for Fraction 3a	=	<0.2000	µg
m_{3b-S}	= mercury amount in sample for Fraction 3b	=	<0.5000	µg
m_{3c-S}	= mercury amount in sample for Fraction 3c	=	<0.4000	µg
$m_{total-S}$	= total amount of mercury in sample	=	4.8386	µg
m_{n-1b}	= mercury corrected for blank - prorated for Fraction 1b	=	<0.1000	µg
m_{n-2b}	= mercury corrected for blank - prorated for Fraction 2b	=	4.8386	µg
m_{n-3a}	= mercury corrected for blank - prorated for Fraction 3a	=	<0.2000	µg
m_{n-3b}	= mercury corrected for blank - prorated for Fraction 3b	=	<0.5000	µg
m_{n-3c}	= mercury corrected for blank - prorated for Fraction 3c	=	<0.4000	µg

Copyright © 2006 Clean Air Engineering Inc.

QA/QC ________
Date ________

USEPA Method 5/29
Mercury Sample Calculations

Sample data taken from Run 1

Note: The tables presenting the results are generated electronically from raw data. It may not be possible to exactly duplicate these results using a calculator. The reference method data, results, and all calculations are carried to sixteen decimal places throughout. The final table is formatted to an appropriate number of significant figures.

042010 103905
J_O

1. Mercury concentration (lb/dscf)

$$C_{sd} = \left(\frac{m_n}{V_{mstd}}\right)\left(\frac{2.205\times10^{-3}}{10^6}\right)$$

Where:

m_n	= mercury collected in sample (total μg)	=	4.8386	μg
V_{mstd}	= volume metered, standard (dscf)	=	77.1689	dscf
2.205×10^{-3}	= conversion factor (lb/g)	=	2.205E-03	lb/g
10^6	= conversion factor (μg/g)	=	1.0E+06	μg/g
C_{sd}	= mercury concentration (lb/dscf)	=	1.3826E-10	lb/dscf

2. Mercury concentration (μg/dscm)

$$C_{sd} = \left(\frac{m_n}{V_{mstd}}\right)(35.31)$$

Where:

m_n	= mercury collected in sample (total μg)	=	4.8386	μg
V_{mstd}	= volume metered, standard (dscf)	=	77.1689	dscf
35.31	= conversion factor (dscf/dscm)	=	35.31	dscf/dscm
C_{sd}	= mercury concentration (μg/dscm)	=	2.2140E+00	μg/dscm

3. Mercury concentration (mg/dscm)

$$C_{sd} = \left(\frac{m_n}{V_{mstd}}\right)\left(\frac{35.31}{1000}\right)$$

Where:

m_n	= mercury collected in sample (total μg)	=	4.8386	μg
V_{mstd}	= volume metered, standard (dscf)	=	77.1689	dscf

Laboratory Data

m Net matter collected (g)

Filterable Particulate Results

C Particulate Concentration (mg/dscm)

C Particulate Concentration @7% O_2 (mg/dscm)

35.31	= conversion factor (dscf/dscm)	=	35.31	dscf/dscm
1000	= conversion factor (μg/mg)	=	1000	μg/mg
C_{sd}	= mercury concentration (mg/dscm)	=	2.2140E-03	mg/dscm

Copyright © 2006 Clean Air Engineering Inc.

QA/QC ________
Date ________

4. Mercury concentration (µg/Nm3 dry)

$$C_{sd} = \left(\frac{m_n}{V_{mstd}}\right)(35.31)\left(\frac{68+460}{32+460}\right)$$

Where:

m_n	= mercury collected in sample (total µg)	=	4.8386	µg
V_{mstd}	= volume metered, standard (dscf)	=	77.1689	dscf
35.31	= conversion factor (dscf/dscm)	=	35.31	dscf/dscm
68	= standard temperature (°F)	=	68	°F
32	= normal temperature (°F)	=	32	°F
460	= °F to °R conversion constant	=	460	
C_{sd}	= mercury concentration (µg/Nm3 dry)	=	2.3760E+00	µg/Nm^3 dry

5. Mercury concentration corrected to x% oxygen (lb/dscf example)

$$C_{sdx} = C_{sd}\left(\frac{20.9-x}{20.9-O_2}\right)$$

Where:

C_{sd}	= mercury concentration (lb/dscf)	=	1.3826E-10	lb/dscf
x	= oxygen content of corrected gas (%)	=	7.0	%
O_2	= proportion of oxygen in the gas stream by volume (%)	=	9.6	%
20.9	= oxygen content of ambient air (%)	=	20.9	%
C_{sdx}	= mercury concentration corrected to x% oxygen (lb/dscf)	=	1.6962E-10	lb/dscf @ x%O_2

6. Mercury concentration corrected to y% carbon dioxide (lb/dscf example)

$$C_{sdy} = C_{sd}\left(\frac{y}{CO_2}\right)$$

Where:

C_{sd}	= mercury concentration (lb/dscf)	=	1.3826E-10	lb/dscf
y	= carbon dioxide content of corrected gas (%)	=	12.0	%
CO_2	= proportion of carbon dioxide in the gas stream by volume (%)	=	9.7	%
C_{sdy}	= mercury conc. corrected to y% carbon dioxide (lb/dscf)	=	1.7122E-10	lb/dscf @ y%CO_2

7. Mercury concentration at actual gas conditions (lb/acf example)

$$C_a = C_{sd}\left(\frac{Q_{std}}{Q_a}\right)$$

Where:

C_{sd}	= mercury concentration (lb/dscf)	=	1.3826E-10	lb/dscf
Q_{std}	= volumetric flow rate at standard conditions, dry basis (dscfm)	=	94,473	dscfm
Q_a	= volumetric flow rate at actual conditions (acfm)	=	177,014	acfm
C_a	= mercury concentration at actual gas conditions (lb/acf)	=	7.3788E-11	lb/acf

Copyright © 2006 Clean Air Engineering Inc.

QA/QC ________
Date ________

8. Mercury emission rate (lb/hr)

$$E_{lb/hr} = \left(\frac{m_n}{V_{mstd}}\right)\left(\frac{2.205\times10^{-3}}{10^6}\right)(Q_{std})(60)$$

Where:

m_n	= mercury collected in sample (total µg)	=	4.8386	µg
V_{mstd}	= volume metered, standard (dscf)	=	77.1689	dscf
2.205×10^{-3}	= conversion factor (lb/g)	=	2.205E-03	lb/g
10^6	= conversion factor (µg/g)	=	1.0E+06	µg/g
Q_{std}	= volumetric flow rate at standard conditions, dry basis (dscfm)	=	94,473	dscfm
60	= conversion factor (min/hr)	=	60	min/hr
$E_{lb/hr}$	= mercury emission rate (lb/hr)	=	7.8369E-04	lb/hr

9. Mercury emission rate (g/s)

$$E_{g/s} = \left(\frac{m_n}{V_{mstd}}\right)\left(\frac{Q_{std}}{(10^6)(60)}\right)$$

Where:

m_n	= mercury collected in sample (total µg)	=	4.8386	µg
V_{mstd}	= volume metered, standard (dscf)	=	77.1689	dscf
Q_{std}	= volumetric flow rate at standard conditions, dry basis (dscfm)	=	94,473	dscfm
10^6	= conversion factor (µg/g)	=	1.0E+06	µg/g
60	= conversion factor (sec/min)	=	60	sec/min
$E_{g/s}$	= mercury emission rate (g/s)	=	9.8727E-05	g/s

10. Mercury emission rate (Ton/yr)

$$E_{T/yr} = \left(\frac{m_n}{V_{mstd}}\right)\left(\frac{2.205\times10^{-3}}{10^6}\right)(Q_{std})(60)\left(\frac{Cap}{2000}\right)$$

Where:

m_n	= mercury collected in sample (total µg)	=	4.8386	µg
V_{mstd}	= volume metered, standard (dscf)	=	77.1689	dscf
2.205×10^{-3}	= conversion factor (lb/g)	=	2.205E-03	lb/g
10^6	= conversion factor (µg/g)	=	1.0E+06	µg/g
Q_{std}	= volumetric flow rate at standard conditions, dry basis (dscfm)	=	94,473	dscfm
60	= conversion factor (min/hr)	=	60	min/hr
Cap	= capacity factor for process (hours operated/year)	=	8,760	hours/yr
2000	= conversion factor (lb/Ton)	=	2000	lb/Ton
$E_{T/yr}$	= mercury emission rate (Ton/yr)	=	3.4326E-03	Ton/yr

Copyright © 2006 Clean Air Engineenng Inc.

QA/QC ________
Date ________

11. Mercury emission rate - Fd-based (lb/MMBtu)

$$E_{Fd} = \left(\frac{m_n}{V_{mstd}}\right)\left(\frac{2.205\times10^{-3}}{10^6}\right)(F_d)\left(\frac{20.9}{20.9-O_2}\right)$$

Where:

m_n	= mercury collected in sample (total µg)	=	4.8386	µg
V_{mstd}	= volume metered, standard (dscf)	=	77.1689	dscf
2.205×10^{-3}	= conversion factor (lb/g)	=	2.205E-03	lb/g
10^6	= conversion factor (µg/g)	=	1.0E+06	µg/g
F_d	= ratio of gas volume to heat content of fuel (dscf/MMBtu)	=	9,570	dscf/MMBtu
O_2	= proportion of oxygen in the gas stream by volume (%)	=	9.6	%
20.9	= oxygen content of ambient air (%)	=	20.9	%
E_{Fd}	= mercury emission rate - Fd-based (lb/MMBtu)	=	2.4407E-06	lb/MMBtu

12. Mercury emission rate - Fc-based (lb/MMBtu)

$$E_{Fc} = \left(\frac{m_n}{V_{mstd}}\right)\left(\frac{2.205\times10^{-3}}{10^6}\right)(F_c)\left(\frac{100}{CO_2}\right)$$

Where:

m_n	= mercury collected in sample (total µg)	=	4.8386	µg
V_{mstd}	= volume metered, standard (dscf)	=	77.1689	dscf
2.205×10^{-3}	= conversion factor (lb/g)	=	2.205E-03	lb/g
10^6	= conversion factor (µg/g)	=	1.0E+06	µg/g
F_c	= ratio of gas volume to heat content of fuel (dscf/MMBtu)	=	1,820	dscf/MMBtu
CO_2	= proportion of oxygen in the gas stream by volume (%)	=	9.7	%
100	= conversion factor	=	100	
E_{Fc}	= mercury emission rate - Fc-based (lb/MMBtu)	=	2.5968E-06	lb/MMBtu

Copyright © 2006 Clean Air Engineering Inc.

QA/QC ________
Date ________

LOGIC FOR TREATING DETECTION LIMITS

(all metals except mercury)

1. Logic for Determining Maximum Allowable Front-Half Blank Correction ($m_{FB\text{-}allow}$)

	CASE 1 m_{FB} = D	CASE 2 m_{FB} = ND
Rule		
ND = 0	$m_{FB\text{-}allow}$ = M29 Rule	$m_{FB\text{-}allow}$ = 0
ND=1x	$m_{FB\text{-}allow}$ = M29 Rule	$m_{FB\text{-}allow}$ = 0
ND=0.5x	$m_{FB\text{-}allow}$ = M29 Rule	$m_{FB\text{-}allow}$ = 0

2. Logic for Determining Blank-Corrected Front-Half Sample Amount (m_F)

	CASE 1 $m_{FS} - m_{FB\text{-}allow} \geq$ MDL	CASE 2 $m_{FS} - m_{FB\text{-}allow} <$ MDL
Rule		
ND = 0	$m_F = m_{FS} - m_{FB\text{-}allow}$	m_F = < MDL
ND=1x	$m_F = m_{FS} - m_{FB\text{-}allow}$	m_F = < MDL
ND=0.5x	$m_F = m_{FS} - m_{FB\text{-}allow}$	m_F = < MDL

3. Logic for Determining Maximum Allowable Back-Half Blank Correction ($m_{BB\text{-}allow}$)

	CASE 1 m_{BB} = D	CASE 2 m_{BB} = ND
Rule		
ND = 0	$m_{BB\text{-}allow}$ = M29 Rule	$m_{BB\text{-}allow}$ = 0
ND=1x	$m_{BB\text{-}allow}$ = M29 Rule	$m_{BB\text{-}allow}$ = 0
ND=0.5x	$m_{BB\text{-}allow}$ = M29 Rule	$m_{BB\text{-}allow}$ = 0

4. Logic for Determining Blank-Corrected Back-Half Sample Amount (m_B)

	CASE 1 $m_{BS} - m_{BB\text{-}allow} \geq$ MDL	CASE 2 $m_{BS} - m_{BB\text{-}allow} <$ MDL
Rule		
ND = 0	$m_B = m_{BS} - m_{BB\text{-}allow}$	m_B = < MDL
ND=1x	$m_B = m_{BS} - m_{BB\text{-}allow}$	m_B = < MDL
ND=0.5x	$m_B = m_{BS} - m_{BB\text{-}allow}$	m_B = < MDL

5. Logic for Adding Front and Back-Half Corrected Samples (m_n)

Laboratory Data

m_n	Net matter collected (g)	

Filterable Particulate Results

	C_{sd}	Particulate Concentration (mg/dscm)	
	C_{sd7}	Particulate Concentration @7% O_2 (mg/dscm)	
	CASE 1 Both are D	**CASE 2** One is D, other is ND	**CASE 3** Both are ND
Rule			
ND = 0	$m_n = m_F + m_B$	m_n = D	m_n = < Sum ND
ND=1x	$m_n = m_F + m_B$	m_n = < [D + ND]	m_n = < Sum ND
ND=0.5x	$m_n = m_F + m_B$	m_n = <[D + 0.5ND]	m_n = < 0.5 Sum ND

<u>**Definitions and Notes**</u>

The term "Rule" refers to the rule being implemented for hanMDLing non-detectable quantities in summations.
MDL = minimum detection limit.
D = Detectable quantity reported as D.
ND = Non-Detectable quantity reported at a value of ND.
If Front and Back-Half fractions are combined, then only Items 1 and 2 are used.

Prepared by Clean Air Engineering Proprietary Software
SS Metals-1 Version 2006-12a

Copyright © 2006 Clean Air Engineering Inc.

USEPA Method 5/29
Beryllium Analyte Calculations

Sample data taken from Run 1

Note: The tables presenting the results are generated electronically from raw data. It may not be possible to exactly duplicate these results using a calculator. The reference method data, results, and all calculations are carried to sixteen decimal places throughout. The final table is formatted to an appropriate number of significant figures.

Note: Please see the preceding page concerning treatment of minimum detection limits and mathematical operations on values that are below minimum detection limits.

042010 103923
P

1. Maximum front-half blank correction criteria (µg)

$$A = (1.4)\left(\frac{3.141593}{4}\right)\left(\frac{D}{2.54}\right)^2$$

Where:

D	= diameter of filter used in sample apparatus	=	8.2	cm
1.4	= allowable blank per square inch of filter area	=	1.4	µg/in^2
2.54	= conversion constant	=	2.54	cm/in
4	= conversion constant	=	4	
3.141593	= conversion constant (pi)	=	3.141593	
A	= maximum front-half blank correction criteria	=	12.46	µg

2. Allowable blank correction - combined front and back-half sample fractions (µg)

$$m_{FB-allow} = m_{FB} \text{ if } m_{FB} \le A+1$$
$$m_{FB-allow} = MAX\ [A+1,\ \ MIN\ (m_{FB},\ \ 0.05 \times m_{FS})] \text{ if } m_{FB} > A+1$$

Where:

m_{FB}	= beryllium amount in combined front- and back-half blank	=	<0.0500	µg
m_{FS}	= beryllium amount in combined front- and back-half sample	=	<0.0500	µg
A+1	= max combined front- & back-half blank correction criteria	=	12.46	µg
0.05 x m_{FS}	= 5% of combined front- and back-half sample amount	=	<0.0025	µg
MAX	= arithmetic operator that returns the maximum of two values			
MIN	= arithmetic operator that returns the minimum of two values			
$m_{FB-allow}$	= allowable combined Beryllium blank correction	=	0.0000	µg

NOTE: In this case, the first criteria applies.

3. Combined front- and back-half sample corrected for allowable blank (µg)

Laboratory Data

m Net matter collected (g)

Filterable Particulate Results

C Particulate Concentration (mg/dscm)

C Particulate Concentration @7% O_2 (mg/dscm)

$$m_n = m_{FS} - m_{FB-allow}$$

Where:

m_{FS}	= beryllium amount in combined front- and back-half sample	=	<0.0500	µg
$m_{FB-allow}$	= allowable combined beryllium blank correction	=	0.0000	µg
m_n	= blank-corrected beryllium in combined sample	=	<0.0500	µg

Copyright © 2006 Clean Air Engineering Inc.

QA/QC ________
Date ________

USEPA Method 5/29
Beryllium Sample Calculations

Sample data taken from Run 1

Note: The tables presenting the results are generated electronically from raw data. It may not be possible to exactly duplicate these results using a calculator. The reference method data, results, and all calculations are carried to sixteen decimal places throughout. The final table is formatted to an appropriate number of significant figures.

042010 103947
J_P

1. Beryllium concentration (lb/dscf)

$$C_{sd} = \left(\frac{m_n}{V_{mstd}}\right)\left(\frac{2.205\times10^{-3}}{10^6}\right)$$

Where:

m_n	= beryllium collected in sample (total µg)	=	<0.0500	µg
V_{mstd}	= volume metered, standard (dscf)	=	77.1689	dscf
2.205×10^{-3}	= conversion factor (lb/g)	=	2.205E-03	lb/g
10^6	= conversion factor (µg/g)	=	1.0E+06	µg/g
C_{sd}	= beryllium concentration (lb/dscf)	=	<1.4287E-12	lb/dscf

2. Beryllium concentration (µg/dscm)

$$C_{sd} = \left(\frac{m_n}{V_{mstd}}\right)(35.31)$$

Where:

m_n	= beryllium collected in sample (total µg)	=	<0.0500	µg
V_{mstd}	= volume metered, standard (dscf)	=	77.1689	dscf
35.31	= conversion factor (dscf/dscm)	=	35.31	dscf/dscm
C_{sd}	= beryllium concentration (µg/dscm)	=	<2.2878E-02	µg/dscm

3. Beryllium concentration (mg/dscm)

$$C_{sd} = \left(\frac{m_n}{V_{mstd}}\right)\left(\frac{35.31}{1000}\right)$$

Where:

m_n	= beryllium collected in sample (total µg)	=	<0.0500	µg
V_{mstd}	= volume metered, standard (dscf)	=	77.1689	dscf
35.31	= conversion factor (dscf/dscm)	=	35.31	dscf/dscm
1000	= conversion factor (µg/mg)	=	1000	µg/mg
C_{sd}	= beryllium concentration (mg/dscm)	=	<2.2878E-05	mg/dscm

Copyright © 2008 Clean Air Engineering Inc.

QA/QC ________
Date ________

4. Beryllium concentration (µg/Nm3 dry)

$$C_{sd} = \left(\frac{m_n}{V_{mstd}}\right)(35.31)\left(\frac{68+460}{32+460}\right)$$

Where:

m_n	= beryllium collected in sample (total µg)	=	<0.0500	µg
V_{mstd}	= volume metered, standard (dscf)	=	77.1689	dscf
35.31	= conversion factor (dscf/dscm)	=	35.31	dscf/dscm
68	= standard temperature (°F)	=	68	°F
32	= normal temperature (°F)	=	32	°F
460	= °F to °R conversion constant	=	460	
C_{sd}	= beryllium concentration (µg/Nm3 dry)	=	<2.4552E-02	µg/Nm^3 dry

5. Beryllium concentration corrected to x% oxygen (lb/dscf example)

$$C_{sdx} = C_{sd}\left(\frac{20.9 - x}{20.9 - O_2}\right)$$

Where:

C_{sd}	= beryllium concentration (lb/dscf)	=	<1.4287E-12	lb/dscf
x	= oxygen content of corrected gas (%)	=	7.0	%
O_2	= proportion of oxygen in the gas stream by volume (%)	=	9.6	%
20.9	= oxygen content of ambient air (%)	=	20.9	%
C_{sdx}	= beryllium concentration corrected to x% oxygen (lb/dscf)	=	<1.7528E-12	lb/dscf @ x%O_2

6. Beryllium concentration corrected to y% carbon dioxide (lb/dscf example)

$$C_{sdy} = C_{sd}\left(\frac{y}{CO_2}\right)$$

Where:

C_{sd}	= beryllium concentration (lb/dscf)	=	<1.4287E-12	lb/dscf
y	= carbon dioxide content of corrected gas (%)	=	12.0	%
CO_2	= proportion of carbon dioxide in the gas stream by volume (%)	=	9.7	%
C_{sdy}	= beryllium conc. corrected to y% carbon dioxide (lb/dscf)	=	<1.7693E-12	lb/dscf @ y%CO_2

7. Beryllium concentration at actual gas conditions (lb/acf example)

$$C_a = C_{sd}\left(\frac{Q_{std}}{Q_a}\right)$$

Where:

C_{sd}	= beryllium concentration (lb/dscf)	=	<1.4287E-12	lb/dscf
Q_{std}	= volumetric flow rate at standard conditions, dry basis (dscfm)	=	94,473	dscfm
Q_a	= volumetric flow rate at actual conditions (acfm)	=	177,014	acfm
C_a	= beryllium concentration at actual gas conditions (lb/acf)	=	<7.6249E-13	lb/acf

Copyright © 2006 Clean Air Engineering Inc.

QA/QC ________
Date ________

8. Beryllium emission rate (lb/hr)

$$E_{lb/hr} = \left(\frac{m_n}{V_{mstd}}\right)\left(\frac{2.205\times10^{-3}}{10^6}\right)(Q_{std})(60)$$

Where:

m_n	= beryllium collected in sample (total µg)	=	<0.0500	µg
V_{mstd}	= volume metered, standard (dscf)	=	77.1689	dscf
2.205×10^{-3}	= conversion factor (lb/g)	=	2.205E-03	lb/g
10^6	= conversion factor (µg/g)	=	1.0E+06	µg/g
Q_{std}	= volumetric flow rate at standard conditions, dry basis (dscfm)	=	94,473	dscfm
60	= conversion factor (min/hr)	=	60	min/hr
$E_{lb/hr}$	= beryllium emission rate (lb/hr)	=	<8.0983E-06	lb/hr

9. Beryllium emission rate (g/s)

$$E_{g/s} = \left(\frac{m_n}{V_{mstd}}\right)\left(\frac{Q_{std}}{(10^6)(60)}\right)$$

Where:

m_n	= beryllium collected in sample (total µg)	=	<0.0500	µg
V_{mstd}	= volume metered, standard (dscf)	=	77.1689	dscf
Q_{std}	= volumetric flow rate at standard conditions, dry basis (dscfm)	=	94,473	dscfm
10^6	= conversion factor (µg/g)	=	1.0E+06	µg/g
60	= conversion factor (sec/min)	=	60	sec/min
$E_{g/s}$	= beryllium emission rate (g/s)	=	<1.0202E-06	g/s

10. Beryllium emission rate (Ton/yr)

$$E_{T/yr} = \left(\frac{m_n}{V_{mstd}}\right)\left(\frac{2.205\times10^{-3}}{10^6}\right)(Q_{std})(60)\left(\frac{Cap}{2000}\right)$$

Where:

m_n	= beryllium collected in sample (total µg)	=	<0.0500	µg
V_{mstd}	= volume metered, standard (dscf)	=	77.1689	dscf
2.205×10^{-3}	= conversion factor (lb/g)	=	2.205E-03	lb/g
10^6	= conversion factor (µg/g)	=	1.0E+06	µg/g
Q_{std}	= volumetric flow rate at standard conditions, dry basis (dscfm)	=	94,473	dscfm
60	= conversion factor (min/hr)	=	60	min/hr
Cap	= capacity factor for process (hours operated/year)	=	8,760	hours/yr
2000	= conversion factor (lb/Ton)	=	2000	lb/Ton
$E_{Ton/yr}$	= beryllium emission rate (Ton/yr)	=	<3.5471E-05	Ton/yr

Copyright © 2006 Clean Air Engineering Inc.

QA/QC ________
Date ________

11. Beryllium emission rate - Fd-based (lb/MMBtu)

$$E_{Fd} = \left(\frac{m_n}{V_{mstd}}\right)\left(\frac{2.205\times10^{-3}}{10^6}\right)(F_d)\left(\frac{20.9}{20.9-O_2}\right)$$

Where:

m_n	= beryllium collected in sample (total µg)	=	<0.0500	µg
V_{mstd}	= volume metered, standard (dscf)	=	77.1689	dscf
2.205×10^{-3}	= conversion factor (lb/g)	=	2.205E-03	lb/g
10^6	= conversion factor (µg/g)	=	1.0E+06	µg/g
F_d	= ratio of gas volume to heat content of fuel (dscf/MMBtu)	=	9,570	dscf/MMBtu
O_2	= proportion of oxygen in the gas stream by volume (%)	=	9.6	%
20.9	= oxygen content of ambient air (%)	=	20.9	%
E_{Fd}	= beryllium emission rate - Fd-based (lb/MMBtu)	=	<2.5221E-08	lb/MMBtu

12. Beryllium emission rate - Fc-based (lb/MMBtu)

$$E_{Fc} = \left(\frac{m_n}{V_{mstd}}\right)\left(\frac{2.205\times10^{-3}}{10^6}\right)(F_c)\left(\frac{100}{CO_2}\right)$$

Where:

m_n	= beryllium collected in sample (total µg)	=	<0.0500	µg
V_{mstd}	= volume metered, standard (dscf)	=	77.1689	dscf
2.205×10^{-3}	= conversion factor (lb/g)	=	2.205E-03	lb/g
10^6	= conversion factor (µg/g)	=	1.0E+06	µg/g
F_c	= ratio of gas volume to heat content of fuel (dscf/MMBtu)	=	1,820	dscf/MMBtu
CO_2	= proportion of oxygen in the gas stream by volume (%)	=	9.7	%
100	= conversion factor	=	100	
E_{Fc}	= beryllium emission rate - Fc-based (lb/MMBtu)	=	<2.6834E-08	lb/MMBtu

Copyright © 2008 Clean Air Engineering Inc.

QA/QC ________
Date ________

USEPA Method 5/29
Cadmium Analyte Calculations

Sample data taken from Run 1

Note: The tables presenting the results are generated electronically from raw data. It may not be possible to exactly duplicate these results using a calculator. The reference method data, results, and all calculations are carried to sixteen decimal places throughout. The final table is formatted to an appropriate number of significant figures.

Note: Please see the preceding page concerning treatment of minimum detection limits and mathematical operations on values that are below minimum detection limits.

042010 104144
P

1. Maximum front-half blank correction criteria (µg)

$$A = (1.4)\left(\frac{3.141593}{4}\right)\left(\frac{D}{2.54}\right)^2$$

Where:

D	= diameter of filter used in sample apparatus	=	8.2	cm
1.4	= allowable blank per square inch of filter area	=	1.4	µg/in^2
2.54	= conversion constant	=	2.54	cm/in
4	= conversion constant	=	4	
3.141593	= conversion constant (pi)	=	3.141593	
A	= maximum front-half blank correction criteria	=	12.46	µg

2. Allowable blank correction - combined front and back-half sample fractions (µg)

$$m_{FB-allow} = m_{FB} \text{ if } m_{FB} \leq A + 1$$

$$m_{FB-allow} = MAX\left[A + 1,\quad MIN\left(m_{FB},\ 0.05 \times m_{FS}\right)\right] \text{ if } m_{FB} > A + 1$$

Where:

m_{FB}	= cadmium amount in combined front- and back-half blank	=	<0.2000	µg
m_{FS}	= cadmium amount in combined front- and back-half sample	=	<0.2000	µg
A+1	= max combined front- & back-half blank correction criteria	=	12.46	µg
0.05 x m_{FS}	= 5% of combined front- and back-half sample amount	=	<0.0100	µg
MAX	= arithmetic operator that returns the maximum of two values			
MIN	= arithmetic operator that returns the minimum of two values			
$m_{FB\text{-}allow}$	= allowable combined Cadmium blank correction	=	0.0000	µg

NOTE: In this case, the first criteria applies.

3. Combined front- and back-half sample corrected for allowable blank (µg)

Laboratory Data

m Net matter collected (g)

Filterable Particulate Results

C Particulate Concentration (mg/dscm)

C Particulate Concentration @7% O_2 (mg/dscm)

$$m_n = m_{FS} - m_{FB-allow}$$

Where:

m_{FS}	= cadmium amount in combined front- and back-half sample	=	<0.2000	µg
$m_{FB\text{-}allow}$	= allowable combined cadmium blank correction	=	0.0000	µg
m_n	= blank-corrected cadmium in combined sample	=	<0.2000	µg

Copyright © 2006 Clean Air Engineering Inc.

QA/QC ________
Date ________

USEPA Method 5/29
Cadmium Sample Calculations

Sample data taken from Run 1

Note: The tables presenting the results are generated electronically from raw data. It may not be possible to exactly duplicate these results using a calculator. The reference method data, results, and all calculations are carried to sixteen decimal places throughout. The final table is formatted to an appropriate number of significant figures.

042010 104156
J_P

1. Cadmium concentration (lb/dscf)

$$C_{sd} = \left(\frac{m_n}{V_{mstd}}\right)\left(\frac{2.205\times10^{-3}}{10^6}\right)$$

Where:

m_n	= cadmium collected in sample (total µg)	=	<0.2000	µg
V_{mstd}	= volume metered, standard (dscf)	=	77.1689	dscf
2.205×10^{-3}	= conversion factor (lb/g)	=	2.205E-03	lb/g
10^6	= conversion factor (µg/g)	=	1.0E+06	µg/g
C_{sd}	= cadmium concentration (lb/dscf)	=	<5.7147E-12	lb/dscf

2. Cadmium concentration (µg/dscm)

$$C_{sd} = \left(\frac{m_n}{V_{mstd}}\right)(35.31)$$

Where:

m_n	= cadmium collected in sample (total µg)	=	<0.2000	µg
V_{mstd}	= volume metered, standard (dscf)	=	77.1689	dscf
35.31	= conversion factor (dscf/dscm)	=	35.31	dscf/dscm
C_{sd}	= cadmium concentration (µg/dscm)	=	<9.1514E-02	µg/dscm

3. Cadmium concentration (mg/dscm)

$$C_{sd} = \left(\frac{m_n}{V_{mstd}}\right)\left(\frac{35.31}{1000}\right)$$

Where:

m_n	= cadmium collected in sample (total µg)	=	<0.2000	µg
V_{mstd}	= volume metered, standard (dscf)	=	77.1689	dscf
35.31	= conversion factor (dscf/dscm)	=	35.31	dscf/dscm
1000	= conversion factor (µg/mg)	=	1000	µg/mg
C_{sd}	= cadmium concentration (mg/dscm)	=	<9.1514E-05	mg/dscm

Copyright © 2006 Clean Air Engineering Inc.

QA/QC ________
Date ________

4. Cadmium concentration (μg/Nm3 dry)

$$C_{sd} = \left(\frac{m_n}{V_{mstd}}\right)(35.31)\left(\frac{68+460}{32+460}\right)$$

Where:

m_n	= cadmium collected in sample (total μg)	=	<0.2000	μg
V_{mstd}	= volume metered, standard (dscf)	=	77.1689	dscf
35.31	= conversion factor (dscf/dscm)	=	35.31	dscf/dscm
68	= standard temperature (°F)	=	68	°F
32	= normal temperature (°F)	=	32	°F
460	= °F to °R conversion constant	=	460	
C_{sd}	= cadmium concentration (μg/Nm3 dry)	=	<9.8210E-02	μg/Nm^3 dry

5. Cadmium concentration corrected to x% oxygen (lb/dscf example)

$$C_{sdx} = C_{sd}\left(\frac{20.9-x}{20.9-O_2}\right)$$

Where:

C_{sd}	= cadmium concentration (lb/dscf)	=	<5.7147E-12	lb/dscf
x	= oxygen content of corrected gas (%)	=	7.0	%
O_2	= proportion of oxygen in the gas stream by volume (%)	=	9.6	%
20.9	= oxygen content of ambient air (%)	=	20.9	%
C_{sdx}	= cadmium concentration corrected to x% oxygen (lb/dscf)	=	<7.0110E-12	lb/dscf @ x%O_2

6. Cadmium concentration corrected to y% carbon dioxide (lb/dscf example)

$$C_{sdy} = C_{sd}\left(\frac{y}{CO_2}\right)$$

Where:

C_{sd}	= cadmium concentration (lb/dscf)	=	<5.7147E-12	lb/dscf
y	= carbon dioxide content of corrected gas (%)	=	12.0	%
CO_2	= proportion of carbon dioxide in the gas stream by volume (%)	=	9.7	%
C_{sdy}	= cadmium conc. corrected to y% carbon dioxide (lb/dscf)	=	<7.0771E-12	lb/dscf @ y%CO_2

7. Cadmium concentration at actual gas conditions (lb/acf example)

$$C_a = C_{sd}\left(\frac{Q_{std}}{Q_a}\right)$$

Where:

C_{sd}	= cadmium concentration (lb/dscf)	=	<5.7147E-12	lb/dscf
Q_{std}	= volumetric flow rate at standard conditions, dry basis (dscfm)	=	94,473	dscfm
Q_a	= volumetric flow rate at actual conditions (acfm)	=	177,014	acfm
C_a	= cadmium concentration at actual gas conditions (lb/acf)	=	<3.0500E-12	lb/acf

Copyright © 2006 Clean Air Engineering Inc.

QA/QC ________
Date ________

8. Cadmium emission rate (lb/hr)

$$E_{lb/hr} = \left(\frac{m_n}{V_{mstd}}\right)\left(\frac{2.205\times10^{-3}}{10^6}\right)(Q_{std})(60)$$

Where:

m_n	= cadmium collected in sample (total µg)	=	<0.2000	µg
V_{mstd}	= volume metered, standard (dscf)	=	77.1689	dscf
2.205×10^{-3}	= conversion factor (lb/g)	=	2.205E-03	lb/g
10^6	= conversion factor (µg/g)	=	1.0E+06	µg/g
Q_{std}	= volumetric flow rate at standard conditions, dry basis (dscfm)	=	94,473	dscfm
60	= conversion factor (min/hr)	=	60	min/hr
$E_{lb/hr}$	= cadmium emission rate (lb/hr)	=	<3.2393E-05	lb/hr

9. Cadmium emission rate (g/s)

$$E_{g/s} = \left(\frac{m_n}{V_{mstd}}\right)\left(\frac{Q_{std}}{(10^6)(60)}\right)$$

Where:

m_n	= cadmium collected in sample (total µg)	=	<0.2000	µg
V_{mstd}	= volume metered, standard (dscf)	=	77.1689	dscf
Q_{std}	= volumetric flow rate at standard conditions, dry basis (dscfm)	=	94,473	dscfm
10^6	= conversion factor (µg/g)	=	1.0E+06	µg/g
60	= conversion factor (sec/min)	=	60	sec/min
$E_{g/s}$	= cadmium emission rate (g/s)	=	<4.0808E-06	g/s

10. Cadmium emission rate (Ton/yr)

$$E_{T/yr} = \left(\frac{m_n}{V_{mstd}}\right)\left(\frac{2.205\times10^{-3}}{10^6}\right)(Q_{std})(60)\left(\frac{Cap}{2000}\right)$$

Where:

m_n	= cadmium collected in sample (total µg)	=	<0.2000	µg
V_{mstd}	= volume metered, standard (dscf)	=	77.1689	dscf
2.205×10^{-3}	= conversion factor (lb/g)	=	2.205E-03	lb/g
10^6	= conversion factor (µg/g)	=	1.0E+06	µg/g
Q_{std}	= volumetric flow rate at standard conditions, dry basis (dscfm)	=	94,473	dscfm
60	= conversion factor (min/hr)	=	60	min/hr
Cap	= capacity factor for process (hours operated/year)	=	8,760	hours/yr
2000	= conversion factor (lb/Ton)	=	2000	lb/Ton
$E_{Ton/yr}$	= cadmium emission rate (Ton/yr)	=	<1.4188E-04	Ton/yr

Copyright © 2006 Clean Air Engineering Inc.

QA/QC ________
Date ________

11. Cadmium emission rate - Fd-based (lb/MMBtu)

$$E_{Fd} = \left(\frac{m_n}{V_{mstd}}\right)\left(\frac{2.205\times10^{-3}}{10^6}\right)(F_d)\left(\frac{20.9}{20.9-O_2}\right)$$

Where:

m_n	= cadmium collected in sample (total µg)	=	<0.2000	µg
V_{mstd}	= volume metered, standard (dscf)	=	77.1689	dscf
2.205×10^{-3}	= conversion factor (lb/g)	=	2.205E-03	lb/g
10^6	= conversion factor (µg/g)	=	1.0E+06	µg/g
F_d	= ratio of gas volume to heat content of fuel (dscf/MMBtu)	=	9,570	dscf/MMBtu
O_2	= proportion of oxygen in the gas stream by volume (%)	=	9.6	%
20.9	= oxygen content of ambient air (%)	=	20.9	%
E_{Fd}	= cadmium emission rate - Fd-based (lb/MMBtu)	=	<1.0088E-07	lb/MMBtu

12. Cadmium emission rate - Fc-based (lb/MMBtu)

$$E_{Fc} = \left(\frac{m_n}{V_{mstd}}\right)\left(\frac{2.205\times10^{-3}}{10^6}\right)(F_c)\left(\frac{100}{CO_2}\right)$$

Where:

m_n	= cadmium collected in sample (total µg)	=	<0.2000	µg
V_{mstd}	= volume metered, standard (dscf)	=	77.1689	dscf
2.205×10^{-3}	= conversion factor (lb/g)	=	2.205E-03	lb/g
10^6	= conversion factor (µg/g)	=	1.0E+06	µg/g
F_c	= ratio of gas volume to heat content of fuel (dscf/MMBtu)	=	1,820	dscf/MMBtu
CO_2	= proportion of oxygen in the gas stream by volume (%)	=	9.7	%
100	= conversion factor	=	100	
E_{Fc}	= cadmium emission rate - Fc-based (lb/MMBtu)	=	<1.0734E-07	lb/MMBtu

Copyright © 2006 Clean Air Engineering Inc.

QA/QC ________
Date ________

USEPA Method 5/29
Lead Analyte Calculations

Sample data taken from Run 1

Note: The tables presenting the results are generated electronically from raw data. It may not be possible to exactly duplicate these results using a calculator. The reference method data, results, and all calculations are carried to sixteen decimal places throughout. The final table is formatted to an appropriate number of significant figures.

Note: Please see the preceding page concerning treatment of minimum detection limits and mathematical operations on values that are below minimum detection limits.

042010 104230
P

1. Maximum front-half blank correction criteria (µg)

$$A = (1.4)\left(\frac{3.141593}{4}\right)\left(\frac{D}{2.54}\right)^2$$

Where:

D	= diameter of filter used in sample apparatus	=	8.2	cm
1.4	= allowable blank per square inch of filter area	=	1.4	µg/in^2
2.54	= conversion constant	=	2.54	cm/in
4	= conversion constant	=	4	
3.141593	= conversion constant (pi)	=	3.141593	
A	= maximum front-half blank correction criteria	=	12.46	µg

2. Allowable blank correction - combined front and back-half sample fractions (µg)

$$m_{FB-allow} = m_{FB} \text{ if } m_{FB} \le A + 1$$
$$m_{FB-allow} = MAX\ [A + 1,\ \ MIN\ (m_{FB},\ \ 0.05 \times m_{FS})] \text{ if } m_{FB} > A + 1$$

Where:

m_{FB}	= lead amount in combined front- and back-half blank	=	0.2067	µg
m_{FS}	= lead amount in combined front- and back-half sample	=	0.5882	µg
A+1	= max combined front- & back-half blank correction criteria	=	12.46	µg
0.05 x m_{FS}	= 5% of combined front- and back-half sample amount	=	0.0294	µg
MAX	= arithmetic operator that returns the maximum of two values			
MIN	= arithmetic operator that returns the minimum of two values			
$m_{FB-allow}$	= allowable combined Lead blank correction	=	0.2067	µg

NOTE: In this case, the first criteria applies.

3. Combined front- and back-half sample corrected for allowable blank (µg)

Laboratory Data
m Net matter collected (g)

Filterable Particulate Results
C Particulate Concentration (mg/dscm)
C Particulate Concentration @7% O_2 (mg/dscm)

$$m_n = m_{FS} - m_{FB-allow}$$

Where:

m_{FS}	= lead amount in combined front- and back-half sample	=	0.5882	µg
$m_{FB-allow}$	= allowable combined lead blank correction	=	0.2067	µg
m_n	= blank-corrected lead in combined sample	=	0.3815	µg

Copyright © 2006 Clean Air Engineering Inc.

QA/QC ________
Date ________

USEPA Method 5/29
Lead Sample Calculations

Sample data taken from Run 1

Note: The tables presenting the results are generated electronically from raw data. It may not be possible to exactly duplicate these results using a calculator. The reference method data, results, and all calculations are carried to sixteen decimal places throughout. The final table is formatted to an appropriate number of significant figures.

042010 104240
J_P

1. Lead concentration (lb/dscf)

$$C_{sd} = \left(\frac{m_n}{V_{mstd}}\right)\left(\frac{2.205\times10^{-3}}{10^6}\right)$$

Where:

m_n	= lead collected in sample (total µg)	=	0.3815	µg
V_{mstd}	= volume metered, standard (dscf)	=	77.1689	dscf
2.205×10^{-3}	= conversion factor (lb/g)	=	2.205E-03	lb/g
10^6	= conversion factor (µg/g)	=	1.0E+06	µg/g
C_{sd}	= lead concentration (lb/dscf)	=	1.0901E-11	lb/dscf

2. Lead concentration (µg/dscm)

$$C_{sd} = \left(\frac{m_n}{V_{mstd}}\right)(35.31)$$

Where:

m_n	= lead collected in sample (total µg)	=	0.3815	µg
V_{mstd}	= volume metered, standard (dscf)	=	77.1689	dscf
35.31	= conversion factor (dscf/dscm)	=	35.31	dscf/dscm
C_{sd}	= lead concentration (µg/dscm)	=	1.7457E-01	µg/dscm

3. Lead concentration (mg/dscm)

$$C_{sd} = \left(\frac{m_n}{V_{mstd}}\right)\left(\frac{35.31}{1000}\right)$$

Where:

m_n	= lead collected in sample (total µg)	=	0.3815	µg
V_{mstd}	= volume metered, standard (dscf)	=	77.1689	dscf
35.31	= conversion factor (dscf/dscm)	=	35.31	dscf/dscm
1000	= conversion factor (µg/mg)	=	1000	µg/mg
C_{sd}	= lead concentration (mg/dscm)	=	1.7457E-04	mg/dscm

Copyright © 2008 Clean Air Engineering Inc.

QA/QC ________
Date ________

4. Lead concentration (µg/Nm3 dry)

$$C_{sd} = \left(\frac{m_n}{V_{mstd}}\right)(35.31)\left(\frac{68 + 460}{32 + 460}\right)$$

Where:

m_n	= lead collected in sample (total µg)	=	0.3815	µg
V_{mstd}	= volume metered, standard (dscf)	=	77.1689	dscf
35.31	= conversion factor (dscf/dscm)	=	35.31	dscf/dscm
68	= standard temperature (°F)	=	68	°F
32	= normal temperature (°F)	=	32	°F
460	= °F to °R conversion constant	=	460	
C_{sd}	= lead concentration (µg/Nm3 dry)	=	1.8734E-01	µg/Nm^3 dry

5. Lead concentration corrected to x% oxygen (lb/dscf example)

$$C_{sdx} = C_{sd}\left(\frac{20.9 - x}{20.9 - O_2}\right)$$

Where:

C_{sd}	= lead concentration (lb/dscf)	=	1.0901E-11	lb/dscf
x	= oxygen content of corrected gas (%)	=	7.0	%
O_2	= proportion of oxygen in the gas stream by volume (%)	=	9.6	%
20.9	= oxygen content of ambient air (%)	=	20.9	%
C_{sdx}	= lead concentration corrected to x% oxygen (lb/dscf)	=	1.3374E-11	lb/dscf @ x%O_2

6. Lead concentration corrected to y% carbon dioxide (lb/dscf example)

$$C_{sdy} = C_{sd}\left(\frac{y}{CO_2}\right)$$

Where:

C_{sd}	= lead concentration (lb/dscf)	=	1.0901E-11	lb/dscf
y	= carbon dioxide content of corrected gas (%)	=	12.0	%
CO_2	= proportion of carbon dioxide in the gas stream by volume (%)	=	9.7	%
C_{sdy}	= lead conc. corrected to y% carbon dioxide (lb/dscf)	=	1.3500E-11	lb/dscf @ y%CO_2

7. Lead concentration at actual gas conditions (lb/acf example)

$$C_a = C_{sd}\left(\frac{Q_{std}}{Q_a}\right)$$

Where:

C_{sd}	= lead concentration (lb/dscf)	=	1.0901E-11	lb/dscf
Q_{std}	= volumetric flow rate at standard conditions, dry basis (dscfm)	=	94,473	dscfm
Q_a	= volumetric flow rate at actual conditions (acfm)	=	177,014	acfm
C_a	= lead concentration at actual gas conditions (lb/acf)	=	5.8181E-12	lb/acf

Copyright © 2006 Clean Air Engineering Inc.

QA/QC ________
Date ________

8. Lead emission rate (lb/hr)

$$E_{lb/hr} = \left(\frac{m_n}{V_{mstd}}\right)\left(\frac{2.205\times10^{-3}}{10^6}\right)(Q_{std})(60)$$

Where:

m_n	= lead collected in sample (total µg)	=	0.3815	µg
V_{mstd}	= volume metered, standard (dscf)	=	77.1689	dscf
2.205×10^{-3}	= conversion factor (lb/g)	=	2.205E-03	lb/g
10^6	= conversion factor (µg/g)	=	1.0E+06	µg/g
Q_{std}	= volumetric flow rate at standard conditions, dry basis (dscfm)	=	94,473	dscfm
60	= conversion factor (min/hr)	=	60	min/hr
$E_{lb/hr}$	= lead emission rate (lb/hr)	=	6.1793E-05	lb/hr

9. Lead emission rate (g/s)

$$E_{g/s} = \left(\frac{m_n}{V_{mstd}}\right)\left(\frac{Q_{std}}{(10^6)(60)}\right)$$

Where:

m_n	= lead collected in sample (total µg)	=	0.3815	µg
V_{mstd}	= volume metered, standard (dscf)	=	77.1689	dscf
Q_{std}	= volumetric flow rate at standard conditions, dry basis (dscfm)	=	94,473	dscfm
10^6	= conversion factor (µg/g)	=	1.0E+06	µg/g
60	= conversion factor (sec/min)	=	60	sec/min
$E_{g/s}$	= lead emission rate (g/s)	=	7.7845E-06	g/s

10. Lead emission rate (Ton/yr)

$$E_{T/yr} = \left(\frac{m_n}{V_{mstd}}\right)\left(\frac{2.205\times10^{-3}}{10^6}\right)(Q_{std})(60)\left(\frac{Cap}{2000}\right)$$

Where:

m_n	= lead collected in sample (total µg)	=	0.3815	µg
V_{mstd}	= volume metered, standard (dscf)	=	77.1689	dscf
2.205×10^{-3}	= conversion factor (lb/g)	=	2.205E-03	lb/g
10^6	= conversion factor (µg/g)	=	1.0E+06	µg/g
Q_{std}	= volumetric flow rate at standard conditions, dry basis (dscfm)	=	94,473	dscfm
60	= conversion factor (min/hr)	=	60	min/hr
Cap	= capacity factor for process (hours operated/year)	=	8,760	hours/yr
2000	= conversion factor (lb/Ton)	=	2000	lb/Ton
$E_{Ton/yr}$	= lead emission rate (Ton/yr)	=	2.7065E-04	Ton/yr

Copyright © 2008 Clean Air Engineering Inc.

QA/QC ________
Date ________

11. Lead emission rate - Fd-based (lb/MMBtu)

$$E_{Fd} = \left(\frac{m_n}{V_{mstd}}\right)\left(\frac{2.205\times10^{-3}}{10^6}\right)(F_d)\left(\frac{20.9}{20.9-O_2}\right)$$

Where:

m_n	= lead collected in sample (total µg)	=	0.3815	µg
V_{mstd}	= volume metered, standard (dscf)	=	77.1689	dscf
2.205×10^{-3}	= conversion factor (lb/g)	=	2.205E-03	lb/g
10^6	= conversion factor (µg/g)	=	1.0E+06	µg/g
F_d	= ratio of gas volume to heat content of fuel (dscf/MMBtu)	=	9,570	dscf/MMBtu
O_2	= proportion of oxygen in the gas stream by volume (%)	=	9.6	%
20.9	= oxygen content of ambient air (%)	=	20.9	%
E_{Fd}	= lead emission rate - Fd-based (lb/MMBtu)	=	1.9245E-07	lb/MMBtu

12. Lead emission rate - Fc-based (lb/MMBtu)

$$E_{Fc} = \left(\frac{m_n}{V_{mstd}}\right)\left(\frac{2.205\times10^{-3}}{10^6}\right)(F_c)\left(\frac{100}{CO_2}\right)$$

Where:

m_n	= lead collected in sample (total µg)	=	0.3815	µg
V_{mstd}	= volume metered, standard (dscf)	=	77.1689	dscf
2.205×10^{-3}	= conversion factor (lb/g)	=	2.205E-03	lb/g
10^6	= conversion factor (µg/g)	=	1.0E+06	µg/g
F_c	= ratio of gas volume to heat content of fuel (dscf/MMBtu)	=	1,820	dscf/MMBtu
CO_2	= proportion of oxygen in the gas stream by volume (%)	=	9.7	%
100	= conversion factor	=	100	
E_{Fc}	= lead emission rate - Fc-based (lb/MMBtu)	=	2.0475E-07	lb/MMBtu

Prepared by Clean Air Engineering Proprietary Software
SS Metals-1 Version 2006-12a

Copyright © 2006 Clean Air Engineering Inc.

QA/QC ________
Date ________

USEPA Method 13B (Total Fluorides)
Sampling, Velocity and Moisture Sample Calculations

Sample data taken from Run 1

Note: The tables presenting the results are generated electronically from raw data. It may not be possible to exactly duplicate these results using a calculator. The reference method data, results, and all calculations are carried to sixteen decimal places throughout. The final table is formatted to an appropriate number of significant figures.

042010 104529
O

1. Volume of water collected (wscf)

$$V_{wstd} = (0.04706)(V_{lc})$$

Where:

V_{lc}	= total volume of liquid collected in impingers and silica gel (ml)	=	218.9	ml
0.04706	= ideal gas conversion factor (ft^3 water vapor/ml or gm)	=	0.04706	ft^3/ml
V_{wstd}	= volume of water vapor collected at standard conditions (ft^3)	=	10.30	ft^3

2. Volume of gas metered, standard conditions (dscf)

$$V_{mstd} = \frac{(17.64)(V_m)\left(P_{bar} + \frac{\Delta H}{13.6}\right)(Y_d)}{(460 + T_m)}$$

Where:

P_{bar}	= barometric pressure (in. Hg)	=	30.10	in. Hg
T_m	= average dry gas meter temperature (°F)	=	69.60	°F
V_m	= volume of gas sample through the dry gas meter at meter conditions (dcf)	=	36.72	dcf
Y_d	= gas meter correction factor (dimensionless)	=	1.0005	
ΔH	= average pressure drop across meter box orifice (in. H_2O)	=	1.14	in. H_2O
17.64	= standard temperature to pressure ratio (°R/in. Hg)	=	17.64	°R/in. Hg
13.6	= conversion factor (in. H_2O/in. Hg)	=	13.6	in.H_2O/in. Hg
460	= °F to °R conversion constant	=	460	
V_{mstd}	= volume of gas sampled through the dry gas meter at standard conditions (dscf)	=	36.936	dscf

3. Sample gas pressure (in. Hg)

$$P_s = P_{bar} + \left(\frac{P_g}{13.6}\right)$$

Where:

P_{bar}	= barometric pressure (in. Hg)	=	30.10	in. Hg
P_g	= sample gas static pressure (in. H_2O)	=	-10.20	in. H_2O
13.6	= conversion factor (in. H_2O/in. Hg)	=	13.6	in. H_2O/in. Hg
P_s	= absolute sample gas pressure (in. Hg)	=	29.35	in. Hg

Copyright © 2006 Clean Air Engineering Inc.

QA/QC ________
Date ________

4. Actual water vapor pressure at sample gas temperature less than 212°F (in. Hg)

$$P_v = \frac{e^{\left(18.3036 - \frac{3816.44}{\frac{5}{9}(T_s - 32) + 273.15 - 46.13}\right)}}{25.4}$$

Where:

T_s	= average sample gas temperature (°F)	=	293.12	°F
18.3036	= Antoine coefficient	=	18.3036	°K
3816.44	= Antoine coefficient	=	3816.44	°K
273.15	= temperature conversion factor	=	273.15	°K
46.13	= Antoine coefficient	=	46.13	°K
25.4	= conversion factor	=	25.4	mm Hg/in. Hg
5/9	= Fahrenheit to Celsius conversion factor	=	5/9	°C/°F
32	= temperature conversion (°F)	=	32	°F
P_v	= vapor pressure, actual (in. Hg)	=	29.35	in. Hg

5. Water vapor pressure at gas temperature greater than 212°F (in. Hg)

$$P_v = P_s$$

Where:

P_s	= absolute sample gas pressure (in. Hg)	=	29.35	in. Hg
P_v	= water vapor pressure, actual (in. Hg)	=	29.35	in. Hg

6. Moisture measured in sample (% by volume)

$$B_{wo} = \frac{V_{wstd}}{(V_{mstd} + V_{wstd})}$$

Where:

V_{mstd}	= volume of gas sampled through the dry gas meter at standard conditions (dscf)	=	36.936	dscf
V_{wstd}	= volume of water collected at standard conditions (scf)	=	10.30	scf
B_{wo}	= proportion of water measured in the gas stream by volume	=	0.2181	
		=	21.81	%

7. Saturated moisture content (% by volume)

$$B_{ws} = \frac{P_v}{P_s}$$

Where:

P_s	= absolute sample gas pressure (in. Hg)	=	29.35	in. Hg
P_v	= water vapor pressure, actual (in. Hg)	=	29.35	in. Hg
B_{ws}	= proportion of water vapor in the gas stream by volume at saturated conditions		1.0000	
		=	100.00	%

Copyright © 2006 Clean Air Engineering Inc.

QA/QC ________
Date ________

8. Actual water vapor in gas (% by volume)

$$B_w = MINIMUM \quad [B_{wo}, B_{ws}]$$

Where:

B_{ws}	= proportion of water vapor in the gas stream by volume at saturated conditions	=	1.0000	
B_{wo}	= proportion of water measured in the gas stream by volume	=	0.2181	
B_w	= actual water vapor in gas	=	0.2181	
		=	21.81	%

9. Nitrogen (plus carbon monoxide) in gas stream (% by volume, dry)

$$N_2 + CO = 100 - CO_2 - O_2$$

Where:

CO_2	= proportion of carbon dioxide in the gas stream by volume (%)	=	10.3	%
O_2	= proportion of oxygen in the gas stream by volume (%)	=	9.2	%
100	= conversion factor (%)	=	100	%
N_2+CO	= proportion of nitrogen and CO in the gas stream by volume (%)	=	80.51	%

10. Molecular weight of dry gas stream (lb/lb·mole)

$$M_d = \left(M_{CO_2}\right)\frac{(CO_2)}{(100)} + \left(M_{O_2}\right)\frac{(O_2)}{(100)} + \left(M_{N_2+CO}\right)\frac{(N_2+CO)}{(100)}$$

Where:

M_{CO2}	= molecular weight of carbon dioxide (lb/lb·mole)	=	44.00	lb/lb·mole
M_{O2}	= molecular weight of oxygen (lb/lb·mole)	=	32.00	lb/lb·mole
M_{N2+CO}	= molecular weight of nitrogen and carbon monoxide (lb/lb·mole)	=	28.00	lb/lb·mole
CO_2	= proportion of carbon dioxide in the gas stream by volume (%)	=	10.3	%
O_2	= proportion of oxygen in the gas stream by volume (%)	=	9.2	%
N_2+CO	= proportion of nitrogen and CO in the gas stream by volume (%)	=	80.5	%
100	= conversion factor (%)	=	100	%
M_d	= dry molecular weight of sample gas (lb/lb·mole)	=	30.02	lb/lb·mole

11. Molecular weight of sample gas (lb/lb·mole)

$$M_s = (M_d)(1 - B_w) + (M_{H_2O})(B_w)$$

Where:

B_w	= proportion of water vapor in the gas stream by volume	=	0.2181	
M_d	= dry molecular weight of sample gas (lb/lb·mole)	=	30.02	lb/lb·mole
M_{H2O}	= molecular weight of water (lb/lb·mole)	=	18.00	lb/lb·mole
M_s	= molecular weight of sample gas, wet basis (lb/lb·mole)	=	27.40	lb/lb·mole

Copyright © 2006 Clean Air Engineering Inc.

QA/QC ________
Date ________

12. Velocity of sample gas (ft/sec)

$$V_s = (K_p)(C_P)(\sqrt{\Delta P})\left(\sqrt{\frac{(T_s+460)}{(M_s)(P_s)}}\right)$$

Where:

K_p	= velocity pressure constant	=	85.49	
C_p	= pitot tube coefficient	=	0.81	
M_s	= wet molecular weight of sample gas, wet basis (lb/lb·mole)	=	27.40	lb/lb·mole
P_s	= absolute sample gas pressure (in. Hg)	=	29.35	in. Hg
T_s	= average sample gas temperature (°F)	=	293.12	°F
$\sqrt{\Delta P}$	= average square roots of velocity heads of sample gas (in. H_2O)	=	0.682	$\sqrt{\text{in. } H_2O}$
460	= °F to °R conversion constant	=	460	
V_s	= sample gas velocity (ft/sec)	=	45.82	ft/sec

13. Volumetric flow rate of sample gas at actual gas conditions (acfm)

$$Q_a = (60)(A_s)(V_s)$$

Where:

A_s	= cross sectional area of sampling location (ft^2)	=	64.00	ft^2
V_s	= sample gas velocity (ft/sec)	=	45.82	ft/sec
60	conversion factor (sec/min)	=	60	sec/min
Q_a	= volumetric flow rate at actual conditions (acfm)	=	175,956	acfm

14. Total flow of sample gas (scfm)

$$Q_s = (Q_a)\left(\frac{P_s}{29.92}\right)\left(\frac{68+460}{T_s+460}\right)$$

Where:

Q_a	= volumetric flow rate at actual conditions (acfm)	=	175,956	acfm
P_s	= absolute sample gas pressure (in. Hg)	=	29.35	in. Hg
29.92	= standard pressure (in. Hg)	=	29.92	in. Hg
T_s	= average sample gas temperature (°F)	=	293.1	°F
68	= standard temperature (°F)	=	68	°F
460	= °F to °R conversion constant	=	460	
Q_s	= volumetric flow rate at standard conditions, wet basis (scfm)	=	121,010	scfm

15. Dry flow of sample gas (dscfm)

$$Q_{std} = (Q_s)(1 - B_w)$$

Where:

B_w	= proportion of water vapor in the gas stream by volume	=	0.2181	
Q_s	= volumetric flow rate at standard conditions, wet basis (scfm)	=	121,010	scfm
Q_{std}	= volumetric flow rate at standard conditions, dry basis (dscfm)	=	94,620	dscfm

Copyright © 2006 Clean Air Engineering Inc.

QA/QC ________
Date ________

16. Dry flow of sample gas corrected to 7%O_2 (dscfm)

$$Q_{std7} = (Q_{std})\left(\frac{20.9 - O_2}{20.9 - 7}\right)$$

Where:

Q_{std}	= volumetric flow rate at standard conditions, dry basis (dscfm)	=	94,620	dscfm
O_2	= proportion of oxygen in the gas stream by volume (%)	=	9.2	%
20.9	= oxygen content of ambient air (%)	=	20.9	%
7	= oxygen content of corrected gas (%)	=	7.0	%
Q_{std7}	= volumetric flow rate at STP and 7%O_2, dry basis (dscfm)	=	79,848	dscfm

17. Hourly time basis conversion of volumetric flow rate (Q_{std} example)

$$Q_{std-hr} = (Q_{std-\min})(60)$$

Where

$Q_{std\text{-}min}$	= volumetric flow rate, english units (ft^3/min)	=	94,620	dscfm
60	= conversion factor (min/hr)	=	60	min/hr
$Q_{std\text{-}hr}$	= volumetric flow rate, hourly basis (dscf/hr)	=	5,677,207	dscf/hr

18. Metric Conversion of Gas Volumes (Q_{std} example)

$$Q_{std-metric} = (Q_{std-english})\left(\frac{60}{35.31}\right)$$

Where:

$Q_{std\text{-}english}$	= volumetric flow rate, english units (ft^3/min)	=	94,620	dscfm
35.31	= conversion factor (ft^3/m^3)	=	35.31	ft^3/m^3
60	= conversion factor (min/hr)	=	60	min/hr
$Q_{std\text{-}metric}$	= volumetric flow rate, metric units (m^3/hr)	=	160,782	dry std m^3/hr

19. Standard to Normal Conversion of Gas Volumes (Q_{std} example)

$$Q_{Normal} = (Q_{std-metric})\left(\frac{32 + 460}{68 + 460}\right)$$

Where:

$Q_{std\text{-}metric}$	= volumetric flow rate, metric units (dry std m^3/hr)	=	160,782	dry std m^3/hr
32	= normal temperature (°F)	=	32	°F
68	standard temperature (°F)	=	68	°F
460	= standard temperature in Rankine (68°F)	=	460	
Q_{Normal}	= volumetric flow rate, metric units (dry Nm^3/hr)	=	149,819	dry Nm^3/hr

Copyright © 2006 Clean Air Engineering Inc.

QA/QC ________
Date ________

20. Percent isokinetic (%)

$$I = \frac{(0.09450)(\overline{T_s} + 460)(V_{mstd})}{(P_s)(V_s)\left(\frac{(D_n)^2(\pi)}{(144)(4)}\right)(\Theta)(1 - B_w)}$$

Where:

D_n	= diameter of nozzle (in)	=	0.268	in.
B_w	= proportion of water vapor in the gas stream by volume	=	0.2181	
P_s	= absolute sample gas pressure (in. Hg)	=	29.35	in. Hg
T_s	= average sample gas temperature (°F)	=	293.1	°F
V_{mstd}	= volume of gas sample through the dry gas meter at standard conditions (dscf)	=	36.936	dscf
V_s	= sample gas velocity (ft/sec)	=	45.82	ft/sec
θ	= total sampling time (min)	=	63	min
0.0945	= conversion constant	=	0.0945	
460	= °F to °R conversion constant	=	460	
I	= percent of isokinetic sampling (%)	=	102.10	%

21. Alternative Method 5 Post-Test Meter Calibration Factor

$$Y_{qa} = \frac{\Theta}{V_m}\sqrt{\frac{(0.0319)(T_m + 460)(28.96)}{(\Delta H_@)(P_{bar} + \frac{\Delta H}{13.6})(M_d)}}\,(\sqrt{\Delta H})_{avg}$$

Where:

θ	= total sampling time (min)	=	63	min
V_m	= volume of gas sample through the dry gas meter at meter conditions (dcf)	=	36.72	dcf
T_m	= average dry gas meter temperature (°F)	=	69.60	°F
$\Delta H_@$	= dry gas meter orifice coefficient	=	1.8097	
P_{bar}	= barometric pressure (in. Hg)	=	30.10	in. Hg
ΔH	= average pressure drop across meter box orifice (in. H_2O)	=	1.144	in. H_2O
M_d	= dry molecular weight of sample gas (lb/lb·mole)	=	30.02	lb/lb·mole
$\sqrt{\Delta H}_{avg}$	= average of square root of pressure drop across meter orifice	=	1.067	√in. H_2O
0.0319	= conversion constant	=	0.0319	
28.96	= molecular weight of ambient air (lb/lb-mole)	=	28.96	lb/lb-mole
13.6	= conversion factor (in. H_2O/in. Hg)	=	13.6	in.H_2O/in. Hg
460	= °F to °R conversion constant	=	460	
Y_{qa}	= alternative Method 5 post-test meter calibration factor	=	0.9921	

QA/QC ________
Date ________

Copyright © 2006 Clean Air Engineering Inc.

USEPA Method 13B
HF Analyte Calculations

Sample data taken from Run 1

Note: The tables presenting the results are generated electronically from raw data. It may not be possible to exactly duplicate these results using a calculator. The reference method data, results, and all calculations are carried to sixteen decimal places throughout. The final table is formatted to an appropriate number of significant figures.

042010 104315
K

1. Fluoride to HF conversion factor

$$K_{HF} = \frac{MW_{HF}}{n \times MW_{F^-}}$$

Where:

MW_{HF}	= molecular weight of HF (mg/mg-mole)	=	20.006	mg/mg-mole
MW_{F-}	= molecular weight of fluoride ion (mg/mg-mole)	=	18.998	mg/mg-mole
n	= molar ratio of fluoride to HF	=	1.0	mole F/mole HF
K_{HF}	= conversion factor to convert mass F^- to mass HF	=	1.053	

2. Total HF collected (mg)

$$m_{HF} = K_{HF} \times \frac{(S_{F-1}v_1 + S_{F-2}v_2)}{1000}$$

Where:

K_{HF}	= conversion factor to convert mass F^- to mass HF	=	1.053	
S_{F-1}	= fluoride concentration of sample fraction 1 (mg/liter)	=	<0.0400	mg/liter
v_1	= liquid volume of sample fraction 1 (ml)	=	924.0	ml
S_{F-2}	= fluoride concentration of sample fraction 2 (mg/liter)	=	0.0000	mg/liter
v_2	= liquid volume of sample fraction 2 (ml)	=	0.0	ml
1000	= conversion factor (ml/liter)	=	1000	ml/liter
m_{HF}	= total HF collected in sample (mg)	=	<0.0389	mg

Note: Non-detects are treated as zero in summations.

DEFINITION
Fraction 1 = entire sample except last impinger containing applicable absorbing reagent.
Fraction 2 = last impinger containing applicable absorbing reagent, analyzed separately to evaluate collection efficiency.
If entire sample is analyzed as a single fraction, then data is included as Fraction 1 (Fraction 2 = 0).

3. Allowable blank subtraction (mg)

$$m_b = K_{HF} \times B_F \times \frac{(v_1 + v_2)}{1000}$$

$$m_b = 0 \quad \text{if } B_F < MDL$$

Where:

K_{HF}	= conversion factor to convert mass F^- to mass HF	=	1.053	
B_F	= fluoride concentration of blank (mg/liter)	=	<0.0400	mg/liter
v_1	= liquid volume of sample fraction 1 (ml)	=	924.0	ml
v_2	= liquid volume of sample fraction 2 (ml)	=	0.0	ml
1000	= conversion factor (ml/liter)	=	1000	ml/liter
m_b	= allowable blank subtraction (mg)	=	0.0000	mg

Copyright © 2006 Clean Air Engineering Inc.

QA/QC ________
Date ________

4. Total HF collected, corrected for blank (mg)

$$m_{nb} = m_{HF} - m_b$$

Where:

m_{HF}	= total HF collected in sample (mg)	=	<0.0389	mg
m_b	= allowable blank subtraction (mg)	=	0.0000	mg
m_{nb}	= total HF collected, corrected for blank (mg)	=	<0.0389	mg

5. Minimum detectable HF (mg)

$$m_{MDL} = K_{HF} \times MDL \times \frac{(v_1 + v_2)}{1000}$$

Where:

K_{HF}	= conversion factor to convert mass F^- to mass HF	=	1.053	
MDL	= minimum detectable fluoride concentration	=	0.008	mg/liter
v_1	= liquid volume of sample fraction 1 (ml)	=	924.0	ml
v_2	= liquid volume of sample fraction 2 (ml)	=	0.0	ml
1000	= conversion factor (ml/liter)	=	1000	ml/liter
m_{MDL}	= minimum detectable HF (mg)	=	0.0078	mg

6. Total HF value used in emission calculations (mg)

$$m_n = MAXIMUM \; [m_{nb} \quad or \quad < m_{MDL}]$$

Where:

m_{nb}	= total HF collected, corrected for blank (mg)	=	<0.0389	mg
m_{MDL}	= minimum detectable HF (mg)	=	0.0078	mg
m_n	= total HF value used in emission calculations (mg)	=	<0.0389	mg

7. Collection QC check (% mass collected in second fraction)

$$EFF = 100 \times \frac{K_{HF} \times S_{F-2} \times \frac{v_2}{1000}}{m_{HF}}$$

Where:

K_{HF}	= conversion factor to convert mass F^- to mass HF	=	1.053	
S_{F-2}	= fluoride concentration of sample fraction 2 (mg/liter)	=	0.0000	mg/liter
v_2	= liquid volume of sample fraction 2 (ml)	=	0.0	ml
m_{HF}	= total HF collected in sample (mg)	=	<0.0389	mg
1000	= conversion factor (ml/liter)	=	1000	ml/liter
100	= conversion factor	=	100	%
EFF	= Collection QC check (% mass collected in second fraction)	=	0.00	%

Copyright © 2006 Clean Air Engineering Inc.

QA/QC ________
Date ________

USEPA Method 13B
HF Sample Calculations

Sample data taken from Run 1

Note: The tables presenting the results are generated electronically from raw data. It may not be possible to exactly duplicate these results using a calculator. The reference method data, results, and all calculations are carried to sixteen decimal places throughout. The final table is formatted to an appropriate number of significant figures.

042010 104328
O_K

1. HF concentration (lb/dscf)

$$C_{sd} = \left(\frac{m_n}{V_{mstd}}\right)\left(\frac{2.205 \times 10^{-3}}{1000}\right)$$

Where:

m_n	= total HF collected, corrected for applicable blank (mg)	=	<0.0389	mg
V_{mstd}	= volume metered, standard (dscf)	=	36.9359	dscf
2.205×10^{-3}	= conversion factor (lb/g)	=	2.205E-03	lb/g
1000	= conversion factor (mg/g)	=	1,000	mg/g
C_{sd}	= HF concentration (lb/dscf)	=	<2.3234E-09	lb/dscf

2. HF concentration (ppmdv)

$$C_{sd} = \left(\frac{m_n}{V_{mstd}}\right)\left(\frac{0.850}{1000}\right)\left(\frac{10^6}{MW}\right)$$

Where:

m_n	= total HF collected, corrected for applicable blank (mg)	=	<0.0389	mg
V_{mstd}	= volume metered, standard (dscf)	=	36.9359	dscf
MW	= molecular weight of HF (g/g-mole)	=	20.006	g/g-mole
0.850	= conversion factor (dscf/g-mole)	=	0.850	dscf/g-mole
1000	= conversion factor (mg/g)	=	1,000	mg/g
10^6	= conversion factor (ppm)	=	10^6	ppm
C_{sd}	= HF concentration (ppmdv)	=	<0.0448	ppmdv

3. HF concentration (ppmwv)

$$C_w = C_{sd}\left(1 - \frac{B_w}{100}\right)$$

Where:

C_{sd}	= HF concentration (ppmdv)	=	<0.0448	ppmdv
B_w	= actual water vapor in gas (% v/v)	=	21.8078	% v/v
100	= conversion factor (%)	=	100	%
C_w	= HF concentration (ppmwv)	=	<0.0350	ppmwv

Copyright © 2006 Clean Air Engineering Inc.

QA/QC ________
Date ________

4. HF concentration (mg/dscm)

$$C_{sd} = \left(\frac{m_n}{V_{mstd}}\right)(35.31)$$

Where:

m_n	= total HF collected, corrected for applicable blank (mg)	=	<0.0389	mg
V_{mstd}	= volume metered, standard (dscf)	=	36.9359	dscf
35.31	= conversion factor (dscf/dscm)	=	35.31	dscf/dscm
C_{sd}	= HF concentration (mg/dscm)	=	<0.0372	mg/dscm

5. HF concentration (mg/Nm^3 dry)

$$C_{sd} = \left(\frac{m_n}{V_{mstd}}\right)(35.31)\left(\frac{68+460}{32+460}\right)$$

Where:

m_n	= total HF collected, corrected for applicable blank (mg)	=	<0.0389	mg
V_{mstd}	= volume metered, standard (dscf)	=	36.9359	dscf
35.31	= conversion factor (dscf/dscm)	=	35.31	dscf/dscm
68	= standard temperature (°F)	=	68	°F
32	= normal temperature (°F)	=	32	°F
460	= °F to °R conversion constant	=	460	
C_{sd}	= HF concentration (mg/Nm^3 dry)	=	<0.0399	mg/Nm^3 dry

6. HF concentration corrected to x% O_2 (ppmdv example)

$$C_{sdx} = C_{sd}\left(\frac{20.9 - x}{20.9 - O_2}\right)$$

Where:

C_{sd}	= HF concentration (ppmdv)	=	<0.0448	ppmdv
x	= oxygen content of corrected gas (%)	=	7.0	%
O_2	= proportion of oxygen in the gas stream by volume (%)	=	9.2	%
20.9	= oxygen content of ambient air (%)	=	20.9	%
C_{sdx}	= HF concentration corrected to x%O_2 (ppmdv)	=	<0.0531	ppmdv @ x%O_2

7. HF concentration corrected to y% CO_2 (ppmdv example)

$$C_{sdy} = C_{sd}\left(\frac{y}{CO_2}\right)$$

Where:

C_{sd}	= HF concentration (ppmdv)	=	<0.0448	ppmdv
y	= carbon dioxide content of corrected gas (%)	=	12.0	%
CO_2	= proportion of carbon dioxide in the gas stream by volume (%)	=	10.3	%
C_{sdy}	= HF concentration corrected to y%CO_2 (ppmdv)	=	<0.0521	ppmdv @ y%CO_2

Copyright © 2006 Clean Air Engineering Inc.

QA/QC ________
Date ________

8. HF concentration at actual gas conditions (lb/acf example)

$$C_a = C_{sd}\left(\frac{Q_{std}}{Q_a}\right)$$

Where:

C_{sd}	= HF concentration (lb/dscf)	=	<2.3234E-09	lb/dscf
Q_{std}	= volumetric flow rate at standard conditions, dry basis (dscfm)	=	94,620	dscfm
Q_a	= volumetric flow rate at actual conditions (acfm)	=	175,956	acfm
C_a	= HF concentration at actual gas conditions (lb/acf)	=	<1.2494E-09	lb/acf

9. HF rate (lb/hr)

$$E_{lb/hr} = \left(\frac{m_n}{V_{mstd}}\right)\left(\frac{2.205\times10^{-3}}{1000}\right)(Q_{std})(60)$$

Where:

m_n	= total HF collected, corrected for applicable blank (mg)	=	<0.0389	mg
V_{mstd}	= volume metered, standard (dscf)	=	36.9359	dscf
2.205×10^{-3}	= conversion factor (lb/g)	=	2.205E-03	lb/g
1000	= conversion factor (mg/g)	=	1,000	mg/g
Q_{std}	= volumetric flow rate at standard conditions, dry basis (dscfm)	=	94,620	dscfm
60	= conversion factor (min/hr)	=	60	min/hr
$E_{lb/hr}$	= HF rate (lb/hr)	=	<0.0132	lb/hr

10. HF rate (kg/hr)

$$E_{kg/hr} = \left(\frac{m_n}{V_{mstd}}\right)\left(\frac{(Q_{std})(60)}{10^6}\right)$$

Where:

m_n	= total HF collected, corrected for applicable blank (mg)	=	<0.0389	mg
V_{mstd}	= volume metered, standard (dscf)	=	36.9359	dscf
Q_{std}	= volumetric flow rate at standard conditions, dry basis (dscfm)	=	94,620	dscfm
60	= conversion factor (min/hr)	=	60	min/hr
10^6	= conversion factor (mg/kg)	=	10^6	g/kg
$E_{kg/hr}$	= HF rate (kg/hr)	=	<0.0060	kg/hr

11. HF rate (Ton/yr)

$$E_{T/yr} = \left(\frac{m_n}{V_{mstd}}\right)\left(\frac{2.205\times10^{-3}}{1000}\right)(Q_{std})(60)\left(\frac{Cap}{2000}\right)$$

Where:

m_n	= total HF collected, corrected for applicable blank (mg)	=	<0.0389	mg
V_{mstd}	= volume metered, standard (dscf)	=	36.9359	dscf
2.205×10^{-3}	= conversion factor (lb/g)	=	2.205E-03	lb/g
1000	= conversion factor (mg/g)	=	1,000	mg/g
Q_{std}	= volumetric flow rate at standard conditions, dry basis (dscfm)	=	94,620	dscfm
60	= conversion factor (min/hr)	=	60	min/hr
Cap	= capacity factor for process (hours operated/year)	=	8,760	hours/yr
2000	= conversion factor (lb/Ton)	=	2,000	lb/Ton
$E_{T/yr}$	= HF rate (Ton/yr)	=	<0.0578	Ton/yr

Copyright © 2006 Clean Air Engineering Inc.

QA/QC ________
Date ________

12. HF rate - F_d-based (lb/MMBtu)

$$E_{Fd} = \left(\frac{m_n}{V_{mstd}}\right)\left(\frac{2.205 \times 10^{-3}}{1000}\right)(F_d)\left(\frac{20.9}{20.9 - O_2}\right)$$

Where:

m_n	= total HF collected, corrected for applicable blank (mg)	=	<0.0389	mg
V_{mstd}	= volume metered, standard (dscf)	=	36.9359	dscf
2.205×10^{-3}	= conversion factor (lb/g)	=	2.205E-03	lb/g
1000	= conversion factor (mg/g)	=	1,000	mg/g
F_d	= ratio of gas volume to heat content of fuel (dscf/MMBtu)	=	9,570	dscf/MMBtu
O_2	= proportion of oxygen in the gas stream by volume (%)	=	9.2	%
20.9	= oxygen content of ambient air (%)	=	20.9	%
E_{Fd}	= HF rate (lb/MMBtu)	=	<3.9617E-05	lb/MMBtu

13. HF rate - F_c-based (lb/MMBtu)

$$E_{Fc} = \left(\frac{m_n}{V_{mstd}}\right)\left(\frac{2.205 \times 10^{-3}}{1000}\right)(F_c)\left(\frac{100}{CO_2}\right)$$

Where:

m_n	= total HF collected, corrected for applicable blank (mg)	=	<0.0389	mg
V_{mstd}	= volume metered, standard (dscf)	=	36.9359	dscf
2.205×10^{-3}	= conversion factor (lb/g)	=	2.205E-03	lb/g
1000	= conversion factor (mg/g)	=	1,000	mg/g
F_c	= ratio of gas volume to heat content of fuel (dscf/MMBtu)	=	1,820	dscf/MMBtu
CO_2	= proportion of oxygen in the gas stream by volume (%)	=	10.3	%
100	= conversion factor	=	100	
E_{Fc}	= HF rate (lb/MMBtu)	=	<4.0974E-05	lb/MMBtu

Copyright © 2008 Clean Air Engineering Inc.

QA/QC ________
Date ________

USEPA Method 23 (PCDD/F)
Sampling, Velocity and Moisture Sample Calculations

Sample data taken from Run 1

Note: The tables presenting the results are generated electronically from raw data. It may not be possible to exactly duplicate these results using a calculator. The reference method data, results, and all calculations are carried to sixteen decimal places throughout. The final table is formatted to an appropriate number of significant figures.

042010 104529
H

1. Volume of water collected (wscf)

$$V_{wstd} = (0.04706)(V_{lc})$$

Where:

V_{lc}	= total volume of liquid collected in impingers and silica gel (ml)	=	815.5	ml
0.04706	= ideal gas conversion factor (ft^3 water vapor/ml or gm)	=	0.04706	ft^3/ml
V_{wstd}	= volume of water vapor collected at standard conditions (ft^3)	=	38.38	ft^3

2. Volume of gas metered, standard conditions (dscf)

$$V_{mstd} = \frac{(17.64)(V_m)\left(P_{bar} + \frac{\Delta H}{13.6}\right)(Y_d)}{(460 + T_m)}$$

Where:

P_{bar}	= barometric pressure (in. Hg)	=	30.10	in. Hg
T_m	= average dry gas meter temperature (°F)	=	72.58	°F
V_m	= volume of gas sample through the dry gas meter at meter conditions (dcf)	=	140.94	dcf
Y_d	= gas meter correction factor (dimensionless)	=	0.9904	
ΔH	= average pressure drop across meter box orifice (in. H_2O)	=	1.00	in. H_2O
17.64	= standard temperature to pressure ratio (°R/in. Hg)	=	17.64	°R/in. Hg
13.6	= conversion factor (in. H_2O/in. Hg)	=	13.6	in.H_2O/in. Hg
460	= °F to °R conversion constant	=	460	
V_{mstd}	= volume of gas sampled through the dry gas meter at standard conditions (dscf)	=	139.505	dscf

3. Sample gas pressure (in. Hg)

$$P_s = P_{bar} + \left(\frac{P_g}{13.6}\right)$$

Where:

P_{bar}	= barometric pressure (in. Hg)	=	30.10	in. Hg
P_g	= sample gas static pressure (in. H_2O)	=	-10.80	in. H_2O
13.6	= conversion factor (in. H_2O/in. Hg)	=	13.6	in. H_2O/in. Hg
P_s	= absolute sample gas pressure (in. Hg)	=	29.31	in. Hg

Copyright © 2008 Clean Air Engineering Inc.

QA/QC ________
Date ________

4. Actual water vapor pressure at sample gas temperature less than 212°F (in. Hg)

$$P_v = \frac{e^{\left(18.3036 - \frac{3816.44}{\frac{5}{9}(T_s - 32) + 273.15 - 46.13}\right)}}{25.4}$$

Where:

T_s	= average sample gas temperature (°F)	=	293.30	°F
18.3036	= Antoine coefficient	=	18.3036	°K
3816.44	= Antoine coefficient	=	3816.44	°K
273.15	= temperature conversion factor	=	273.15	°K
46.13	= Antoine coefficient	=	46.13	°K
25.4	= conversion factor	=	25.4	mm Hg/in. Hg
5/9	= Fahrenheit to Celsius conversion factor	=	5/9	°C/°F
32	= temperature conversion (°F)	=	32	°F
P_v	= vapor pressure, actual (in. Hg)	=	29.31	in. Hg

5. Water vapor pressure at gas temperature greater than 212°F (in. Hg)

$$P_v = P_s$$

Where:

P_s	= absolute sample gas pressure (in. Hg)	=	29.31	in. Hg
P_v	= water vapor pressure, actual (in. Hg)	=	29.31	in. Hg

6. Moisture measured in sample (% by volume)

$$B_{wo} = \frac{V_{wstd}}{(V_{mstd} + V_{wstd})}$$

Where:

V_{mstd}	= volume of gas sampled through the dry gas meter at standard conditions (dscf)	=	139.505	dscf
V_{wstd}	= volume of water collected at standard conditions (scf)	=	38.38	scf
B_{wo}	= proportion of water measured in the gas stream by volume	=	0.2157	
		=	21.57	%

7. Saturated moisture content (% by volume)

$$B_{ws} = \frac{P_v}{P_s}$$

Where:

P_s	= absolute sample gas pressure (in. Hg)	=	29.31	in. Hg
P_v	= water vapor pressure, actual (in. Hg)	=	29.31	in. Hg
B_{ws}	= proportion of water vapor in the gas stream by volume at saturated conditions		1.0000	
		=	100.00	%

QA/QC ________
Date ________

Copyright © 2006 Clean Air Engineering Inc.

8. Actual water vapor in gas (% by volume)

$$B_w = MINIMUM \quad [B_{wo}, B_{ws}]$$

Where:

B_{ws}	= proportion of water vapor in the gas stream by volume at saturated conditions	=	1.0000	
B_{wo}	= proportion of water measured in the gas stream by volume	=	0.2157	
B_w	= actual water vapor in gas	=	0.2157	
		=	21.57	%

9. Nitrogen (plus carbon monoxide) in gas stream (% by volume, dry)

$$N_2 + CO = 100 - CO_2 - O_2$$

Where:

CO_2	= proportion of carbon dioxide in the gas stream by volume (%)	=	10.2	%
O_2	= proportion of oxygen in the gas stream by volume (%)	=	9.2	%
100	= conversion factor (%)	=	100	%
N_2+CO	= proportion of nitrogen and CO in the gas stream by volume (%)	=	80.63	%

10. Molecular weight of dry gas stream (lb/lb·mole)

$$M_d = (M_{CO_2})\frac{(CO_2)}{(100)} + (M_{O_2})\frac{(O_2)}{(100)} + (M_{N_2+CO})\frac{(N_2+CO)}{(100)}$$

Where:

M_{CO2}	= molecular weight of carbon dioxide (lb/lb·mole)	=	44.00	lb/lb·mole
M_{O2}	= molecular weight of oxygen (lb/lb·mole)	=	32.00	lb/lb·mole
M_{N2+CO}	= molecular weight of nitrogen and carbon monoxide (lb/lb·mole)	=	28.00	lb/lb·mole
CO_2	= proportion of carbon dioxide in the gas stream by volume (%)	=	10.2	%
O_2	= proportion of oxygen in the gas stream by volume (%)	=	9.2	%
N_2+CO	= proportion of nitrogen and CO in the gas stream by volume (%)	=	80.6	%
100	= conversion factor (%)	=	100	%
M_d	= dry molecular weight of sample gas (lb/lb·mole)	=	29.99	lb/lb·mole

11. Molecular weight of sample gas (lb/lb·mole)

$$M_s = (M_d)(1 - B_w) + (M_{H_2O})(B_w)$$

Where:

B_w	= proportion of water vapor in the gas stream by volume	=	0.2157	
M_d	= dry molecular weight of sample gas (lb/lb·mole)	=	29.99	lb/lb·mole
M_{H2O}	= molecular weight of water (lb/lb·mole)	=	18.00	lb/lb·mole
M_s	= molecular weight of sample gas, wet basis (lb/lb·mole)	=	27.41	lb/lb·mole

Copyright © 2006 Clean Air Engineering Inc.

QA/QC ________
Date ________

12. Velocity of sample gas (ft/sec)

$$V_s = (K_p)(C_P)\left(\sqrt{\Delta P}\right)\left(\sqrt{\frac{(T_s+460)}{(M_s)(P_s)}}\right)$$

Where:

K_p	= velocity pressure constant	=	85.49	
C_p	= pitot tube coefficient	=	0.83	
M_s	= wet molecular weight of sample gas, wet basis (lb/lb·mole)	=	27.41	lb/lb·mole
P_s	= absolute sample gas pressure (in. Hg)	=	29.31	in. Hg
T_s	= average sample gas temperature (°F)	=	293.30	°F
$\sqrt{\Delta P}$	= average square roots of velocity heads of sample gas (in. H_2O)	=	0.654	$\sqrt{\text{in. } H_2O}$
460	= °F to °R conversion constant	=	460	
V_s	= sample gas velocity (ft/sec)	=	45.17	ft/sec

13. Volumetric flow rate of sample gas at actual gas conditions (acfm)

$$Q_a = (60)(A_s)(V_s)$$

Where:

A_s	= cross sectional area of sampling location (ft^2)	=	64.00	ft^2
V_s	= sample gas velocity (ft/sec)	=	45.17	ft/sec
60	conversion factor (sec/min)	=	60	sec/min
Q_a	= volumetric flow rate at actual conditions (acfm)	=	173,437	acfm

14. Total flow of sample gas (scfm)

$$Q_s = (Q_a)\left(\frac{P_s}{29.92}\right)\left(\frac{68+460}{T_s+460}\right)$$

Where:

Q_a	= volumetric flow rate at actual conditions (acfm)	=	173,437	acfm
P_s	= absolute sample gas pressure (in. Hg)	=	29.31	in. Hg
29.92	= standard pressure (in. Hg)	=	29.92	in. Hg
T_s	= average sample gas temperature (°F)	=	293.3	°F
68	= standard temperature (°F)	=	68	°F
460	= °F to °R conversion constant	=	460	
Q_s	= volumetric flow rate at standard conditions, wet basis (scfm)	=	119,070	scfm

15. Dry flow of sample gas (dscfm)

$$Q_{std} = (Q_s)(1 - B_w)$$

Where:

B_w	= proportion of water vapor in the gas stream by volume	=	0.2157	
Q_s	= volumetric flow rate at standard conditions, wet basis (scfm)	=	119,070	scfm
Q_{std}	= volumetric flow rate at standard conditions, dry basis (dscfm)	=	93,381	dscfm

Copyright © 2006 Clean Air Engineering Inc.

QA/QC ________
Date ________

16. Dry flow of sample gas corrected to 7%O_2 (dscfm)

$$Q_{std7} = (Q_{std})\left(\frac{20.9 - O_2}{20.9 - 7}\right)$$

Where:

Q_{std}	= volumetric flow rate at standard conditions, dry basis (dscfm)	=	93,381	dscfm
O_2	= proportion of oxygen in the gas stream by volume (%)	=	9.2	%
20.9	= oxygen content of ambient air (%)	=	20.9	%
7	= oxygen content of corrected gas (%)	=	7.0	%
Q_{std7}	= volumetric flow rate at STP and 7%O_2, dry basis (dscfm)	=	78,534	dscfm

17. Hourly time basis conversion of volumetric flow rate (Q_{std} example)

$$Q_{std-hr} = (Q_{std-\min})(60)$$

Where

$Q_{std-min}$	= volumetric flow rate, english units (ft^3/min)	=	93,381	dscfm
60	= conversion factor (min/hr)	=	60	min/hr
Q_{std-hr}	= volumetric flow rate, hourly basis (dscf/hr)	=	5,602,843	dscf/hr

18. Metric Conversion of Gas Volumes (Q_{std} example)

$$Q_{std-metric} = (Q_{std-english})\left(\frac{60}{35.31}\right)$$

Where:

$Q_{std-english}$	= volumetric flow rate, english units (ft^3/min)	=	93,381	dscfm
35.31	= conversion factor (ft^3/m^3)	=	35.31	ft^3/m^3
60	= conversion factor (min/hr)	=	60	min/hr
$Q_{std-metric}$	= volumetric flow rate, metric units (m^3/hr)	=	158,676	dry std m^3/hr

19. Standard to Normal Conversion of Gas Volumes (Q_{std} example)

$$Q_{Normal} = (Q_{std-metric})\left(\frac{32 + 460}{68 + 460}\right)$$

Where:

$Q_{std-metric}$	= volumetric flow rate, metric units (dry std m^3/hr)	=	158,676	dry std m^3/hr
32	= normal temperature (°F)	=	32	°F
68	standard temperature (°F)	=	68	°F
460	= standard temperature in Rankine (68°F)	=	460	
Q_{Normal}	= volumetric flow rate, metric units (dry Nm^3/hr)	=	147,857	dry Nm^3/hr

Copyright © 2006 Clean Air Engineering Inc.

QA/QC ________
Date ________

20. Percent isokinetic (%)

$$I = \frac{(0.09450)(\overline{T_s} + 460)(V_{mstd})}{(P_s)(V_s)\left(\frac{(D_n)^2(\pi)}{(144)(4)}\right)(\Theta)(1 - B_w)}$$

Where:

D_n	= diameter of nozzle (in)	=	0.264	in.
B_w	= proportion of water vapor in the gas stream by volume	=	0.2157	
P_s	= absolute sample gas pressure (in. Hg)	=	29.31	in. Hg
T_s	= average sample gas temperature (°F)	=	293.3	°F
V_{mstd}	= volume of gas sample through the dry gas meter at standard conditions (dscf)	=	139.505	dscf
V_s	= sample gas velocity (ft/sec)	=	45.17	ft/sec
θ	= total sampling time (min)	=	250	min
0.0945	= conversion constant	=	0.0945	
460	= °F to °R conversion constant	=	460	
I	= percent of isokinetic sampling (%)	=	100.67	%

21. Alternative Method 5 Post-Test Meter Calibration Factor

$$Y_{qa} = \frac{\Theta}{V_m}\sqrt{\frac{(0.0319)(T_m + 460)(28.96)}{(\Delta H_@)(P_{bar} + \frac{\Delta H}{13.6})(M_d)}}\,(\sqrt{\Delta H})_{avg}$$

Where:

θ	= total sampling time (min)	=	250	min
V_m	= volume of gas sample through the dry gas meter at meter conditions (dcf)	=	140.94	dcf
T_m	= average dry gas meter temperature (°F)	=	72.58	°F
$\Delta H_@$	= dry gas meter orifice coefficient	=	1.7516	
P_{bar}	= barometric pressure (in. Hg)	=	30.10	in. Hg
ΔH	= average pressure drop across meter box orifice (in. H_2O)	=	1.004	in. H_2O
M_d	= dry molecular weight of sample gas (lb/lb·mole)	=	29.99	lb/lb·mole
$\sqrt{\Delta H}_{avg}$	= average of square root of pressure drop across meter orifice	=	1.001	√in. H_2O
0.0319	= conversion constant	=	0.0319	
28.96	= molecular weight of ambient air (lb/lb-mole)	=	28.96	lb/lb-mole
13.6	= conversion factor (in. H_2O/in. Hg)	=	13.6	in.H_2O/in. Hg
460	= °F to °R conversion constant	=	460	
Y_{qa}	= alternative Method 5 post-test meter calibration factor	=	0.9887	

Copyright © 2006 Clean Air Engineering Inc.

QA/QC ________
Date ________

USEPA Method 23
PCDD/PCDF Emissions Calculations

Sample data taken from Run 1

Note: The tables presenting the results are generated electronically from raw data. It may not be possible to exactly duplicate these results using a calculator. The reference method data, results and all calculations are carried to sixteen decimal places throughout. The final table is formatted to an appropriate number of significant figures.

Note: PCDD/F results may be presented in two formats - normally expected levels and the maximum possible levels. In the normal case, data classified as ND (non-detect) or EMPC (estimated maximum possible concentration) are not counted. In the maximum possible emissions case, NDs and EMPCs are fully counted.

042010 104529
H_P

			Normal Case (ND & EMPC = 0)		Maximum Case (ND & EMPC fully counted)	

1. TEQ concentration (ng/dscm)

$$C_{sd} = \left(\frac{m_{n\_TEQ}}{V_{mstd}}\right) \times 35.31$$

Where:

			Normal Case		Maximum Case	
m_{n_TEQ}	= total TEQ mass for PCDDs and PCDFs (ng)	=	9.0700E-02	ng	9.6000E-02	ng
V_{mstd}	= volume metered, standard (dscf)	=	139.5047	dscf	139.5047	dscf
35.31	= conversion factor (dscf/dscm)	=	35.31	dscf/dscm	35.31	dscf/dscm
C_{sd}	= PCDD/F TEQ concentration (ng/dscm)	=	2.2957E-02	ng/dscm	2.4299E-02	ng/dscm

2. TEQ concentration (ng/Nm3 dry)

$$C_{sd} = \left(\frac{m_{n\_TEQ}}{V_{mstd}}\right)(35.31)\left(\frac{68+460}{32+460}\right)$$

Where:

			Normal Case		Maximum Case	
m_{n_TEQ}	= total TEQ mass for PCDDs and PCDFs (ng)	=	9.0700E-02	ng	9.6000E-02	ng
V_{mstd}	= volume metered, standard (dscf)	=	139.5047	dscf	139.5047	dscf
35.31	= conversion factor (dscf/dscm)	=	35.31	dscf/dscm	35.31	dscf/dscm
68	= standard temperature (°F)	=	68	°F	68	°F
32	= normal temperature (°F)	=	32	°F	32	°F
460	= °F to °R conversion constant	=	460		460	
C_{sd}	= PCDD/F TEQ concentration (ng/Nm3 dry)	=	2.4637E-02	ng/Nm^3 dry	2.6076E-02	ng/Nm^3 dry

3. TEQ concentration at actual gas conditions (ng/acm example)

$$C_a = C_{sd}\left(\frac{Q_{std}}{Q_a}\right)$$

Where:

			Normal Case		Maximum Case	
C_{sd}	= PCDD/F TEQ concentration (ng/dscm)	=	2.2957E-02	ng/dscm	2.4299E-02	ng/dscm
Q_{std}	= volumetric flow rate at standard conditions, dry basis (dscm/h)	=	158,676	dry std m^3/hr	158,676	dry std m^3/hr
Q_a	= volumetric flow rate at actual conditions (acm/h)	=	294,710	actual m^3/hr	294,710	actual m^3/hr
C_a	= PCDD/F TEQ concentration at actual gas conditions (ng/acm)	=	1.2360E-02	ng/acm	1.3083E-02	ng/acm

Prepared by Clean Air Engineering Proprietary Software
SS PCDD-F v2007-01a

Copyright © 2007 Clean Air Engineering Inc.

QA/QC ________
Date ________

4. TEQ concentration corrected to x% O2 (ng/dscm example)

$$C_{sdx} = C_{sd}\left(\frac{20.9 - x}{20.9 - O_2}\right)$$

Where:

C_{sd}	= PCDD/F TEQ concentration (ng/dscm)	=	2.2957E-02	ng/dscm	2.4299E-02	ng/dscm
x	= oxygen content of corrected gas (%)	=	7.0	%	7.0	%
O_2	= proportion of oxygen in the gas stream by volume (%)	=	9.2	%	9.2	%
20.9	= oxygen content of ambient air (%)	=	20.9	%	20.9	%
C_{sdx}	= PCDD/F TEQ concentration (ng/dscm corrected to x% O_2)	=	2.7297E-02	ng/dscm @ x% O_2	2.8892E-02	ng/dscm @ x% O_2

5. TEQ concentration corrected to y% CO2 (ng/dscm example)

$$C_{sdy} = C_{sd}\left(\frac{y}{CO_2}\right)$$

Where:

C_{sd}	= PCDD/F TEQ concentration (ng/dscm)	=	2.2957E-02	ng/dscm	2.4299E-02	ng/dscm
y	= carbon dioxide content of corrected gas (%)	=	12.0	%	12.0	%
CO_2	= proportion of carbon dioxide in the gas stream by volume (%)	=	10.2	%	10.2	%
C_{sdy}	= PCDD/F TEQ concentration (ng/dscm corrected to y% CO_2)	=	2.7115E-02	ng/dscm @ y% CO_2	2.8699E-02	ng/dscm @ y% CO_2

6. TEQ Emission rate (lb/hr)

$$E_{lb/hr} = \left(\frac{m_{n\_TEQ}}{V_{mstd}}\right)\left(2.205 \times 10^{-3}\right)\left(Q_{std}\right)\frac{(60)}{(10^9)}$$

Where:

m_{n_TEQ}	= total TEQ mass for PCDDs and PCDFs (ng)	=	9.0700E-02	ng	9.6000E-02	ng
V_{mstd}	= volume metered, standard (dscf)	=	139.5047	dscf	139.5047	dscf
2.205×10^{-3}	= conversion factor (lb/g)	=	2.205E-03	lb/g	2.205E-03	lb/g
Q_{std}	= volumetric flow rate at standard conditions, dry basis (dscfm)	=	93,381	dscfm	93,381	dscfm
60	= conversion factor (min/hr)	=	60	min/hr	60	min/hr
10^9	= conversion factor to convert from ng to grams	=	1.0E+09	ng/g	1.0E+09	ng/g
$E_{lb/hr}$	= PCDDF TEQ Emission rate (lb/hr)	=	8.0322E-09	lb/hr	8.5016E-09	lb/hr

7. TEQ Emission rate (g/sec)

$$E_{g/sec} = \left(\frac{m_{n\_TEQ}}{V_{mstd}}\right)\left(\frac{Q_{std}}{60 \times 10^9}\right)$$

Where:

m_{n_TEQ}	= total TEQ mass for PCDDs and PCDFs (ng)	=	9.0700E-02	ng	9.6000E-02	ng
V_{mstd}	= volume metered, standard (dscf)	=	139.5047	dscf	139.5047	dscf
Q_{std}	= volumetric flow rate at standard conditions, dry basis (dscfm)	=	93,381	dscfm	93,381	dscfm
60	= conversion factor (sec/min)	=	60	sec/min	60	sec/min
10^9	= conversion factor to convert from ng to grams	=	1.0E+09	ng/g	1.0E+09	ng/g
$E_{g/sec}$	= PCDDF TEQ Emission rate (g/sec)	=	1.0119E-09	g/sec	1.0710E-09	g/sec

Copyright © 2007 Clean Air Engineering Inc.

QA/QC ________
Date ________

8. TEQ emission rate (Ton/yr)

$$E_{T/yr} = \left(\frac{m_{n\_TEQ}}{V_{mstd}}\right)\left(\frac{2.205\times10^{-3}}{10^9}\right)(Q_{std})(60)\left(\frac{Cap}{2000}\right)$$

Where:

m_{n_TEQ}	= total TEQ mass for PCDDs and PCDFs (ng)	=	9.0700E-02	ng	9.6000E-02	ng
V_{mstd}	= volume metered, standard (dscf)	=	139.5047	dscf	139.5047	dscf
2.205×10^{-3}	= conversion factor (lb/g)	=	2.205E-03	lb/g	2.205E-03	lb/g
Q_{std}	= volumetric flow rate at standard conditions, dry basis (dscfm)	=	93,381	dscfm	93,381	dscfm
60	= conversion factor (min/hr)	=	60	min/hr	60	min/hr
Cap	= capacity factor for process (hours operated/year)	=	8,760	hours/yr	8,760	hours/yr
2000	= conversion factor (lb/Ton)	=	2,000	lb/Ton	2,000	lb/Ton
10^9	= conversion factor to convert from ng to grams	=	1.0E+09	ng/g	1.0E+09	ng/g
$E_{T/yr}$	= PCDDF TEQ Emission rate (Ton/yr)	=	3.5181E-08	Ton/yr	3.7237E-08	Ton/yr

9. TEQ emission rate - Fd-based (lb/MMBtu)

$$E_{Fd} = \left(\frac{m_{n\_TEQ}}{V_{mstd}}\right)\left(\frac{2.205\times10^{-3}}{10^9}\right)(F_d)\left(\frac{20.9}{20.9-O_2}\right)$$

Where:

m_{n_TEQ}	= total TEQ mass for PCDDs and PCDFs (ng)	=	9.0700E-02	ng	9.6000E-02	ng
V_{mstd}	= volume metered, standard (dscf)	=	139.5047	dscf	139.5047	dscf
2.205×10^{-3}	= conversion factor (lb/g)	=	2.205E-03	lb/g	2.205E-03	lb/g
F_d	= ratio of gas volume to heat content of fuel (dscf/MMBtu)	=	9,570	dscf/MMBtu	9,570	dscf/MMBtu
O_2	= proportion of oxygen in the gas stream by volume (%)	=	9.2	%	9.2	%
20.9	= oxygen content of ambient air (%)	=	20.9	%	20.9	%
10^9	= conversion factor to convert from ng to grams	=	1.0E+09	ng/g	1.0E+09	ng/g
E_{Fd}	= PCDDF TEQ Emission rate (lb/MMBtu)	=	2.4528E-11	lb/MMBtu	2.5962E-11	lb/MMBtu

10. TEQ emission rate - Fc-based (lb/MMBtu)

$$E_{Fc} = \left(\frac{m_{n\_TEQ}}{V_{mstd}}\right)\left(\frac{2.205\times10^{-3}}{10^9}\right)(F_c)\left(\frac{100}{CO_2}\right)$$

Where:

m_{n_TEQ}	= total TEQ mass for PCDDs and PCDFs (ng)	=	9.0700E-02	ng	9.6000E-02	ng
V_{mstd}	= volume metered, standard (dscf)	=	139.5047	dscf	139.5047	dscf
2.205×10^{-3}	= conversion factor (lb/g)	=	2.205E-03	lb/g	2.205E-03	lb/g
F_c	= ratio of gas volume to heat content of fuel (dscf/MMBtu)	=	1,820	dscf/MMBtu	1,820	dscf/MMBtu
CO_2	= proportion of carbon dioxide in the gas stream by volume (%)	=	10.2	%	10.2	%
100	= conversion factor	=	100		100	
10^9	= conversion factor to convert from ng to grams	=	1.0E+09	ng/g	1.0E+09	ng/g
E_{Fc}	= PCDDF TEQ Emission rate (lb/MMBtu)	=	2.5681E-11	lb/MMBtu	2.7181E-11	lb/MMBtu

Copyright © 2007 Clean Air Engineering Inc.

QA/QC ________
Date ________

USEPA Method 26A (HCl)
Sampling, Velocity and Moisture Sample Calculations

Sample data taken from Run 1

Note: The tables presenting the results are generated electronically from raw data. It may not be possible to exactly duplicate these results using a calculator. The reference method data, results, and all calculations are carried to sixteen decimal places throughout. The final table is formatted to an appropriate number of significant figures.

042010 104735
0

1. Volume of water collected (wscf)

$$V_{wstd} = (0.04706)(V_{lc})$$

Where:

V_{lc}	= total volume of liquid collected in impingers and silica gel (ml)	=	247.6	ml
0.04706	= ideal gas conversion factor (ft^3 water vapor/ml or gm)	=	0.04706	ft^3/ml
V_{wstd}	= volume of water vapor collected at standard conditions (ft^3)	=	11.65	ft^3

2. Volume of gas metered, standard conditions (dscf)

$$V_{mstd} = \frac{(17.64)(V_m)\left(P_{bar} + \frac{\Delta H}{13.6}\right)(Y_d)}{(460 + T_m)}$$

Where:

P_{bar}	= barometric pressure (in. Hg)	=	30.10	in. Hg
T_m	= average dry gas meter temperature (°F)	=	67.58	°F
V_m	= volume of gas sample through the dry gas meter at meter conditions (dcf)	=	41.32	dcf
Y_d	= gas meter correction factor (dimensionless)	=	1.0005	
ΔH	= average pressure drop across meter box orifice (in. H_2O)	=	1.50	in. H_2O
17.64	= standard temperature to pressure ratio (°R/in. Hg)	=	17.64	°R/in. Hg
13.6	= conversion factor (in. H_2O/in. Hg)	=	13.6	in.H_2O/in. Hg
460	= °F to °R conversion constant	=	460	
V_{mstd}	= volume of gas sampled through the dry gas meter at standard conditions (dscf)	=	41.758	dscf

3. Sample gas pressure (in. Hg)

$$P_s = P_{bar} + \left(\frac{P_g}{13.6}\right)$$

Where:

P_{bar}	= barometric pressure (in. Hg)	=	30.10	in. Hg
P_g	= sample gas static pressure (in. H_2O)	=	-10.60	in. H_2O
13.6	= conversion factor (in. H_2O/in. Hg)	=	13.6	in. H_2O/in. Hg
P_s	= absolute sample gas pressure (in. Hg)	=	29.32	in. Hg

Copyright © 2006 Clean Air Engineering Inc.

QA/QC ________
Date ________

4. Actual water vapor pressure at sample gas temperature less than 212°F (in. Hg)

$$P_v = \frac{e^{\left(18.3036 - \frac{3816.44}{\frac{5}{9}(T_s - 32) + 273.15 - 46.13}\right)}}{25.4}$$

Where:

T_s	= average sample gas temperature (°F)	=	294.67	°F
18.3036	= Antoine coefficient	=	18.3036	°K
3816.44	= Antoine coefficient	=	3816.44	°K
273.15	= temperature conversion factor	=	273.15	°K
46.13	= Antoine coefficient	=	46.13	°K
25.4	= conversion factor	=	25.4	mm Hg/in. Hg
5/9	= Fahrenheit to Celsius conversion factor	=	5/9	°C/°F
32	= temperature conversion (°F)	=	32	°F
P_v	= vapor pressure, actual (in. Hg)	=	29.32	in. Hg

5. Water vapor pressure at gas temperature greater than 212°F (in. Hg)

$$P_v = P_s$$

Where:

P_s	= absolute sample gas pressure (in. Hg)	=	29.32	in. Hg
P_v	= water vapor pressure, actual (in. Hg)	=	29.32	in. Hg

6. Moisture measured in sample (% by volume)

$$B_{wo} = \frac{V_{wstd}}{(V_{mstd} + V_{wstd})}$$

Where:

V_{mstd}	= volume of gas sampled through the dry gas meter at standard conditions (dscf)	=	41.758	dscf
V_{wstd}	= volume of water collected at standard conditions (scf)	=	11.65	scf
B_{wo}	= proportion of water measured in the gas stream by volume	=	0.2182	
		=	21.82	%

7. Saturated moisture content (% by volume)

$$B_{ws} = \frac{P_v}{P_s}$$

Where:

P_s	= absolute sample gas pressure (in. Hg)	=	29.32	in. Hg
P_v	= water vapor pressure, actual (in. Hg)	=	29.32	in. Hg
B_{ws}	= proportion of water vapor in the gas stream by volume at saturated conditions		1.0000	
		=	100.00	%

Copyright © 2006 Clean Air Engineering Inc.

QA/QC ________
Date ________

8. Actual water vapor in gas (% by volume)

$$B_w = MINIMUM \quad [B_{wo}, B_{ws}]$$

Where:

B_{ws}	= proportion of water vapor in the gas stream by volume at saturated conditions	=	1.0000	
B_{wo}	= proportion of water measured in the gas stream by volume	=	0.2182	
B_w	= actual water vapor in gas	=	0.2182	
		=	21.82	%

9. Nitrogen (plus carbon monoxide) in gas stream (% by volume, dry)

$$N_2 + CO = 100 - CO_2 - O_2$$

Where:

CO_2	= proportion of carbon dioxide in the gas stream by volume (%)	=	9.2	%
O_2	= proportion of oxygen in the gas stream by volume (%)	=	10.0	%
100	= conversion factor (%)	=	100	%
N_2+CO	= proportion of nitrogen and CO in the gas stream by volume (%)	=	80.74	%

10. Molecular weight of dry gas stream (lb/lb·mole)

$$M_d = (M_{CO_2})\frac{(CO_2)}{(100)} + (M_{O_2})\frac{(O_2)}{(100)} + (M_{N_2+CO})\frac{(N_2+CO)}{(100)}$$

Where:

M_{CO2}	= molecular weight of carbon dioxide (lb/lb·mole)	=	44.00	lb/lb·mole
M_{O2}	= molecular weight of oxygen (lb/lb·mole)	=	32.00	lb/lb·mole
M_{N2+CO}	= molecular weight of nitrogen and carbon monoxide (lb/lb·mole)	=	28.00	lb/lb·mole
CO_2	= proportion of carbon dioxide in the gas stream by volume (%)	=	9.2	%
O_2	= proportion of oxygen in the gas stream by volume (%)	=	10.0	%
N_2+CO	= proportion of nitrogen and CO in the gas stream by volume (%)	=	80.7	%
100	= conversion factor (%)	=	100	%
M_d	= dry molecular weight of sample gas (lb/lb·mole)	=	29.88	lb/lb·mole

11. Molecular weight of sample gas (lb/lb·mole)

$$M_s = (M_d)(1 - B_w) + (M_{H_2O})(B_w)$$

Where:

B_w	= proportion of water vapor in the gas stream by volume	=	0.2182	
M_d	= dry molecular weight of sample gas (lb/lb·mole)	=	29.88	lb/lb·mole
M_{H2O}	= molecular weight of water (lb/lb·mole)	=	18.00	lb/lb·mole
M_s	= molecular weight of sample gas, wet basis (lb/lb·mole)	=	27.29	lb/lb·mole

Copyright © 2006 Clean Air Engineering Inc.

QA/QC ________
Date ________

USEPA Method 26A
HCl Analyte Calculations

Sample data taken from Run 1

Note: The tables presenting the results are generated electronically from raw data. It may not be possible to exactly duplicate these results using a calculator. The reference method data, results, and all calculations are carried to sixteen decimal places throughout. The final table is formatted to an appropriate number of significant figures.

042010 104735
@

1. Chloride to HCl conversion factor

$$K_{HCl} = \frac{MW_{HCl}}{n \times MW_{Cl^-}}$$

Where:

MW_{HCl}	= molecular weight of HCl (mg/mg-mole)	=	36.461	mg/mg-mole
MW_{Cl^-}	= molecular weight of chloride ion (mg/mg-mole)	=	35.453	mg/mg-mole
n	= molar ratio of chloride to HCl	=	1.0	mole Cl/mole HCl
K_{HCl}	= conversion factor to convert mass Cl^- to mass HCl	=	1.028	

2. Total HCl collected (mg)

$$m_{HCl} = K_{HCl} \times \frac{(S_{Cl\text{-}1} v_1 + S_{Cl\text{-}2} v_2)}{1000}$$

Where:

K_{HCl}	= conversion factor to convert mass Cl^- to mass HCl	=	1.028	
$S_{Cl\text{-}1}$	= chloride concentration of sample fraction 1 (mg/liter)	=	13.0700	mg/liter
v_1	= liquid volume of sample fraction 1 (ml)	=	826.0	ml
$S_{Cl\text{-}2}$	= chloride concentration of sample fraction 2 (mg/liter)	=	0.0000	mg/liter
v_2	= liquid volume of sample fraction 2 (ml)	=	0.0	ml
1000	= conversion factor (ml/liter)	=	1000	ml/liter
m_{HCl}	= total HCl collected in sample (mg)	=	11.0981	mg

Note: Non-detects are treated as zero in summations.

DEFINITION
Fraction 1 = entire sample except last impinger containing applicable absorbing reagent.
Fraction 2 = last impinger containing applicable absorbing reagent, analyzed separately to evaluate collection efficiency.
If entire sample is analyzed as a single fraction, then data is included as Fraction 1 (Fraction 2 = 0).

3. Allowable blank subtraction (mg)

$$m_b = K_{HCl} \times B_{Cl} \times \frac{(v_1 + v_2)}{1000}$$

$$m_b = 0 \quad \text{if } B_{Cl} < MDL$$

Where:

K_{HCl}	= conversion factor to convert mass Cl^- to mass HCl	=	1.0280	
B_{Cl}	= chloride concentration of blank (mg/liter)	=	<0.1	mg/liter
v_1	= liquid volume of sample fraction 1 (ml)	=	826.0	ml
v_2	= liquid volume of sample fraction 2 (ml)	=	0	ml
1000	= conversion factor (ml/liter)	=	1000.0000	ml/liter
m_b	= *allowable blank subtraction (mg)*	=	0.0000	mg

Prepared by Clean Air Engineering Proprietary Software
SS EPA26-1 Version 2006-10a (Cl)

Copyright © 2006 Clean Air Engineering Inc.

QA/QC ________
Date ________

4. Total HCl collected, corrected for blank (mg)

$$m_{nb} = m_{HCl} - m_b$$

Where:

m_{HCl}	= total HCl collected in sample (mg)	=	11.0981	mg
m_b	= allowable blank subtraction (mg)	=	0.0000	mg
m_{nb}	= *total HCl collected, corrected for blank (mg)*	=	11.09810296	mg

5. Minimum detectable HCl (mg)

$$m_{MDL} = K_{HCl} \times MDL \times \frac{(v_1 + v_2)}{1000}$$

Where:

K_{HCl}	= conversion factor to convert mass Cl^- to mass HCl	=	1.028	
MDL	= minimum detectable chloride concentration	=	0.0	mg/liter
v_1	= liquid volume of sample fraction 1 (ml)	=	826.0	ml
v_2	= liquid volume of sample fraction 2 (ml)	=	0	ml
1000	= conversion factor (ml/liter)	=	1000	ml/liter
m_{MDL}	= minimum detectable HCl (mg)	=	0.01698256	mg

6. Total HCl value used in emission calculations (mg)

$$m_n = MAXIMUM\ [m_{nb} \quad or \quad < m_{MDL}]$$

Where:

m_{nb}	= total HCl collected, corrected for blank (mg)	=	11.0981	mg
m_{MDL}	= minimum detectable HCl (mg)	=	0.01698256	mg
m_n	= total HCl value used in emission calculations (mg)	=	11.09810296	mg

7. Collection QC check (% mass collected in second fraction)

$$EFF = 100 \times \frac{K_{HCl} \times S_{Cl-2} \times \frac{v_2}{1000}}{m_{HCl}}$$

Where:

K_{HCl}	= conversion factor to convert mass Cl^- to mass HCl	=	1.0280	
S_{Cl-2}	= chloride concentration of sample fraction 2 (mg/liter)	=	0.0	mg/liter
v_2	= liquid volume of sample fraction 2 (ml)	=	0.0000	ml
m_{HCl}	= total HCl collected in sample (mg)	=	11	mg
1000	= conversion factor (ml/liter)	=	1000	ml/liter
100	= conversion factor	=	100	%
EFF	= *Collection QC check (% mass collected in second fraction)*	=	0	%

Prepared by Clean Air Engineering Proprietary Software
SS EPA26-1 Version 2006-10a (CI)

Copyright © 2006 Clean Air Engineering Inc.

QA/QC ________
Date ________

USEPA Method 26A
HCl Sample Calculations

Sample data taken from Run 1

Note: The tables presenting the results are generated electronically from raw data. It may not be possible to exactly duplicate these results using a calculator. The reference method data, results, and all calculations are carried to sixteen decimal places throughout. The final table is formatted to an appropriate number of significant figures.

042010 104735
0_@

1. HCl concentration (lb/dscf)

$$C_{sd} = \left(\frac{m_n}{V_{mstd}}\right)\left(\frac{2.205\times10^{-3}}{1000}\right)$$

Where:

m_n	= total HCl collected, corrected for applicable blank (mg)	=	11.0981	mg
V_{mstd}	= volume metered, standard (dscf)	=	41.7580	dscf
2.205×10^{-3}	= conversion factor (lb/g)	=	2.205E-03	lb/g
1000	= conversion factor (mg/g)	=	1,000	mg/g
C_{sd}	= HCl concentration (lb/dscf)	=	5.8603E-07	lb/dscf

2. HCl concentration (ppmdv)

$$C_{sd} = \left(\frac{m_n}{V_{mstd}}\right)\left(\frac{0.850}{1000}\right)\left(\frac{10^6}{MW}\right)$$

Where:

m_n	= total HCl collected, corrected for applicable blank (mg)	=	11.0981	mg
V_{mstd}	= volume metered, standard (dscf)	=	41.7580	dscf
MW	= molecular weight of HCl (g/g-mole)	=	36.461	g/g-mole
0.850	= conversion factor (dscf/g-mole)	=	0.850	dscf/g-mole
1000	= conversion factor (mg/g)	=	1,000	mg/g
10^6	= conversion factor (ppm)	=	10^6	ppm
C_{sd}	= HCl concentration (ppmdv)	=	6.1958	ppmdv

3. HCl concentration (ppmwv)

$$C_w = C_{sd}\left(1-\frac{B_w}{100}\right)$$

Where:

C_{sd}	= HCl concentration (ppmdv)	=	6.1958	ppmdv
B_w	= actual water vapor in gas (% v/v)	=	21.8162	% v/v
100	= conversion factor (%)	=	100	%
C_w	= HCl concentration (ppmwv)	=	4.8441	ppmwv

Copyright © 2008 Clean Air Engineering Inc.

QA/QC ________
Date ________

4. HCl concentration (mg/dscm)

$$C_{sd} = \left(\frac{m_n}{V_{mstd}}\right)(35.31)$$

Where:

m_n	= total HCl collected, corrected for applicable blank (mg)	=	11.0981	mg
V_{mstd}	= volume metered, standard (dscf)	=	41.7580	dscf
35.31	= conversion factor (dscf/dscm)	=	35.31	dscf/dscm
C_{sd}	= HCl concentration (mg/dscm)	=	9.3844	mg/dscm

5. HCl concentration (mg/Nm^3 dry)

$$C_{sd} = \left(\frac{m_n}{V_{mstd}}\right)(35.31)\left(\frac{68+460}{32+460}\right)$$

Where:

m_n	= total HCl collected, corrected for applicable blank (mg)	=	11.0981	mg
V_{mstd}	= volume metered, standard (dscf)	=	41.7580	dscf
35.31	= conversion factor (dscf/dscm)	=	35.31	dscf/dscm
68	= standard temperature (°F)	=	68	°F
32	= normal temperature (°F)	=	32	°F
460	= °F to °R conversion constant	=	460	
C_{sd}	= HCl concentration (mg/Nm^3 dry)	=	10.0711	mg/Nm^3 dry

6. HCl concentration corrected to x% O_2 (ppmdv example)

$$C_{sdx} = C_{sd}\left(\frac{20.9-x}{20.9-O_2}\right)$$

Where:

C_{sd}	= HCl concentration (ppmdv)	=	6.1958	ppmdv
x	= oxygen content of corrected gas (%)	=	7.0	%
O_2	= proportion of oxygen in the gas stream by volume (%)	=	10.0	%
20.9	= oxygen content of ambient air (%)	=	20.9	%
C_{sdx}	= HCl concentration corrected to x%O_2 (ppmdv)	=	7.9156	ppmdv @ x%O_2

7. HCl concentration corrected to y% CO_2 (ppmdv example)

$$C_{sdy} = C_{sd}\left(\frac{y}{CO_2}\right)$$

Where:

C_{sd}	= HCl concentration (ppmdv)	=	6.1958	ppmdv
y	= carbon dioxide content of corrected gas (%)	=	12.0	%
CO_2	= proportion of carbon dioxide in the gas stream by volume (%)	=	9.2	%
C_{sdy}	= HCl concentration corrected to y%CO2 (ppmdv)	=	8.0465	ppmdv @ y%CO_2

Copyright © 2006 Clean Air Engineering Inc.

QA/QC ________
Date ________

8. HCl rate - F_d-based (lb/MMBtu)

$$E_{Fd} = \left(\frac{m_n}{V_{mstd}}\right)\left(\frac{2.205 \times 10^{-3}}{1000}\right)(F_d)\left(\frac{20.9}{20.9 - O_2}\right)$$

Where:

m_n	= total HCl collected, corrected for applicable blank (mg)	=	11.0981	mg
V_{mstd}	= volume metered, standard (dscf)	=	41.7580	dscf
2.205×10^{-3}	= conversion factor (lb/g)	=	2.205E-03	lb/g
1000	= conversion factor (mg/g)	=	1,000	mg/g
F_d	= ratio of gas volume to heat content of fuel (dscf/MMBtu)	=	9,570	dscf/MMBtu
O_2	= proportion of oxygen in the gas stream by volume (%)	=	10.0	%
20.9	= oxygen content of ambient air (%)	=	20.9	%
E_{Fd}	= HCl rate (lb/MMBtu)	=	1.0773E-02	lb/MMBtu

9. HCl rate - F_c-based (lb/MMBtu)

$$E_{Fc} = \left(\frac{m_n}{V_{mstd}}\right)\left(\frac{2.205 \times 10^{-3}}{1000}\right)(F_c)\left(\frac{100}{CO_2}\right)$$

Where:

m_n	= total HCl collected, corrected for applicable blank (mg)	=	11.0981	mg
V_{mstd}	= volume metered, standard (dscf)	=	41.7580	dscf
2.205×10^{-3}	= conversion factor (lb/g)	=	2.205E-03	lb/g
1000	= conversion factor (mg/g)	=	1,000	mg/g
F_c	= ratio of gas volume to heat content of fuel (dscf/MMBtu)	=	1,820	dscf/MMBtu
CO_2	= proportion of oxygen in the gas stream by volume (%)	=	9.2	%
100	= conversion factor	=	100	
E_{Fc}	= HCl rate (lb/MMBtu)	=	1.1543E-02	lb/MMBtu

Prepared by Clean Air Engineering Proprietary Software
SS EPA26-1 Version 2006-10a (CI)

Copyright © 2006 Clean Air Engineering Inc.

QA/QC ________
Date ________

This Page Intentionally Left Blank

PLANT DATA

C

This Page Intentionally Left Blank

WHEELABRATOR SOUTH BROWARD
TONS OF REFUSE PROCESSED PER STACK TEST RUN LOG (2010)

UNIT #1

Date	Test	Method #	Run #	Steam (klb/hr)	Run Length (hr)	Trash Processed (tons)
3/22/2010	HCl	26A	1	183.3	1.00	32.2
3/22/2010	HCl	26A	2	184.8	1.00	32.4
3/22/2010	HCl	26A	3	184.6	1.10	35.6
3/23/2010	Particulate/Metals	5/29	1	183.5	2.25	72.5
3/23/2010	Particulate/Metals	5/29	2	183.9	2.23	72.0
3/23/2010	Particulate/Metals	5/29	3	183.3	2.23	71.7
3/22/2010	Fluorides	13B	1	183.9	1.25	40.3
3/22/2010	Fluorides	13B	2	184.2	1.23	39.7
3/22/2010	Fluorides	13B	3	184.8	1.18	38.2
n/a	Dioxins/Furans	23	1	n/a	n/a	n/a
n/a	Dioxins/Furans	23	2	n/a	n/a	n/a
n/a	Dioxins/Furans	23	3	n/a	n/a	n/a

UNIT #2

Date	Test	Method #	Run #	Steam (klb/hr)	Run Length (hr)	Trash Processed (tons)
3/23/2010	HCl	26A	1	185.2	1.00	32.5
3/23/2010	HCl	26A	2	183.2	1.00	32.1
3/23/2010	HCl	26A	3	185.3	1.18	38.4
3/24/2010	Particulate/Metals	5/29	1	183.9	2.22	71.6
3/24/2010	Particulate/Metals	5/29	2	183.7	2.53	81.5
3/24/2010	Particulate/Metals	5/29	3	183.3	2.17	69.8
3/24/2010	Fluorides	13B	1	184.3	1.30	42.0
3/24/2010	Fluorides	13B	2	183.8	1.28	41.3
3/24/2010	Fluorides	13B	3	183.6	1.30	41.9
3/22/2010	Dioxins/Furans	23	1	184.2	4.67	150.9
3/23/2010	Dioxins/Furans	23	2	184.2	4.60	148.6
3/23/2010	Dioxins/Furans	23	3	183.9	4.50	145.2

UNIT #3

Date	Test	Method #	Run #	Steam (klb/hr)	Run Length (hr)	Trash Processed (tons)
3/24/2010	HCl	26A	1	184.1	1.00	32.3
3/24/2010	HCl	26A	2	184.2	1.00	32.3
3/24/2010	HCl	26A	3	184.1	1.00	32.3
3/22/2010	Particulate/Metals	5/29	1	184.1	2.30	74.3
3/22/2010	Particulate/Metals	5/29	2	184.0	2.23	72.0
3/22/2010	Particulate/Metals	5/29	3	184.2	2.25	72.7
3/23/2010	Fluorides	13B	1	183.8	1.22	39.3
3/23/2010	Fluorides	13B	2	184.4	1.13	36.5
3/23/2010	Fluorides	13B	3	183.9	1.13	36.5
n/a	Dioxins/Furans	23	1	n/a	n/a	n/a
n/a	Dioxins/Furans	23	2	n/a	n/a	n/a
n/a	Dioxins/Furans	23	3	n/a	n/a	n/a

Metals: Cd (cadmium) Hg (mercury) Be (beryllium) Pb (lead)

Stack Test Process Data

PLANT NAME: SOUTH BROWARD 2010						Data from DCS Printouts						Calculated		Lime Feed Rate			
Test	Unit No.	Run No.	Date	Time Start	Time Stop	Steam Flow klbs/hr	FF Inlet Temp deg F	Fabric Filter Delta In. H2O	SDA Inlet Temp deg F	Total SDA Flow gpm	Diluton H2O flow gpm	Slurry Flow gpm	Slurry Conc. %	Slurry Specific Gravity	Slurry CaO Density lb/gal	CaO Flow lbs/hr	Test Run Comments
M-26A HCl	1	1	3/22/2010	08:31	09:31	183.3	315.0	6.5	507.4	37.1	27.7	9.5	25.7	1.071	0.738	418.4	All times based on CEMS time
		2	3/22/2010	09:58	10:58	184.8	314.9	6.5	508.3	36.7	30.2	6.5	17.6	1.096	1.002	390.8	
		3	3/22/2010	11:30	12:36	184.6	316.5	6.3	505.4	35.8	18.5	17.3	20.4	1.093	0.970	1009.2	
					Avg	184.2	315.4	6.5	507.0	36.6	25.5	11.1	21.2	1.087	0.903	606.1	
M-29/5 Metals PM	1	1	3/23/2010	07:43	09:58	183.5	315.0	6.5	505.5	35.9	25.2	10.7	28.7	1.064	0.671	432.4	All times based on CEMS time
		2	3/23/2010	10:31	12:45	183.9	315.1	6.6	512.1	37.9	28.5	9.4	28.7	1.060	0.624	350.8	
		3	3/23/2010	13:32	15:46	183.3	315.0	6.6	514.7	38.0	30.4	7.6	19.6	1.088	0.915	416.7	
					Avg	183.6	315.0	6.6	510.8	37.3	28.0	9.2	25.7	1.071	0.737	400.0	
M-13B HF	1	1	3/22/2010	13:19	14:34	183.9	315.0	6.5	503.2	34.8	23.2	11.6	19.8	1.092	0.966	669.4	All times based on CEMS time
		2	3/22/2010	15:07	16:21	184.2	314.9	6.4	508.3	35.9	28.7	7.2	17.0	1.090	0.942	406.9	
		3	3/22/2010	16:30	17:41	184.8	314.9	6.5	505.8	34.8	24.8	10.0	27.1	1.072	0.749	448.1	
					Avg	184.3	314.9	6.5	505.8	35.2	25.6	9.6	21.3	1.085	0.886	508.1	

Stack Test Process Data

PLANT NAME: SOUTH BROWARD 2010						Data From DCS Printouts						Calculated		Lime Feed Rate			
Test	Unit No.	Run No.	Date	Time Start	Time Stop	Steam Flow klbs/hr	FF Inlet Temp deg F	Fabric Filter Delta In. H2O	SDA Inlet Temp deg F	Total SDA Flow gpm	Diluton H2O flow gpm	Slurry Flow gpm	Slurry Conc. %	Slurry Specific Gravity	Slurry CaO Density lb/gal	CaO Flow lbs/hr	Test Run Comments
M-26A HCl	2	1	3/23/2010	07:55	08:55	185.2	319.8	6.5	492.3	31.0	19.3	11.7	33.2	1.064	0.673	472.0	All times based on CEMS time
		2	3/23/2010	09:30	10:30	183.2	320.2	6.7	496.5	32.5	22.1	10.5	32.2	1.063	0.659	413.6	
		3	3/23/2010	10:55	12:06	185.3	319.9	6.6	495.5	31.6	20.8	10.8	34.3	1.060	0.624	402.5	
					Avg	184.6	319.9	6.6	494.7	31.7	20.7	11.0	33.2	1.062	0.652	429.4	
M-29/5 Metals PM	2	1	3/24/2010	07:53	10:06	183.9	315.1	6.6	486.9	30.3	21.6	8.7	26.8	1.082	0.858	448.4	All times based on CEMS time
		2	3/24/2010	11:03	13:35	183.7	315.2	6.6	492.0	31.4	22.4	9.0	25.5	1.084	0.880	476.8	
		3	3/24/2010	14:12	16:22	183.3	315.1	6.7	498.9	33.6	24.2	9.5	18.1	1.099	1.044	591.9	
					Avg	183.6	315.1	6.6	492.6	31.8	22.7	9.1	23.5	1.088	0.927	505.7	
M-23 dioxins	2	1	3/22/2010	10:04	14:44	184.2	318.0	6.6	491.0	31.2	19.8	11.3	22.1	1.093	0.978	665.4	All times based on CEMS time
		2	3/23/2010	07:36	12:12	184.2	319.8	6.6	494.7	31.7	20.9	10.8	33.1	1.063	0.655	424.4	
		3	3/23/2010	12:32	17:02	183.9	320.0	6.7	503.2	33.8	23.1	10.7	23.3	1.084	0.881	565.6	
					Avg	184.1	319.3	6.6	496.3	32.2	21.3	10.9	26.1	1.080	0.838	551.8	
M-13B HF	2	1	3/24/2010	07:53	09:11	184.3	315.1	6.6	485.8	29.9	21.9	8.0	26.7	1.083	0.871	418.6	All times based on CEMS time
		2	3/24/2010	09:37	10:54	183.8	315.0	6.5	489.5	31.0	21.3	9.6	27.2	1.080	0.832	480.2	
		3	3/24/2010	11:24	12:46	183.6	315.1	6.6	490.5	30.9	21.9	9.0	29.0	1.076	0.789	425.6	
					Avg	183.9	315.0	6.6	488.6	30.6	21.7	8.9	27.6	1.080	0.831	441.5	

Stack Test Process Data

PLANT NAME: SOUTH BROWARD 2010						Data From DCS Printouts						Calculated		Lime Feed Rate			
Test	Unit No.	Run No.	Date	Time Start	Time Stop	Steam Flow klbs/hr	FF Inlet Temp deg F	Fabric Filter Delta In. H2O	SDA Inlet Temp deg F	Total SDA Flow gpm	Diluton H2O flow gpm	Slurry Flow gpm	Slurry Conc. %	Slurry Specific Gravity	Slurry CaO Density lb/gal	CaO Flow lbs/hr	Test Run Comments
M-26A	3	1	3/24/2010	07:45	08:45	184.1	315.0	6.8	464.8	31.7	22.5	9.2	25.8	1.084	0.879	483.6	All times based on CEMS time
HCl		2	3/24/2010	09:16	10:16	184.2	315.1	6.7	462.8	30.8	19.4	11.4	27.6	1.081	0.840	573.0	
		3	3/24/2010	10:54	11:54	184.1	314.8	6.7	466.9	31.4	21.5	10.0	28.8	1.076	0.792	472.8	
					Avg	184.1	315.0	6.7	464.8	31.3	21.1	10.2	27.4	1.080	0.837	509.8	
M-29/5	3	1	3/22/2010	8:47	11:05	184.1	315.0	6.9	471.8	35.4	25.3	10.1	23.5	1.084	0.874	531.2	All times based on CEMS time
Metals		2	3/22/2010	11:43	13:57	184.0	315.2	6.8	467.5	32.4	19.9	12.5	23.4	1.092	0.967	722.9	
PM		3	3/22/2010	14:24	16:39	184.2	314.9	6.7	470.4	33.0	21.4	11.5	23.6	1.089	0.927	641.3	
					Avg	184.1	315.0	6.8	469.9	33.6	22.2	11.4	23.5	1.088	0.923	631.8	
M-13B	3	1	3/23/2010	12:41	13:54	183.8	315.1	7.0	481.9	38.1	27.3	10.8	22.5	1.082	0.850	551.8	All times based on CEMS time
HF		2	3/23/2010	14:31	15:39	184.4	314.9	7.0	487.0	39.8	29.8	10.0	20.0	1.087	0.906	541.4	
		3	3/23/2010	15:54	17:02	183.9	315.0	6.9	479.5	36.7	25.6	11.1	21.9	1.086	0.898	598.1	
					Avg	184.0	315.0	7.0	482.8	38.2	27.6	10.6	21.4	1.085	0.885	563.8	

Stack Test Data Sheet, Mar 10

Wheelabrator
SOUTH BROWARD
Emission Test Log

Date: 3/22/2010
Start Time: 8:31:00
End Time: 9:31:00
TEST 26A run 1

	SDA INLET TEMP	SDA OUTLET TEMP	TOTAL SLURRY FL	DIL WATER FLOW	LIME SLURRY	FF OUT TEMP	FF DP	ID INLET PRESS	STEAM FLOW	Lime Feed Rate
	DEG F	DEG F	GPM	GPM	GPM	DEG F	" H2O	" H2O	KLBs/hr	lb/hr
Unit 1	507.44	314.96	37.14	27.69	9.45	293.15	6.53	-11.00	183.28	418.24

	FEED H2O FLOW	SH OUT STM PRESS	FINAL STM TEMP	TOT AIR FLOW	FURNACE DRAFT	ECONO OUT TEMP	SH ROLL AVG	SNCR CHEM FLOW	FURNACE O2	OUTLET O2
	KLBs/hr	DEG F	DEG F	KSCFM	" H2O	DEG F	DEG F	GPH	%	%
Unit 1	186.20	902.68	825.39	85.21	-0.09	434.77	1081.16	7.26	6.98	9.49

Lime Slurry 3/22/2010
S.G. **1.071**
Lb/gal **0.738**

Specific Gravity	CaO lb/gal	Lime Conc %
1.071	0.738	25.745

C - 7

Wheelabrator
SOUTH BROWARD
Emission Test Log

Date: 3/22/2010
Start Time: 9:58:00
End Time: 10:58:00
TEST 26A run 2

	SDA INLET TEMP	SDA OUTLET TEMP	TOTAL SLURRY FL	DIL WATER FLOW	LIME SLURRY	FF OUT TEMP	FF DP	ID INLET PRESS	STEAM FLOW	Lime Feed Rate
	DEG F	DEG F	GPM	GPM	GPM	DEG F	" H2O	" H2O	KLBs/hr	lb/hr
Unit 1	508.27	314.88	36.74	30.24	6.51	294.01	6.53	-10.97	184.79	391.28

	FEED H2O FLOW	SH OUT STM PRESS	FINAL STM TEMP	TOT AIR FLOW	FURNACE DRAFT	ECONO OUT TEMP	SH ROLL AVG	SNCR CHEM FLOW	FURNACE O2	OUTLET O2
	KLBs/hr	DEG F	DEG F	KSCFM	" H2O	DEG F	DEG F	GPH	%	%
Unit 1	187.54	903.14	826.20	85.72	-0.10	434.69	1094.28	8.10	6.78	9.28

Lime Slurry 3/22/2010
S.G. **1.096**
Lb/gal **1.002**

Specific Gravity	CaO lb/gal	Lime Conc. %
1.096	1.002	17.616

Wheelabrator
SOUTH BROWARD
Emission Test Log

Date: 3/22/2010
Start Time: 11:30:00
End Time: 12:36:00
TEST 26A run 3

	SDA INLET TEMP	SDA OUTLET TEMP	TOTAL SLURRY FL	DIL WATER FLOW	LIME SLURRY	FF OUT TEMP	FF DP	ID INLET PRESS	STEAM FLOW	Lime Feed Rate
	DEG F	DEG F	GPM	GPM	GPM	DEG F	" H2O	" H2O	KLBs/hr	lb/hr
Unit 1	505.43	316.46	35.79	18.45	17.34	294.57	6.34	-10.66	184.61	1008.47

	FEED H2O FLOW	SH OUT STM PRESS	FINAL STM TEMP	TOT AIR FLOW	FURNACE DRAFT	ECONO OUT TEMP	SH ROLL AVG	SNCR CHEM FLOW	FURNACE O2	OUTLET O2
	KLBs/hr	DEG F	DEG F	KSCFM	" H2O	DEG F	DEG F	GPH	%	%
Unit 1	187.91	902.98	826.43	82.57	-0.11	431.13	1101.43	7.53	6.58	8.96

Lime Slurry 3/22/2010
S.G. **1.093**
Lb/gal **0.970**

Specific Gravity	CaO lb/gal	Lime Conc %
1.093	0.970	20.382

C - 9

Wheelabrator
SOUTH BROWARD
Emission Test Log

Date: 3/23/2010
Start Time: 7:43:00
End Time: 9:58:00
TEST 5/29 run 1

	SDA INLET TEMP	SDA OUTLET TEMP	TOTAL SLURRY FL	DIL WATER FLOW	LIME SLURRY	FF OUT TEMP	FF DP	ID INLET PRESS	STEAM FLOW	Lime Feed Rate
	DEG F	DEG F	GPM	GPM	GPM	DEG F	" H2O	" H2O	KLBs/hr	lb/hr
Unit 1	505.46	315.02	35.90	25.16	10.74	295.15	6.49	-10.77	183.54	432.47

	FEED H2O FLOW	SH OUT STM PRESS	FINAL STM TEMP	TOT AIR FLOW	FURNACE DRAFT	ECONO OUT TEMP	SH ROLL AVG	SNCR CHEM FLOW	FURNACE O2	OUTLET O2
	KLBs/hr	DEG F	DEG F	KSCFM	" H2O	DEG F	DEG F	GPH	%	%
Unit 1	185.66	904.87	826.07	85.77	-0.10	431.80	1105.81	7.65	6.49	8.97

Lime Slurry 3/23/2010
S.G. **1.064**
Lb/gal **0.671**

Specific Gravity	CaO lb/gal	Lime Conc %
1.064	0.671	28.676

Wheelabrator
SOUTH BROWARD
Emission Test Log

Date: 3/23/2010
Start Time: 10:31:00
End Time: 12:45:00
TEST 5/29 run 2

	SDA INLET TEMP	SDA OUTLET TEMP	TOTAL SLURRY FL	DIL WATER FLOW	LIME SLURRY	FF OUT TEMP	FF DP	ID INLET PRESS	STEAM FLOW	Lime Feed Rate
	DEG F	DEG F	GPM	GPM	GPM	DEG F	" H2O	" H2O	KLBs/hr	lb/hr
Unit 1	512.09	315.08	37.89	28.52	9.36	295.77	6.55	-10.93	183.94	350.67

	FEED H2O FLOW	SH OUT STM PRESS	FINAL STM TEMP	TOT AIR FLOW	FURNACE DRAFT	ECONO OUT TEMP	SH ROLL AVG	SNCR CHEM FLOW	FURNACE O2	OUTLET O2
	KLBs/hr	DEG F	DEG F	KSCFM	" H2O	DEG F	DEG F	GPH	%	%
Unit 1	185.48	906.92	824.13	86.96	-0.10	434.58	1100.30	10.34	6.52	9.08

C - 11

Lime Slurry 3/23/2010
S.G. **1.060**
Lb/gal **0.624**

Specific Gravity	CaO lb/gal	Lime Conc %
1.060	0.624	28.714

Wheelabrator
SOUTH BROWARD
Emission Test Log

Date: 3/23/2010
Start Time: 13:32:00
End Time: 15:46:00
TEST 5/29 run 3

	SDA INLET TEMP	SDA OUTLET TEMP	TOTAL SLURRY FL	DIL WATER FLOW	LIME SLURRY	FF OUT TEMP	FF DP	ID INLET PRESS	STEAM FLOW	Lime Feed Rate
	DEG F	DEG F	GPM	GPM	GPM	DEG F	" H2O	" H2O	KLBs/hr	lb/hr
Unit 1	514.70	314.98	38.01	30.42	7.59	296.30	6.62	-11.01	183.31	416.61

	FEED H2O FLOW	SH OUT STM PRESS	FINAL STM TEMP	TOT AIR FLOW	FURNACE DRAFT	ECONO OUT TEMP	SH ROLL AVG	SNCR CHEM FLOW	FURNACE O2	OUTLET O2
	KLBs/hr	DEG F	DEG F	KSCFM	" H2O	DEG F	DEG F	GPH	%	%
Unit 1	185.39	907.78	824.60	86.34	-0.09	434.89	1099.50	9.79	6.71	9.24

C - 12

Lime Slurry 3/23/2010
S.G. **1.088**
Lb/gal **0.915**

Specific Gravity	CaO lb/gal	Lime Conc %
1.088	0.915	19.626

Wheelabrator
SOUTH BROWARD
Emission Test Log

Date: 3/22/2010
Start Time: 13:19:00
End Time: 14:34:00
TEST 13B run 1

	SDA INLET TEMP	SDA OUTLET TEMP	TOTAL SLURRY FL	DIL WATER FLOW	LIME SLURRY	FF OUT TEMP	FF DP	ID INLET PRESS	STEAM FLOW	Lime Feed Rate
	DEG F	DEG F	GPM	GPM	GPM	DEG F	" H2O	" H2O	KLBs/hr	lb/hr
Unit 1	503.21	314.97	34.76	23.21	11.55	293.88	6.50	-10.68	183.85	669.46

	FEED H2O FLOW	SH OUT STMPRESS	FINAL STM TEMP	TOT AIR FLOW	FURNACE DRAFT	ECONO OUT TEMP	SH ROLL AVG	SNCR CHEM FLOW	FURNACE O2	OUTLET O2
	KLBs/hr	DEG F	DEG F	KSCFM	" H2O	DEG F	DEG F	GPH	%	%
Unit 1	187.02	903.36	826.21	81.72	-0.10	429.30	1110.32	4.54	6.75	9.08

Lime Slurry 3/22/2010
S.G. **1.092**
Lb/gal **0.966**

Specific Gravity	CaO lb/gal	Lime Conc %
1.092	0.966	19.817

C - 13

Wheelabrator
SOUTH BROWARD
Emission Test Log

Date: 3/22/2010
Start Time: 15:07:00
End Time: 16:21:00
TEST 13B run 2

	SDA INLET TEMP	SDA OUTLET TEMP	TOTAL SLURRY FL	DIL WATER FLOW	LIME SLURRY	FF OUT TEMP	FF DP	ID INLET PRESS	STEAM FLOW	Lime Feed Rate
	DEG F	DEG F	GPM	GPM	GPM	DEG F	" H2O	" H2O	KLBs/hr	lb/hr
Unit 1	508.28	314.94	35.92	28.72	7.20	293.36	6.38	-10.65	184.16	407.06

	FEED H2O FLOW	SH OUT STM PRESS	FINAL STM TEMP	TOT AIR FLOW	FURNACE DRAFT	ECONO OUT TEMP	SH ROLL AVG	SNCR CHEM FLOW	FURNACE O2	OUTLET O2
	KLBs/hr	DEG F	DEG F	KSCFM	" H2O	DEG F	DEG F	GPH	%	%
Unit 1	186.55	904.19	825.99	83.01	-0.09	431.26	1121.11	5.67	6.75	9.18

Lime Slurry 3/22/2010
S.G. **1.090**
Lb/gal **0.942**

Specific Gravity	CaO lb/gal	Lime Conc %
1.090	0.942	19.965

C - 14

Wheelabrator
SOUTH BROWARD
Emission Test Log

Date: 3/22/2010
Start Time: 16:30:00
End Time: 17:41:00
TEST 13B run 3

	SDA INLET TEMP	SDA OUTLET TEMP	TOTAL SLURRY FL	DIL WATER FLOW	LIME SLURRY	FF OUT TEMP	FF DP	ID INLET PRESS	STEAM FLOW	Lime Feed Rate
	DEG F	DEG F	GPM	GPM	GPM	DEG F	" H2O	" H2O	KLBs/hr	lb/hr
Unit 1	505.83	314.89	34.77	24.80	9.97	292.60	6.47	-10.66	184.75	448.06

	FEED H2O FLOW	SH OUT STM PRESS	FINAL STM TEMP	TOT AIR FLOW	FURNACE DRAFT	ECONO OUT TEMP	SH ROLL AVG	SNCR CHEM FLOW	FURNACE O2	OUTLET O2
	KLBs/hr	DEG F	DEG F	KSCFM	" H2O	DEG F	DEG F	GPH	%	%
Unit 1	186.65	905.17	824.72	81.44	-0.10	429.77	1106.66	5.52	6.45	8.95

C - 15

Lime Slurry 3/22/2010
S.G. **1.072**
Lb/gal **0.749**

Specific Gravity	CaO lb/gal	Lime Conc %
1.072	0.749	27.069

Wheelabrator
SOUTH BROWARD
Emission Test Log

Date: 3/23/2010
Start Time: 7:55:00
End Time: 8:55
TEST 26A run 1

	SDA INLET TEMP	SDA OUTLET TEMP	TOTAL SLURRY FL	DIL WATER FLOW	LIME SLURRY	FF OUT TEMP	FF DP	ID INLET PRESS	STEAM FLOW	Lime Feed Rate
	DEG F	DEG F	GPM	GPM	GPM	DEG F	" H2O	" H2O	KLBs/hr	lb/hr
Unit 2	492.29	319.78	31.03	19.34	11.6935	301.82	6.48	-10.94	185.24	472.27

	FEED H2O FLOW	SH OUT STM PRESS	FINAL STM TEMP	TOT AIR FLOW	FURNACE DRAFT	ECONO OUT TEMP	SH ROLL AVG	SNCR CHEM FLOW	FURNACE O2	OUTLET O2
	KLBs/hr	DEG F	DEG F	KSCFM	" H2O	DEG F	DEG F	GPH	%	%
Unit 2	188.23	898.05	825.29	85.52	-0.10	413.31	1073.17	2.47	6.41	8.92

Lime Slurry 3/23/2010
S.G. **1.064**
Lb/gal **0.673**

Specific Gravity	Cao lb/gal	Lime Conc %
1.064	0.673	33.238

C - 16

Wheelabrator
SOUTH BROWARD
Emission Test Log

Date: 3/23/2010
Start Time: 9:30:00
End Time: 10:30
TEST 26A run 2

	SDA INLET TEMP	SDA OUTLET TEMP	TOTAL SLURRY FL	DIL WATER FLOW	LIME SLURRY	FF OUT TEMP	FF DP	ID INLET PRESS	STEAM FLOW	Lime Feed Rate
	DEG F	DEG F	GPM	GPM	GPM	DEG F	" H2O	" H2O	KLBs/hr	lb/hr
Unit 2	496.47	320.19	32.51	22.05	10.4573	301.22	6.71	-11.32	183.16	413.46

	FEED H2O FLOW	SH OUT STM PRESS	FINAL STM TEMP	TOT AIR FLOW	FURNACE DRAFT	ECONO OUT TEMP	SH ROLL AVG	SNCR CHEM FLOW	FURNACE O2	OUTLET O2
	KLBs/hr	DEG F	DEG F	KSCFM	" H2O	DEG F	DEG F	GPH	%	%
Unit 2	185.85	898.03	822.57	87.68	-0.09	414.69	1083.09	3.77	6.77	9.51

C - 17

Lime Slurry 3/23/2010
S.G. **1.063**
Lb/gal **0.659**

Specific Gravity	Cao lb/gal	Lime Conc %
1.063	0.659	32.184

Wheelabrator
SOUTH BROWARD
Emission Test Log

Date: 3/23/2010
Start Time: 10:55:00
End Time: 12:06
TEST 26A run 3

	SDA INLET TEMP	SDA OUTLET TEMP	TOTAL SLURRY FL	DIL WATER FLOW	LIME SLURRY	FF OUTS TEMP	FF DP	ID INLET PRESS	STEAM FLOW	Lime Feed Rate
	DEG F	DEG F	GPM	GPM	GPM	DEG F	" H2O	" H2O	KLBs/hr	lb/hr
Unit 2	495.48	319.85	31.56	20.81	10.7450	298.62	6.62	-11.07	185.26	402.44

	FEED H2O FLOW	SH OUT STM PRESS	FINAL STM TEMP	TOT AIR FLOW	FURNACE DRAFT	ECONO OUT TEMP	SH ROLL AVG	SNCR CHEM FLOW	FURNACE O2	OUTLET O2
	KLBs/hr	DEG F	DEG F	KSCFM	" H2O	DEG F	DEG F	GPH	%	%
Unit 2	188.67	899.45	824.05	85.84	-0.09	412.33	1098.27	2.53	6.22	8.93

Lime Slurry 3/23/2010
S.G. **1.060**
Lb/gal **0.624**

Specific Gravity	Cao lb/gal	Lime Conc %
1.060	0.624	34.259

C - 18

Wheelabrator
SOUTH BROWARD
Emission Test Log

Date: 3/24/2010
Start Time: 7:53:00
End Time: 10:06
TEST 5/29 run 1

	SDA INLET TEMP	SDA OUTLET TEMP	TOTAL SLURRY FL	DIL WATER FLOW	LIME SLURRY	FF OUT TEMP	FF DP	ID INLET PRESS	STEAM FLOW	Lime Feed Rate
	DEG F	DEG F	GPM	GPM	GPM	DEG F	" H2O	" H2O	KLBs/hr	lb/hr
Unit 2	486.88	315.06	30.26	21.55	8.7102	294.58	6.55	-11.04	183.87	448.37

	FEED H2O FLOW	SH OUT STM PRESS	FINAL STM TEMP	TOT AIR FLOW	FURNACE DRAFT	ECONO OUT TEMP	SH ROLL AVG	SNCR CHEM FLOW	FURNACE O2	OUTLET O2
	KLBs/hr	DEG F	DEG F	KSCFM	" H2O	DEG F	DEG F	GPH	%	%
Unit 2	187.31	898.34	825.04	81.80	-0.10	411.17	1062.56	2.44	6.11	8.95

Lime Slurry 3/24/2010
S.G. **1.082**
Lb/gal **0.858**

Specific Gravity	Cao lb/gal	Lime Conc %
1.082	0.858	26.822

C - 19

Wheelabrator
SOUTH BROWARD
Emission Test Log

Date: 3/24/2010
Start Time: 11:03:00
End Time: 13:35
TEST 5/29 run 2

	SDA INLET TEMP	SDA OUTLET TEMP	TOTAL SLURRY FL	DIL WATER FLOW	LIME SLURRY	FF OUT TEMP	FF DP	ID INLET PRESS	STEAM FLOW	Lime Feed Rate
	DEG F	DEG F	GPM	GPM	GPM	DEG F	" H2O	" H2O	KLBs/hr	lb/hr
Unit 2	492.03	315.15	31.39	22.36	9.0368	295.45	6.58	-11.16	183.71	477.25

	FEED H2O FLOW	SH OUT STM PRESS	FINAL STM TEMP	TOT AIR FLOW	FURNACE DRAFT	ECONO OUT TEMP	SH ROLL AVG	SNCR CHEM FLOW	FURNACE O2	OUTLET O2
	KLBs/hr	DEG F	DEG F	KSCFM	" H2O	DEG F	DEG F	GPH	%	%
Unit 2	186.96	899.54	825.04	82.80	-0.10	411.56	1071.47	2.40	6.17	9.00

Lime Slurry 3/24/2010
S.G. **1.084**
Lb/gal **0.880**

Specific Gravity	Cao lb/gal	Lime Conc %
1.084	0.880	25.466

Wheelabrator
SOUTH BROWARD
Emission Test Log

Date: 3/24/2010
Start Time: 14:12:00
End Time: 16:22
TEST 5/29 run 3

	SDA INLET TEMP	SDA OUTLET TEMP	TOTAL SLURRY FL	DIL WATER FLOW	LIME SLURRY	FF OUT TEMP	FF DP	ID INLET PRESS	STEAM FLOW	Lime Feed Rate
	DEG F	DEG F	GPM	GPM	GPM	DEG F	" H2O	" H2O	KLBs/hr	lb/hr
Unit 2	498.93	315.08	33.64	24.19	9.4444	296.18	6.68	-11.44	183.28	591.54

	FEED H2O FLOW	SH OUT STM PRESS	FINAL STM TEMP	TOT AIR FLOW	FURNACE DRAFT	ECONO OUT TEMP	SH ROLL AVG	SNCR CHEM FLOW	FURNACE O2	OUTLET O2
	KLBs/hr	DEG F	DEG F	KSCFM	" H2O	DEG F	DEG F	GPH	%	%
Unit 2	186.44	899.61	824.82	85.12	-0.10	413.97	1075.67	2.06	6.55	9.32

C - 21

Lime Slurry 3/24/2010
S.G. **1.099**
Lb/gal **1.044**

Specific Gravity	Cao lb/gal	Lime Conc %
1.099	1.044	18.096

Wheelabrator
SOUTH BROWARD
Emission Test Log

Date: 3/22/2010
Start Time: 10:04:00
End Time: 14:44
TEST 23 run 1

	SDA INLET TEMP	SDA OUTLET TEMP	TOTAL SLURRY FL	DIL WATER FLOW	LIME SLURRY	FF OUT TEMP	FF DP	ID INLET PRESS	STEAM FLOW	Lime Feed Rate
	DEG F	DEG F	GPM	GPM	GPM	DEG F	" H2O	" H2O	KLBs/hr	lb/hr
Unit 2	491.00	318.04	31.17	19.83	11.3333	297.13	6.57	-10.65	184.20	665.02

	FEED H2O FLOW	SH OUT STM PRESS	FINAL STM TEMP	TOT AIR FLOW	FURNACE DRAFT	ECONO OUT TEMP	SH ROLL AVG	SNCR CHEM FLOW	FURNACE O2	OUTLET O2
	KLBs/hr	DEG F	DEG F	KSCFM	" H2O	DEG F	DEG F	GPH	%	%
Unit 2	187.57	897.43	825.38	83.45	-0.10	411.95	1072.08	2.19	6.26	9.08

Lime Slurry 3/22/2010
S.G. **1.093**
Lb/gal **0.978**

Specific Gravity	Cao lb/gal	Lime Conc %
1.093	0.978	22.054

C - 22

Wheelabrator
SOUTH BROWARD
Emission Test Log

Date: 3/23/2010
Start Time: 7:36:00
End Time: 12:12
TEST 23 run 2

	SDA INLET TEMP	SDA OUTLET TEMP	TOTAL SLURRY FL	DIL WATER FLOW	LIME SLURRY	FF OUT TEMP	FF DP	ID INLET PRESS	STEAM FLOW	Lime Feed Rate
	DEG F	DEG F	GPM	GPM	GPM	DEG F	" H2O	" H2O	KLBs/hr	lb/hr
Unit 2	494.72	319.79	31.74	20.94	10.7944	300.59	6.61	-11.14	184.19	424.08

	FEED H2O FLOW	SH OUT STM PRESS	FINAL STM TEMP	TOT AIR FLOW	FURNACE DRAFT	ECONO OUT TEMP	SH ROLL AVG	SNCR CHEM FLOW	FURNACE O2	OUTLET O2
	KLBs/hr	DEG F	DEG F	KSCFM	" H2O	DEG F	DEG F	GPH	%	%
Unit 2	187.49	898.33	824.78	86.57	-0.10	413.58	1087.40	2.84	6.57	9.19

Lime Slurry 3/23/2010
S.G. **1.063**
Lb/gal **0.655**

Specific Gravity	Cao lb/gal	Lime Conc %
1.063	0.655	33.104

C - 23

Wheelabrator
SOUTH BROWARD
Emission Test Log

Date: 3/23/2010
Start Time: 12:32:00
End Time: 17:02
TEST 23 run 3

	SDA INLET TEMP	SDA OUTLET TEMP	TOTAL SLURRY FL	DIL WATER FLOW	LIME SLURRY	FF OUT TEMP	FF DP	ID INLET PRESS	STEAM FLOW	Lime Feed Rate
	DEG F	DEG F	GPM	GPM	GPM	DEG F	" H2O	" H2O	KLBs/hr	lb/hr
Unit 2	503.15	320.03	33.81	23.11	10.7049	301.91	6.67	-11.34	183.94	565.69

	FEED H2O FLOW	SH OUT STM PRESS	FINAL STM TEMP	TOT AIR FLOW	FURNACE DRAFT	ECONO OUT TEMP	SH ROLL AVG	SNCR CHEM FLOW	FURNACE O2	OUTLET O2
	KLBs/hr	DEG F	DEG F	KSCFM	" H2O	DEG F	DEG F	GPH	%	%
Unit 2	186.78	900.28	823.88	85.99	-0.10	414.96	1094.18	3.86	6.41	9.12

Lime Slurry 3/23/2010
S.G. **1.084**
Lb/gal **0.881**

Specific Gravity	Cao lb/gal	Lime Conc %
1.084	0.881	23.272

C - 24

Wheelabrator
SOUTH BROWARD
Emission Test Log

Date: 3/24/2010
Start Time: 7:53:00
End Time: 9:11
TEST 13B run 1

	SDA INLET TEMP	SDA OUTLET TEMP	TOTAL SLURRY FL	DIL WATER FLOW	LIME SLURRY	FF OUT TEMP	FF DP	ID INLET PRESS	STEAM FLOW	Lime Feed Rate
	DEG F	DEG F	GPM	GPM	GPM	DEG F	" H2O	" H2O	KLBs/hr	lb/hr
Unit 2	485.81	315.05	29.87	21.86	8.0074	294.34	6.55	-11.02	184.26	418.27

	FEED H2O FLOW	SH OUT STM PRESS	FINAL STM TEMP	TOT AIR FLOW	FURNACE DRAFT	ECONO OUT TEMP	SH ROLL AVG	SNCR CHEM FLOW	FURNACE O2	OUTLET O2
	KLBs/hr	DEG F	DEG F	KSCFM	" H2O	DEG F	DEG F	GPH	%	%
Unit 2	187.43	898.08	823.57	81.40	-0.10	410.77	1064.59	2.48	6.07	8.90

C - 25

Lime Slurry 3/24/2010
S.G. **1.083**
Lb/gal **0.871**

Specific Gravity	Cao lb/gal	Lime Conc %
1.083	0.871	26.725

C - 26

Wheelabrator
SOUTH BROWARD
Emission Test Log

Date: 3/24/2010
Start Time: 9:37:00
End Time: 10:54
TEST 13B run 2

	SDA INLET TEMP	SDA OUTLET TEMP	TOTAL SLURRY FL	DIL WATER FLOW	LIME SLURRY	FF OUT TEMP	FF DP	ID INLET PRESS	STEAM FLOW	Lime Feed Rate
	DEG F	DEG F	GPM	GPM	GPM	DEG F	" H2O	" H2O	KLBs/hr	lb/hr
Unit 2	489.47	314.99	30.96	21.34	9.6187	295.88	6.52	-11.03	183.82	479.93

	FEED H2O FLOW	SH OUT STM PRESS	FINAL STM TEMP	TOT AIR FLOW	FURNACE DRAFT	ECONO OUT TEMP	SH ROLL AVG	SNCR CHEM FLOW	FURNACE O2	OUTLET O2
	KLBs/hr	DEG F	DEG F	KSCFM	" H2O	DEG F	DEG F	GPH	%	%
Unit 2	187.16	898.98	825.31	82.93	-0.10	411.77	1063.29	2.25	6.19	9.05

Lime Slurry 3/24/2010
S.G. **1.080**
Lb/gal **0.832**

Specific Gravity	Cao lb/gal	Lime Conc %
1.080	0.832	27.225

Wheelabrator
SOUTH BROWARD
Emission Test Log

Date: 3/24/2010
Start Time: 11:24:00
End Time: 12:46
TEST 13B run 3

	SDA INLET TEMP	SDA OUTLET TEMP	TOTAL SLURRY FL	DIL WATER FLOW	LIME SLURRY	FF OUT TEMP	FF DP	ID INLET PRESS	STEAM FLOW	Lime Feed Rate
	DEG F	DEG F	GPM	GPM	GPM	DEG F	" H2O	" H2O	KLBs/hr	lb/hr
Unit 2	490.53	315.08	30.93	21.94	8.9854	294.55	6.59	-11.11	183.55	425.23

	FEED H2O FLOW	SH OUT STM PRESS	FINAL STM TEMP	TOT AIR FLOW	FURNACE DRAFT	ECONO OUT TEMP	SH ROLL AVG	SNCR CHEM FLOW	FURNACE O2	OUTLET O2
	KLBs/hr	DEG F	DEG F	KSCFM	" H2O	DEG F	DEG F	GPH	%	%
Unit 2	186.98	899.49	825.49	82.35	-0.11	410.80	1071.68	2.08	6.12	8.97

Lime Slurry	3/24/2010
S.G.	**1.076**
Lb/gal	**0.789**

Specific Gravity	Cao lb/gal	Lime Conc %
1.076	0.789	28.972

C - 27

C - 28

Wheelabrator
SOUTH BROWARD
Emission Test Log

Date: 3/24/2010
Start Time: 7:45:00
End Time: 8:45:00
TEST 26A run 1

	SDA INLET TEMP	SDA OUTLET TEMP	TOTAL SLURRY FL	DIL WATER FLOW	LIME SLURRY	FF OUT TEMP	FF DP	ID INLET PRESS	STEAM FLOW	Lime Feed Rate
	DEG F	DEG F	GPM	GPM	GPM	DEG F	" H2O	" H2O	KLBs/hr	lb/hr
Unit 3	464.75	314.96	31.70	22.53	9.17	296.99	6.75	-9.51	184.05	484.09

	FEED H2O FLOW	SH OUT STM PRESS	FINAL STM TEMP	TOT AIR FLOW	FURNACE DRAFT	ECONO OUT TEMP	SH ROLL AVG	SNCR CHEM FLOW	FURNACE O2	OUTLET O2
Unit 3	KLBs/hr	DEG F	DEG F	KSCFM	" H2O	DEG F	DEG F	GPH	%	%
	188.89	891.35	820.01	80.18	-0.11	390.23	1057.32	7.67	6.15	9.26

Lime Slurry 3/24/2010
S.G. **1.084**
Lb/gal **0.879**

Specific Gravity	CaO lb/gal	Lime Conc %
1.084	0.879	25.787

Wheelabrator
SOUTH BROWARD
Emission Test Log

Date: 3/24/2010
Start Time: 9:16:00
End Time: 10:16:00
TEST 26A run 2

	SDA INLET TEMP	SDA OUTLET TEMP	TOTAL SLURRY FL	DIL WATER FLOW	LIME SLURRY	FF OUT TEMP	FF DP	ID INLET PRESS	STEAM FLOW	Lime Feed Rate
	DEG F	DEG F	GPM	GPM	GPM	DEG F	" H2O	" H2O	KLBs/hr	lb/hr
Unit 3	462.78	315.08	30.75	19.38	11.37	298.35	6.68	-9.46	184.18	572.74

Unit 3	FEED H2O FLOW	SH OUT STM PRESS	FINAL STM TEMP	TOT AIR FLOW	FURNACE DRAFT	ECONO OUT TEMP	SH ROLL AVG	SNCR CHEM FLOW	FURNACE O2	OUTLET O2
	KLBs/hr	DEG F	DEG F	KSCFM	" H2O	DEG F	DEG F	GPH	%	%
	189.60	891.92	827.04	77.61	-0.11	385.80	1057.86	9.85	5.64	8.88

Lime Slurry 3/24/2010
S.G. **1.081**
Lb/gal **0.840**

Specific Gravity	CaO lb/gal	Lime Conc %
1.081	0.840	27.649

C - 29

Wheelabrator
SOUTH BROWARD
Emission Test Log

Date: 3/24/2010
Start Time: 10:54:00
End Time: 11:54:00
TEST 26A run 3

	SDA INLET TEMP	SDA OUTLET TEMP	TOTAL SLURRY FL	DIL WATER FLOW	LIME SLURRY	FF OUT TEMP	FF DP	ID INLET PRESS	STEAM FLOW	Lime Feed Rate
	DEG F	DEG F	GPM	GPM	GPM	DEG F	" H2O	" H2O	KLBs/hr	lb/hr
Unit 3	466.94	314.81	31.40	21.45	9.95	297.21	6.70	-9.69	184.14	472.72

	FEED H2O FLOW	SH OUT STM PRESS	FINAL STM TEMP	TOT AIR FLOW	FURNACE DRAFT	ECONO OUT TEMP	SH ROLL AVG	SNCR CHEM FLOW	FURNACE O2	OUTLET O2
	KLBs/hr	DEG F	DEG F	KSCFM	" H2O	DEG F	DEG F	GPH	%	%
Unit 3	189.40	892.49	824.18	77.80	-0.11	386.76	1073.00	11.62	5.62	8.90

C - 30

Lime Slurry 3/24/2010
S.G. **1.076**
Lb/gal **0.792**

Specific Gravity	CaO lb/gal	Lime Conc %
1.076	0.792	28.815

Wheelabrator
SOUTH BROWARD
Emission Test Log

Date: 3/22/2010
Start Time: 8:47:00
End Time: 11:05:00
TEST 5/29 run 1

	SDA INLET TEMP	SDA OUTLET TEMP	TOTAL SLURRY FL	DIL WATER FLOW	LIME SLURRY	FF OUT TEMP	FF DP	ID INLET PRESS	STEAM FLOW	Lime Feed Rate
	DEG F	DEG F	GPM	GPM	GPM	DEG F	" H2O	" H2O	KLBs/hr	lb/hr
Unit 3	471.76	314.97	35.38	25.25	10.12	297.81	6.93	-10.00	184.13	531.04

Unit 3	FEED H2O FLOW	SH OUT STM PRESS	FINAL STM TEMP	TOT AIR FLOW	FURNACE DRAFT	ECONO OUT TEMP	SH ROLL AVG	SNCR CHEM FLOW	FURNACE O2	OUTLET O2
	KLBs/hr	DEG F	DEG F	KSCFM	" H2O	DEG F	DEG F	GPH	%	%
	188.78	894.95	824.83	85.00	-0.10	393.82	1031.07	12.17	6.70	9.78

C - 31

Lime Slurry 3/22/2010
S.G. **1.084**
Lb/gal **0.874**

Specific Gravity	CaO lb/gal	Lime Conc %
1.084	0.874	23.479

Wheelabrator
SOUTH BROWARD
Emission Test Log

Date: 3/22/2010
Start Time: 11:43:00
End Time: 13:57:00
TEST 5/29 run 2

	SDA INLET TEMP	SDA OUTLET TEMP	TOTAL SLURRY FL	DIL WATER FLOW	LIME SLURRY	FF OUT TEMP	FF DP	ID INLET PRESS	STEAM FLOW	Lime Feed Rate
	DEG F	DEG F	GPM	GPM	GPM	DEG F	" H2O	" H2O	KLBs/hr	lb/hr
Unit 3	467.49	315.15	32.40	19.94	12.46	297.02	6.75	-9.64	184.00	722.81

Unit 3	FEED H2O FLOW	SH OUT STM PRESS	FINAL STM TEMP	TOT AIR FLOW	FURNACE DRAFT	ECONO OUT TEMP	SH ROLL AVG	SNCR CHEM FLOW	FURNACE O2	OUTLET O2
	KLBs/hr	DEG F	DEG F	KSCFM	" H2O	DEG F	DEG F	GPH	%	%
	188.69	894.87	825.65	80.33	-0.11	387.32	1042.54	10.07	6.26	9.39

Lime Slurry 3/22/2010
S.G. **1.092**
Lb/gal **0.967**

Specific Gravity	CaO lb/gal	Lime Conc %
1.092	0.967	23.428

C - 32

Wheelabrator
SOUTH BROWARD
Emission Test Log

Date: 3/22/2010
Start Time: 14:24:00
End Time: 16:39:00
TEST 5/29 run 3

	SDA INLET TEMP	SDA OUTLET TEMP	TOTAL SLURRY FL	DIL WATER FLOW	LIME SLURRY	FF OUT TEMP	FF DP	ID INLET PRESS	STEAM FLOW	Lime Feed Rate
	DEG F	DEG F	GPM	GPM	GPM	DEG F	" H2O	" H2O	KLBs/hr	lb/hr
Unit 3	470.38	314.92	32.95	21.42	11.52	296.46	6.70	-9.64	184.16	640.91

Unit 3	FEED H2O FLOW	SH OUT STM PRESS	FINAL STM TEMP	TOT AIR FLOW	FURNACE DRAFT	ECONO OUT TEMP	SH ROLL AVG	SNCR CHEM FLOW	FURNACE O2	OUTLET O2
	KLBs/hr	DEG F	DEG F	KSCFM	" H2O	DEG F	DEG F	GPH	%	%
	188.52	894.82	822.72	81.01	-0.10	387.01	1059.52	9.28	6.28	9.45

Lime Slurry 3/22/2010
S.G. **1.089**
Lb/gal **0.927**

Specific Gravity	CaO lb/gal	Lime Conc. %
1.089	0.927	23.579

C - 33

Wheelabrator
SOUTH BROWARD
Emission Test Log

Date: 3/23/2010
Start Time: 12:41:00
End Time: 13:54:00
TEST 13B run 1

	SDA INLET TEMP	SDA OUTLET TEMP	TOTAL SLURRY FL	DIL WATER FLOW	LIME SLURRY	FF OUT TEMP	FF DP	ID INLET PRESS	STEAM FLOW	Lime Feed Rate
	DEG F	DEG F	GPM	GPM	GPM	DEG F	" H2O	" H2O	KLBs/hr	lb/hr
Unit 3	481.92	315.06	38.14	27.32	10.83	299.74	6.97	-10.33	183.84	552.14

Unit 3	FEED H2O FLOW	SH OUT STM PRESS	FINAL STM TEMP	TOT AIR FLOW	FURNACE DRAFT	ECONO OUT TEMP	SH ROLL AVG	SNCR CHEM FLOW	FURNACE O2	OUTLET O2
	KLBs/hr	DEG F	DEG F	KSCFM	" H2O	DEG F	DEG F	GPH	%	%
	188.94	891.61	824.07	85.03	-0.11	393.63	1054.76	9.45	6.58	9.60

C - 34

Lime Slurry 3/23/2010
S.G. **1.082**
Lb/gal **0.850**

Specific Gravity	CaO lb/gal	Lime Conc %
1.082	0.850	22.460

Wheelabrator
SOUTH BROWARD
Emission Test Log

Date: 3/23/2010
Start Time: 14:31:00
End Time: 15:39:00
TEST 13B run 2

	SDA INLET TEMP	SDA OUTLET TEMP	TOTAL SLURRY FL	DIL WATER FLOW	LIME SLURRY	FF OUT TEMP	FF DP	ID INLET PRESS	STEAM FLOW	Lime Feed Rate
	DEG F	DEG F	GPM	GPM	GPM	DEG F	" H2O	" H2O	KLBs/hr	lb/hr
Unit 3	486.97	314.87	39.77	29.81	9.96	299.22	7.02	-10.44	184.35	541.47

Unit 3	FEED H2O FLOW	SH OUT STM PRESS	FINAL STM TEMP	TOT AIR FLOW	FURNACE DRAFT	ECONO OUT TEMP	SH ROLL AVG	SNCR CHEM FLOW	FURNACE O2	OUTLET O2
	KLBs/hr	DEG F	DEG F	KSCFM	" H2O	DEG F	DEG F	GPH	%	%
	189.85	891.81	825.70	86.40	-0.11	396.16	1061.48	11.40	6.68	9.66

C - 35

Lime Slurry 3/23/2010
S.G. **1.087**
Lb/gal **0.906**

Specific Gravity	CaO lb/gal	Lime Conc %
1.087	0.906	19.978

Wheelabrator
SOUTH BROWARD
Emission Test Log

Date: 3/23/2010
Start Time: 15:54:00
End Time: 17:02:00
TEST 13B run 3

	SDA INLET TEMP	SDA OUTLET TEMP	TOTAL SLURRY FL	DIL WATER FLOW	LIME SLURRY	FF OUT TEMP	FF DP	ID INLET PRESS	STEAM FLOW	Lime Feed Rate
	DEG F	DEG F	GPM	GPM	GPM	DEG F	" H2O	" H2O	KLBs/hr	lb/hr
Unit 3	479.47	314.98	36.68	25.58	11.10	298.34	6.87	-9.99	183.87	598.15

Unit 3	FEED H2O FLOW	SH OUT STM PRESS	FINAL STM TEMP	TOT AIR FLOW	FURNACE DRAFT	ECONO OUT TEMP	SH ROLL AVG	SNCR CHEM FLOW	FURNACE O2	OUTLET O2
	KLBs/hr	DEG F	DEG F	KSCFM	" H2O	DEG F	DEG F	GPH	%	%
	188.91	891.17	820.85	81.70	-0.11	391.08	1074.39	9.31	6.37	9.21

Lime Slurry 3/23/2010
S.G. **1.086**
Lb/gal **0.898**

Specific Gravity	CaO lb/gal	Lime Conc %
1.086	0.898	21.866

Plant Name: SBWD
General Average Report
Reporting Period: 03/23/2010 to 03/23/2010

Site Name: UNIT1
Data Averaging Type: 6m

Time of Report: 03/24/10 07:22
Rolling Average Interval: 1

Date	Time	OPACITY1 (PERCENT)
03/23/10	07:48	1
	07:54	1
	08:00	1
	08:06	1
	08:12	1
	08:18	1
	08:24	1
	08:30	1
	08:36	1
	08:42	1
	08:48	1
	08:54	1
	09:00	1
	09:06	1
	09:12	1
	09:18	1
	09:24	1
	09:30	1
	09:36	1
	09:42	1
	09:48	1
	09:54	1

Average =	1
Geometric Avg. =	1
Maximum =	1
Minimum =	1
Possible Values =	22
Included Values =	22
Total =	29

* - excluded values (missing, OOC, invalid, suspect)
< - missing
T - out-of-control
I - invalid
S - suspect
H - exceedance
F - stack not operating
B - invalid (PADER)
U - missing data substituted
-999 - missing value
-888 - value could not be calculated

Plant Name: SBWD
General Average Report
Reporting Period: 03/23/2010 to 03/23/2010

Site Name: UNIT1
Data Averaging Type: 6m

Time of Report: 03/24/10 07:22
Rolling Average Interval: 1

Date	Time	OPACITY1 (PERCENT)
03/23/10	10:36	1
	10:42	1
	10:48	1
	10:54	1
	11:00	1
	11:06	1
	11:12	1
	11:18	1
	11:24	1
	11:30	1
	11:36	1
	11:42	1
	11:48	1
	11:54	1
	12:00	1
	12:06	1
	12:12	1
	12:18	1
	12:24	1
	12:30	1
	12:36	1
	12:42	1
Average =		1
Geometric Avg. =		1
Maximum =		1
Minimum =		1
Possible Values =		22
Included Values =		22
Total =		31

* - excluded values (missing, OOC, invalid, suspect)
< - missing
T - out-of-control
I - invalid
S - suspect
H - exceedance
F - stack not operating
B - invalid (PADER)
U - missing data substituted
-999 - missing value
-888 - value could not be calculated

Plant Name: SBWD

General Average Report

Reporting Period: 03/23/2010 to 03/23/2010

Site Name: UNIT1

Data Averaging Type: 6m

Time of Report: 03/24/10 07:22

Rolling Average Interval: 1

Date	Time	OPACITY1 (PERCENT)
03/23/10	13:36	1
	13:42	1
	13:48	1
	13:54	1
	14:00	1
	14:06	1
	14:12	1
	14:18	1
	14:24	1
	14:30	1
	14:36	1
	14:42	1
	14:48	1
	14:54	1
	15:00	1
	15:06	1
	15:12	1
	15:18	1
	15:24	1
	15:30	2
	15:36	2
	15:42	1

Average =	1
Geometric Avg. =	1
Maximum =	2
Minimum =	1
Possible Values =	22
Included Values =	22
Total =	31

* - excluded values (missing, OOC, invalid, suspect)
< - missing
T - out-of-control
I - invalid
S - suspect
H - exceedance
F - stack not operating
B - invalid (PADER)
U - missing data substituted
-999 - missing value
-888 - value could not be calculated

Plant Name: SBWD
General Average Report
Reporting Period: 03/24/2010 to 03/24/2010

Site Name: UNIT2
Data Averaging Type: 6m

Time of Report: 03/24/10 16:32
Rolling Average Interval: 1

Date	Time	OPACITY2 (PERCENT)
03/24/10	07:54	0
	08:00	0
	08:06	0
	08:12	0
	08:18	0
	08:24	0
	08:30	0
	08:36	0
	08:42	0
	08:48	0
	08:54	0
	09:00	0
	09:06	0
	09:12	0
	09:18	0
	09:24	0
	09:30	0
	09:36	0
	09:42	0
	09:48	0
	09:54	0
	10:00	0
	10:06	0
Average =		0
Geometric Avg. =		
Maximum =		0
Minimum =		0
Possible Values =		23
Included Values =		23
Total =		0

* - excluded values (missing, OOC, invalid, suspect)
< - missing
T - out-of-control
I - invalid
S - suspect
H - exceedance
F - stack not operating
B - invalid (PADER)
U - missing data substituted
-999 - missing value
-888 - value could not be calculated

Plant Name: SBWD

General Average Report

Reporting Period: 03/24/2010 to 03/24/2010

Site Name: UNIT2

Data Averaging Type: 6m

Time of Report: 03/24/10 16:32

Rolling Average Interval: 1

Date	Time	OPACITY2 (PERCENT)
03/24/10	11:06	0
	11:12	0
	11:18	0
	11:24	0
	11:30	0
	11:36	0
	11:42	0
	11:48	0
	11:54	0
	12:00	0
	12:06	0
	12:12	0
	12:18	0
	12:24	0
	12:30	0
	12:36	0
	12:42	0
	12:48	0
	12:54	0
	13:00	0
	13:06	0
	13:12	0
	13:18	0
	13:24	0
	13:30	0

Average =	0
Geometric Avg. =	
Maximum =	0
Minimum =	0
Possible Values =	25
Included Values =	25
Total =	0

* - excluded values (missing, OOC, invalid, suspect)

< - missing

T - out-of-control

I - invalid

S - suspect

H - exceedance

F - stack not operating

B - invalid (PADER)

U - missing data substituted

-999 - missing value

-888 - value could not be calculated

Plant Name: SBWD

General Average Report

Reporting Period: 03/24/2010 to 03/24/2010

Site Name: UNIT2

Data Averaging Type: 6m

Time of Report: 03/24/10 16:32

Rolling Average Interval: 1

Date	Time	OPACITY2 (PERCENT)
03/24/10	14:12	0
	14:18	0
	14:24	0
	14:30	0
	14:36	0
	14:42	0
	14:48	0
	14:54	0
	15:00	0
	15:06	0
	15:12	0
	15:18	0
	15:24	0
	15:30	0
	15:36	0
	15:42	0
	15:48	0
	15:54	0
	16:00	0
	16:06	0
	16:12	0
	16:18	0

Average =	0
Geometric Avg. =	
Maximum =	0
Minimum =	0
Possible Values =	22
Included Values =	22
Total =	0

* - excluded values (missing, OOC, invalid, suspect)
< - missing
T - out-of-control
I - invalid
S - suspect
H - exceedance
F - stack not operating
B - invalid (PADER)
U - missing data substituted
-999 - missing value
-888 - value could not be calculatsd

Plant Name: SBWD
General Average Report
Reporting Period: 03/22/2010 to 03/22/2010

Site Name: UNIT3
Data Averaging Type: 6m

Time of Report: 03/23/10 07:06
Rolling Average Interval: 1

Date	Time	OPACITY3 (PERCENT)
03/22/10	08:48	0
	08:54	0
	09:00	0
	09:06	0
	09:12	0
	09:18	0
	09:24	0
	09:30	0
	09:36	0
	09:42	0
	09:48	0
	09:54	0
	10:00	0
	10:06	0
	10:12	0
	10:18	0
	10:24	0
	10:30	0
	10:36	0
	10:42	0
	10:48	0
	10:54	0
	11:00	0

Average =	0
Geometric Avg. =	
Maximum =	0
Minimum =	0
Possible Values =	23
Included Values =	23
Total =	0

* - excluded values (missing, OOC, invalid, suspect)
< - missing
T - out-of-control
I - invalid
S - suspect
H - exceedance
F - stack not operating
B - invalid (PADER)
U - missing data substituted
-999 - missing value
-888 - value could not be calculated

Plant Name: SBWD

General Average Report

Reporting Period: 03/22/2010 to 03/22/2010

Site Name: UNIT3

Time of Report: 03/23/10 07:06

Data Averaging Type: 6m

Rolling Average Interval: 1

Date	Time	OPACITY3 (PERCENT)
03/22/10	11:48	0
	11:54	0
	12:00	0
	12:06	0
	12:12	0
	12:18	0
	12:24	0
	12:30	0
	12:36	0
	12:42	0
	12:48	0
	12:54	0
	13:00	0
	13:06	0
	13:12	0
	13:18	0
	13:24	0
	13:30	0
	13:36	0
	13:42	0
	13:48	0
	13:54	0

Average =	0
Geometric Avg. =	
Maximum =	0
Minimum =	0
Possible Values =	22
Included Values =	22
Total =	0

* - excluded values (missing, OOC, invalid, suspect)
< - missing
T - out-of-control
I - invalid
S - suspect
H - exceedance
F - stack not operating
B - invalid (PADER)
U - missing data substituted
-999 - missing value
-888 - value could not be calculated

Plant Name: SBWD
General Average Report
Reporting Period: 03/22/2010 to 03/22/2010

Site Name: UNIT3
Data Averaging Type: 6m

Time of Report: 03/23/10 07:07
Rolling Average Interval: 1

Date	Time	OPACITY3 (PERCENT)
03/22/10	14:24	0
	14:30	0
	14:36	0
	14:42	0
	14:48	0
	14:54	0
	15:00	0
	15:06	0
	15:12	0
	15:18	0
	15:24	0
	15:30	0
	15:36	0
	15:42	0
	15:48	0
	15:54	0
	16:00	0
	16:06	0
	16:12	0
	16:18	0
	16:24	0
	16:30	0
	16:36	0

Average =	0
Geometric Avg. =	
Maximum =	0
Minimum =	0
Possible Values =	23
Included Values =	23
Total =	0

* - excluded values (missing, OOC, invalid, suspect)
< - missing
T - out-of-control
I - invalid
S - suspect
H - exceedance
F - stack not operating
B - invalid (PADER)
U - missing data substituted
-999 - missing value
-888 - value could not be calculated

Plant Name: SBWD

General Average Report

Reporting Period: 03/23/2010 to 03/23/2010

Site Name: UNIT1

Time of Report: 03/24/10 07:23

Data Averaging Type: 15m

Rolling Average Interval: 1

Date	Time	CARFEED1 (LBS/HR)
03/23/10	07:45	6
	08:00	7
	08:15	6
	08:30	6
	08:45	6
	09:00	6
	09:15	6
	09:30	6
	09:45	6

Average =	6
Geometric Avg. =	6
Maximum =	7
Minimum =	6
Possible Values =	9
Included Values =	9
Total =	54

* - excluded values (missing, OOC, invalid, suspect)

< - missing

T - out-of-control

I - invalid

S - suspect

H - exceedance

F - stack not operating

B - invalid (PADER)

U - missing data substituted

-999 - missing value

-888 - value could not be calculated

Plant Name: SBWD

General Average Report

Reporting Period: 03/23/2010 to 03/23/2010

Site Name: UNIT1

Data Averaging Type: 15m

Time of Report: 03/24/10 07:23

Rolling Average Interval: 1

Date	Time	CARFEED1 (LBS/HR)
03/23/10	10:45	6
	11:00	6
	11:15	6
	11:30	6
	11:45	6
	12:00	6
	12:15	6
	12:30	6
	12:45	6

Average =	6
Geometric Avg. =	6
Maximum =	6
Minimum =	6
Possible Values =	9
Included Values =	9
Total =	54

* - excluded values (missing, OOC, invalid, suspect)

< - missing

T - out-of-control

I - invalid

S - suspect

H - exceedance

F - stack not operating

B - invalid (PADER)

U - missing data substituted

-999 - missing value

-888 - value could not be calculated

Plant Name: SBWD

General Average Report

Reporting Period: 03/23/2010 to 03/23/2010

Site Name: UNIT1

Time of Report: 03/24/10 07:23

Data Averaging Type: 15m

Rolling Average Interval: 1

Date	Time	CARFEED1 (LBS/HR)
03/23/10	13:45	6
	14:00	6
	14:15	6
	14:30	6
	14:45	6
	15:00	6
	15:15	6
	15:30	6
	15:45	6
Average =		6
Geometric Avg. =		6
Maximum =		6
Minimum =		6
Possible Values =		9
Included Values =		9
Total =		54

* - excluded values (missing, OOC, invalid, suspect)
< - missing
T - out-of-control
I - invalid
S - suspect
H - exceedance
F - stack not operating
B - invalid (PADER)
U - missing data substituted
-999 - missing value
-888 - value could not be calculated

Plant Name: SBWD

General Average Report

Reporting Period: 03/24/2010 to 03/24/2010

Site Name: UNIT2

Data Averaging Type: 15m

Time of Report: 03/24/10 16:33

Rolling Average Interval: 1

Date	Time	CARFEED2 (LBS/HR)
03/24/10	08:00	6
	08:15	6
	08:30	7
	08:45	6
	09:00	6
	09:15	7
	09:30	6
	09:45	5
	10:00	7
Average =		6
Geometric Avg. =		6
Maximum =		7
Minimum =		5
Possible Values =		9
Included Values =		9
Total =		56

* - excluded values (missing, OOC, invalid, suspect)

< - missing

T - out-of-control

I - invalid

S - suspect

H - exceedance

F - stack not operating

B - invalid (PADER)

U - missing data substituted

-999 - missing value

-888 - value could not be calculated

Plant Name: SBWD
General Average Report
Reporting Period: 03/24/2010 to 03/24/2010

Site Name: UNIT2
Data Averaging Type: 15m

Time of Report: 03/24/10 16:33
Rolling Average Interval: 1

Date	Time	CARFEED2 (LBS/HR)
03/24/10	11:15	6
	11:30	6
	11:45	6
	12:00	6
	12:15	6
	12:30	6
	12:45	6
	13:00	6
	13:15	8
	13:30	6

Average =	6
Geometric Avg. =	6
Maximum =	8
Minimum =	6
Possible Values =	10
Included Values =	10
Total =	62

* - excluded values (missing, OOC, invalid, suspect)
< - missing
T - out-of-control
I - invalid
S - suspect
H - exceedance
F - stack not operating
B - invalid (PADER)
U - missing data substituted
-999 - missing value
-888 - value could not be calculated

Plant Name: SBWD

General Average Report

Reporting Period: 03/24/2010 to 03/24/2010

Site Name: UNIT2

Data Averaging Type: 15m

Time of Report: 03/24/10 16:32

Rolling Average Interval: 1

Date	Time	CARFEED2 (LBS/HR)
03/24/10	14:15	6
	14:30	6
	14:45	6
	15:00	6
	15:15	6
	15:30	6
	15:45	6
	16:00	6
	16:15	6

Average =	6
Geometric Avg. =	6
Maximum =	6
Minimum =	6
Possible Values =	9
Included Values =	9
Total =	52

* - excluded values (missing, OOC, invalid, suspect)

< - missing

T - out-of-control

I - invalid

S - suspect

H - exceedance

F - stack not operating

B - invalid (PADER)

U - missing data substituted

-999 - missing value

-888 - value could not be calculated

Plant Name: SBWD
General Average Report
Reporting Period: 03/22/2010 to 03/22/2010

Site Name: UNIT2
Data Averaging Type: 15m

Time of Report: 03/23/10 07:04
Rolling Average Interval: 1

Date	Time	CARFEED2 (LBS/HR)
03/22/10	10:15	6
	10:30	7
	10:45	7
	11:00	7
	11:15	7
	11:30	7
	11:45	6
	12:00	6
	12:15	7
	12:30	6
	12:45	6
	13:00	6
	13:15	7
	13:30	6
	13:45	5
	14:00	8
	14:15	7
	14:30	8

Average =	7
Geometric Avg. =	7
Maximum =	8
Minimum =	5
Possible Values =	18
Included Values =	18
Total =	119

* - excluded values (missing, OOC, invalid, suspect)
< - missing
T - out-of-control
I - invalid
S - suspect
H - exceedance
F - stack not operating
B - invalid (PADER)
U - missing data substituted
-999 - missing value
-888 - value could not be calculated

Plant Name: SBWD
General Average Report
Reporting Period: 03/23/2010 to 03/23/2010

Site Name: UNIT2
Data Averaging Type: 15m

Time of Report: 03/24/10 07:24
Rolling Average Interval: 1

Date	Time	CARFEED2 (LBS/HR)
03/23/10	07:45	5
	08:00	6
	08:15	6
	08:30	6
	08:45	6
	09:00	6
	09:15	7
	09:30	6
	09:45	7
	10:00	5
	10:15	6
	10:30	6
	10:45	6
	11:00	6
	11:15	6
	11:30	5
	11:45	6
	12:00	6

Average =	6
Geometric Avg. =	6
Maximum =	7
Minimum =	5
Possible Values =	18
Included Values =	18
Total =	105

* - excluded values (missing, OOC, invalid, suspect)
< - missing
T - out-of-control
I - invalid
S - suspect
H - exceedance
F - stack not operating
B - invalid (PADER)
U - missing data substituted
-999 - missing value
-888 - value could not be calculated

Plant Name: SBWD
General Average Report
Reporting Period: 03/23/2010 to 03/23/2010

Site Name: UNIT2
Data Averaging Type: 15m

Time of Report: 03/24/10 07:24
Rolling Average Interval: 1

Date	Time	CARFEED2 (LBS/HR)
03/23/10	12:45	6
	13:00	6
	13:15	6
	13:30	6
	13:45	6
	14:00	6
	14:15	6
	14:30	6
	14:45	6
	15:00	6
	15:15	6
	15:30	6
	15:45	6
	16:00	6
	16:15	5
	16:30	6
	16:45	6
	17:00	7

Average =	6
Geometric Avg. =	6
Maximum =	7
Minimum =	5
Possible Values =	18
Included Values =	18
Total =	104

* - excluded values (missing, OOC, invalid, suspect)
< - missing
T - out-of-control
I - invalid
S - suspect
H - exceedance
F - stack not operating
B - invalid (PADER)
U - missing data substituted
-999 - missing value
-888 - value could not be calculated

Plant Name: SBWD
General Average Report
Reporting Period: 03/22/2010 to 03/22/2010

Site Name: UNIT3
Data Averaging Type: 15m

Time of Report: 03/23/10 07:05
Rolling Average Interval: 1

Date	Time	CARFEED3 (LBS/HR)
03/22/10	09:00	6
	09:15	6
	09:30	7
	09:45	6
	10:00	6
	10:15	6
	10:30	6
	10:45	6
	11:00	6

Average =	6
Geometric Avg. =	6
Maximum =	7
Minimum =	6
Possible Values =	9
Included Values =	9
Total =	55

* - excluded values (missing, OOC, invalid, suspect)
< - missing
T - out-of-control
I - invalid
S - suspect
H - exceedance
F - stack not operating
B - invalid (PADER)
U - missing data substituted
-999 - missing value
-888 - value could not be calculated

Plant Name: SBWD

General Average Report

Reporting Period: 03/22/2010 to 03/22/2010

Site Name: UNIT3

Data Averaging Type: 15m

Time of Report: 03/23/10 07:05

Rolling Average Interval: 1

Date	Time	CARFEED3 (LBS/HR)
03/22/10	11:45	6
	12:00	6
	12:15	6
	12:30	6
	12:45	7
	13:00	6
	13:15	6
	13:30	6
	13:45	6

Average =	6
Geometric Avg. =	6
Maximum =	7
Minimum =	6
Possible Values =	9
Included Values =	9
Total =	55

* - excluded values (missing, OOC, invalid, suspect)

< - missing

T - out-of-control

I - invalid

S - suspect

H - exceedance

F - stack not operating

B - invalid (PADER)

U - missing data substituted

-999 - missing value

-888 - value could not be calculated

Plant Name: SBWD
General Average Report
Reporting Period: 03/22/2010 to 03/22/2010

Site Name: UNIT3
Data Averaging Type: 15m

Time of Report: 03/23/10 07:05
Rolling Average Interval: 1

Date	Time	CARFEED3 (LBS/HR)
03/22/10	14:30	6
	14:45	6
	15:00	6
	15:15	7
	15:30	6
	15:45	6
	16:00	6
	16:15	6
	16:30	6

Average =	6
Geometric Avg. =	6
Maximum =	7
Minimum =	6
Possible Values =	9
Included Values =	9
Total =	56

* - excluded values (missing, OOC, invalid, suspect)
< - missing
T - out-of-control
I - invalid
S - suspect
H - exceedance
F - stack not operating
B - invalid (PADER)
U - missing data substituted
-999 - missing value
-888 - value could not be calculated

C-58

WHEELABRATOR SOUTH BROWARD INC.

4400 South State Road 7
Fort Lauderdale, FL 33314
Tel: (954) 581-6606 Fax: (954) 581-6705

829438

3/24/2010 IN: 10:13:44 AM OUT: 12:00:45 PM OPERATOR: JWS MAINTENA

ACCOUNT: 623030 CHE001
CUSTOMER: Chemical Lime
Chemical Lime
PO Box 7247-8945
Philadelphia, PA 19170-8945

DECAL #: LIME1
VEHICLE#: LIME1
AUTOID #: 0
TYPE: Tractor/Trailer

OTHER: 2539721

PRODUCT: 90204 Lime

QTY: **25.63 Ton**

ORIGIN: Wheelabrator So

	LB	TON
GROSS	79520	39.76
TARE	28260	14.13
NET	51260	25.63

PRICE/TON:		0.00
FEES:		0.00
OTHER:		0.00
TOTAL:	$	0.00

REPRINT ORIGINAL

Wheelabrator South Broward (2010)

Carbon Feeder Calibration

Feeder	A	B	C	D
Boiler #	n/a	2	n/a	n/a
Time		05:37		
Old Zero		201.11		
New Zero		201.70		
Difference %		0.3		
Calibration Weight		49.26		
Scale Factor Old		4056.8777		
Scale Factor New		4070.2871		
Difference %		0.3		

Calibrated by: Steve Voigt

Date 3/24/2010

Wheelabrator South Broward

Carbon Feeder Calibration

Feeder	A	B	C	D
Boiler #	3	2	n/a	1
Time	07:39	07:32		07:48
Old Zero	196.42	195.29		131.05
New Zero	196.68	195.56		134.71
Difference %	0.1	0.1		2.8
Calibration Weight	49.26	49.26		49.26
Scale Factor Old	4196.6802	4172.0815		4159.2573
Scale Factor New	4196.0298	4056.8777		4175.7764
Difference %	0.0	-2.8		0.4

Calibrated by: Luis Romero & Steve Voigt

Date: 3/23/2010

Wheelabrator South Broward (2010)

Carbon Feeder Calibration

Feeder	A	B	C	D
Boiler #	3	2	n/a	1
Time	21:35	20:40		20:30
Old Zero	191.67	193.88		118.75
New Zero	197.57	199.51		131.57
Difference %	3.1	2.9		10.8
Calibration Weight	49.26	49.26		49.26
Scale Factor Old	4172.2002	4083.9648		4142.8062
Scale Factor New	4196.6802	4172.0815		4159.2573
Difference %	0.6	2.2		0.4

Calibrated by:	Luis Romero
Date	3/22/2010

This Page Intentionally Left Blank

PARAMETERS

D

This Page Intentionally Left Blank

Wheelabrator South Broward, Inc.
Clean Air Project No: 10955
Unit 1 FF Outlet

USEPA Method 5/29 (Particulate/Metals)
Sampling, Velocity and Moisture Parameters

Run No.		1	2	3	Average
Date (2010)		Mar 23	Mar 23	Mar 23	
Start Time (approx.)		07:43	10:31	13:32	
Stop Time (approx.)		09:58	12:45	15:46	
Sampling Conditions					
Y_d	Dry gas meter correction factor	1.0005	1.0005	1.0005	
C_p	Pitot tube coefficient	0.8050	0.8050	0.8050	
P_g	Static pressure (in. H_2O)	-11.0000	-10.8000	-10.9000	
A_s	Sample location area (ft^2)	64.0000	64.0000	64.0000	
P_{bar}	Barometric pressure (in. Hg)	30.10	30.10	30.10	**30.1000**
D_n	Nozzle diameter (in.)	0.2700	0.2700	0.2700	
O_2	Oxygen (dry volume %)	9.5700	9.3800	9.7300	**9.5600**
CO_2	Carbon dioxide (dry volume %)	9.6900	9.9400	9.8400	**9.8233**
N_2+CO	Nitrogen plus carbon monoxide (dry volume %)	80.7400	80.6800	80.4300	**80.6167**
V_{lc}	Total Liquid collected (ml)	463.20	472.70	458.70	
V_m	Volume metered, meter conditions (ft^3)	76.5450	77.7000	78.1800	
T_m	Dry gas meter temperature (°F)	68.4600	74.9400	76.7200	
T_s	Sample temperature (°F)	295.2000	295.1200	296.2400	**295.5200**
ΔH	Meter box orifice pressure drop (in. H_2O)	1.1852	1.2108	1.2280	
θ	Total sampling time (min)	125.0	125.0	125.0	
Flow Results					
V_{wstd}	Volume of water collected (ft^3)	21.7982	22.2453	21.5864	**21.8766**
V_{mstd}	Volume metered, standard (dscf)	77.1689	77.3893	77.6124	**77.3902**
P_s	Sample gas pressure, absolute (in. Hg)	29.2912	29.3059	29.2985	**29.2985**
P_v	Vapor pressure, actual (in. Hg)	29.2912	29.3059	29.2985	**29.2985**
B_{wo}	Moisture measured in sample (% by volume)	22.0257	22.3269	21.7608	**22.0378**
B_{ws}	Saturated moisture content (% by volume)	100.0000	100.0000	100.0000	**100.0000**
B_w	Actual water vapor in gas (% by volume)	22.0257	22.3269	21.7608	**22.0378**
$\sqrt{\Delta P}$	Velocity head ($\sqrt{}$in. H_2O)	0.6893	0.7003	0.7076	**0.6991**
M_d	MW of sample gas, dry (lb/lb-mole)	29.9332	29.9656	29.9636	**29.9541**
M_s	MW of sample gas, wet (lb/lb-mole)	27.3048	27.2941	27.3602	**27.3197**
V_s	Velocity of sample (ft/sec)	46.0974	46.8282	47.2988	**46.7415**
%I	Isokinetic sampling (%)	105.2463	104.2391	102.9288	**104.1381**
Q_a	Volumetric flow rate, actual (acfm)	177,014	179,820	181,627	**179,487**
Q_s	Volumetric flow rate, standard (scfm)	121,159	123,154	124,177	**122,830**
Q_{std}	Volumetric flow rate, dry standard (dscfm)	94,473	95,658	97,155	**95,762**
Q_{std7}	Volumetric flow rate, dry std@7%O_2 (dscfm)	77,005	79,279	78,073	**78,119**
Q_a	Volumetric flow rate, actual (acf/hr)	10,620,832	10,789,216	10,897,644	**10,769,231**
Q_s	Volumetric flow rate, standard (scf/hr)	7,269,519	7,389,262	7,450,598	**7,369,793**
Q_{std}	Volumetric flow rate, dry standard (dscf/hr)	5,668,358	5,739,472	5,829,290	**5,745,707**
Q_a	Volumetric flow rate, actual (m^3/hr)	300,788	305,557	308,628	**304,991**
Q_s	Volumetric flow rate, standard (m^3/hr)	205,877	209,268	211,005	**208,717**
Q_{std}	Volumetric flow rate, dry standard (dry m^3/hr)	160,531	162,545	165,089	**162,722**
Q_{std7}	Volumetric flow rate, dry std@7%O_2 (dry m^3/hr)	130,850	134,714	132,665	**132,743**
Q_s	Volumetric flow rate, normal (Nm^3/hr)	191,840	195,000	196,619	**194,486**
Q_{std}	Volumetric flow rate, dry normal (Nm^3/hr)	149,586	151,463	153,833	**151,627**
Q_{std7}	Volumetric flow rate, dry normal @7%O_2 (Nm^3/hr)	121,929	125,529	123,620	**123,692**

Comments:

Average includes 3 runs.

042010 111410
JLL@

Prepared by Clean Air Engineering Proprietary Software
SS ISOKINETIC Version 2006-13d

Copyright © 2006 Clean Air Engineering Inc.

QA/QC ________
Date ________

Wheelabrator South Broward, Inc.
Clean Air Project No: 10955
Unit 1 FF Outlet

USEPA Method 5/29
Filterable Particulate Parameters

Run No.		1	2	3	Average
Date (2010)		Mar 23	Mar 23	Mar 23	
Start Time (approx.)		07:43	10:31	13:32	
Stop Time (approx.)		09:58	12:45	15:46	
Process Conditions					
R_P	Steam Production Rate (Klbs/hour)	183.5	183.9	183.3	**183.6**
P_1	Fabric Filter Inlet Temperature (°F)	315	315	315	**315**
F_d	Oxygen-based F-factor (dscf/MMBtu)	9,570	9,570	9,570	**9,570**
F_c	Carbon dioxide-based F-factor (dscf/MMBtu)	1,820	1,820	1,820	**1,820**
Cap	Capacity factor (hours/year)	8,760	8,760	8,760	**8,760**
Gas Conditions					
O_2	Oxygen (dry volume %)	9.5700	9.3800	9.7300	**9.5600**
CO_2	Carbon dioxide (dry volume %)	9.6900	9.9400	9.8400	**9.8233**
T_s	Sample temperature (°F)	295.2000	295.1200	296.2400	**295.5200**
B_w	Actual water vapor in gas (% by volume)	22.0257	22.3269	21.7608	**22.0378**
Gas Flow Rate					
Q_a	Volumetric flow rate, actual (acfm)	177,014	179,820	181,627	**179,487**
Q_s	Volumetric flow rate, standard (scfm)	121,159	123,154	124,177	**122,830**
Q_{std}	Volumetric flow rate, dry standard (dscfm)	94,473	95,658	97,155	**95,762**
Q_{std7}	Volumetric flow rate, dry std@7%O_2 (dscfm)	77,005	79,279	78,073	**78,119**
Q_a	Volumetric flow rate, actual (acf/hr)	10,620,832	10,789,216	10,897,644	**10,769,231**
Q_s	Volumetric flow rate, standard (scf/hr)	7,269,519	7,389,262	7,450,598	**7,369,793**
Q_{std}	Volumetric flow rate, dry standard (dscf/hr)	5,668,358	5,739,472	5,829,290	**5,745,707**
Q_a	Volumetric flow rate, actual (m^3/hr)	300,788	305,557	308,628	**304,991**
Q_s	Volumetric flow rate, standard (m^3/hr)	205,877	209,268	211,005	**208,717**
Q_{std}	Volumetric flow rate, dry standard (dry m^3/hr)	160,531	162,545	165,089	**162,722**
Q_{std7}	Volumetric flow rate, dry std@7%O_2 (dry m^3/hr)	130,850	134,714	132,665	**132,743**
Q_s	Volumetric flow rate, normal (Nm^3/hr)	191,840	195,000	196,619	**194,486**
Q_{std}	Volumetric flow rate, dry normal (Nm^3/hr)	149,586	151,463	153,833	**151,627**
Q_{std7}	Volumetric flow rate, dry normal @7%O_2 (Nm^3/hr)	121,929	125,529	123,620	**123,692**
Sampling Data					
V_{mstd}	Volume metered, standard (dscf)	77.1689	77.3893	77.6124	**77.3902**
%I	Isokinetic sampling (%)	105.2463	104.2391	102.9288	**104.1381**
Laboratory Data					
m_{filter}	Matter collected on filter(s) (g)	0.00050	0.00010	0.00070	
m_s	Matter collected in solvent rinse(s) (g)	0.00060	0.00210	0.00150	
m_n	Total particulate matter collected (g)	0.00110	0.00220	0.00220	
Filterable Particulate Results					
C_{sd}	Particulate Concentration (lb/dscf)	3.1431E-08	6.2683E-08	6.2503E-08	**5.2206E-08**
C_{sd7}	Particulate Concentration @7% O_2 (lb/dscf)	3.8561E-08	7.5633E-08	7.7779E-08	**6.3991E-08**
C_{sd12}	Particulate Concentration @12% CO_2 (lb/dscf)	3.8924E-08	7.5674E-08	7.6223E-08	**6.3607E-08**
C_a	Particulate Concentration (lb/acf)	1.6775E-08	3.3345E-08	3.3434E-08	**2.7851E-08**
C_{sd}	Particulate Concentration (gr/dscf)	0.0002	0.0004	0.0004	**0.0004**
C_{sd7}	Particulate Concentration @7% O_2 (gr/dscf)	0.0003	0.0005	0.0005	**0.0004**
C_{sd12}	Particulate Concentration @12% CO_2 (gr/dscf)	0.0003	0.0005	0.0005	**0.0004**
C_a	Particulate Concentration (gr/acf)	0.0001	0.0002	0.0002	**0.0002**
C_{sd}	Particulate Concentration (mg/dscm)	0.5033	1.0038	1.0009	**0.8360**
C_{sd7}	Particulate Concentration @7% O_2 (mg/dscm)	0.6175	1.2112	1.2455	**1.0247**
C_{sd12}	Particulate Concentration @12% CO_2 (mg/dscm)	0.6233	1.2118	1.2206	**1.0186**
C_a	Particulate Concentration (mg/m^3 (actual,wet))	0.2686	0.5340	0.5354	**0.4460**
C_{sd}	Particulate Concentration (mg/Nm^3 dry)	0.5402	1.0772	1.0741	**0.8972**
C_{sd7}	Particulate Concentration @7% O_2 (mg/Nm^3 dry)	0.6627	1.2998	1.3367	**1.0997**
C_{sd12}	Particulate Concentration @12% CO_2 (mg/Nm^3 dry)	0.6689	1.3005	1.3099	**1.0931**
$E_{lb/hr}$	Particulate Rate (lb/hr)	0.1782	0.3598	0.3643	**0.3008**
$E_{kg/hr}$	Particulate Rate (kg/hr)	0.0808	0.1632	0.1652	**0.1364**
$E_{T/yr}$	Particulate Rate (Ton/yr)	0.7804	1.5758	1.5958	**1.3173**
E_{Fd}	Particulate Rate - F_d-based (lb/MMBtu)	0.0006	0.0011	0.0011	**0.0009**
E_{Fc}	Particulate Rate - F_c-based (lb/MMBtu)	0.0006	0.0011	0.0012	**0.0010**

Comments:

Average includes 3 runs.

042010 111410
JLL@_N

Prepared by Clean Air Engineering Proprietary Software
SS EPA 5-1 Version 2008-06b

Copyright © 2008 Clean Air Engineering Inc.

QA/QC ________
Date ________

Wheelabrator South Broward, Inc.
Clean Air Project No: 10955
Unit 1 FF Outlet

USEPA Method 5/29
Mercury (Hg) Emission Parameters

Run No.		1	2	3	Average
Date (2010)		Mar 23	Mar 23	Mar 23	
Start Time (approx.)		07:43	10:31	13:32	
Stop Time (approx.)		09:58	12:45	15:46	
Process Conditions					
R_P	Steam Production Rate (Klbs/hour)	183.5	183.9	183.3	**183.6**
P_1	Fabric Filter Inlet Temperature (°F)	315	315	315	**315**
P_2	Carbon Feed Rate (lb/hr)	6	6	6	**6**
F_d	Oxygen-based F-factor (dscf/MMBtu)	9,570	9,570	9,570	**9,570**
F_c	Carbon dioxide-based F-factor (dscf/MMBtu)	1,820	1,820	1,820	**1,820**
Cap	Capacity factor (hours/year)	8,760	8,760	8,760	**8,760**
Gas Conditions					
O_2	Oxygen (dry volume %)	9.5700	9.3800	9.7300	**9.5600**
CO_2	Carbon dioxide (dry volume %)	9.6900	9.9400	9.8400	**9.8233**
T_s	Sample temperature (°F)	295.2000	295.1200	296.2400	**295.5200**
B_w	Actual water vapor in gas (% by volume)	22.0257	22.3269	21.7608	**22.0378**
Gas Flow Rate					
Q_a	Volumetric flow rate, actual (acfm)	177,014	179,820	181,627	**179,487**
Q_s	Volumetric flow rate, standard (scfm)	121,159	123,154	124,177	**122,830**
Q_{std}	Volumetric flow rate, dry standard (dscfm)	94,473	95,658	97,155	**95,762**
Q_{std7}	Volumetric flow rate, dry std@7%O_2 (dscfm)	77,005	79,279	78,073	**78,119**
Q_a	Volumetric flow rate, actual (acf/hr)	10,620,832	10,789,216	10,897,644	**10,769,231**
Q_s	Volumetric flow rate, standard (scf/hr)	7,269,519	7,389,262	7,450,598	**7,369,793**
Q_{std}	Volumetric flow rate, dry standard (dscf/hr)	5,668,358	5,739,472	5,829,290	**5,745,707**
Q_a	Volumetric flow rate, actual (m^3/hr)	300,788	305,557	308,628	**304,991**
Q_s	Volumetric flow rate, standard (m^3/hr)	205,877	209,268	211,005	**208,717**
Q_{std}	Volumetric flow rate, dry standard (dry m^3/hr)	160,531	162,545	165,089	**162,722**
Q_{std7}	Volumetric flow rate, dry std@7%O_2 (dry m^3/hr)	130,850	134,714	132,665	**132,743**
Q_s	Volumetric flow rate, normal (Nm^3/hr)	191,840	195,000	196,619	**194,486**
Q_{std}	Volumetric flow rate, dry normal (Nm^3/hr)	149,586	151,463	153,833	**151,627**
Q_{std7}	Volumetric flow rate, dry normal @7%O_2 (Nm^3/hr)	121,929	125,529	123,620	**123,692**
Sampling Data					
V_{mstd}	Volume metered, standard (dscf)	77.1689	77.3893	77.6124	**77.3902**
%I	Isokinetic sampling (%)	105.2463	104.2391	102.9288	**104.1381**
Laboratory Data					
$m_{n\text{-}1b}$	Fraction 1B (µg)	<0.1000	<0.1000	<0.1000	
$m_{n\text{-}2b}$	Fraction 2B (µg)	4.8386	4.5386	5.0072	
$m_{n\text{-}3a}$	Fraction 3A (µg)	<0.2000	<0.2000	<0.2000	
$m_{n\text{-}3b}$	Fraction 3B (µg)	<0.5000	<0.5000	<0.5000	
$m_{n\text{-}3c}$	Fraction 3C (µg)	<0.4000	<0.4000	<0.4000	
m_n	Total matter corrected for allowable blanks (µg)	4.8386	4.5386	5.0072	
Mercury Results - Total					
C_{sd}	Concentration (lb/dscf)	1.3826E-10	1.2932E-10	1.4226E-10	**1.3661E-10**
C_{sd7}	Concentration @7% O_2 (lb/dscf)	1.6962E-10	1.5603E-10	1.7703E-10	**1.6756E-10**
C_{sd12}	Concentration @12% CO_2 (lb/dscf)	1.7122E-10	1.5612E-10	1.7348E-10	**1.6694E-10**
C_a	Concentration (lb/acf)	7.3788E-11	6.8792E-11	7.6095E-11	**7.2892E-11**
C_{sd}	Concentration (µg/dscm)	2.2140E+00	2.0708E+00	2.2780E+00	**2.1876E+00**
C_{sd7}	Concentration @7% O_2 (µg/dscm)	2.7162E+00	2.4987E+00	2.8348E+00	**2.6832E+00**
C_{sd12}	Concentration @12% CO_2 (µg/dscm)	2.7418E+00	2.5000E+00	2.7781E+00	**2.6733E+00**
C_{sd}	Concentration (mg/dscm)	2.2140E-03	2.0708E-03	2.2780E-03	**2.1876E-03**
C_{sd7}	Concentration @7% O_2 (mg/dscm)	2.7162E-03	2.4987E-03	2.8348E-03	**2.6832E-03**
C_{sd12}	Concentration @12% CO_2 (mg/dscm)	2.7418E-03	2.5000E-03	2.7781E-03	**2.6733E-03**
C_a	Concentration (µg/m^3 (actual,wet))	1.1816E+00	1.1016E+00	1.2186E+00	**1.1673E+00**
C_{sd}	Concentration (µg/Nm^3 dry)	2.3760E+00	2.2223E+00	2.4447E+00	**2.3477E+00**
C_{sd7}	Concentration @7% O_2 (µg/Nm^3 dry)	2.9150E+00	2.6815E+00	3.0422E+00	**2.8796E+00**
C_{sd12}	Concentration @12% CO_2 (µg/Nm^3 dry)	2.9424E+00	2.6829E+00	2.9814E+00	**2.8689E+00**
$E_{lb/hr}$	Rate (lb/hr)	7.8369E-04	7.4221E-04	8.2926E-04	**7.8505E-04**
$E_{g/s}$	Rate (g/s)	9.8727E-05	9.3501E-05	1.0447E-04	**9.8898E-05**
$E_{T/yr}$	Rate (Ton/yr)	3.4326E-03	3.2509E-03	3.6321E-03	**3.4385E-03**
E_{Fd}	Rate - Fd-based (lb/MMBtu)	2.4407E-06	2.2452E-06	2.5473E-06	**2.4111E-06**
E_{Fc}	Rate - Fc-based (lb/MMBtu)	2.5968E-06	2.3678E-06	2.6312E-06	**2.5319E-06**

Prepared by Clean Air Engineering Proprietary Software
SS Metals-1 Version 2006-12a

Copyright © 2006 Clean Air Engineering Inc.

QA/QC ________
Date ________

Wheelabrator South Broward, Inc.
Clean Air Project No: 10955
Unit 1 FF Outlet

USEPA Method 5/29
Beryllium (Be) Emission Parameters

Run No.		1	2	3	Average
Date (2010)		Mar 23	Mar 23	Mar 23	
Start Time (approx.)		07:43	10:31	13:32	
Stop Time (approx.)		09:58	12:45	15:46	
Process Conditions					
R_P	Steam Production Rate (Klbs/hour)	183.5	183.9	183.3	**183.6**
P_1	Fabric Filter Inlet Temperature (°F)	315	315	315	**315**
P_2	Carbon Feed Rate (lb/hr)	6	6	6	**6**
F_d	Oxygen-based F-factor (dscf/MMBtu)	9,570	9,570	9,570	**9,570**
F_c	Carbon dioxide-based F-factor (dscf/MMBtu)	1,820	1,820	1,820	**1,820**
Cap	Capacity factor (hours/year)	8,760	8,760	8,760	**8,760**
Gas Conditions					
O_2	Oxygen (dry volume %)	9.5700	9.3800	9.7300	**9.5600**
CO_2	Carbon dioxide (dry volume %)	9.6900	9.9400	9.8400	**9.8233**
T_s	Sample temperature (°F)	295.2000	295.1200	296.2400	**295.5200**
B_w	Actual water vapor in gas (% by volume)	22.0257	22.3269	21.7608	**22.0378**
Gas Flow Rate					
Q_a	Volumetric flow rate, actual (acfm)	177,014	179,820	181,627	**179,487**
Q_s	Volumetric flow rate, standard (scfm)	121,159	123,154	124,177	**122,830**
Q_{std}	Volumetric flow rate, dry standard (dscfm)	94,473	95,658	97,155	**95,762**
Q_{std7}	Volumetric flow rate, dry std@7%O_2 (dscfm)	77,005	79,279	78,073	**78,119**
Q_a	Volumetric flow rate, actual (acf/hr)	10,620,832	10,789,216	10,897,644	**10,769,231**
Q_s	Volumetric flow rate, standard (scf/hr)	7,269,519	7,389,262	7,450,598	**7,369,793**
Q_{std}	Volumetric flow rate, dry standard (dscf/hr)	5,668,358	5,739,472	5,829,290	**5,745,707**
Q_a	Volumetric flow rate, actual (m^3/hr)	300,788	305,557	308,628	**304,991**
Q_s	Volumetric flow rate, standard (m^3/hr)	205,877	209,268	211,005	**208,717**
Q_{std}	Volumetric flow rate, dry standard (dry m^3/hr)	160,531	162,545	165,089	**162,722**
Q_{std7}	Volumetric flow rate, dry std@7%O_2 (dry m^3/hr)	130,850	134,714	132,665	**132,743**
Q_s	Volumetric flow rate, normal (Nm^3/hr)	191,840	195,000	196,619	**194,486**
Q_{std}	Volumetric flow rate, dry normal (Nm^3/hr)	149,586	151,463	153,833	**151,627**
Q_{std7}	Volumetric flow rate, dry normal @7%O_2 (Nm^3/hr)	121,929	125,529	123,620	**123,692**
Sampling Data					
V_{mstd}	Volume metered, standard (dscf)	77.1689	77.3893	77.6124	**77.3902**
%I	Isokinetic sampling (%)	105.2463	104.2391	102.9288	**104.1381**
Laboratory Data					
m_n	Total matter corrected for allowable blanks (µg)	<0.0500	<0.0500	<0.0500	
Beryllium Results - Total					
C_{sd}	Concentration (lb/dscf)	<1.4287E-12	<1.4246E-12	<1.4205E-12	**<1.4246E-12**
C_{sd7}	Concentration @7% O_2 (lb/dscf)	<1.7528E-12	<1.7189E-12	<1.7677E-12	**<1.7465E-12**
C_{sd12}	Concentration @12% CO_2 (lb/dscf)	<1.7693E-12	<1.7199E-12	<1.7323E-12	**<1.7405E-12**
C_a	Concentration (lb/acf)	<7.6249E-13	<7.5784E-13	<7.5986E-13	**<7.6006E-13**
C_{sd}	Concentration (µg/dscm)	<2.2878E-02	<2.2813E-02	<2.2748E-02	**<2.2813E-02**
C_{sd7}	Concentration @7% O_2 (µg/dscm)	<2.8068E-02	<2.7526E-02	<2.8307E-02	**<2.7967E-02**
C_{sd12}	Concentration @12% CO_2 (µg/dscm)	<2.8332E-02	<2.7541E-02	<2.7741E-02	**<2.7872E-02**
C_{sd}	Concentration (mg/dscm)	<2.2878E-05	<2.2813E-05	<2.2748E-05	**<2.2813E-05**
C_{sd7}	Concentration @7% O_2 (mg/dscm)	<2.8068E-05	<2.7526E-05	<2.8307E-05	**<2.7967E-05**
C_{sd12}	Concentration @12% CO_2 (mg/dscm)	<2.8332E-05	<2.7541E-05	<2.7741E-05	**<2.7872E-05**
C_a	Concentration (µg/m^3 (actual,wet))	<1.2210E-02	<1.2136E-02	<1.2168E-02	**<1.2171E-02**
C_{sd}	Concentration (µg/Nm^3 dry)	<2.4552E-02	<2.4483E-02	<2.4412E-02	**<2.4482E-02**
C_{sd7}	Concentration @7% O_2 (µg/Nm^3 dry)	<3.0122E-02	<2.9541E-02	<3.0379E-02	**<3.0014E-02**
C_{sd12}	Concentration @12% CO_2 (µg/Nm^3 dry)	<3.0405E-02	<2.9556E-02	<2.9771E-02	**<2.9911E-02**
$E_{lb/hr}$	Rate (lb/hr)	<8.0983E-06	<8.1765E-06	<8.2806E-06	**<8.1852E-06**
$E_{g/s}$	Rate (g/s)	<1.0202E-06	<1.0301E-06	<1.0432E-06	**<1.0311E-06**
$E_{T/yr}$	Rate (Ton/yr)	<3.5471E-05	<3.5813E-05	<3.6269E-05	**<3.5851E-05**
E_{Fd}	Rate - Fd-based (lb/MMBtu)	<2.5221E-08	<2.4735E-08	<2.5436E-08	**<2.5131E-08**
E_{Fc}	Rate - Fc-based (lb/MMBtu)	<2.6834E-08	<2.6085E-08	<2.6274E-08	**<2.6397E-08**

042010 111503
JLL@_P

Prepared by Clean Air Engineering Proprietary Software
SS Metals-1 Version 2008-12a

Copyright © 2008 Clean Air Engineering Inc.

QA/QC ________
Date ________

Wheelabrator South Broward, Inc.
Clean Air Project No: 10955
Unit 1 FF Outlet

USEPA Method 5/29
Cadmium (Cd) Emission Parameters

	Run No.	1	2	3	Average
	Date (2010)	Mar 23	Mar 23	Mar 23	
	Start Time (approx.)	07:43	10:31	13:32	
	Stop Time (approx.)	09:58	12:45	15:46	
Process Conditions					
R_P	Steam Production Rate (Klbs/hour)	183.5	183.9	183.3	**183.6**
P_1	Fabric Filter Inlet Temperature (°F)	315	315	315	**315**
P_2	Carbon Feed Rate (lb/hr)	6	6	6	**6**
F_d	Oxygen-based F-factor (dscf/MMBtu)	9,570	9,570	9,570	**9,570**
F_c	Carbon dioxide-based F-factor (dscf/MMBtu)	1,820	1,820	1,820	**1,820**
Cap	Capacity factor (hours/year)	8,760	8,760	8,760	**8,760**
Gas Conditions					
O_2	Oxygen (dry volume %)	9.5700	9.3800	9.7300	**9.5600**
CO_2	Carbon dioxide (dry volume %)	9.6900	9.9400	9.8400	**9.8233**
T_s	Sample temperature (°F)	295.2000	295.1200	296.2400	**295.5200**
B_w	Actual water vapor in gas (% by volume)	22.0257	22.3269	21.7608	**22.0378**
Gas Flow Rate					
Q_a	Volumetric flow rate, actual (acfm)	177,014	179,820	181,627	**179,487**
Q_s	Volumetric flow rate, standard (scfm)	121,159	123,154	124,177	**122,830**
Q_{std}	Volumetric flow rate, dry standard (dscfm)	94,473	95,658	97,155	**95,762**
Q_{std7}	Volumetric flow rate, dry std@7%O_2 (dscfm)	77,005	79,279	78,073	**78,119**
Q_a	Volumetric flow rate, actual (acf/hr)	10,620,832	10,789,216	10,897,644	**10,769,231**
Q_s	Volumetric flow rate, standard (scf/hr)	7,269,519	7,389,262	7,450,598	**7,369,793**
Q_{std}	Volumetric flow rate, dry standard (dscf/hr)	5,668,358	5,739,472	5,829,290	**5,745,707**
Q_a	Volumetric flow rate, actual (m^3/hr)	300,788	305,557	308,628	**304,991**
Q_s	Volumetric flow rate, standard (m^3/hr)	205,877	209,268	211,005	**208,717**
Q_{std}	Volumetric flow rate, dry standard (dry m^3/hr)	160,531	162,545	165,089	**162,722**
Q_{std7}	Volumetric flow rate, dry std@7%O_2 (dry m^3/hr)	130,850	134,714	132,665	**132,743**
Q_s	Volumetric flow rate, normal (Nm^3/hr)	191,840	195,000	196,619	**194,486**
Q_{std}	Volumetric flow rate, dry normal (Nm^3/hr)	149,586	151,463	153,833	**151,627**
Q_{std7}	Volumetric flow rate, dry normal @7%O_2 (Nm^3/hr)	121,929	125,529	123,620	**123,692**
Sampling Data					
V_{mstd}	Volume metered, standard (dscf)	77.1689	77.3893	77.6124	**77.3902**
%I	Isokinetic sampling (%)	105.2463	104.2391	102.9288	**104.1381**
Laboratory Data					
m_n	Total matter corrected for allowable blanks (µg)	<0.2000	<0.2000	<0.2000	
Cadmium Results - Total					
C_{sd}	Concentration (lb/dscf)	<5.7147E-12	<5.6985E-12	<5.6821E-12	**<5.6984E-12**
C_{sd7}	Concentration @7% O_2 (lb/dscf)	<7.0110E-12	<6.8758E-12	<7.0708E-12	**<6.9859E-12**
C_{sd12}	Concentration @12% CO_2 (lb/dscf)	<7.0771E-12	<6.8794E-12	<6.9294E-12	**<6.9620E-12**
C_a	Concentration (lb/acf)	<3.0500E-12	<3.0314E-12	<3.0394E-12	**<3.0403E-12**
C_{sd}	Concentration (µg/dscm)	<9.1514E-02	<9.1253E-02	<9.0991E-02	**<9.1252E-02**
C_{sd7}	Concentration @7% O_2 (µg/dscm)	<1.1227E-01	<1.1011E-01	<1.1323E-01	**<1.1187E-01**
C_{sd12}	Concentration @12% CO_2 (µg/dscm)	<1.1333E-01	<1.1016E-01	<1.1096E-01	**<1.1149E-01**
C_{sd}	Concentration (mg/dscm)	<9.1514E-05	<9.1253E-05	<9.0991E-05	**<9.1252E-05**
C_{sd7}	Concentration @7% O_2 (mg/dscm)	<1.1227E-04	<1.1011E-04	<1.1323E-04	**<1.1187E-04**
C_{sd12}	Concentration @12% CO_2 (mg/dscm)	<1.1333E-04	<1.1016E-04	<1.1096E-04	**<1.1149E-04**
C_a	Concentration (µg/m^3 (actual,wet))	<4.8841E-02	<4.8543E-02	<4.8672E-02	**<4.8685E-02**
C_{sd}	Concentration (µg/Nm^3 dry)	<9.8210E-02	<9.7930E-02	<9.7649E-02	**<9.7929E-02**
C_{sd7}	Concentration @7% O_2 (µg/Nm^3 dry)	<1.2049E-01	<1.1816E-01	<1.2151E-01	**<1.2005E-01**
C_{sd12}	Concentration @12% CO_2 (µg/Nm^3 dry)	<1.2162E-01	<1.1823E-01	<1.1908E-01	**<1.1964E-01**
$E_{lb/hr}$	Rate (lb/hr)	<3.2393E-05	<3.2706E-05	<3.3123E-05	**<3.2741E-05**
$E_{g/s}$	Rate (g/s)	<4.0808E-06	<4.1202E-06	<4.1727E-06	**<4.1245E-06**
$E_{T/yr}$	Rate (Ton/yr)	<1.4188E-04	<1.4325E-04	<1.4508E-04	**<1.4340E-04**
E_{Fd}	Rate - Fd-based (lb/MMBtu)	<1.0088E-07	<9.8938E-08	<1.0174E-07	**<1.0052E-07**
E_{Fc}	Rate - Fc-based (lb/MMBtu)	<1.0734E-07	<1.0434E-07	<1.0510E-07	**<1.0559E-07**

042010 111503
JLL@_P

Prepared by Clean Air Engineering Proprietary Software
5S Metals-1 Version 2008-12a

Copyright © 2008 Clean Air Engineering Inc.

QA/QC ________
Date ________

Wheelabrator South Broward, Inc.
Clean Air Project No: 10955
Unit 1 FF Outlet

USEPA Method 5/29
Lead (Pb) Emission Parameters

Run No.		1	2	3	Average
Date (2010)		Mar 23	Mar 23	Mar 23	
Start Time (approx.)		07:43	10:31	13:32	
Stop Time (approx.)		09:58	12:45	15:46	
Process Conditions					
R_P	Steam Production Rate (Klbs/hour)	183.5	183.9	183.3	**183.6**
P_1	Fabric Filter Inlet Temperature (°F)	315	315	315	**315**
P_2	Carbon Feed Rate (lb/hr)	6	6	6	**6**
F_d	Oxygen-based F-factor (dscf/MMBtu)	9,570	9,570	9,570	**9,570**
F_c	Carbon dioxide-based F-factor (dscf/MMBtu)	1,820	1,820	1,820	**1,820**
Cap	Capacity factor (hours/year)	8,760	8,760	8,760	**8,760**
Gas Conditions					
O_2	Oxygen (dry volume %)	9.5700	9.3800	9.7300	**9.5600**
CO_2	Carbon dioxide (dry volume %)	9.6900	9.9400	9.8400	**9.8233**
T_s	Sample temperature (°F)	295.2000	295.1200	296.2400	**295.5200**
B_w	Actual water vapor in gas (% by volume)	22.0257	22.3269	21.7608	**22.0378**
Gas Flow Rate					
Q_a	Volumetric flow rate, actual (acfm)	177,014	179,820	181,627	**179,487**
Q_s	Volumetric flow rate, standard (scfm)	121,159	123,154	124,177	**122,830**
Q_{std}	Volumetric flow rate, dry standard (dscfm)	94,473	95,658	97,155	**95,762**
Q_{std7}	Volumetric flow rate, dry std@7%O_2 (dscfm)	77,005	79,279	78,073	**78,119**
Q_a	Volumetric flow rate, actual (acf/hr)	10,620,832	10,789,216	10,897,644	**10,769,231**
Q_s	Volumetric flow rate, standard (scf/hr)	7,269,519	7,389,262	7,450,598	**7,369,793**
Q_{std}	Volumetric flow rate, dry standard (dscf/hr)	5,668,358	5,739,472	5,829,290	**5,745,707**
Q_a	Volumetric flow rate, actual (m^3/hr)	300,788	305,557	308,628	**304,991**
Q_s	Volumetric flow rate, standard (m^3/hr)	205,877	209,268	211,005	**208,717**
Q_{std}	Volumetric flow rate, dry standard (dry m^3/hr)	160,531	162,545	165,089	**162,722**
Q_{std7}	Volumetric flow rate, dry std@7%O_2 (dry m^3/hr)	130,850	134,714	132,665	**132,743**
Q_s	Volumetric flow rate, normal (Nm^3/hr)	191,840	195,000	196,619	**194,486**
Q_{std}	Volumetric flow rate, dry normal (Nm^3/hr)	149,586	151,463	153,833	**151,627**
Q_{std7}	Volumetric flow rate, dry normal @7%O_2 (Nm^3/hr)	121,929	125,529	123,620	**123,692**
Sampling Data					
V_{mstd}	Volume metered, standard (dscf)	77.1689	77.3893	77.6124	**77.3902**
%I	Isokinetic sampling (%)	105.2463	104.2391	102.9288	**104.1381**
Laboratory Data					
m_n	Total matter corrected for allowable blanks (µg)	0.3815	0.7111	0.5419	
Lead Results - Total					
C_{sd}	Concentration (lb/dscf)	1.0901E-11	2.0261E-11	1.5395E-11	**1.5519E-11**
C_{sd7}	Concentration @7% O_2 (lb/dscf)	1.3374E-11	2.4447E-11	1.9157E-11	**1.8993E-11**
C_{sd12}	Concentration @12% CO_2 (lb/dscf)	1.3500E-11	2.4460E-11	1.8774E-11	**1.8911E-11**
C_a	Concentration (lb/acf)	5.8181E-12	1.0778E-11	8.2348E-12	**8.2770E-12**
C_{sd}	Concentration (µg/dscm)	1.7457E-01	3.2445E-01	2.4652E-01	**2.4852E-01**
C_{sd7}	Concentration @7% O_2 (µg/dscm)	2.1417E-01	3.9148E-01	3.0678E-01	**3.0414E-01**
C_{sd12}	Concentration @12% CO_2 (µg/dscm)	2.1619E-01	3.9169E-01	3.0064E-01	**3.0284E-01**
C_{sd}	Concentration (mg/dscm)	1.7457E-04	3.2445E-04	2.4652E-04	**2.4852E-04**
C_{sd7}	Concentration @7% O_2 (mg/dscm)	2.1417E-04	3.9148E-04	3.0678E-04	**3.0414E-04**
C_{sd12}	Concentration @12% CO_2 (mg/dscm)	2.1619E-04	3.9169E-04	3.0064E-04	**3.0284E-04**
C_a	Concentration (µg/m^3 (actual,wet))	9.3169E-02	1.7260E-01	1.3187E-01	**1.3254E-01**
C_{sd}	Concentration (µg/Nm^3 dry)	1.8734E-01	3.4819E-01	2.6456E-01	**2.6670E-01**
C_{sd7}	Concentration @7% O_2 (µg/Nm^3 dry)	2.2984E-01	4.2013E-01	3.2922E-01	**3.2640E-01**
C_{sd12}	Concentration @12% CO_2 (µg/Nm^3 dry)	2.3201E-01	4.2035E-01	3.2264E-01	**3.2500E-01**
$E_{lb/hr}$	Rate (lb/hr)	6.1793E-05	1.1629E-04	8.9740E-05	**8.9274E-05**
$E_{g/s}$	Rate (g/s)	7.7845E-06	1.4649E-05	1.1305E-05	**1.1246E-05**
$E_{T/yr}$	Rate (Ton/yr)	2.7065E-04	5.0934E-04	3.9306E-04	**3.9102E-04**
E_{Fd}	Rate - Fd-based (lb/MMBtu)	1.9245E-07	3.5178E-07	2.7566E-07	**2.7329E-07**
E_{Fc}	Rate - Fc-based (lb/MMBtu)	2.0475E-07	3.7098E-07	2.8474E-07	**2.8682E-07**

042010 111503
JLL@_P

Prepared by Clean Air Engineering Proprietary Software
SS Metals-1 Version 2008-12a

Copyright © 2008 Clean Air Engineering Inc.

QA/QC ________
Date ________

Wheelabrator South Broward, Inc.
Clean Air Project No: 10955
Unit 1 SDA Inlet

USEPA Method 29 (Trace Metals)
Sampling, Velocity and Moisture Parameters

Run No.		1	2	3	Average
Date (2010)		Mar 23	Mar 23	Mar 23	
Start Time (approx.)		07:43	10:31	13:32	
Stop Time (approx.)		09:58	12:45	15:46	
Sampling Conditions					
Y_d	Dry gas meter correction factor	0.9916	0.9916	0.9916	
C_p	Pitot tube coefficient	0.8250	0.8250	0.8250	
P_g	Static pressure (in. H_2O)	-1.4000	-1.4000	-1.5000	
A_s	Sample location area (ft^2)	60.1320	60.1320	60.1320	
P_{bar}	Barometric pressure (in. Hg)	30.10	30.10	30.10	**30.1000**
D_n	Nozzle diameter (in.)	0.2700	0.2700	0.2700	
O_2	Oxygen (dry volume %)	8.0900	8.3300	8.4900	**8.3033**
CO_2	Carbon dioxide (dry volume %)	10.9500	10.9400	10.9500	**10.9467**
N_2+CO	Nitrogen plus carbon monoxide (dry volume %)	80.9600	80.7300	80.5600	**80.7500**
V_{lc}	Total Liquid collected (ml)	324.10	318.30	308.90	
V_m	Volume metered, meter conditions (ft^3)	70.1450	68.2850	68.8600	
T_m	Dry gas meter temperature (°F)	80.2708	89.0208	92.4375	
T_s	Sample temperature (°F)	499.3333	505.0833	507.0833	**503.8333**
ΔH	Meter box orifice pressure drop (in. H_2O)	1.0925	1.0479	1.0542	
θ	Total sampling time (min)	120.0	120.0	120.0	
Flow Results					
V_{wstd}	Volume of water collected (ft^3)	15.2521	14.9792	14.5368	**14.9227**
V_{mstd}	Volume metered, standard (dscf)	68.5400	65.6521	65.7964	**66.6628**
P_s	Sample gas pressure, absolute (in. Hg)	29.9971	29.9971	29.9897	**29.9946**
P_v	Vapor pressure, actual (in. Hg)	29.9971	29.9971	29.9897	**29.9946**
B_{wo}	Moisture measured in sample (% by volume)	18.2024	18.5774	18.0957	**18.2918**
B_{ws}	Saturated moisture content (% by volume)	100.0000	100.0000	100.0000	**100.0000**
B_w	Actual water vapor in gas (% by volume)	18.2024	18.5774	18.0957	**18.2918**
$\sqrt{\Delta P}$	Velocity head ($\sqrt{}$in. H_2O)	0.7057	0.6876	0.6894	**0.6942**
M_d	MW of sample gas, dry (lb/lb-mole)	30.0756	30.0836	30.0916	**30.0836**
M_s	MW of sample gas, wet (lb/lb-mole)	27.8776	27.8388	27.9035	**27.8733**
V_s	Velocity of sample (ft/sec)	53.3078	52.1341	52.2685	**52.5702**
%I	Isokinetic sampling (%)	99.5632	98.5515	98.1618	**98.7588**
Q_a	Volumetric flow rate, actual (acfm)	192,331	188,096	188,581	**189,669**
Q_s	Volumetric flow rate, standard (scfm)	106,128	103,173	103,200	**104,167**
Q_{std}	Volumetric flow rate, dry standard (dscfm)	86,810	84,006	84,525	**85,114**
Q_{std7}	Volumetric flow rate, dry std@7%O_2 (dscfm)	80,003	75,968	75,464	**77,145**
Q_a	Volumetric flow rate, actual (acf/hr)	11,539,835	11,285,753	11,314,844	**11,380,144**
Q_s	Volumetric flow rate, standard (scf/hr)	6,367,678	6,190,372	6,191,975	**6,250,008**
Q_{std}	Volumetric flow rate, dry standard (dscf/hr)	5,208,611	5,040,361	5,071,497	**5,106,823**
Q_a	Volumetric flow rate, actual (m^3/hr)	326,815	319,619	320,443	**322,292**
Q_s	Volumetric flow rate, standard (m^3/hr)	180,336	175,315	175,360	**177,004**
Q_{std}	Volumetric flow rate, dry standard (dry m^3/hr)	147,511	142,746	143,628	**144,628**
Q_{std7}	Volumetric flow rate, dry std@7%O_2 (dry m^3/hr)	135,944	129,088	128,232	**131,088**
Q_s	Volumetric flow rate, normal (Nm^3/hr)	168,041	163,362	163,404	**164,935**
Q_{std}	Volumetric flow rate, dry normal (Nm^3/hr)	137,453	133,013	133,835	**134,767**
Q_{std7}	Volumetric flow rate, dry normal @7%O_2 (Nm^3/hr)	126,675	120,286	119,489	**122,150**

Comments:
Average includes 3 runs.

042010 111626
JNK@

Prepared by Clean Air Engineering Proprietary Software
SS ISOKINETIC Version 2006-13d

Copyright © 2006 Clean Air Engineering Inc.

QA/QC ________
Date ________

Wheelabrator South Broward, Inc.
Clean Air Project No: 10955
Unit 1 SDA Inlet

USEPA Method 29
Mercury (Hg) Emission Parameters

Run No.		1	2	3	Average
Date (2010)		Mar 23	Mar 23	Mar 23	
Start Time (approx.)		07:43	10:31	13:32	
Stop Time (approx.)		09:58	12:45	15:46	
Process Conditions					
R_P	Steam Production Rate (Klbs/hour)	183.5	183.9	183.3	**183.6**
P_1	Fabric Filter Inlet Temperature (°F)	315	315	315	**315**
P_2	Carbon Feed Rate (lb/hr)	6	6	6	**6**
F_d	Oxygen-based F-factor (dscf/MMBtu)	9,570	9,570	9,570	**9,570**
F_c	Carbon dioxide-based F-factor (dscf/MMBtu)	1,820	1,820	1,820	**1,820**
Cap	Capacity factor (hours/year)	8,760	8,760	8,760	**8,760**
Gas Conditions					
O_2	Oxygen (dry volume %)	8.0900	8.3300	8.4900	**8.3033**
CO_2	Carbon dioxide (dry volume %)	10.9500	10.9400	10.9500	**10.9467**
T_s	Sample temperature (°F)	499.3333	505.0833	507.0833	**503.8333**
B_w	Actual water vapor in gas (% by volume)	18.2024	18.5774	18.0957	**18.2918**
Gas Flow Rate					
Q_a	Volumetric flow rate, actual (acfm)	192,331	188,096	188,581	**189,669**
Q_s	Volumetric flow rate, standard (scfm)	106,128	103,173	103,200	**104,167**
Q_{std}	Volumetric flow rate, dry standard (dscfm)	86,810	84,006	84,525	**85,114**
Q_{std7}	Volumetric flow rate, dry std@7%O_2 (dscfm)	80,003	75,968	75,464	**77,145**
Q_a	Volumetric flow rate, actual (acf/hr)	11,539,835	11,285,753	11,314,844	**11,380,144**
Q_s	Volumetric flow rate, standard (scf/hr)	6,367,678	6,190,372	6,191,975	**6,250,008**
Q_{std}	Volumetric flow rate, dry standard (dscf/hr)	5,208,611	5,040,361	5,071,497	**5,106,823**
Q_a	Volumetric flow rate, actual (m^3/hr)	326,815	319,619	320,443	**322,292**
Q_s	Volumetric flow rate, standard (m^3/hr)	180,336	175,315	175,360	**177,004**
Q_{std}	Volumetric flow rate, dry standard (dry m^3/hr)	147,511	142,746	143,628	**144,628**
Q_{std7}	Volumetric flow rate, dry std@7%O_2 (dry m^3/hr)	135,944	129,088	128,232	**131,088**
Q_s	Volumetric flow rate, normal (Nm^3/hr)	168,041	163,362	163,404	**164,935**
Q_{std}	Volumetric flow rate, dry normal (Nm^3/hr)	137,453	133,013	133,835	**134,767**
Q_{std7}	Volumetric flow rate, dry normal @7%O_2 (Nm^3/hr)	126,675	120,286	119,489	**122,150**
Sampling Data					
V_{mstd}	Volume metered, standard (dscf)	68.5400	65.6521	65.7964	**66.6628**
%I	Isokinetic sampling (%)	99.5632	98.5515	98.1618	**98.7588**
Laboratory Data					
m_{n-1b}	Fraction 1B (µg)	22.5792	69.6536	55.4324	
m_{n-2b}	Fraction 2B (µg)	50.8761	24.7029	27.0182	
m_{n-3a}	Fraction 3A (µg)	0.0000	0.0000	0.0000	
m_{n-3b}	Fraction 3B (µg)	0.0000	0.0000	0.7870	
m_{n-3c}	Fraction 3C (µg)	4.6198	1.0851	2.9106	
m_n	Total matter corrected for allowable blanks (µg)	78.0752	95.4417	86.1483	
Mercury Results - Total					
C_{sd}	Concentration (lb/dscf)	2.5118E-09	3.2055E-09	2.8870E-09	**2.8681E-09**
C_{sd7}	Concentration @7% O_2 (lb/dscf)	2.7255E-09	3.5447E-09	3.2337E-09	**3.1679E-09**
C_{sd12}	Concentration @12% CO_2 (lb/dscf)	2.7526E-09	3.5161E-09	3.1639E-09	**3.1442E-09**
C_a	Concentration (lb/acf)	1.1337E-09	1.4316E-09	1.2940E-09	**1.2864E-09**
C_{sd}	Concentration (µg/dscm)	4.0222E+01	5.1332E+01	4.6232E+01	**4.5929E+01**
C_{sd7}	Concentration @7% O_2 (µg/dscm)	4.3645E+01	5.6763E+01	5.1783E+01	**5.0730E+01**
C_{sd12}	Concentration @12% CO_2 (µg/dscm)	4.4079E+01	5.6306E+01	5.0665E+01	**5.0350E+01**
C_{sd}	Concentration (mg/dscm)	4.0222E-02	5.1332E-02	4.6232E-02	**4.5929E-02**
C_{sd7}	Concentration @7% O_2 (mg/dscm)	4.3645E-02	5.6763E-02	5.1783E-02	**5.0730E-02**
C_{sd12}	Concentration @12% CO_2 (mg/dscm)	4.4079E-02	5.6306E-02	5.0665E-02	**5.0350E-02**
C_a	Concentration (µg/m^3 (actual,wet))	1.8155E+01	2.2925E+01	2.0722E+01	**2.0601E+01**
C_{sd}	Concentration (µg/Nm^3 dry)	4.3165E+01	5.5088E+01	4.9615E+01	**4.9289E+01**
C_{sd7}	Concentration @7% O_2 (µg/Nm^3 dry)	4.6838E+01	6.0917E+01	5.5572E+01	**5.4442E+01**
C_{sd12}	Concentration @12% CO_2 (µg/Nm^3 dry)	4.7304E+01	6.0425E+01	5.4372E+01	**5.4034E+01**
$E_{lb/hr}$	Rate (lb/hr)	1.3083E-02	1.6157E-02	1.4642E-02	**1.4627E-02**
$E_{g/s}$	Rate (g/s)	1.6481E-03	2.0354E-03	1.8445E-03	**1.8427E-03**
$E_{T/yr}$	Rate (Ton/yr)	5.7302E-02	7.0768E-02	6.4130E-02	**6.4067E-02**
E_{Fd}	Rate - Fd-based (lb/MMBtu)	3.9218E-05	5.1006E-05	4.6531E-05	**4.5585E-05**
E_{Fc}	Rate - Fc-based (lb/MMBtu)	4.1748E-05	5.3328E-05	4.7986E-05	**4.7687E-05**

Prepared by Clean Air Engineering Proprietary Software
SS Metals-1 Version 2006-12a

Copyright © 2006 Clean Air Engineering Inc.

042010 111647
JNK@_N

QA/QC ________
Date ________

Wheelabrator South Broward, Inc.
Clean Air Project No: 10955
Unit 1 FF Outlet

USEPA Method 13B (Total Fluorides)
Sampling, Velocity and Moisture Parameters

Run No.		1	2	3	Average
Date (2010)		Mar 22	Mar 22	Mar 22	
Start Time (approx.)		13:19	15:07	16:30	
Stop Time (approx.)		14:34	16:21	17:41	
Sampling Conditions					
Y_d	Dry gas meter correction factor	1.0005	1.0005	1.0005	
C_p	Pitot tube coefficient	0.8120	0.8120	0.8120	
P_g	Static pressure (in. H_2O)	-10.2000	-10.2000	-10.2000	
A_s	Sample location area (ft^2)	64.0000	64.0000	64.0000	
P_{bar}	Barometric pressure (in. Hg)	30.10	30.10	30.10	**30.1000**
D_n	Nozzle diameter (in.)	0.2680	0.2680	0.2680	
O_2	Oxygen (dry volume %)	9.1700	9.3100	9.1500	**9.2100**
CO_2	Carbon dioxide (dry volume %)	10.3200	10.0400	10.3100	**10.2233**
N_2+CO	Nitrogen plus carbon monoxide (dry volume %)	80.5100	80.6500	80.5400	**80.5667**
V_{lc}	Total Liquid collected (ml)	218.90	224.00	218.30	
V_m	Volume metered, meter conditions (ft^3)	36.7200	38.0000	36.4950	
T_m	Dry gas meter temperature (°F)	69.6000	73.3800	75.5600	
T_s	Sample temperature (°F)	293.1200	293.4800	292.9600	**293.1867**
ΔH	Meter box orifice pressure drop (in. H_2O)	1.1440	1.1544	1.0652	
θ	Total sampling time (min)	62.5	62.5	62.5	
Flow Results					
V_{wstd}	Volume of water collected (ft^3)	10.3014	10.5414	10.2732	**10.3720**
V_{mstd}	Volume metered, standard (dscf)	36.9359	37.9535	36.2941	**37.0612**
P_s	Sample gas pressure, absolute (in. Hg)	29.3500	29.3500	29.3500	**29.3500**
P_v	Vapor pressure, actual (in. Hg)	29.3500	29.3500	29.3500	**29.3500**
B_{wo}	Moisture measured in sample (% by volume)	21.8078	21.7372	22.0610	**21.8687**
B_{ws}	Saturated moisture content (% by volume)	100.0000	100.0000	100.0000	**100.0000**
B_w	Actual water vapor in gas (% by volume)	21.8078	21.7372	22.0610	**21.8687**
$\sqrt{\Delta P}$	Velocity head ($\sqrt{}$in. H_2O)	0.6821	0.6822	0.6568	**0.6737**
M_d	MW of sample gas, dry (lb/lb-mole)	30.0180	29.9788	30.0156	**30.0041**
M_s	MW of sample gas, wet (lb/lb-mole)	27.3971	27.3749	27.3648	**27.3790**
V_s	Velocity of sample (ft/sec)	45.8219	45.8590	44.1479	**45.2762**
%I	Isokinetic sampling (%)	102.0995	104.7829	104.4456	**103.7760**
Q_a	Volumetric flow rate, actual (acfm)	175,956	176,099	169,528	**173,861**
Q_s	Volumetric flow rate, standard (scfm)	121,010	121,050	116,614	**119,558**
Q_{std}	Volumetric flow rate, dry standard (dscfm)	94,620	94,737	90,888	**93,415**
Q_{std7}	Volumetric flow rate, dry std@7%O_2 (dscfm)	79,848	78,993	76,829	**78,557**
Q_a	Volumetric flow rate, actual (acf/hr)	10,557,355	10,565,919	10,171,667	**10,431,647**
Q_s	Volumetric flow rate, standard (scf/hr)	7,260,581	7,262,999	6,996,820	**7,173,466**
Q_{std}	Volumetric flow rate, dry standard (dscf/hr)	5,677,207	5,684,227	5,453,253	**5,604,896**
Q_a	Volumetric flow rate, actual (m^3/hr)	298,990	299,233	288,068	**295,430**
Q_s	Volumetric flow rate, standard (m^3/hr)	205,624	205,692	198,154	**203,157**
Q_{std}	Volumetric flow rate, dry standard (dry m^3/hr)	160,782	160,981	154,439	**158,734**
Q_{std7}	Volumetric flow rate, dry std@7%O_2 (dry m^3/hr)	135,681	134,228	130,551	**133,487**
Q_s	Volumetric flow rate, normal (Nm^3/hr)	191,604	191,668	184,644	**189,305**
Q_{std}	Volumetric flow rate, dry normal (Nm^3/hr)	149,819	150,005	143,909	**147,911**
Q_{std7}	Volumetric flow rate, dry normal @7%O_2 (Nm^3/hr)	126,430	125,076	121,650	**124,385**

Comments:
Average includes 3 runs.

042010 111711
OKP@

Prepared by Clean Air Engineering Proprietary Software
SS ISOKINETIC Version 2006-13d

Copyright © 2006 Clean Air Engineering Inc.

QA/QC ________
Date ________

Wheelabrator South Broward, Inc.
Clean Air Project No: 10955
Unit 1 FF Outlet

USEPA Method 13B
HF Parameters

Run No.		1	2	3	Average
Date (2010)		Mar 22	Mar 22	Mar 22	
Start Time (approx.)		13:19	15:07	16:30	
Stop Time (approx.)		14:34	16:21	17:41	
Process Conditions					
R_P	Steam Production Rate (Klbs/hour)	183.9	184.2	184.8	**184.3**
P_1	Fabric Filter Inlet Temperature (°F)	315	315	315	**315**
F_d	Oxygen-based F-factor (dscf/MMBtu)	9,570	9,570	9,570	**9,570**
F_c	Carbon dioxide-based F-factor (dscf/MMBtu)	1,820	1,820	1,820	**1,820**
Cap	Capacity factor (hours/year)	8,760	8,760	8,760	**8,760**
Gas Conditions					
O_2	Oxygen (dry volume %)	9.1700	9.3100	9.1500	**9.2100**
CO_2	Carbon dioxide (dry volume %)	10.3200	10.0400	10.3100	**10.2233**
T_s	Sample temperature (°F)	293.1200	293.4800	292.9600	**293.1867**
B_w	Actual water vapor in gas (% by volume)	21.8078	21.7372	22.0610	**21.8687**
Gas Flow Rate					
Q_a	Volumetric flow rate, actual (acfm)	175,956	176,099	169,528	**173,861**
Q_s	Volumetric flow rate, standard (scfm)	121,010	121,050	116,614	**119,558**
Q_{std}	Volumetric flow rate, dry standard (dscfm)	94,620	94,737	90,888	**93,415**
Q_{std7}	Volumetric flow rate, dry std@7%O_2 (dscfm)	79,848	78,993	76,829	**78,557**
Q_a	Volumetric flow rate, actual (acf/hr)	10,557,355	10,565,919	10,171,667	**10,431,647**
Q_s	Volumetric flow rate, standard (scf/hr)	7,260,581	7,262,999	6,996,820	**7,173,466**
Q_{std}	Volumetric flow rate, dry standard (dscf/hr)	5,677,207	5,684,227	5,453,253	**5,604,896**
Q_a	Volumetric flow rate, actual (m^3/hr)	298,990	299,233	288,068	**295,430**
Q_s	Volumetric flow rate, standard (m^3/hr)	205,624	205,692	198,154	**203,157**
Q_{std}	Volumetric flow rate, dry standard (dry m^3/hr)	160,782	160,981	154,439	**158,734**
Q_{std7}	Volumetric flow rate, dry std@7%O_2 (dry m^3/hr)	135,681	134,228	130,551	**133,487**
Q_s	Volumetric flow rate, normal (Nm^3/hr)	191,604	191,668	184,644	**189,305**
Q_{std}	Volumetric flow rate, dry normal (Nm^3/hr)	149,819	150,005	143,909	**147,911**
Q_{std7}	Volumetric flow rate, dry normal @7%O_2 (Nm^3/hr)	126,430	125,076	121,650	**124,385**
Sampling Data					
V_{mstd}	Volume metered, standard (dscf)	36.9359	37.9535	36.2941	**37.0612**
%I	Isokinetic sampling (%)	102.0995	104.7829	104.4456	**103.7760**
Laboratory Data					
m_n	Total HF collected (mg)	<0.0389	<0.0374	<0.0378	
Hydrogen Fluoride (HF) Results					
C_{sd}	HF Concentration (lb/dscf)	<2.3234E-09	<2.1754E-09	<2.2979E-09	**<2.2656E-09**
C_{sd7}	HF Concentration @7% O_2 (lb/dscf)	<2.7532E-09	<2.6090E-09	<2.7184E-09	**<2.6935E-09**
C_{sd12}	HF Concentration @12% CO_2 (lb/dscf)	<2.7016E-09	<2.6001E-09	<2.6746E-09	**<2.6588E-09**
C_a	HF Concentration (lb/acf)	<1.2494E-09	<1.1703E-09	<1.2320E-09	**<1.2172E-09**
C_{sd}	HF Concentration (ppmdv)	<0.0448	<0.0419	<0.0443	**<0.0437**
C_{sd7}	HF Concentration @7% O_2 (ppmdv)	<0.0531	<0.0503	<0.0524	**<0.0519**
C_{sd12}	HF Concentration @12% CO_2 (ppmdv)	<0.0521	<0.0501	<0.0515	**<0.0512**
C_w	HF Concentration (ppmwv)	<0.0350	<0.0328	<0.0345	**<0.0341**
C_{sd}	HF Concentration (mg/dscm)	<0.0372	<0.0348	<0.0368	**<0.0363**
C_{sd7}	HF Concentration @7% O_2 (mg/dscm)	<0.0441	<0.0418	<0.0435	**<0.0431**
C_{sd12}	HF Concentration @12% CO_2 (mg/dscm)	<0.0433	<0.0416	<0.0428	**<0.0426**
C_a	HF Concentration (mg/m^3 (actual,wet))	<0.0200	<0.0187	<0.0197	**<0.0195**
C_{sd}	HF Concentration (mg/Nm^3 dry)	<0.0399	<0.0374	<0.0395	**<0.0389**
C_{sd7}	HF Concentration @7% O_2 (mg/Nm^3 dry)	<0.0473	<0.0448	<0.0467	**<0.0463**
C_{sd12}	HF Concentration @12% CO_2 (mg/Nm^3 dry)	<0.0464	<0.0447	<0.0460	**<0.0457**
$E_{lb/hr}$	HF Rate (lb/hr)	<0.0132	<0.0124	<0.0125	**<0.0127**
$E_{kg/hr}$	HF Rate (kg/hr)	<0.0060	<0.0056	<0.0057	**<0.0058**
$E_{T/yr}$	HF Rate (Ton/yr)	<0.0578	<0.0542	<0.0549	**<0.0556**
E_{Fd}	HF Rate - Fd-based (lb/MMBtu)	<0.000040	<0.000038	<0.000039	**<0.000039**
E_{Fc}	HF Rate - Fc-based (lb/MMBtu)	<0.000041	<0.000039	<0.000041	**<0.000040**

Prepared by Clean Air Engineering Proprietary Software
SS EPA26-1 Version 2006-10s (F)

Copyright © 2006 Clean Air Engineering Inc.

042010 111711
OKP@_K

QA/QC ________
Date ________

Wheelabrator South Broward, Inc.
Clean Air Project No: 10955
Unit 1 FF Outlet

USEPA Method 26A (HCl)
Sampling, Velocity and Moisture Parameters

Run No.		1	2	3	Average
Date (2010)		Mar 22	Mar 22	Mar 22	
Start Time (approx.)		08:31	09:58	11:30	
Stop Time (approx.)		09:31	10:58	12:47	
Sampling Conditions					
Y_d	Dry gas meter correction factor	1.0005	1.0005	1.0005	
C_p	Pitot tube coefficient	0.8400	0.8400	0.8400	
P_g	Static pressure (in. H_2O)	-10.6000	-10.6000	-10.6000	
A_s	Sample location area (ft^2)	64.0000	64.0000	64.0000	
P_{bar}	Barometric pressure (in. Hg)	30.10	30.10	30.10	**30.1000**
O_2	Oxygen (dry volume %)	10.0200	9.5200	9.1900	**9.5767**
CO_2	Carbon dioxide (dry volume %)	9.2400	9.9600	10.2400	**9.8133**
N_2+CO	Nitrogen plus carbon monoxide (dry volume %)	80.7400	80.5200	80.5700	**80.6100**
V_{lc}	Total Liquid collected (ml)	247.60	236.90	247.90	
V_m	Volume metered, meter conditions (ft^3)	41.3200	41.2350	40.9900	
T_m	Dry gas meter temperature (°F)	67.5833	67.3750	66.7917	
T_s	Sample temperature (°F)	294.6667	294.9167	296.2500	**295.2778**
ΔH	Meter box orifice pressure drop (in. H_2O)	1.5000	1.5000	1.5000	
θ	Total sampling time (min)	60.0	60.0	60.0	
Flow Results					
V_{wstd}	Volume of water collected (ft^3)	11.6521	11.1485	11.6662	**11.4889**
V_{mstd}	Volume metered, standard (dscf)	41.7580	41.6886	41.4868	**41.6445**
P_s	Sample gas pressure, absolute (in. Hg)	29.3206	29.3206	29.3206	**29.3206**
P_v	Vapor pressure, actual (in. Hg)	29.3206	29.3206	29.3206	**29.3206**
B_{wo}	Moisture measured in sample (% by volume)	21.8162	21.0998	21.9483	**21.6214**
B_{ws}	Saturated moisture content (% by volume)	100.0000	100.0000	100.0000	**100.0000**
B_w	Actual water vapor in gas (% by volume)	21.8162	21.0998	21.9483	**21.6214**
M_d	MW of sample gas, dry (lb/lb-mole)	29.8792	29.9744	30.0060	**29.9532**
M_s	MW of sample gas, wet (lb/lb-mole)	27.2876	27.4478	27.3709	**27.3688**

Comments:
Average includes 3 runs.

042010 111804
ONK@

Prepared by Clean Air Engineering Proprietary Software
SS ISOKINETIC Version 2006-13d

Copyright © 2006 Clean Air Engineering Inc.

QA/QC ________
Date ________

Wheelabrator South Broward, Inc.
Clean Air Project No: 10955
Unit 1 FF Outlet

USEPA Method 26A
HCl Parameters

Run No.		1	2	3	Average
Date (2010)		Mar 22	Mar 22	Mar 22	
Start Time (approx.)		08:31	09:58	11:30	
Stop Time (approx.)		09:31	10:58	12:47	
Process Conditions					
R_P	Steam Production Rate (Klbs/hour)	183.3	184.8	184.6	**184.2**
P_1	Fabric Filter Inlet Temperature (°F)	315	315	316	**315**
F_d	Oxygen-based F-factor (dscf/MMBtu)	9,570	9,570	9,570	**9,570**
F_c	Carbon dioxide-based F-factor (dscf/MMBtu)	1,820	1,820	1,820	**1,820**
Cap	Capacity factor (hours/year)	8,760	8,760	8,760	**8,760**
Gas Conditions					
O_2	Oxygen (dry volume %)	10.0200	9.5200	9.1900	**9.5767**
CO_2	Carbon dioxide (dry volume %)	9.2400	9.9600	10.2400	**9.8133**
T_s	Sample temperature (°F)	294.6667	294.9167	296.2500	**295.2778**
B_w	Actual water vapor in gas (% by volume)	21.8162	21.0998	21.9483	**21.6214**
Sampling Data					
V_{mstd}	Volume metered, standard (dscf)	41.7580	41.6886	41.4868	**41.6445**
Laboratory Data					
m_n	Total HCl collected (mg)	11.0981	11.4642	15.4584	
Hydrogen Chloride (HCl) Results					
C_{sd}	HCl Concentration (lb/dscf)	5.8603E-07	6.0637E-07	8.2161E-07	**6.7133E-07**
C_{sd7}	HCl Concentration @7% O_2 (lb/dscf)	7.4869E-07	7.4064E-07	9.7527E-07	**8.2153E-07**
C_{sd12}	HCl Concentration @12% CO_2 (lb/dscf)	7.6107E-07	7.3056E-07	9.6282E-07	**8.1815E-07**
C_{sd}	HCl Concentration (ppmdv)	6.1958	6.4109	8.6865	**7.0977**
C_{sd7}	HCl Concentration @7% O_2 (ppmdv)	7.9156	7.8305	10.3111	**8.6857**
C_{sd12}	HCl Concentration @12% CO_2 (ppmdv)	8.0465	7.7240	10.1795	**8.6500**
C_w	HCl Concentration (ppmwv)	4.8441	5.0582	6.7800	**5.5608**
C_{sd}	HCl Concentration (mg/dscm)	9.3844	9.7101	13.1569	**10.7505**
C_{sd7}	HCl Concentration @7% O_2 (mg/dscm)	11.9893	11.8603	15.6175	**13.1557**
C_{sd12}	HCl Concentration @12% CO_2 (mg/dscm)	12.1875	11.6989	15.4183	**13.1016**
C_{sd}	HCl Concentration (mg/Nm^3 dry)	10.0711	10.4206	14.1196	**11.5371**
C_{sd7}	HCl Concentration @7% O_2 (mg/Nm^3 dry)	12.8665	12.7282	16.7603	**14.1183**
C_{sd12}	HCl Concentration @12% CO_2 (mg/Nm^3 dry)	13.0793	12.5550	16.5464	**14.0602**
E_{Fd}	HCl Rate - Fd-based (lb/MMBtu)	0.0108	0.0107	0.0140	**0.0118**
E_{Fc}	HCl Rate - Fc-based (lb/MMBtu)	0.0115	0.0111	0.0146	**0.0124**

042010 111804
O N K @_@

Prepared by Clean Air Engineering Proprietary Software
SS EPA26-1 Version 2006-10a (CI)

QA/QC ________
Date ________

Copyright © 2006 Clean Air Engineering Inc.

Wheelabrator South Broward, Inc.
Clean Air Project No: 10955
Unit 1 SDA Inlet

USEPA Method 26A (HCl)
Sampling, Velocity and Moisture Parameters

Run No.		**1**	**2**	**3**	**Average**
Date (2010)		Mar 22	Mar 22	Mar 22	
Start Time (approx.)		08:31	09:58	11:30	
Stop Time (approx.)		09:31	10:58	12:46	
Sampling Conditions					
Y_d	Dry gas meter correction factor	0.9916	0.9916	0.9916	
C_p	Pitot tube coefficient	0.8400	0.8400	0.8400	
P_g	Static pressure (in. H_2O)	-1.6000	-1.8000	-1.7000	
A_s	Sample location area (ft^2)	60.1320	60.1320	60.1320	
P_{bar}	Barometric pressure (in. Hg)	30.10	30.10	30.10	**30.1000**
O_2	Oxygen (dry volume %)	8.4500	8.5900	7.9200	**8.3200**
CO_2	Carbon dioxide (dry volume %)	10.8700	10.8200	11.3900	**11.0267**
N_2+CO	Nitrogen plus carbon monoxide (dry volume %)	80.6800	80.5900	80.6900	**80.6533**
V_{lc}	Total Liquid collected (ml)	159.30	159.10	177.80	
V_m	Volume metered, meter conditions (ft^3)	35.0250	36.1650	35.7300	
T_m	Dry gas meter temperature (°F)	65.5417	69.8750	71.1667	
T_s	Sample temperature (°F)	494.9167	496.9167	493.7500	**495.1944**
ΔH	Meter box orifice pressure drop (in. H_2O)	1.1258	1.1917	1.2000	
θ	Total sampling time (min)	60.0	60.0	60.0	
Flow Results					
V_{wstd}	Volume of water collected (ft^3)	7.4967	7.4872	8.3673	**7.7837**
V_{mstd}	Volume metered, standard (dscf)	35.1856	36.0395	35.5202	**35.5818**
P_s	Sample gas pressure, absolute (in. Hg)	29.9824	29.9676	29.9750	**29.9750**
P_v	Vapor pressure, actual (in. Hg)	29.9824	29.9676	29.9750	**29.9750**
B_{wo}	Moisture measured in sample (% by volume)	17.5639	17.2015	19.0653	**17.9435**
B_{ws}	Saturated moisture content (% by volume)	100.0000	100.0000	100.0000	**100.0000**
B_w	Actual water vapor in gas (% by volume)	17.5639	17.2015	19.0653	**17.9435**
M_d	MW of sample gas, dry (lb/lb-mole)	30.0772	30.0748	30.1392	**30.0971**
M_s	MW of sample gas, wet (lb/lb-mole)	27.9560	27.9978	27.8248	**27.9262**

Comments:

Average includes 3 runs.

042010 111818
JQJ@

Prepared by Clean Air Engineering Proprietary Software
SS ISOKINETIC Version 2006-13d

Copyright © 2006 Clean Air Engineering Inc.

QA/QC ________
Date ________

Wheelabrator South Broward, Inc.
Clean Air Project No: 10955
Unit 1 SDA Inlet

USEPA Method 26A
HCl Parameters

Run No.		**1**	**2**	**3**	**Average**
Date (2010)		Mar 22	Mar 22	Mar 22	
Start Time (approx.)		08:31	09:58	11:30	
Stop Time (approx.)		09:31	10:58	12:46	
Process Conditions					
R_P	Steam Production Rate (Klbs/hour)	183.3	184.8	184.6	**184.2**
P_1	Fabric Filter Inlet Temperature (°F)	315	315	316	**315**
F_d	Oxygen-based F-factor (dscf/MMBtu)	9,570	9,570	9,570	**9,570**
F_c	Carbon dioxide-based F-factor (dscf/MMBtu)	1,820	1,820	1,820	**1,820**
Cap	Capacity factor (hours/year)	8,760	8,760	8,760	**8,760**
Gas Conditions					
O_2	Oxygen (dry volume %)	8.4500	8.5900	7.9200	**8.3200**
CO_2	Carbon dioxide (dry volume %)	10.8700	10.8200	11.3900	**11.0267**
T_s	Sample temperature (°F)	494.9167	496.9167	493.7500	**495.1944**
B_w	Actual water vapor in gas (% by volume)	17.5639	17.2015	19.0653	**17.9435**
Sampling Data					
V_{mstd}	Volume metered, standard (dscf)	35.1856	36.0395	35.5202	**35.5818**
Laboratory Data					
m_n	Total HCl collected (mg)	592.5061	671.5237	1044.3603	
Hydrogen Chloride (HCl) Results					
C_{sd}	HCl Concentration (lb/dscf)	3.7131E-05	4.1086E-05	6.4831E-05	**4.7683E-05**
C_{sd7}	HCl Concentration @7% O_2 (lb/dscf)	4.1455E-05	4.6392E-05	6.9426E-05	**5.2425E-05**
C_{sd12}	HCl Concentration @12% CO_2 (lb/dscf)	4.0991E-05	4.5566E-05	6.8303E-05	**5.1620E-05**
C_{sd}	HCl Concentration (ppmdv)	392.5707	434.3828	685.4341	**504.1292**
C_{sd7}	HCl Concentration @7% O_2 (ppmdv)	438.2917	490.4891	734.0165	**554.2658**
C_{sd12}	HCl Concentration @12% CO_2 (ppmdv)	433.3807	481.7554	722.1430	**545.7597**
C_w	HCl Concentration (ppmwv)	323.6201	359.6626	554.7541	**412.6789**
C_{sd}	HCl Concentration (mg/dscm)	594.6004	657.9305	1038.1810	**763.5706**
C_{sd7}	HCl Concentration @7% O_2 (mg/dscm)	663.8511	742.9109	1111.7654	**839.5091**
C_{sd12}	HCl Concentration @12% CO_2 (mg/dscm)	656.4126	729.6826	1093.7815	**826.6256**
C_{sd}	HCl Concentration (mg/Nm^3 dry)	638.1078	706.0717	1114.1454	**819.4416**
C_{sd7}	HCl Concentration @7% O_2 (mg/Nm^3 dry)	712.4255	797.2703	1193.1141	**900.9366**
C_{sd12}	HCl Concentration @12% CO_2 (mg/Nm^3 dry)	704.4428	783.0740	1173.8143	**887.1104**
E_{Fd}	HCl Rate - Fd-based (lb/MMBtu)	0.5965	0.6676	0.9990	**0.7544**
E_{Fc}	HCl Rate - Fc-based (lb/MMBtu)	0.6217	0.6911	1.0359	**0.7829**

042010 111818
JQJ@_@

Prepared by Clean Air Engineering Proprietary Software
SS EPA26-1 Version 2006-10a (CI)

Copyright © 2006 Clean Air Engineering Inc.

QA/QC ________
Date ________

Wheelabrator South Broward, Inc.
Clean Air Project No: 10955
Unit 2 FF Outlet

USEPA Method 5/29 (Particulate/Metals)
Sampling, Velocity and Moisture Parameters

Run No.		1	2	3	Average
Date (2010)		Mar 24	Mar 24	Mar 24	
Start Time (approx.)		07:53	11:03	14:12	
Stop Time (approx.)		10:06	13:35	16:22	
Sampling Conditions					
Y_d	Dry gas meter correction factor	1.0066	1.0066	1.0066	
C_p	Pitot tube coefficient	0.8050	0.8050	0.8050	
P_g	Static pressure (in. H_2O)	-11.0000	-11.0000	-11.1000	
A_s	Sample location area (ft^2)	64.0000	64.0000	64.0000	
P_{bar}	Barometric pressure (in. Hg)	30.10	30.10	30.10	**30.1000**
D_n	Nozzle diameter (in.)	0.2700	0.2700	0.2700	
O_2	Oxygen (dry volume %)	9.4500	9.3900	9.7900	**9.5433**
CO_2	Carbon dioxide (dry volume %)	9.9100	10.1500	9.8600	**9.9733**
N_2+CO	Nitrogen plus carbon monoxide (dry volume %)	80.6400	80.4600	80.3500	**80.4833**
V_{lc}	Total Liquid collected (ml)	432.50	455.00	442.20	
V_m	Volume metered, meter conditions (ft^3)	70.8050	73.8600	74.5150	
T_m	Dry gas meter temperature (°F)	67.7600	80.8000	81.9000	
T_s	Sample temperature (°F)	295.1600	297.6400	297.3200	**296.7067**
ΔH	Meter box orifice pressure drop (in. H_2O)	1.0812	1.1520	1.1828	
θ	Total sampling time (min)	125.0	125.0	125.0	
Flow Results					
V_{wstd}	Volume of water collected (ft^3)	20.3535	21.4123	20.8099	**20.8586**
V_{mstd}	Volume metered, standard (dscf)	71.8944	73.2007	73.7054	**72.9335**
P_s	Sample gas pressure, absolute (in. Hg)	29.2912	29.2912	29.2838	**29.2887**
P_v	Vapor pressure, actual (in. Hg)	29.2912	29.2912	29.2838	**29.2887**
B_{wo}	Moisture measured in sample (% by volume)	22.0639	22.6315	22.0175	**22.2376**
B_{ws}	Saturated moisture content (% by volume)	100.0000	100.0000	100.0000	**100.0000**
B_w	Actual water vapor in gas (% by volume)	22.0639	22.6315	22.0175	**22.2376**
$\sqrt{\Delta P}$	Velocity head ($\sqrt{}$in. H_2O)	0.6758	0.6947	0.7011	**0.6905**
M_d	MW of sample gas, dry (lb/lb-mole)	29.9636	29.9996	29.9692	**29.9775**
M_s	MW of sample gas, wet (lb/lb-mole)	27.3240	27.2839	27.3339	**27.3139**
V_s	Velocity of sample (ft/sec)	45.1764	46.5496	46.9334	**46.2198**
%I	Isokinetic sampling (%)	100.0953	99.9603	99.0236	**99.6931**
Q_a	Volumetric flow rate, actual (acfm)	173,477	178,750	180,224	**177,484**
Q_s	Volumetric flow rate, standard (scfm)	118,744	121,953	122,980	**121,226**
Q_{std}	Volumetric flow rate, dry standard (dscfm)	92,545	94,353	95,903	**94,267**
Q_{std7}	Volumetric flow rate, dry std@7%O_2 (dscfm)	76,233	78,130	76,653	**77,005**
Q_a	Volumetric flow rate, actual (acf/hr)	10,408,646	10,725,027	10,813,459	**10,649,044**
Q_s	Volumetric flow rate, standard (scf/hr)	7,124,664	7,317,195	7,378,793	**7,273,551**
Q_{std}	Volumetric flow rate, dry standard (dscf/hr)	5,552,687	5,661,207	5,754,167	**5,656,020**
Q_a	Volumetric flow rate, actual (m^3/hr)	294,779	303,739	306,244	**301,587**
Q_s	Volumetric flow rate, standard (m^3/hr)	201,775	207,227	208,972	**205,991**
Q_{std}	Volumetric flow rate, dry standard (dry m^3/hr)	157,255	160,329	162,961	**160,182**
Q_{std7}	Volumetric flow rate, dry std@7%O_2 (dry m^3/hr)	129,538	132,761	130,252	**130,850**
Q_s	Volumetric flow rate, normal (Nm^3/hr)	188,017	193,098	194,724	**191,946**
Q_{std}	Volumetric flow rate, dry normal (Nm^3/hr)	146,533	149,397	151,850	**149,260**
Q_{std7}	Volumetric flow rate, dry normal @7%O_2 (Nm^3/hr)	120,706	123,709	121,371	**121,929**

Comments:

Average includes 3 runs.

042010 111911
KKN@

Prepared by Clean Air Engineering Proprietary Software
SS ISOKINETIC Version 2006-13d

Copyright © 2006 Clean Air Engineering Inc

QA/QC ________
Date ________

Wheelabrator South Broward, Inc.
Clean Air Project No: 10955
Unit 2 FF Outlet

USEPA Method 5/29
Filterable Particulate Parameters

Run No.		1	2	3	**Average**
Date (2010)		Mar 24	Mar 24	Mar 24	
Start Time (approx.)		07:53	11:03	14:12	
Stop Time (approx.)		10:06	13:35	16:22	
Process Conditions					
R_P	Steam Production Rate (Klbs/hour)	183.9	183.7	183.3	**183.6**
P_1	Fabric Filter Inlet Temperature (°F)	315	315	315	**315**
F_d	Oxygen-based F-factor (dscf/MMBtu)	9,570	9,570	9,570	**9,570**
F_c	Carbon dioxide-based F-factor (dscf/MMBtu)	1,820	1,820	1,820	**1,820**
Cap	Capacity factor (hours/year)	8,760	8,760	8,760	**8,760**
Gas Conditions					
O_2	Oxygen (dry volume %)	9.4500	9.3900	9.7900	**9.5433**
CO_2	Carbon dioxide (dry volume %)	9.9100	10.1500	9.8600	**9.9733**
T_s	Sample temperature (°F)	295.1600	297.6400	297.3200	**296.7067**
B_w	Actual water vapor in gas (% by volume)	22.0639	22.6315	22.0175	**22.2376**
Gas Flow Rate					
Q_a	Volumetric flow rate, actual (acfm)	173,477	178,750	180,224	**177,484**
Q_s	Volumetric flow rate, standard (scfm)	118,744	121,953	122,980	**121,226**
Q_{std}	Volumetric flow rate, dry standard (dscfm)	92,545	94,353	95,903	**94,267**
Q_{std7}	Volumetric flow rate, dry std@7%O_2 (dscfm)	76,233	78,130	76,653	**77,005**
Q_a	Volumetric flow rate, actual (acf/hr)	10,408,646	10,725,027	10,813,459	**10,649,044**
Q_s	Volumetric flow rate, standard (scf/hr)	7,124,664	7,317,195	7,378,793	**7,273,551**
Q_{std}	Volumetric flow rate, dry standard (dscf/hr)	5,552,687	5,661,207	5,754,167	**5,656,020**
Q_a	Volumetric flow rate, actual (m^3/hr)	294,779	303,739	306,244	**301,587**
Q_s	Volumetric flow rate, standard (m^3/hr)	201,775	207,227	208,972	**205,991**
Q_{std}	Volumetric flow rate, dry standard (dry m^3/hr)	157,255	160,329	162,961	**160,182**
Q_{std7}	Volumetric flow rate, dry std@7%O_2 (dry m^3/hr)	129,538	132,761	130,252	**130,850**
Q_s	Volumetric flow rate, normal (Nm^3/hr)	188,017	193,098	194,724	**191,946**
Q_{std}	Volumetric flow rate, dry normal (Nm^3/hr)	146,533	149,397	151,850	**149,260**
Q_{std7}	Volumetric flow rate, dry normal @7%O_2 (Nm^3/hr)	120,706	123,709	121,371	**121,929**
Sampling Data					
V_{mstd}	Volume metered, standard (dscf)	71.8944	73.2007	73.7054	**72.9335**
%I	Isokinetic sampling (%)	100.0953	99.9603	99.0236	**99.6931**
Laboratory Data					
m_{filter}	Matter collected on filter(s) (g)	0.00110	0.00060	0.00030	
m_s	Matter collected in solvent rinse(s) (g)	0.00140	0.00240	0.00120	
m_n	Total particulate matter collected (g)	0.00250	0.00300	0.00150	
Filterable Particulate Results					
C_{sd}	Particulate Concentration (lb/dscf)	7.6675E-08	9.0368E-08	4.4875E-08	**7.0639E-08**
C_{sd7}	Particulate Concentration @7% O_2 (lb/dscf)	9.3081E-08	1.0913E-07	5.6144E-08	**8.6119E-08**
C_{sd12}	Particulate Concentration @12% CO_2 (lb/dscf)	9.2846E-08	1.0684E-07	5.4614E-08	**8.4766E-08**
C_a	Particulate Concentration (lb/acf)	4.0904E-08	4.7701E-08	2.3879E-08	**3.7495E-08**
C_{sd}	Particulate Concentration (gr/dscf)	0.0005	0.0006	0.0003	**0.0005**
C_{sd7}	Particulate Concentration @7% O_2 (gr/dscf)	0.0007	0.0008	0.0004	**0.0006**
C_{sd12}	Particulate Concentration @12% CO_2 (gr/dscf)	0.0006	0.0007	0.0004	**0.0006**
C_a	Particulate Concentration (gr/acf)	0.0003	0.0003	0.0002	**0.0003**
C_{sd}	Particulate Concentration (mg/dscm)	1.2278	1.4471	0.7186	**1.1312**
C_{sd7}	Particulate Concentration @7% O_2 (mg/dscm)	1.4906	1.7476	0.8991	**1.3791**
C_{sd12}	Particulate Concentration @12% CO_2 (mg/dscm)	1.4868	1.7109	0.8746	**1.3574**
C_a	Particulate Concentration (mg/m^3 (actual,wet))	0.6550	0.7639	0.3824	**0.6004**
C_{sd}	Particulate Concentration (mg/Nm^3 dry)	1.3177	1.5530	0.7712	**1.2140**
C_{sd7}	Particulate Concentration @7% O_2 (mg/Nm^3 dry)	1.5996	1.8755	0.9648	**1.4800**
C_{sd12}	Particulate Concentration @12% CO_2 (mg/Nm^3 dry)	1.5956	1.8361	0.9386	**1.4567**
$E_{lb/hr}$	Particulate Rate (lb/hr)	0.4258	0.5116	0.2582	**0.3985**
$E_{kg/hr}$	Particulate Rate (kg/hr)	0.1931	0.2320	0.1171	**0.1807**
$E_{T/yr}$	Particulate Rate (Ton/yr)	1.8648	2.2408	1.1310	**1.7455**
E_{Fd}	Particulate Rate - F_d-based (lb/MMBtu)	0.0013	0.0016	0.0008	**0.0012**
E_{Fc}	Particulate Rate - F_c-based (lb/MMBtu)	0.0014	0.0016	0.0008	**0.0013**

Comments:
Average includes 3 runs.

042010 111911
KKN@_M

Prepared by Clean Air Engineering Proprietary Software
SS EPA 5-1 Version 2008-08b

Copyright © 2008 Clean Air Engineering Inc.

QA/QC ________
Date ________

Wheelabrator South Broward, Inc.
Clean Air Project No: 10955
Unit 2 FF Outlet

USEPA Method 5/29
Mercury (Hg) Emission Parameters

	Run No.	1	2	3	Average
	Date (2010)	Mar 24	Mar 24	Mar 24	
	Start Time (approx.)	07:53	11:03	14:12	
	Stop Time (approx.)	10:06	13:35	16:22	
Process Conditions					
R_P	Steam Production Rate (Klbs/hour)	183.9	183.7	183.3	**183.6**
P_1	Fabric Filter Inlet Temperature (°F)	315	315	315	**315**
P_2	Carbon Feed Rate (lb/hr)	6	6	6	**6**
F_d	Oxygen-based F-factor (dscf/MMBtu)	9,570	9,570	9,570	**9,570**
F_c	Carbon dioxide-based F-factor (dscf/MMBtu)	1,820	1,820	1,820	**1,820**
Cap	Capacity factor (hours/year)	8,760	8,760	8,760	**8,760**
Gas Conditions					
O_2	Oxygen (dry volume %)	9.4500	9.3900	9.7900	**9.5433**
CO_2	Carbon dioxide (dry volume %)	9.9100	10.1500	9.8600	**9.9733**
T_s	Sample temperature (°F)	295.1600	297.6400	297.3200	**296.7067**
B_w	Actual water vapor in gas (% by volume)	22.0639	22.6315	22.0175	**22.2376**
Gas Flow Rate					
Q_a	Volumetric flow rate, actual (acfm)	173,477	178,750	180,224	**177,484**
Q_s	Volumetric flow rate, standard (scfm)	118,744	121,953	122,980	**121,226**
Q_{std}	Volumetric flow rate, dry standard (dscfm)	92,545	94,353	95,903	**94,267**
Q_{std7}	Volumetric flow rate, dry std@7%O_2 (dscfm)	76,233	78,130	76,653	**77,005**
Q_a	Volumetric flow rate, actual (acf/hr)	10,408,646	10,725,027	10,813,459	**10,649,044**
Q_s	Volumetric flow rate, standard (scf/hr)	7,124,664	7,317,195	7,378,793	**7,273,551**
Q_{std}	Volumetric flow rate, dry standard (dscf/hr)	5,552,687	5,661,207	5,754,167	**5,656,020**
Q_a	Volumetric flow rate, actual (m^3/hr)	294,779	303,739	306,244	**301,587**
Q_s	Volumetric flow rate, standard (m^3/hr)	201,775	207,227	208,972	**205,991**
Q_{std}	Volumetric flow rate, dry standard (dry m^3/hr)	157,255	160,329	162,961	**160,182**
Q_{std7}	Volumetric flow rate, dry std@7%O_2 (dry m^3/hr)	129,538	132,761	130,252	**130,850**
Q_s	Volumetric flow rate, normal (Nm^3/hr)	188,017	193,098	194,724	**191,946**
Q_{std}	Volumetric flow rate, dry normal (Nm^3/hr)	146,533	149,397	151,850	**149,260**
Q_{std7}	Volumetric flow rate, dry normal @7%O_2 (Nm^3/hr)	120,706	123,709	121,371	**121,929**
Sampling Data					
V_{mstd}	Volume metered, standard (dscf)	71.8944	73.2007	73.7054	**72.9335**
%I	Isokinetic sampling (%)	100.0953	99.9603	99.0236	**99.6931**
Laboratory Data					
m_{n-1b}	Fraction 1B (µg)	<0.1000	<0.1000	<0.1000	
m_{n-2b}	Fraction 2B (µg)	2.8801	3.2488	3.4006	
m_{n-3a}	Fraction 3A (µg)	<0.2000	<0.2000	<0.2000	
m_{n-3b}	Fraction 3B (µg)	<0.5000	<0.5000	<0.5000	
m_{n-3c}	Fraction 3C (µg)	<0.4000	<0.4000	<0.4000	
m_n	Total matter corrected for allowable blanks (µg)	2.8801	3.2488	3.4006	
Mercury Results - Total					
C_{sd}	Concentration (lb/dscf)	8.8333E-11	9.7864E-11	1.0173E-10	**9.5976E-11**
C_{sd7}	Concentration @7% O_2 (lb/dscf)	1.0723E-10	1.1818E-10	1.2728E-10	**1.1757E-10**
C_{sd12}	Concentration @12% CO_2 (lb/dscf)	1.0696E-10	1.1570E-10	1.2381E-10	**1.1549E-10**
C_a	Concentration (lb/acf)	4.7123E-11	5.1657E-11	5.4135E-11	**5.0972E-11**
C_{sd}	Concentration (µg/dscm)	1.4145E+00	1.5672E+00	1.6291E+00	**1.5369E+00**
C_{sd7}	Concentration @7% O_2 (µg/dscm)	1.7172E+00	1.8926E+00	2.0382E+00	**1.8827E+00**
C_{sd12}	Concentration @12% CO_2 (µg/dscm)	1.7129E+00	1.8528E+00	1.9827E+00	**1.8494E+00**
C_{sd}	Concentration (mg/dscm)	1.4145E-03	1.5672E-03	1.6291E-03	**1.5369E-03**
C_{sd7}	Concentration @7% O_2 (mg/dscm)	1.7172E-03	1.8926E-03	2.0382E-03	**1.8827E-03**
C_{sd12}	Concentration @12% CO_2 (mg/dscm)	1.7129E-03	1.8528E-03	1.9827E-03	**1.8494E-03**
C_a	Concentration (µg/m^3 (actual,wet))	7.5461E-01	8.2722E-01	8.6689E-01	**8.1624E-01**
C_{sd}	Concentration (µg/Nm^3 dry)	1.5180E+00	1.6818E+00	1.7483E+00	**1.6494E+00**
C_{sd7}	Concentration @7% O_2 (µg/Nm^3 dry)	1.8429E+00	2.0310E+00	2.1873E+00	**2.0204E+00**
C_{sd12}	Concentration @12% CO_2 (µg/Nm^3 dry)	1.8382E+00	1.9884E+00	2.1278E+00	**1.9848E+00**
$E_{lb/hr}$	Rate (lb/hr)	4.9049E-04	5.5403E-04	5.8538E-04	**5.4330E-04**
$E_{g/s}$	Rate (g/s)	6.1790E-05	6.9794E-05	7.3745E-05	**6.8443E-05**
$E_{T/yr}$	Rate (Ton/yr)	2.1483E-03	2.4266E-03	2.5640E-03	**2.3796E-03**
E_{Fd}	Rate - Fd-based (lb/MMBtu)	1.5430E-06	1.7006E-06	1.8315E-06	**1.6917E-06**
E_{Fc}	Rate - Fc-based (lb/MMBtu)	1.6223E-06	1.7548E-06	1.8778E-06	**1.7516E-06**

Prepared by Clean Air Engineering Proprietary Software
SS Metals-1 Version 2008-12a

Copyright © 2008 Clean Air Engineering Inc.

042010 112720
KKN@_K

QA/QC ________
Date ________

Wheelabrator South Broward, Inc.
Clean Air Project No: 10955
Unit 2 FF Outlet

USEPA Method 5/29
Beryllium (Be) Emission Parameters

Run No.		1	2	3	Average
Date (2010)		Mar 24	Mar 24	Mar 24	
Start Time (approx.)		07:53	11:03	14:12	
Stop Time (approx.)		10:06	13:35	16:22	
Process Conditions					
R_P	Steam Production Rate (Klbs/hour)	183.9	183.7	183.3	**183.6**
P_1	Fabric Filter Inlet Temperature (°F)	315	315	315	**315**
P_2	Carbon Feed Rate (lb/hr)	6	6	6	**6**
F_d	Oxygen-based F-factor (dscf/MMBtu)	9,570	9,570	9,570	**9,570**
F_c	Carbon dioxide-based F-factor (dscf/MMBtu)	1,820	1,820	1,820	**1,820**
Cap	Capacity factor (hours/year)	8,760	8,760	8,760	**8,760**
Gas Conditions					
O_2	Oxygen (dry volume %)	9.4500	9.3900	9.7900	**9.5433**
CO_2	Carbon dioxide (dry volume %)	9.9100	10.1500	9.8600	**9.9733**
T_s	Sample temperature (°F)	295.1600	297.6400	297.3200	**296.7067**
B_w	Actual water vapor in gas (% by volume)	22.0639	22.6315	22.0175	**22.2376**
Gas Flow Rate					
Q_a	Volumetric flow rate, actual (acfm)	173,477	178,750	180,224	**177,484**
Q_s	Volumetric flow rate, standard (scfm)	118,744	121,953	122,980	**121,226**
Q_{std}	Volumetric flow rate, dry standard (dscfm)	92,545	94,353	95,903	**94,267**
Q_{std7}	Volumetric flow rate, dry std@7%O_2 (dscfm)	76,233	78,130	76,653	**77,005**
Q_a	Volumetric flow rate, actual (acf/hr)	10,408,646	10,725,027	10,813,459	**10,649,044**
Q_s	Volumetric flow rate, standard (scf/hr)	7,124,664	7,317,195	7,378,793	**7,273,551**
Q_{std}	Volumetric flow rate, dry standard (dscf/hr)	5,552,687	5,661,207	5,754,167	**5,656,020**
Q_a	Volumetric flow rate, actual (m^3/hr)	294,779	303,739	306,244	**301,587**
Q_s	Volumetric flow rate, standard (m^3/hr)	201,775	207,227	208,972	**205,991**
Q_{std}	Volumetric flow rate, dry standard (dry m^3/hr)	157,255	160,329	162,961	**160,182**
Q_{std7}	Volumetric flow rate, dry std@7%O_2 (dry m^3/hr)	129,538	132,761	130,252	**130,850**
Q_s	Volumetric flow rate, normal (Nm^3/hr)	188,017	193,098	194,724	**191,946**
Q_{std}	Volumetric flow rate, dry normal (Nm^3/hr)	146,533	149,397	151,850	**149,260**
Q_{std7}	Volumetric flow rate, dry normal @7%O_2 (Nm^3/hr)	120,706	123,709	121,371	**121,929**
Sampling Data					
V_{mstd}	Volume metered, standard (dscf)	71.8944	73.2007	73.7054	**72.9335**
%I	Isokinetic sampling (%)	100.0953	99.9603	99.0236	**99.6931**
Laboratory Data					
m_n	Total matter corrected for allowable blanks (µg)	<0.0500	<0.0500	<0.0500	
Beryllium Results - Total					
C_{sd}	Concentration (lb/dscf)	<1.5335E-12	<1.5061E-12	<1.4958E-12	**<1.5118E-12**
C_{sd7}	Concentration @7% O_2 (lb/dscf)	<1.8616E-12	<1.8189E-12	<1.8715E-12	**<1.8507E-12**
C_{sd12}	Concentration @12% CO_2 (lb/dscf)	<1.8569E-12	<1.7807E-12	<1.8205E-12	**<1.8193E-12**
C_a	Concentration (lb/acf)	<8.1807E-13	<7.9501E-13	<7.9597E-13	**<8.0302E-13**
C_{sd}	Concentration (µg/dscm)	<2.4557E-02	<2.4119E-02	<2.3953E-02	**<2.4210E-02**
C_{sd7}	Concentration @7% O_2 (µg/dscm)	<2.9811E-02	<2.9127E-02	<2.9969E-02	**<2.9636E-02**
C_{sd12}	Concentration @12% CO_2 (µg/dscm)	<2.9736E-02	<2.8515E-02	<2.9152E-02	**<2.9134E-02**
C_{sd}	Concentration (mg/dscm)	<2.4557E-05	<2.4119E-05	<2.3953E-05	**<2.4210E-05**
C_{sd7}	Concentration @7% O_2 (mg/dscm)	<2.9811E-05	<2.9127E-05	<2.9969E-05	**<2.9636E-05**
C_{sd12}	Concentration @12% CO_2 (mg/dscm)	<2.9736E-05	<2.8515E-05	<2.9152E-05	**<2.9134E-05**
C_a	Concentration (µg/m^3 (actual,wet))	<1.3100E-02	<1.2731E-02	<1.2746E-02	**<1.2859E-02**
C_{sd}	Concentration (µg/Nm^3 dry)	<2.6354E-02	<2.5883E-02	<2.5706E-02	**<2.5981E-02**
C_{sd7}	Concentration @7% O_2 (µg/Nm^3 dry)	<3.1993E-02	<3.1258E-02	<3.2162E-02	**<3.1804E-02**
C_{sd12}	Concentration @12% CO_2 (µg/Nm^3 dry)	<3.1912E-02	<3.0601E-02	<3.1285E-02	**<3.1266E-02**
$E_{lb/hr}$	Rate (lb/hr)	<8.5150E-06	<8.5265E-06	<8.6072E-06	**<8.5496E-06**
$E_{g/s}$	Rate (g/s)	<1.0727E-06	<1.0741E-06	<1.0843E-06	**<1.0770E-06**
$E_{T/yr}$	Rate (Ton/yr)	<3.7296E-05	<3.7346E-05	<3.7699E-05	**<3.7447E-05**
E_{Fd}	Rate - Fd-based (lb/MMBtu)	<2.6788E-08	<2.6173E-08	<2.6929E-08	**<2.6630E-08**
E_{Fc}	Rate - Fc-based (lb/MMBtu)	<2.8163E-08	<2.7007E-08	<2.7610E-08	**<2.7593E-08**

042010 112729
KKN@_K

Prepared by Clean Air Engineering Proprietary Software
SS Metals-1 Version 2006-12a

Copyright © 2006 Clean Air Engineering Inc.

QA/QC ________
Date ________

Wheelabrator South Broward, Inc.
Clean Air Project No: 10955
Unit 2 FF Outlet

USEPA Method 5/29
Cadmium (Cd) Emission Parameters

Run No.		1	2	3	Average
Date (2010)		Mar 24	Mar 24	Mar 24	
Start Time (approx.)		07:53	11:03	14:12	
Stop Time (approx.)		10:06	13:35	16:22	
Process Conditions					
R_P	Steam Production Rate (Klbs/hour)	183.9	183.7	183.3	**183.6**
P_1	Fabric Filter Inlet Temperature (°F)	315	315	315	**315**
P_2	Carbon Feed Rate (lb/hr)	6	6	6	**6**
F_d	Oxygen-based F-factor (dscf/MMBtu)	9,570	9,570	9,570	**9,570**
F_c	Carbon dioxide-based F-factor (dscf/MMBtu)	1,820	1,820	1,820	**1,820**
Cap	Capacity factor (hours/year)	8,760	8,760	8,760	**8,760**
Gas Conditions					
O_2	Oxygen (dry volume %)	9.4500	9.3900	9.7900	**9.5433**
CO_2	Carbon dioxide (dry volume %)	9.9100	10.1500	9.8600	**9.9733**
T_s	Sample temperature (°F)	295.1600	297.6400	297.3200	**296.7067**
B_w	Actual water vapor in gas (% by volume)	22.0639	22.6315	22.0175	**22.2376**
Gas Flow Rate					
Q_a	Volumetric flow rate, actual (acfm)	173,477	178,750	180,224	**177,484**
Q_s	Volumetric flow rate, standard (scfm)	118,744	121,953	122,980	**121,226**
Q_{std}	Volumetric flow rate, dry standard (dscfm)	92,545	94,353	95,903	**94,267**
Q_{std7}	Volumetric flow rate, dry std@7%O_2 (dscfm)	76,233	78,130	76,653	**77,005**
Q_a	Volumetric flow rate, actual (acf/hr)	10,408,646	10,725,027	10,813,459	**10,649,044**
Q_s	Volumetric flow rate, standard (scf/hr)	7,124,664	7,317,195	7,378,793	**7,273,551**
Q_{std}	Volumetric flow rate, dry standard (dscf/hr)	5,552,687	5,661,207	5,754,167	**5,656,020**
Q_a	Volumetric flow rate, actual (m^3/hr)	294,779	303,739	306,244	**301,587**
Q_s	Volumetric flow rate, standard (m^3/hr)	201,775	207,227	208,972	**205,991**
Q_{std}	Volumetric flow rate, dry standard (dry m^3/hr)	157,255	160,329	162,961	**160,182**
Q_{std7}	Volumetric flow rate, dry std@7%O_2 (dry m^3/hr)	129,538	132,761	130,252	**130,850**
Q_s	Volumetric flow rate, normal (Nm^3/hr)	188,017	193,098	194,724	**191,946**
Q_{std}	Volumetric flow rate, dry normal (Nm^3/hr)	146,533	149,397	151,850	**149,260**
Q_{std7}	Volumetric flow rate, dry normal @7%O_2 (Nm^3/hr)	120,706	123,709	121,371	**121,929**
Sampling Data					
V_{mstd}	Volume metered, standard (dscf)	71.8944	73.2007	73.7054	**72.9335**
%I	Isokinetic sampling (%)	100.0953	99.9603	99.0236	**99.6931**
Laboratory Data					
m_n	Total matter corrected for allowable blanks (µg)	0.5113	0.9717	0.9525	
Cadmium Results - Total					
C_{sd}	Concentration (lb/dscf)	1.5682E-11	2.9271E-11	2.8496E-11	**2.4483E-11**
C_{sd7}	Concentration @7% O_2 (lb/dscf)	1.9037E-11	3.5349E-11	3.5652E-11	**3.0013E-11**
C_{sd12}	Concentration @12% CO_2 (lb/dscf)	1.8989E-11	3.4606E-11	3.4681E-11	**2.9425E-11**
C_a	Concentration (lb/acf)	8.3657E-12	1.5451E-11	1.5164E-11	**1.2993E-11**
C_{sd}	Concentration (µg/dscm)	2.5112E-01	4.6874E-01	4.5632E-01	**3.9206E-01**
C_{sd7}	Concentration @7% O_2 (µg/dscm)	3.0485E-01	5.6607E-01	5.7092E-01	**4.8061E-01**
C_{sd12}	Concentration @12% CO_2 (µg/dscm)	3.0408E-01	5.5417E-01	5.5536E-01	**4.7121E-01**
C_{sd}	Concentration (mg/dscm)	2.5112E-04	4.6874E-04	4.5632E-04	**3.9206E-04**
C_{sd7}	Concentration @7% O_2 (mg/dscm)	3.0485E-04	5.6607E-04	5.7092E-04	**4.8061E-04**
C_{sd12}	Concentration @12% CO_2 (mg/dscm)	3.0408E-04	5.5417E-04	5.5536E-04	**4.7121E-04**
C_a	Concentration (µg/m^3 (actual,wet))	1.3396E-01	2.4742E-01	2.4282E-01	**2.0807E-01**
C_{sd}	Concentration (µg/Nm^3 dry)	2.6950E-01	5.0303E-01	4.8971E-01	**4.2075E-01**
C_{sd7}	Concentration @7% O_2 (µg/Nm^3 dry)	3.2716E-01	6.0749E-01	6.1269E-01	**5.1578E-01**
C_{sd12}	Concentration @12% CO_2 (µg/Nm^3 dry)	3.2633E-01	5.9472E-01	5.9600E-01	**5.0568E-01**
$E_{lb/hr}$	Rate (lb/hr)	8.7076E-05	1.6571E-04	1.6397E-04	**1.3892E-04**
$E_{g/s}$	Rate (g/s)	1.0969E-05	2.0876E-05	2.0656E-05	**1.7500E-05**
$E_{T/yr}$	Rate (Ton/yr)	3.8139E-04	7.2581E-04	7.1819E-04	**6.0846E-04**
E_{Fd}	Rate - Fd-based (lb/MMBtu)	2.7393E-07	5.0865E-07	5.1301E-07	**4.3187E-07**
E_{Fc}	Rate - Fc-based (lb/MMBtu)	2.8800E-07	5.2486E-07	5.2599E-07	**4.4628E-07**

042010 112729
KKN@_K

Prepared by Clean Air Engineering Proprietary Software
SS Metals-1 Version 2008-12a

Copyright © 2008 Clean Air Engineering Inc.

QA/QC ________
Date ________

Wheelabrator South Broward, Inc.
Clean Air Project No: 10955
Unit 2 FF Outlet

USEPA Method 5/29
Lead (Pb) Emission Parameters

Run No.		1	2	3	Average
Date (2010)		Mar 24	Mar 24	Mar 24	
Start Time (approx.)		07:53	11:03	14:12	
Stop Time (approx.)		10:06	13:35	16:22	
Process Conditions					
R_P	Steam Production Rate (Klbs/hour)	183.9	183.7	183.3	**183.6**
P_1	Fabric Filter Inlet Temperature (°F)	315	315	315	**315**
P_2	Carbon Feed Rate (lb/hr)	6	6	6	**6**
F_d	Oxygen-based F-factor (dscf/MMBtu)	9,570	9,570	9,570	**9,570**
F_c	Carbon dioxide-based F-factor (dscf/MMBtu)	1,820	1,820	1,820	**1,820**
Cap	Capacity factor (hours/year)	8,760	8,760	8,760	**8,760**
Gas Conditions					
O_2	Oxygen (dry volume %)	9.4500	9.3900	9.7900	**9.5433**
CO_2	Carbon dioxide (dry volume %)	9.9100	10.1500	9.8600	**9.9733**
T_s	Sample temperature (°F)	295.1600	297.6400	297.3200	**296.7067**
B_w	Actual water vapor in gas (% by volume)	22.0639	22.6315	22.0175	**22.2376**
Gas Flow Rate					
Q_a	Volumetric flow rate, actual (acfm)	173,477	178,750	180,224	**177,484**
Q_s	Volumetric flow rate, standard (scfm)	118,744	121,953	122,980	**121,226**
Q_{std}	Volumetric flow rate, dry standard (dscfm)	92,545	94,353	95,903	**94,267**
Q_{std7}	Volumetric flow rate, dry std@7%O_2 (dscfm)	76,233	78,130	76,653	**77,005**
Q_a	Volumetric flow rate, actual (acf/hr)	10,408,646	10,725,027	10,813,459	**10,649,044**
Q_s	Volumetric flow rate, standard (scf/hr)	7,124,664	7,317,195	7,378,793	**7,273,551**
Q_{std}	Volumetric flow rate, dry standard (dscf/hr)	5,552,687	5,661,207	5,754,167	**5,656,020**
Q_a	Volumetric flow rate, actual (m^3/hr)	294,779	303,739	306,244	**301,587**
Q_s	Volumetric flow rate, standard (m^3/hr)	201,775	207,227	208,972	**205,991**
Q_{std}	Volumetric flow rate, dry standard (dry m^3/hr)	157,255	160,329	162,961	**160,182**
Q_{std7}	Volumetric flow rate, dry std@7%O_2 (dry m^3/hr)	129,538	132,761	130,252	**130,850**
Q_s	Volumetric flow rate, normal (Nm^3/hr)	188,017	193,098	194,724	**191,946**
Q_{std}	Volumetric flow rate, dry normal (Nm^3/hr)	146,533	149,397	151,850	**149,260**
Q_{std7}	Volumetric flow rate, dry normal @7%O_2 (Nm^3/hr)	120,706	123,709	121,371	**121,929**
Sampling Data					
V_{mstd}	Volume metered, standard (dscf)	71.8944	73.2007	73.7054	**72.9335**
%I	Isokinetic sampling (%)	100.0953	99.9603	99.0236	**99.6931**
Laboratory Data					
m_n	Total matter corrected for allowable blanks (µg)	5.3271	5.6541	6.3189	
Lead Results - Total					
C_{sd}	Concentration (lb/dscf)	1.6338E-10	1.7032E-10	1.8904E-10	**1.7425E-10**
C_{sd7}	Concentration @7% O_2 (lb/dscf)	1.9834E-10	2.0568E-10	2.3651E-10	**2.1351E-10**
C_{sd12}	Concentration @12% CO_2 (lb/dscf)	1.9784E-10	2.0136E-10	2.3007E-10	**2.0975E-10**
C_a	Concentration (lb/acf)	8.7159E-11	8.9901E-11	1.0059E-10	**9.2551E-11**
C_{sd}	Concentration (µg/dscm)	2.6163E+00	2.7274E+00	3.0272E+00	**2.7903E+00**
C_{sd7}	Concentration @7% O_2 (µg/dscm)	3.1762E+00	3.2937E+00	3.7874E+00	**3.4191E+00**
C_{sd12}	Concentration @12% CO_2 (µg/dscm)	3.1681E+00	3.2245E+00	3.6842E+00	**3.3589E+00**
C_{sd}	Concentration (mg/dscm)	2.6163E-03	2.7274E-03	3.0272E-03	**2.7903E-03**
C_{sd7}	Concentration @7% O_2 (mg/dscm)	3.1762E-03	3.2937E-03	3.7874E-03	**3.4191E-03**
C_{sd12}	Concentration @12% CO_2 (mg/dscm)	3.1681E-03	3.2245E-03	3.6842E-03	**3.3589E-03**
C_a	Concentration (µg/m^3 (actual,wet))	1.3957E+00	1.4396E+00	1.6109E+00	**1.4821E+00**
C_{sd}	Concentration (µg/Nm^3 dry)	2.8078E+00	2.9269E+00	3.2487E+00	**2.9945E+00**
C_{sd7}	Concentration @7% O_2 (µg/Nm^3 dry)	3.4086E+00	3.5347E+00	4.0645E+00	**3.6693E+00**
C_{sd12}	Concentration @12% CO_2 (µg/Nm^3 dry)	3.3999E+00	3.4604E+00	3.9538E+00	**3.6047E+00**
$E_{lb/hr}$	Rate (lb/hr)	9.0721E-04	9.6419E-04	1.0878E-03	**9.8639E-04**
$E_{g/s}$	Rate (g/s)	1.1429E-04	1.2147E-04	1.3703E-04	**1.2426E-04**
$E_{T/yr}$	Rate (Ton/yr)	3.9736E-03	4.2232E-03	4.7644E-03	**4.3204E-03**
E_{Fd}	Rate - Fd-based (lb/MMBtu)	2.8540E-06	2.9596E-06	3.4033E-06	**3.0723E-06**
E_{Fc}	Rate - Fc-based (lb/MMBtu)	3.0005E-06	3.0539E-06	3.4894E-06	**3.1813E-06**

042010 112729
KKN@_K

Prepared by Clean Air Engineering Proprietary Software
58 Metals-1 Version 2008-12a

Copyright © 2006 Clean Air Engineering Inc.

QA/QC ______
Date ______

Wheelabrator South Broward, Inc.
Clean Air Project No: 10955
Unit 2 SDA Inlet

USEPA Method 29 (Trace Metals)
Sampling, Velocity and Moisture Parameters

Run No.		1	2	3	Average
Date (2010)		Mar 24	Mar 24	Mar 24	
Start Time (approx.)		07:53	11:03	14:12	
Stop Time (approx.)		10:06	13:32	16:19	
Sampling Conditions					
Y_d	Dry gas meter correction factor	0.9933	0.9933	0.9933	
C_p	Pitot tube coefficient	0.8250	0.8250	0.8250	
P_g	Static pressure (in. H_2O)	-1.4000	-1.6000	-1.6000	
A_s	Sample location area (ft^2)	60.1320	60.1320	60.1320	
P_{bar}	Barometric pressure (in. Hg)	30.10	30.10	30.10	**30.1000**
D_n	Nozzle diameter (in.)	0.2700	0.2700	0.2700	
O_2	Oxygen (dry volume %)	7.7900	8.0300	8.1900	**8.0033**
CO_2	Carbon dioxide (dry volume %)	11.4100	11.3900	11.3700	**11.3900**
N_2+CO	Nitrogen plus carbon monoxide (dry volume %)	80.8000	80.5800	80.4400	**80.6067**
V_{lc}	Total Liquid collected (ml)	333.40	309.10	326.90	
V_m	Volume metered, meter conditions (ft^3)	65.5450	64.5350	68.1250	
T_m	Dry gas meter temperature (°F)	68.8333	79.9375	78.7292	
T_s	Sample temperature (°F)	483.2083	488.0833	494.8333	**488.7083**
ΔH	Meter box orifice pressure drop (in. H_2O)	1.0283	0.9975	1.1117	
θ	Total sampling time (min)	120.0	120.0	120.0	
Flow Results					
V_{wstd}	Volume of water collected (ft^3)	15.6898	14.5462	15.3839	**15.2067**
V_{mstd}	Volume metered, standard (dscf)	65.5324	63.1909	66.8743	**65.1992**
P_s	Sample gas pressure, absolute (in. Hg)	29.9971	29.9824	29.9824	**29.9873**
P_v	Vapor pressure, actual (in. Hg)	29.9971	29.9824	29.9824	**29.9873**
B_{wo}	Moisture measured in sample (% by volume)	19.3171	18.7121	18.7020	**18.9104**
B_{ws}	Saturated moisture content (% by volume)	100.0000	100.0000	100.0000	**100.0000**
B_w	Actual water vapor in gas (% by volume)	19.3171	18.7121	18.7020	**18.9104**
$\sqrt{\Delta P}$	Velocity head ($\sqrt{}$in. H_2O)	0.6654	0.6589	0.6902	**0.6715**
M_d	MW of sample gas, dry (lb/lb-mole)	30.1372	30.1436	30.1468	**30.1425**
M_s	MW of sample gas, wet (lb/lb-mole)	27.7926	27.8713	27.8751	**27.8463**
V_s	Velocity of sample (ft/sec)	49.9206	49.5018	52.0306	**50.4843**
%I	Isokinetic sampling (%)	101.3257	98.3521	99.7190	**99.7989**
Q_a	Volumetric flow rate, actual (acfm)	180,110	178,599	187,722	**182,144**
Q_s	Volumetric flow rate, standard (scfm)	101,084	99,671	104,022	**101,592**
Q_{std}	Volumetric flow rate, dry standard (dscfm)	81,557	81,021	84,568	**82,382**
Q_{std7}	Volumetric flow rate, dry std@7%O_2 (dscfm)	76,922	75,017	77,328	**76,422**
Q_a	Volumetric flow rate, actual (acf/hr)	10,806,580	10,715,920	11,263,346	**10,928,615**
Q_s	Volumetric flow rate, standard (scf/hr)	6,065,012	5,980,273	6,241,341	**6,095,542**
Q_{std}	Volumetric flow rate, dry standard (dscf/hr)	4,893,425	4,861,238	5,074,087	**4,942,917**
Q_a	Volumetric flow rate, actual (m^3/hr)	306,049	303,481	318,985	**309,505**
Q_s	Volumetric flow rate, standard (m^3/hr)	171,765	169,365	176,758	**172,629**
Q_{std}	Volumetric flow rate, dry standard (dry m^3/hr)	138,585	137,673	143,701	**139,986**
Q_{std7}	Volumetric flow rate, dry std@7%O_2 (dry m^3/hr)	130,708	127,471	131,399	**129,859**
Q_s	Volumetric flow rate, normal (Nm^3/hr)	160,053	157,817	164,707	**160,859**
Q_{std}	Volumetric flow rate, dry normal (Nm^3/hr)	129,136	128,286	133,903	**130,442**
Q_{std7}	Volumetric flow rate, dry normal @7%O_2 (Nm^3/hr)	121,796	118,780	122,440	**121,005**

Comments:

Average includes 3 runs.

042010 112815
HJK@

Prepared by Clean Air Engineering Proprietary Software
SS ISOKINETIC Version 2006-13d

Copyright © 2006 Clean Air Engineering Inc.

QA/QC ________
Date ________

Wheelabrator South Broward, Inc.
Clean Air Project No: 10955
Unit 2 SDA Inlet

USEPA Method 29
Mercury (Hg) Emission Parameters

Run No.		1	2	3	Average
Date (2010)		Mar 24	Mar 24	Mar 24	
Start Time (approx.)		07:53	11:03	14:12	
Stop Time (approx.)		10:06	13:32	16:19	
Process Conditions					
R_P	Steam Production Rate (Klbs/hour)	183.9	183.7	183.3	**183.6**
P_1	Fabric Filter Inlet Temperature (°F)	315	315	315	**315**
P_2	Carbon Feed Rate (lb/hr)	6	6	6	**6**
F_d	Oxygen-based F-factor (dscf/MMBtu)	9,570	9,570	9,570	**9,570**
F_c	Carbon dioxide-based F-factor (dscf/MMBtu)	1,820	1,820	1,820	**1,820**
Cap	Capacity factor (hours/year)	8,760	8,760	8,760	**8,760**
Gas Conditions					
O_2	Oxygen (dry volume %)	7.7900	8.0300	8.1900	**8.0033**
CO_2	Carbon dioxide (dry volume %)	11.4100	11.3900	11.3700	**11.3900**
T_s	Sample temperature (°F)	483.2083	488.0833	494.8333	**488.7083**
B_w	Actual water vapor in gas (% by volume)	19.3171	18.7121	18.7020	**18.9104**
Gas Flow Rate					
Q_a	Volumetric flow rate, actual (acfm)	180,110	178,599	187,722	**182,144**
Q_s	Volumetric flow rate, standard (scfm)	101,084	99,671	104,022	**101,592**
Q_{std}	Volumetric flow rate, dry standard (dscfm)	81,557	81,021	84,568	**82,382**
Q_{std7}	Volumetric flow rate, dry std@7%O_2 (dscfm)	76,922	75,017	77,328	**76,422**
Q_a	Volumetric flow rate, actual (acf/hr)	10,806,580	10,715,920	11,263,346	**10,928,615**
Q_s	Volumetric flow rate, standard (scf/hr)	6,065,012	5,980,273	6,241,341	**6,095,542**
Q_{std}	Volumetric flow rate, dry standard (dscf/hr)	4,893,425	4,861,238	5,074,087	**4,942,917**
Q_a	Volumetric flow rate, actual (m^3/hr)	306,049	303,481	318,985	**309,505**
Q_s	Volumetric flow rate, standard (m^3/hr)	171,765	169,365	176,758	**172,629**
Q_{std}	Volumetric flow rate, dry standard (dry m^3/hr)	138,585	137,673	143,701	**139,986**
Q_{std7}	Volumetric flow rate, dry std@7%O_2 (dry m^3/hr)	130,708	127,471	131,399	**129,859**
Q_s	Volumetric flow rate, normal (Nm^3/hr)	160,053	157,817	164,707	**160,859**
Q_{std}	Volumetric flow rate, dry normal (Nm^3/hr)	129,136	128,286	133,903	**130,442**
Q_{std7}	Volumetric flow rate, dry normal @7%O_2 (Nm^3/hr)	121,796	118,780	122,440	**121,005**
Sampling Data					
V_{mstd}	Volume metered, standard (dscf)	65.5324	63.1909	66.8743	**65.1992**
%I	Isokinetic sampling (%)	101.3257	98.3521	99.7190	**99.7989**
Laboratory Data					
m_{n-1b}	Fraction 1B (µg)	32.2231	63.8393	28.8006	
m_{n-2b}	Fraction 2B (µg)	26.7448	50.0603	50.0603	
m_{n-3a}	Fraction 3A (µg)	0.0000	0.0000	0.0000	
m_{n-3b}	Fraction 3B (µg)	0.0000	0.0000	0.0000	
m_{n-3c}	Fraction 3C (µg)	0.4458	0.5270	2.0492	
m_n	Total matter corrected for allowable blanks (µg)	59.4137	114.4267	80.9101	
Mercury Results - Total					
C_{sd}	Concentration (lb/dscf)	1.9991E-09	3.9928E-09	2.6678E-09	**2.8866E-09**
C_{sd7}	Concentration @7% O_2 (lb/dscf)	2.1196E-09	4.3124E-09	2.9176E-09	**3.1165E-09**
C_{sd12}	Concentration @12% CO_2 (lb/dscf)	2.1025E-09	4.2067E-09	2.8156E-09	**3.0416E-09**
C_a	Concentration (lb/acf)	9.0524E-10	1.8113E-09	1.2018E-09	**1.3061E-09**
C_{sd}	Concentration (µg/dscm)	3.2013E+01	6.3940E+01	4.2721E+01	**4.6225E+01**
C_{sd7}	Concentration @7% O_2 (µg/dscm)	3.3942E+01	6.9057E+01	4.6721E+01	**4.9907E+01**
C_{sd12}	Concentration @12% CO_2 (µg/dscm)	3.3669E+01	6.7364E+01	4.5088E+01	**4.8707E+01**
C_{sd}	Concentration (mg/dscm)	3.2013E-02	6.3940E-02	4.2721E-02	**4.6225E-02**
C_{sd7}	Concentration @7% O_2 (mg/dscm)	3.3942E-02	6.9057E-02	4.6721E-02	**4.9907E-02**
C_{sd12}	Concentration @12% CO_2 (mg/dscm)	3.3669E-02	6.7364E-02	4.5088E-02	**4.8707E-02**
C_a	Concentration (µg/m^3 (actual,wet))	1.4496E+01	2.9006E+01	1.9246E+01	**2.0916E+01**
C_{sd}	Concentration (µg/Nm^3 dry)	3.4356E+01	6.8618E+01	4.5847E+01	**4.9607E+01**
C_{sd7}	Concentration @7% O_2 (µg/Nm^3 dry)	3.6426E+01	7.4110E+01	5.0139E+01	**5.3558E+01**
C_{sd12}	Concentration @12% CO_2 (µg/Nm^3 dry)	3.6132E+01	7.2293E+01	4.8387E+01	**5.2271E+01**
$E_{lb/hr}$	Rate (lb/hr)	9.7826E-03	1.9410E-02	1.3537E-02	**1.4243E-02**
$E_{g/s}$	Rate (g/s)	1.2324E-03	2.4452E-03	1.7053E-03	**1.7943E-03**
$E_{T/yr}$	Rate (Ton/yr)	4.2848E-02	8.5016E-02	5.9290E-02	**6.2385E-02**
E_{Fd}	Rate - Fd-based (lb/MMBtu)	3.0500E-05	6.2053E-05	4.1982E-05	**4.4845E-05**
E_{Fc}	Rate - Fc-based (lb/MMBtu)	3.1888E-05	6.3801E-05	4.2703E-05	**4.6131E-05**

Prepared by Clean Air Engineering Proprietary Software
SS Metals-1 Version 2006-12a

042010 112830
HJK@_N

QA/QC ________
Date ________

Copyright © 2006 Clean Air Engineering Inc.

Wheelabrator South Broward, Inc.
Clean Air Project No: 10955
Unit 2 FF Outlet

USEPA Method 13B (Total Fluorides)
Sampling, Velocity and Moisture Parameters

Run No.		1	2	3	Average
Date (2010)		Mar 24	Mar 24	Mar 24	
Start Time (approx.)		07:53	09:37	11:24	
Stop Time (approx.)		09:11	10:54	12:46	
Sampling Conditions					
Y_d	Dry gas meter correction factor	0.9904	0.9904	0.9904	
C_p	Pitot tube coefficient	0.8120	0.8120	0.8120	
P_g	Static pressure (in. H_2O)	-11.0000	-11.0000	-11.0000	
A_s	Sample location area (ft^2)	64.0000	64.0000	64.0000	
P_{bar}	Barometric pressure (in. Hg)	30.10	30.10	30.10	**30.1000**
D_n	Nozzle diameter (in.)	0.2680	0.2680	0.2680	
O_2	Oxygen (dry volume %)	9.3800	9.3200	9.3600	**9.3533**
CO_2	Carbon dioxide (dry volume %)	10.0000	10.0000	10.1100	**10.0367**
N_2+CO	Nitrogen plus carbon monoxide (dry volume %)	80.6200	80.6800	80.5300	**80.6100**
V_{lc}	Total Liquid collected (ml)	217.30	217.70	210.30	
V_m	Volume metered, meter conditions (ft^3)	35.9350	36.3750	35.7900	
T_m	Dry gas meter temperature (°F)	62.7800	72.8200	79.4800	
T_s	Sample temperature (°F)	291.9200	292.0400	293.0400	**292.3333**
ΔH	Meter box orifice pressure drop (in. H_2O)	1.0596	1.0672	1.0264	
θ	Total sampling time (min)	62.5	62.5	62.5	
Flow Results					
V_{wstd}	Volume of water collected (ft^3)	10.2261	10.2450	9.8967	**10.1226**
V_{mstd}	Volume metered, standard (dscf)	36.2407	35.9939	34.9743	**35.7363**
P_s	Sample gas pressure, absolute (in. Hg)	29.2912	29.2912	29.2912	**29.2912**
P_v	Vapor pressure, actual (in. Hg)	29.2912	29.2912	29.2912	**29.2912**
B_{wo}	Moisture measured in sample (% by volume)	22.0074	22.1566	22.0559	**22.0733**
B_{ws}	Saturated moisture content (% by volume)	100.0000	100.0000	100.0000	**100.0000**
B_w	Actual water vapor in gas (% by volume)	22.0074	22.1566	22.0559	**22.0733**
$\sqrt{\Delta P}$	Velocity head ($\sqrt{}$in. H_2O)	0.6777	0.6772	0.6614	**0.6721**
M_d	MW of sample gas, dry (lb/lb-mole)	29.9752	29.9728	29.9920	**29.9800**
M_s	MW of sample gas, wet (lb/lb-mole)	27.3398	27.3200	27.3471	**27.3356**
V_s	Velocity of sample (ft/sec)	45.5847	45.5705	44.5182	**45.2245**
%I	Isokinetic sampling (%)	100.9984	100.5500	100.0149	**100.5211**
Q_a	Volumetric flow rate, actual (acfm)	175,045	174,991	170,950	**173,662**
Q_s	Volumetric flow rate, standard (scfm)	120,334	120,277	117,344	**119,318**
Q_{std}	Volumetric flow rate, dry standard (dscfm)	93,851	93,628	91,463	**92,981**
Q_{std7}	Volumetric flow rate, dry std@7%O_2 (dscfm)	77,782	78,001	75,934	**77,239**
Q_a	Volumetric flow rate, actual (acf/hr)	10,502,705	10,499,447	10,256,995	**10,419,715**
Q_s	Volumetric flow rate, standard (scf/hr)	7,220,024	7,216,633	7,040,625	**7,159,094**
Q_{std}	Volumetric flow rate, dry standard (dscf/hr)	5,631,087	5,617,672	5,487,752	**5,578,837**
Q_a	Volumetric flow rate, actual (m^3/hr)	297,443	297,351	290,484	**295,092**
Q_s	Volumetric flow rate, standard (m^3/hr)	204,475	204,379	199,395	**202,750**
Q_{std}	Volumetric flow rate, dry standard (dry m^3/hr)	159,476	159,096	155,416	**157,996**
Q_{std7}	Volumetric flow rate, dry std@7%O_2 (dry m^3/hr)	132,170	132,542	129,029	**131,247**
Q_s	Volumetric flow rate, normal (Nm^3/hr)	190,534	190,444	185,800	**188,926**
Q_{std}	Volumetric flow rate, dry normal (Nm^3/hr)	148,602	148,248	144,820	**147,224**
Q_{std7}	Volumetric flow rate, dry normal @7%O_2 (Nm^3/hr)	123,158	123,505	120,232	**122,298**

Comments:

Average includes 3 runs.

042010 112850
LPI@

Prepared by Clean Air Engineering Proprietary Software
SS ISOKINETIC Version 2006-13d

Copyright © 2006 Clean Air Engineering Inc.

QA/QC ________
Date ________

Wheelabrator South Broward, Inc.
Clean Air Project No: 10955
Unit 2 FF Outlet

USEPA Method 13B
HF Parameters

Run No.		1	2	3	Average
Date (2010)		Mar 24	Mar 24	Mar 24	
Start Time (approx.)		07:53	09:37	11:24	
Stop Time (approx.)		09:11	10:54	12:46	
Process Conditions					
R_P	Steam Production Rate (Klbs/hour)	184.3	183.8	183.6	**183.9**
P_1	Fabric Filter Inlet Temperature (°F)	315	315	315	**315**
F_d	Oxygen-based F-factor (dscf/MMBtu)	9,570	9,570	9,570	**9,570**
F_c	Carbon dioxide-based F-factor (dscf/MMBtu)	1,820	1,820	1,820	**1,820**
Cap	Capacity factor (hours/year)	8,760	8,760	8,760	**8,760**
Gas Conditions					
O_2	Oxygen (dry volume %)	9.3800	9.3200	9.3600	**9.3533**
CO_2	Carbon dioxide (dry volume %)	10.0000	10.0000	10.1100	**10.0367**
T_s	Sample temperature (°F)	291.9200	292.0400	293.0400	**292.3333**
B_w	Actual water vapor in gas (% by volume)	22.0074	22.1566	22.0559	**22.0733**
Gas Flow Rate					
Q_a	Volumetric flow rate, actual (acfm)	175,045	174,991	170,950	**173,662**
Q_s	Volumetric flow rate, standard (scfm)	120,334	120,277	117,344	**119,318**
Q_{std}	Volumetric flow rate, dry standard (dscfm)	93,851	93,628	91,463	**92,981**
Q_{std7}	Volumetric flow rate, dry std@7%O_2 (dscfm)	77,782	78,001	75,934	**77,239**
Q_a	Volumetric flow rate, actual (acf/hr)	10,502,705	10,499,447	10,256,995	**10,419,715**
Q_s	Volumetric flow rate, standard (scf/hr)	7,220,024	7,216,633	7,040,625	**7,159,094**
Q_{std}	Volumetric flow rate, dry standard (dscf/hr)	5,631,087	5,617,672	5,487,752	**5,578,837**
Q_a	Volumetric flow rate, actual (m^3/hr)	297,443	297,351	290,484	**295,092**
Q_s	Volumetric flow rate, standard (m^3/hr)	204,475	204,379	199,395	**202,750**
Q_{std}	Volumetric flow rate, dry standard (dry m^3/hr)	159,476	159,096	155,416	**157,996**
Q_{std7}	Volumetric flow rate, dry std@7%O_2 (dry m^3/hr)	132,170	132,542	129,029	**131,247**
Q_s	Volumetric flow rate, normal (Nm^3/hr)	190,534	190,444	185,800	**188,926**
Q_{std}	Volumetric flow rate, dry normal (Nm^3/hr)	148,602	148,248	144,820	**147,224**
Q_{std7}	Volumetric flow rate, dry normal @7%O_2 (Nm^3/hr)	123,158	123,505	120,232	**122,298**
Sampling Data					
V_{mstd}	Volume metered, standard (dscf)	36.2407	35.9939	34.9743	**35.7363**
%I	Isokinetic sampling (%)	100.9984	100.5500	100.0149	**100.5211**
Laboratory Data					
m_n	Total HF collected (mg)	<0.0327	<0.0362	<0.0392	
Hydrogen Fluoride (HF) Results					
C_{sd}	HF Concentration (lb/dscf)	<1.9912E-09	<2.2190E-09	<2.4723E-09	**<2.2275E-09**
C_{sd7}	HF Concentration @7% O_2 (lb/dscf)	<2.4026E-09	<2.6636E-09	<2.9779E-09	**<2.6814E-09**
C_{sd12}	HF Concentration @12% CO_2 (lb/dscf)	<2.3895E-09	<2.6629E-09	<2.9345E-09	**<2.6623E-09**
C_a	HF Concentration (lb/acf)	<1.0676E-09	<1.1873E-09	<1.3227E-09	**<1.1925E-09**
C_{sd}	HF Concentration (ppmdv)	<0.0384	<0.0428	<0.0476	**<0.0429**
C_{sd7}	HF Concentration @7% O_2 (ppmdv)	<0.0463	<0.0513	<0.0574	**<0.0517**
C_{sd12}	HF Concentration @12% CO_2 (ppmdv)	<0.0460	<0.0513	<0.0565	**<0.0513**
C_w	HF Concentration (ppmwv)	<0.0299	<0.0333	<0.0371	**<0.0334**
C_{sd}	HF Concentration (mg/dscm)	<0.0319	<0.0355	<0.0396	**<0.0357**
C_{sd7}	HF Concentration @7% O_2 (mg/dscm)	<0.0385	<0.0427	<0.0477	**<0.0429**
C_{sd12}	HF Concentration @12% CO_2 (mg/dscm)	<0.0383	<0.0426	<0.0470	**<0.0426**
C_a	HF Concentration (mg/m^3 (actual,wet))	<0.0171	<0.0190	<0.0212	**<0.0191**
C_{sd}	HF Concentration (mg/Nm^3 dry)	<0.0342	<0.0381	<0.0425	**<0.0383**
C_{sd7}	HF Concentration @7% O_2 (mg/Nm^3 dry)	<0.0413	<0.0458	<0.0512	**<0.0461**
C_{sd12}	HF Concentration @12% CO_2 (mg/Nm^3 dry)	<0.0411	<0.0458	<0.0504	**<0.0458**
$E_{lb/hr}$	HF Rate (lb/hr)	<0.0112	<0.0125	<0.0136	**<0.0124**
$E_{kg/hr}$	HF Rate (kg/hr)	<0.0051	<0.0057	<0.0062	**<0.0056**
$E_{T/yr}$	HF Rate (Ton/yr)	<0.0491	<0.0546	<0.0594	**<0.0544**
E_{Fd}	HF Rate - Fd-based (lb/MMBtu)	<0.000035	<0.000038	<0.000043	**<0.000039**
E_{Fc}	HF Rate - Fc-based (lb/MMBtu)	<0.000036	<0.000040	<0.000045	**<0.000040**

Prepared by Clean Air Engineering Proprietary Software
SS EPA26-1 Version 2006-10a (F)

042010 112850
LPI@_O

QA/QC ________
Date ________

Copyright © 2006 Clean Air Engineering Inc.

Wheelabrator South Broward, Inc.
Clean Air Project No: 10955
Unit 2 FF Outlet

USEPA Method 23 (PCDD/F)
Sampling, Velocity and Moisture Parameters

Run No.		1	2	3	Average
Date (2010)		Mar 22	Mar 23	Mar 23	
Start Time (approx.)		10:04	07:36	12:32	
Stop Time (approx.)		14:44	12:10	17:02	
Sampling Conditions					
Y_d	Dry gas meter correction factor	0.9904	0.9904	0.9904	
C_p	Pitot tube coefficient	0.8340	0.8340	0.8340	
P_g	Static pressure (in. H_2O)	-10.8000	-11.0000	-11.0000	
A_s	Sample location area (ft^2)	64.0000	64.0000	64.0000	
P_{bar}	Barometric pressure (in. Hg)	30.10	30.10	30.10	**30.1000**
D_n	Nozzle diameter (in.)	0.2640	0.2640	0.2640	
O_2	Oxygen (dry volume %)	9.2100	9.5700	9.2800	**9.3533**
CO_2	Carbon dioxide (dry volume %)	10.1600	9.6900	10.2000	**10.0167**
N_2+CO	Nitrogen plus carbon monoxide (dry volume %)	80.6300	80.7400	80.5200	**80.6300**
V_{lc}	Total Liquid collected (ml)	815.50	830.00	867.60	
V_m	Volume metered, meter conditions (ft^3)	140.9400	145.9200	146.0200	
T_m	Dry gas meter temperature (°F)	72.5800	78.6300	82.9900	
T_s	Sample temperature (°F)	293.3000	296.9000	298.5200	**296.2400**
ΔH	Meter box orifice pressure drop (in. H_2O)	1.0038	1.0594	1.0590	
θ	Total sampling time (min)	250.0	250.0	250.0	
Flow Results					
V_{wstd}	Volume of water collected (ft^3)	38.3774	39.0598	40.8293	**39.4222**
V_{mstd}	Volume metered, standard (dscf)	139.5047	142.8310	141.7811	**141.3722**
P_s	Sample gas pressure, absolute (in. Hg)	29.3059	29.2912	29.2912	**29.2961**
P_v	Vapor pressure, actual (in. Hg)	29.3059	29.2912	29.2912	**29.2961**
B_{wo}	Moisture measured in sample (% by volume)	21.5746	21.4743	22.3587	**21.8025**
B_{ws}	Saturated moisture content (% by volume)	100.0000	100.0000	100.0000	**100.0000**
B_w	Actual water vapor in gas (% by volume)	21.5746	21.4743	22.3587	**21.8025**
$\sqrt{\Delta P}$	Velocity head ($\sqrt{}$in. H_2O)	0.6541	0.6716	0.6674	**0.6644**
M_d	MW of sample gas, dry (lb/lb-mole)	29.9940	29.9332	30.0032	**29.9768**
M_s	MW of sample gas, wet (lb/lb-mole)	27.4063	27.3706	27.3194	**27.3655**
V_s	Velocity of sample (ft/sec)	45.1659	46.5267	46.3268	**46.0065**
%I	Isokinetic sampling (%)	100.6681	100.4539	101.5032	**100.8750**
Q_a	Volumetric flow rate, actual (acfm)	173,437	178,662	177,895	**176,665**
Q_s	Volumetric flow rate, standard (scfm)	119,070	122,012	121,229	**120,770**
Q_{std}	Volumetric flow rate, dry standard (dscfm)	93,381	95,811	94,124	**94,438**
Q_{std7}	Volumetric flow rate, dry std@7%O_2 (dscfm)	78,534	78,096	78,685	**78,438**
Q_a	Volumetric flow rate, actual (acf/hr)	10,406,215	10,719,745	10,673,702	**10,599,887**
Q_s	Volumetric flow rate, standard (scf/hr)	7,144,173	7,320,742	7,273,730	**7,246,215**
Q_{std}	Volumetric flow rate, dry standard (dscf/hr)	5,602,843	5,748,663	5,647,420	**5,666,309**
Q_a	Volumetric flow rate, actual (m^3/hr)	294,710	303,589	302,286	**300,195**
Q_s	Volumetric flow rate, standard (m^3/hr)	202,327	207,328	205,996	**205,217**
Q_{std}	Volumetric flow rate, dry standard (dry m^3/hr)	158,676	162,806	159,938	**160,473**
Q_{std7}	Volumetric flow rate, dry std@7%O_2 (dry m^3/hr)	133,448	132,704	133,704	**133,285**
Q_s	Volumetric flow rate, normal (Nm^3/hr)	188,532	193,192	191,951	**191,225**
Q_{std}	Volumetric flow rate, dry normal (Nm^3/hr)	147,857	151,705	149,033	**149,532**
Q_{std7}	Volumetric flow rate, dry normal @7%O_2 (Nm^3/hr)	124,349	123,656	124,588	**124,197**

Comments:

Average includes 3 runs.

042010 112912
HNP@

Prepared by Clean Air Engineering Proprietary Software
SS ISOKINETIC Version 2006-13d

Copyright © 2006 Clean Air Engineering Inc.

QA/QC ________
Date ________

Wheelabrator South Broward, Inc.
Clean Air Project No: 10955
Unit 2 FF Outlet

USEPA Method 23 Parameters (NDs & EMPCs counted as Zero)
Total Tetra- through Octa-PCDD/F Results (using USEPA/INTL 1989 TEFs)

Run No.		1	2	3	Average
Date (2010)		Mar 22	Mar 23	Mar 23	
Start Time (approx.)		10:04	07:36	12:32	
Stop Time (approx.)		14:44	12:10	17:02	
Process Conditions					
R_p	Steam Production Rate (Klbs/hour)	184.2	184.2	183.9	184.1
P_1	Fabric Filter Inlet Temperature (°F)	318	320	320	319
P_2	Carbon Feed Rate (lb/hr)	7	6	6	6
F_d	Oxygen-based F-factor (dscf/MMBtu)	9,570	9,570	9,570	9,570
F_c	Carbon dioxide-based F-factor (dscf/MMBtu)	1,820	1,820	1,820	1,820
Cap	Capacity factor (hours/year)	8,760	8,760	8,760	8,760
Gas Conditions					
O_2	Oxygen (dry volume %)	9.2100	9.5700	9.2800	9.3533
CO_2	Carbon dioxide (dry volume %)	10.1600	9.6900	10.2000	10.0167
T_s	Sample temperature (°F)	293.3	296.9	298.5	296.2
B_w	Actual water vapor in gas (% by volume)	21.5746	21.4743	22.3587	21.8025
Gas Flow Rate					
Q_a	Volumetric flow rate, actual (acfm)	173,437	178,662	177,895	176,665
Q_s	Volumetric flow rate, standard (scfm)	119,070	122,012	121,229	120,770
Q_{std}	Volumetric flow rate, dry standard (dscfm)	93,381	95,811	94,124	94,438
Q_{std7}	Volumetric flow rate, dry std@7%O_2 (dscfm)	78,534	78,096	78,685	78,438
Q_a	Volumetric flow rate, actual (acf/hr)	10,406,215	10,719,745	10,673,702	10,599,887
Q_s	Volumetric flow rate, standard (scf/hr)	7,144,173	7,320,742	7,273,730	7,246,215
Q_{std}	Volumetric flow rate, dry standard (dscf/hr)	5,602,843	5,748,663	5,647,420	5,666,309
Q_a	Volumetric flow rate, actual (m^3/hr)	294,710	303,589	302,286	300,195
Q_s	Volumetric flow rate, standard (m^3/hr)	202,327	207,328	205,996	205,217
Q_{std}	Volumetric flow rate, dry standard (dry m^3/hr)	158,676	162,806	159,938	160,473
Q_{std7}	Volumetric flow rate, dry std@7%O_2 (dry m^3/hr)	133,448	132,704	133,704	133,285
Q_s	Volumetric flow rate, normal (Nm^3/hr)	188,532	193,192	191,951	191,225
Q_{std}	Volumetric flow rate, dry normal (Nm^3/hr)	147,857	151,705	149,033	149,532
Q_{std7}	Volumetric flow rate, dry normal @7%O_2 (Nm^3/hr)	124,349	123,656	124,588	124,197
Sampling Data					
V_{mstd}	Volume metered, standard (dscf)	139.5047	142.8310	141.7811	141.3722
%I	Isokinetic sampling (%)	100.6681	100.4539	101.5032	100.8750
Laboratory Data from USEPA Method 23					
	Total PCDDs (ng)	9.65000	10.67000	11.61000	
	Total PCDFs (ng)	2.41080	2.57500	2.80840	
m_n	Total PCDDs & PCDFs (ng)	12.10000	13.30000	14.40000	
m_{n_TEQ}	Total TEQ PCDDs & PCDFs (ng)	0.09070	0.08800	0.11100	
Total PCDD/F Results (TEF=1)					
C_{sd}	PCDD/F Concentration (ng/dscm)	3.0626E+00	3.2880E+00	3.5863E+00	3.3123E+00
C_{sd7}	PCDD/F Concentration @7% O_2 (ng/dscm)	3.6416E+00	4.0338E+00	4.2899E+00	3.9884E+00
C_{sd12}	PCDD/F Concentration @12% CO_2 (ng/dscm)	3.6173E+00	4.0718E+00	4.2191E+00	3.9694E+00
C_{sd}	PCDD/F Concentration (ng/Nm^3 dry)	3.2867E+00	3.5285E+00	3.8487E+00	3.5546E+00
C_{sd7}	PCDD/F Concentration @7% O_2 (ng/Nm^3 dry)	3.9081E+00	4.3289E+00	4.6038E+00	4.2803E+00
C_{sd12}	PCDD/F Concentration @12% CO_2 (ng/Nm^3 dry)	3.8820E+00	4.3697E+00	4.5278E+00	4.2598E+00
$E_{lb/hr}$	PCDD/F Rate (lb/hr)	1.0716E-06	1.1803E-06	1.2647E-06	1.1722E-06
$E_{g/s}$	PCDD/F Rate (g/s)	1.3499E-07	1.4869E-07	1.5933E-07	1.4767E-07
$E_{T/yr}$	PCDD/F Rate (Ton/yr)	4.6934E-06	5.1699E-06	5.5396E-06	5.1343E-06
E_{Fd}	PCDD/F Rate - F_d-based (lb/MMBtu)	3.2723E-09	3.6247E-09	3.8548E-09	3.5839E-09
E_{Fc}	PCDD/F Rate - F_c-based (lb/MMBtu)	3.4260E-09	3.8564E-09	3.9960E-09	3.7595E-09
Total PCDD/F TEQ Results (using USEPA/INTL 1989 TEFs)					
C_{sdTEQ}	TEQ Concentration (ng/dscm)	2.2957E-02	2.1755E-02	2.7644E-02	2.4119E-02
C_{sd7TEQ}	TEQ Concentration @7% O_2 (ng/dscm)	2.7297E-02	2.6690E-02	3.3068E-02	2.9018E-02
$C_{sd12TEQ}$	TEQ Concentration @12% CO_2 (ng/dscm)	2.7115E-02	2.6941E-02	3.2522E-02	2.8859E-02
C_{sdTEQ}	TEQ Concentration (ng/Nm^3 dry)	2.4637E-02	2.3347E-02	2.9667E-02	2.5883E-02
C_{sd7TEQ}	TEQ Concentration @7% O_2 (ng/Nm^3 dry)	2.9294E-02	2.8643E-02	3.5488E-02	3.1142E-02
$C_{sd12TEQ}$	TEQ Concentration @12% CO_2 (ng/Nm^3 dry)	2.9099E-02	2.8912E-02	3.4902E-02	3.0971E-02
$E_{lb/hrTEQ}$	TEQ Rate (lb/hr)	8.0322E-09	7.8097E-09	9.7491E-09	8.5303E-09
$E_{g/sTEQ}$	TEQ Rate (g/sec)	1.0119E-09	9.8384E-10	1.2282E-09	1.0746E-09
$E_{T/yrTEQ}$	TEQ Rate (Ton/yr)	3.5181E-08	3.4207E-08	4.2701E-08	3.7363E-08
E_{FdTEQ}	TEQ Rate - F_d-based (lb/MMBtu)	2.4528E-11	2.3983E-11	2.9714E-11	2.6075E-11
E_{FcTEQ}	TEQ Rate - F_c-based (lb/MMBtu)	2.5681E-11	2.5516E-11	3.0802E-11	2.7333E-11

042010 112912
HNP@_P

Prepared by Clean Air Engineering Proprietary Software
SS PCDD-F v2007-01a

Copyright © 2007 Clean Air Engineering Inc.

QA/QC ________
Date ________

Wheelabrator South Broward, Inc.
Clean Air Project No: 10955
Unit 2 FF Outlet

Max

USEPA Method 23 Maximum Emissions Parameters (NDs & EMPCs included)
Total Tetra- through Octa-PCDD/F Results (TEQ based on USEPA/INTL 1989 TEFs)

Run No.		1	2	3	Average
Date (2010)		Mar 22	Mar 23	Mar 23	
Start Time (approx.)		10:04	07:36	12:32	
Stop Time (approx.)		14:44	12:10	17:02	
Process Conditions					
R_P	Steam Production Rate (Klbs/hour)	184	184	184	184
P_1	Fabric Filter Inlet Temperature (°F)	318	320	320	319
P_2	Carbon Feed Rate (lb/hr)	7	6	6	6
F_d	Oxygen-based F-factor (dscf/MMBtu)	9,570	9,570	9,570	9,570
F_c	Carbon dioxide-based F-factor (dscf/MMBtu)	1,820	1,820	1,820	1,820
Cap	Capacity factor (hours/year)	8,760	8,760	8,760	8,760
Gas Conditions					
O_2	Oxygen (dry volume %)	9.2100	9.5700	9.2800	9.3533
CO_2	Carbon dioxide (dry volume %)	10.1600	9.6900	10.2000	10.0167
T_s	Sample temperature (°F)	293.3	296.9	298.5	296.2
B_w	Actual water vapor in gas (% by volume)	21.5746	21.4743	22.3587	21.8025
Gas Flow Rate					
Q_a	Volumetric flow rate, actual (acfm)	173,437	178,662	177,895	176,665
Q_s	Volumetric flow rate, standard (scfm)	119,070	122,012	121,229	120,770
Q_{std}	Volumetric flow rate, dry standard (dscfm)	93,381	95,811	94,124	94,438
Q_{std7}	Volumetric flow rate, dry std@7%O_2 (dscfm)	78,534	78,096	78,685	78,438
Q_a	Volumetric flow rate, actual (acf/hr)	10,406,215	10,719,745	10,673,702	10,599,887
Q_s	Volumetric flow rate, standard (scf/hr)	7,144,173	7,320,742	7,273,730	7,246,215
Q_{std}	Volumetric flow rate, dry standard (dscf/hr)	5,602,843	5,748,663	5,647,420	5,666,309
Q_a	Volumetric flow rate, actual (m^3/hr)	294,710	303,589	302,286	300,195
Q_s	Volumetric flow rate, standard (m^3/hr)	202,327	207,328	205,996	205,217
Q_{std}	Volumetric flow rate, dry standard (dry m^3/hr)	158,676	162,806	159,938	160,473
Q_{std7}	Volumetric flow rate, dry std@7%O_2 (dry m^3/hr)	133,448	132,704	133,704	133,285
Q_s	Volumetric flow rate, normal (Nm^3/hr)	188,532	193,192	191,951	191,225
Q_{std}	Volumetric flow rate, dry normal (Nm^3/hr)	147,857	151,705	149,033	149,532
Q_{std7}	Volumetric flow rate, dry normal @7%O_2 (Nm^3/hr)	124,349	123,656	124,588	124,197
Sampling Data					
V_{mstd}	Volume metered, standard (dscf)	139.5047	142.8310	141.7811	141.3722
%I	Isokinetic sampling (%)	100.6681	100.4539	101.5032	100.8750
Laboratory Data from USEPA Method 23, including NDs and EMPCs					
m_n	Total PCDDs & PCDFs (ng)	12.10000	13.40000	14.60000	
m_{n_TEQ}	Total TEQ PCDDs & PCDFs (ng)	0.09600	0.11000	0.12100	
Total PCDD/F Results (TEF=1)					
C_{sd}	PCDD/F Concentration (ng/dscm)	3.0626E+00	3.3127E+00	3.6361E+00	3.3371E+00
C_{sd7}	PCDD/F Concentration @7% O_2 (ng/dscm)	3.6416E+00	4.0641E+00	4.3495E+00	4.0184E+00
C_{sd12}	PCDD/F Concentration @12% CO_2 (ng/dscm)	3.6173E+00	4.1024E+00	4.2777E+00	3.9991E+00
C_{sd}	PCDD/F Concentration (ng/Nm^3 dry)	3.2867E+00	3.5551E+00	3.9021E+00	3.5813E+00
C_{sd7}	PCDD/F Concentration @7% O_2 (ng/Nm^3 dry)	3.9081E+00	4.3615E+00	4.6678E+00	4.3124E+00
C_{sd12}	PCDD/F Concentration @12% CO_2 (ng/Nm^3 dry)	3.8820E+00	4.4026E+00	4.5907E+00	4.2918E+00
$E_{lb/hr}$	PCDD/F Rate (lb/hr)	1.0716E-06	1.1892E-06	1.2823E-06	1.1810E-06
$E_{g/s}$	PCDD/F Rate (g/s)	1.3499E-07	1.4981E-07	1.6154E-07	1.4878E-07
$E_{T/yr}$	PCDD/F Rate (Ton/yr)	4.6934E-06	5.2087E-06	5.6165E-06	5.1729E-06
E_{Fd}	PCDD/F - F_d-based (lb/MMBtu)	3.2723E-09	3.6519E-09	3.9084E-09	3.6108E-09
E_{Fc}	PCDD/F Rate - F_c-based (lb/MMBtu)	3.4260E-09	3.8854E-09	4.0515E-09	3.7876E-09
Total PCDD/F TEQ Results (using USEPA/INTL 1989 TEFs)					
C_{sdTEQ}	TEQ Concentration (ng/dscm)	2.4299E-02	2.7194E-02	3.0135E-02	2.7209E-02
C_{sd7TEQ}	TEQ Concentration @7% O_2 (ng/dscm)	2.8892E-02	3.3362E-02	3.6047E-02	3.2767E-02
$C_{sd12TEQ}$	TEQ Concentration @12% CO_2 (ng/dscm)	2.8699E-02	3.3676E-02	3.5452E-02	3.2609E-02
C_{sdTEQ}	TEQ Concentration (ng/Nm^3 dry)	2.6076E-02	2.9183E-02	3.2340E-02	2.9200E-02
C_{sd7TEQ}	TEQ Concentration @7% O_2 (ng/Nm^3 dry)	3.1006E-02	3.5803E-02	3.8685E-02	3.5165E-02
$C_{sd12TEQ}$	TEQ Concentration @12% CO_2 (ng/Nm^3 dry)	3.0799E-02	3.6141E-02	3.8046E-02	3.4995E-02
$E_{lb/hrTEQ}$	TEQ Rate (lb/hr)	8.5016E-09	9.7622E-09	1.0627E-08	9.6304E-09
$E_{g/sTEQ}$	TEQ Rate (g/sec)	1.0710E-09	1.2298E-09	1.3388E-09	1.2132E-09
$E_{T/yrTEQ}$	TEQ Rate (Ton/yr)	3.7237E-08	4.2758E-08	4.6548E-08	4.2181E-08
E_{FdTEQ}	TEQ Rate - F_d-based (lb/MMBtu)	2.5962E-11	2.9978E-11	3.2391E-11	2.9444E-11
E_{FcTEQ}	TEQ Rate - F_c-based (lb/MMBtu)	2.7181E-11	3.1895E-11	3.3577E-11	3.0885E-11

042010 112912
HNP @ P

Prepared by Clean Air Engineering Proprietary Software
SS PCDD-F v2007-01a

Copyright © 2007 Clean Air Engineering Inc

QA/QC ________
Date ________

Wheelabrator South Broward, Inc.
Clean Air Project No: 10955
Unit 2 FF Outlet

USEPA Method 26A (HCl)
Sampling, Velocity and Moisture Parameters

Run No.		**1**	**2**	**3**	**Average**
Date (2010)		Mar 23	Mar 23	Mar 23	
Start Time (approx.)		07:55	09:30	10:55	
Stop Time (approx.)		08:55	10:31	12:06	
Sampling Conditions					
Y_d	Dry gas meter correction factor	1.0066	1.0066	1.0066	
C_p	Pitot tube coefficient	0.8400	0.8400	0.8400	
P_g	Static pressure (in. H_2O)	-11.0000	-11.0000	-11.0000	
A_s	Sample location area (ft^2)	64.0000	64.0000	64.0000	
P_{bar}	Barometric pressure (in. Hg)	30.10	30.10	30.10	**30.1000**
O_2	Oxygen (dry volume %)	9.5400	10.1000	9.2600	**9.6333**
CO_2	Carbon dioxide (dry volume %)	9.6600	9.2700	10.1300	**9.6867**
N_2+CO	Nitrogen plus carbon monoxide (dry volume %)	80.8000	80.6300	80.6100	**80.6800**
V_{lc}	Total Liquid collected (ml)	231.70	233.50	247.10	
V_m	Volume metered, meter conditions (ft^3)	40.0400	40.5300	41.1750	
T_m	Dry gas meter temperature (°F)	75.8750	83.9583	81.0000	
T_s	Sample temperature (°F)	300.9167	301.2500	300.0833	**300.7500**
ΔH	Meter box orifice pressure drop (in. H_2O)	1.5000	1.5000	1.5000	
θ	Total sampling time (min)	60.0	60.0	60.0	
Flow Results					
V_{wstd}	Volume of water collected (ft^3)	10.9038	10.9885	11.6285	**11.1736**
V_{mstd}	Volume metered, standard (dscf)	40.0812	39.9688	40.8269	**40.2923**
P_s	Sample gas pressure, absolute (in. Hg)	29.2912	29.2912	29.2912	**29.2912**
P_v	Vapor pressure, actual (in. Hg)	29.2912	29.2912	29.2912	**29.2912**
B_{wo}	Moisture measured in sample (% by volume)	21.3863	21.5641	22.1684	**21.7063**
B_{ws}	Saturated moisture content (% by volume)	100.0000	100.0000	100.0000	**100.0000**
B_w	Actual water vapor in gas (% by volume)	21.3863	21.5641	22.1684	**21.7063**
M_d	MW of sample gas, dry (lb/lb-mole)	29.9272	29.8872	29.9912	**29.9352**
M_s	MW of sample gas, wet (lb/lb-mole)	27.3764	27.3238	27.3329	**27.3444**

Comments:

Average includes 3 runs.

042010 112942
OKQ@

Prepared by Clean Air Engineering Proprietary Software
SS ISOKINETIC Version 2006-13d

Copyright © 2008 Clean Air Engineering Inc.

QA/QC ________
Date ________

Wheelabrator South Broward, Inc.
Clean Air Project No: 10955
Unit 2 FF Outlet

USEPA Method 26A
HCl Parameters

Run No.		1	2	3	Average
Date (2010)		Mar 23	Mar 23	Mar 23	
Start Time (approx.)		07:55	09:30	10:55	
Stop Time (approx.)		08:55	10:31	12:06	
Process Conditions					
R_P	Steam Production Rate (Klbs/hour)	185.2	183.2	185.3	**184.6**
P_1	Fabric Filter Inlet Temperature (°F)	320	320	320	**320**
F_d	Oxygen-based F-factor (dscf/MMBtu)	9,570	9,570	9,570	**9,570**
F_c	Carbon dioxide-based F-factor (dscf/MMBtu)	1,820	1,820	1,820	**1,820**
Cap	Capacity factor (hours/year)	8,760	8,760	8,760	**8,760**
Gas Conditions					
O_2	Oxygen (dry volume %)	9.5400	10.1000	9.2600	**9.6333**
CO_2	Carbon dioxide (dry volume %)	9.6600	9.2700	10.1300	**9.6867**
T_s	Sample temperature (°F)	300.9167	301.2500	300.0833	**300.7500**
B_w	Actual water vapor in gas (% by volume)	21.3863	21.5641	22.1684	**21.7063**
Sampling Data					
V_{mstd}	Volume metered, standard (dscf)	40.0812	39.9688	40.8269	**40.2923**
Laboratory Data					
m_n	Total HCl collected (mg)	21.2629	16.6326	16.8368	
Hydrogen Chloride (HCl) Results					
C_{sd}	HCl Concentration (lb/dscf)	1.1697E-06	9.1759E-07	9.0933E-07	**9.9889E-07**
C_{sd7}	HCl Concentration @7% O_2 (lb/dscf)	1.4313E-06	1.1810E-06	1.0859E-06	**1.2327E-06**
C_{sd12}	HCl Concentration @12% CO_2 (lb/dscf)	1.4531E-06	1.1878E-06	1.0772E-06	**1.2394E-06**
C_{sd}	HCl Concentration (ppmdv)	12.3672	9.7013	9.6140	**10.5608**
C_{sd7}	HCl Concentration @7% O_2 (ppmdv)	15.1324	12.4859	11.4806	**13.0330**
C_{sd12}	HCl Concentration @12% CO_2 (ppmdv)	15.3630	12.5583	11.3887	**13.1033**
C_w	HCl Concentration (ppmwv)	9.7223	7.6093	7.4827	**8.2714**
C_{sd}	HCl Concentration (mg/dscm)	18.7318	14.6939	14.5616	**15.9958**
C_{sd7}	HCl Concentration @7% O_2 (mg/dscm)	22.9200	18.9116	17.3889	**19.7402**
C_{sd12}	HCl Concentration @12% CO_2 (mg/dscm)	23.2693	19.0212	17.2497	**19.8467**
C_{sd}	HCl Concentration (mg/Nm^3 dry)	20.1024	15.7691	15.6271	**17.1662**
C_{sd7}	HCl Concentration @7% O_2 (mg/Nm^3 dry)	24.5971	20.2954	18.6613	**21.1846**
C_{sd12}	HCl Concentration @12% CO_2 (mg/Nm^3 dry)	24.9719	20.4130	18.5119	**21.2989**
E_{Fd}	HCl Rate - Fd-based (lb/MMBtu)	0.0206	0.0170	0.0156	**0.0177**
E_{Fc}	HCl Rate - Fc-based (lb/MMBtu)	0.0220	0.0180	0.0163	**0.0188**

042010 112942
OKQ@_@

Prepared by Clean Air Engineering Proprietary Software
SS EPA26-1 Version 2006-10a (CI)

Copyright © 2006 Clean Air Engineering Inc.

QA/QC ________
Date ________

Wheelabrator South Broward, Inc.
Clean Air Project No: 10955
Unit 2 SDA Inlet

USEPA Method 26A (HCl)
Sampling, Velocity and Moisture Parameters

Run No.		1	2	3	Average
Date (2010)		Mar 23	Mar 23	Mar 23	
Start Time (approx.)		07:55	09:30	10:55	
Stop Time (approx.)		08:55	10:30	12:06	
Sampling Conditions					
Y_d	Dry gas meter correction factor	0.9933	0.9933	0.9933	
C_p	Pitot tube coefficient	0.8400	0.8400	0.8400	
P_g	Static pressure (in. H_2O)	-1.4000	-1.4000	-1.5000	
A_s	Sample location area (ft^2)	60.1320	60.1320	60.1320	
P_{bar}	Barometric pressure (in. Hg)	30.10	30.10	30.10	**30.1000**
O_2	Oxygen (dry volume %)	8.1400	8.7100	7.5900	**8.1467**
CO_2	Carbon dioxide (dry volume %)	10.8900	10.4900	11.5900	**10.9900**
N_2+CO	Nitrogen plus carbon monoxide (dry volume %)	80.9700	80.8000	80.8200	**80.8633**
V_{lc}	Total Liquid collected (ml)	156.80	158.10	176.10	
V_m	Volume metered, meter conditions (ft^3)	34.9050	35.3500	35.1100	
T_m	Dry gas meter temperature (°F)	73.6667	83.0417	85.5833	
T_s	Sample temperature (°F)	489.9167	494.5833	493.8333	**492.7778**
ΔH	Meter box orifice pressure drop (in. H_2O)	1.1917	1.2000	1.2000	
θ	Total sampling time (min)	60.0	60.0	60.0	
Flow Results					
V_{wstd}	Volume of water collected (ft^3)	7.3790	7.4402	8.2873	**7.7022**
V_{mstd}	Volume metered, standard (dscf)	34.5960	34.4329	34.0398	**34.3562**
P_s	Sample gas pressure, absolute (in. Hg)	29.9971	29.9971	29.9897	**29.9946**
P_v	Vapor pressure, actual (in. Hg)	29.9971	29.9971	29.9897	**29.9946**
B_{wo}	Moisture measured in sample (% by volume)	17.5795	17.7684	19.5791	**18.3090**
B_{ws}	Saturated moisture content (% by volume)	100.0000	100.0000	100.0000	**100.0000**
B_w	Actual water vapor in gas (% by volume)	17.5795	17.7684	19.5791	**18.3090**
M_d	MW of sample gas, dry (lb/lb-mole)	30.0680	30.0268	30.1580	**30.0843**
M_s	MW of sample gas, wet (lb/lb-mole)	27.9465	27.8898	27.7776	**27.8713**

Comments:

Average includes 3 runs.

042010 112955
KOH@

Prepared by Clean Air Engineering Proprietary Software
SS ISOKINETIC Version 2006-13d

Copyright © 2006 Clean Air Engineering Inc.

QA/QC ________
Date ________

Wheelabrator South Broward, Inc.
Clean Air Project No: 10955
Unit 2 SDA Inlet

USEPA Method 26A
HCl Parameters

Run No.		**1**	**2**	**3**	**Average**
Date (2010)		Mar 23	Mar 23	Mar 23	
Start Time (approx.)		07:55	09:30	10:55	
Stop Time (approx.)		08:55	10:30	12:06	
Process Conditions					
R_P	Steam Production Rate (Klbs/hour)	185.2	183.2	185.3	**184.6**
P_1	Fabric Filter Inlet Temperature (°F)	320	320	320	**320**
F_d	Oxygen-based F-factor (dscf/MMBtu)	9,570	9,570	9,570	**9,570**
F_c	Carbon dioxide-based F-factor (dscf/MMBtu)	1,820	1,820	1,820	**1,820**
Cap	Capacity factor (hours/year)	8,760	8,760	8,760	**8,760**
Gas Conditions					
O_2	Oxygen (dry volume %)	8.1400	8.7100	7.5900	**8.1467**
CO_2	Carbon dioxide (dry volume %)	10.8900	10.4900	11.5900	**10.9900**
T_s	Sample temperature (°F)	489.9167	494.5833	493.8333	**492.7778**
B_w	Actual water vapor in gas (% by volume)	17.5795	17.7684	19.5791	**18.3090**
Sampling Data					
V_{mstd}	Volume metered, standard (dscf)	34.5960	34.4329	34.0398	**34.3562**
Laboratory Data					
m_n	Total HCl collected (mg)	542.6130	510.8841	606.2813	
Hydrogen Chloride (HCl) Results					
C_{sd}	HCl Concentration (lb/dscf)	3.4584E-05	3.2716E-05	3.9273E-05	**3.5524E-05**
C_{sd7}	HCl Concentration @7% O_2 (lb/dscf)	3.7674E-05	3.7305E-05	4.1014E-05	**3.8664E-05**
C_{sd12}	HCl Concentration @12% CO_2 (lb/dscf)	3.8109E-05	3.7425E-05	4.0663E-05	**3.8732E-05**
C_{sd}	HCl Concentration (ppmdv)	365.6412	345.8914	415.2198	**375.5841**
C_{sd7}	HCl Concentration @7% O_2 (ppmdv)	398.3082	394.4126	433.6255	**408.7821**
C_{sd12}	HCl Concentration @12% CO_2 (ppmdv)	402.9104	395.6812	429.9083	**409.5000**
C_w	HCl Concentration (ppmwv)	301.3631	284.4319	333.9233	**306.5728**
C_{sd}	HCl Concentration (mg/dscm)	553.8121	523.8984	628.9055	**568.8720**
C_{sd7}	HCl Concentration @7% O_2 (mg/dscm)	603.2906	597.3903	656.7834	**619.1548**
C_{sd12}	HCl Concentration @12% CO_2 (mg/dscm)	610.2613	599.3118	651.1532	**620.2421**
C_{sd}	HCl Concentration (mg/Nm^3 dry)	594.3349	562.2324	674.9230	**610.4968**
C_{sd7}	HCl Concentration @7% O_2 (mg/Nm^3 dry)	647.4338	641.1018	704.8407	**664.4588**
C_{sd12}	HCl Concentration @12% CO_2 (mg/Nm^3 dry)	654.9145	643.1639	698.7986	**665.6257**
E_{Fd}	HCl Rate - Fd-based (lb/MMBtu)	0.5421	0.5368	0.5902	**0.5564**
E_{Fc}	HCl Rate - Fc-based (lb/MMBtu)	0.5780	0.5676	0.6167	**0.5874**

042010 112955
KOH@_@

Prepared by Clean Air Engineering Proprietary Software
SS EPA26-1 Version 2006-10a (CI)

Copyright © 2006 Clean Air Engineering Inc.

QA/QC ________
Date ________

Wheelabrator South Broward, Inc.
Clean Air Project No: 10955
Unit 3 FF Outlet

USEPA Method 5/29 (Particulate/Metals)
Sampling, Velocity and Moisture Parameters

Run No.		**1**	**2**	**3**	**Average**
Date (2010)		Mar 22	Mar 22	Mar 22	
Start Time (approx.)		08:47	11:43	14:24	
Stop Time (approx.)		11:05	13:57	16:39	
Sampling Conditions					
Y_d	Dry gas meter correction factor	1.0085	1.0085	1.0085	
C_p	Pitot tube coefficient	0.8050	0.8050	0.8050	
P_g	Static pressure (in. H_2O)	-10.3000	-10.0000	-10.1000	
A_s	Sample location area (ft^2)	64.0000	64.0000	64.0000	
P_{bar}	Barometric pressure (in. Hg)	30.10	30.10	30.10	**30.1000**
D_n	Nozzle diameter (in.)	0.2700	0.2700	0.2700	
O_2	Oxygen (dry volume %)	10.0200	9.7000	9.5000	**9.7400**
CO_2	Carbon dioxide (dry volume %)	9.4200	9.7800	9.9800	**9.7267**
N_2+CO	Nitrogen plus carbon monoxide (dry volume %)	80.5600	80.5200	80.5200	**80.5333**
V_{lc}	Total Liquid collected (ml)	441.20	399.40	408.30	
V_m	Volume metered, meter conditions (ft^3)	77.9900	72.4500	75.0500	
T_m	Dry gas meter temperature (°F)	79.2600	79.5000	85.2800	
T_s	Sample temperature (°F)	296.5600	295.6800	295.2800	**295.8400**
ΔH	Meter box orifice pressure drop (in. H_2O)	1.2684	1.0928	1.1404	
θ	Total sampling time (min)	125.0	125.0	125.0	
Flow Results					
V_{wstd}	Volume of water collected (ft^3)	20.7629	18.7958	19.2146	**19.5911**
V_{mstd}	Volume metered, standard (dscf)	77.6829	72.1017	73.9061	**74.5636**
P_s	Sample gas pressure, absolute (in. Hg)	29.3426	29.3647	29.3574	**29.3549**
P_v	Vapor pressure, actual (in. Hg)	29.3426	29.3647	29.3574	**29.3549**
B_{wo}	Moisture measured in sample (% by volume)	21.0907	20.6780	20.6341	**20.8009**
B_{ws}	Saturated moisture content (% by volume)	100.0000	100.0000	100.0000	**100.0000**
B_w	Actual water vapor in gas (% by volume)	21.0907	20.6780	20.6341	**20.8009**
$\sqrt{\Delta P}$	Velocity head ($\sqrt{\text{in. } H_2O}$)	0.7213	0.6667	0.6791	**0.6890**
M_d	MW of sample gas, dry (lb/lb-mole)	29.9080	29.9528	29.9768	**29.9459**
M_s	MW of sample gas, wet (lb/lb-mole)	27.3965	27.4812	27.5055	**27.4611**
V_s	Velocity of sample (ft/sec)	48.1582	44.3982	45.2011	**45.9192**
%I	Isokinetic sampling (%)	100.2162	100.1764	100.7755	**100.3894**
Q_a	Volumetric flow rate, actual (acfm)	184,927	170,489	173,572	**176,330**
Q_s	Volumetric flow rate, standard (scfm)	126,570	116,911	119,059	**120,847**
Q_{std}	Volumetric flow rate, dry standard (dscfm)	99,875	92,737	94,492	**95,701**
Q_{std7}	Volumetric flow rate, dry std@7%O_2 (dscfm)	78,176	74,723	77,497	**76,799**
Q_a	Volumetric flow rate, actual (acf/hr)	11,095,639	10,229,354	10,414,338	**10,579,777**
Q_s	Volumetric flow rate, standard (scf/hr)	7,594,174	7,014,687	7,143,530	**7,250,797**
Q_{std}	Volumetric flow rate, dry standard (dscf/hr)	5,992,512	5,564,191	5,669,529	**5,742,077**
Q_a	Volumetric flow rate, actual (m^3/hr)	314,235	289,701	294,940	**299,626**
Q_s	Volumetric flow rate, standard (m^3/hr)	215,071	198,660	202,309	**205,347**
Q_{std}	Volumetric flow rate, dry standard (dry m^3/hr)	169,711	157,581	160,564	**162,619**
Q_{std7}	Volumetric flow rate, dry std@7%O_2 (dry m^3/hr)	132,839	126,972	131,686	**130,499**
Q_s	Volumetric flow rate, normal (Nm^3/hr)	200,408	185,115	188,515	**191,346**
Q_{std}	Volumetric flow rate, dry normal (Nm^3/hr)	158,140	146,837	149,617	**151,531**
Q_{std7}	Volumetric flow rate, dry normal @7%O_2 (Nm^3/hr)	123,782	118,315	122,707	**121,601**

Comments:

Average includes 3 runs.

042010 113035
IPJ@

Prepared by Clean Air Engineering Proprietary Software
SS ISOKINETIC Version 2006-13d

Copyright © 2006 Clean Air Engineering Inc.

QA/QC ________
Date ________

Wheelabrator South Broward, Inc.
Clean Air Project No: 10955
Unit 3 FF Outlet

USEPA Method 5/29
Filterable Particulate Parameters

Run No.		1	2	3	Average
Date (2010)		Mar 22	Mar 22	Mar 22	
Start Time (approx.)		08:47	11:43	14:24	
Stop Time (approx.)		11:05	13:57	16:39	
Process Conditions					
R_P	Steam Production Rate (Klbs/hour)	184.1	184.0	184.2	**184.1**
P_1	Fabric Filter Inlet Temperature (°F)	315	315	315	**315**
F_d	Oxygen-based F-factor (dscf/MMBtu)	9,570	9,570	9,570	**9,570**
F_c	Carbon dioxide-based F-factor (dscf/MMBtu)	1,820	1,820	1,820	**1,820**
Cap	Capacity factor (hours/year)	8,760	8,760	8,760	**8,760**
Gas Conditions					
O_2	Oxygen (dry volume %)	10.0200	9.7000	9.5000	**9.7400**
CO_2	Carbon dioxide (dry volume %)	9.4200	9.7800	9.9800	**9.7267**
T_s	Sample temperature (°F)	296.5600	295.6800	295.2800	**295.8400**
B_w	Actual water vapor in gas (% by volume)	21.0907	20.6780	20.6341	**20.8009**
Gas Flow Rate					
Q_a	Volumetric flow rate, actual (acfm)	184,927	170,489	173,572	**176,330**
Q_s	Volumetric flow rate, standard (scfm)	126,570	116,911	119,059	**120,847**
Q_{std}	Volumetric flow rate, dry standard (dscfm)	99,875	92,737	94,492	**95,701**
Q_{std7}	Volumetric flow rate, dry std@7%O_2 (dscfm)	78,176	74,723	77,497	**76,799**
Q_a	Volumetric flow rate, actual (acf/hr)	11,095,639	10,229,354	10,414,338	**10,579,777**
Q_s	Volumetric flow rate, standard (scf/hr)	7,594,174	7,014,687	7,143,530	**7,250,797**
Q_{std}	Volumetric flow rate, dry standard (dscf/hr)	5,992,512	5,564,191	5,669,529	**5,742,077**
Q_a	Volumetric flow rate, actual (m^3/hr)	314,235	289,701	294,940	**299,626**
Q_s	Volumetric flow rate, standard (m^3/hr)	215,071	198,660	202,309	**205,347**
Q_{std}	Volumetric flow rate, dry standard (dry m^3/hr)	169,711	157,581	160,564	**162,619**
Q_{std7}	Volumetric flow rate, dry std@7%O_2 (dry m^3/hr)	132,839	126,972	131,686	**130,499**
Q_s	Volumetric flow rate, normal (Nm^3/hr)	200,408	185,115	188,515	**191,346**
Q_{std}	Volumetric flow rate, dry normal (Nm^3/hr)	158,140	146,837	149,617	**151,531**
Q_{std7}	Volumetric flow rate, dry normal @7%O_2 (Nm^3/hr)	123,782	118,315	122,707	**121,601**
Sampling Data					
V_{mstd}	Volume metered, standard (dscf)	77.6829	72.1017	73.9061	**74.5636**
%I	Isokinetic sampling (%)	100.2162	100.1764	100.7755	**100.3894**
Laboratory Data					
m_{filter}	Matter collected on filter(s) (g)	0.00290	0.00110	0.00160	
m_s	Matter collected in solvent rinse(s) (g)	0.00100	0.00230	0.00170	
m_n	Total particulate matter collected (g)	0.00390	0.00340	0.00330	
Filterable Particulate Results					
C_{sd}	Particulate Concentration (lb/dscf)	1.1070E-07	1.0398E-07	9.8456E-08	**1.0438E-07**
C_{sd7}	Particulate Concentration @7% O_2 (lb/dscf)	1.4143E-07	1.2904E-07	1.2005E-07	**1.3017E-07**
C_{sd12}	Particulate Concentration @12% CO_2 (lb/dscf)	1.4102E-07	1.2758E-07	1.1838E-07	**1.2899E-07**
C_a	Particulate Concentration (lb/acf)	5.9787E-08	5.6558E-08	5.3599E-08	**5.6648E-08**
C_{sd}	Particulate Concentration (gr/dscf)	0.0008	0.0007	0.0007	**0.0007**
C_{sd7}	Particulate Concentration @7% O_2 (gr/dscf)	0.0010	0.0009	0.0008	**0.0009**
C_{sd12}	Particulate Concentration @12% CO_2 (gr/dscf)	0.0010	0.0009	0.0008	**0.0009**
C_a	Particulate Concentration (gr/acf)	0.0004	0.0004	0.0004	**0.0004**
C_{sd}	Particulate Concentration (mg/dscm)	1.7727	1.6651	1.5766	**1.6715**
C_{sd7}	Particulate Concentration @7% O_2 (mg/dscm)	2.2648	2.0665	1.9224	**2.0845**
C_{sd12}	Particulate Concentration @12% CO_2 (mg/dscm)	2.2582	2.0430	1.8958	**2.0657**
C_a	Particulate Concentration (mg/m^3 (actual,wet))	0.9574	0.9057	0.8583	**0.9071**
C_{sd}	Particulate Concentration (mg/Nm^3 dry)	1.9024	1.7869	1.6920	**1.7938**
C_{sd7}	Particulate Concentration @7% O_2 (mg/Nm^3 dry)	2.4305	2.2177	2.0631	**2.2371**
C_{sd12}	Particulate Concentration @12% CO_2 (mg/Nm^3 dry)	2.4235	2.1925	2.0345	**2.2168**
$E_{lb/hr}$	Particulate Rate (lb/hr)	0.6634	0.5786	0.5582	**0.6000**
$E_{kg/hr}$	Particulate Rate (kg/hr)	0.3008	0.2624	0.2532	**0.2721**
$E_{T/yr}$	Particulate Rate (Ton/yr)	2.9056	2.5341	2.4449	**2.6282**
E_{Fd}	Particulate Rate - F_d-based (lb/MMBtu)	0.0020	0.0019	0.0017	**0.0019**
E_{Fc}	Particulate Rate - F_c-based (lb/MMBtu)	0.0021	0.0019	0.0018	**0.0020**

Comments:
Average includes 3 runs.

042010 113052
IPJ@_P

Prepared by Clean Air Engineering Proprietary Software
SS EPA 5-1 Version 2008-08b

Copyright © 2008 Clean Air Engineering Inc.

QA/QC ________
Date ________

Wheelabrator South Broward, Inc.
Clean Air Project No: 10955
Unit 3 FF Outlet

USEPA Method 5/29
Mercury (Hg) Emission Parameters

Run No.		1	2	3	Average
Date (2010)		Mar 22	Mar 22	Mar 22	
Start Time (approx.)		08:47	11:43	14:24	
Stop Time (approx.)		11:05	13:57	16:39	
Process Conditions					
R_P	Steam Production Rate (Klbs/hour)	184.1	184.0	184.2	**184.1**
P_1	Fabric Filter Inlet Temperature (°F)	315	315	315	**315**
P_2	Carbon Feed Rate (lb/hr)	7	6	6	**6**
F_d	Oxygen-based F-factor (dscf/MMBtu)	9,570	9,570	9,570	**9,570**
F_c	Carbon dioxide-based F-factor (dscf/MMBtu)	1,820	1,820	1,820	**1,820**
Cap	Capacity factor (hours/year)	8,760	8,760	8,760	**8,760**
Gas Conditions					
O_2	Oxygen (dry volume %)	10.0200	9.7000	9.5000	**9.7400**
CO_2	Carbon dioxide (dry volume %)	9.4200	9.7800	9.9800	**9.7267**
T_s	Sample temperature (°F)	296.5600	295.6800	295.2800	**295.8400**
B_w	Actual water vapor in gas (% by volume)	21.0907	20.6780	20.6341	**20.8009**
Gas Flow Rate					
Q_a	Volumetric flow rate, actual (acfm)	184,927	170,489	173,572	**176,330**
Q_s	Volumetric flow rate, standard (scfm)	126,570	116,911	119,059	**120,847**
Q_{std}	Volumetric flow rate, dry standard (dscfm)	99,875	92,737	94,492	**95,701**
Q_{std7}	Volumetric flow rate, dry std@7%O_2 (dscfm)	78,176	74,723	77,497	**76,799**
Q_a	Volumetric flow rate, actual (acf/hr)	11,095,639	10,229,354	10,414,338	**10,579,777**
Q_s	Volumetric flow rate, standard (scf/hr)	7,594,174	7,014,687	7,143,530	**7,250,797**
Q_{std}	Volumetric flow rate, dry standard (dscf/hr)	5,992,512	5,564,191	5,669,529	**5,742,077**
Q_a	Volumetric flow rate, actual (m^3/hr)	314,235	289,701	294,940	**299,626**
Q_s	Volumetric flow rate, standard (m^3/hr)	215,071	198,660	202,309	**205,347**
Q_{std}	Volumetric flow rate, dry standard (dry m^3/hr)	169,711	157,581	160,564	**162,619**
Q_{std7}	Volumetric flow rate, dry std@7%O_2 (dry m^3/hr)	132,839	126,972	131,686	**130,499**
Q_s	Volumetric flow rate, normal (Nm^3/hr)	200,408	185,115	188,515	**191,346**
Q_{std}	Volumetric flow rate, dry normal (Nm^3/hr)	158,140	146,837	149,617	**151,531**
Q_{std7}	Volumetric flow rate, dry normal @7%O_2 (Nm^3/hr)	123,782	118,315	122,707	**121,601**
Sampling Data					
V_{mstd}	Volume metered, standard (dscf)	77.6829	72.1017	73.9061	**74.5636**
%I	Isokinetic sampling (%)	100.2162	100.1764	100.7755	**100.3894**
Laboratory Data					
m_{n-1b}	Fraction 1B (µg)	<0.1000	<0.1000	<0.1000	
m_{n-2b}	Fraction 2B (µg)	3.6560	3.5329	3.2883	
m_{n-3a}	Fraction 3A (µg)	<0.2000	<0.2000	<0.2000	
m_{n-3b}	Fraction 3B (µg)	<0.5000	<0.5000	<0.5000	
m_{n-3c}	Fraction 3C (µg)	<0.4000	<0.4000	<0.4000	
m_n	Total matter corrected for allowable blanks (µg)	3.6560	3.5329	3.2883	
Mercury Results - Total					
C_{sd}	Concentration (lb/dscf)	1.0377E-10	1.0804E-10	9.8106E-11	**1.0331E-10**
C_{sd7}	Concentration @7% O_2 (lb/dscf)	1.3258E-10	1.3409E-10	1.1962E-10	**1.2876E-10**
C_{sd12}	Concentration @12% CO_2 (lb/dscf)	1.3220E-10	1.3257E-10	1.1796E-10	**1.2758E-10**
C_a	Concentration (lb/acf)	5.6046E-11	5.8770E-11	5.3408E-11	**5.6075E-11**
C_{sd}	Concentration (µg/dscm)	1.6618E+00	1.7302E+00	1.5710E+00	**1.6543E+00**
C_{sd7}	Concentration @7% O_2 (µg/dscm)	2.1231E+00	2.1473E+00	1.9156E+00	**2.0620E+00**
C_{sd12}	Concentration @12% CO_2 (µg/dscm)	2.1169E+00	2.1229E+00	1.8890E+00	**2.0430E+00**
C_{sd}	Concentration (mg/dscm)	1.6618E-03	1.7302E-03	1.5710E-03	**1.6543E-03**
C_{sd7}	Concentration @7% O_2 (mg/dscm)	2.1231E-03	2.1473E-03	1.9156E-03	**2.0620E-03**
C_{sd12}	Concentration @12% CO_2 (mg/dscm)	2.1169E-03	2.1229E-03	1.8890E-03	**2.0430E-03**
C_a	Concentration (µg/m^3 (actual,wet))	8.9750E-01	9.4112E-01	8.5526E-01	**8.9796E-01**
C_{sd}	Concentration (µg/Nm^3 dry)	1.7834E+00	1.8568E+00	1.6860E+00	**1.7754E+00**
C_{sd7}	Concentration @7% O_2 (µg/Nm^3 dry)	2.2784E+00	2.3044E+00	2.0557E+00	**2.2128E+00**
C_{sd12}	Concentration @12% CO_2 (µg/Nm^3 dry)	2.2718E+00	2.2782E+00	2.0272E+00	**2.1924E+00**
$E_{lb/hr}$	Rate (lb/hr)	6.2186E-04	6.0118E-04	5.5621E-04	**5.9308E-04**
$E_{g/s}$	Rate (g/s)	7.8340E-05	7.5734E-05	7.0070E-05	**7.4715E-05**
$E_{T/yr}$	Rate (Ton/yr)	2.7238E-03	2.6332E-03	2.4362E-03	**2.5977E-03**
E_{Fd}	Rate - Fd-based (lb/MMBtu)	1.9077E-06	1.9295E-06	1.7213E-06	**1.8528E-06**
E_{Fc}	Rate - Fc-based (lb/MMBtu)	2.0050E-06	2.0106E-06	1.7891E-06	**1.9349E-06**

042010 113062
I P J @_N

Prepared by Clean Air Engineering Proprietary Software
SS Metals-1 Version 2006-12a

Copyright © 2006 Clean Air Engineering Inc.

QA/QC ________
Date ________

Wheelabrator South Broward, Inc.
Clean Air Project No: 10955
Unit 3 FF Outlet

USEPA Method 5/29
Beryllium (Be) Emission Parameters

Run No.		1	2	3	Average
Date (2010)		Mar 22	Mar 22	Mar 22	
Start Time (approx.)		08:47	11:43	14:24	
Stop Time (approx.)		11:05	13:57	16:39	
Process Conditions					
R_P	Steam Production Rate (Klbs/hour)	184.1	184.0	184.2	**184.1**
P_1	Fabric Filter Inlet Temperature (°F)	315	315	315	**315**
P_2	Carbon Feed Rate (lb/hr)	7	6	6	**6**
F_d	Oxygen-based F-factor (dscf/MMBtu)	9,570	9,570	9,570	**9,570**
F_c	Carbon dioxide-based F-factor (dscf/MMBtu)	1,820	1,820	1,820	**1,820**
Cap	Capacity factor (hours/year)	8,760	8,760	8,760	**8,760**
Gas Conditions					
O_2	Oxygen (dry volume %)	10.0200	9.7000	9.5000	**9.7400**
CO_2	*Carbon dioxide (dry volume %)*	*9.4200*	*9.7800*	*9.9800*	***9.7267***
T_s	Sample temperature (°F)	296.5600	295.6800	295.2800	**295.8400**
B_w	Actual water vapor in gas (% by volume)	21.0907	20.6780	20.6341	**20.8009**
Gas Flow Rate					
Q_a	Volumetric flow rate, actual (acfm)	184,927	170,489	173,572	**176,330**
Q_s	Volumetric flow rate, standard (scfm)	126,570	116,911	119,059	**120,847**
Q_{std}	Volumetric flow rate, dry standard (dscfm)	99,875	92,737	94,492	**95,701**
Q_{std7}	Volumetric flow rate, dry std@7%O_2 (dscfm)	78,176	74,723	77,497	**76,799**
Q_a	Volumetric flow rate, actual (acf/hr)	11,095,639	10,229,354	10,414,338	**10,579,777**
Q_s	Volumetric flow rate, standard (scf/hr)	7,594,174	7,014,687	7,143,530	**7,250,797**
Q_{std}	Volumetric flow rate, dry standard (dscf/hr)	5,992,512	5,564,191	5,669,529	**5,742,077**
Q_a	Volumetric flow rate, actual (m^3/hr)	314,235	289,701	294,940	**299,626**
Q_s	Volumetric flow rate, standard (m^3/hr)	215,071	198,660	202,309	**205,347**
Q_{std}	Volumetric flow rate, dry standard (dry m^3/hr)	169,711	157,581	160,564	**162,619**
Q_{std7}	Volumetric flow rate, dry std@7%O_2 (dry m^3/hr)	132,839	126,972	131,686	**130,499**
Q_s	Volumetric flow rate, normal (Nm^3/hr)	200,408	185,115	188,515	**191,346**
Q_{std}	Volumetric flow rate, dry normal (Nm^3/hr)	158,140	146,837	149,617	**151,531**
Q_{std7}	Volumetric flow rate, dry normal @7%O_2 (Nm^3/hr)	123,782	118,315	122,707	**121,601**
Sampling Data					
V_{mstd}	Volume metered, standard (dscf)	77.6829	72.1017	73.9061	**74.5636**
%I	*Isokinetic sampling (%)*	*100.2162*	*100.1764*	*100.7755*	***100.3894***
Laboratory Data					
m_n	Total matter corrected for allowable blanks (µg)	<0.0500	<0.0500	<0.0500	
Beryllium Results - Total					
C_{sd}	Concentration (lb/dscf)	<1.4192E-12	<1.5291E-12	<1.4918E-12	**<1.4800E-12**
C_{sd7}	Concentration @7% O_2 (lb/dscf)	<1.8132E-12	<1.8977E-12	<1.8189E-12	**<1.8433E-12**
C_{sd12}	Concentration @12% CO_2 (lb/dscf)	<1.8079E-12	<1.8762E-12	<1.7937E-12	**<1.8259E-12**
C_a	Concentration (lb/acf)	<7.6650E-13	<8.3174E-13	<8.1211E-13	**<8.0345E-13**
C_{sd}	Concentration (µg/dscm)	<2.2727E-02	<2.4486E-02	<2.3888E-02	**<2.3701E-02**
C_{sd7}	Concentration @7% O_2 (µg/dscm)	<2.9035E-02	<3.0389E-02	<2.9127E-02	**<2.9517E-02**
C_{sd12}	Concentration @12% CO_2 (µg/dscm)	<2.8952E-02	<3.0044E-02	<2.8724E-02	**<2.9240E-02**
C_{sd}	Concentration (mg/dscm)	<2.2727E-05	<2.4486E-05	<2.3888E-05	**<2.3701E-05**
C_{sd7}	Concentration @7% O_2 (mg/dscm)	<2.9035E-05	<3.0389E-05	<2.9127E-05	**<2.9517E-05**
C_{sd12}	Concentration @12% CO_2 (mg/dscm)	<2.8952E-05	<3.0044E-05	<2.8724E-05	**<2.9240E-05**
C_a	Concentration (µg/m^3 (actual,wet))	<1.2274E-02	<1.3319E-02	<1.3005E-02	**<1.2866E-02**
C_{sd}	Concentration (µg/Nm^3 dry)	<2.4390E-02	<2.6278E-02	<2.5636E-02	**<2.5435E-02**
C_{sd7}	Concentration @7% O_2 (µg/Nm^3 dry)	<3.1160E-02	<3.2613E-02	<3.1258E-02	**<3.1677E-02**
C_{sd12}	Concentration @12% CO_2 (µg/Nm^3 dry)	<3.1070E-02	<3.2243E-02	<3.0825E-02	**<3.1379E-02**
$E_{lb/hr}$	Rate (lb/hr)	<8.5048E-06	<8.5081E-06	<8.4576E-06	**<8.4902E-06**
$E_{g/s}$	Rate (g/s)	<1.0714E-06	<1.0718E-06	<1.0655E-06	**<1.0696E-06**
$E_{T/yr}$	Rate (Ton/yr)	<3.7251E-05	<3.7266E-05	<3.7044E-05	**<3.7187E-05**
E_{Fd}	Rate - Fd-based (lb/MMBtu)	<2.6091E-08	<2.7307E-08	<2.6173E-08	**<2.6523E-08**
E_{Fc}	Rate - Fc-based (lb/MMBtu)	<2.7420E-08	<2.8455E-08	<2.7204E-08	**<2.7693E-08**

042010 113052
I P J @_O

Prepared by Clean Air Engineering Proprietary Software
SS Metals-1 Version 2006-12a

Copyright © 2006 Clean Air Engineering Inc.

QA/QC ________
Date ________

Wheelabrator South Broward, Inc.
Clean Air Project No: 10955
Unit 3 FF Outlet

USEPA Method 5/29
Cadmium (Cd) Emission Parameters

Run No.		1	2	3	Average
Date (2010)		Mar 22	Mar 22	Mar 22	
Start Time (approx.)		08:47	11:43	14:24	
Stop Time (approx.)		11:05	13:57	16:39	
Process Conditions					
R_P	Steam Production Rate (Klbs/hour)	184.1	184.0	184.2	**184.1**
P_1	Fabric Filter Inlet Temperature (°F)	315	315	315	**315**
P_2	Carbon Feed Rate (lb/hr)	7	6	6	**6**
F_d	Oxygen-based F-factor (dscf/MMBtu)	9,570	9,570	9,570	**9,570**
F_c	Carbon dioxide-based F-factor (dscf/MMBtu)	1,820	1,820	1,820	**1,820**
Cap	Capacity factor (hours/year)	8,760	8,760	8,760	**8,760**
Gas Conditions					
O_2	Oxygen (dry volume %)	10.0200	9.7000	9.5000	**9.7400**
CO_2	Carbon dioxide (dry volume %)	9.4200	9.7800	9.9800	**9.7267**
T_s	Sample temperature (°F)	296.5600	295.6800	295.2800	**295.8400**
B_w	Actual water vapor in gas (% by volume)	21.0907	20.6780	20.6341	**20.8009**
Gas Flow Rate					
Q_a	Volumetric flow rate, actual (acfm)	184,927	170,489	173,572	**176,330**
Q_s	Volumetric flow rate, standard (scfm)	126,570	116,911	119,059	**120,847**
Q_{std}	Volumetric flow rate, dry standard (dscfm)	99,875	92,737	94,492	**95,701**
Q_{std7}	Volumetric flow rate, dry std@7%O_2 (dscfm)	78,176	74,723	77,497	**76,799**
Q_a	Volumetric flow rate, actual (acf/hr)	11,095,639	10,229,354	10,414,338	**10,579,777**
Q_s	Volumetric flow rate, standard (scf/hr)	7,594,174	7,014,687	7,143,530	**7,250,797**
Q_{std}	Volumetric flow rate, dry standard (dscf/hr)	5,992,512	5,564,191	5,669,529	**5,742,077**
Q_a	Volumetric flow rate, actual (m^3/hr)	314,235	289,701	294,940	**299,626**
Q_s	Volumetric flow rate, standard (m^3/hr)	215,071	198,660	202,309	**205,347**
Q_{std}	Volumetric flow rate, dry standard (dry m^3/hr)	169,711	157,581	160,564	**162,619**
Q_{std7}	Volumetric flow rate, dry std@7%O_2 (dry m^3/hr)	132,839	126,972	131,686	**130,499**
Q_s	Volumetric flow rate, normal (Nm^3/hr)	200,408	185,115	188,515	**191,346**
Q_{std}	Volumetric flow rate, dry normal (Nm^3/hr)	158,140	146,837	149,617	**151,531**
Q_{std7}	Volumetric flow rate, dry normal @7%O_2 (Nm^3/hr)	123,782	118,315	122,707	**121,601**
Sampling Data					
V_{mstd}	Volume metered, standard (dscf)	77.6829	72.1017	73.9061	**74.5636**
%I	Isokinetic sampling (%)	100.2162	100.1764	100.7755	**100.3894**
Laboratory Data					
m_n	Total matter corrected for allowable blanks (µg)	0.7733	0.7704	0.7331	
Cadmium Results - Total					
C_{sd}	Concentration (lb/dscf)	2.1951E-11	2.3560E-11	2.1873E-11	**2.2461E-11**
C_{sd7}	Concentration @7% O_2 (lb/dscf)	2.8044E-11	2.9239E-11	2.6669E-11	**2.7984E-11**
C_{sd12}	Concentration @12% CO_2 (lb/dscf)	2.7963E-11	2.8908E-11	2.6300E-11	**2.7723E-11**
C_a	Concentration (lb/acf)	1.1855E-11	1.2815E-11	1.1907E-11	**1.2193E-11**
C_{sd}	Concentration (µg/dscm)	3.5152E-01	3.7728E-01	3.5026E-01	**3.5968E-01**
C_{sd7}	Concentration @7% O_2 (µg/dscm)	4.4909E-01	4.6823E-01	4.2707E-01	**4.4813E-01**
C_{sd12}	Concentration @12% CO_2 (µg/dscm)	4.4779E-01	4.6291E-01	4.2115E-01	**4.4395E-01**
C_{sd}	Concentration (mg/dscm)	3.5152E-04	3.7728E-04	3.5026E-04	**3.5968E-04**
C_{sd7}	Concentration @7% O_2 (mg/dscm)	4.4909E-04	4.6823E-04	4.2707E-04	**4.4813E-04**
C_{sd12}	Concentration @12% CO_2 (mg/dscm)	4.4779E-04	4.6291E-04	4.2115E-04	**4.4395E-04**
C_a	Concentration (µg/m^3 (actual,wet))	1.8985E-01	2.0522E-01	1.9068E-01	**1.9525E-01**
C_{sd}	Concentration (µg/Nm^3 dry)	3.7724E-01	4.0488E-01	3.7589E-01	**3.8600E-01**
C_{sd7}	Concentration @7% O_2 (µg/Nm^3 dry)	4.8195E-01	5.0249E-01	4.5832E-01	**4.8092E-01**
C_{sd12}	Concentration @12% CO_2 (µg/Nm^3 dry)	4.8056E-01	4.9679E-01	4.5197E-01	**4.7644E-01**
$E_{lb/hr}$	Rate (lb/hr)	1.3154E-04	1.3109E-04	1.2401E-04	**1.2888E-04**
$E_{g/s}$	Rate (g/s)	1.6571E-05	1.6514E-05	1.5622E-05	**1.6236E-05**
$E_{T/yr}$	Rate (Ton/yr)	5.7615E-04	5.7418E-04	5.4315E-04	**5.6449E-04**
E_{Fd}	Rate - Fd-based (lb/MMBtu)	4.0354E-07	4.2074E-07	3.8375E-07	**4.0268E-07**
E_{Fc}	Rate - Fc-based (lb/MMBtu)	4.2411E-07	4.3843E-07	3.9888E-07	**4.2047E-07**

042010 113052
IPJ@_O

Prepared by Clean Air Engineering Proprietary Software
SS Metals-1 Version 2008-12a

Copyright © 2008 Clean Air Engineering Inc.

QA/QC ________
Date ________

Wheelabrator South Broward, Inc.
Clean Air Project No: 10955
Unit 3 FF Outlet

USEPA Method 5/29
Lead (Pb) Emission Parameters

Run No.		1	2	3	Average
Date (2010)		Mar 22	Mar 22	Mar 22	
Start Time (approx.)		08:47	11:43	14:24	
Stop Time (approx.)		11:05	13:57	16:39	
Process Conditions					
R_P	Steam Production Rate (Klbs/hour)	184.1	184.0	184.2	**184.1**
P_1	Fabric Filter Inlet Temperature (°F)	315	315	315	**315**
P_2	Carbon Feed Rate (lb/hr)	7	6	6	**6**
F_d	Oxygen-based F-factor (dscf/MMBtu)	9,570	9,570	9,570	**9,570**
F_c	Carbon dioxide-based F-factor (dscf/MMBtu)	1,820	1,820	1,820	**1,820**
Cap	Capacity factor (hours/year)	8,760	8,760	8,760	**8,760**
Gas Conditions					
O_2	Oxygen (dry volume %)	10.0200	9.7000	9.5000	**9.7400**
CO_2	Carbon dioxide (dry volume %)	9.4200	9.7800	9.9800	**9.7267**
T_s	Sample temperature (°F)	296.5600	295.6800	295.2800	**295.8400**
B_w	Actual water vapor in gas (% by volume)	21.0907	20.6780	20.6341	**20.8009**
Gas Flow Rate					
Q_a	Volumetric flow rate, actual (acfm)	184,927	170,489	173,572	**176,330**
Q_s	Volumetric flow rate, standard (scfm)	126,570	116,911	119,059	**120,847**
Q_{std}	Volumetric flow rate, dry standard (dscfm)	99,875	92,737	94,492	**95,701**
Q_{std7}	Volumetric flow rate, dry std@7%O_2 (dscfm)	78,176	74,723	77,497	**76,799**
Q_a	Volumetric flow rate, actual (acf/hr)	11,095,639	10,229,354	10,414,338	**10,579,777**
Q_s	Volumetric flow rate, standard (scf/hr)	7,594,174	7,014,687	7,143,530	**7,250,797**
Q_{std}	Volumetric flow rate, dry standard (dscf/hr)	5,992,512	5,564,191	5,669,529	**5,742,077**
Q_a	Volumetric flow rate, actual (m^3/hr)	314,235	289,701	294,940	**299,626**
Q_s	Volumetric flow rate, standard (m^3/hr)	215,071	198,660	202,309	**205,347**
Q_{std}	Volumetric flow rate, dry standard (dry m^3/hr)	169,711	157,581	160,564	**162,619**
Q_{std7}	Volumetric flow rate, dry std@7%O_2 (dry m^3/hr)	132,839	126,972	131,686	**130,499**
Q_s	Volumetric flow rate, normal (Nm^3/hr)	200,408	185,115	188,515	**191,346**
Q_{std}	Volumetric flow rate, dry normal (Nm^3/hr)	158,140	146,837	149,617	**151,531**
Q_{std7}	Volumetric flow rate, dry normal @7%O_2 (Nm^3/hr)	123,782	118,315	122,707	**121,601**
Sampling Data					
V_{mstd}	Volume metered, standard (dscf)	77.6829	72.1017	73.9061	**74.5636**
%I	Isokinetic sampling (%)	100.2162	100.1764	100.7755	**100.3894**
Laboratory Data					
m_n	Total matter corrected for allowable blanks (µg)	6.8716	5.5360	5.9671	
Lead Results - Total					
C_{sd}	Concentration (lb/dscf)	1.9505E-10	1.6930E-10	1.7803E-10	**1.8079E-10**
C_{sd7}	Concentration @7% O_2 (lb/dscf)	2.4919E-10	2.1012E-10	2.1707E-10	**2.2546E-10**
C_{sd12}	Concentration @12% CO_2 (lb/dscf)	2.4847E-10	2.0773E-10	2.1406E-10	**2.2342E-10**
C_a	Concentration (lb/acf)	1.0534E-10	9.2091E-11	9.6918E-11	**9.8117E-11**
C_{sd}	Concentration (µg/dscm)	3.1234E+00	2.7111E+00	2.8509E+00	**2.8951E+00**
C_{sd7}	Concentration @7% O_2 (µg/dscm)	3.9904E+00	3.3647E+00	3.4761E+00	**3.6104E+00**
C_{sd12}	Concentration @12% CO_2 (µg/dscm)	3.9789E+00	3.3265E+00	3.4279E+00	**3.5778E+00**
C_{sd}	Concentration (mg/dscm)	3.1234E-03	2.7111E-03	2.8509E-03	**2.8951E-03**
C_{sd7}	Concentration @7% O_2 (mg/dscm)	3.9904E-03	3.3647E-03	3.4761E-03	**3.6104E-03**
C_{sd12}	Concentration @12% CO_2 (mg/dscm)	3.9789E-03	3.3265E-03	3.4279E-03	**3.5778E-03**
C_a	Concentration (µg/m^3 (actual,wet))	1.6869E+00	1.4747E+00	1.5520E+00	**1.5712E+00**
C_{sd}	Concentration (µg/Nm^3 dry)	3.3520E+00	2.9095E+00	3.0595E+00	**3.1070E+00**
C_{sd7}	Concentration @7% O_2 (µg/Nm^3 dry)	4.2824E+00	3.6109E+00	3.7304E+00	**3.8746E+00**
C_{sd12}	Concentration @12% CO_2 (µg/Nm^3 dry)	4.2700E+00	3.5699E+00	3.6787E+00	**3.8396E+00**
$E_{lb/hr}$	Rate (lb/hr)	1.1688E-03	9.4203E-04	1.0093E-03	**1.0401E-03**
$E_{g/s}$	Rate (g/s)	1.4724E-04	1.1867E-04	1.2715E-04	**1.3102E-04**
$E_{T/yr}$	Rate (Ton/yr)	5.1195E-03	4.1261E-03	4.4209E-03	**4.5555E-03**
E_{Fd}	Rate - Fd-based (lb/MMBtu)	3.5857E-06	3.0234E-06	3.1235E-06	**3.2442E-06**
E_{Fc}	Rate - Fc-based (lb/MMBtu)	3.7684E-06	3.1506E-06	3.2466E-06	**3.3886E-06**

042010 113052
IPJ@_O

Prepared by Clean Air Engineering Proprietary Software
SS Metals-1 Version 2008-12a

Copyright © 2008 Clean Air Engineering Inc.

QA/QC ________
Date ________

Wheelabrator South Broward, Inc.
Clean Air Project No: 10955
Unit 3 SDA Inlet

USEPA Method 29 (Trace Metals)
Sampling, Velocity and Moisture Parameters

Run No.		1	2	3	Average
Date (2010)		Mar 22	Mar 22	Mar 22	
Start Time (approx.)		08:47	11:43	14:27	
Stop Time (approx.)		11:05	13:57	16:39	
Sampling Conditions					
Y_d	Dry gas meter correction factor	0.9900	0.9900	0.9900	
C_p	Pitot tube coefficient	0.8250	0.8250	0.8250	
P_g	Static pressure (in. H_2O)	-1.3000	-1.3000	-1.3000	
A_s	Sample location area (ft^2)	60.1320	60.1320	60.1320	
P_{bar}	Barometric pressure (in. Hg)	30.10	30.10	30.10	**30.1000**
D_n	Nozzle diameter (in.)	0.2700	0.2700	0.2700	
O_2	Oxygen (dry volume %)	9.1900	8.1900	8.1400	**8.5067**
CO_2	Carbon dioxide (dry volume %)	10.4700	11.1000	11.1900	**10.9200**
N_2+CO	Nitrogen plus carbon monoxide (dry volume %)	80.3400	80.7100	80.6700	**80.5733**
V_{lc}	Total Liquid collected (ml)	318.60	308.00	297.10	
V_m	Volume metered, meter conditions (ft^3)	67.9800	65.7850	66.6100	
T_m	Dry gas meter temperature (°F)	70.1250	72.6458	80.5000	
T_s	Sample temperature (°F)	473.2083	469.0833	471.1667	**471.1528**
ΔH	Meter box orifice pressure drop (in. H_2O)	0.9754	0.9167	0.9196	
θ	Total sampling time (min)	120.0	120.0	120.0	
Flow Results					
V_{wstd}	Volume of water collected (ft^3)	14.9933	14.4945	13.9815	**14.4898**
V_{mstd}	Volume metered, standard (dscf)	67.5673	65.0669	64.9260	**65.8534**
P_s	Sample gas pressure, absolute (in. Hg)	30.0044	30.0044	30.0044	**30.0044**
P_v	Vapor pressure, actual (in. Hg)	30.0044	30.0044	30.0044	**30.0044**
B_{wo}	Moisture measured in sample (% by volume)	18.1604	18.2180	17.7189	**18.0324**
B_{ws}	Saturated moisture content (% by volume)	100.0000	100.0000	100.0000	**100.0000**
B_w	Actual water vapor in gas (% by volume)	18.1604	18.2180	17.7189	**18.0324**
$\sqrt{\Delta P}$	Velocity head ($\sqrt{}$in. H_2O)	0.6765	0.6528	0.6525	**0.6606**
M_d	MW of sample gas, dry (lb/lb-mole)	30.0428	30.1036	30.1160	**30.0875**
M_s	MW of sample gas, wet (lb/lb-mole)	27.8558	27.8986	27.9692	**27.9078**
V_s	Velocity of sample (ft/sec)	50.4133	48.5065	48.4754	**49.1317**
%I	Isokinetic sampling (%)	100.8827	100.5929	100.0541	**100.5099**
Q_a	Volumetric flow rate, actual (acfm)	181,887	175,008	174,895	**177,264**
Q_s	Volumetric flow rate, standard (scfm)	103,200	99,738	99,451	**100,796**
Q_{std}	Volumetric flow rate, dry standard (dscfm)	84,459	81,568	81,829	**82,619**
Q_{std7}	Volumetric flow rate, dry std@7%O_2 (dscfm)	71,152	74,585	75,118	**73,618**
Q_a	Volumetric flow rate, actual (acf/hr)	10,913,243	10,500,470	10,493,727	**10,635,813**
Q_s	Volumetric flow rate, standard (scf/hr)	6,192,025	5,984,275	5,967,051	**6,047,784**
Q_{std}	Volumetric flow rate, dry standard (dscf/hr)	5,067,530	4,894,060	4,909,757	**4,957,116**
Q_a	Volumetric flow rate, actual (m^3/hr)	309,069	297,379	297,189	**301,212**
Q_s	Volumetric flow rate, standard (m^3/hr)	175,362	169,478	168,990	**171,277**
Q_{std}	Volumetric flow rate, dry standard (dry m^3/hr)	143,515	138,603	139,047	**140,388**
Q_{std7}	Volumetric flow rate, dry std@7%O_2 (dry m^3/hr)	120,904	126,737	127,643	**125,095**
Q_s	Volumetric flow rate, normal (Nm^3/hr)	163,405	157,923	157,468	**159,599**
Q_{std}	Volumetric flow rate, dry normal (Nm^3/hr)	133,730	129,152	129,567	**130,816**
Q_{std7}	Volumetric flow rate, dry normal @7%O_2 (Nm^3/hr)	112,661	118,096	118,940	**116,565**

Comments:
Average includes 3 runs.

042010 113220
NOQ@

Prepared by Clean Air Engineering Proprietary Software
SS ISOKINETIC Version 2008-13d

Copyright © 2006 Clean Air Engineering Inc.

QA/QC ________
Date ________

Wheelabrator South Broward, Inc.
Clean Air Project No: 10955
Unit 3 SDA Inlet

USEPA Method 29
Mercury (Hg) Emission Parameters

Run No.		1	2	3	Average
Date (2010)		Mar 22	Mar 22	Mar 22	
Start Time (approx.)		08:47	11:43	14:27	
Stop Time (approx.)		11:05	13:57	16:39	
Process Conditions					
R_P	Steam Production Rate (Klbs/hour)	184.1	184.0	184.2	**184.1**
P_1	Fabric Filter Inlet Temperature (°F)	315	315	315	**315**
P_2	Coal Feed Rate (lb/hr)	7	6	6	**6**
F_d	Oxygen-based F-factor (dscf/MMBtu)	9,570	9,570	9,570	**9,570**
F_c	Carbon dioxide-based F-factor (dscf/MMBtu)	1,820	1,820	1,820	**1,820**
Cap	Capacity factor (hours/year)	8,760	8,760	8,760	**8,760**
Gas Conditions					
O_2	Oxygen (dry volume %)	9.1900	8.1900	8.1400	**8.5067**
CO_2	Carbon dioxide (dry volume %)	10.4700	11.1000	11.1900	**10.9200**
T_s	Sample temperature (°F)	473.2083	469.0833	471.1667	**471.1528**
B_w	Actual water vapor in gas (% by volume)	18.1604	18.2180	17.7189	**18.0324**
Gas Flow Rate					
Q_a	Volumetric flow rate, actual (acfm)	181,887	175,008	174,895	**177,264**
Q_s	Volumetric flow rate, standard (scfm)	103,200	99,738	99,451	**100,796**
Q_{std}	Volumetric flow rate, dry standard (dscfm)	84,459	81,568	81,829	**82,619**
Q_{std7}	Volumetric flow rate, dry std@7%O_2 (dscfm)	71,152	74,585	75,118	**73,618**
Q_a	Volumetric flow rate, actual (acf/hr)	10,913,243	10,500,470	10,493,727	**10,635,813**
Q_s	Volumetric flow rate, standard (scf/hr)	6,192,025	5,984,275	5,967,051	**6,047,784**
Q_{std}	Volumetric flow rate, dry standard (dscf/hr)	5,067,530	4,894,060	4,909,757	**4,957,116**
Q_a	Volumetric flow rate, actual (m^3/hr)	309,069	297,379	297,189	**301,212**
Q_s	Volumetric flow rate, standard (m^3/hr)	175,362	169,478	168,990	**171,277**
Q_{std}	Volumetric flow rate, dry standard (dry m^3/hr)	143,515	138,603	139,047	**140,388**
Q_{std7}	Volumetric flow rate, dry std@7%O_2 (dry m^3/hr)	120,904	126,737	127,643	**125,095**
Q_s	Volumetric flow rate, normal (Nm^3/hr)	163,405	157,923	157,468	**159,599**
Q_{std}	Volumetric flow rate, dry normal (Nm^3/hr)	133,730	129,152	129,567	**130,816**
Q_{std7}	Volumetric flow rate, dry normal @7%O_2 (Nm^3/hr)	112,661	118,096	118,940	**116,565**
Sampling Data					
V_{mstd}	Volume metered, standard (dscf)	67.5673	65.0669	64.9260	**65.8534**
%I	Isokinetic sampling (%)	100.8827	100.5929	100.0541	**100.5099**
Laboratory Data					
m_{n-1b}	Fraction 1B (µg)	46.7982	94.5017	74.2463	
m_{n-2b}	Fraction 2B (µg)	21.1531	22.0588	25.4675	
m_{n-3a}	Fraction 3A (µg)	<0.2000	<0.2000	<0.2000	
m_{n-3b}	Fraction 3B (µg)	<0.5000	<0.5000	<0.5000	
m_{n-3c}	Fraction 3C (µg)	1.8293	1.7245	0.9416	
m_n	Total matter corrected for allowable blanks (µg)	69.7807	118.2850	100.6553	
Mercury Results - Total					
C_{sd}	Concentration (lb/dscf)	2.2772E-09	4.0085E-09	3.4184E-09	**3.2347E-09**
C_{sd7}	Concentration @7% O_2 (lb/dscf)	2.7031E-09	4.3838E-09	3.7238E-09	**3.6036E-09**
C_{sd12}	Concentration @12% CO_2 (lb/dscf)	2.6100E-09	4.3335E-09	3.6659E-09	**3.5365E-09**
C_a	Concentration (lb/acf)	1.0574E-09	1.8683E-09	1.5994E-09	**1.5084E-09**
C_{sd}	Concentration (µg/dscm)	3.6467E+01	6.4190E+01	5.4741E+01	**5.1799E+01**
C_{sd7}	Concentration @7% O_2 (µg/dscm)	4.3287E+01	7.0200E+01	5.9632E+01	**5.7706E+01**
C_{sd12}	Concentration @12% CO_2 (µg/dscm)	4.1796E+01	6.9395E+01	5.8704E+01	**5.6631E+01**
C_{sd}	Concentration (mg/dscm)	3.6467E-02	6.4190E-02	5.4741E-02	**5.1799E-02**
C_{sd7}	Concentration @7% O_2 (mg/dscm)	4.3287E-02	7.0200E-02	5.9632E-02	**5.7706E-02**
C_{sd12}	Concentration @12% CO_2 (mg/dscm)	4.1796E-02	6.9395E-02	5.8704E-02	**5.6631E-02**
C_a	Concentration (µg/m^3 (actual,wet))	1.6933E+01	2.9918E+01	2.5612E+01	**2.4154E+01**
C_{sd}	Concentration (µg/Nm^3 dry)	3.9135E+01	6.8887E+01	5.8747E+01	**5.5590E+01**
C_{sd7}	Concentration @7% O_2 (µg/Nm^3 dry)	4.6454E+01	7.5337E+01	6.3995E+01	**6.1929E+01**
C_{sd12}	Concentration @12% CO_2 (µg/Nm^3 dry)	4.4854E+01	7.4472E+01	6.2999E+01	**6.0775E+01**
$E_{lb/hr}$	Rate (lb/hr)	1.1540E-02	1.9618E-02	1.6784E-02	**1.5980E-02**
$E_{g/s}$	Rate (g/s)	1.4538E-03	2.4714E-03	2.1143E-03	**2.0132E-03**
$E_{T/yr}$	Rate (Ton/yr)	5.0545E-02	8.5925E-02	7.3512E-02	**6.9994E-02**
E_{Fd}	Rate - Fd-based (lb/MMBtu)	3.8896E-05	6.3080E-05	5.3584E-05	**5.1853E-05**
E_{Fc}	Rate - Fc-based (lb/MMBtu)	3.9585E-05	6.5724E-05	5.5599E-05	**5.3636E-05**

Prepared by Clean Air Engineering Proprietary Software
SS Metals-1 Version 2006-12a

Copyright © 2006 Clean Air Engineering Inc.

042010 113232
NOQ@_N

QA/QC ______
Date ______

Wheelabrator South Broward, Inc.
Clean Air Project No: 10955
Unit 3 FF Outlet

USEPA Method 13B (Total Fluorides)
Sampling, Velocity and Moisture Parameters

Run No.		1	2	3	Average
Date (2010)		Mar 23	Mar 23	Mar 23	
Start Time (approx.)		12:41	14:31	15:54	
Stop Time (approx.)		13:54	15:39	17:02	
Sampling Conditions					
Y_d	Dry gas meter correction factor	1.0085	1.0085	1.0085	
C_p	Pitot tube coefficient	0.8120	0.8120	0.8120	
P_g	Static pressure (in. H_2O)	-10.2000	-10.2000	-10.2000	
A_s	Sample location area (ft^2)	64.0000	64.0000	64.0000	
P_{bar}	Barometric pressure (in. Hg)	30.10	30.10	30.10	**30.1000**
D_n	Nozzle diameter (in.)	0.2680	0.2680	0.2680	
O_2	Oxygen (dry volume %)	9.7500	9.9300	9.4000	**9.6933**
CO_2	Carbon dioxide (dry volume %)	9.5800	9.6200	10.1900	**9.7967**
N_2+CO	Nitrogen plus carbon monoxide (dry volume %)	80.6700	80.4500	80.4100	**80.5100**
V_{lc}	Total Liquid collected (ml)	217.50	217.00	209.70	
V_m	Volume metered, meter conditions (ft^3)	36.2600	37.8500	35.9900	
T_m	Dry gas meter temperature (°F)	86.0600	86.6800	85.5600	
T_s	Sample temperature (°F)	296.7600	296.3600	296.4000	**296.5067**
ΔH	Meter box orifice pressure drop (in. H_2O)	1.1160	1.1812	1.0072	
θ	Total sampling time (min)	62.5	62.5	62.5	
Flow Results					
V_{wstd}	Volume of water collected (ft^3)	10.2356	10.2120	9.8685	**10.1054**
V_{mstd}	Volume metered, standard (dscf)	35.6542	37.1813	35.4118	**36.0824**
P_s	Sample gas pressure, absolute (in. Hg)	29.3500	29.3500	29.3500	**29.3500**
P_v	Vapor pressure, actual (in. Hg)	29.3500	29.3500	29.3500	**29.3500**
B_{wo}	Moisture measured in sample (% by volume)	22.3047	21.5474	21.7942	**21.8821**
B_{ws}	Saturated moisture content (% by volume)	100.0000	100.0000	100.0000	**100.0000**
B_w	Actual water vapor in gas (% by volume)	22.3047	21.5474	21.7942	**21.8821**
$\sqrt{\Delta P}$	Velocity head ($\sqrt{}$in. H_2O)	0.6718	0.6925	0.6423	**0.6689**
M_d	MW of sample gas, dry (lb/lb-mole)	29.9228	29.9364	30.0064	**29.9552**
M_s	MW of sample gas, wet (lb/lb-mole)	27.2635	27.3644	27.3897	**27.3392**
V_s	Velocity of sample (ft/sec)	45.3498	46.6506	43.2527	**45.0844**
%I	Isokinetic sampling (%)	100.7037	101.0498	104.1344	**101.9626**
Q_a	Volumetric flow rate, actual (acfm)	174,143	179,138	166,090	**173,124**
Q_s	Volumetric flow rate, standard (scfm)	119,187	122,671	113,729	**118,529**
Q_{std}	Volumetric flow rate, dry standard (dscfm)	92,603	96,238	88,943	**92,595**
Q_{std7}	Volumetric flow rate, dry std@7%O_2 (dscfm)	74,282	75,952	73,586	**74,607**
Q_a	Volumetric flow rate, actual (acf/hr)	10,448,592	10,748,298	9,965,413	**10,387,434**
Q_s	Volumetric flow rate, standard (scf/hr)	7,151,219	7,360,233	6,823,767	**7,111,740**
Q_{std}	Volumetric flow rate, dry standard (dscf/hr)	5,556,164	5,774,297	5,336,580	**5,555,680**
Q_a	Volumetric flow rate, actual (m^3/hr)	295,910	304,398	282,226	**294,178**
Q_s	Volumetric flow rate, standard (m^3/hr)	202,527	208,446	193,253	**201,409**
Q_{std}	Volumetric flow rate, dry standard (dry m^3/hr)	157,354	163,531	151,135	**157,340**
Q_{std7}	Volumetric flow rate, dry std@7%O_2 (dry m^3/hr)	126,223	129,060	125,040	**126,774**
Q_s	Volumetric flow rate, normal (Nm^3/hr)	188,718	194,234	180,077	**187,676**
Q_{std}	Volumetric flow rate, dry normal (Nm^3/hr)	146,625	152,382	140,830	**146,612**
Q_{std7}	Volumetric flow rate, dry normal @7%O_2 (Nm^3/hr)	117,617	120,261	116,514	**118,131**

Comments:

Average includes 3 runs.

042010 113253
RKL@

Prepared by Clean Air Engineering Proprietary Software
SS ISOKINETIC Version 2006-13d

Copyright © 2006 Clean Air Engineering Inc.

QA/QC ________
Date ________

Wheelabrator South Broward, Inc.
Clean Air Project No: 10955
Unit 3 FF Outlet

USEPA Method 13B
HF Parameters

Run No.		1	2	3	Average
Date (2010)		Mar 23	Mar 23	Mar 23	
Start Time (approx.)		12:41	14:31	15:54	
Stop Time (approx.)		13:54	15:39	17:02	
Process Conditions					
R_P	Steam Production Rate (Klbs/hour)	183.8	184.4	183.9	**184.0**
P_1	Fabric Filter Inlet Temperature (°F)	315	315	315	**315**
F_d	Oxygen-based F-factor (dscf/MMBtu)	9,570	9,570	9,570	**9,570**
F_c	Carbon dioxide-based F-factor (dscf/MMBtu)	1,820	1,820	1,820	**1,820**
Cap	Capacity factor (hours/year)	8,760	8,760	8,760	**8,760**
Gas Conditions					
O_2	Oxygen (dry volume %)	9.7500	9.9300	9.4000	**9.6933**
CO_2	Carbon dioxide (dry volume %)	9.5800	9.6200	10.1900	**9.7967**
T_s	Sample temperature (°F)	296.7600	296.3600	296.4000	**296.5067**
B_w	Actual water vapor in gas (% by volume)	22.3047	21.5474	21.7942	**21.8821**
Gas Flow Rate					
Q_a	Volumetric flow rate, actual (acfm)	174,143	179,138	166,090	**173,124**
Q_s	Volumetric flow rate, standard (scfm)	119,187	122,671	113,729	**118,529**
Q_{std}	Volumetric flow rate, dry standard (dscfm)	92,603	96,238	88,943	**92,595**
Q_{std7}	Volumetric flow rate, dry std@7%O_2 (dscfm)	74,282	75,952	73,586	**74,607**
Q_a	Volumetric flow rate, actual (acf/hr)	10,448,592	10,748,298	9,965,413	**10,387,434**
Q_s	Volumetric flow rate, standard (scf/hr)	7,151,219	7,360,233	6,823,767	**7,111,740**
Q_{std}	Volumetric flow rate, dry standard (dscf/hr)	5,556,164	5,774,297	5,336,580	**5,555,680**
Q_a	Volumetric flow rate, actual (m^3/hr)	295,910	304,398	282,226	**294,178**
Q_s	Volumetric flow rate, standard (m^3/hr)	202,527	208,446	193,253	**201,409**
Q_{std}	Volumetric flow rate, dry standard (dry m^3/hr)	157,354	163,531	151,135	**157,340**
Q_{std7}	Volumetric flow rate, dry std@7%O_2 (dry m^3/hr)	126,223	129,060	125,040	**126,774**
Q_s	Volumetric flow rate, normal (Nm^3/hr)	188,718	194,234	180,077	**187,676**
Q_{std}	Volumetric flow rate, dry normal (Nm^3/hr)	146,625	152,382	140,830	**146,612**
Q_{std7}	Volumetric flow rate, dry normal @7%O_2 (Nm^3/hr)	117,617	120,261	116,514	**118,131**
Sampling Data					
V_{mstd}	Volume metered, standard (dscf)	35.6542	37.1813	35.4118	**36.0824**
%I	Isokinetic sampling (%)	100.7037	101.0498	104.1344	**101.9626**
Laboratory Data					
m_n	Total HF collected (mg)	<0.0397	<0.0398	<0.0378	
Hydrogen Fluoride (HF) Results					
C_{sd}	HF Concentration (lb/dscf)	<2.4564E-09	<2.3630E-09	<2.3526E-09	**<2.3907E-09**
C_{sd7}	HF Concentration @7% O_2 (lb/dscf)	<3.0622E-09	<2.9941E-09	<2.8435E-09	**<2.9666E-09**
C_{sd12}	HF Concentration @12% CO_2 (lb/dscf)	<3.0769E-09	<2.9476E-09	<2.7704E-09	**<2.9316E-09**
C_a	HF Concentration (lb/acf)	<1.3062E-09	<1.2695E-09	<1.2598E-09	**<1.2785E-09**
C_{sd}	HF Concentration (ppmdv)	<0.0473	<0.0455	<0.0453	**<0.0461**
C_{sd7}	HF Concentration @7% O_2 (ppmdv)	<0.0590	<0.0577	<0.0548	**<0.0572**
C_{sd12}	HF Concentration @12% CO_2 (ppmdv)	<0.0593	<0.0568	<0.0534	**<0.0565**
C_w	HF Concentration (ppmwv)	<0.0368	<0.0357	<0.0355	**<0.0360**
C_{sd}	HF Concentration (mg/dscm)	<0.0393	<0.0378	<0.0377	**<0.0383**
C_{sd7}	HF Concentration @7% O_2 (mg/dscm)	<0.0490	<0.0479	<0.0455	**<0.0475**
C_{sd12}	HF Concentration @12% CO_2 (mg/dscm)	<0.0493	<0.0472	<0.0444	**<0.0469**
C_a	HF Concentration (mg/m^3 (actual,wet))	<0.0209	<0.0203	<0.0202	**<0.0205**
C_{sd}	HF Concentration (mg/Nm^3 dry)	<0.0422	<0.0406	<0.0404	**<0.0411**
C_{sd7}	HF Concentration @7% O_2 (mg/Nm^3 dry)	<0.0526	<0.0515	<0.0489	**<0.0510**
C_{sd12}	HF Concentration @12% CO_2 (mg/Nm^3 dry)	<0.0529	<0.0507	<0.0476	**<0.0504**
$E_{lb/hr}$	HF Rate (lb/hr)	<0.0136	<0.0136	<0.0126	**<0.0133**
$E_{kg/hr}$	HF Rate (kg/hr)	<0.0062	<0.0062	<0.0057	**<0.0060**
$E_{T/yr}$	HF Rate (Ton/yr)	<0.0598	<0.0598	<0.0550	**<0.0582**
E_{Fd}	HF Rate - Fd-based (lb/MMBtu)	<0.000044	<0.000043	<0.000041	**<0.000043**
E_{Fc}	HF Rate - Fc-based (lb/MMBtu)	<0.000047	<0.000045	<0.000042	**<0.000044**

Prepared by Clean Air Engineering Proprietary Software
SS EPA26-1 Version 2005-10a (F)

042010 113253
RKL@_J

QA/QC ________
Date ________

Copyright © 2006 Clean Air Engineering Inc.

Wheelabrator South Broward, Inc.
Clean Air Project No: 10955
Unit 3 FF Outlet

USEPA Method 26A (HCl)
Sampling, Velocity and Moisture Parameters

Run No.		**1**	**2**	**3**	**Average**
Date (2010)		Mar 24	Mar 24	Mar 24	
Start Time (approx.)		07:45	09:16	10:54	
Stop Time (approx.)		08:45	10:16	11:54	
Sampling Conditions					
Y_d	Dry gas meter correction factor	0.9898	0.9898	0.9898	
C_p	Pitot tube coefficient	0.8400	0.8400	0.8400	
P_g	Static pressure (in. H_2O)	-10.0000	-10.0000	-10.0000	
A_s	Sample location area (ft^2)	64.0000	64.0000	64.0000	
P_{bar}	Barometric pressure (in. Hg)	30.10	30.10	30.10	**30.1000**
O_2	Oxygen (dry volume %)	9.6100	9.0700	9.0800	**9.2533**
CO_2	Carbon dioxide (dry volume %)	9.7500	10.2900	10.3000	**10.1133**
N_2+CO	Nitrogen plus carbon monoxide (dry volume %)	80.6400	80.6400	80.6200	**80.6333**
V_{lc}	Total Liquid collected (ml)	236.90	236.80	244.70	
V_m	Volume metered, meter conditions (ft^3)	40.2150	41.5700	41.4850	
T_m	Dry gas meter temperature (°F)	67.5833	78.3333	87.3750	
T_s	Sample temperature (°F)	294.9167	295.5000	295.3333	**295.2500**
ΔH	Meter box orifice pressure drop (in. H_2O)	1.5000	1.5000	1.5000	
θ	Total sampling time (min)	60.0	60.0	60.0	
Flow Results					
V_{wstd}	Volume of water collected (ft^3)	11.1485	11.1438	11.5156	**11.2693**
V_{mstd}	Volume metered, standard (dscf)	40.2067	40.7314	39.9767	**40.3049**
P_s	Sample gas pressure, absolute (in. Hg)	29.3647	29.3647	29.3647	**29.3647**
P_v	Vapor pressure, actual (in. Hg)	29.3647	29.3647	29.3647	**29.3647**
B_{wo}	Moisture measured in sample (% by volume)	21.7086	21.4819	22.3637	**21.8514**
B_{ws}	Saturated moisture content (% by volume)	100.0000	100.0000	100.0000	**100.0000**
B_w	Actual water vapor in gas (% by volume)	21.7086	21.4819	22.3637	**21.8514**
M_d	MW of sample gas, dry (lb/lb-mole)	29.9444	30.0092	30.0112	**29.9883**
M_s	MW of sample gas, wet (lb/lb-mole)	27.3514	27.4294	27.3251	**27.3686**

Comments:

Average includes 3 runs.

042010 113310
QLK@

Prepared by Clean Air Engineering Proprietary Software
SS ISOKINETIC Version 2006-13d

Copyright © 2006 Clean Air Engineering Inc.

QA/QC ________
Date ________

Wheelabrator South Broward, Inc.
Clean Air Project No: 10955
Unit 3 FF Outlet

USEPA Method 26A
HCl Parameters

Run No.		1	2	3	Average
Date (2010)		Mar 24	Mar 24	Mar 24	
Start Time (approx.)		07:45	09:16	10:54	
Stop Time (approx.)		08:45	10:16	11:54	
Process Conditions					
R_P	Steam Production Rate (Klbs/hour)	184.1	184.2	184.1	**184.1**
P_1	Fabric Filter Inlet Temperature (°F)	315	315	315	**315**
F_d	Oxygen-based F-factor (dscf/MMBtu)	9,570	9,570	9,570	**9,570**
F_c	Carbon dioxide-based F-factor (dscf/MMBtu)	1,820	1,820	1,820	**1,820**
Cap	Capacity factor (hours/year)	8,760	8,760	8,760	**8,760**
Gas Conditions					
O_2	Oxygen (dry volume %)	9.6100	9.0700	9.0800	**9.2533**
CO_2	Carbon dioxide (dry volume %)	9.7500	10.2900	10.3000	**10.1133**
T_s	Sample temperature (°F)	294.9167	295.5000	295.3333	**295.2500**
B_w	Actual water vapor in gas (% by volume)	21.7086	21.4819	22.3637	**21.8514**
Sampling Data					
V_{mstd}	Volume metered, standard (dscf)	40.2067	40.7314	39.9767	**40.3049**
Laboratory Data					
m_n	Total HCl collected (mg)	30.1359	28.8286	29.3329	
Hydrogen Chloride (HCl) Results					
C_{sd}	HCl Concentration (lb/dscf)	1.6527E-06	1.5606E-06	1.6179E-06	**1.6104E-06**
C_{sd7}	HCl Concentration @7% O_2 (lb/dscf)	2.0348E-06	1.8337E-06	1.9026E-06	**1.9237E-06**
C_{sd12}	HCl Concentration @12% CO_2 (lb/dscf)	2.0341E-06	1.8200E-06	1.8850E-06	**1.9130E-06**
C_{sd}	HCl Concentration (ppmdv)	17.4733	16.5000	17.1056	**17.0263**
C_{sd7}	HCl Concentration @7% O_2 (ppmdv)	21.5128	19.3872	20.1157	**20.3386**
C_{sd12}	HCl Concentration @12% CO_2 (ppmdv)	21.5057	19.2420	19.9289	**20.2255**
C_w	HCl Concentration (ppmwv)	13.6801	12.9555	13.2802	**13.3053**
C_{sd}	HCl Concentration (mg/dscm)	26.4657	24.9915	25.9087	**25.7886**
C_{sd7}	HCl Concentration @7% O_2 (mg/dscm)	32.5840	29.3644	30.4679	**30.8055**
C_{sd12}	HCl Concentration @12% CO_2 (mg/dscm)	32.5732	29.1446	30.1849	**30.6342**
C_{sd}	HCl Concentration (mg/Nm^3 dry)	28.4022	26.8201	27.8045	**27.6756**
C_{sd7}	HCl Concentration @7% O_2 (mg/Nm^3 dry)	34.9682	31.5131	32.6973	**33.0595**
C_{sd12}	HCl Concentration @12% CO_2 (mg/Nm^3 dry)	34.9566	31.2771	32.3936	**32.8757**
E_{Fd}	HCl Rate - Fd-based (lb/MMBtu)	0.0293	0.0264	0.0274	**0.0277**
E_{Fc}	HCl Rate - Fc-based (lb/MMBtu)	0.0309	0.0276	0.0286	**0.0290**

042010 113310
QLK@_@

Prepared by Clean Air Engineering Proprietary Software
SS EPA26-1 Version 2006-10a (CI)

Copyright © 2006 Clean Air Engineering Inc.

QA/QC ________
Date ________

Wheelabrator South Broward, Inc.
Clean Air Project No: 10955
Unit 3 SDA Inlet

USEPA Method 26A (HCl)
Sampling, Velocity and Moisture Parameters

Run No.		**1**	**2**	**3**	**Average**
Date (2010)		Mar 24	Mar 24	Mar 24	
Start Time (approx.)		07:45	09:16	10:54	
Stop Time (approx.)		08:45	10:16	11:54	
Sampling Conditions					
Y_d	Dry gas meter correction factor	0.9900	0.9900	0.9900	
C_p	Pitot tube coefficient	0.8400	0.8400	0.8400	
P_g	Static pressure (in. H_2O)	-1.1000	-1.1000	-1.2000	
A_s	Sample location area (ft^2)	60.1320	60.1320	60.1320	
P_{bar}	Barometric pressure (in. Hg)	30.10	30.10	30.10	**30.1000**
O_2	Oxygen (dry volume %)	8.9800	8.0700	8.0300	**8.3600**
CO_2	Carbon dioxide (dry volume %)	10.3600	11.1600	11.2600	**10.9267**
N_2+CO	Nitrogen plus carbon monoxide (dry volume %)	80.6600	80.7700	80.7100	**80.7133**
V_{lc}	Total Liquid collected (ml)	166.40	171.40	178.00	
V_m	Volume metered, meter conditions (ft^3)	35.9400	36.5250	37.0400	
T_m	Dry gas meter temperature (°F)	65.4167	71.5417	75.1667	
T_s	Sample temperature (°F)	465.1667	464.1667	468.0000	**465.7778**
ΔH	Meter box orifice pressure drop (in. H_2O)	1.2000	1.1917	1.2000	
θ	Total sampling time (min)	60.0	60.0	60.0	
Flow Results					
V_{wstd}	Volume of water collected (ft^3)	7.8308	8.0661	8.3767	**8.0912**
V_{mstd}	Volume metered, standard (dscf)	36.0617	36.2256	36.4883	**36.2585**
P_s	Sample gas pressure, absolute (in. Hg)	30.0191	30.0191	30.0118	**30.0167**
P_v	Vapor pressure, actual (in. Hg)	30.0191	30.0191	30.0118	**30.0167**
B_{wo}	Moisture measured in sample (% by volume)	17.8408	18.2113	18.6709	**18.2410**
B_{ws}	Saturated moisture content (% by volume)	100.0000	100.0000	100.0000	**100.0000**
B_w	Actual water vapor in gas (% by volume)	17.8408	18.2113	18.6709	**18.2410**
M_d	MW of sample gas, dry (lb/lb-mole)	30.0168	30.1084	30.1228	**30.0827**
M_s	MW of sample gas, wet (lb/lb-mole)	27.8729	27.9033	27.8594	**27.8785**

Comments:

Average includes 3 runs.

042010 113320
MJK@

Prepared by Clean Air Engineering Proprietary Software
SS ISOKINETIC Version 2006-13d

Copyright © 2006 Clean Air Engineering Inc.

QA/QC ________
Date ________

Wheelabrator South Broward, Inc.
Clean Air Project No: 10955
Unit 3 SDA Inlet

USEPA Method 26A
HCl Parameters

Run No.		1	2	3	Average
Date (2010)		Mar 24	Mar 24	Mar 24	
Start Time (approx.)		07:45	09:16	10:54	
Stop Time (approx.)		08:45	10:16	11:54	
Process Conditions					
R_P	Steam Production Rate (Klbs/hour)	184.1	184.2	184.1	**184.1**
P_1	Fabric Filter Inlet Temperature (°F)	315	315	315	**315**
F_d	Oxygen-based F-factor (dscf/MMBtu)	9,570	9,570	9,570	**9,570**
F_c	Carbon dioxide-based F-factor (dscf/MMBtu)	1,820	1,820	1,820	**1,820**
Cap	Capacity factor (hours/year)	8,760	8,760	8,760	**8,760**
Gas Conditions					
O_2	Oxygen (dry volume %)	8.9800	8.0700	8.0300	**8.3600**
CO_2	Carbon dioxide (dry volume %)	10.3600	11.1600	11.2600	**10.9267**
T_s	Sample temperature (°F)	465.1667	464.1667	468.0000	**465.7778**
B_w	Actual water vapor in gas (% by volume)	17.8408	18.2113	18.6709	**18.2410**
Sampling Data					
V_{mstd}	Volume metered, standard (dscf)	36.0617	36.2256	36.4883	**36.2585**
Laboratory Data					
m_n	Total HCl collected (mg)	607.2973	714.3158	701.1579	
Hydrogen Chloride (HCl) Results					
C_{sd}	HCl Concentration (lb/dscf)	3.7133E-05	4.3479E-05	4.2371E-05	**4.0995E-05**
C_{sd7}	HCl Concentration @7% O_2 (lb/dscf)	4.3301E-05	4.7105E-05	4.5762E-05	**4.5390E-05**
C_{sd12}	HCl Concentration @12% CO_2 (lb/dscf)	4.3012E-05	4.6752E-05	4.5156E-05	**4.4973E-05**
C_{sd}	HCl Concentration (ppmdv)	392.5961	459.6899	447.9739	**433.4200**
C_{sd7}	HCl Concentration @7% O_2 (ppmdv)	457.8092	498.0273	483.8258	**479.8874**
C_{sd12}	HCl Concentration @12% CO_2 (ppmdv)	454.7445	494.2902	477.4145	**475.4831**
C_w	HCl Concentration (ppmwv)	322.5536	375.9745	364.3333	**354.2871**
C_{sd}	HCl Concentration (mg/dscm)	594.6390	696.2614	678.5160	**656.4721**
C_{sd7}	HCl Concentration @7% O_2 (mg/dscm)	693.4129	754.3285	732.8184	**726.8532**
C_{sd12}	HCl Concentration @12% CO_2 (mg/dscm)	688.7710	748.6682	723.1076	**720.1823**
C_{sd}	HCl Concentration (mg/Nm^3 dry)	638.1491	747.2074	728.1635	**704.5067**
C_{sd7}	HCl Concentration @7% O_2 (mg/Nm^3 dry)	744.1504	809.5232	786.4392	**780.0376**
C_{sd12}	HCl Concentration @12% CO_2 (mg/Nm^3 dry)	739.1689	803.4488	776.0180	**772.8786**
E_{Fd}	HCl Rate - Fd-based (lb/MMBtu)	0.6231	0.6778	0.6585	**0.6531**
E_{Fc}	HCl Rate - Fc-based (lb/MMBtu)	0.6523	0.7091	0.6849	**0.6821**

042010 113320
M J K @_@

Prepared by Clean Air Engineering Proprietary Software
SS EPA26-1 Version 2006-10a (CI)

Copyright © 2006 Clean Air Engineering Inc.

QA/QC ________
Date ________

Wheelabrator North Broward, Inc.
CleanAir Project No. 10955
Lime Silo

Visible Emission Parameters

Run	**1**
Date (2010)	Mar 24
Start Time	10:32

Time	Time (sec)			
(min)	15	30	45	60
0	0	0	0	0
1	0	0	0	0
2	0	0	0	0
3	0	0	0	0
4	0	0	0	0
5	0	0	0	0
6	0	0	0	0
7	0	0	0	0
8	0	0	0	0
9	0	0	0	0
10	0	0	0	0
11	0	0	0	0
12	0	0	0	0
13	0	0	0	0
14	0	0	0	0
15	0	0	0	0
16	0	0	0	0
17	0	0	0	0
18	0	0	0	0
19	0	0	0	0
20	0	0	0	0
21	0	0	0	0
22	0	0	0	0
23	0	0	0	0
24	0	0	0	0
25	0	0	0	0
26	0	0	0	0
27	0	0	0	0
28	0	0	0	0
29	0	0	0	0
30	0	0	0	0
31	0	0	0	0
32	0	0	0	0
33	0	0	0	0
34	0	0	0	0
35	0	0	0	0
36	0	0	0	0
37	0	0	0	0
38	0	0	0	0
39	0	0	0	0
40	0	0	0	0
41	0	0	0	0
42	0	0	0	0
43	0	0	0	0
44	0	0	0	0
45	0	0	0	0
46	0	0	0	0
47	0	0	0	0
48	0	0	0	0
49	0	0	0	0
50	0	0	0	0
51	0	0	0	0
52	0	0	0	0
53	0	0	0	0
54	0	0	0	0
55	0	0	0	0
56	0	0	0	0
57	0	0	0	0
58	0	0	0	0
59	0	0	0	0

Time	Time (sec)			
(min)	15	30	45	60
0	0	0	0	0
1	0	0	0	0
2	0	0	0	0
3	0	0	0	0
4	0	0	0	0
5	0	0	0	0
6	0	0	0	0
7	0	0	0	0
8	0	0	0	0
9	0	0	0	0
10	0	0	0	0
11	0	0	0	0
12	0	0	0	0
13	0	0	0	0
14	0	0	0	0
15	0	0	0	0
16	0	0	0	0
17	0	0	0	0
18	0	0	0	0
19	0	0	0	0
20				
21				
22				
23				
24				
25				
26				
27				
28				
29				
30				
31				
32				
33				
34				
35				
36				
37				
38				
39				
40				
41				
42				
43				
44				
45				
46				
47				
48				
49				
50				
51				
52				
53				
54				
55				
56				
57				
58				
59				

Average Opacity	**0**
Minimum Reading	**0**
Maximum Reading	**0**
No. of Readings >5%	**0**

Prepared by CleanAir Engineering Proprietary Software
SS EPA M9 Version 01-2003

Copyright © 2003 Clean Air Engineering Inc.

End of Appendix

QA/QC DATA

E

This Page Intentionally Left Blank

Wheelabrator South Broward, Inc.
Clean Air Project No: 10955
Unit 1 FF Outlet

USEPA Method 5/29 (Particulate/Metals)
QA/QC Results

	Run No.	1	2	3	
	Date (2010)	Mar 23	Mar 23	Mar 23	
	Start Time (approx.)	07:43	10:31	13:32	
	Stop Time (approx.)	09:58	12:45	15:46	
	Total Duration of Test Run (min.)	135	134	134	
	Net Sampling Time (min.)	125	125	125	
Sampling System Calibration Summary					
	Nozzle ID No:	270-1	270-1	270-1	
D_n	Nozzle Diameter (in):	0.270	0.270	0.270	
	Probe ID No:	67-8-4	67-8-4	67-8-4	
C_p	Pitot Coefficient:	0.8050	0.8050	0.8050	
	Meter Box ID. No:	66-22	66-22	66-22	
Y_d	Meter Box Yd - Field Sheet	1.0005	1.0005	1.0005	
	Meter Box Yd - Database	1.0005	1.0005	1.0005	
	Meter Box ΔH@ - Field Sheet	1.8097	1.8097	1.8097	
	Meter Box ΔH@ - Database	1.8097	1.8097	1.8097	
QA/QC					
	Final Leak Check				
	(a) 4% of Sampling Rate (cfm)	0.0245	0.0249	0.0250	
	(b) Allowable Rate from Method (cfm)	0.0200	0.0200	0.0200	
	Allowable Limit - minimum of a and b (cfm)	0.0200	0.0200	0.0200	
	Actual Final Leak Rate (cfm)	0.0020	0.0010	0.0030	
	Sample Volume				
	Minimum Volume Required (dscf)	30.00	30.00	30.00	
V_{mstd}	Actual Sample Volume (dscf)	77.169	77.389	77.612	
	Alternative Method 5 Post-Test Calibration (EPA ALT-009)				
$\sqrt{\Delta H}_{avg}$	Average of Square Root of ΔH (in. W.C.)	1.0847	1.0964	1.1041	
Y_{qa}	Alternative Meter Calibration Factor	0.9679	0.9691	0.9716	**Average**
	Variation from full-test Y_d (average ≤ ±5%)	-3.3%	-3.1%	-2.9%	**-3.1%**
	Mean Isokinetic Sampling Rate Variation				
	Minimum Allowable (%)	90	90	90	
	Maximum Allowable (%)	110	110	110	
%I	Actual Variation (%)	105.25	104.24	102.93	
	Point-by-Point Isokinetic Variation				
	Number of points <90%	1	0	0	
	Number of points >110%	1	0	0	
	Number of points <80%	1	0	0	
	Number of points >120%	1	0	0	

042010 114448
JLL@

Prepared by Clean Air Engineering Proprietary Software
SS ISOKINETIC Version 2008-13d

Copyright © 2008 Clean Air Engineering Inc.

QA/QC ________
Date ________

Wheelabrator South Broward, Inc.
Clean Air Project No: 10955
Unit 1 SDA Inlet

USEPA Method 29 (Trace Metals)
QA/QC Results

Run No.		**1**	**2**	**3**	
	Date (2010)	Mar 23	Mar 23	Mar 23	
	Start Time (approx.)	07:43	10:31	13:32	
	Stop Time (approx.)	09:58	12:45	15:46	
	Total Duration of Test Run (min.)	135	134	134	
	Net Sampling Time (min.)	120	120	120	
Sampling System Calibration Summary					
	Nozzle ID No:	270-2	270-2	270-2	
D_n	Nozzle Diameter (in):	0.270	0.270	0.270	
	Probe ID No:	67-10-3	67-10-3	67-10-3	
C_p	Pitot Coefficient:	0.8250	0.8250	0.8250	
	Meter Box ID. No:	61-8	61-8	61-8	
Y_d	Meter Box Yd - Field Sheet	0.9916	0.9916	0.9916	
	Meter Box Yd - Database	0.9916	0.9916	0.9916	
	Meter Box ΔH@ - Field Sheet	1.7580	1.7580	1.7580	
	Meter Box ΔH@ - Database	1.7580	1.7580	1.7580	
QA/QC					
	Final Leak Check				
	(a) 4% of Sampling Rate (cfm)	0.0234	0.0228	0.0230	
	(b) Allowable Rate from Method (cfm)	0.0200	0.0200	0.0200	
	Allowable Limit - minimum of a and b (cfm)	0.0200	0.0200	0.0200	
	Actual Final Leak Rate (cfm)	0.0070	0.0030	0.0030	
	Sample Volume				
	Minimum Volume Required (dscf)	30.00	30.00	30.00	
V_{mstd}	Actual Sample Volume (dscf)	68.540	65.652	65.796	
	Alternative Method 5 Post-Test Calibration (EPA ALT-009)				
$\sqrt{\Delta H}_{avg}$	Average of Square Root of ΔH (in. W.C.)	1.0404	1.0174	1.0223	
Y_{qa}	Alternative Meter Calibration Factor	0.9954	1.0079	1.0073	**Average**
	Variation from full-test Y_d (average ≤ ±5%)	0.4%	1.6%	1.6%	**1.2%**
	Mean Isokinetic Sampling Rate Variation				
	Minimum Allowable (%)	90	90	90	
	Maximum Allowable (%)	110	110	110	
%I	Actual Variation (%)	99.56	98.55	98.16	
	Point-by-Point Isokinetic Variation				
	Number of points <90%	0	0	0	
	Number of points >110%	0	0	0	
	Number of points <80%	0	0	0	
	Number of points >120%	0	0	0	

042010 114448
JNK@

Prepared by Clean Air Engineering Proprietary Software
SS ISOKINETIC Version 2006-13d

Copyright © 2006 Clean Air Engineering Inc.

QA/QC ________
Date ________

Wheelabrator South Broward, Inc.
Clean Air Project No: 10955
Unit 2 FF Outlet

USEPA Method 5/29 (Particulate/Metals) QA/QC Results

	Run No.	1	2	3	
	Date (2010)	Mar 24	Mar 24	Mar 24	
	Start Time (approx.)	07:53	11:03	14:12	
	Stop Time (approx.)	10:06	13:35	16:22	
	Total Duration of Test Run (min.)	133	152	130	
	Net Sampling Time (min.)	125	125	125	
	Sampling System Calibration Summary				
	Nozzle ID No:	270-1	270-1	270-1	
D_n	Nozzle Diameter (in):	0.270	0.270	0.270	
	Probe ID No:	67-8-4	67-8-4	67-8-4	
C_p	Pitot Coefficient:	0.8050	0.8050	0.8050	
	Meter Box ID. No:	85-2	85-2	85-2	
Y_d	Meter Box Yd - Field Sheet	1.0066	1.0066	1.0066	
	Meter Box Yd - Database	1.0066	1.0066	1.0066	
	Meter Box ΔH@ - Field Sheet	1.7759	1.7759	1.7759	
	Meter Box ΔH@ - Database	1.7759	1.7759	1.7759	
QA/QC					
	Final Leak Check				
	(a) 4% of Sampling Rate (cfm)	0.0227	0.0236	0.0238	
	(b) Allowable Rate from Method (cfm)	0.0200	0.0200	0.0200	
	Allowable Limit - minimum of a and b (cfm)	0.0200	0.0200	0.0200	
	Actual Final Leak Rate (cfm)	0.0020	0.0020	0.0020	
	Sample Volume				
	Minimum Volume Required (dscf)	30.00	30.00	30.00	
V_{mstd}	Actual Sample Volume (dscf)	71.894	73.201	73.705	
	Alternative Method 5 Post-Test Calibration (EPA ALT-009)				
$\sqrt{\Delta H}_{avg}$	Average of Square Root of ΔH (in. W.C.)	1.0373	1.0721	1.0849	
Y_{qa}	Alternative Meter Calibration Factor	1.0090	1.0113	1.0159	**Average**
	Variation from full-test Y_d (average ≤ ±5%)	0.2%	0.5%	0.9%	**0.5%**
	Mean Isokinetic Sampling Rate Variation				
	Minimum Allowable (%)	90	90	90	
	Maximum Allowable (%)	110	110	110	
%I	Actual Variation (%)	100.10	99.96	99.02	
	Point-by-Point Isokinetic Variation				
	Number of points <90%	0	0	0	
	Number of points >110%	0	0	0	
	Number of points <80%	0	0	0	
	Number of points >120%	0	0	0	

042010 114448
KKN@

Prepared by Clean Air Engineering Proprietary Software
SS ISOKINETIC Version 2006-13d

Copyright © 2006 Clean Air Engineering Inc.

QA/QC ________
Date ________

Wheelabrator South Broward, Inc.
Clean Air Project No: 10955
Unit 2 SDA Inlet

USEPA Method 29 (Trace Metals)
QA/QC Results

	Run No.	**1**	**2**	**3**	
	Date (2010)	Mar 24	Mar 24	Mar 24	
	Start Time (approx.)	07:53	11:03	14:12	
	Stop Time (approx.)	10:06	13:32	16:19	
	Total Duration of Test Run (min.)	133	149	127	
	Net Sampling Time (min.)	120	120	120	
Sampling System Calibration Summary					
	Nozzle ID No:	270-2	270-2	270-2	
D_n	Nozzle Diameter (in):	0.270	0.270	0.270	
	Probe ID No:	67-10-3	67-10-3	67-10-3	
C_p	Pitot Coefficient:	0.8250	0.8250	0.8250	
	Meter Box ID. No:	66-11	66-11	66-11	
Y_d	Meter Box Yd - Field Sheet	0.9933	0.9933	0.9933	
	Meter Box Yd - Database	0.9933	0.9933	0.9933	
	Meter Box ΔH@ - Field Sheet	1.8619	1.8619	1.8619	
	Meter Box ΔH@ - Database	1.8619	1.8619	1.8619	
QA/QC					
	Final Leak Check				
	(a) 4% of Sampling Rate (cfm)	0.0218	0.0215	0.0227	
	(b) Allowable Rate from Method (cfm)	0.0200	0.0200	0.0200	
	Allowable Limit - minimum of a and b (cfm)	0.0200	0.0200	0.0200	
	Actual Final Leak Rate (cfm)	0.0040	0.0030	0.0040	
	Sample Volume				
	Minimum Volume Required (dscf)	30.00	30.00	30.00	
V_{mstd}	Actual Sample Volume (dscf)	65.532	63.191	66.874	
	Alternative Method 5 Post-Test Calibration (EPA ALT-009)				
$\sqrt{\Delta H}_{avg}$	Average of Square Root of ΔH (in. W.C.)	1.0106	0.9956	1.0515	
Y_{qa}	Alternative Meter Calibration Factor	0.9939	1.0048	1.0039	**Average**
	Variation from full-test Y_d (average ≤ ±5%)	0.1%	1.2%	1.1%	**0.8%**
	Mean Isokinetic Sampling Rate Variation				
	Minimum Allowable (%)	90	90	90	
	Maximum Allowable (%)	110	110	110	
%I	Actual Variation (%)	101.33	98.35	99.72	
	Point-by-Point Isokinetic Variation				
	Number of points <90%	0	1	0	
	Number of points >110%	0	1	0	
	Number of points <80%	0	1	0	
	Number of points >120%	0	1	0	

042010 114448
HJK@

Prepared by Clean Air Engineering Proprietary Software
SS ISOKINETIC Version 2008-13d

Copyright © 2006 Clean Air Engineering Inc.

QA/QC ________
Date ________

Wheelabrator South Broward, Inc.
Clean Air Project No: 10955
Unit 3 FF Outlet

USEPA Method 5/29 (Particulate/Metals)
QA/QC Results

	Run No.	1	2	3	
	Date (2010)	Mar 22	Mar 22	Mar 22	
	Start Time (approx.)	08:47	11:43	14:24	
	Stop Time (approx.)	11:05	13:57	16:39	
	Total Duration of Test Run (min.)	138	134	135	
	Net Sampling Time (min.)	125	125	125	
Sampling System Calibration Summary					
	Nozzle ID No:	270-1	270-1	270-1	
D_n	Nozzle Diameter (in):	0.270	0.270	0.270	
	Probe ID No:	67-8-4	67-8-4	67-8-4	
C_p	Pitot Coefficient:	0.8050	0.8050	0.8050	
	Meter Box ID. No:	85-4	85-4	85-4	
Y_d	Meter Box Yd - Field Sheet	1.0085	1.0085	1.0085	
	Meter Box Yd - Database	1.0085	1.0085	1.0085	
	Meter Box ΔH@ - Field Sheet	1.7723	1.7723	1.7723	
	Meter Box ΔH@ - Database	1.7723	1.7723	1.7723	
QA/QC					
	Final Leak Check				
	(a) 4% of Sampling Rate (cfm)	0.0250	0.0232	0.0240	
	(b) Allowable Rate from Method (cfm)	0.0200	0.0200	0.0200	
	Allowable Limit - minimum of a and b (cfm)	0.0200	0.0200	0.0200	
	Actual Final Leak Rate (cfm)	0.0030	0.0010	0.0010	
	Sample Volume				
	Minimum Volume Required (dscf)	30.00	30.00	30.00	
V_{mstd}	Actual Sample Volume (dscf)	77.683	72.102	73.906	
	Alternative Method 5 Post-Test Calibration (EPA ALT-009)				
$\sqrt{\Delta H}_{avg}$	Average of Square Root of ΔH (in. W.C.)	1.1226	1.0432	1.0657	
Y_{qa}	Alternative Meter Calibration Factor	1.0038	1.0039	0.9948	**Average**
	Variation from full-test Y_d (average ≤ ±5%)	-0.5%	-0.5%	-1.4%	**-0.8%**
	Mean Isokinetic Sampling Rate Variation				
	Minimum Allowable (%)	90	90	90	
	Maximum Allowable (%)	110	110	110	
%I	Actual Variation (%)	100.22	100.18	100.78	
	Point-by-Point Isokinetic Variation				
	Number of points <90%	0	0	0	
	Number of points >110%	0	0	0	
	Number of points <80%	0	0	0	
	Number of points >120%	0	0	0	

042010 114448
IPJ@

Prepared by Clean Air Engineering Proprietary Software
SS ISOKINETIC Version 2006-13d

Copyright © 2006 Clean Air Engineering Inc.

QA/QC ________
Date ________

Wheelabrator South Broward, Inc.
Clean Air Project No: 10955
Unit 3 SDA Inlet

USEPA Method 29 (Trace Metals)
QA/QC Results

	Run No.	**1**	**2**	**3**	
	Date (2010)	Mar 22	Mar 22	Mar 22	
	Start Time (approx.)	08:47	11:43	14:27	
	Stop Time (approx.)	11:05	13:57	16:39	
	Total Duration of Test Run (min.)	138	134	132	
	Net Sampling Time (min.)	120	120	120	
Sampling System Calibration Summary					
	Nozzle ID No:	270-2	270-2	270-2	
D_n	Nozzle Diameter (in):	0.270	0.270	0.270	
	Probe ID No:	67-10-3	67-10-3	67-10-3	
C_p	Pitot Coefficient:	0.8250	0.8250	0.8250	
	Meter Box ID. No:	61-6	61-6	61-6	
Y_d	Meter Box Yd - Field Sheet	0.9900	0.9900	0.9900	
	Meter Box Yd - Database	0.9900	0.9900	0.9900	
	Meter Box ΔH@ - Field Sheet	1.6820	1.6820	1.6820	
	Meter Box ΔH@ - Database	1.6820	1.6820	1.6820	
QA/QC					
	Final Leak Check				
	(a) 4% of Sampling Rate (cfm)	0.0227	0.0219	0.0222	
	(b) Allowable Rate from Method (cfm)	0.0200	0.0200	0.0200	
	Allowable Limit - minimum of a and b (cfm)	0.0200	0.0200	0.0200	
	Actual Final Leak Rate (cfm)	0.0060	0.0060	0.0050	
	Sample Volume				
	Minimum Volume Required (dscf)	30.00	30.00	30.00	
V_{mstd}	Actual Sample Volume (dscf)	67.567	65.067	64.926	
	Alternative Method 5 Post-Test Calibration (EPA ALT-009)				
$\sqrt{\Delta H}_{avg}$	Average of Square Root of ΔH (in. W.C.)	0.9851	0.9531	0.9541	
Y_{qa}	Alternative Meter Calibration Factor	0.9856	0.9867	0.9826	**Average**
	Variation from full-test Y_d (average ≤ ±5%)	-0.4%	-0.3%	-0.8%	**-0.5%**
	Mean Isokinetic Sampling Rate Variation				
	Minimum Allowable (%)	90	90	90	
	Maximum Allowable (%)	110	110	110	
%I	Actual Variation (%)	100.88	100.59	100.05	
	Point-by-Point Isokinetic Variation				
	Number of points <90%	0	0	0	
	Number of points >110%	0	0	0	
	Number of points <80%	0	0	0	
	Number of points >120%	0	0	0	

042010 114448
NOQ@

Prepared by Clean Air Engineering Proprietary Software
SS ISOKINETIC Version 2008-13d

Copyright © 2008 Clean Air Engineering Inc.

QA/QC ________
Date ________

Wheelabrator South Broward, Inc.
Clean Air Project No: 10955
Unit 1 FF Outlet

USEPA Method 13B (Total Fluorides)
QA/QC Results

	Run No.	1	2	3	
	Date (2010)	Mar 22	Mar 22	Mar 22	
	Start Time (approx.)	13:19	15:07	16:30	
	Stop Time (approx.)	14:34	16:21	17:41	
	Total Duration of Test Run (min.)	75	74	71	
	Net Sampling Time (min.)	63	63	63	
	Sampling System Calibration Summary				
	Nozzle ID No:	0.268-1	0.268-1	0.268-1	
D_n	Nozzle Diameter (in):	0.268	0.268	0.268	
	Probe ID No:	67-8-14	67-8-14	67-8-14	
C_p	Pitot Coefficient:	0.8120	0.8120	0.8120	
	Meter Box ID. No:	66-22	66-22	66-22	
Y_d	Meter Box Yd - Field Sheet	1.0005	1.0005	1.0005	
	Meter Box Yd - Database	1.0005	1.0005	1.0005	
	Meter Box ΔH@ - Field Sheet	1.8097	1.8097	1.8097	
	Meter Box ΔH@ - Database	1.8097	1.8097	1.8097	
QA/QC					
	Final Leak Check				
	(a) 4% of Sampling Rate (cfm)	0.0235	0.0243	0.0234	
	(b) Allowable Rate from Method (cfm)	0.0200	0.0200	0.0200	
	Allowable Limit - minimum of a and b (cfm)	0.0200	0.0200	0.0200	
	Actual Final Leak Rate (cfm)	0.0020	0.0020	0.0010	
	Sample Volume				
	Minimum Volume Required (dscf)	30.00	30.00	30.00	
V_{mstd}	Actual Sample Volume (dscf)	36.936	37.954	36.294	
	Alternative Method 5 Post-Test Calibration (EPA ALT-009)				
$\sqrt{\Delta H}_{avg}$	Average of Square Root of ΔH (in. W.C.)	1.0670	1.0698	1.0284	
Y_{qa}	Alternative Meter Calibration Factor	0.9921	0.9652	0.9676	**Average**
	Variation from full-test Y_d (average ≤ ±5%)	-0.8%	-3.5%	-3.3%	**-2.6%**
	Mean Isokinetic Sampling Rate Variation				
	Minimum Allowable (%)	90	90	90	
	Maximum Allowable (%)	110	110	110	
%I	Actual Variation (%)	102.10	104.78	104.45	
	Point-by-Point Isokinetic Variation				
	Number of points <90%	1	1	2	
	Number of points >110%	2	9	7	
	Number of points <80%	1	0	0	
	Number of points >120%	0	0	0	

042010 114600
OKP@

Prepared by Clean Air Engineering Proprietary Software
SS ISOKINETIC Version 2006-13d

Copyright © 2006 Clean Air Engineering Inc.

QA/QC ________
Date ________

Wheelabrator South Broward, Inc.
Clean Air Project No: 10955
Unit 2 FF Outlet

USEPA Method 13B (Total Fluorides)
QA/QC Results

Run No.		1	2	3	
Date (2010)		Mar 24	Mar 24	Mar 24	
Start Time (approx.)		07:53	09:37	11:24	
Stop Time (approx.)		09:11	10:54	12:46	
Total Duration of Test Run (min.)		78	77	82	
Net Sampling Time (min.)		63	63	63	
Sampling System Calibration Summary					
	Nozzle ID No:	0.268-1	0.268-1	0.268-1	
D_n	Nozzle Diameter (in):	0.268	0.268	0.268	
	Probe ID No:	67-8-14	67-8-14	67-8-14	
C_p	Pitot Coefficient:	0.8120	0.8120	0.8120	
	Meter Box ID. No:	66-24	66-24	66-24	
Y_d	Meter Box Yd - Field Sheet	0.9904	0.9904	0.9904	
	Meter Box Yd - Database	0.9904	0.9904	0.9904	
	Meter Box ΔH@ - Field Sheet	1.7516	1.7516	1.7516	
	Meter Box ΔH@ - Database	1.7516	1.7516	1.7516	
QA/QC					
	Final Leak Check				
	(a) 4% of Sampling Rate (cfm)	0.0230	0.0233	0.0229	
	(b) Allowable Rate from Method (cfm)	0.0200	0.0200	0.0200	
	Allowable Limit - minimum of a and b (cfm)	0.0200	0.0200	0.0200	
	Actual Final Leak Rate (cfm)	0.0010	0.0040	0.0020	
	Sample Volume				
	Minimum Volume Required (dscf)	30.00	30.00	30.00	
V_{mstd}	Actual Sample Volume (dscf)	36.241	35.994	34.974	
	Alternative Method 5 Post-Test Calibration (EPA ALT-009)				
$\sqrt{\Delta H_{avg}}$	Average of Square Root of ΔH (in. W.C.)	1.0278	1.0303	1.0096	
Y_{qa}	Alternative Meter Calibration Factor	0.9869	0.9867	0.9886	**Average**
	Variation from full-test Y_d (average ≤ ±5%)	-0.3%	-0.4%	-0.2%	**-0.3%**
	Mean Isokinetic Sampling Rate Variation				
	Minimum Allowable (%)	90	90	90	
	Maximum Allowable (%)	110	110	110	
%I	Actual Variation (%)	101.00	100.55	100.01	
	Point-by-Point Isokinetic Variation				
	Number of points <90%	0	0	0	
	Number of points >110%	0	0	0	
	Number of points <80%	0	0	0	
	Number of points >120%	0	0	0	

042010 114600
LPI@

Prepared by Clean Air Engineering Proprietary Software
SS ISOKINETIC Version 2006-13d

Copyright © 2006 Clean Air Engineering Inc.

QA/QC ________
Date ________

Wheelabrator South Broward, Inc.
Clean Air Project No: 10955
Unit 3 FF Outlet

USEPA Method 13B (Total Fluorides)
QA/QC Results

	Run No.	**1**	**2**	**3**	
	Date (2010)	Mar 23	Mar 23	Mar 23	
	Start Time (approx.)	12:41	14:31	15:54	
	Stop Time (approx.)	13:54	15:39	17:02	
	Total Duration of Test Run (min.)	73	68	68	
	Net Sampling Time (min.)	63	63	63	
	Sampling System Calibration Summary				
	Nozzle ID No:	0.268-1	0.268-1	0.268-1	
D_n	Nozzle Diameter (in):	0.268	0.268	0.268	
	Probe ID No:	67-8-14	67-8-14	67-8-14	
C_p	Pitot Coefficient:	0.8120	0.8120	0.8120	
	Meter Box ID. No:	85-4	85-4	85-4	
Y_d	Meter Box Yd - Field Sheet	1.0085	1.0085	1.0085	
	Meter Box Yd - Database	1.0085	1.0085	1.0085	
	Meter Box ΔH@ - Field Sheet	1.7723	1.7723	1.7723	
	Meter Box ΔH@ - Database	1.7723	1.7723	1.7723	
	QA/QC				
	Final Leak Check				
	(a) 4% of Sampling Rate (cfm)	0.0232	0.0242	0.0230	
	(b) Allowable Rate from Method (cfm)	0.0200	0.0200	0.0200	
	Allowable Limit - minimum of a and b (cfm)	0.0200	0.0200	0.0200	
	Actual Final Leak Rate (cfm)	0.0030	0.0010	0.0020	
	Sample Volume				
	Minimum Volume Required (dscf)	30.00	30.00	30.00	
V_{mstd}	Actual Sample Volume (dscf)	35.654	37.181	35.412	
	Alternative Method 5 Post-Test Calibration (EPA ALT-009)				
$\sqrt{\Delta H}_{avg}$	Average of Square Root of ΔH (in. W.C.)	1.0531	1.0826	1.0023	
Y_{qa}	Alternative Meter Calibration Factor	1.0191	1.0039	0.9755	**Average**
	Variation from full-test Y_d (average ≤ ±5%)	1.0%	-0.5%	-3.3%	**-0.9%**
	Mean Isokinetic Sampling Rate Variation				
	Minimum Allowable (%)	90	90	90	
	Maximum Allowable (%)	110	110	110	
%I	Actual Variation (%)	100.70	101.05	104.13	
	Point-by-Point Isokinetic Variation				
	Number of points <90%	1	2	0	
	Number of points >110%	1	1	3	
	Number of points <80%	1	0	0	
	Number of points >120%	0	0	1	

042010 114600
RKL@

Prepared by Clean Air Engineering Proprietary Software
SS ISOKINETIC Version 2006-13d

Copyright © 2006 Clean Air Engineering Inc.

QA/QC ________
Date ________

Wheelabrator South Broward, Inc.
Clean Air Project No: 10955
Unit 2 FF Outlet

USEPA Method 23 (PCDD/F)
QA/QC Results

	Run No.	1	2	3	
	Date (2010)	Mar 22	Mar 23	Mar 23	
	Start Time (approx.)	10:04	07:36	12:32	
	Stop Time (approx.)	14:44	12:10	17:02	
	Total Duration of Test Run (min.)	280	274	270	
	Net Sampling Time (min.)	250	250	250	
Sampling System Calibration Summary					
	Nozzle ID No:	264-1	264-1	264-1	
D_n	Nozzle Diameter (in):	0.264	0.264	0.264	
	Probe ID No:	67-8-17	67-8-17	67-8-17	
C_p	Pitot Coefficient:	0.8340	0.8340	0.8340	
	Meter Box ID. No:	66-24	66-24	66-24	
Y_d	Meter Box Yd - Field Sheet	0.9904	0.9904	0.9904	
	Meter Box Yd - Database	0.9904	0.9904	0.9904	
	Meter Box ΔH@ - Field Sheet	1.7516	1.7516	1.7516	
	Meter Box ΔH@ - Database	1.7516	1.7516	1.7516	
QA/QC					
	Final Leak Check				
	(a) 4% of Sampling Rate (cfm)	0.0226	0.0233	0.0234	
	(b) Allowable Rate from Method (cfm)	0.0200	0.0200	0.0200	
	Allowable Limit - minimum of a and b (cfm)	0.0200	0.0200	0.0200	
	Actual Final Leak Rate (cfm)	0.0040	0.0030	0.0030	
	Sample Volume				
	Minimum Volume Required (dscf)	30.00	30.00	30.00	
V_{mstd}	Actual Sample Volume (dscf)	139.505	142.831	141.781	
	Alternative Method 5 Post-Test Calibration (EPA ALT-009)				
$\sqrt{\Delta H}_{avg}$	Average of Square Root of ΔH (in. W.C.)	1.0005	1.0269	1.0257	
Y_{qa}	Alternative Meter Calibration Factor	0.9887	0.9866	0.9876	**Average**
	Variation from full-test Y_d (average ≤ ±5%)	-0.2%	-0.4%	-0.3%	**-0.3%**
	Mean Isokinetic Sampling Rate Variation				
	Minimum Allowable (%)	90	90	90	
	Maximum Allowable (%)	110	110	110	
%I	Actual Variation (%)	100.67	100.45	101.50	
	Point-by-Point Isokinetic Variation				
	Number of points <90%	0	0	0	
	Number of points >110%	0	0	0	
	Number of points <80%	0	0	0	
	Number of points >120%	0	0	0	

042010 114630
HNP@

Prepared by Clean Air Engineering Proprietary Software
SS ISOKINETIC Version 2006-13d

Copyright © 2006 Clean Air Engineering Inc.

QA/QC ________
Date ________

Wheelabrator South Broward, Inc.
Clean Air Project No: 10955
Unit 1 FF Outlet

USEPA Method 26A (HCl)
QA/QC Results

Run No.		**1**	**2**	**3**	
Date (2010)		Mar 22	Mar 22	Mar 22	
Start Time (approx.)		08:31	09:58	11:30	
Stop Time (approx.)		09:31	10:58	12:47	
Total Duration of Test Run (min.)		60	60	77	
Net Sampling Time (min.)		60	60	60	
Sampling System Calibration Summary					
	Nozzle ID No:	NA	NA	NA	
D_n	Nozzle Diameter (in):	NA	NA	NA	
	Probe ID No:	67-4-3	67-4-3	67-4-3	
C_p	Pitot Coefficient:	0.8400	0.8400	0.8400	
	Meter Box ID. No:	66-22	66-22	66-22	
Y_d	Meter Box Yd - Field Sheet	1.0005	1.0005	1.0005	
	Meter Box Yd - Database	1.0005	1.0005	1.0005	
	Meter Box ΔH@ - Field Sheet	1.8097	1.8097	1.8097	
	Meter Box ΔH@ - Database	1.8097	1.8097	1.8097	
QA/QC					
	Final Leak Check				
	(a) 4% of Sampling Rate (cfm)	0.0275	0.0275	0.0273	
	(b) Allowable Rate from Method (cfm)	0.0200	0.0200	0.0200	
	Allowable Limit - minimum of a and b (cfm)	0.0200	0.0200	0.0200	
	Actual Final Leak Rate (cfm)	0.0010	0.0010	0.0014	
	Sample Volume				
	Minimum Volume Required (dscf)	30.00	30.00	30.00	
V_{mstd}	Actual Sample Volume (dscf)	41.758	41.689	41.487	
	Alternative Method 5 Post-Test Calibration (EPA ALT-009)				
$\sqrt{\Delta H}_{avg}$	Average of Square Root of ΔH (in. W.C.)	1.2247	1.2247	1.2247	
Y_{qa}	Alternative Meter Calibration Factor	0.9714	0.9717	0.9764	**Average**
	Variation from full-test Y_d (average ≤ ±5%)	-2.9%	-2.9%	-2.4%	**-2.7%**

042010 114659
ONK@

Prepared by Clean Air Engineering Proprietary Software
SS ISOKINETIC Version 2006-13d

Copyright © 2006 Clean Air Engineering Inc.

QA/QC ________
Date ________

Wheelabrator South Broward, Inc.
Clean Air Project No: 10955
Unit 1 SDA Inlet

USEPA Method 26A (HCl)
QA/QC Results

	Run No.	**1**	**2**	**3**	
	Date (2010)	Mar 22	Mar 22	Mar 22	
	Start Time (approx.)	08:31	09:58	11:30	
	Stop Time (approx.)	09:31	10:58	12:46	
	Total Duration of Test Run (min.)	60	60	76	
	Net Sampling Time (min.)	60	60	60	
Sampling System Calibration Summary					
	Nozzle ID No:	NA	NA	NA	
D_n	Nozzle Diameter (in):	NA	NA	NA	
	Probe ID No:	67-4-1	67-4-1	67-4-5	
C_p	Pitot Coefficient:	0.8400	0.8400	0.8400	
	Meter Box ID. No:	61-8	61-8	61-8	
Y_d	Meter Box Yd - Field Sheet	0.9916	0.9916	0.9916	
	Meter Box Yd - Database	0.9916	0.9916	0.9916	
	Meter Box $\Delta H@$ - Field Sheet	1.7580	1.7580	1.7580	
	Meter Box $\Delta H@$ - Database	1.7580	1.7580	1.7580	
QA/QC					
	Final Leak Check				
	(a) 4% of Sampling Rate (cfm)	0.0234	0.0241	0.0238	
	(b) Allowable Rate from Method (cfm)	0.0200	0.0200	0.0200	
	Allowable Limit - minimum of a and b (cfm)	0.0200	0.0200	0.0200	
	Actual Final Leak Rate (cfm)	0.0040	0.0080	0.0050	
	Sample Volume				
	Minimum Volume Required (dscf)	30.00	30.00	30.00	
V_{mstd}	Actual Sample Volume (dscf)	35.186	36.040	35.520	
	Alternative Method 5 Post-Test Calibration (EPA ALT-009)				
$\sqrt{\Delta H_{avg}}$	Average of Square Root of ΔH (in. W.C.)	1.0595	1.0916	1.0954	
Y_{qa}	Alternative Meter Calibration Factor	1.0011	1.0029	1.0189	**Average**
	Variation from full-test Y_d (average $\leq \pm 5\%$)	1.0%	1.1%	2.8%	**1.6%**

042010 114709
JQJ@

Prepared by Clean Air Engineering Proprietary Software
SS ISOKINETIC Version 2006-13d

Copyright © 2006 Clean Air Engineering Inc.

QA/QC ________
Date ________

Wheelabrator South Broward, Inc.
Clean Air Project No: 10955
Unit 2 FF Outlet

USEPA Method 26A (HCl)
QA/QC Results

	Run No.	1	2	3	
	Date (2010)	Mar 23	Mar 23	Mar 23	
	Start Time (approx.)	07:55	09:30	10:55	
	Stop Time (approx.)	08:55	10:31	12:06	
	Total Duration of Test Run (min.)	60	61	71	
	Net Sampling Time (min.)	60	60	60	
Sampling System Calibration Summary					
	Nozzle ID No:	NA	NA	NA	
D_n	Nozzle Diameter (in):	NA	NA	NA	
	Probe ID No:	67-4-3	67-4-3	67-4-3	
C_p	Pitot Coefficient:	0.8400	0.8400	0.8400	
	Meter Box ID. No:	85-2	85-2	85-2	
Y_d	Meter Box Yd - Field Sheet	1.0066	1.0066	1.0066	
	Meter Box Yd - Database	1.0066	1.0066	1.0066	
	Meter Box ΔH@ - Field Sheet	1.7759	1.7759	1.7759	
	Meter Box ΔH@ - Database	1.7759	1.7759	1.7759	
QA/QC					
	Final Leak Check				
	(a) 4% of Sampling Rate (cfm)	0.0267	0.0270	0.0275	
	(b) Allowable Rate from Method (cfm)	0.0200	0.0200	0.0200	
	Allowable Limit - minimum of a and b (cfm)	0.0200	0.0200	0.0200	
	Actual Final Leak Rate (cfm)	0.0050	0.0010	0.0020	
	Sample Volume				
	Minimum Volume Required (dscf)	30.00	30.00	30.00	
V_{mstd}	Actual Sample Volume (dscf)	40.081	39.969	40.827	
	Alternative Method 5 Post-Test Calibration (EPA ALT-009)				
$\sqrt{\Delta H_{avg}}$	Average of Square Root of ΔH (in. W.C.)	1.2247	1.2247	1.2247	
Y_{qa}	Alternative Meter Calibration Factor	1.0191	1.0150	0.9947	**Average**
	Variation from full-test Y_d (average ≤ ±5%)	1.2%	0.8%	-1.2%	**0.3%**

042010 114717
OKQ@

Prepared by Clean Air Engineering Proprietary Software
SS ISOKINETIC Version 2006-13d

Copyright © 2006 Clean Air Engineering Inc.

QA/QC ________
Date ________

Wheelabrator South Broward, Inc.
Clean Air Project No: 10955
Unit 2 SDA Inlet

USEPA Method 26A (HCl)
QA/QC Results

	Run No.	**1**	**2**	**3**	
	Date (2010)	Mar 23	Mar 23	Mar 23	
	Start Time (approx.)	07:55	09:30	10:55	
	Stop Time (approx.)	08:55	10:30	12:06	
	Total Duration of Test Run (min.)	60	60	71	
	Net Sampling Time (min.)	60	60	60	
	Sampling System Calibration Summary				
	Nozzle ID No:	NA	NA	NA	
D_n	Nozzle Diameter (in):	NA	NA	NA	
	Probe ID No:	67-4-5	67-4-5	67-4-5	
C_p	Pitot Coefficient:	0.8400	0.8400	0.8400	
	Meter Box ID. No:	66-11	66-11	66-11	
Y_d	Meter Box Yd - Field Sheet	0.9933	0.9933	0.9933	
	Meter Box Yd - Database	0.9933	0.9933	0.9933	
	Meter Box ΔH@ - Field Sheet	1.8619	1.8619	1.8619	
	Meter Box ΔH@ - Database	1.8619	1.8619	1.8619	
	QA/QC				
	Final Leak Check				
	(a) 4% of Sampling Rate (cfm)	0.0233	0.0236	0.0234	
	(b) Allowable Rate from Method (cfm)	0.0200	0.0200	0.0200	
	Allowable Limit - minimum of a and b (cfm)	0.0200	0.0200	0.0200	
	Actual Final Leak Rate (cfm)	0.0050	0.0040	0.0040	
	Sample Volume				
	Minimum Volume Required (dscf)	30.00	30.00	30.00	
V_{mstd}	Actual Sample Volume (dscf)	34.596	34.433	34.040	
	Alternative Method 5 Post-Test Calibration (EPA ALT-009)				
$\sqrt{\Delta H}_{avg}$	Average of Square Root of ΔH (in. W.C.)	1.0916	1.0954	1.0954	
Y_{qa}	Alternative Meter Calibration Factor	1.0134	1.0137	1.0208	**Average**
	Variation from full-test Y_d (average ≤ ±5%)	2.0%	2.1%	2.8%	**2.3%**

042010 114725
KOH@

Prepared by Clean Air Engineering Proprietary Software
SS ISOKINETIC Version 2008-13d

Copyright © 2008 Clean Air Engineering Inc.

QA/QC ________
Date ________

Wheelabrator South Broward, Inc.
Clean Air Project No: 10955
Unit 3 FF Outlet

USEPA Method 26A (HCl)
QA/QC Results

	Run No.	1	2	3	
	Date (2010)	Mar 24	Mar 24	Mar 24	
	Start Time (approx.)	07:45	09:16	10:54	
	Stop Time (approx.)	08:45	10:16	11:54	
	Total Duration of Test Run (min.)	60	60	60	
	Net Sampling Time (min.)	60	60	60	
Sampling System Calibration Summary					
	Nozzle ID No:	NA	NA	NA	
D_n	Nozzle Diameter (in):	NA	NA	NA	
	Probe ID No:	67-4-3	67-4-3	67-4-3	
C_p	Pitot Coefficient:	0.8400	0.8400	0.8400	
	Meter Box ID. No:	66-14	66-14	66-14	
Y_d	Meter Box Yd - Field Sheet	0.9898	0.9898	0.9898	
	Meter Box Yd - Database	0.9898	0.9898	0.9898	
	Meter Box ΔH@ - Field Sheet	1.7643	1.7643	1.7643	
	Meter Box ΔH@ - Database	1.7643	1.7643	1.7643	
QA/QC					
	Final Leak Check				
	(a) 4% of Sampling Rate (cfm)	0.0268	0.0277	0.0277	
	(b) Allowable Rate from Method (cfm)	0.0200	0.0200	0.0200	
	Allowable Limit - minimum of a and b (cfm)	0.0200	0.0200	0.0200	
	Actual Final Leak Rate (cfm)	0.0020	0.0010	0.0020	
	Sample Volume				
	Minimum Volume Required (dscf)	30.00	30.00	30.00	
V_{mstd}	Actual Sample Volume (dscf)	40.207	40.731	39.977	
	Alternative Method 5 Post-Test Calibration (EPA ALT-009)				
$\sqrt{\Delta H}_{avg}$	Average of Square Root of ΔH (in. W.C.)	1.2247	1.2247	1.2247	
Y_{qa}	Alternative Meter Calibration Factor	1.0098	0.9857	0.9959	**Average**
	Variation from full-test Y_d (average ≤ ±5%)	2.0%	-0.4%	0.6%	**0.7%**

042010 114734
QLK@

Prepared by Clean Air Engineering Proprietary Software
SS ISOKINETIC Version 2006-13d

Copyright © 2008 Clean Air Engineering Inc.

QA/QC ________
Date ________

Wheelabrator South Broward, Inc.
Clean Air Project No: 10955
Unit 3 SDA Inlet

USEPA Method 26A (HCl)
QA/QC Results

	Run No.	**1**	**2**	**3**	
	Date (2010)	Mar 24	Mar 24	Mar 24	
	Start Time (approx.)	07:45	09:16	10:54	
	Stop Time (approx.)	08:45	10:16	11:54	
	Total Duration of Test Run (min.)	60	60	60	
	Net Sampling Time (min.)	60	60	60	
Sampling System Calibration Summary					
	Nozzle ID No:	NA	NA	NA	
D_n	Nozzle Diameter (in):	NA	NA	NA	
	Probe ID No:	*67-4-5*	*67-4-5*	*67-4-5*	
C_p	Pitot Coefficient:	0.8400	0.8400	0.8400	
	Meter Box ID. No:	61-6	61-6	61-6	
Y_d	Meter Box Yd - Field Sheet	0.9900	0.9900	0.9900	
	Meter Box Yd - Database	0.9900	0.9900	0.9900	
	Meter Box ΔH@ - Field Sheet	1.6820	1.6820	1.6820	
	Meter Box ΔH@ - Database	1.6820	1.6820	1.6820	
QA/QC					
	Final Leak Check				
	(a) 4% of Sampling Rate (cfm)	0.0240	0.0244	0.0247	
	(b) Allowable Rate from Method (cfm)	0.0200	0.0200	0.0200	
	Allowable Limit - minimum of a and b (cfm)	0.0200	0.0200	0.0200	
	Actual Final Leak Rate (cfm)	0.0040	0.0030	0.0040	
	Sample Volume				
	Minimum Volume Required (dscf)	30.00	30.00	30.00	
V_{mstd}	Actual Sample Volume (dscf)	36.062	36.226	36.488	
	Alternative Method 5 Post-Test Calibration (EPA ALT-009)				
$\sqrt{\Delta H}_{avg}$	Average of Square Root of ΔH (in. W.C.)	1.0954	1.0916	1.0954	
Y_{qa}	Alternative Meter Calibration Factor	1.0320	1.0162	1.0089	**Average**
	Variation from full-test Y_d (average ≤ ±5%)	4.2%	2.7%	1.9%	**2.9%**

042010 114745
MJK@

Prepared by Clean Air Engineering Proprietary Software
SS ISOKINETIC Version 2006-13d

Copyright © 2006 Clean Air Engineering Inc.

QA/QC ________
Date ________

Nozzle Calibration Sheet

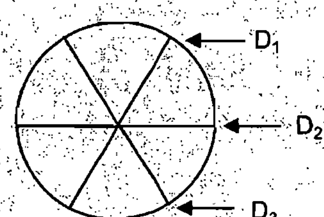
Client	Wheelabrator North Broward	Project Number	10955
Calibrated by	S. Brown	Unit	1-3 (Both Plants)
Date	3/15/10	Runs	-3

	Nozzle Identification	D_1 (inches)	D_2 (inches)	D_3 (inches)	ΔD (inches)	D_{ave} (inches)
5/29	0.270-1	0.270	0.270	0.271	0.001	0.270
M23	0.264-1	0.265	0.264	0.263	0.002	0.264
M13B	0.268-1	0.269	0.268	0.268	0.001	0.268
inlet	0.270-2	0.271	0.270	0.270	0.001	0.270
	0.270-3	0.270	0.270	0.270	0.000	0.270

D_1, D_2, D_3 = three nozzle diameter measurements

ΔD = maximum difference between any two diameters ΔD = 0.004 inches*

D_{ave} = average of D_1, D_2, D_3



* (40 CFR 60, Appendix A, Method 5, Section 5.1)

QA/QC SB
Date 3/24/10

CleanAir ENGINEERING

CDS005A-Nozzle.xls, August 2004
Copyright © 2004 Clean Air Engineering, Inc.

Meter Box Full Test Calibration

Meter Box No: 61-6

Date of Calibration: 7/17/2009

Meter Box Y_d: 0.9900

Calibration conducted by: OLEG LAVROV

Meter Box ΔH@: 1.6820

Barometric Pressure: 29.04

				Standard Meter Gas Volume (ft³)			Meter Box Gas Volume (ft³)			Std. Meter Temperature (°F)			Meter Box Temperature (°F)			Time (min.)	Calibration Results	
Q	ΔH	ΔP	Y_{ds}	Initial	Final	V_{ds} Net	Initial	Final	V_d Net	In	Out	T_{ds} Avg.	In	T_o Out	T_d Avg.	Θ	Y_d	ΔH@
0.965	3.00	-1.70	1.0000	0.000	10.000	10.000	209.181	219.284	10.103	77.0	77.0	77.00	85.0	77.0	81.00	9.89	0.9854	1.7309
0.971	3.00	-1.70	1.0000	0.000	10.000	10.000	219.284	229.389	10.105	77.0	77.0	77.00	86.0	78.0	82.00	9.82	0.9870	1.7034
0.401	0.50	-1.00	1.0000	0.000	5.000	5.000	234.378	239.419	5.041	77.0	77.0	77.00	81.0	78.0	79.50	11.88	0.9927	1.6620
0.401	0.50	-1.00	1.0000	0.000	5.000	5.000	239.419	244.459	5.040	77.0	77.0	77.00	81.0	78.0	79.50	11.90	0.9929	1.6676
0.695	1.50	-1.50	1.0000	0.000	10.000	10.000	253.277	263.387	10.110	76.0	76.0	76.00	84.0	79.0	81.50	13.76	0.9917	1.6629
0.694	1.50	-1.50	1.0000	0.000	10.000	10.000	263.387	273.514	10.127	76.0	76.0	76.00	84.0	79.0	81.50	13.77	0.9900	1.6653
																Averages	0.98996	1.68200

Nomenclature

P_b	Barometric Pressure (in. Hg)
Q	Flow Rate (cfm)
ΔH	Orifice Pressure differential (in. H_2O)
ΔP	Inlet Pressure Differential (in. H_2O)
V_d	Gas Meter Volume - Dry (ft³)
V_{ds}	Standard Meter Volume - Dry (ft³)
T_d	Average Meter Box Temperature (°F)
T_o	Outlet Meter Box Temperature (°F)
T_{ds}	Average Standard Meter Temperature (°F)
Y_d	Meter Correction Factor (unitless), $Y_i \leq Y_{avg} \pm 0.02$
Y_{ds}	Standard Meter Correction Factor (unitless)
ΔH@	Orifice Pressure Differential giving 0.75 cfm of air at 68°F and 29.92 in. Hg (in. H_2O) $\Delta H@_i \leq \Delta H@_{avg} \pm 0.2$
Θ	Duration of Run (minutes)

Equations

$$Y_d = (Y_{ds})\left[\frac{V_{ds}}{V_d}\right]\left[\frac{T_d + 460}{T_{ds} + 460}\right]\left[\frac{P_b + \Delta P/13.6}{P_b + \Delta H/13.6}\right]$$

$$\Delta H@ = \frac{(0.0319)(\Delta H)}{P_b(T_o + 460)}\left[\frac{(T_{ds} + 460)\Theta}{(V_{ds})(Y_{ds})}\right]^2$$

$$Q = \frac{17.64(V_{ds})(P_b)}{(T_{ds} + 460)(\Theta)}$$

Vacuum Gauge

Standard (in.Hg)	Gauge (in.Hg)
5.6	5.0
10.7	10.0
15.4	15.0
20.4	20.0
24.8	24.7

CDS005C-Meter Full, April 2004a
Copyright © 2004 Clean Air Engineering Inc.

CleanAir ENGINEERING

Meter Box - Pyrometer Calibration Sheet

Meter Box No: 61-6

Office:

Calibrated by: OLEG LAVROV

Client:

Date: 1/18/08

Job No:

Temperature Scale Used: Fahrenheit

Type of Calibration: Full-Test

Calibration Reference Settings (°F)	Pyrometer Reading for each Channel (°F)						
	1 Stack	2 Probe	3 Filter	4 Imp Out	5 Aux	6 DGM In	7 DGM Out
50	49	51	50				
100	98	100	99				
150	148	150	150				
200	199	200	200				
250	249	250	250				
300	299	300	300				
350	349	350	350				
400	399	400	399				
450	449	450	450				
500	499	500	500				
550	548	550	550				
600	599	600	599				

Tolerance = ±2°F difference from reference setting.

Calibration Reference Information

Reference Used: Omega CL23A

Serial No: T-225950

Calibrated By: JH Metrology

Exp date : 6/22/2010

Calibration Report No: R044791

CDS005C-Meter Full, April 2004a
Copyright © 2004 Clean Air Engineering Inc.

CleanAir.
ENGINEERING

Meter Box Critical Orifice Post-Test Calibration Data

Project No. 10955
Location warehouse
Test Date 03/30/10
Operator E. Dieter

Meter No. 61-6
Meter Yd 0.9900
Meter ΔH@ 1.6820
Full Test Cal. Date 07/17/09

Orifice B-5
Orifice K' 0.5463
Orifice Cal. Date 01/28/10

Leak Checks

Negative Pressure
No movement of manometer in one-minute ☑ Pass

Positive Pressure
No movement of manometer in one-minute ☑ Pass

Important: All leak checks must pass in order for calibration to be valid.

Barom. Press. (P_b) 29.26 in. Hg

Run	Elapsed Time (minutes)	Meter Volume V_m (dcf)	Meter Temperature		Ambient Temp. T_{amb} (°F)	Orifice ΔH (in. W.C.)	Vacuum (in. Hg)	Net Run Time θ (minutes)	Net Meter Volume for Run V_m (dcf)	Avg Meter Temp. for Run T_m (°F)	DGM Calibration Factor Y_i	Percent Variation ΔY_i
			Inlet (°F)	Outlet (°F)								
	0.0	773.90	68	66								
1	5.0	777.48	68	66	71	1.50	19	5.0	3.58	67.0	0.9855	0.2%
2	10.0	781.07	70	66	71	1.50	19	5.0	3.59	67.5	0.9837	0.0%
3	15.0	784.66	71	67	74	1.50	19	5.0	3.59	68.5	0.9828	-0.1%
										Average Y_i	0.9840	
										Cal. Error	-0.6%	

Calculations and Specifications

$$Y_i = \frac{K' \times P_b \times (T_m + 460) \times \theta}{17.64 \times V_m \times \left(P_b + \Delta H/13.6\right) \times \sqrt{T_{amb} + 460}}$$

$$\Delta Y_i = \frac{Y_i - \overline{Y_i}}{\overline{Y_i}} \times 100 \qquad \text{Spec.: } \Delta Y_i \le \pm 2\%$$

$$Cal.Error = \frac{\overline{Y_i} - Y_d}{Y_d} \times 100 \qquad \text{Spec.: } Cal.Error \le \pm 5\%$$

CDS005B-Meter Post-CO, February 2004
Copyright © 2004 Clean Air Engineering, Inc.

CleanAir ENGINEERING

Meter Box Full Test Calibration

Meter Box No: 61-8

Date of Calibration: 5/11/2009

Calibration Conducted by: OLEG LAVROV

Meter Box Y_d: 0.9916

Meter Box ΔH@: 1.7580

Barometric Pressure: 29.39

				Standard Meter Gas Volume (ft^3)			Meter Box Gas Volume (ft^3)			Std. Meter Temperature (°F)			Meter Box Temperature (°F)			Time (min.)	Calibration Results	
Q	ΔH	ΔP	Y_{ds}	Initial	Final	V_{ds} Net	Initial	Final	V_d Net	T_{is} In	T_{os} Out	T_{ds} Avg.	T_i In	T_o Out	T_d Avg.	Θ	Y_d	ΔH@
0.984	3.00	-1.70	1.0000	0.000	10.000	10.000	62.712	72.772	10.060	68.0	68.0	68.00	73.0	69.0	71.00	9.98	0.9880	1.7092
0.972	3.00	-1.70	1.0000	0.000	10.000	10.000	72.772	82.872	10.100	68.0	68.0	68.00	76.0	70.0	73.00	10.10	0.9878	1.7472
0.387	0.50	-1.10	1.0000	0.000	5.000	5.000	86.333	91.393	5.060	68.0	68.0	68.00	75.0	72.0	73.50	12.68	0.9944	1.8290
0.385	0.50	-1.10	1.0000	0.000	5.000	5.000	91.393	96.466	5.073	68.0	68.0	68.00	75.0	73.0	74.00	12.76	0.9928	1.8487
0.692	1.50	-1.30	1.0000	0.000	10.000	10.000	98.815	108.963	10.148	68.0	68.0	68.00	78.0	73.0	75.50	14.19	0.9924	1.7147
0.694	1.50	-1.30	1.0000	0.000	10.000	10.000	108.963	119.111	10.148	68.0	68.0	68.00	79.0	74.0	76.50	14.14	0.9943	1.6994
																Averages	0.99164	1.75804

Nomenclature

- P_b Barometric Pressure (in. Hg)
- Q Flow Rate (cfm)
- ΔH Orifice Pressure differential (in. H_2O)
- ΔP Inlet Pressure Differential (in. H_2O)
- V_d Gas Meter Volume - Dry (ft^3)
- V_{ds} Standard Meter Volume - Dry (ft^3)
- T_d Average Meter Box Temperature (°F)
- T_o Outlet Meter Box Temperature (°F)
- T_{ds} Average Standard Meter Temperature (°F)
- Y_d Meter Correction Factor (unitless), $Y_i \leq Y_{avg} \pm 0.02$
- Y_{ds} Standard Meter Correction Factor (unitless)
- ΔH@ Orifice Pressure Differential giving 0.75 cfm of air at 68°F and 29.92 in. Hg (in. H_2O) $\Delta H@_i \leq \Delta H@_{avg} \pm 0.2$
- Θ Duration of Run (minutes)

Equations

$$Y_d = (Y_{ds})\left[\frac{V_{ds}}{V_d}\right]\left[\frac{T_d + 460}{T_{ds} + 460}\right]\left[\frac{P_b + \Delta P/13.6}{P_b + \Delta H/13.6}\right]$$

$$\Delta H@ = \frac{(0.0319)(\Delta H)}{P_b(T_o + 460)}\left[\frac{(T_{ds} + 460)\Theta}{(V_{ds})(Y_{ds})}\right]^2$$

$$Q = \frac{17.64(V_{ds})(P_b)}{(T_{ds} + 460)(\Theta)}$$

Vacuum Gauge

Standard (in.Hg)	Gauge (in.Hg)
4.7	5.0
9.6	10.0
14.6	15.0
19.5	20.0
23.3	24.0

CDS005C-Meter Full, April 2004a
Copyright © 2004 Clean Air Engineering Inc

CleanAir ENGINEERING

Meter Box - Pyrometer Calibration Sheet

Meter Box No: 61-8

Office:

Calibrated by: OLEG LAVROV

Client:

Date: 5/11/09

Job No:

Temperature Scale Used: Fahrenheit

Type of Calibration: Full-Test

Calibration Reference Settings (°F)	Pyrometer Reading for each Channel (°F)						
	1 Stack	2 Probe	3 Filter	4 Imp Out	5 Aux	6 DGM In	7 DGM Out
50	49	49	48				
100	99	99	98				
150	149	149	149				
200	199	199	199				
250	250	249	249				
300	300	299	299				
350	350	349	350				
400	400	399	399				
450	450	449	449				
500	500	499	499				
550	549	549	549				
600	599	599	599				

Tolerance = ±2°F difference from reference setting.

Calibration Reference Information

Reference Used: Omega CL23A

Serial No: T-225950

Calibrated By: JH Metrology

Exp. Date: 10/13/2009

Calibration Report No: R044791

CDS005C-Meter Full, April 2004a
Copyright © 2004 Clean Air Engineering Inc

CleanAir
ENGINEERING

Meter Box Critical Orifice Post-Test Calibration Data

Project No.	10955	Meter No.	61-8	Orifice	B-5
Location	warehouse	Meter Yd	0.9916	Orifice K'	0.5463
Test Date	03/30/10	Meter ΔH@	1.7580	Orifice Cal. Date	01/28/10
Operator	E. Dieter	Full Test Cal. Date	05/11/09		

Leak Checks

Negative Pressure

No movement of manometer in one-minute ☑ Pass

Positive Pressure

No movement of manometer in one-minute ☑ Pass

Important: All leak checks must pass in order for calibration to be valid.

Barom. Press. (P_b) 29.26 in. Hg

Run	Elapsed Time (minutes)	Meter Volume (dcf)	Meter Temperature Inlet (°F)	Meter Temperature Outlet (°F)	Ambient Temp. T_{amb} (°F)	Orifice ΔH (in. W.C.)	Vacuum (in. Hg)	Net Run Time, θ (minutes)	Net Meter Volume for Run, V_m (dcf)	Avg Meter Temp. for Run, T_m (°F)	DGM Calibration Factor, Y_i	Percent Variation ΔY_i
	0.0	535.20	71	68								
1	5.0	538.80	72	69	71	1.50	15	5.0	3.60	70.0	0.9856	-0.2%
2	10.0	542.40	73	69	73	1.50	15	5.0	3.60	70.8	0.9851	-0.2%
3	15.0	545.99	74	70	71	1.50	15	5.0	3.59	71.5	0.9911	0.4%
										Average Y_i	0.9873	
										Cal. Error	-0.4%	

Calculations and Specifications

$$Y_i = \frac{K' \times P_b \times (T_m + 460) \times \theta}{17.64 \times V_m \times \left(P_b + \Delta H / 13.6\right) \times \sqrt{T_{amb} + 460}}$$

$$\Delta Y_i = \frac{Y_i - \overline{Y_i}}{\overline{Y_i}} \times 100 \qquad \text{Spec.: } \Delta Y_i \le \pm 2\%$$

$$Cal.Error = \frac{\overline{Y_i} - Y_d}{Y_d} \times 100 \qquad \text{Spec.: } Cal.Error \le \pm 5\%$$

CleanAir ENGINEERING

CDS005B-Meter Post-CO, February 2004
Copyright © 2004 Clean Air Engineering, Inc.

Meter Box Full Test Calibration

Meter Box No: 66-11

Date of Calibration: 10/14/2009 **Meter Box Y_d:** 0.9933

Calibration Conducted by: OLEG LAVROV **Meter Box ΔH@:** 1.8619

Barometric Pressure: 29.45

				Standard Meter Gas Volume (ft^3)			Meter Box Gas Volume (ft^3)			Std. Meter Temperature (°F)			Meter Box Temperature (°F)			Time (min.)	Calibration Results	
Q	ΔH	ΔP	Y_{ds}	Initial	Final	V_{ds} Net	Initial	Final	V_d Net	T_{is} In	T_{os} Out	T_{ds} Avg.	T_i In	T_o Out	T_d Avg.	Θ	Y_d	ΔH@
0.942	3.00	-1.90	1.0000	0.000	10.000	10.000	527.575	537.612	10.037	69.5	69.5	69.50	78.0	70.0	74.00	10.42	0.9926	1.8665
0.943	3.00	-1.90	1.0000	0.000	10.000	10.000	537.612	547.671	10.059	69.5	69.5	69.50	80.0	72.0	76.00	10.40	0.9941	1.8523
0.374	0.50	-1.30	1.0000	0.000	5.000	5.000	551.323	556.370	5.047	69.5	69.5	69.50	76.0	73.0	74.50	13.12	0.9956	1.9616
0.376	0.50	-1.30	1.0000	0.000	5.500	5.500	556.370	561.927	5.557	69.5	69.5	69.50	76.0	74.0	75.00	14.37	0.9955	1.9411
0.679	1.50	-1.50	1.0000	0.000	10.000	10.000	565.835	576.002	10.167	69.5	69.5	69.50	81.0	75.0	78.00	14.44	0.9919	1.7755
0.679	1.50	-1.50	1.0000	0.000	10.000	10.000	576.002	586.200	10.198	69.5	69.5	69.50	81.0	76.0	78.50	14.45	0.9898	1.7746
																Averages	0.99325	1.86192

Nomenclature

- P_b Barometric Pressure (in. Hg)
- Q Flow Rate (cfm)
- ΔH Orifice Pressure differential (in. H_2O)
- ΔP Inlet Pressure Differential (in. H_2O)
- V_d Gas Meter Volume - Dry (ft^3)
- V_{ds} Standard Meter Volume - Dry (ft^3)
- T_d Average Meter Box Temperature (°F)
- T_o Outlet Meter Box Temperature (°F)
- T_{ds} Average Standard Meter Temperature (°F)
- Y_d Meter Correction Factor (unitless), $Y_i \leq Y_{avg} \pm 0.02$
- Y_{ds} Standard Meter Correction Factor (unitless)
- ΔH@ Orifice Pressure Differential giving 0.75 cfm of air at 68°F and 29.92 in. Hg (in. H_2O) $\Delta H@_i \leq \Delta H@_{avg} \pm 0.2$
- Θ Duration of Run (minutes)

Equations

$$Y_d = (Y_{ds})\left[\frac{V_{ds}}{V_d}\right]\left[\frac{T_d + 460}{T_{ds} + 460}\right]\left[\frac{P_b + \Delta P/13.6}{P_b + \Delta H/13.6}\right]$$

$$\Delta H@ = \frac{(0.0319)(\Delta H)}{P_b(T_o + 460)}\left[\frac{(T_{ds} + 460)\Theta}{(V_{ds})(Y_{ds})}\right]^2$$

$$Q = \frac{17.64(V_{ds})(P_b)}{(T_{ds} + 460)(\Theta)}$$

Vacuum Gauge

Standard (in.Hg)	Gauge (in.Hg)
4.7	5.0
9.7	10.0
14.9	15.0
20.5	20.0
24.9	25.0

CDS005C-Meter Full, April 2004a
Copyright © 2004 Clean Air Engineering Inc.

CleanAir ENGINEERING

Meter Box - Pyrometer Calibration Sheet

Meter Box No: 66-11 | Office: ______

Calibrated by: OLEG LAVROV | Client: ______

Date: 10/14/09 | Job No: ______

Temperature Scale Used: Fahrenheit | Type of Calibration: Full-Test

Calibration Reference Settings (°F)	Pyrometer Reading for each Channel (°F)						
	1 Stack	2 Probe	3 Filter	4 Imp Out	5 Aux	6 DGM In	7 DGM Out
50	50	52	51				
100	100	101	101				
150	150	151	151				
200	200	201	201				
250	250	251	251				
300	300	301	301				
350	349	351	351				
400	399	401	400				
450	449	451	450				
500	499	501	500				
550	549	551	550				
600	599	601	600				

Tolerance = ±2°F difference from reference setting.

Calibration Reference Information

Reference Used: Omega CL23A | Serial No: T-225950

Calibrated By: JH Metrology | Exp Date : 10/7/2010

Calibration Report No: R044701

CDS005C-Meter Full, April 2004e
Copyright © 2004 Clean Air Engineering Inc

CleanAir ENGINEERING

Meter Box Critical Orifice Post-Test Calibration Data

Project No. 10955
Location warehouse
Test Date 03/29/10
Operator E. Dieter

Meter No. 66-11
Meter Yd 0.9933
Meter $\Delta H@$ 1.8619
Full Test Cal. Date 10/14/09

Orifice B-5
Orifice K' 0.5463
Orifice Cal. Date 01/28/10

Leak Checks

Negative Pressure
No movement of manometer in one-minute ☑ Pass

Positive Pressure
No movement of manometer in one-minute ☑ Pass

Important: All leak checks must pass in order for calibration to be valid.

Barom. Press. (P_b) 29.26 in. Hg

Run	Elapsed Time (minutes)	Meter Volume (dcf)	Meter Temperature Inlet (°F)	Meter Temperature Outlet (°F)	Ambient Temp - T_{amb} (°F)	Orifice ΔH (in. W.C.)	Vacuum (in. Hg)	Net Run Time - θ (minutes)	Net Meter Volume for Run - V_m (dcf)	Avg Meter Temp. for Run T_m (°F)	DGM Calibration Factor - Y_i	Percent Variation - ΔY_i
	0.0	916.90	67	59								
1	5.0	920.43	67	59	72	1.60	20	5.0	3.53	63.0	0.9907	0.0%
2	10.0	923.97	68	61	71	1.60	20	5.0	3.54	63.8	0.9902	-0.1%
3	15.0	927.51	70	62	72	1.60	20	5.0	3.54	65.3	0.9921	0.1%
										Average Y_i	0.9910	
										Cal. Error	-0.2%	

Calculations and Specifications

$$Y_i = \frac{K' \times P_b \times (T_m + 460) \times \theta}{17.64 \times V_m \times \left(P_b + \Delta H/13.6\right) \times \sqrt{T_{amb} + 460}}$$

$$\Delta Y_i = \frac{Y_i - \overline{Y_i}}{\overline{Y_i}} \times 100 \qquad \text{Spec.}: \Delta Y_i \le \pm 2\%$$

$$Cal.Error = \frac{\overline{Y_i} - Y_d}{Y_d} \times 100 \qquad \text{Spec.}: Cal.Error \le \pm 5\%$$

CDS005B-Meter Post-CO, February 2004
Copyright © 2004 Clean Air Engineering, Inc.

CleanAir ENGINEERING

Meter Box Full Test Calibration

Meter Box No: 66-14

Date of Calibration: 8/17/2009

Meter Box Y_d: 0.9898

Calibration Conducted by: O. Lavrov

Meter Box $\Delta H@$: 1.7643

Barometric Pressure: 29.21

				Standard Meter Gas Volume (ft³)			Meter Box Gas Volume (ft³)			Std. Meter Temperature (°F)			Meter Box Temperature (°F)			Time (min.)	Calibration Results	
Q	ΔH	ΔP	Y_{ds}	Initial	Final	V_{ds} Net	Initial	Final	V_d Net	T_{is} In	T_{os} Out	T_{ds} Avg.	T_i In	T_o Out	T_d Avg.	Θ	Y_d	ΔH@
0.943	3.00	-1.80	1.0000	0.000	10.000	10.000	473.148	483.260	10.112	77.0	77.0	77.00	86.0	79.0	82.50	10.18	0.9871	1.8165
0.938	3.00	-1.80	1.0000	0.000	10.000	10.000	483.260	493.403	10.143	77.0	77.0	77.00	88.0	81.0	84.50	10.23	0.9877	1.8276
0.392	0.50	-1.20	1.0000	0.000	5.000	5.000	502.282	507.357	5.075	77.0	77.0	77.00	85.0	82.0	83.50	12.24	0.9929	1.7410
0.392	0.50	-1.20	1.0000	0.000	5.000	5.000	507.357	512.444	5.087	77.0	77.0	77.00	85.0	82.0	83.50	12.25	0.9905	1.7439
0.680	1.50	-1.40	1.0000	0.000	10.000	10.000	521.145	531.347	10.202	77.5	77.5	77.50	89.0	84.0	86.50	14.09	0.9894	1.7272
0.680	1.50	-1.40	1.0000	0.000	10.000	10.000	531.347	541.532	10.185	77.5	77.5	77.50	89.0	84.0	86.50	14.10	0.9910	1.7296
																Averages	0.98976	1.76429

E - 29

Nomenclature	
P_b	Barometric Pressure (in. Hg)
Q	Flow Rate (cfm)
ΔH	Orifice Pressure differential (in. H_2O)
ΔP	Inlet Pressure Differential (in. H_2O)
V_d	Gas Meter Volume - Dry (ft³)
V_{ds}	Standard Meter Volume - Dry (ft³)
T_d	Average Meter Box Temperature (°F)
T_o	Outlet Meter Box Temperature (°F)
T_{ds}	Average Standard Meter Temperature (°F)
Y_d	Meter Correction Factor (unitless), $Y_i \leq Y_{avg} \pm 0.02$
Y_{ds}	Standard Meter Correction Factor (unitless)
ΔH@	Orifice Pressure Differential giving 0.75 cfm of air at 68°F and 29.92 in. Hg (in. H_2O) $\Delta H@_i \leq \Delta H@_{avg} \pm 0.2$
Θ	Duration of Run (minutes)

Equations

$$Y_d = (Y_{ds})\left[\frac{V_{ds}}{V_d}\right]\left[\frac{T_d + 460}{T_{ds} + 460}\right]\left[\frac{P_b + \Delta P/13.6}{P_b + \Delta H/13.6}\right]$$

$$\Delta H@ = \frac{(0.0319)(\Delta H)}{P_b(T_o + 460)}\left[\frac{(T_{ds} + 460)\Theta}{(V_{ds})(Y_{ds})}\right]^2$$

$$Q = \frac{17.64(V_{ds})(P_b)}{(T_{ds} + 460)(\Theta)}$$

Vacuum Gauge

Standard (in.Hg)	Gauge (in.Hg)
5.6	5.0
10.5	10.0
15.8	15.0
20.6	20.0
25.2	25.0

Copyright © 2004 Clean Air Engineering Inc.

CleanAir ENGINEERING

Meter Box - Pyrometer Calibration Sheet

Meter Box No: 66-14 Office:

Calibrated by: O. Lavrov Client:

Date: 8/17/09 Job No:

Temperature Scale Used: Fahrenheit Type of Calibration: Full-Test

Calibration Reference Settings (°F)	Pyrometer Reading for each Channel (°F)						
	1 Stack	2 Probe	3 Filter	4 Imp Out	5 Aux	6 DGM In	7 DGM Out
50	49	51	52				
100	99	101	102				
150	149	151	151				
200	199	201	202				
250	249	251	252				
300	299	301	302				
350	349	351	351				
400	399	401	402				
450	449	451	452				
500	499	501	502				
550	549	551	551				
600	599	601	602				

Tolerance = ±2°F difference from reference setting.

Calibration Reference Information

Reference Used: Omega CL23A Serial No: T-225950

Calibrated By: JH Metrology Exp.date : 6/22/2010

Calibration Report No: R044701

CleanAir ENGINEERING

CDS005C-Meter Full, April 2004a
Copyright © 2004 Clean Air Engineering Inc

Meter Box Critical Orifice Post-Test Calibration Data

Project No.	10955	Meter No.	66-14	Orifice	C-5		
Location	warehouse	Meter Yd	0.9898	Orifice K'	0.5643		
Test Date	03/30/10	Meter ΔH@	1.7643	Orifice Cal. Date	02/03/10		
Operator	E. Dieter	Full Test Cal. Date	08/17/09				

Leak Checks

Negative Pressure

No movement of manometer in one-minute ☑ Pass

Positive Pressure

No movement of manometer in one-minute ☑ Pass

Important: All leak checks must pass in order for calibration to be valid.

Barom. Press. (P_b) 29.26 in. Hg

Run	Elapsed Time (minutes)	Meter Volume (dcf)	Meter Temperature Inlet (°F)	Meter Temperature Outlet (°F)	Ambient Temp., T_{amb} (°F)	Orifice ΔH (in. W.C.)	Vacuum (in. Hg)	Net Run Time, θ (minutes)	Net Meter Volume for Run, V_m (dcf)	Avg Meter Temp. for Run T_m (°F)	DGM Calibration Factor, Y_i	Percent Variation ΔY_i
	0.0	753.30	73	71								
1	5.0	756.99	72	70	74	1.70	19	5.0	3.69	71.5	0.9927	0.0%
2	10.0	760.71	74	71	74	1.70	19	5.0	3.72	71.8	0.9852	-0.8%
3	15.0	764.38	75	71	73	1.70	19	5.0	3.67	72.8	1.0014	0.8%
										Average Y_i	0.9931	
										Cal. Error	0.3%	

Calculations and Specifications

$$Y_i = \frac{K' \times P_b \times (T_m + 460) \times \theta}{17.64 \times V_m \times \left(P_b + \Delta H / 13.6\right) \times \sqrt{T_{amb} + 460}}$$

$$\Delta Y_i = \frac{Y_i - \overline{Y_i}}{\overline{Y_i}} \times 100 \qquad \text{Spec.: } \Delta Y_i \le \pm 2\%$$

$$Cal.Error = \frac{\overline{Y_i} - Y_d}{Y_d} \times 100 \qquad \text{Spec.: } Cal.Error \le \pm 5\%$$

CDS005B-Meter Post-CO, February 2004

Copyright © 2004 Clean Air Engineering, Inc.

CleanAir. ENGINEERING

Meter Box Full Test Calibration

Meter Box No: 66-22

Date of Calibration: 10/29/2009

Meter Box Y_d: 1.0005

Calibration Conducted by: Jeff Ivens

Meter Box ΔH@: 1.8097

Signature:

Barometric Pressure: 29.30

				Standard Meter Gas Volume (ft^3)			Meter Box Gas Volume (ft^3)			Std. Meter Temperature (°F)			Meter Box Temperature (°F)			Time (min.)	Calibration Results	
Q	ΔH	ΔP	Y_{ds}	Initial	Final	V_{ds} Net	Initial	Final	V_d Net	T_{is} In	T_{os} Out	T_{ds} Avg.	T_i In	T_o Out	T_d Avg.	Θ	Y_d	ΔH@
0.973	3.00	-1.80	1.0000	0.000	10.000	10.000	631.172	641.189	10.017	68.5	68.5	68.50	80.0	73.0	76.50	10.05	1.0013	1.7288
0.969	3.00	-1.80	1.0000	0.000	10.000	10.000	641.189	651.236	10.047	68.5	68.5	68.50	81.0	73.0	77.00	10.09	0.9992	1.7426
0.376	0.50	-1.30	1.0000	0.000	5.000	5.000	706.600	711.641	5.041	69.5	69.5	69.50	78.0	76.0	77.00	12.97	1.0014	1.9160
0.376	0.50	-1.20	1.0000	0.000	5.000	5.000	711.641	716.682	5.041	69.5	69.5	69.50	78.0	76.0	77.00	12.97	1.0016	1.9160
0.676	1.50	-1.50	1.0000	0.000	10.000	10.000	723.300	733.419	10.119	69.5	69.5	69.50	83.0	77.0	80.00	14.44	1.0003	1.7779
0.676	1.50	-1.50	1.0000	0.000	10.000	10.000	733.419	743.556	10.137	69.5	69.5	69.50	83.0	78.0	80.50	14.45	0.9994	1.7771
																Averages	1.00054	1.80972

Nomenclature

- P_b Barometric Pressure (in. Hg)
- Q Flow Rate (cfm)
- ΔH Orifice Pressure differential (in. H_2O)
- ΔP Inlet Pressure Differential (in. H_2O)
- V_d Gas Meter Volume - Dry (ft^3)
- V_{ds} Standard Meter Volume - Dry (ft^3)
- T_d Average Meter Box Temperature (°F)
- T_o Outlet Meter Box Temperature (°F)
- T_{ds} Average Standard Meter Temperature (°F)
- Y_d Meter Correction Factor (unitless), $Y_i \le Y_{avg} \pm 0.02$
- Y_{ds} Standard Meter Correction Factor (unitless)
- ΔH@ Orifice Pressure Differential giving 0.75 cfm of air at 68°F and 29.92 in. Hg (in. H_2O) $\Delta H@_i \le \Delta H@_{avg} \pm 0.2$
- Θ Duration of Run (minutes)

Equations

$$Y_d = (Y_{ds})\left[\frac{V_{ds}}{V_d}\right]\left[\frac{T_d+460}{T_{ds}+460}\right]\left[\frac{P_b+\Delta P/13.6}{P_b+\Delta H/13.6}\right]$$

$$\Delta H@ = \frac{(0.0319)(\Delta H)}{P_b(T_o+460)}\left[\frac{(T_{ds}+460)\Theta}{(V_{ds})(Y_{ds})}\right]^2$$

$$Q = \frac{17.64(V_{ds})(P_b)}{(T_{ds}+460)(\Theta)}$$

Vacuum Gauge

Standard (in.Hg)	Gauge (in.Hg)
5.5	5.0
10.2	10.0
15.3	15.0
20.5	20.0
25.2	25.0

COS005C-Meter Full, April 2004a
Copyright © 2004 Clean Air Engineering Inc

CleanAir ENGINEERING

Meter Box - Pyrometer Calibration Sheet

Meter Box No: 66-22 Office: ______

Calibrated by: Jeff Ivens Client: ______

Date: 10/29/09 Job No: ______

Temperature Scale Used: Fahrenheit Type of Calibration: Full-Test

Calibration Reference Settings (°F)	Pyrometer Reading for each Channel (°F)						
	1 Stack	2 Probe	3 Filter	4 Imp Out	5 Aux	6 DGM In	7 DGM Out
50	49	51	51				
100	99	101	101				
150	149	151	151				
200	199	201	201				
250	249	251	251				
300	299	301	301				
350	349	351	351				
400	399	401	401				
450	449	451	451				
500	498	501	501				
550	548	551	551				
600	598	601	601				

Tolerance = ±2°F difference from reference setting.

Calibration Reference Information

Reference Used: Omega CL23A Serial No: T-225950

Calibrated By: JH Metrology Exp. Date: 10/7/2010

Calibration Report No: R044791

CDS005C-Meter Full, April 2004

Copyright © 2004 Clean Air Engineering Inc.

CleanAir ENGINEERING

Meter Box Critical Orifice Post-Test Calibration Data

Project No.	10955	Meter No.	66-22	Orifice	B-5
Location	warehouse	Meter Yd	1.0005	Orifice K'	0.5463
Test Date	03/29/10	Meter ΔH@	1.8097	Orifice Cal. Date	01/28/10
Operator	E. Dieter	Full Test Cal. Date	10/29/09		

Leak Checks

Negative Pressure

No movement of manometer in one-minute ☑ Pass

Positive Pressure

No movement of manometer in one-minute ☑ Pass

Important: All leak checks must pass in order for calibration to be valid.

Barom. Press. (P_b) 29.26 in. Hg

Run #	Elapsed Time (minutes)	Meter Volume (dcf)	Meter Temperature Inlet (°F)	Meter Temperature Outlet (°F)	Ambient Temp., T_{amb} (°F)	Orifice ΔH (in. W.C.)	Vacuum (in. Hg)	Net Run Time, Θ (minutes)	Net Meter Volume for Run, V_m (dcf)	Avg Meter Temp. for Run T_m (°F)	DGM Calibration Factor, Y_i	Percent Variation ΔY_i
	0.0	625.20	59	52								
1	5.0	628.67	62	54	71	1.50	20	5.0	3.47	56.8	0.9969	0.1%
2	10.0	632.15	64	56	72	1.50	20	5.0	3.48	59.0	0.9975	0.2%
3	15.0	635.65	66	58	75	1.50	20	5.0	3.50	61.0	0.9928	-0.3%
										Average Y_i	0.9957	
										Cal. Error	-0.5%	

Calculations and Specifications

$$Y_i = \frac{K' \times P_b \times (T_m + 460) \times \theta}{17.64 \times V_m \times \left(P_b + \Delta H/13.6\right) \times \sqrt{T_{amb} + 460}}$$

$$\Delta Y_i = \frac{Y_i - \overline{Y_i}}{\overline{Y_i}} \times 100 \qquad \text{Spec.: } \Delta Y_i \le \pm 2\%$$

$$Cal.Error = \frac{\overline{Y_i} - Y_d}{Y_d} \times 100 \qquad \text{Spec.: } Cal.Error \le \pm 5\%$$

CDS005B-Meter Post-CO, February 2004
Copyright © 2004 Clean Air Engineering, Inc.

CleanAir ENGINEERING

Meter Box Full Test Calibration

Meter Box No: 66-24

Date of Calibration: 8/19/2009

Calibration Conducted by: OLEG LAVROV

Meter Box Y_d: 0.9904

Meter Box ΔH@: 1.7516

Barometric Pressure: 29.15

				Standard Meter Gas Volume (ft^3)			Meter Box Gas Volume (ft^3)			Std. Meter Temperature (°F)			Meter Box Temperature (°F)			Time (min.)	Calibration Results	
Q	ΔH	ΔP	Y_{ds}	Initial	Final	V_{ds} Net	Initial	Final	V_d Net	T_{is} In	T_{os} Out	T_{ds} Avg.	T_i In	T_o Out	T_d Avg.	Θ	Y_d	ΔH@
0.962	3.00	-1.80	1.0000	0.000	10.000	10.000	580.884	591.020	10.136	76.5	76.5	76.50	86.0	79.0	82.50	9.96	0.9856	1.7392
0.967	3.00	-1.80	1.0000	0.000	10.000	10.000	591.020	601.178	10.158	76.5	76.5	76.50	89.0	80.0	84.50	9.91	0.9871	1.7186
0.381	0.50	-1.10	1.0000	0.000	5.000	5.000	615.932	621.024	5.092	77.0	77.0	77.00	86.0	84.0	85.00	12.58	0.9925	1.8361
0.381	0.50	-1.10	1.0000	0.000	5.000	5.000	621.024	626.117	5.093	77.0	77.0	77.00	87.0	85.0	86.00	12.58	0.9942	1.8327
0.685	1.50	-1.50	1.0000	0.000	10.000	10.000	629.337	639.566	10.229	77.0	77.0	77.00	92.0	86.0	89.00	13.98	0.9919	1.6944
0.685	1.50	-1.50	1.0000	0.000	10.000	10.000	639.566	649.822	10.256	77.0	77.0	77.00	93.0	87.0	90.00	13.97	0.9911	1.6889
																Averages	0.99042	1.75163

Nomenclature

- P_b Barometric Pressure (in. Hg)
- Q Flow Rate (cfm)
- ΔH Orifice Pressure differential (in. H_2O)
- ΔP Inlet Pressure Differential (in. H_2O)
- V_d Gas Meter Volume - Dry (ft^3)
- V_{ds} Standard Meter Volume - Dry (ft^3)
- T_d Average Meter Box Temperature (°F)
- T_o Outlet Meter Box Temperature (°F)
- T_{ds} Average Standard Meter Temperature (°F)
- Y_d Meter Correction Factor (unitless), $Y_i \leq Y_{avg} \pm 0.02$
- Y_{ds} Standard Meter Correction Factor (unitless)
- ΔH@ Orifice Pressure Differential giving 0.75 cfm of air at 68°F and 29.92 in. Hg (in. H_2O) $\Delta H@_i \leq \Delta H@_{avg} \pm 0.2$
- Θ Duration of Run (minutes)

Equations

$$Y_d = (Y_{ds})\left[\frac{V_{ds}}{V_d}\right]\left[\frac{T_d + 460}{T_{ds} + 460}\right]\left[\frac{P_b + \Delta P/13.6}{P_b + \Delta H/13.6}\right]$$

$$\Delta H@ = \frac{(0.0319)(\Delta H)}{P_b(T_o + 460)}\left[\frac{(T_{ds} + 460)\Theta}{(V_{ds})(Y_{ds})}\right]^2$$

$$Q = \frac{17.64(V_{ds})(P_b)}{(T_{ds} + 460)(\Theta)}$$

Vacuum Gauge

Standard (in.Hg)	Gauge (in.Hg)
4.7	5.0
9.8	10.0
14.7	15.0
20.0	20.0
24.2	25.0

CleanAir

CD3005C-Meter Full, April 2004a
Copyright © 2004 Clean Air Engineering Inc.

Meter Box - Pyrometer Calibration Sheet

Meter Box No: 66-24 Office:

Calibrated by: OLEG LAVROV Client:

Date: 8/19/09 Job No:

Temperature Scale Used: Fahrenheit Type of Calibration: Full-Test

Calibration Reference Settings (°F)	Pyrometer Reading for each Channel (°F)						
	1 Stack	2 Probe	3 Filter	4 Imp Out	5 Aux	6 DGM In	7 DGM Out
50	49	48	48				
100	99	98	98				
150	149	148	148				
200	199	198	198				
250	249	248	248				
300	299	298	299				
350	349	348	349				
400	399	398	398				
450	450	448	449				
500	499	498	499				
550	549	548	549				
600	599	598	599				

Tolerance = ±2°F difference from reference setting.

Calibration Reference Information

Reference Used: Omega CL23A Serial No: T-225950

Calibrated By: JH Metrology Exp. Date : 6/22/2010

Calibration Report No: RO44791

CDS005C-Meter Full, April 2004a
Copyright © 2004 Clean Air Engineering Inc.

CleanAir ENGINEERING

Meter Box Critical Orifice Post-Test Calibration Data

Project No. 10955

Location warehouse

Test Date 03/30/10

Operator E. Dieter

Meter No. 66-24

Meter Yd 0.9904

Meter ΔH@ 1.7516

Full Test Cal. Date 08/19/09

Orifice B-5

Orifice K' 0.5463

Orifice Cal. Date 01/28/10

Leak Checks

Negative Pressure

No movement of manometer in one-minute

☑ Pass

Positive Pressure

No movement of manometer in one-minute

☑ Pass

Important: All leak checks must pass in order for calibration to be valid.

Barom. Press. (P_b) 29.26 in. Hg

Run	Elapsed Time (minutes)	Meter Volume (dcf)	Meter Temperature Inlet (°F)	Meter Temperature Outlet (°F)	Ambient Temp. - T_{amb} (°F)	Orifice ΔH (in. W.C.)	Vacuum (in. Hg)	Net Run Time - θ (minutes)	Net Meter Volume for Run - V_m (dcf)	Avg Meter Temp. for Run - T_m (°F)	DGM Calibration Factor - Y_i	Percent Variation ΔY_i
	0.0	253.50	69	67								
1	5.0	257.08	70	67	71	1.50	20	5.0	3.58	68.3	0.9878	0.2%
2	10.0	260.67	71	67	72	1.50	20	5.0	3.59	68.8	0.9851	-0.1%
3	15.0	264.26	73	69	74	1.50	20	5.0	3.59	70.0	0.9856	-0.1%
										Average Y_i	0.9861	
										Cal. Error	-0.4%	

Calculations and Specifications

$$Y_i = \frac{K' \times P_b \times (T_m + 460) \times \theta}{17.64 \times V_m \times \left(P_b + \Delta H/13.6\right) \times \sqrt{T_{amb} + 460}}$$

$$\Delta Y_i = \frac{Y_i - \overline{Y_i}}{\overline{Y_i}} \times 100 \qquad \text{Spec.: } \Delta Y_i \le \pm 2\%$$

$$Cal.Error = \frac{\overline{Y_i} - Y_d}{Y_d} \times 100 \qquad \text{Spec.: } Cal.Error \le \pm 5\%$$

CDS005B-Meter Post-CO, February 2004
Copyright © 2004 Clean Air Engineering, Inc.

CleanAir ENGINEERING

Meter Box Full Test Calibration

Meter Box No: 85-2

Date of Calibration: 11/17/2009

Meter Box Y_d: 1.0066

Calibration Conducted by: OLEG LAVROV

Meter Box $\Delta H@$: 1.7759

Barometric Pressure: 29.35

				Standard Meter Gas Volume (ft³)			Meter Box Gas Volume (ft³)			Std. Meter Temperature (°F)			Meter Box Temperature (°F)			Time (min.)	Calibration Results	
Q	ΔH	ΔP	Y_{ds}	Initial	Final	V_{ds} Net	Initial	Final	V_d Net	T_{is} In	T_{os} Out	T_{ds} Avg.	T_i In	T_o Out	T_d Avg.	Θ	Y_d	ΔH@
0.966	3.00	-1.70	1.0000	0.000	10.000	10.000	200.383	210.311	9.928	67.5	67.5	67.50	77.0	74.0	75.50	10.16	1.0106	1.7539
0.959	3.00	-1.70	1.0000	0.000	10.000	10.000	210.311	220.285	9.974	67.5	67.5	67.50	80.0	75.0	77.50	10.23	1.0097	1.7748
0.388	0.50	-1.10	1.0000	0.000	5.000	5.000	222.808	227.844	5.036	68.0	68.0	68.00	75.0	75.0	75.00	12.65	1.0020	1.8126
0.388	0.50	-1.10	1.0000	0.000	5.000	5.000	227.844	232.882	5.038	68.0	68.0	68.00	75.0	75.0	75.00	12.65	1.0016	1.8126
0.683	1.50	-1.50	1.0000	0.000	10.000	10.000	237.848	247.883	10.035	68.0	68.0	68.00	81.0	75.0	78.00	14.36	1.0078	1.7518
0.683	1.50	-1.50	1.0000	0.000	10.000	10.000	247.883	257.913	10.030	68.0	68.0	68.00	81.0	75.0	78.00	14.35	1.0083	1.7494
																Averages	1.00665	1.77586

Nomenclature

- P_b Barometric Pressure (in. Hg)
- Q Flow Rate (cfm)
- ΔH Orifice Pressure differential (in. H_2O)
- ΔP Inlet Pressure Differential (in. H_2O)
- V_d Gas Meter Volume - Dry (ft³)
- V_{ds} Standard Meter Volume - Dry (ft³)
- T_d Average Meter Box Temperature (°F)
- T_o Outlet Meter Box Temperature (°F)
- T_{ds} Average Standard Meter Temperature (°F)
- Y_d Meter Correction Factor (unitless), $Y_i \le Y_{avg} \pm 0.02$
- Y_{ds} Standard Meter Correction Factor (unitless)
- ΔH@ Orifice Pressure Differential giving 0.75 cfm of air at 68°F and 29.92 in. Hg (in. H_2O) $\Delta H@_i \le \Delta H@_{avg} \pm 0.2$
- Θ Duration of Run (minutes)

Equations

$$Y_d = (Y_{ds})\left[\frac{V_{ds}}{V_d}\right]\left[\frac{T_d + 460}{T_{ds} + 460}\right]\left[\frac{P_b + \Delta P/13.6}{P_b + \Delta H/13.6}\right]$$

$$\Delta H@ = \frac{(0.0319)(\Delta H)}{P_b(T_o + 460)}\left[\frac{(T_{ds} + 460)\Theta}{(V_{ds})(Y_{ds})}\right]^2$$

$$Q = \frac{17.64(V_{ds})(P_b)}{(T_{ds} + 460)(\Theta)}$$

Vacuum Gauge

Standard (in.Hg)	Gauge (in.Hg)
4.9	5.0
10.1	10.0
15.3	15.0
20.5	20.0
25.3	25.0

CDS005C-Meter Full, April 2004a
Copyright © 2004 Clean Air Engineering Inc.

CleanAir.

Meter Box - Pyrometer Calibration Sheet

Meter Box No: 85-2

Office:

Calibrated by: OLEG LAVROV

Client:

Date: 11/17/09

Job No:

Temperature Scale Used: Fahrenheit

Type of Calibration: Full-Test

Calibration Reference Settings (°F)	Pyrometer Reading for each Channel (°F)						
	1 Stack	2 Probe	3 Filter	4 Imp Out	5 Aux	6 DGM In	7 DGM Out
50	49	52	51				
100	98	101	101				
150	149	151	151				
200	200	201	201				
250	251	252	251				
300	301	301	301				
350	350	348	351				
400	400	401	400				
450	450	451	450				
500	500	502	500				
550	550	551	550				
600	600	602	600				

Tolerance = ±2°F difference from reference setting.

Calibration Reference Information

Reference Used: Omega CL23A

Serial No: T-225950

Calibrated By: JH Metrology

Exp. Date: 10/7/2010

Calibration Report No: R044791

CDS005C-Meter Full, April 2004a

Copyright © 2004 Clean Air Engineering Inc

CleanAir. ENGINEERING

Meter Box Critical Orifice Post-Test Calibration Data

Project No.	10955	Meter No.	85-2	Orifice	C-5
Location	warehouse	Meter Yd	1.0066	Orifice K'	0.5643
Test Date	03/29/10	Meter ΔH@	1.7759	Orifice Cal. Date	02/03/10
Operator	E. Dieter	Full Test Cal. Date	11/17/09		

Leak Checks

Negative Pressure

No movement of manometer in one-minute ☑ Pass

Positive Pressure

No movement of manometer in one-minute ☑ Pass

Important: All leak checks must pass in order for calibration to be valid.

Barom. Press. (P_b) 29.26 in. Hg

Run	Elapsed Time (minutes)	Meter Volume (dcf)	Meter Temperature Inlet (°F)	Meter Temperature Outlet (°F)	Ambient Temp. T_{amb} (°F)	Orifice ΔH (in. W.C.)	Vacuum (in. Hg)	Net Run Time θ (minutes)	Net Meter Volume for Run V_m (dcf)	Avg Meter Temp. for Run T_m (°F)	DGM Calibration Factor Y_i	Percent Variation ΔY_i
	0.0	745.20	63	55								
1	5.0	748.71	65	56	73	1.60	19	5.0	3.51	59.8	1.0218	0.3%
2	10.0	752.24	66	58	75	1.60	19	5.0	3.53	61.3	1.0170	-0.2%
3	15.0	755.78	68	59	75	1.60	19	5.0	3.54	62.8	1.0171	-0.2%
										Average Y_i	1.0186	
										Cal. Error	1.2%	

Calculations and Specifications

$$Y_i = \frac{K' \times P_b \times (T_m + 460) \times \theta}{17.64 \times V_m \times \left(P_b + \Delta H/13.6\right) \times \sqrt{T_{amb} + 460}}$$

$$\Delta Y_i = \frac{Y_i - \overline{Y}_i}{\overline{Y}_i} \times 100 \qquad \text{Spec.: } \Delta Y_i \le \pm 2\%$$

$$Cal.Error = \frac{\overline{Y}_i - Y_d}{Y_d} \times 100 \qquad \text{Spec.: } Cal.Error \le \pm 5\%$$

CDS005B-Meter Post-CO, February 2004
Copyright © 2004 Clean Air Engineering, Inc.

CleanAir ENGINEERING

Meter Box Full Test Calibration

Meter Box No: 85-4

Date of Calibration: 11/25/2009

Calibration Conducted by: OLEG LAVROV

Meter Box Y_d: 1.0085

Meter Box ΔH@: 1.7723

Barometric Pressure: 29.09

				Standard Meter Gas Volume (ft³)			Meter Box Gas Volume (ft³)			Std. Meter Temperature (°F)			Meter Box Temperature (°F)			Time (min.)	Calibration Results	
Q	ΔH	ΔP	Y_{ds}	Initial	Final	V_{ds} Net	Initial	Final	V_d Net	T_{is} In	T_{os} Out	T_{ds} Avg.	T_i In	T_o Out	T_d Avg.	Θ	Y_d	ΔH@
0.965	3.00	-1.70	1.0000	0.000	11.000	11.000	278.946	289.808	10.862	67.5	67.5	67.50	76.0	69.0	72.50	11.09	1.0103	1.7589
0.954	3.00	-1.70	1.0000	0.000	10.000	10.000	289.808	299.707	9.899	67.5	67.5	67.50	79.0	71.0	75.00	10.20	1.0125	1.7936
0.385	0.50	-1.10	1.0000	0.000	5.000	5.000	304.068	309.063	4.995	67.5	67.5	67.50	76.0	72.0	74.00	12.62	1.0092	1.8270
0.385	0.50	-1.10	1.0000	0.000	5.000	5.000	309.063	314.066	5.003	67.5	67.5	67.50	76.0	73.0	74.50	12.65	1.0086	1.8322
0.687	1.50	-1.30	1.0000	0.000	10.000	10.000	345.224	355.314	10.090	67.5	67.5	67.50	81.0	76.0	78.50	14.15	1.0046	1.7097
0.687	1.50	-1.30	1.0000	0.000	10.000	10.000	355.314	365.392	10.078	67.5	67.5	67.50	81.0	76.0	78.50	14.16	1.0058	1.7122
																Averages	1.00850	1.77225

Nomenclature

- P_b Barometric Pressure (in. Hg)
- Q Flow Rate (cfm)
- ΔH Orifice Pressure differential (in. H_2O)
- ΔP Inlet Pressure Differential (in. H_2O)
- V_d Gas Meter Volume - Dry (ft³)
- V_{ds} Standard Meter Volume - Dry (ft³)
- T_d Average Meter Box Temperature (°F)
- T_o Outlet Meter Box Temperature (°F)
- T_{ds} Average Standard Meter Temperature (°F)
- Y_d Meter Correction Factor (unitless), $Y_i \leq Y_{avg} \pm 0.02$
- Y_{ds} Standard Meter Correction Factor (unitless)
- ΔH@ Orifice Pressure Differential giving 0.75 cfm of air at 68°F and 29.92 in. Hg (in. H_2O) $\Delta H@_i \leq \Delta H@_{avg} \pm 0.2$
- Θ Duration of Run (minutes)

Equations

$$Y_d = (Y_{ds})\left[\frac{V_{ds}}{V_d}\right]\left[\frac{T_d + 460}{T_{ds} + 460}\right]\left[\frac{P_b + \Delta P/13.6}{P_b + \Delta H/13.6}\right]$$

$$\Delta H@ = \frac{(0.0319)(\Delta H)}{P_b(T_o + 460)}\left[\frac{(T_{ds} + 460)\Theta}{(V_{ds})(Y_{ds})}\right]^2$$

$$Q = \frac{17.64(V_{ds})(P_b)}{(T_{ds} + 460)(\Theta)}$$

Vacuum Gauge

Standard (in.Hg)	Gauge (in.Hg)
5.1	5.0
9.9	10.0
15.1	15.0
19.5	20.0
24.8	25.0

CleanAir ENGINEERING

CD30050-Meter Full, April 2004e
Copyright © 2004 Clean Air Engineering Inc.

Meter Box - Pyrometer Calibration Sheet

Meter Box No: 85-4

Office:

Calibrated by: OLEG LAVROV

Client:

Date: 11/25/09

Job No:

Temperature Scale Used: Fahrenheit

Type of Calibration: Full-Test

Calibration Reference Settings (°F)	Pyrometer Reading for each Channel (°F)						
	1 Stack	2 Probe	3 Filter	4 Imp Out	5 Aux	6 DGM In	7 DGM Out
50	49	52	52				
100	99	102	102				
150	150	152	152				
200	200	202	202				
250	250	252	251				
300	300	302	301				
350	350	352	351				
400	400	401	401				
450	450	452	452				
500	500	501	501				
550	550	551	551				
600	600	601	601				

Tolerance = ±2°F difference from reference setting.

Calibration Reference Information

Reference Used: Omega CL23A

Serial No: T-225950

Calibrated By: JH Metrology

Exp date : 10/7/2010

Calibration Report No: R044701

CleanAir ENGINEERING

CDS005C-Meter Full, April 2004a
Copyright © 2004 Clean Air Engineering Inc

Meter Box Critical Orifice Post-Test Calibration Data

Project No. 10955

Location warehouse

Test Date 03/30/10

Operator E. Dieter

Meter No. 85-4

Meter Yd 1.0085

Meter ΔH@ 1.7723

Full Test Cal. Date 11/25/09

Orifice C-5

Orifice K' 0.5643

Orifice Cal. Date 02/03/10

Leak Checks

Negative Pressure

No movement of manometer in one-minute ☑ Pass

Positive Pressure

No movement of manometer in one-minute ☑ Pass

Important: All leak checks must pass in order for calibration to be valid.

Barom. Press. (P_b) 29.26 in. Hg

Run	Elapsed Time (minutes)	Meter Volume (dcf)	Meter Temperature Inlet (°F)	Meter Temperature Outlet (°F)	Ambient Temp. - T_{amb} (°F)	Orifice ΔH (in. W.C.)	Vacuum (in. Hg)	Net Run Time - θ (minutes)	Net Meter Volume for Run - V_m (dcf)	Avg Meter Temp. for Run T_m (°F)	DGM Calibration Factor - Y_i	Percent Variation ΔY_i
	0.0	77.40	70	67								
1	5.0	81.03	71	67	72	1.60	21	5.0	3.63	68.8	1.0061	0.0%
2	10.0	84.67	72	68	72	1.60	21	5.0	3.64	69.5	1.0047	-0.2%
3	15.0	88.30	73	68	73	1.60	21	5.0	3.63	70.3	1.0080	0.2%
										Average Y_i	1.0063	
										Cal. Error	-0.2%	

Calculations and Specifications

$$Y_i = \frac{K' \times P_b \times (T_m + 460) \times \theta}{17.64 \times V_m \times \left(P_b + \Delta H/13.6\right) \times \sqrt{T_{amb} + 460}}$$

$$\Delta Y_i = \frac{Y_i - \overline{Y_i}}{\overline{Y_i}} \times 100 \qquad \text{Spec.: } \Delta Y_i \le \pm 2\%$$

$$Cal.Error = \frac{\overline{Y_i} - Y_d}{Y_d} \times 100 \qquad \text{Spec.: } Cal.Error \le \pm 5\%$$

CDS005B-Meter Post-CO, February 2004
Copyright © 2004 Clean Air Engineering, Inc.

CleanAir ENGINEERING

Sample Probe Calibration

Probe Type: M5 with S-Type Pitot **I.D. Number:** 67-4-1
Project Number:

Thermocouple Calibration

Reference Type: Thermocouple Reference I.D. No: 15-078-39 Pyrometer I.D. No: 80512890 Units: °F

Point No.	Target Temp.	Reference Temp.	Indicated Temp.	Temp. Difference	% Difference*	Specification
1	Ambient	70	67	3	0.57%	
2	200°F-250°F	228	221	7	1.02%	%Difference ≤ 1.5

* Based on Absolute Temperature (Rankine)

Does thermocouple assembly meet specifications? ⟶ YES

Pitot Tube Calibration (Wind Tunnel Method @ 50 ft/sec)

Reference Pitot I.D. No: Wind Tunnel Reference Pitot Cp: 0.99

Pitot Side 'A' :

Trial No.	Reference ΔP	Probe ΔP	Probe $C_{p(S)}$*	Abs. Deviation from Avg. $C_{p(A)}$**
1	0.556	0.810	0.820	0.000
2	0.556	0.809	0.821	0.000
3	0.554	0.805	0.821	0.000
		Side 'A' Average Probe $C_{p(A)}$=	0.8207	0.0002

Specification
Avg. C_p Deviations ≤ 0.01

Pitot Side 'B' :

Trial No.	Reference ΔP	Probe ΔP	Probe $C_{p(S)}$*	Abs. Deviation from Avg. $C_{p(B)}$**
1	0.554	0.800	0.824	0.002
2	0.545	0.798	0.818	0.004
3	0.555	0.800	0.825	0.002
		Side 'B' Average Probe $C_{p(B)}$=	0.8223	0.0026

Specification
Avg. C_p Deviations ≤ 0.01

'A' Average C_p		'B' Average C_p		Difference	Specification
0.821	−	0.822	=	-0.001	|Difference| ≤ 0.01

Does assembly meet specifications? YES ⟶ **If "Yes", C_p= Average of Side 'A' and 'B' Cp values. If "No", Pitot must be replaced.**

$$^{*}C_{P(S)} = C_{P(STD)}\sqrt{\frac{\Delta p_{(STD)}}{\Delta p_{(S)}}}$$

$$^{**}\,Deviation = \left|C_{P(S)} - \overline{C}_{P\,(\text{A or B})}\right|$$

All specifications are from EPA-600/9-76-005 section 3.1

Probe Cp= 0.822 Calibrated by: R ARNOLD Date: 03/01/2010

CleanAir. ENGINEERING

CDS002C-Pitot_TNL, Dec 2008
Copyright © 2008 Clean Air Engineering Inc.

Sample Probe Calibration

Probe Type: M5 with S-Type Pitot **I.D. Number:** 67-4-5
Project Number:

Thermocouple Calibration

Reference Type: Thermocouple Reference I.D. No: 15-078-39 Pyrometer I.D. No: 80512890 Units: °F

Point No.	Target Temp.	Reference Temp.	Indicated Temp.	Temp. Difference	% Difference*	Specification
1	Ambient	69	67	2	0.38%	
2	200°F-250°F	241	237	4	0.57%	%Difference ≤ 1.5

* Based on Absolute Temperature (Rankine)

Does thermocouple assembly meet specifications? → **YES**

Pitot Tube Calibration (Wind Tunnel Method @49 ft/sec)

Reference Pitot I.D. No: Wind Tunnel Reference Pitot Cp: 0.99

Pitot Side 'A' :

Trial No.	Reference ΔP	Probe ΔP	Probe $C_{p(S)}$*	Abs. Deviation from Avg. $C_{p(A)}$**
1	0.551	0.773	0.836	0.001
2	0.549	0.778	0.832	0.003
3	0.555	0.777	0.837	0.002
		Side 'A' Average Probe $C_{p(A)}$=	0.8348	0.0021

Specification
Avg. C_p Deviations ≤ 0.01

Pitot Side 'B' :

Trial No.	Reference ΔP	Probe ΔP	Probe $C_{p(S)}$*	Abs. Deviation from Avg. $C_{p(B)}$**
1	0.566	0.772	0.847	0.003
2	0.557	0.777	0.838	0.006
3	0.568	0.775	0.847	0.003
		Side 'B' Average Probe $C_{p(B)}$=	0.8442	0.0039

Specification
Avg. C_p Deviations ≤ 0.01

'A' Average C_p		'B' Average C_p		Difference	Specification
0.835	−	0.844	=	-0.009	|Difference| ≤ 0.01

Does assembly meet specifications? **YES** → **If "Yes", C_p= Average of Side 'A' and 'B' Cp values. If "No", Pitot must be replaced.**

$$^{*}C_{P(S)} = C_{P(STD)}\sqrt{\frac{\Delta p_{(STD)}}{\Delta p_{(S)}}}$$

$$^{**}\,Deviation = \left|C_{P(S)} - \overline{C}_{P\,(\text{A or B})}\right|$$

All specifications are from EPA 600/9-76-005, section 3.1

Probe Cp= 0.839 Calibrated by: R ARNOLD Date: 03/01/2010

CleanAir ENGINEERING

CDS002C-Pitot_TNL, Dec 2008
Copyright © 2008 Clean Air Engineering Inc.

Sample Probe Calibration

Probe Type: M5 with S-Type Pitot **I.D. Number:** 67-8-4
Project Number:

Thermocouple Calibration

Reference Type: Thermocouple Reference I.D. No: 15-078-39 Pyrometer I.D. No: 80512890 Units: °F

Point No.	Target Temp.	Reference Temp.	Indicated Temp.	Temp. Difference	% Difference*	Specification
1	Ambient	75	70	5	0.93%	
2	200°F-250°F	246	240	6	0.85%	%Difference ≤ 1.5

* Based on Absolute Temperature (Rankine)

Does thermocouple assembly meet specifications? → **YES**

Pitot Tube Calibration (Wind Tunnel Method @ 49 ft/sec)

Reference Pitot I.D. No: Wind Tunnel Reference Pitot Cp: 0.99

Pitot Side 'A' :

Trial No.	Reference ΔP	Probe ΔP	Probe $C_{p(S)}$*	Abs. Deviation from Avg. $C_{p(A)}$**
1	0.538	0.814	0.805	0.000
2	0.540	0.815	0.806	0.001
3	0.539	0.816	0.805	0.001
		Side 'A' Average Probe $C_{p(A)}$=	0.8052	0.0008

Specification
Avg. C_p Deviations ≤ 0.01

Pitot Side 'B' :

Trial No.	Reference ΔP	Probe ΔP	Probe $C_{p(S)}$*	Abs. Deviation from Avg. $C_{p(B)}$**
1	0.542	0.818	0.806	0.002
2	0.536	0.814	0.803	0.001
3	0.538	0.818	0.803	0.001
		Side 'B' Average Probe $C_{p(B)}$=	0.8039	0.0012

Specification
Avg. C_p Deviations ≤ 0.01

'A' Average C_p		'B' Average C_p		Difference	Specification
0.805	−	0.804	=	0.001	|Difference| ≤ 0.01

Does assembly meet specifications? **YES** → **If "Yes", C_p= Average of Side 'A' and 'B' Cp values. If "No", Pitot must be replaced.**

$$^{*}C_{P(S)} = C_{P(STD)}\sqrt{\frac{\Delta p_{(STD)}}{\Delta p_{(S)}}}$$

$$^{**}Deviation = \left|C_{P(S)} - \overline{C}_{P\,(\mathrm{A\,or\,B})}\right|$$

All specifications are from EPA 600/9-76-005 section 3.1

Probe Cp= 0.805 Calibrated by: B. ARNOLD Date: 09/21/2009

CleanAir ENGINEERING

CDS002C-Pitot_TNL, Dec 2008
Copyright © 2008 Clean Air Engineering Inc.

Sample Probe Calibration

gP
67.8.14

Probe Type: M5 with S-Type Pitot

I.D. Number: 5G-~~96-11~~

Project Number: ——

Thermocouple Calibration

Reference Type: Thermocouple Reference I.D. No: 15-078-39 Pyrometer I.D. No: 80512890 Units: °F

Point No.	Target Temp.	Reference Temp.	Indicated Temp.	Temp. Difference	% Difference*	Specification
1	Ambient	75	72	3	0.56%	
2	200°F-250°F	247	254	-7	0.99%	%Difference ≤ 1.5

* Based on Absolute Temperature (Rankine)

Does thermocouple assembly meet specifications? ⟶ **YES**

Pitot Tube Calibration (Wind Tunnel Method @ 60 ft/sec)

Reference Pitot I.D. No: Wind Tunnel Reference Pitot Cp: 0.99

Pitot Side 'A':

Trial No.	Reference ΔP	Probe ΔP	Probe $C_{p(S)}$*	Abs. Deviation from Avg. $C_{p(A)}$**
1	0.547	0.808	0.815	0.001
2	0.548	0.813	0.813	0.001
3	0.548	0.811	0.814	0.000
		Side 'A' Average Probe $C_{p(A)}$=	0.8139	0.0008

Specification
Avg. C_p Deviations ≤ 0.01

Pitot Side 'B':

Trial No.	Reference ΔP	Probe ΔP	Probe $C_{p(B)}$*	Abs. Deviation from Avg. $C_{p(B)}$**
1	0.544	0.810	0.812	0.002
2	0.543	0.810	0.811	0.000
3	0.541	0.812	0.808	0.002
		Side 'B' Average Probe $C_{p(B)}$=	0.8102	0.0014

Specification
Avg. C_p Deviations ≤ 0.01

'A' Average C_p		'B' Average C_p		Difference	Specification
0.814	−	0.810	=	0.004	|Difference| ≤ 0.01

Does assembly meet specifications? **YES** ⟶ **If "Yes", C_p= Average of Side 'A' and 'B' Cp values. If "No", Pitot must be replaced.**

$$^{*}C_{P(S)} = C_{P(STD)}\sqrt{\frac{\Delta p_{(STD)}}{\Delta p_{(S)}}}$$

$$^{**}Deviation = \left|C_{P(S)} - \overline{C}_{P\,(\text{A or B})}\right|$$

All specifications are from EPA-600/9-76-005, section 3.1.

Probe Cp= 0.812 Calibrated by: R. ARNOLD Date: 09/21/2009

CleanAir ENGINEERING

CDS002C-Pitot_TNL, Dec 2008
Copyright © 2008 Clean Air Engineering Inc.

Sample Probe Calibration

Probe Type: M5 with S-Type Pitot **I.D. Number:** 67-8-17
Project Number:

Thermocouple Calibration

Reference Type: Thermocouple Reference I.D. No: 15-078-39 Pyrometer I.D. No: 80512890 Units: °F

Point No.	Target Temp.	Reference Temp.	Indicated Temp.	Temp. Difference	% Difference*	Specification
1	Ambient	69	71	-2	0.38%	
2	200°F-250°F	240	235	5	0.71%	%Difference ≤ 1.5

* Based on Absolute Temperature (Rankine)

Does thermocouple assembly meet specifications? → **YES**

Pitot Tube Calibration (Wind Tunnel Method @ 50 ft/sec)

Reference Pitot I.D. No: Wind Tunnel Reference Pitot Cp: 0.99

Pitot Side 'A' :

Trial No.	Reference ΔP	Probe ΔP	Probe $C_{p(S)}$*	Abs. Deviation from Avg. $C_{p(A)}$**
1	0.566	0.790	0.838	0.001
2	0.564	0.797	0.833	0.004
3	0.568	0.790	0.840	0.003
		Side 'A' Average Probe $C_{p(A)}$=	0.8368	0.0028

Specification
Avg. C_p Deviations ≤ 0.01

Pitot Side 'B' :

Trial No.	Reference ΔP	Probe ΔP	Probe $C_{p(S)}$*	Abs. Deviation from Avg. $C_{p(B)}$**
1	0.548	0.769	0.836	0.005
2	0.543	0.774	0.829	0.002
3	0.548	0.782	0.829	0.003
		Side 'B' Average Probe $C_{p(B)}$=	0.8315	0.0032

Specification
Avg. C_p Deviations ≤ 0.01

'A' Average C_p		'B' Average C_p		Difference	Specification
0.837	−	0.831	=	0.006	|Difference| ≤ 0.01

Does assembly meet specifications? **YES** → **If "Yes", C_p= Average of Side 'A' and 'B' Cp values. If "No", Pitot must be replaced.**

$$^{*}C_{P(S)} = C_{P(STD)}\sqrt{\frac{\Delta p_{(STD)}}{\Delta p_{(S)}}} \qquad ^{**}Deviation = \left|C_{P(S)} - \overline{C}_{P\,(\mathrm{A\ or\ B})}\right|$$

All specifications are from EPA 600/9-76-005, section 3.1.

Probe Cp= 0.834 Calibrated by: R ARNOLD Date: 03/04/2010

CleanAir ENGINEERING

CDS002C-Pitot_TNL, Dec 2008
Copyright © 2008 Clean Air Engineering Inc.

Sample Probe Calibration

Probe Type: M5 with S-Type Pitot **I.D. Number:** 67-10-3
Project Number:

Thermocouple Calibration

Reference Type: Thermocouple Reference I.D. No: 15-078-39 Pyrometer I.D. No: 80512890 Units: °F

Point No.	Target Temp.	Reference Temp.	Indicated Temp.	Temp. Difference	% Difference*	Specification
1	Ambient	72	76	-4	0.75%	
2	200°F-250°F	230	224	6	0.87%	%Difference ≤ 1.5

* Based on Absolute Temperature (Rankine)

Does thermocouple assembly meet specifications? → **YES**

Pitot Tube Calibration (Wind Tunnel Method @ 60 ft/sec)

Reference Pitot I.D. No: Wind Tunnel Reference Pitot Cp: 0.99

Pitot Side 'A' :

Trial No.	Reference ΔP	Probe ΔP	Probe $C_{p(S)}$*	Abs. Deviation from Avg. $C_{p(A)}$**
1	0.557	0.800	0.826	0.000
2	0.557	0.799	0.826	0.000
3	0.556	0.798	0.826	0.000
		Side 'A' Average Probe $C_{p(A)}$=	0.8259	0.0002

Specification
Avg. C_p Deviations ≤ 0.01

Pitot Side 'B' :

Trial No.	Reference ΔP	Probe ΔP	Probe $C_{p(S)}$*	Abs. Deviation from Avg. $C_{p(B)}$**
1	0.562	0.810	0.825	0.001
2	0.566	0.817	0.824	0.000
3	0.562	0.811	0.824	0.000
		Side 'B' Average Probe $C_{p(B)}$=	0.8244	0.0004

Specification
Avg. C_p Deviations ≤ 0.01

'A' Average C_p		'B' Average C_p		Difference	Specification
0.826	−	0.824	=	0.002	|Difference| ≤ 0.01

Does assembly meet specifications? **YES** → **If "Yes", C_p= Average of Side 'A' and 'B' Cp values. If "No", Pitot must be replaced.**

$$^{*}C_{P(S)} = C_{P(STD)}\sqrt{\frac{\Delta p_{(STD)}}{\Delta p_{(S)}}} \qquad ^{**}Deviation = \left|C_{P(S)} - \overline{C_{P}}_{(\text{A or B})}\right|$$

All specifications are from EPA-600/9-76-005, section 3.1

Probe Cp= 0.825 Calibrated by: R ARNOLD Date: 03/01/2010

CleanAir ENGINEERING

CDS002C-Pitot_TNL, Dec 2008
Copyright © 2008 Clean Air Engineering Inc.

AIR LIQUIDE Air Liquide America Specialty Gases LLC SCOTT™

Zero

Shipped From: 1290 COMBERMERE STREET
TROY MI 48083
Phone: 248-589-2950 Fax: 248-589-2134

CERTIFICATE OF ANALYSIS

CLEAN AIR ENGINEERING
SCOTT BROWN
500 WEST WOOD STREET

PALATINE IL 60067

PROJECT #: 05-76361-001
PO#: 24559-66-65000
ITEM #: 0501813 AL
DATE: 29May2009

CYLINDER #: AAL14589
FILL PRESSURE: 02000 PSIG

PURE MATERIAL: NITROGEN CAS# 7727-37-9

GRADE: ZERO GAS

PURITY: 99.998%

IMPURITY	MAXIMUM CONCENTRATIONS
THC	0.5 PPM

ANALYST: aOrcie

AIR LIQUIDE Air Liquide America Specialty Gases LLC Scott™

RATA CLASS

Dual-Analyzed Calibration Standard

1290 COMBERMERE STREET, TROY, MI 48083 Phone: 248-589-2950 Fax: 248-589-2134

CERTIFICATE OF ACCURACY: EPA Protocol Gas

Assay Laboratory

P.O. No.: 57534-71-65000

AIR LIQUIDE AMERICA SPECIALTY GASES LLC Project No.: 05-78153-003

1290 COMBERMERE STREET

TROY, MI 48083

Customer

CLEAN AIR ENGINEERING

DON ALLEN

500 W. WOOD STREET

PALATINE IL 60067

ANALYTICAL INFORMATION

This certification was performed according to EPA Traceability Protocol For Assay & Certification of Gaseous Calibration Standards; Procedure G-1; September, 1997.

Cylinder Number: ALM033730 **Certification Date:** 27Jul2009 **Exp. Date:** 26Jul2012

Cylinder Pressure*:** 2000 PSIG

COMPONENT	CERTIFIED CONCENTRATION (Moles)	ANALYTICAL ACCURACY**	TRACEABILITY
CARBON DIOXIDE	5.91 %	+/- 1%	Direct NIST and NMi
OXYGEN	14.1 %	+/- 1%	Direct NIST and NMi
NITROGEN	BALANCE		

*** Do not use when cylinder pressure is below 150 psig.

** Analytical accuracy is based on the requirements of EPA Protocol Procedure G1, September 1997.

REFERENCE STANDARD

TYPE/SRM NO.	EXPIRATION DATE	CYLINDER NUMBER	CONCENTRATION	COMPONENT
NTRM 2300	01Nov2010	1D002807	23.04 %	CARBON DIOXIDE
NTRM 2350	01Dec2011	K016398	23.20 %	OXYGEN

INSTRUMENTATION

INSTRUMENT/MODEL/SERIAL#	DATE LAST CALIBRATED	ANALYTICAL PRINCIPLE
PIR/2000/609015	16Jul2009	NDIR
CAI/110P/V03018	01Jul2009	PARAMAGNETIC

ANALYZER READINGS

(Z=Zero Gas R=Reference Gas T=Test Gas r=Correlation Coefficient)

First Triad Analysis — Second Triad Analysis — Calibration Curve

CARBON DIOXIDE

Date: 27Jul2009	Response Unit:MV	
Z1=0.00000	R1=102.5000	T1=43.00000
R2=102.5000	Z2=0.00000	T2=43.00000
Z3=0.00000	T3=43.00000	R3=102.5000
Avg. Concentration:	5.909	%

Concentration=A+Bx+Cx2+Dx3+Ex4

r=0.999992

Constants:	A=-0.00322681
B=0.13615338	C=-0.0005754
D=1.40219E-05	E=0

OXYGEN

Date: 28Jul2009	Response Unit:%	
Z1=0.00000	R1=23.20000	T1=14.06000
R2=23.20000	Z2=0.00000	T2=14.06000
Z3=0.00000	T3=14.06000	R3=23.20000
Avg. Concentration:	14.05	%

Concentration=A+Bx+Cx2+Dx3+Ex4

r=0.999992

Constants:	A=-0.00675568
B=0.999864575	C=0
D=0	E=0

APPROVED BY: ______________________

JEFF CROTEAU

Page 1 of 1

AIR LIQUIDE Air Liquide America Specialty Gases LLC Scott™

RATA CLASS

Dual-Analyzed Calibration Standard

1290 COMBERMERE STREET, TROY, MI 48083 Phone: 248-589-2950 Fax: 248-589-2134

CERTIFICATE OF ACCURACY: EPA Protocol Gas

Assay Laboratory

AIR LIQUIDE AMERICA SPECIALTY GASES LLC
1290 COMBERMERE STREET
TROY, MI 48083

P.O. No.: 57439-71-65000
Project No.: 05-76738-005

Customer

CLEAN AIR ENGINEERING
DON ALLEN
500 W. WOOD STREET
PALATINE IL 60067

ANALYTICAL INFORMATION

This certification was performed according to EPA Traceability Protocol For Assay & Certification of Gaseous Calibration Standards; Procedure G-1; September, 1997.

Cylinder Number: ALM046255 **Certification Date:** 09Jun2009 **Exp. Date:** 08Jun2012
Cylinder Pressure*:** 2000 PSIG

COMPONENT	CERTIFIED CONCENTRATION (Moles)	ANALYTICAL ACCURACY**	TRACEABILITY
CARBON DIOXIDE	13.9 %	+/- 1%	Direct NIST and NMi
OXYGEN	6.01 %	+/- 1%	Direct NIST and NMi
NITROGEN	BALANCE		

*** Do not use when cylinder pressure is below 150 psig.
** Analytical accuracy is based on the requirements of EPA Protocol Procedure G1, September 1997.

REFERENCE STANDARD

TYPE/SRM NO.	EXPIRATION DATE	CYLINDER NUMBER	CONCENTRATION	COMPONENT
NTRM 1675	02Oct2012	K006545	13.93 %	CARBON DIOXIDE
NTRM 2658	01Jan2010	K001290	10.03 %	OXYGEN

INSTRUMENTATION

INSTRUMENT/MODEL/SERIAL#	DATE LAST CALIBRATED	ANALYTICAL PRINCIPLE
PIR/2000/609015	11May2009	NDIR
CAI/110P/V03018	01Jun2009	PARAMAGNETIC

ANALYZER READINGS

(Z=Zero Gas R=Reference Gas T=Test Gas r=Correlation Coefficient)

First Triad Analysis — Second Triad Analysis — Calibration Curve

CARBON DIOXIDE

Date: 09Jun2009	Response Unit:MV	
Z1=0.00000	R1=80.60000	T1=80.30000
R2=80.60000	Z2=0.00000	T2=80.30000
Z3=0.00000	T3=80.30000	R3=80.60000
Avg. Concentration:	13.86 %	

Concentration=A+Bx+Cx2+Dx3+Ex4
r=0.999998
Constants: A=-0.00492643
B=0.111614122 C=0.00014738
D=6.76093E-06 E=0

OXYGEN

Date: 09Jun2009	Response Unit:%	
Z1=0.00000	R1=10.06000	T1=6.01000
R2=10.06000	Z2=0.00000	T2=6.01000
Z3=0.00000	T3=6.01000	R3=10.06000
Avg. Concentration:	6.005 %	

Concentration=A+Bx+Cx2+Dx3+Ex4
r=0.999998
Constants: A=-0.00970246
B=0.999816092 C=0
D=0 E=0

APPROVED BY: [signature]
JEFF GROTEAU

End of Appendix

ASTM D 6866-08 AND 7459-08 CO_2 SAMPLING/ANALYSIS RESULTS

F

This Page Intentionally Left Blank

RESULTS

Air Flow Summary

Run Number	Run Date	Run Time	Steam Flow Klbs/hour	Flue Gas Temp Deg F	Air Flow ACFM	O_2 %	CO_2 %	CO_2 Sample Rate (lpm)[1]	Stack Flow 2RSD (%)	Air Flow, DSCFM	Air Flow, DSCFM@ 7%O_2
1-O-M5/29-1	3/23/2010	07:43-09:58	183.5	295	177,014	9.6	9.7	0.2	11.6%	94,473	77,005
1-O-M5/29-2	3/23/2010	10:31-12:45	183.9	295	179,820	9.4	9.9	0.2	12.2%	95,658	79,279
1-O-M5/29-3	3/23/2010	13:32-15:46	183.3	296	181,627	9.7	9.8	0.2	13.1%	97,155	78,073
1-O-M13B-1	3/22/2010	13:19-14:34	183.9	293	175,956	9.2	10.3	0.4	9.1%	94,620	79,848
1-O-M13B-2	3/22/2010	15:07-16:21	184.2	293	176,099	9.3	10.0	0.4	13.9%	94,737	78,993
1-O-M13B-3	3/22/2010	16:30-17:41	184.8	293	169,528	9.2	10.3	0.4	11.1%	90,888	76,829
		Average	183.9	294	176,674	9.4	10.0	NA	11.8%	94,588	78,338
2-O-M5/29-1	3/24/2010	07:53-10:06	183.9	295	173,477	9.5	9.9	0.2	9.3%	92,545	76,233
2-O-M5/29-2	3/24/2010	11:03-13:35	183.7	288	178,750	9.4	10.2	0.2	6.4%	94,353	78,130
2-O-M5/29-3	3/24/2010	14:12-16:22	183.3	297	180,224	9.8	9.9	0.2	10.0%	95,903	76,653
2-O-M13B-1	3/24/2010	07:53-09:11	184.3	292	175,045	9.4	10.0	0.4	6.9%	93,851	77,782
2-O-M13B-2	3/24/2010	09:37-10:54	183.8	292	174,991	9.3	10.0	0.4	9.8%	93,628	78,001
2-O-M13B-3	3/24/2010	11:24-12:46	183.6	293	170,950	9.4	10.1	0.4	11.0%	91,463	75,934
2-O-M23-1	3/22/2010	10:04-14:44	184.2	293	173,437	9.2	10.2	0.1	6.9%	93,381	78,534
2-O-M23-2	3/23/2010	07:36-12:10	184.2	297	178,662	9.6	9.7	0.1	8.9%	95,611	78,098
2-O-M23-3	3/23/2010	12:32-17:02	183.9	299	177,895	9.3	10.2	0.1	10.8%	94,124	78,685
		Average	183.9	295	175,937	9.4	10.0	NA	8.9%	93,895	77,561
3-O-M5/29-1	3/22/2010	08:47-11:05	184.1	297	184,927	10.0	9.4	0.2	11.7%	99,675	78,176
3-O-M5/29-2	3/22/2010	11:43-13:57	184.0	296	170,489	9.7	9.8	0.2	9.0%	92,737	74,723
3-O-M5/29-3	3/22/2010	14:24-16:39	184.2	295	173,572	9.5	10.0	0.2	9.1%	94,492	77,497
3-O-M13B-1	3/23/2010	12:41-13:54	183.8	297	174,143	9.8	9.6	0.4	10.7%	92,603	74,282
3-O-M13B-2	3/23/2010	14:31-15:39	184.4	296	179,138	9.9	9.6	0.4	12.3%	96,238	75,952
3-O-M13B-3	3/23/2010	15:54-17:02	183.9	296	166,090	9.4	10.2	0.4	6.5%	88,943	73,586
		Average	184.1	296	174,727	9.7	9.8	NA	9.9%	94,148	75,703
		Facility Average	184.0	295	175,779	9.5	9.9	NA	10.2%	94,211	77,201

[1] CO_2 gas sample flow rate was within 10% of initial flow rate throughout all test runs.

In accordance with the EPA Greenhouse Gas (GHG) Monitoring, Reporting and Recordkeeping Regulations (MRRR) an integrated gas sample (IGS) of all FF Outlet isokinetic sample trains was collected in accordance with ASTM Method 7459-08.

The IGS bags were all leak checked prior to use in accordance with the method. All samples were at the FF Outlets using Method 3 in conjunction with Method 5/29, 23 and 13B isokinetic sampling trains. All of the test run IGS bags that met the 2 times relative standard deviation (2RSD) stack flow rate criteria (<30%) were proportionally combined into a single Tedlar® bag for analysis by Beta Analytic, Inc for Biogenic CO_2 utilizing ASTM Method D6866-08.

All of the IGS bags were collected within 10% of the initial sample rate using the orifice off of the dry gas meter. The IGS bag collection rate is recorded on the field data sheets presented in Appendix G. All of the samples contained approximately 15L of stack gas. The stack flow rate 2RSD for each isokinetic test run is calculated from the square root of the pitot readings and presented in the field data printouts (Appendix H) of this report. All outlet isokinetic samples met the 2RSD requirements.

BETA

ISO-17025 Accredited Testing Laboratory

PJLA ISO/IEC 17025:2005 Testina Accreditation #

Beta Analytic Inc.
4985 SW 74 Court
Miami, Florida 33155 USA
Tel: 305-667-5167
Fax: 305-663-0964
info@betalabservices.com
www.betalabservices.com

Explanation of Results

Biomass Analysis using ASTM-D6866

The application of ASTM-D6866 to derive a "Biomass CO2 content" for carbon dioxide effluents is built upon the same concepts as those used by the US Department of Agriculture to derive the biobased content of manufactured products containing biomass carbon. It is done by comparing a relative amount of radiocarbon (C14) in an unknown sample to that of a modern reference standard. The ratio in contemporary biomass will be 100% and the ratio in fossil materials will be zero. Carbon dioxide derived from combustion of a mixture of present day biomass and fossil carbon will yield an ASTM-D6866 result that directly correlates to the amount of biomass carbon combusted and carbon-neutral CO2 generated.

The modern reference standard is a National Institute of Standards and Technology (NIST) standard with a defined radiocarbon content of 100% contemporary carbon for the year AD 1950. AD 1950 was chosen since it represented a time prior to thermo-nuclear weapons testing which introduced large amounts of excess radiocarbon into the atmosphere with each explosion (termed "bomb carbon"). This was a logical point in time to use as a reference since this excess bomb carbon would change with increased or decreased weapons testing. A fixed correction for this effect is applied per the ASTM-D6866 requirements, applying specifically to carbon removed from the atmospheric CO2 reservoir since about 1996. Carbon removed prior to about 1996 will contain elevated radiocarbon signatures, not directly applicable to the ASTM-D6866 correction. Typical areas to which the correction may not apply are landfills more than 5-10 years old and to trees which began to grow more than 20 years ago.

Carbon dioxide effluent derived from combustion of 100% present day biomass will yield results of 100% renewable content. Carbon dioxide effluent derived from the combustion of 100% fossil fuel will yield results of 0% renewable content. Carbon dioxide produced from mixed fuels (biomass plus fossil fuel) will yield a percentage result in direct proportion to the biomass carbon consumed vs. fossil carbon consumed in the combustion. The final result is referred to as the MEAN BIOMASS CO2 CONTENT and assumes all the carbon in the carbon dioxide was derived from either present day living or fossil sources.

The results provided in this report involved materials provided without any source information. This situation is highly probable in a real life situation. The MEAN VALUE quoted in this report encompasses an absolute range of 6% (plus and minus 3% on either side of the MEAN BIOMASS CO2 CONTENT to account for variations in end component radiocarbon signatures (a conservative approximation). It is presumed that all materials are present day or fossil in origin and that the desired result is the amount of biomass component "present" in the material, not the amount of biomass material "used" in the manufacturing process. The most conservative interpretation of the reported percentages is as maximum values.

ASTM-D6866 results relate directly to the percentage carbon-neutral CO2 in an incineration effluent. A value of 71% renewable content measured on CO2 effluent would indicate that 71% of the exhausted CO2 was from biomass (29% from fossil fuel). It does not represent the weight of biomass combusted or the weight of fossil fuel combusted. This is advantageous since the weight of the fuels only indirectly relate to the up-take of carbon dioxide from the atmosphere. The respiration uptake compound was carbon dioxide and the combustion effluent was carbon dioxide. The ASTM-D6866 result directly and specifically relates to the amount of carbon-neutral CO2 consumed and expelled.

BETA

ISO-17025 Accredited Testing Laboratory

PJLA ISO/IEC 17025:2005 Testing Accreditation # 59423

Beta Analytic Inc.
4985 SW 74 Court
Miami, Florida 33155 USA
Tel: 305-667-5167
Fax: 305-663-0964
info@betalabservices.com
www.betalabservices.com

Summary of Results : Biogenic CO2 Determination using ASTM-D6866

Submitter: Mr. Scott A. Brown		Date Received:	March 25, 2010
Company: Clean Air Engineering		Date Reported:	March 29, 2010

Laboratory Number	Submitter Label	Material	Mean Biomass CO2 Content*
Beta-277427	WHEELABRATOR South Broward - 3/22-24/10	Biogenic CO2	65%

* ASTM-D6866 cites precision on the Mean Biomass CO2 Content as +/- 3% (absolute). This is the most conservative estimate of error in the measurement of complex biomass containing solids and liquids based on empirical results. Real precision for readily combustible and homogenous materials (e.g. gasoline) and especially samples recieved as CO2 (e.g. flue gas or CEMS exhaust) can be as low as +/- 0.5-2%. The result only applies to the analyzed material. Fluctuations in carbon content within a batch of product, gasoline or flue gas must be determined separately (e.g. averaged measurements of multiple solids or liquids, and single measurement of the combination of gas aliquots collected over time). The accuracy of the result as it applies to the analyzed product, fuel, or flue gas relies upon all the carbon in the analyzed material originating from either recently respired atmospheric carbon dioxide (within the last decade) or fossil carbon (more than 50,000 years old). "Percent biomass" specifically relates % renewable (or fossil) carbon to total carbon, not to total mass or molecular weight. Mean Biomass CO2 estimates greater than 100% are assigned a value of 100% for simplification.

ISO-17025 Accredited Testing Laboratory

PJLA ISO/IEC 17025:2005 Testing Accreditation #

Beta Analytic Inc.
4985 SW 74 Court
Miami, Florida 33155 USA
Tel: 305-667-5167
Fax: 305-663-0964
info@betalabservices.com
www.betalabservices.com

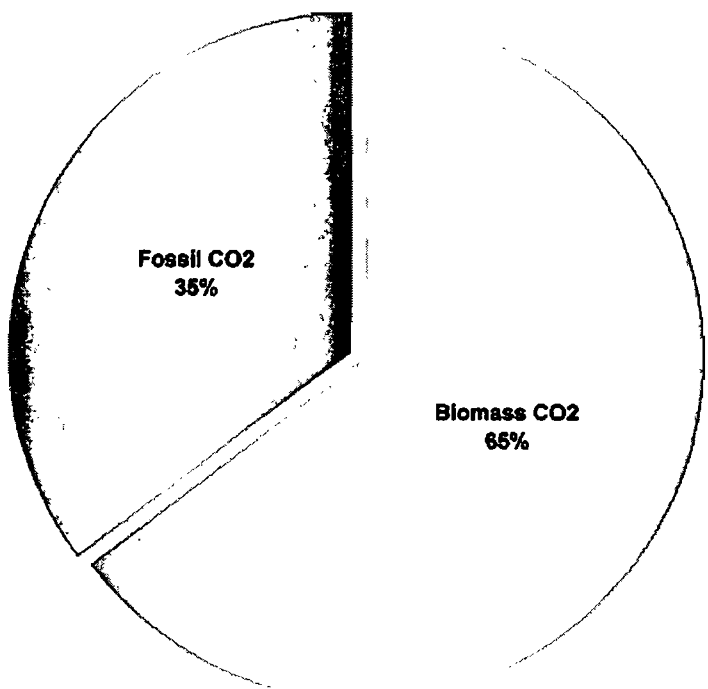
Report of Biomass CO2 Content Analysis using ASTM-D6866

Submitter:	**Clean Air Engineering**
Submitter Label:	**WHEELABRATOR South Broward - 3/22-24/10**
Laboratory Number:	**Beta-277427**
Material Analyzed:	**Biogenic CO2**
Date Received:	**March 25, 2010**
Date Reported:	**March 29, 2010**

Biomass CO2: 65% *

(carbon-neutral CO2) (renewable carbon to total carbon)

Proportions Biomass CO2 vs. Fossil CO2
indicated by C14 content



* ASTM-D6866 cites precision on the mean Biomass CO2 Result as +/- 3% (absolute). This is the most conservative estimate of error in the measurement of complex biomass containing solids and liquids based on empirical results. Real precision for readily combustible and homogenous materials (e.g. gasoline) and especially samples recieved as CO2 (e.g. flue gas or CEMS exhaust) can be as low as +/- 0.5-2%. The result only applies to the analyzed material. Fluctuations in carbon content within a batch of product, gasoline or flue gas must be determined separately (e.g. averaged measurements of multiple solids or liquids, and single measurement of the combination of gas aliquots collected over time). The accuracy of the result as it applies to the analyzed product, fuel, or flue gas relies upon all the carbon in the analyzed material originating from either recently respired atmospheric carbon dioxide (within the last few decades) or fossil carbon (more than 50,000 years old). "Percent biomass" specifically relates % renewable (or fossil) carbon to total carbon, not to total mass or molecular weight. Mean Biomass CO2 estimates greater than 100% are assigned a value of 100% for simplification.

CHAIN OF CUSTODY FORM

M23-SB-10955-02

CLIENT: Wheelabrator South Broward
PLANT: Same
PROJECT MANAGER: Scott Brown
PROJECT NO.: 10955
DEPT.: 66

CLEANAIR LAB NO.	RUN NO.	TEST LOCATION	DATE	SAMPLE MATRIX	NO. OF CONTAINERS	ORIGINAL VOLUME	ANALYSIS REQUESTED: ASTM D6866				ADDITIONAL INFORMATION
	all	Wheelabrator South Broward - 3/22-24/10	3/22/2010 to 3/24/10	Tedlar Bag	1		X				

Relinquished by: (Signature)	Date / Time	Received by: (Signature)	Date / Time	Relinquished by: (Signature)	Date / Time
Scott Brown	3/24/10 17:00	Zenaida Grada	3/25/10 - 9:00		
Courier:	Date / Time	Relinquished by: (Signature)	Date / Time	Received for Analysis by: Zenaida Grada Beta Analytic, Inc	3/25/10 9:00

Special Handling Instructions

Forwarding Lab: Beta Analytical

PO Number:

This form was completed by: Scott Brown

Signature: Scott Brown Date: 3/24/10

CleanAir ENGINEERING

LDS001A_2-COC Palatine_M23, Jul 2002
Copyright©2002 Clean Air Engineering Inc.

500 West Wood Street
Palatine, IL 60067
(800) 627-0033 ph
(847) 991-3385 fax
www.cleanair.com

*277427*137591*
Brown, S / C13 / BM
WHEELABRATOR South Brow

F-7

This Page Intentionally Left Blank