Wheelabrator North Broward
A Waste Management Company
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January 9, 2013

CERTIFIED MAIL #70073020000226914737

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

Re: Wheelabrator North Broward
F.A.C. 62-296.416 Quarterly Mercury Stack Testing
Fourth Quarter of 2012, Report Submittal

Dear Mr. Lurix:

As required by F.A.C. 62-296.416, please find enclosed the 2012 fourth quarter report on mercury stack testing which was conducted on Unit #1.

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) 971-8701.

Sincerely,

Jim Epsilantis
Plant Manager

cc: USEPA, Region IV, Pesticides and Toxics Management Division, Air & EPCRA Enforcement Branch, Air Enforcement Section CERTIFIED MAIL #70073020000226914744
FDEP, Tallahassee, Bureau of Air Regulation, New Source Review Section, CERTIFIED MAIL #70073020000226914751
Broward County Department of Planning and Environmental Protection, Air Quality Division CERTIFIED MAIL #70073020000226914768

Chuck Faller (with)
Rob French – MPI - (with)
Ram Tewari – BCWRS (without)

WM
WASTE MANAGEMENT

CleanAir

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Wheelabrator North Broward, Inc.
2600 Wiles Road
Pompano Beach, FL 33073

REPORT ON MERCURY TESTING

Performed for:
WHEELABRATOR NORTH BROWARD, INC.
UNIT 1 FF OUTLET
POMPANO BEACH, FL

Client Reference No: Service Agreement
CleanAir Project No: 11414-8
Revision 0: January 7, 2013

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. Clean Air Engineering operates in conformance with the requirements of ASTM D7036-04 Standard Practice for Competence of Air Emission Testing Bodies.

Submitted by,

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Project Manager
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Reviewed by,

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REPORT ON MERCURY TESTING

DRAFT REPORT REVISION HISTORY

Revision:	Date	Pages	Comments
D0a	01/04/13	All	Draft version of original document.

FINAL REPORT REVISION HISTORY

Revision:	Date	Pages	Comments
0	01/07/13	All	Final version of original document.

CONTENTS

PROJECT OVERVIEW

INTRODUCTION

Wheelabrator North Broward, Inc. operates a refuse-to-energy facility, located in Pompano Beach, Florida. The facility's emission levels are regulated by the Florida Department of Environmental Protection (DEP). Wheelabrator North Broward contracted Clean Air Engineering (CleanAir) to perform a compliance test program at its municipal waste combustor (MWC) facility in Pompano Beach, Florida. Testing was conducted in accordance with 40 CFR 60, Subpart Cb, and applicable sections of PSD-FL-112(B) and PA86-22. The sampling was conducted at the Unit 1 Fabric Filter (FF) Outlet on December 4 and 5, 2012.

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

Key Project Participants

Individuals responsible for coordinating and conducting the test program were:

C. Faller – Wheelabrator North Broward, Inc.
A. Obuchowski – CleanAir

Test Program Parameters

The testing included the following emissions measurements:

- flue gas composition (e.g., O_2, CO_2, H_2O)
- flue gas flow rate
- flue gas temperature
- mercury (Hg)

Chuck Faller of Wheelabrator North Broward provided all the process (operating) data. This data is presented in its entirety in Appendix G.

The CleanAir test crew consisted of Nic Hitchins, and all equipment utilized for testing was manufactured by CleanAir.

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	USEPA Method 29	Mercury	12/04/12	13:14	15:28
2	Unit 1 FF Outlet	USEPA Method 29	Mercury	12/05/12	07:44	09:58
3	Unit 1 FF Outlet	USEPA Method 29	Mercury	12/05/12	10:30	12:45
4	Unit 1 FF Outlet	USEPA Method 29	Mercury	12/05/12	13:12	15:26

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 and 2-2 on pages 2-1 and 2-2.

Table 1-2:
Summary of Test Results

Source Constituent	Sampling Method	Average Emission	Permit Limit[1]
Unit 1 FF Outlet			
Mercury (µg/dscm @7% O_2)	EPA M29	3.6	50

[1] Limit obtained from the facility's Title V Permit No. 0112120-010-AV and Subpart Cb as of April 28, 2009.

Four (4) Method 29 test runs for mercury were performed at the Unit 1 FF Outlet and an average of all four (4) runs were averaged to determine compliance with permit limit.

End of Section 1 – Project Overview

RESULTS

Table 2-1:
Unit 1 FF Outlet – Mercury

Run No.		1	2	3	4	Average
Date (2012)		Dec 4	Dec 5	Dec 5	Dec 5	
Start Time (approx.)		13:14	07:44	10:30	13:12	
Stop Time (approx.)		15:28	09:58	12:45	15:26	
Process Conditions						
R_P	Steam Production Rate - (Klbs/hour)	184	184	183	184	**184**
P_1	Fabric Filter Inlet Temperature (°F)	321	323	320	320	**321**
F_d	Oxygen-based F-factor (dscf/MMBtu)	9,570	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	**1,820**
H_i	Actual heat input (MMBtu/hr)					
Cap	Capacity factor (hours/year)	8,760	8,760	8,760	8,760	**8,760**
Gas Conditions						
O_2	Oxygen (dry volume %)	9.7	10.5	10.4	10.3	**10.2**
CO_2	Carbon dioxide (dry volume %)	9.9	9.4	9.4	9.5	**9.6**
T_s	Sample temperature (°F)	308	310	307	307	**308**
B_w	Actual water vapor in gas (% by volume)	21.0	22.1	21.4	21.8	**21.6**
Gas Flow Rate						
Q_a	Volumetric flow rate, actual (acfm)	187,000	187,000	187,000	183,000	**186,000**
Q_s	Volumetric flow rate, standard (scfm)	127,000	126,000	126,000	124,000	**126,000**
Q_{std}	Volumetric flow rate, dry standard (dscfm)	101,000	98,400	99,200	96,800	**98,800**
Sampling Data						
V_{mstd}	Volume metered, standard (dscf)	76.94	76.92	76.71	74.99	**76.39**
%I	Isokinetic sampling (%)	98.6	100.7	99.6	99.8	**99.7**
Laboratory Data						
m_n	Total matter corrected for allowable blanks (µg)	8.6394	6.2753	7.1601	1.7814	
Mercury Results - Total						
C_{sd}	Concentration (µg/dscm)	4.0	2.9	3.3	0.84	**2.7**
C_{sd7}	Concentration @7% O_2 (µg/dscm)	4.9	3.8	4.4	1.1	**3.6**
$E_{lb/hr}$	Rate (lb/hr)	1.493E-03	1.062E-03	1.226E-03	3.044E-04	**1.021E-03**
E_{Fd}	Rate - Fd-based (lb/MMBtu)	4.422E-06	3.459E-06	3.921E-06	9.884E-07	**3.198E-06**

Table 2-2:
Quality Assurance and Quality Control

RPD RESULTS

Run Number	FH Front Half	BH H_2O_2/HNO_3	A Empty Impinger	B $KMnO_4$	C HCl
U1 FF O R1	NA	0.4%	NA	NA	NA
U1 FF O R2	NA	0.3%	NA	NA	NA
U1 FF O R3	NA	0.4%	NA	NA	NA
U1 FF O R4	NA	0.4%	NA	NA	NA
Field Blank	NA	NA	NA	NA	NA
Reagent Blank	NA	NA	NA	NA	NA
Sample Spike and Recovery					
U1 FF O R3	108%	94%	102%	101%	103%
	108%	93%	101%	101%	102%
Blanks					
Field Blank	< 0.1	< 0.3	< 0.2	< 0.5	< 0.4
	< 0.1	< 0.3	< 0.2	< 0.5	< 0.4
Reagent Blank	< 0.1	< 0.195	< 0.2	< 0.5	< 0.4
	< 0.1	< 0.195	< 0.2	< 0.5	< 0.4

End of Section 2 – Results

DESCRIPTION OF INSTALLATION

PROCESS DESCRIPTION

The North Broward Resource Recovery facility operates three (3) 750 tons-per-day municipal refuse-fired, water-wall boiler trains. The trains were manufactured by Babcock & Wilcox to produce electricity for sale to a local utility company.

Each boiler is equipped with the following air pollution controls (APCs):

1) A selective non-catalytic reduction (SNCR) for nitrogen oxides (NO_X) control;
2) A spray dry absorber (SDA) for acid gas removal;
3) A fabric filter (FF) for the control of particulate emissions.

Each fabric filter is followed by an induced draft (ID) fan that directs the flue gas to a dedicated flue in a common stack. The APC equipment is manufactured by Wheelabrator Air Pollution Control, Inc. All APC equipment is generally in excellent condition. Each boiler is also equipped with a continuous emission monitoring (CEM) system to demonstrate the compliance with sulfur dioxide (SO_2), NO_X and carbon monoxide (CO) limits.

Figure 3-1 shows a general schematic for the facility. All of the testing reported in this document was performed at the Unit 1 FF Outlet as shown in Figure 3-2 on page 3-2.

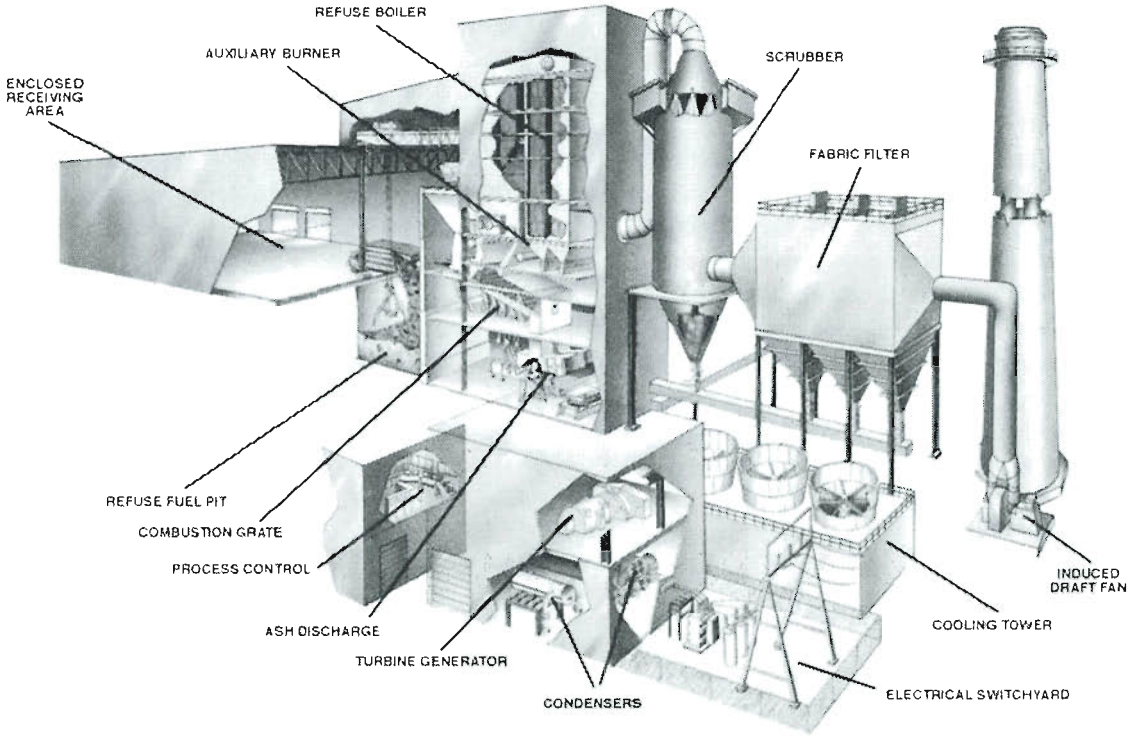


Figure 3-1: General Process Schematic

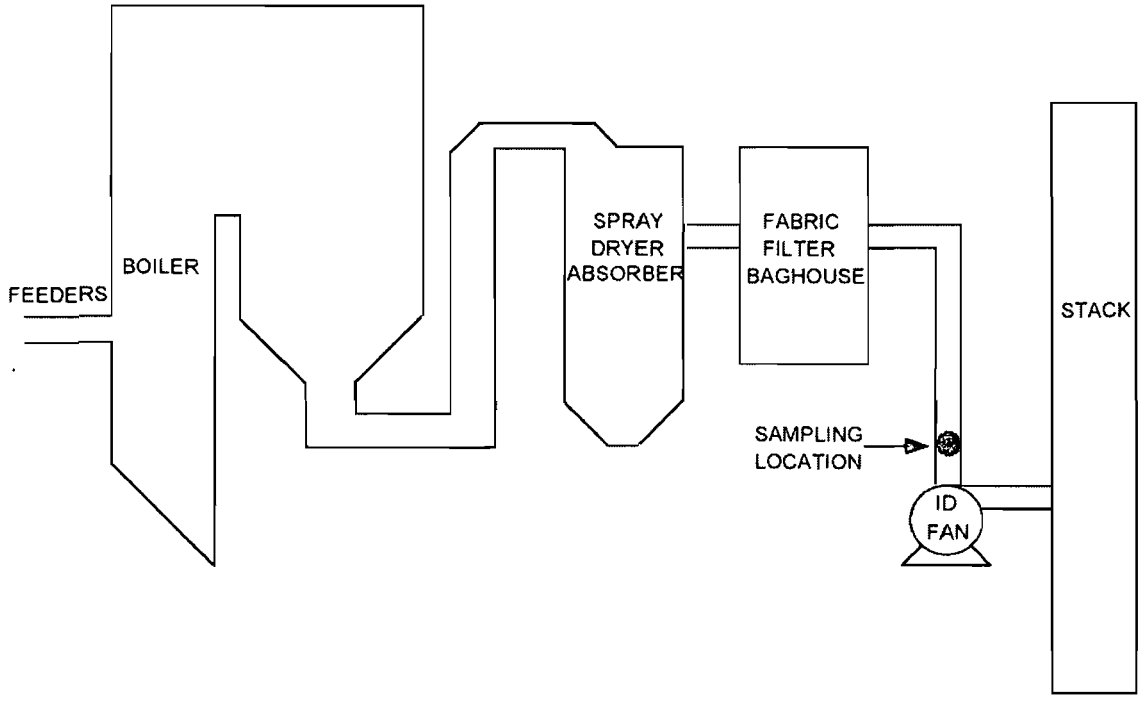


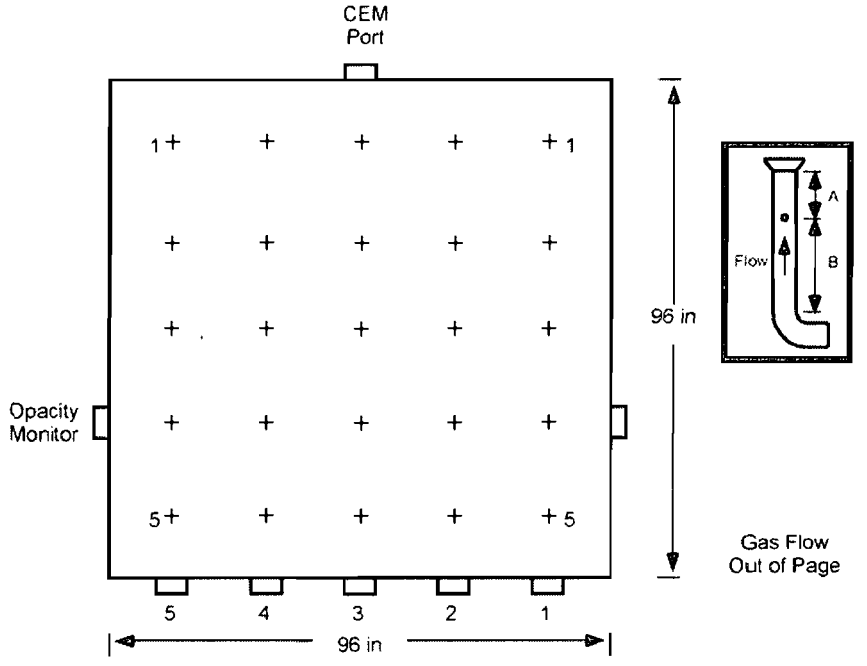
Figure 3-2: Process Schematic

DESCRIPTION OF SAMPLING LOCATIONS

Sampling point locations were determined according to EPA Method 1. Table 3-1 outlines the sampling point configurations. Figure 3-3 illustrates the sampling points and orientation of sampling ports for the source tested in the program.

Table 3-1:
Sampling Points

Location	Constituent	Method	Run No.	Ports	Points per Port	Minutes per Point	Total Minutes	Figure
Unit 1 FF Outlet	Mercury	29	1-4	5	5	5	125	3-3



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

Equivalent Duct diameters upstream from flow disturbance (A):	0.5	Limit: 0.5
Equivalent Duct diameters downstream from flow disturbance (B):	2.0	Limit: 2.0

Figure 3-3: Unit 1 FF Outlet Sampling Point Determination (EPA Method 1)

End of Section 3 – Description of Installation

METHODOLOGY

Clean Air Engineering followed procedures as detailed in EPA Methods 1, 2, 3, 3B, 4 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 3B	"Gas Analysis for the Determination of Emission Rate Correction Factor or Excess Air"
Method 4	"Determination of Moisture Content in Stack Gases"
Method 29	"Determination of Metals Emissions from Stationary Sources"

These methods appear in detail in Title 40 of the Code of Federal Regulations (CFR) and are located on the internet at http://ecfr.gpoaccess.gov.

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 as prescribed in CleanAir's internal Quality Manual. Results of all QA/QC activities performed by CleanAir are summarized in Appendix D.

End of Section 4 – Methodology

APPENDIX

TEST METHOD SPECIFICATIONS

A

I herby certify that all pages contained within this Appendix have been reviewed and, to the best of my ability, verified as accurate.

QA/QC Initials: MA

Date: 1/7/13

CleanAir

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Specification Sheet for EPA Method 29

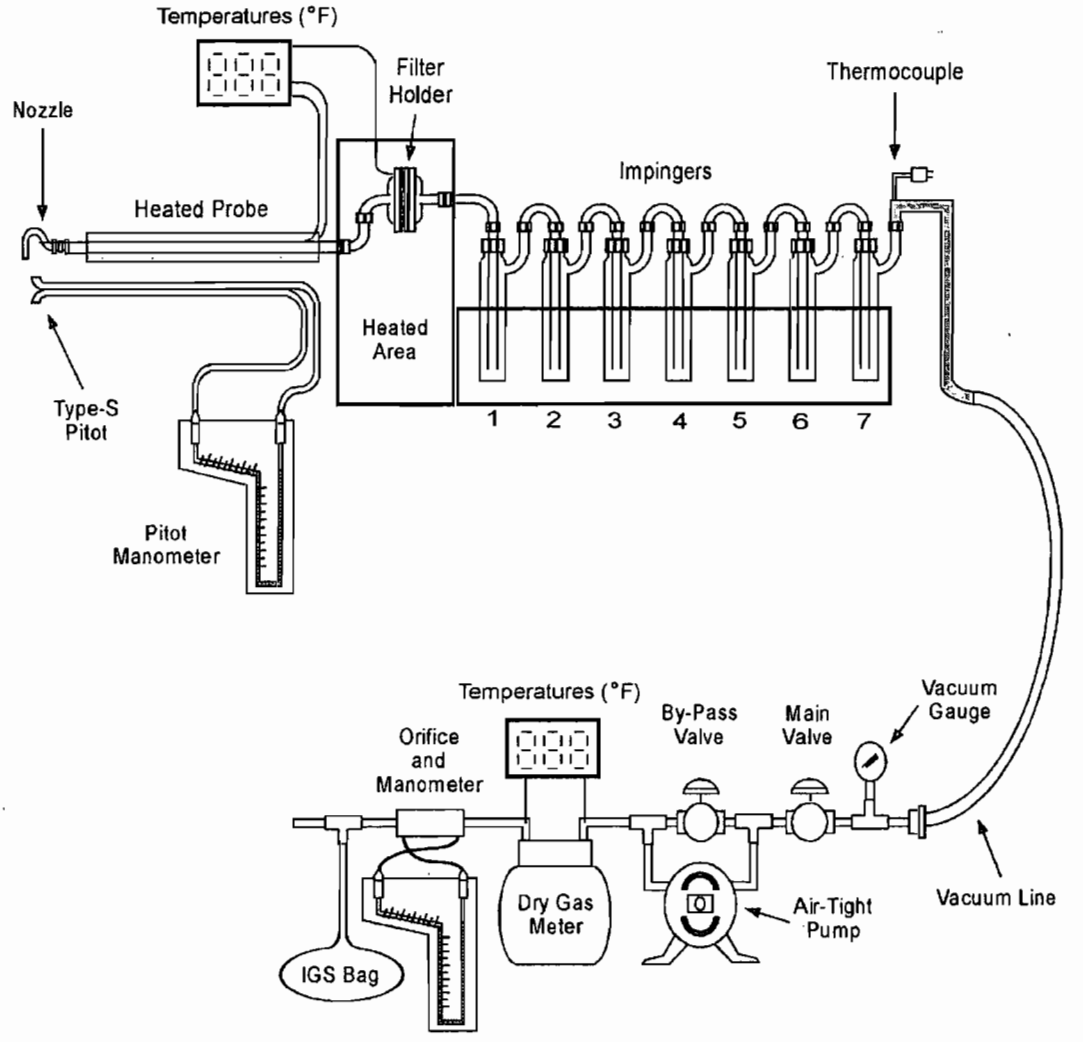
Source Location Name(s)	Unit 1 FF Outlet
Pollutant(s) to be Determined	Mercury
Other Parameters to be Determined from Train	Gas Density, Moisture, Flow Rate

	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	0.827
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

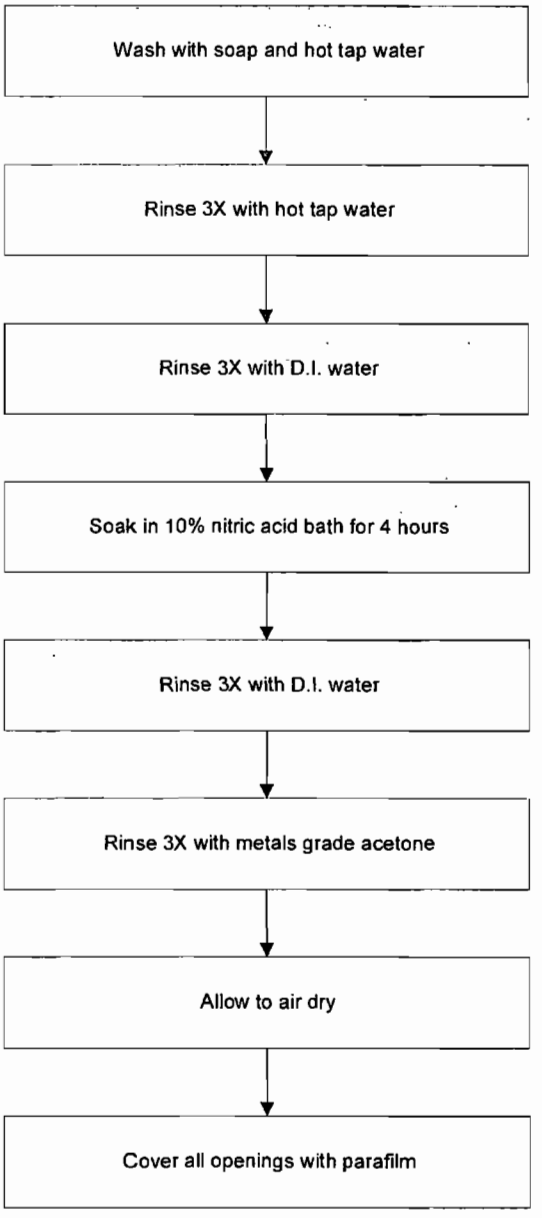
	Standard Method Specification	Actual Specification Used
Impinger Train Description		
Type of Glassware Connections	Ground Glass or Equivalent	Screw Joint with Silicone Gasket
Connection to Probe or Filter by	Direct Glass Connection	Direct Glass Connection
Number of Impingers	7	7
Impinger Stem Types		
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	Orsat
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
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



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)

SAMPLE CALCULATIONS

B

I herby certify that all pages contained within this Appendix have been reviewed and, to the best of my ability, verified as accurate.

QA/QC Initials: MF

Date: 4/7/13

CleanAir.

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USEPA Method 29 (Trace 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.

121812 101322
M

1. Volume of water collected (wscf)

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

Where:

V_{lc}	= total volume of liquid collected in impingers and silica gel (ml)	=	435.3	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)	=	20.49	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)	=	30.35	in. Hg
T_m	= average dry gas meter temperature (°F)	=	87.68	°F
V_m	= volume of gas sample through the dry gas meter at meter conditions (dcf)	=	79.03	dcf
Y_d	= gas meter correction factor (dimensionless)	=	0.9928	
ΔH	= average pressure drop across meter box orifice (in. H_2O)	=	1.29	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)	=	76.938	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)	=	30.35	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)	=	29.54	in. Hg

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)	=	307.60	°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)	=	29.54	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)	=	29.54	in. Hg
P_v	= water vapor pressure, actual (in. Hg)	=	29.54	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)	=	76.938	dscf
V_{wstd}	= volume of water collected at standard conditions (scf)	=	20.49	scf
B_{wo}	= proportion of water measured in the gas stream by volume	=	0.2103	
		=	21.03	%

7. Saturated moisture content (% by volume)

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

Where:

P_s	= absolute sample gas pressure (in. Hg)	=	29.54	in. Hg
P_v	= water vapor pressure, actual (in. Hg)	=	29.54	in. Hg
B_{ws}	= proportion of water vapor in the gas stream by volume at saturated conditions		1.0000	
		=	100.00	%

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	=	0.2103	
B_w	= actual water vapor in gas	=	0.2103	
		=	21.03	%

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 (%)	=	9.9	%
O_2	= proportion of oxygen in the gas stream by volume (%)	=	9.7	%
100	= conversion factor (%)	=	100	%
N_2+CO	= proportion of nitrogen and CO in the gas stream by volume (%)	=	80.40	%

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 (%)	=	9.9	%
O_2	= proportion of oxygen in the gas stream by volume (%)	=	9.7	%
N_2+CO	= proportion of nitrogen and CO in the gas stream by volume (%)	=	80.4	%
100	= conversion factor (%)	=	100	%
M_d	= dry molecular weight of sample gas (lb/lb·mole)	=	29.97	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	=	0.2103	
M_d	= dry molecular weight of sample gas (lb/lb·mole)	=	29.97	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)	=	27.45	lb/lb·mole

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)	=	27.45	lb/lb·mole
P_s	= absolute sample gas pressure (in. Hg)	=	29.54	in. Hg
T_s	= average sample gas temperature (°F)	=	307.60	°F
$\sqrt{\Delta P}$	= average square roots of velocity heads of sample gas (in. H_2O)	=	0.710	$\sqrt{}$in. H_2O
460	= °F to °R conversion constant	=	460	
V_s	= sample gas velocity (ft/sec)	=	48.81	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)	=	48.81	ft/sec
60	conversion factor (sec/min)	=	60	sec/min
Q_a	= volumetric flow rate at actual conditions (acfm)	=	187,435	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)	=	187,435	acfm
P_s	= absolute sample gas pressure (in. Hg)	=	29.54	in. Hg
29.92	= standard pressure (in. Hg)	=	29.92	in. Hg
T_s	= average sample gas temperature (°F)	=	307.6	°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)	=	127,296	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	=	0.2103	
Q_s	= volumetric flow rate at standard conditions, wet basis (scfm)	=	127,296	scfm
Q_{std}	= volumetric flow rate at standard conditions, dry basis (dscfm)	=	100,530	dscfm

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

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

Where:

Q_{std}	= volumetric flow rate at standard conditions, dry basis (dscfm)	=	100,530	dscfm
O_2	= proportion of oxygen in the gas stream by volume (%)	=	9.7	%
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)	=	81,002	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)	=	100,530	dscfm
60	= conversion factor (min/hr)	=	60	min/hr
Q_{std-hr}	= volumetric flow rate, hourly basis (dscf/hr)	=	6,031,781	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)	=	100,530	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)	=	170,824	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)	=	170,824	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)	=	159,177	dry Nm^3/hr

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)	=	0.270	in.
B_w	= proportion of water vapor in the gas stream by volume	=	0.2103	
P_s	= absolute sample gas pressure (in. Hg)	=	29.54	in. Hg
T_s	= average sample gas temperature (°F)	=	307.6	°F
V_{mstd}	= volume of gas sample through the dry gas meter at standard conditions (dscf)	=	76.938	dscf
V_s	= sample gas velocity (ft/sec)	=	48.81	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 (%)	=	98.61	%

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)	=	79.03	dcf
T_m	= average dry gas meter temperature (°F)	=	87.68	°F
$\Delta H_@$	= dry gas meter orifice coefficient	=	1.7924	
P_{bar}	= barometric pressure (in. Hg)	=	30.35	in. Hg
ΔH	= average pressure drop across meter box orifice (in. H_2O)	=	1.292	in. H_2O
M_d	= dry molecular weight of sample gas (lb/lb·mole)	=	29.97	lb/lb·mole
$\sqrt{\Delta H_{avg}}$	= average of square root of pressure drop across meter orifice	=	1.135	√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	=	0.9984	

LOGIC FOR TREATING DETECTION LIMITS

(mercury only)

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

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

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

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

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

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

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

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

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

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 2006-12c

USEPA Method 29 (Trace Metals)
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.

121812 100528
L

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	=	<0.1950	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	=	<1.3950	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	=	8.6394	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	=	8.6394	µg

3. Allowable blank correction (µg)

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

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

Where:

$m_{total-B}$	= total amount of mercury in blank	=	<1.3950	µg
$m_{total-S}$	= total amount of mercury in sample	=	8.6394	µg
0.05 x $m_{total-S}$	= 5% of $m_{total-S}$	=	0.4320	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.

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	=	8.6394	µg
$m_{T-B-allow}$	= total allowable blank correction	=	0.0000	µg
m_n	= total mercury in sample corrected for allowable blank	=	8.6394	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	=	8.6394	µg
m_{1b-S}	= mercury amount in sample for Fraction 1b	=	<0.1000	µg
m_{2b-S}	= mercury amount in sample for Fraction 2b	=	8.6394	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	=	8.6394	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	=	8.6394	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

USEPA Method 29 (Trace Metals)
Mercury Sample Calculations

Sample data taken from Run 1

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121812 100529
M_L

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)	=	8.6394	µg
V_{mstd}	= volume metered, standard (dscf)	=	76.9381	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)	=	2.4760E-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)	=	8.6394	µg
V_{mstd}	= volume metered, standard (dscf)	=	76.9381	dscf
35.31	= conversion factor (dscf/dscm)	=	35.31	dscf/dscm
C_{sd}	= mercury concentration (µg/dscm)	=	3.9650E+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)	=	8.6394	µg
V_{mstd}	= volume metered, standard (dscf)	=	76.9381	dscf
35.31	= conversion factor (dscf/dscm)	=	35.31	dscf/dscm
1000	= conversion factor (µg/mg)	=	1000	µg/mg
C_{sd}	= mercury concentration (mg/dscm)	=	3.9650E-03	mg/dscm

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)	=	8.6394	µg
V_{mstd}	= volume metered, standard (dscf)	=	76.9381	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)	=	4.2551E+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)	=	2.4760E-10	lb/dscf
x	= oxygen content of corrected gas (%)	=	7.0	%
O_2	= proportion of oxygen in the gas stream by volume (%)	=	9.7	%
20.9	= oxygen content of ambient air (%)	=	20.9	%
C_{sdx}	= mercury concentration corrected to x% oxygen (lb/dscf)	=	3.0729E-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)	=	2.4760E-10	lb/dscf
y	= carbon dioxide content of corrected gas (%)	=	12.0	%
CO_2	= proportion of carbon dioxide in the gas stream by volume (%)	=	9.9	%
C_{sdy}	= mercury conc. corrected to y% carbon dioxide (lb/dscf)	=	3.0012E-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)	=	2.4760E-10	lb/dscf
Q_{std}	= volumetric flow rate at standard conditions, dry basis (dscfm)	=	100,530	dscfm
Q_a	= volumetric flow rate at actual conditions (acfm)	=	187,435	acfm
C_a	= mercury concentration at actual gas conditions (lb/acf)	=	1.3280E-10	lb/acf

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)	=	8.6394	µg
V_{mstd}	= volume metered, standard (dscf)	=	76.9381	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)	=	100,530	dscfm
60	= conversion factor (min/hr)	=	60	min/hr
$E_{lb/hr}$	= mercury emission rate (lb/hr)	=	1.4935E-03	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)	=	8.6394	µg
V_{mstd}	= volume metered, standard (dscf)	=	76.9381	dscf
Q_{std}	= volumetric flow rate at standard conditions, dry basis (dscfm)	=	100,530	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)	=	1.8814E-04	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)	=	8.6394	µg
V_{mstd}	= volume metered, standard (dscf)	=	76.9381	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)	=	100,530	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)	=	6.5414E-03	Ton/yr

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

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

Where:

m_n	= mercury collected in sample (total µg)	=	8.6394	µg
V_{mstd}	= volume metered, standard (dscf)	=	76.9381	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 (%)	=	9.7	%
20.9	= oxygen content of ambient air (%)	=	20.9	%
E_{Fd}	= mercury emission rate - Fd-based (lb/MMBtu)	=	4.4217E-06	lb/MMBtu

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

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

Where:

m_n	= mercury collected in sample (total µg)	=	8.6394	µg
V_{mstd}	= volume metered, standard (dscf)	=	76.9381	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 (%)	=	9.9	%
100	= conversion factor	=	100	
E_{Fc}	= mercury emission rate - Fc-based (lb/MMBtu)	=	4.5518E-06	lb/MMBtu

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PARAMETERS

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I herby certify that all pages contained within this Appendix have been reviewed and, to the best of my ability, verified as accurate.

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Date: 1/7/13

CleanAir

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Wheelabrator
Clean Air Project No: 11414
Unit 1 FF Outlet

USEPA Method 29 (Trace Metals)
Sampling, Velocity and Moisture Parameters

Run No.		1	2	3	4	Average
Date (2012)		Dec 4	Dec 5	Dec 5	Dec 5	
Start Time (approx.)		13:14	07:44	10:30	13:12	
Stop Time (approx.)		15:28	09:58	12:45	15:26	
Sampling Conditions						
Y_d	Dry gas meter correction factor	0.9928	0.9928	0.9928	0.9928	
C_p	Pitot tube coefficient	0.8270	0.8270	0.8270	0.8270	
P_g	Static pressure (in. H_2O)	-11.0000	-10.0000	-12.0000	-10.0000	
A_s	Sample location area (ft^2)	64.0000	64.0000	64.0000	64.0000	
P_{bar}	Barometric pressure (in. Hg)	30.35	30.20	30.20	30.20	**30.2375**
D_n	Nozzle diameter (in.)	0.2700	0.2700	0.2700	0.2700	
O_2	Oxygen (dry volume %)	9.7000	10.5000	10.4000	10.3000	**10.2250**
CO_2	Carbon dioxide (dry volume %)	9.9000	9.4000	9.4000	9.5000	**9.5500**
N_2+CO	Nitrogen plus carbon monoxide (dry volume %)	80.4000	80.1000	80.2000	80.2000	**80.2250**
V_{lc}	Total Liquid collected (ml)	435.30	464.20	444.10	443.30	
V_m	Volume metered, meter conditions (ft^3)	79.0300	79.1150	79.3650	77.9650	
T_m	Dry gas meter temperature (°F)	87.6800	85.6600	88.9400	91.5400	
T_s	Sample temperature (°F)	307.6000	309.9600	307.0400	306.9600	**307.8900**
ΔH	Meter box orifice pressure drop (in. H_2O)	1.2920	1.2840	1.2840	1.2300	
θ	Total sampling time (min)	125.0	125.0	125.0	125.0	
Flow Results						
V_{wstd}	Volume of water collected (ft^3)	20.4852	21.8453	20.8993	20.8617	**21.0229**
V_{mstd}	Volume metered, standard (dscf)	76.9381	76.9236	76.7056	74.9875	**76.3887**
P_s	Sample gas pressure, absolute (in. Hg)	29.5412	29.4647	29.3176	29.4647	**29.4471**
P_v	Vapor pressure, actual (in. Hg)	29.5412	29.4647	29.3176	29.4647	**29.4471**
B_{wo}	Moisture measured in sample (% by volume)	21.0270	22.1176	21.4122	21.7651	**21.5805**
B_{ws}	Saturated moisture content (% by volume)	100.0000	100.0000	100.0000	100.0000	**100.0000**
B_w	Actual water vapor in gas (% by volume)	21.0270	22.1176	21.4122	21.7651	**21.5805**
$\sqrt{\Delta P}$	Velocity head ($\sqrt{}$in. H_2O)	0.7097	0.7043	0.7053	0.6892	**0.7021**
M_d	MW of sample gas, dry (lb/lb-mole)	29.9720	29.9240	29.9200	29.9320	**29.9370**
M_s	MW of sample gas, wet (lb/lb-mole)	27.4546	27.2867	27.3677	27.3350	**27.3610**
V_s	Velocity of sample (ft/sec)	48.8112	48.7284	48.7568	47.5502	**48.4617**
%I	Isokinetic sampling (%)	98.6092	100.7095	99.5847	99.7638	**99.6668**
Q_a	Volumetric flow rate, actual (acfm)	187,435	187,117	187,226	182,593	**186,093**
Q_s	Volumetric flow rate, standard (scfm)	127,296	126,363	126,284	123,790	**125,933**
Q_{std}	Volumetric flow rate, dry standard (dscfm)	100,530	98,415	99,244	96,847	**98,759**
Q_{std7}	Volumetric flow rate, dry std@7%O_2 (dscfm)	81,002	73,634	74,969	73,855	**75,865**
Q_a	Volumetric flow rate, actual (acf/hr)	11,246,098	11,227,032	11,233,555	10,955,573	**11,165,565**
Q_s	Volumetric flow rate, standard (scf/hr)	7,637,778	7,581,781	7,577,059	7,427,400	**7,556,004**
Q_{std}	Volumetric flow rate, dry standard (dscf/hr)	6,031,781	5,904,877	5,954,645	5,810,816	**5,925,530**
Q_a	Volumetric flow rate, actual (m^3/hr)	318,496	317,956	318,141	310,268	**316,215**
Q_s	Volumetric flow rate, standard (m^3/hr)	216,306	214,721	214,587	210,348	**213,990**
Q_{std}	Volumetric flow rate, dry standard (dry m^3/hr)	170,824	167,230	168,639	164,566	**167,814**
Q_{std7}	Volumetric flow rate, dry std@7%O_2 (dry m^3/hr)	137,642	125,121	127,389	125,496	**128,912**
Q_s	Volumetric flow rate, normal (Nm^3/hr)	201,558	200,080	199,956	196,006	**199,400**
Q_{std}	Volumetric flow rate, dry normal (Nm^3/hr)	159,177	155,828	157,141	153,345	**156,373**
Q_{std7}	Volumetric flow rate, dry normal @7%O_2 (Nm^3/hr)	128,257	116,590	118,704	116,940	**120,123**

Comments:
Average includes 4 runs.

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Wheelabrator
Clean Air Project No: 11414
Unit 1 FF Outlet

USEPA Method 29 (Trace Metals)
Mercury (Hg) Emission Parameters

Run No.		1	2	3	4	Average
Date (2012)		Dec 4	Dec 5	Dec 5	Dec 5	
Start Time (approx.)		13:14	07:44	10:30	13:12	
Stop Time (approx.)		15:28	09:58	12:45	15:26	
Process Conditions						
R_P	Steam Production Rate - (Klbs/hour)	184	184	183	184	**184**
P_1	Fabric Filter Inlet Temperature (°F)	321	323	320	320	**321**
F_d	Oxygen-based F-factor (dscf/MMBtu)	9,570	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	**1,820**
Cap	Capacity factor (hours/year)	8,760	8,760	8,760	8,760	**8,760**
Gas Conditions						
O_2	Oxygen (dry volume %)	9.7000	10.5000	10.4000	10.3000	**10.2250**
CO_2	Carbon dioxide (dry volume %)	9.9000	9.4000	9.4000	9.5000	**9.5500**
T_s	Sample temperature (°F)	307.6000	309.9600	307.0400	306.9600	**307.8900**
B_w	Actual water vapor in gas (% by volume)	21.0270	22.1176	21.4122	21.7651	**21.5805**
Gas Flow Rate						
Q_a	Volumetric flow rate, actual (acfm)	187,435	187,117	187,226	182,593	**186,093**
Q_s	Volumetric flow rate, standard (scfm)	127,296	126,363	126,284	123,790	**125,933**
Q_{std}	Volumetric flow rate, dry standard (dscfm)	100,530	98,415	99,244	96,847	**98,759**
Sampling Data						
V_{mstd}	Volume metered, standard (dscf)	76.9381	76.9236	76.7056	74.9875	**76.3887**
%I	Isokinetic sampling (%)	98.6092	100.7095	99.5847	99.7638	**99.6668**
Laboratory Data						
$m_{n\text{-}1b}$	Fraction 1B (µg)	<0.1000	<0.1000	<0.1000	<0.1000	
$m_{n\text{-}2b}$	Fraction 2B (µg)	8.6394	6.2753	7.1601	1.7814	
$m_{n\text{-}3a}$	Fraction 3A (µg)	<0.2000	<0.2000	<0.2000	<0.2000	
$m_{n\text{-}3b}$	Fraction 3B (µg)	<0.5000	<0.5000	<0.5000	<0.5000	
$m_{n\text{-}3c}$	Fraction 3C (µg)	<0.4000	<0.4000	<0.4000	<0.4000	
m_n	Total matter corrected for allowable blanks (µg)	8.6394	6.2753	7.1601	1.7814	
Mercury Results - Total						
C_{sd}	Concentration (lb/dscf)	2.4760E-10	1.7988E-10	2.0583E-10	5.2382E-11	**1.7142E-10**
C_{sd7}	Concentration @7% O_2 (lb/dscf)	3.0729E-10	2.4042E-10	2.7247E-10	6.8689E-11	**2.2222E-10**
C_{sd12}	Concentration @12% CO_2 (lb/dscf)	3.0012E-10	2.2963E-10	2.6276E-10	6.6166E-11	**2.1467E-10**
C_a	Concentration (lb/acf)	1.3280E-10	9.4608E-11	1.0910E-10	2.7783E-11	**9.1073E-11**
C_{sd}	Concentration (µg/dscm)	3.9650E+00	2.8805E+00	3.2960E+00	8.3882E-01	**2.7451E+00**
C_{sd7}	Concentration @7% O_2 (µg/dscm)	4.9208E+00	3.8499E+00	4.3633E+00	1.1000E+00	**3.5585E+00**
C_{sd12}	Concentration @12% CO_2 (µg/dscm)	4.8060E+00	3.6773E+00	4.2077E+00	1.0596E+00	**3.4376E+00**
C_{sd}	Concentration (mg/dscm)	3.9650E-03	2.8805E-03	3.2960E-03	8.3882E-04	**2.7451E-03**
C_{sd7}	Concentration @7% O_2 (mg/dscm)	4.9208E-03	3.8499E-03	4.3633E-03	1.1000E-03	**3.5585E-03**
C_{sd12}	Concentration @12% CO_2 (mg/dscm)	4.8060E-03	3.6773E-03	4.2077E-03	1.0596E-03	**3.4376E-03**
C_a	Concentration (µg/m^3 (actual,wet))	2.1266E+00	1.5150E+00	1.7471E+00	4.4491E-01	**1.4584E+00**
C_{sd}	Concentration (µg/Nm^3 dry)	4.2551E+00	3.0913E+00	3.5372E+00	9.0020E-01	**2.9459E+00**
C_{sd7}	Concentration @7% O_2 (µg/Nm^3 dry)	5.2809E+00	4.1316E+00	4.6825E+00	1.1804E+00	**3.8189E+00**
C_{sd12}	Concentration @12% CO_2 (µg/Nm^3 dry)	5.1577E+00	3.9463E+00	4.5155E+00	1.1371E+00	**3.6892E+00**
$E_{lb/hr}$	Rate (lb/hr)	1.4935E-03	1.0622E-03	1.2256E-03	3.0438E-04	**1.0214E-03**
$E_{g/s}$	Rate (g/s)	1.8814E-04	1.3381E-04	1.5440E-04	3.8345E-05	**1.2867E-04**
$E_{T/yr}$	Rate (Ton/yr)	6.5414E-03	4.6523E-03	5.3682E-03	1.3332E-03	**4.4738E-03**
E_{Fd}	Rate - Fd-based (lb/MMBtu)	4.4217E-06	3.4595E-06	3.9207E-06	9.8840E-07	**3.1976E-06**
E_{Fc}	Rate - Fc-based (lb/MMBtu)	4.5518E-06	3.4828E-06	3.9851E-06	1.0035E-06	**3.2558E-06**

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Wheelabrator
Clean Air Project No: 11414
Unit 1 FF Outlet

USEPA Method 29 (Trace Metals)
Mercury (Hg) Emission Parameters (continued)
Separate Front Half Results

Run No.		1	2	3	4	Average
Date (2012)		Dec 4	Dec 5	Dec 5	Dec 5	
Start Time (approx.)		13:14	07:44	10:30	13:12	
Stop Time (approx.)		15:28	09:58	12:45	15:26	
Mercury Results - Front Half						
C_{sd}	Concentration (lb/dscf)	<2.8659E-12	<2.8665E-12	<2.8746E-12	<2.9405E-12	**<2.8869E-12**
C_{sd7}	Concentration @7% O_2 (lb/dscf)	<3.5568E-12	<3.8312E-12	<3.8055E-12	<3.8559E-12	**<3.7623E-12**
C_{sd12}	Concentration @12% CO_2 (lb/dscf)	<3.4739E-12	<3.6593E-12	<3.6697E-12	<3.7143E-12	**<3.6293E-12**
C_a	Concentration (lb/acf)	<1.5371E-12	<1.5076E-12	<1.5238E-12	<1.5596E-12	**<1.5320E-12**
C_{sd}	Concentration (µg/dscm)	<4.5894E-02	<4.5903E-02	<4.6033E-02	<4.7088E-02	**<4.6229E-02**
C_{sd7}	Concentration @7% O_2 (µg/dscm)	<5.6958E-02	<6.1351E-02	<6.0939E-02	<6.1747E-02	**<6.0249E-02**
C_{sd12}	Concentration @12% CO_2 (µg/dscm)	<5.5629E-02	<5.8599E-02	<5.8766E-02	<5.9479E-02	**<5.8118E-02**
C_{sd}	Concentration (mg/dscm)	<4.5894E-05	<4.5903E-05	<4.6033E-05	<4.7088E-05	**<4.6229E-05**
C_{sd7}	Concentration @7% O_2 (mg/dscm)	<5.6958E-05	<6.1351E-05	<6.0939E-05	<6.1747E-05	**<6.0249E-05**
C_{sd12}	Concentration @12% CO_2 (mg/dscm)	<5.5629E-05	<5.8599E-05	<5.8766E-05	<5.9479E-05	**<5.8118E-05**
C_a	Concentration (µg/m^3 (actual,wet))	<2.4615E-02	<2.4143E-02	<2.4401E-02	<2.4975E-02	**<2.4534E-02**
C_{sd}	Concentration (µg/Nm^3 dry)	<4.9252E-02	<4.9261E-02	<4.9401E-02	<5.0533E-02	**<4.9612E-02**
C_{sd7}	Concentration @7% O_2 (µg/Nm^3 dry)	<6.1125E-02	<6.5840E-02	<6.5398E-02	<6.6265E-02	**<6.4657E-02**
C_{sd12}	Concentration @12% CO_2 (µg/Nm^3 dry)	<5.9700E-02	<6.2887E-02	<6.3066E-02	<6.3832E-02	**<6.2371E-02**
$E_{lb/hr}$	Rate (lb/hr)	<1.7287E-05	<1.6926E-05	<1.7117E-05	<1.7087E-05	**<1.7104E-05**
$E_{g/s}$	Rate (g/s)	<2.1777E-06	<2.1323E-06	<2.1564E-06	<2.1525E-06	**<2.1547E-06**
$E_{T/yr}$	Rate (Ton/yr)	<7.5716E-05	<7.4137E-05	<7.4974E-05	<7.4840E-05	**<7.4917E-05**
E_{Fd}	Rate - Fd-based (lb/MMBtu)	<5.1181E-08	<5.5128E-08	<5.4758E-08	<5.5485E-08	**<5.4138E-08**
E_{Fc}	Rate - Fc-based (lb/MMBtu)	<5.2687E-08	<5.5500E-08	<5.5658E-08	<5.6334E-08	**<5.5045E-08**

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Wheelabrator
Clean Air Project No: 11414
Unit 1 FF Outlet

USEPA Method 29 (Trace Metals)
Mercury (Hg) Emission Parameters (continued)
Separate Impinger 1-3 Results

Run No.		1	2	3	4	Average
Date (2012)		Dec 4	Dec 5	Dec 5	Dec 5	
Start Time (approx.)		13:14	07:44	10:30	13:12	
Stop Time (approx.)		15:28	09:58	12:45	15:26	
Mercury Results - Impingers 1-3 Solution						
C_{sd}	Concentration (lb/dscf)	2.4760E-10	1.7988E-10	2.0583E-10	5.2382E-11	**1.7142E-10**
C_{sd7}	Concentration @7% O_2 (lb/dscf)	3.0729E-10	2.4042E-10	2.7247E-10	6.8689E-11	**2.2222E-10**
C_{sd12}	Concentration @12% CO_2 (lb/dscf)	3.0012E-10	2.2963E-10	2.6276E-10	6.6166E-11	**2.1467E-10**
C_a	Concentration (lb/acf)	1.3280E-10	9.4608E-11	1.0910E-10	2.7783E-11	**9.1073E-11**
C_{sd}	Concentration (µg/dscm)	3.9650E+00	2.8805E+00	3.2960E+00	8.3882E-01	**2.7451E+00**
C_{sd7}	Concentration @7% O_2 (µg/dscm)	4.9208E+00	3.8499E+00	4.3633E+00	1.1000E+00	**3.5585E+00**
C_{sd12}	Concentration @12% CO_2 (µg/dscm)	4.8060E+00	3.6773E+00	4.2077E+00	1.0596E+00	**3.4376E+00**
C_{sd}	Concentration (mg/dscm)	3.9650E-03	2.8805E-03	3.2960E-03	8.3882E-04	**2.7451E-03**
C_{sd7}	Concentration @7% O_2 (mg/dscm)	4.9208E-03	3.8499E-03	4.3633E-03	1.1000E-03	**3.5585E-03**
C_{sd12}	Concentration @12% CO_2 (mg/dscm)	4.8060E-03	3.6773E-03	4.2077E-03	1.0596E-03	**3.4376E-03**
C_a	Concentration (µg/m^3 (actual,wet))	2.1266E+00	1.5150E+00	1.7471E+00	4.4491E-01	**1.4584E+00**
C_{sd}	Concentration (µg/Nm^3 dry)	4.2551E+00	3.0913E+00	3.5372E+00	9.0020E-01	**2.9459E+00**
C_{sd7}	Concentration @7% O_2 (µg/Nm^3 dry)	5.2809E+00	4.1316E+00	4.6825E+00	1.1804E+00	**3.8189E+00**
C_{sd12}	Concentration @12% CO_2 (µg/Nm^3 dry)	5.1577E+00	3.9463E+00	4.5155E+00	1.1371E+00	**3.6892E+00**
$E_{lb/hr}$	Rate (lb/hr)	1.4935E-03	1.0622E-03	1.2256E-03	3.0438E-04	**1.0214E-03**
$E_{g/s}$	Rate (g/s)	1.8814E-04	1.3381E-04	1.5440E-04	3.8345E-05	**1.2867E-04**
$E_{T/yr}$	Rate (Ton/yr)	6.5414E-03	4.6523E-03	5.3682E-03	1.3332E-03	**4.4738E-03**
E_{Fd}	Rate - Fd-based (lb/MMBtu)	4.4217E-06	3.4595E-06	3.9207E-06	9.8840E-07	**3.1976E-06**
E_{Fc}	Rate - Fc-based (lb/MMBtu)	4.5518E-06	3.4828E-06	3.9851E-06	1.0035E-06	**3.2558E-06**

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Wheelabrator
Clean Air Project No: 11414
Unit 1 FF Outlet

USEPA Method 29 (Trace Metals)
Mercury (Hg) Emission Parameters (continued)
Separate Impinger 4 Results

Run No.		1	2	3	4	Average
Date (2012)		Dec 4	Dec 5	Dec 5	Dec 5	
Start Time (approx.)		13:14	07:44	10:30	13:12	
Stop Time (approx.)		15:28	09:58	12:45	15:26	
Mercury Results - Impinger 4 Solution						
C_{sd}	Concentration (lb/dscf)	<5.7319E-12	<5.7330E-12	<5.7493E-12	<5.8810E-12	**<5.7738E-12**
C_{sd7}	Concentration @7% O_2 (lb/dscf)	<7.1137E-12	<7.6623E-12	<7.6109E-12	<7.7119E-12	**<7.5247E-12**
C_{sd12}	Concentration @12% CO_2 (lb/dscf)	<6.9477E-12	<7.3187E-12	<7.3395E-12	<7.4286E-12	**<7.2586E-12**
C_a	Concentration (lb/acf)	<3.0743E-12	<3.0153E-12	<3.0475E-12	<3.1193E-12	**<3.0641E-12**
C_{sd}	Concentration (µg/dscm)	<9.1788E-02	<9.1805E-02	<9.2066E-02	<9.4176E-02	**<9.2459E-02**
C_{sd7}	Concentration @7% O_2 (µg/dscm)	<1.1392E-01	<1.2270E-01	<1.2188E-01	<1.2349E-01	**<1.2050E-01**
C_{sd12}	Concentration @12% CO_2 (µg/dscm)	<1.1126E-01	<1.1720E-01	<1.1753E-01	<1.1896E-01	**<1.1624E-01**
C_{sd}	Concentration (mg/dscm)	<9.1788E-05	<9.1805E-05	<9.2066E-05	<9.4176E-05	**<9.2459E-05**
C_{sd7}	Concentration @7% O_2 (mg/dscm)	<1.1392E-04	<1.2270E-04	<1.2188E-04	<1.2349E-04	**<1.2050E-04**
C_{sd12}	Concentration @12% CO_2 (mg/dscm)	<1.1126E-04	<1.1720E-04	<1.1753E-04	<1.1896E-04	**<1.1624E-04**
C_a	Concentration (µg/m^3 (actual,wet))	<4.9230E-02	<4.8285E-02	<4.8802E-02	<4.9951E-02	**<4.9067E-02**
C_{sd}	Concentration (µg/Nm^3 dry)	<9.8504E-02	<9.8523E-02	<9.8803E-02	<1.0107E-01	**<9.9224E-02**
C_{sd7}	Concentration @7% O_2 (µg/Nm^3 dry)	<1.2225E-01	<1.3168E-01	<1.3080E-01	<1.3253E-01	**<1.2931E-01**
C_{sd12}	Concentration @12% CO_2 (µg/Nm^3 dry)	<1.1940E-01	<1.2577E-01	<1.2613E-01	<1.2766E-01	**<1.2474E-01**
$E_{lb/hr}$	Rate (lb/hr)	<3.4573E-05	<3.3852E-05	<3.4235E-05	<3.4173E-05	**<3.4208E-05**
$E_{g/s}$	Rate (g/s)	<4.3554E-06	<4.2646E-06	<4.3128E-06	<4.3050E-06	**<4.3095E-06**
$E_{T/yr}$	Rate (Ton/yr)	<1.5143E-04	<1.4827E-04	<1.4995E-04	<1.4968E-04	**<1.4983E-04**
E_{Fd}	Rate - Fd-based (lb/MMBtu)	<1.0236E-07	<1.1026E-07	<1.0952E-07	<1.1097E-07	**<1.0828E-07**
E_{Fc}	Rate - Fc-based (lb/MMBtu)	<1.0537E-07	<1.1100E-07	<1.1132E-07	<1.1267E-07	**<1.1009E-07**

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Wheelabrator
Clean Air Project No: 11414
Unit 1 FF Outlet

USEPA Method 29 (Trace Metals)
Mercury (Hg) Emission Parameters (continued)
Separate Impinger 5-6 Results

Run No.		1	2	3	4	Average
Date (2012)		Dec 4	Dec 5	Dec 5	Dec 5	
Start Time (approx.)		13:14	07:44	10:30	13:12	
Stop Time (approx.)		15:28	09:58	12:45	15:26	
Mercury Results - Filtered Permanganate Solution						
C_{sd}	Concentration (lb/dscf)	<1.4330E-11	<1.4332E-11	<1.4373E-11	<1.4702E-11	**<1.4434E-11**
C_{sd7}	Concentration @7% O_2 (lb/dscf)	<1.7784E-11	<1.9156E-11	<1.9027E-11	<1.9280E-11	**<1.8812E-11**
C_{sd12}	Concentration @12% CO_2 (lb/dscf)	<1.7369E-11	<1.8297E-11	<1.8349E-11	<1.8572E-11	**<1.8147E-11**
C_a	Concentration (lb/acf)	<7.6857E-12	<7.5382E-12	<7.6189E-12	<7.7982E-12	**<7.6602E-12**
C_{sd}	Concentration (µg/dscm)	<2.2947E-01	<2.2951E-01	<2.3017E-01	<2.3544E-01	**<2.3115E-01**
C_{sd7}	Concentration @7% O_2 (µg/dscm)	<2.8479E-01	<3.0675E-01	<3.0470E-01	<3.0874E-01	**<3.0124E-01**
C_{sd12}	Concentration @12% CO_2 (µg/dscm)	<2.7815E-01	<2.9300E-01	<2.9383E-01	<2.9740E-01	**<2.9059E-01**
C_{sd}	Concentration (mg/dscm)	<2.2947E-04	<2.2951E-04	<2.3017E-04	<2.3544E-04	**<2.3115E-04**
C_{sd7}	Concentration @7% O_2 (mg/dscm)	<2.8479E-04	<3.0675E-04	<3.0470E-04	<3.0874E-04	**<3.0124E-04**
C_{sd12}	Concentration @12% CO_2 (mg/dscm)	<2.7815E-04	<2.9300E-04	<2.9383E-04	<2.9740E-04	**<2.9059E-04**
C_a	Concentration (µg/m^3 (actual,wet))	<1.2308E-01	<1.2071E-01	<1.2201E-01	<1.2488E-01	**<1.2267E-01**
C_{sd}	Concentration (µg/Nm^3 dry)	<2.4626E-01	<2.4631E-01	<2.4701E-01	<2.5267E-01	**<2.4806E-01**
C_{sd7}	Concentration @7% O_2 (µg/Nm^3 dry)	<3.0563E-01	<3.2920E-01	<3.2699E-01	<3.3133E-01	**<3.2329E-01**
C_{sd12}	Concentration @12% CO_2 (µg/Nm^3 dry)	<2.9850E-01	<3.1443E-01	<3.1533E-01	<3.1916E-01	**<3.1185E-01**
$E_{lb/hr}$	Rate (lb/hr)	<8.6434E-05	<8.4631E-05	<8.5587E-05	<8.5433E-05	**<8.5521E-05**
$E_{g/s}$	Rate (g/s)	<1.0889E-05	<1.0662E-05	<1.0782E-05	<1.0763E-05	**<1.0774E-05**
$E_{T/yr}$	Rate (Ton/yr)	<3.7858E-04	<3.7068E-04	<3.7487E-04	<3.7420E-04	**<3.7458E-04**
E_{Fd}	Rate - Fd-based (lb/MMBtu)	<2.5590E-07	<2.7564E-07	<2.7379E-07	<2.7742E-07	**<2.7069E-07**
E_{Fc}	Rate - Fc-based (lb/MMBtu)	<2.6343E-07	<2.7750E-07	<2.7829E-07	<2.8167E-07	**<2.7522E-07**
Mercury Results - HCl Rinse + HCl/MnO2 Precipitate						
C_{sd}	Concentration (lb/dscf)	<1.1464E-11	<1.1466E-11	<1.1499E-11	<1.1762E-11	**<1.1548E-11**
C_{sd7}	Concentration @7% O_2 (lb/dscf)	<1.4227E-11	<1.5325E-11	<1.5222E-11	<1.5424E-11	**<1.5049E-11**
C_{sd12}	Concentration @12% CO_2 (lb/dscf)	<1.3895E-11	<1.4637E-11	<1.4679E-11	<1.4857E-11	**<1.4517E-11**
C_a	Concentration (lb/acf)	<6.1485E-12	<6.0305E-12	<6.0951E-12	<6.2385E-12	**<6.1282E-12**
C_{sd}	Concentration (µg/dscm)	<1.8358E-01	<1.8361E-01	<1.8413E-01	<1.8835E-01	**<1.8492E-01**
C_{sd7}	Concentration @7% O_2 (µg/dscm)	<2.2783E-01	<2.4540E-01	<2.4376E-01	<2.4699E-01	**<2.4099E-01**
C_{sd12}	Concentration @12% CO_2 (µg/dscm)	<2.2252E-01	<2.3440E-01	<2.3506E-01	<2.3792E-01	**<2.3247E-01**
C_{sd}	Concentration (mg/dscm)	<1.8358E-04	<1.8361E-04	<1.8413E-04	<1.8835E-04	**<1.8492E-04**
C_{sd7}	Concentration @7% O_2 (mg/dscm)	<2.2783E-04	<2.4540E-04	<2.4376E-04	<2.4699E-04	**<2.4099E-04**
C_{sd12}	Concentration @12% CO_2 (mg/dscm)	<2.2252E-04	<2.3440E-04	<2.3506E-04	<2.3792E-04	**<2.3247E-04**
C_a	Concentration (µg/m^3 (actual,wet))	<9.8460E-02	<9.6570E-02	<9.7604E-02	<9.9901E-02	**<9.8134E-02**
C_{sd}	Concentration (µg/Nm^3 dry)	<1.9701E-01	<1.9705E-01	<1.9761E-01	<2.0213E-01	**<1.9845E-01**
C_{sd7}	Concentration @7% O_2 (µg/Nm^3 dry)	<2.4450E-01	<2.6336E-01	<2.6159E-01	<2.6506E-01	**<2.5863E-01**
C_{sd12}	Concentration @12% CO_2 (µg/Nm^3 dry)	<2.3880E-01	<2.5155E-01	<2.5226E-01	<2.5533E-01	**<2.4948E-01**
$E_{lb/hr}$	Rate (lb/hr)	<6.9147E-05	<6.7705E-05	<6.8470E-05	<6.8347E-05	**<6.8417E-05**
$E_{g/s}$	Rate (g/s)	<8.7109E-06	<8.5292E-06	<8.6255E-06	<8.6101E-06	**<8.6189E-06**
$E_{T/yr}$	Rate (Ton/yr)	<3.0286E-04	<2.9655E-04	<2.9990E-04	<2.9936E-04	**<2.9967E-04**
E_{Fd}	Rate - Fd-based (lb/MMBtu)	<2.0472E-07	<2.2051E-07	<2.1903E-07	<2.2194E-07	**<2.1655E-07**
E_{Fc}	Rate - Fc-based (lb/MMBtu)	<2.1075E-07	<2.2200E-07	<2.2263E-07	<2.2533E-07	**<2.2018E-07**

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QA/QC DATA

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I herby certify that all pages contained within this Appendix have been reviewed and, to the best of my ability, verified as accurate.

QA/QC Initials: NR

Date: 1/7/13

CleanAir.

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Wheelabrator
Clean Air Project No: 11414
Unit 1 FF Outlet

USEPA Method 29 (Trace Metals)
QA/QC Results

	Run No.	1	2	3	4	
	Date (2012)	Dec 4	Dec 5	Dec 5	Dec 5	
	Start Time (approx.)	13:14	07:44	10:30	13:12	
	Stop Time (approx.)	15:28	09:58	12:45	15:26	
	Total Duration of Test Run (min.)	134	134	135	134	
	Net Sampling Time (min.)	125	125	125	125	
	Sampling System Calibration Summary					
	Nozzle ID No:	270-1	270-1	270-1	270-1	
D_n	Nozzle Diameter (in):	0.270	0.270	0.270	0.270	
	Probe ID No:	67-8-10	67-8-10	67-8-10	67-8-10	
C_p	Pitot Coefficient:	0.827	0.827	0.827	0.827	
	Meter Box ID. No:	66-19	66-19	66-19	66-19	
Y_d	Meter Box Yd - Field Sheet	0.9928	0.9928	0.9928	0.9928	
	Meter Box Yd - Database	0.9928	0.9928	0.9928	0.9928	
	Meter Box ΔH@ - Field Sheet	1.7924	1.7924	1.7924	1.7924	
	Meter Box ΔH@ - Database	1.7924	1.7924	1.7924	1.7924	
	QA/QC					
	Final Leak Check					
	(a) 4% of Sampling Rate (cfm)	0.0253	0.0253	0.0254	0.0249	
	(b) Allowable Rate from Method (cfm)	0.0200	0.0200	0.0200	0.0200	
	Allowable Limit - minimum of a and b (cfm)	0.0200	0.0200	0.0200	0.0200	
	Actual Final Leak Rate (cfm)	0.002	0.002	0.003	0.002	
	Sample Volume					
	Minimum Volume Required (dscf)	60.00	60.00	60.00	60.00	
V_{mstd}	Actual Sample Volume (dscf)	76.938	76.924	76.706	74.987	
	Alternative Method 5 Post-Test Calibration (EPA ALT-009)					
$\sqrt{\Delta H_{avg}}$	Average of Square Root of ΔH (in. W.C.)	1.1352	1.1312	1.1302	1.1047	
Y_{qa}	Alternative Meter Calibration Factor	0.9984	0.9954	0.9943	0.9913	**Average**
	Variation from full-test Y_d (average ≤ ±5%)	0.6%	0.3%	0.2%	-0.2%	**0.2%**
	Mean Isokinetic Sampling Rate Variation					
	Minimum Allowable (%)	90	90	90	90	
	Maximum Allowable (%)	110	110	110	110	
%I	Actual Variation (%)	98.6	100.7	99.6	99.8	
	Point-by-Point Isokinetic Variation					
	Number of points <90%	0	0	0	0	
	Number of points >110%	0	0	0	0	
	Number of points <80%	0	0	0	0	
	Number of points >120%	0	0	0	0	

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Nozzle Calibration Sheet

Client	Wheelabrator	Project Number	11414
Calibrated by	A. Obuchanski	Unit	1
Date	12-4-12	Runs	1-4

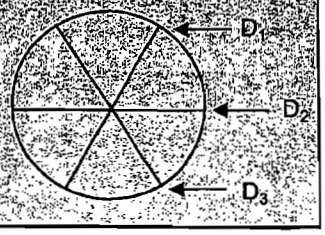
Nozzle Identification	D_1 (inches)	D_2 (inches)	D_3 (inches)	ΔD (inches)	D_{ave} (inches)
270-1	0.2705	0.2710	0.2695	~~0.270~~ 0.0015	0.270

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
Date 12-4-12

CleanAir ENGINEERING

Client: SOURCE 66 **Reviewed By:** R.Redel **Calibration Signature:**

ID No: 66-19 **Calibrated By:** O.Lavrov **Meter Box Yd:** 0.9928

Job No: N/A **Date of Calibration:** 10/16/12 **Meter Box ΔH@:** 1.7924

Meter Box Serial No: 28-101503-1 **Due Date of Calibration:** 10/17/13 **Barometer Serial No:** W12837

Manufacturer Part No: 0028 **Meter Box Vacuum:** 1.0 in. H_2O **Barometric Pressure:** 29.03 in. Hg

				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@
0.383	0.50	-1.00	1.0000	0.000	5.000	5.000	155.563	160.682	5.119	72.5	72.5	72.50	85.0	83.0	84.00	12.54	0.9941	1.8047
0.383	0.50	-1.00	1.0000	0.000	5.000	5.000	160.682	165.806	5.124	72.5	72.5	72.50	85.0	84.0	84.50	12.54	0.9940	1.8014
0.671	1.50	-1.30	1.0000	0.000	10.000	10.000	180.600	190.887	10.287	73.0	73.0	73.00	92.0	86.0	89.00	14.32	0.9942	1.7587
0.671	1.50	-1.30	1.0000	0.000	10.000	10.000	190.887	201.187	10.300	73.0	73.0	73.00	92.0	87.0	89.50	14.31	0.9939	1.7530
0.931	3.00	-1.70	1.0000	0.000	10.000	10.000	219.858	230.213	10.355	73.0	73.0	73.00	97.0	88.0	92.50	10.32	0.9892	1.8201
0.931	3.00	-1.70	1.0000	0.000	10.000	10.000	230.213	240.565	10.352	73.0	73.0	73.00	98.0	89.0	93.50	10.32	0.9913	1.8168
																Averages	0.99277	1.79245

Nomenclature

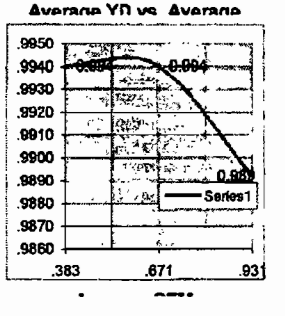
P_b	Barometric Pressure (in. Hg)
Q	Flow Rate (cfm)
ΔH	Orifice Pressure differential (in. H_2O)
ΔP	Inlet Pressure Differential (in. H_2O)
V_d	Gas Meter Volume - Dry (ft^3)
V_{ds}	Standard Meter Volume - Dry (ft^3)
T_d	Average Meter Box Temperature (°F)
T_o	Outlet Meter Box Temperature (°F)
T_{ds}	Average 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)
5.1	5.0
10.1	10.0
15.3	15.0
20.2	20.0
25.3	25.0

Calibration Reference Information (Standard Meter)

Reference Used: Wet Test Meter Serial No: 11AH6

Calibrated By: Martin Vaquero Date Calibrated: 10/26/2011

Percent Error: 0.230% Calibration Due Date: 10/26/2012

Meter Box Pre-Calibration Inspection

Positive Leak Check:	Pass	Electrical Check:	Pass
Negative Leak Check:	Pass	Pyrometer Check	Pass
Vacuum Gauge Check	Pass	YD Tolerance: ± 2% of 1.0000	Pass

Meter Box - Pyrometer Calibration Sheet

Meter Box No: 66-19 | Office: Express

Calibrated by: O.Lavrov | Client: SOURCE 66

Date: 10/16/12 | Job No: n/a

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		
50	52	51	52	52	52		
100	102	101	102	102	102		
150	152	151	152	152	152		
200	202	201	201	202	202		
250	252	251	251	252	252		
300	302	300	301	302	302		
350	352	350	352	352	352		
400	402	400	402	402	402		
450	452	450	452	452	452		
500	502	500	502	502	502		
550	552	550	552	552	552		
600	602	600	602	602	602		

Tolerance = ±2°F difference from reference setting.

Calibration Reference Information

Reference Used: Omega CL23A | Serial No: T-279500

Calibrated By: JH Metrology | Date Calibrated: 8/20/2012

Calibration Report No: 1000164078 | Calibration Due Date: 8/20/2013

Sample Probe Calibration

Probe Type: M5 with S-Type Pitot **I.D. Number:** 67-8-10
Project Number: 11414

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	73	73	0	0.00%	
2	200°F-250°F	255	255	0	0.00%	%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	0.543	0.774	0.829	0.001
2	0.546	0.774	0.832	0.002
3	0.542	0.772	0.829	0.001
		Side 'A' Average Probe $C_{p(A)}$=	0.8300	0.0011

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	0.540	0.782	0.823	0.000
2	0.537	0.777	0.823	0.001
3	0.541	0.781	0.825	0.001
		Side 'B' Average Probe $C_{p(B)}$=	0.8236	0.0006

Specification
Avg. C_p Deviations ≤ 0.01

'A' Average C_p		'B' Average C_p		Difference	Specification
0.830	—	0.824	=	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.**

$$^{*}C_{P(S)} = C_{P(STD)}\sqrt{\frac{\Delta p_{(STD)}}{\Delta p_{(S)}}} \qquad ^{**}Deviation = \left|C_{P(S)} - \overline{C_{P\,(A\text{ or }B)}}\right|$$

All specifications are from EPA-600/9-76-005, section 3.1

Probe Cp= 0.827 Calibrated by: B ARNOLD Date: 03/12/2012

CleanAir ENGINEERING

TROEMNER
Henry Troemner LLC

Traceable Certificate

201 Wolf Drive • P.O. Box 87 • Thorofare, NJ 08086-0087 • Phone:856-686-1600 • Fax: 856-686-1601 • www.troemner.com • e-mail: troemner@troemner.com

Weight

Clean Air Engineering
500 West Wood Street
Palatine, IL 60067

Order Number	CREDIT CARD
Certificate Number	661379
Date Of Calibration	06-AUG-2012
Calibration Due Date	06-AUG-2013
As Found	In Tolerance
As Left	In Tolerance

Description of Weights: ASTM Weight

Material	Assumed Density at 20°C	Range
Stainless Steel	8.03 g/cm3	500g

Tested with Reference Standards Traceable to the National Institute of Standards & Technology through NIST Test Number 822-275872-11.

We certify that the weights listed are calibrated to ASTM E617-97 Class 1 tolerances.

The calibration of these weights is based on apparent mass vs material of density 8.0g/cm3.

Nominal Mass Value	Serial Number	Correction before Calibration *	Correction after Calibration *	Tolerance (+ or -)	Uncertainty (+ or -)
500 g	1000022549	+0.4926 mg	+0.4926 mg	1.200 mg	0.30 mg

* Correction is defined as the difference between the mass value of a weight and its nominal value. A positive correction indicates that the mass value is greater than the nominal value by the amount of the correction.

Joseph Moran, Metrology Manager, Approved Signatory

1 As Found / 1 Total

CARSTAN SCALE
ACCU-DATA SYSTEMS, INC.
214 E. HELLEN ST.
PALATINE, IL 60067
847-934-6666 FAX 847-934-9272

FIELD SERVICE ORDER # 29471
DATE: 8/13/11
P.O.#:
CONTACT:

CUST. ID:
CUSTOMER: Vlasic Packaging
ADDRESS: 500 W. Wood St.
CITY/STATE/ZIP: Palatine, IL 60067
PHONE: ( ) X

BILL TO:
( ) X

☐ CALL SERVICE ☑ INSPECTION ☐ WARRANTY ☐ INSTALLATION ☐ CALL BACK ☐ RENTAL

M	MOD	SERIAL #	DESCRIPTION
4 Ohaus	AV4101	8028 0106	1000 = 1000.0 2000 = 2000.0 -0.1e
4/100g x .1g			3000 = 3000.0 4000 = 4000.0
9 Mettler	PE160	C41248	40 = 40.00 80 = 80.00 -0.1e
160g x .01g			120 = 120.00 160 = 160.00
9 A&D	FX2000	W40236	1000 = 1000.00 2000 = 2000.00 -0.1e Resisting
600g x .01g			4000 = 4000.00 5100 = 5100.00

MATERIALS USED

QTY	PART NUMBER	DESCRIPTION	PRICE	EXTENSION
		Inspection of 2 11 Scales		
		See Calibration Pads		
		For Passing		
			MATERIAL TOTAL:	

TIME START	TIME STOP	JOB STATUS	
:	:	☑ COMPLETE ☐ INCOMPLETE ☐ TO SHOP ☐ LOANER	

MEMO
TO:

REGULAR HOURS	2 @ 72	144.00
OVERTIME HOURS	@	
FREIGHT		
☐ ZONE CHARGE ☐ MILEAGE	1	59.00
☐ I.M.E. ☐ RESALE #	TAX	
	TOTAL THIS REPORT	203.00

TECHNICIAN

X CUSTOMER SIGNATURE

Date: 8/17/2011

Company: CLEANAI1

Carstan Scale/Accu Data Systems
214 E. Hellen Rd.
Palatine, IL 60067
(847) 934-6666

Standard Used: A: _____ B: _____ C: _____

Model: AP250D **Unit Number:** 1
Manufacturer: Ohaus
Serial Number: 1127211987
Capacity: 200 g
Location:
Weight Standards Used: CTG2

Pass — Initial ☑ Final ☑
Resolution: .0001 g

Calibration Test

Wgt App	Inital Rd	Error	Final Rd	Error
50	50.0000	—		
100	100.0000	—		
150	150.0000	—		
200	200.0000	—		

Comments: O.k.

Model: IR120 **Unit Number:** 2
Manufacturer: Denver Inst
Serial Number: 23103436
Capacity: 120 g
Location:
Weight Standards Used: CTG2

Pass — Initial ☑ Final ☑
Resolution: .001 g

Calibration Test

Wgt App	Inital Rd	Error	Final Rd	Error
10	10.000	—		
20	20.000	—		
50	50.000	—		
100	100.000	—		

Comments: O.k.

Model: GA200D **Unit Number:** 3
Manufacturer: Ohaus
Serial Number: 2204
Capacity: 40 g/200 g
Location:
Weight Standards Used: CTG2

Pass — Initial ☑ Final ☑
Resolution: .0001 g

Calibration Test

Wgt App	Inital Rd	Error	Final Rd	Error
50	50.0001	+.0001	50.0000	—
100	100.0003	+.0003	100.0000	—
150	150.0010	+.0010	150.0000	—
200	200.0023	+.0023	200.0000	—

Comments: Neg / O.k.

Model: AV3102 **Unit Number:** 4
Manufacturer: Ohaus
Serial Number: 8029361053
Capacity: 3100 g
Location:
Weight Standards Used: CTG2

Pass — Initial ☑ Final ☑
Resolution: .01 g

Calibration Test

Wgt App	Inital Rd	Error	Final Rd	Error
500	500.00	—		
1000	1000.00	—		
2000	2000.00	—		
3000	3000.00	—		

Comments: O.k.

Model: AJ100 **Unit Number:** 5
Manufacturer: Mettler
Serial Number: M26013
Capacity: 100 g
Location:
Weight Standards Used: CTG2

Pass — Initial ☑ Final ☑
Resolution: .0001 g

Calibration Test

Wgt App	Inital Rd	Error	Final Rd	Error
10	10.0000	—		
20	20.0000	—		
50	50.0000	—		
100	100.0000	—		

Comments: Scale has a Bind-Adjustment
Neg / O.k.

Scales were calibrated with certified test weights. Adjustments made to restore and/or maintain the accuracy of the scale conform to the tolerances established by NIST as specified in Handbook 44 or Manufacturers Specifications. Best measurement for uncertainty calculated using a coverage factor of K=2. This provides confidence level of 95%.

Calibrated by: _____

QMF12 1

Date: 8/17/2011

Company: CLEANAI1

Carstan Scale/Accu Data Systems
214 E. Hellen Rd.
Palatine, IL 60067
(847) 934-6666

Standard Used: A: _____ B: _____ C: _____

Model: GA200D **Unit Number:** 7
Manufacturer: Ohaus
Serial Number: 4139
Capacity: 200g
Resolution: .0001g
Location:
Weight Standards Used: C162

Pass: Initial ☐ Final ☑

Calibration Test

Wgt App	Inital Rd	Error	Final Rd	Error
50	50.0015	+.0015	50.0010	—
100	100.0035	+.0015	100.0000	—
150	150.0071	+.0021	150.0000	—
200	200.0142	+.0142	100.0000	—

Comments: Recal 10.6

Model: Discovery **Unit Number:** 11
Manufacturer: Ohaus
Serial Number: 1123173913
Capacity: 200g
Resolution: .01mg/.1m
Location: LAB6
Weight Standards Used: C162

Pass: Initial ☐ Final ☑

Calibration Test

Wgt App	Inital Rd	Error	Final Rd	Error
50	50.01	+.01		—
100	100.02	+.02		—
150	150.03	+.03		—
200	200.04	+.04		—

Comments: Cal 10.6

Model: Discovery **Unit Number:** 12
Manufacturer: Ohaus
Serial Number: 1123181459
Capacity: 200g
Resolution: .01mg/.1m
Location: LAB6
Weight Standards Used: C162

Pass: Initial ☑ Final ☑

Calibration Test

Wgt App	Inital Rd	Error	Final Rd	Error
50	50.00	—		
100	100.00	—		
150	150.00	—		
200	200.00	—		

Comments: Cal 10.6

Model: Adventurer **Unit Number:** 13
Manufacturer: Ohaus
Serial Number: 8028101133
Capacity: 4100 g
Resolution: .1
Location:
Weight Standards Used: C162

Pass: Initial ☑ Final ☑

Calibration Test

Wgt App	Inital Rd	Error	Final Rd	Error
1000	1000.0	—		
2000	2000.0	—		
3000	3000.0	—		
4000	4000.0	—		

Comments: Cal 10.6

Model: Adventurer **Unit Number:** 15
Manufacturer: Ohaus
Serial Number: 8028301069
Capacity: 4100 g
Resolution: .1
Location:
Weight Standards Used: C162

Pass: Initial ☑ Final ☑

Calibration Test

Wgt App	Inital Rd	Error	Final Rd	Error
1000	1000.0	—		
2000	2000.0	—		
3000	3000.0	—		
4000	4000.0	—		

Comments: Cal 10.6

Scales were calibrated with certified test weights. Adjustments made to restore and/or maintain the accuracy of the scale conform to the tolerances established by NIST as specified in Handbook 44 or Manufacturers Specifications. Best measurement for uncertainty calculated using a coverage factor of K=2. This provides confidence level of 95%.

Calibrated by: _____

QMF12 2

Date: 8/17/2011

Company: CLEANAI1

Carstan Scale/Accu Data Systems
214 E. Hellen Rd.
Palatine, IL 60067
(847) 934-6666

Standard Used:

A: _____

B: _____

C: _____

Model: Adventurer **Unit Number:** 16
Manufacturer: Ohaus
Serial Number: 8028301068
Capacity: 4100 g
Resolution: .1
Location:
Weight Standards Used: F-12

Pass — Initial ☑ Final ☑

Calibration Test

Wgt App	Inital Rd	Error	Final Rd	Error
1000	1000.0	—		
2000	2000.0	—		
3000	3000.0	—		
4000	4000.0	—		

Comments: OK

Model: Adventurer **Unit Number:** 17
Manufacturer: Ohaus
Serial Number: 8028101135
Capacity: 4100 g
Resolution: .1
Location:
Weight Standards Used: F-12

Pass — Initial ☑ Final ☑

Calibration Test

Wgt App	Inital Rd	Error	Final Rd	Error
1000	1000.0	—		
2000	2000.0	—		
3000	3000.0	—		
4000	4000.0	—		

Comments: OK

Model: Discoverer **Unit Number:** 18
Manufacturer: Ohaus
Serial Number: 1129400331
Capacity: 210 g
Resolution: .0001
Location:
Weight Standards Used: F-12

Pass — Initial ☐ Final ☑

Calibration Test

Wgt App	Inital Rd	Error	Final Rd	Error
50	50.0001	+.0001	50	
100	100.0003	+.0003	100.0000	
150	150.0001	+.0001	150.0000	
200	200.0002	+.0002	200.0000	

Comments: OK

Model: 1600 **Unit Number:** 19
Manufacturer: Ohaus
Serial Number: 3BB-10
Capacity: 2610 g
Resolution:
Location:
Weight Standards Used: F-12

Pass — Initial ☐ Final ☐

Calibration Test

Wgt App	Inital Rd	Error	Final Rd	Error
500	500	—		
1000	1000	—		
1500	1500	—		
2000	2000	—		

Comments: OK

Model: 1600 **Unit Number:** 20
Manufacturer: Ohaus
Serial Number: 3BB-09
Capacity: 2610 g
Resolution:
Location:
Weight Standards Used: F-12

Pass — Initial ☐ Final ☐

Calibration Test

Wgt App	Inital Rd	Error	Final Rd	Error
500				
1000				
1500				
2000				

Comments: Scale will not Tare

Scales were calibrated with certified test weights. Adjustments made to restore and/or maintain the accuracy of the scale conform to the tolerances established by NIST as specified in Handbook 44 or Manufacturers Specifications. Best measurement for uncertainty calculated using a coverage factor of K=2. This provides confidence level of 95%.

Calibrated by: _____

QMF12 3

Date: 8/17/2011

Company: CLEANAI1

Carstan Scale/Accu Data Systems
214 E. Hellen Rd.
Palatine, IL 60067
(847) 934-6666

Standard Used: A: _____ B: _____ C: _____

Model: 1600 **Unit Number:** 21
Manufacturer: Ohaus
Serial Number: 3BB-08
Capacity: 2610 g
Resolution:
Location:
Weight Standards Used: 1162

Pass: Initial ☑ Final ☑

Calibration Test

Wgt App	Inital Rd	Error	Final Rd	Error
500	500	—		
1000	1000	—		
1500	1500	—		
2000	2000	—		

Comments: OK

Model: 1600 **Unit Number:** 22
Manufacturer: Ohaus
Serial Number: 3BB-07
Capacity: 2610 g
Resolution:
Location:
Weight Standards Used: 1162

Pass: Initial ☑ Final ☑

Calibration Test

Wgt App	Inital Rd	Error	Final Rd	Error
500	500	—		
1000	1000	—		
1500	1500	—		
2000	2000	—		

Comments: OK

Model: Adventurer **Unit Number:** 23
Manufacturer: Ohaus
Serial Number: B032276010
Capacity: 3100 g
Resolution: .01
Location: LAB 01
Weight Standards Used: 1162

Pass: Initial ☐ Final ☐

Calibration Test

Wgt App	Inital Rd	Error	Final Rd	Error
500	499.98	-.02	500.00	—
1000	999.96	-.04	1000.00	—
2000	999.93	-.07	2000.00	—
3000	999.81	-.19	3000.00	—

Comments: Cal'd OK

Scales were calibrated with certified test weights. Adjustments made to restore and/or maintain the accuracy of the scale conform to the tolerances established by NIST as specified in Handbook 44 or Manufacturers Specifications. Best measurement for uncertainty calculated using a coverage factor of K=2. This provides confidence level of 95%.

Calibrated by: _____

QMF12

4

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FIELD DATA

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I herby certify that all pages contained within this Appendix have been reviewed and, to the best of my ability, verified as accurate.

QA/QC Initials: MC

Date: 1/7/13

CleanAir.

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Test Location: FF Outlet
Unit: 1 Run: 1

Trace Metals Testing
FIELD DATA SHEET

Method: USEPA Method 29

Start Time: 13:14 Stop Time: 15:28

Client: Wheelabrator
Plant: North Broward
Meter Operator: N. Hitchins (569)
Probe Operator: N. Hitchins (569)
Meter Box: 66-19 Sample Box: m10
Meter Yd: 0.9928 Meter ΔH@: 1.7924
K Factor: 2.56 Pitot Cp: 0.827
Initial Leak Rate: 0.006 cfm @ 15.0"Hg
Final Leak Rate: 0.002 cfm @ 6.0"Hg
Pitot Leak Check ☑ Initial Final ☑ Pass ☐ Fail

Project No: 11414
Date: 12/04/12

Stack/Duct Dimensions: 96.0 In. x 96.0 in.
Stack/Duct Area: 64 sq.ft.
O_2 (dry volume %): 9.70
CO_2 (dry volume %): 9.90
N_2+CO (dry volume %): 80.40
H_2O (condensate, ml or gm): 419.1
H_2O (silica, g): 16.2
Actual Measured Moisture (%): 21.03

Probe I.D. No: 67-8-10
Liner Material: Pyrex Glass
Pitot Cp: 0.827

Filter No(s): n/a
Thimble No(s): n/a
Nozzle ID No: 270-1
Nozzle Dia (in.): 0.270

Meter Bar. Press. (in. Hg): 30.35
Location Bar. Press. (in. Hg): 30.35
Static Pressure (in. H2O): -11.0
Amb. Temp. (°F): 81

Traverse Point Number	5.0 min/read Elapsed Time (min)	Velocity Head Δp (in. H_2O)	Orifice Setting ΔH (in. H_2O)	Gas Sample Volume V_m (ft^3)	Thermocouple Record: Stack t_S (°F)	Cond. t_C (°F)	DGM In $t_{M\,in}$ (°F)	DGM Out $t_{M\,out}$ (°F)	Probe t_P (°F)	Filter t_F (°F)	Not Used	Pump Vacuum (in. Hg)	Observed Oxygen, approx. (%,dv)	Notes:	Stack Velocity V_s (ft/sec)	Isokinetic Variation I (%)
	0.0			240.890					250	250						
1-01	5.0	0.47	1.2	244.000	307	66	82	82	255	255		4	9.0		47.1	101.4
1-02	10.0	0.48	1.2	247.050	310	48	84	82	247	250		4	8.7		47.7	98.4
1-03	15.0	0.53	1.4	250.270	310	45	86	82	250	252		4	8.0		50.2	98.8
1-04	20.0	0.57	1.5	253.640	308	45	88	83	251	251		5	8.4		51.9	99.3
1-05	25.0	0.52	1.3	256.840	305	46	89	84	249	250		5	9.2		49.5	98.3
Port Chng	25.0	New Initial Vm		257.095												
2-01	30.0	0.47	1.2	260.100	306	50	89	85	253	252		4	9.1		47.1	97.0
2-02	35.0	0.44	1.1	263.040	308	46	91	86	252	250		4	9.0		45.6	97.9
2-03	40.0	0.5	1.3	266.220	309	47	92	86	252	250		5	8.8		48.7	99.4
2-04	45.0	0.6	1.5	269.600	309	48	91	86	250	250		5	9.2		53.3	96.6
2-05	50.0	0.53	1.4	272.950	308	49	90	86	251	249		5	9.3		50.1	101.9
Port Chng	50.0	New Initial Vm		273.230												
3-01	55.0	0.52	1.3	276.360	305	50	89	86	253	251		5	9.5		49.5	96.0
3-02	60.0	0.44	1.1	279.330	308	60	90	86	249	250		5	9.5		45.6	99.0
3-03	65.0	0.5	1.3	282.500	308	62	90	86	250	250		5	9.5		48.6	99.2
3-04	70.0	0.55	1.4	285.770	308	46	92	86	252	249		5	9.2		51.0	97.4
3-05	75.0	0.54	1.4	289.060	308	43	92	87	249	249		5	9.7		50.6	98.8
Port Chng	75.0	New Initial Vm		289.255												
4-01	80.0	0.55	1.4	292.550	309	48	91	87	253	249		5	9.5		51.1	98.2
4-02	85.0	0.44	1.1	295.500	309	43	92	87	247	250		4	9.8		45.7	98.2
4-03	90.0	0.47	1.2	298.570	310	43	93	87	249	250		5	9.4		47.2	98.8
4-04	95.0	0.56	1.4	301.860	308	42	91	86	249	250		5	9.1		51.5	97.2
4-05	100.0	0.58	1.5	305.235	308	43	91	86	251	250		5	8.3		52.4	98.0
Port Chng	100.0	New Initial Vm		305.505												
5-01	105.0	0.42	1.1	308.440	305	52	89	86	252	250		4	9.0		44.5	100.1
5-02	110.0	0.47	1.2	311.500	308	55	90	86	247	250		5	8.5		47.2	98.8
5-03	115.0	0.44	1.1	314.470	303	56	91	86	249	250		5	8.5		45.5	98.6
5-04	120.0	0.53	1.4	317.750	307	56	92	86	250	250		5	8.3		50.1	99.5
5-05	125.0	0.5	1.3	320.920	306	56	92	87	249	249		5	8.3		48.6	99.8
Avg/Tot/Rng	125.0	0.70966	1.29200	79.030	307.6000	42-66	87.6800		247-255	249-255		5.0	9.0	121812 095714 M	48.8119	98.6

Meter Operator SB Date 1/4/13

CleanAir

Test Location: FF Outlet
Unit: 1 Run: 2

Trace Metals Testing
FIELD DATA SHEET

Method: USEPA Method 29
Start Time: 07:44 Stop Time: 09:58

Client: Wheelabrator
Plant: North Broward
Meter Operator: N. Hitchins (569)
Probe Operator: N. Hitchins (569)
Meter Box: 66-19 Sample Box: m11
Meter Yd: 0.9928 Meter ΔH@: 1.7924
K Factor: 2.6 Pitot Cp: 0.827
Initial Leak Rate: 0.003 cfm @ 15.0"Hg
Final Leak Rate: 0.002 cfm @ 7.0"Hg
Pitot Leak Check ☑ Initial Final ☑ Pass ☐ Fail

Project No: 11414
Date: 12/05/12

Stack/Duct Dimensions: 96.0 in. x 96.0 in.
Stack/Duct Area: 64 sq.ft.
O_2 (dry volume %): 10.50
CO_2 (dry volume %): 9.40
N_2+CO (dry volume %): 80.10
H_2O (condensate, ml or gm): 447.1
H_2O (silica, g): 17.1
Actual Measured Moisture (%): 22.12

Probe I.D. No: 67-8-10
Liner Material: Pyrex Glass
Pitot Cp: 0.827
Filter No(s): n/a
Thimble No(s): n/a
Nozzle ID No: 270-1
Nozzle Dia (in.): 0.270

Meter Bar. Press. (in. Hg): 30.20
Location Bar. Press. (in. Hg): 30.20
Static Pressure (in. H2O): -10.0
Amb. Temp. (°F): 77

Traverse Point Number	5.0 min/read Elapsed Time (min)	Velocity Head Δp (in. H_2O)	Orifice Setting ΔH (in. H_2O)	Gas Sample Volume V_m (ft^3)	Thermocouple Record: Stack t_S (°F)	Cond. t_C (°F)	DGM In $t_{M\ in}$ (°F)	DGM Out $t_{M\ out}$ (°F)	Probe t_P (°F)	Filter t_F (°F)	Not Used	Pump Vacuum (in. Hg)	Observed Oxygen, approx. (%,dv)	Notes:	Stack Velocity V_s (ft/sec)	Isokinetic Variation I (%)
	0.0			322.110					250	250						
1-01	5.0	0.4	1	324.930	308	62	77	76	252	252		4	10.0		43.7	101.4
1-02	10.0	0.44	1.1	327.810	304	50	79	76	249	250		4	9.4		45.7	98.4
1-03	15.0	0.47	1.2	330.840	311	47	81	76	252	250		4	9.4		47.5	100.4
1-04	20.0	0.53	1.4	334.100	307	46	83	77	249	249		5	9.5		50.3	101.3
1-05	25.0	0.56	1.5	337.460	308	46	84	78	250	250		5	9.2		51.7	101.4
Port Chng	25.0	New Initial Vm		337.645												
2-01	30.0	0.47	1.2	340.690	307	49	83	79	248	250		5	8.5		47.3	100.2
2-02	35.0	0.44	1.1	343.610	308	47	86	80	252	249		4	8.8		45.8	99.0
2-03	40.0	0.48	1.2	346.680	308	47	86	80	249	249		5	8.6		47.9	99.7
2-04	45.0	0.56	1.5	350.050	305	48	87	81	251	251		5	8.5		51.6	101.0
2-05	50.0	0.55	1.4	353.395	311	50	89	81	249	247		5	8.3		51.3	101.3
Port Chng	50.0	New Initial Vm		353.595												
3-01	55.0	0.48	1.2	356.630	309	54	88	82	250	250		5	8.4		47.9	98.2
3-02	60.0	0.43	1.1	359.640	312	52	90	83	249	250		5	9.0		45.4	102.8
3-03	65.0	0.5	1.3	362.830	310	53	90	84	251	251		5	8.8		48.9	100.9
3-04	70.0	0.59	1.5	366.220	314	54	91	84	250	250		5	8.6		53.3	98.9
3-05	75.0	0.63	1.6	369.800	314	57	93	85	251	251		6	9.5		55.1	100.8
Port Chng	75.0	New Initial Vm		370.020												
4-01	80.0	0.45	1.2	373.130	318	62	92	86	248	249		5	8.8		46.7	103.8
4-02	85.0	0.45	1.2	376.220	313	62	93	86	250	251		5	9.0		46.5	102.7
4-03	90.0	0.48	1.2	379.310	310	52	93	86	250	249		5	9.7		47.9	99.2
4-04	95.0	0.55	1.4	382.680	319	49	93	87	251	250		5	9.3		51.6	101.7
4-05	100.0	0.54	1.4	386.000	309	49	92	86	250	250		5	8.8		50.8	100.6
Port Chng	100.0	New Initial Vm		386.395												
5-01	105.0	0.45	1.2	389.440	309	54	91	87	249	250		5	9.3		46.4	101.0
5-02	110.0	0.45	1.2	392.530	309	54	93	87	249	249		5	8.8		46.4	102.3
5-03	115.0	0.46	1.2	395.620	307	54	93	87	251	249		5	8.8		46.8	101.1
5-04	120.0	0.54	1.4	398.930	308	54	93	88	249	249		6	8.6		50.8	100.0
5-05	125.0	0.54	1.4	402.225	311	55	93	88	250	250		6	7.8		50.9	99.7
Avg/Tot/Rng	125.0	0.70429	1.28400	79.115	309.9600	46-62	85.6600		248-252	247-252		6.0	8.9		48.7299	100.7

Meter Operator _____ Date 1/4/13

CleanAir.

Test Location: FF Outlet
Unit: 1 Run: 3

Trace Metals Testing
FIELD DATA SHEET

Method: USEPA Method 29
Start Time: 10:30 Stop Time: 12:45

Client: Wheelabrator
Plant: North Broward
Meter Operator: N. Hitchins (569)
Probe Operator: N. Hitchins (569)
Meter Box: 66-19 Sample Box: m10
Meter Yd: 0.9928 Meter ΔH@: 1.7924
K Factor: 2.55 Pitot Cp: 0.827
Initial Leak Rate: 0.003 cfm @ 15.0"Hg
Final Leak Rate: 0.003 cfm @ 7.0"Hg
Pitot Leak Check ☑ Initial Final ☑ Pass ☐ Fail

Project No: 11414
Date: 12/05/12

Stack/Duct Dimensions: 96.0 in. x 96.0 in.
Stack/Duct Area: 64 sq.ft.
O_2 (dry volume %): 10.40
CO_2 (dry volume %): 9.40
N_2+CO (dry volume %): 80.20
H_2O (condensate, ml or gm): 427.1
H_2O (silica, g): 17.0
Actual Measured Moisture (%): 21.41

Probe I.D. No: 67-8-10
Liner Material: Pyrex Glass
Pitot Cp: 0.827

Filter No(s): n/a
Thimble No(s): n/a
Nozzle ID No: 270-1
Nozzle Dia (in.): 0.270

Meter Bar. Press. (in. Hg): 30.20
Location Bar. Press. (in. Hg): 30.20
Static Pressure (in. H2O): -12.0
Amb. Temp. (°F): 85

Traverse Point Number	5.0 min/read Elapsed Time (min)	Velocity Head Δp (in. H_2O)	Orifice Setting ΔH (in. H_2O)	Gas Sample Volume V_m (ft^3)	Thermocouple Record: Stack t_S (°F)	Cond. t_C (°F)	DGM In $t_{M\,in}$ (°F)	DGM Out $t_{M\,out}$ (°F)	Probe t_P (°F)	Filter t_F (°F)	Not Used	Pump Vacuum (in. Hg)	Observed Oxygen, approx. (%,dv)	Notes:	Stack Velocity V_s (ft/sec)	Isokinetic Variation I (%)
	0.0			403.240					250	250						
1-01	5.0	0.59	1.5	406.730	309	62	85	85	256	254		5	11.0		53.2	101.4
1-02	10.0	0.52	1.4	410.000	309	53	86	85	250	253		5	8.8		49.9	101.1
1-03	15.0	0.52	1.4	413.260	308	49	89	85	245	251		5	8.3		49.9	100.5
1-04	20.0	0.53	1.4	416.530	307	48	90	85	248	250		5	8.0		50.3	99.7
1-05	25.0	0.51	1.3	419.720	307	49	91	85	250	252		5	7.7		49.4	99.0
Port Chng	25.0	New Initial Vm		419.900												
2-01	30.0	0.4	1	422.720	304	53	89	86	254	250		4	9.5		43.6	98.6
2-02	35.0	0.4	1	425.560	307	53	90	86	248	250		4	7.8		43.7	99.5
2-03	40.0	0.48	1.3	428.750	308	53	90	86	249	250		5	8.0		47.9	102.1
2-04	45.0	0.54	1.4	432.060	307	53	91	86	247	249		5	8.7		50.8	99.8
2-05	50.0	0.55	1.4	435.405	308	54	91	86	251	250		5	8.8		51.3	100.0
Port Chng	50.0	New Initial Vm		435.650												
3-01	55.0	0.41	1.1	438.580	306	57	90	86	252	251		4	9.5		44.2	101.3
3-02	60.0	0.39	1	441.370	307	60	92	86	250	251		4	8.2		43.2	98.8
3-03	65.0	0.49	1.3	444.560	308	61	92	86	250	250		4	8.4		48.4	100.9
3-04	70.0	0.58	1.5	447.970	308	61	93	86	249	249		4	8.9		52.7	99.1
3-05	75.0	0.56	1.4	451.305	307	62	94	88	250	250		5	8.7		51.7	98.3
Port Chng	75.0	New Initial Vm		451.545												
4-01	80.0	0.45	1.1	454.500	307	62	92	88	253	251		5	9.0		46.4	97.2
4-02	85.0	0.4	1	457.340	308	60	93	88	249	249		4	9.4		43.7	99.1
4-03	90.0	0.48	1.2	460.440	305	59	92	88	249	249		4	9.6		47.8	98.7
4-04	95.0	0.59	1.5	463.850	309	62	92	88	247	248		5	9.7		53.2	98.2
4-05	100.0	0.68	1.7	467.540	309	59	93	88	251	250		6	10.3		57.1	99.0
Port Chng	100.0	New Initial Vm		467.895												
5-01	105.0	0.48	1.2	470.980	306	64	92	88	252	252		5	10.4		47.9	98.2
5-02	110.0	0.49	1.2	474.090	307	57	92	88	249	250		5	9.6		48.4	98.1
5-03	115.0	0.42	1.1	477.120	303	54	93	88	249	248		5	9.4		44.7	102.8
5-04	120.0	0.5	1.3	480.320	305	57	94	88	244	250		5	9.1		48.8	99.6
5-05	125.0	0.54	1.4	483.625	307	57	94	88	250	250		5	8.7		50.8	99.2
Avg/Tot/Rng	125.0	0.70532	1.28400	79.365	307.0400	48-64	88.9400		244-256	248-254		6.0	9.0		48.7586	99.6

121812 095714 N

Meter Operator JB Date 1/14/13

CleanAir

Test Location: FF Outlet
Unit: 1 Run: 4

Trace Metals Testing
FIELD DATA SHEET

Method: USEPA Method 29
Start Time: 13:12 Stop Time: 15:26

Client: Wheelabrator
Plant: North Broward
Meter Operator: N. Hitchins (569)
Probe Operator: N. Hitchins (569)
Meter Box: 66-19 Sample Box: m11
Meter Yd: 0.9928 Meter ΔH@: 1.7924
K Factor: 2.58 Pitot Cp: 0.827
Initial Leak Rate: 0.002 cfm @ 15.0"Hg
Final Leak Rate: 0.002 cfm @ 7.0"Hg
Pitot Leak Check ☑ Initial Final ☑ Pass ☐ Fail

Project No: 11414
Date: 12/05/12

Stack/Duct Dimensions: 96.0 in. x 96.0 in.
Stack/Duct Area: 64 sq.ft.
O_2 (dry volume %): 10.30
CO_2 (dry volume %): 9.50
N_2+CO (dry volume %): 80.20
H_2O (condensate, ml or gm): 427
H_2O (silica, g): 16.3
Actual Measured Moisture (%): 21.77

Probe I.D. No: 67-8-10
Liner Material: Pyrex Glass
Pitot Cp: 0.827

Meter Bar. Press. (in. Hg): 30.20
Location Bar. Press. (in. Hg): 30.20
Static Pressure (in. H2O): -10.0
Amb. Temp. (°F): 87

Filter No(s): n/a
Thimble No(s): n/a
Nozzle ID No: 270-1
Nozzle Dia (in.): 0.270

Traverse Point Number	5.0 min/read Elapsed Time (min)	Velocity Head Δp (in. H_2O)	Orifice Setting ΔH (in. H_2O)	Gas Sample Volume V_m (ft^3)	Thermocouple Record: Stack t_S (°F)	Cond. t_C (°F)	DGM In $t_{M\,in}$ (°F)	DGM Out $t_{M\,out}$ (°F)	Probe t_P (°F)	Filter t_F (°F)	Not Used	Pump Vacuum (in. Hg)	Observed Oxygen, approx. (%,dv)	Notes:	Stack Velocity V_s (ft/sec)	Isokinetic Variation I (%)
	0.0			484.440					250	250						
1-01	5.0	0.35	0.9	487.180	305	62	89	88	255	255		4	10.7		40.8	102.5
1-02	10.0	0.37	0.95	489.900	307	47	92	89	254	254		4	11.0		42.0	98.7
1-03	15.0	0.46	1.2	493.020	308	44	94	89	250	250		4	9.5		46.8	101.5
1-04	20.0	0.48	1.2	496.160	307	47	95	90	250	250		4	9.0		47.8	99.7
1-05	25.0	0.48	1.2	499.270	308	43	96	90	250	250		4	8.2		47.8	98.8
Port Chng	25.0	New Initial Vm		499.480												
2-01	30.0	0.44	1.1	502.460	303	48	94	90	250	250		4	10.0		45.6	98.7
2-02	35.0	0.4	1	505.270	307	46	94	89	249	250		4	8.1		43.6	97.9
2-03	40.0	0.47	1.2	508.320	308	47	93	89	250	251		4	8.0		47.3	98.2
2-04	45.0	0.61	1.6	511.830	308	48	94	89	252	251		5	8.2		53.9	99.2
2-05	50.0	0.58	1.5	515.265	308	49	95	89	250	249		5	7.7		52.6	99.5
Port Chng	50.0	New Initial Vm		515.495												
3-01	55.0	0.43	1.1	518.490	305	55	95	90	250	251		5	9.7		45.2	100.4
3-02	60.0	0.44	1.1	521.570	308	57	96	90	250	252		5	8.6		45.8	102.1
3-03	65.0	0.5	1.3	524.750	308	57	95	90	250	249		5	8.5		48.8	99.1
3-04	70.0	0.61	1.6	528.230	308	57	94	90	248	247		5	9.2		53.9	98.3
3-05	75.0	0.65	1.7	531.865	308	57	94	90	250	251		6	9.0		55.7	99.5
Port Chng	75.0	New Initial Vm		532.055												
4-01	80.0	0.45	1.2	535.180	304	59	93	89	251	251		5	9.5		46.2	102.6
4-02	85.0	0.4	1	538.030	308	60	94	89	251	251		5	9.3		43.7	99.4
4-03	90.0	0.45	1.2	541.110	308	53	94	90	251	251		5	9.3		46.3	101.2
4-04	95.0	0.55	1.4	544.410	309	52	96	90	251	249		5	8.6		51.2	98.0
4-05	100.0	0.61	1.6	547.930	308	57	96	90	248	249		6	8.0		53.9	99.3
Port Chng	100.0	New Initial Vm		548.230												
5-01	105.0	0.51	1.3	551.510	308	60	93	90	249	250		6	8.3		49.3	101.4
5-02	110.0	0.46	1.2	554.590	308	58	93	90	248	251		6	8.8		46.8	100.2
5-03	115.0	0.35	0.9	557.260	305	58	92	89	252	253		4	9.0		40.8	99.5
5-04	120.0	0.43	1.1	560.250	304	60	91	88	250	248		5	8.3		45.2	100.7
5-05	125.0	0.48	1.2	563.335	306	59	91	87	250	250		5	8.4		47.8	98.6
Avg/Tot/Rng	125.0	0.68922	1.23000	77.965	306.9600	43-62	91.5400		248-255	247-255		6.0	8.9		47.5524	99.8

Meter Operator SB Date 12/4/13

CleanAir.

ORSAT READINGS

TEST LOCATION: FF Outlet Unit 1 **PAGE** 1 **OF** 1

Client	Wheelabrator	Project Number	11414	$Fo = \frac{20.9 - \%O_2}{\%CO_2}$
Plant	North Broward	Unit	1	
Orsat ID	7	Fuel Type	MSW	Leak Check Passed ☑

Run Number	Method Number	Trial	Percent CO_2	Percent O_2+CO_2	Percent O_2	Fo	Analyst	Analysis Date	Analysis Time
1	29	1	9.9	19.6	9.7	1.13	A. Obuchowski	12/04/12	15:50
		2	9.9	19.6	9.7				
		3	9.9	19.6	9.7	Data meets Method 3 criteria, Md is 29.97 lb/lb•mole.			
		Avg.	**9.9**		**9.7**	Data meets Method 3B analysis criteria.			
2	29	1	9.4	20.0	10.6	1.11	A. Obuchowski	12/05/12	10:24
		2	9.4	20.0	10.6				
		3	9.4	19.8	10.4	Data meets Method 3 criteria, Md is 29.93 lb/lb•mole.			
		Avg.	**9.4**		**10.5**	Data meets Method 3B analysis criteria.			
3	29	1	9.4	19.8	10.4	1.12	A. Obuchowski	12/05/12	13:29
		2	9.4	19.8	10.4				
		3	9.4	19.8	10.4	Data meets Method 3 criteria, Md is 29.92 lb/lb•mole.			
		Avg.	**9.4**		**10.4**	Data meets Method 3B analysis criteria.			
4	29	1	9.4	19.8	10.4	1.12	A. Obuchowski	12/05/12	16:00
		2	9.6	19.8	10.2				
		3	9.4	19.8	10.4	Data meets Method 3 criteria, Md is 29.93 lb/lb•mole.			
		Avg.	**9.5**		**10.3**	Data meets Method 3B analysis criteria.			
		1							
		2							
		3							
		Avg.							
		1							
		2							
		3							
		Avg.							

Repeat analysis until the following criteria are met:

The three CO2 analyses must be within 0.3% by volume when CO2 is > 4.0%; within 0.2% by volume when CO2 is ≤ 4.0% by volume.

The three O2 analyses must be within 0.3% by volume when O2 is < 15.0%; within 0.2% by volume when O2 is ≥ 15.0% by volume.

Calculate Fo to verify results. Acceptable ranges for Fo:

Coal: Anthracite and Lignite	1.016-1.130	Gas: Natural	1.600-1.836
Bituminous	1.083-1.230	Propane	1.434-1.586
Oil: Distillate	1.260-1.413	Butane	1.405-1.553
Residual	1.210-1.370	Wood	1.000-1.120
Municipal Solid Waste	1.030-1.300	Wood Bark	1.003-1.130

QA/QC SB
Date 1/18/13

CleanAir ENGINEERING

USEPA Method 4 Laboratory Data

Location: Unit 1 FF Outlet
Client: Wheelabrator
Project No: 11414

Test Method: USEPA Method 29
Analyte: Trace Metals
Analyst: A. Obuchowski
Analyst Emp No: 567

Test Run: 1

	Contents	Gross (gm)	Tare (gm)	Net (gm)
Impinger 1	Empty	716.5	472.0	244.5
Impinger 2	5%HNO3/10%H2O2	679.6	562.3	117.3
Impinger 3	5%HNO3/10%H2O2	602.2	562.5	39.7
Impinger 4	Empty	447.1	439.4	7.7
Impinger 5	4%KMnO4/10%H2SO4	550.5	542.6	7.9
Impinger 6	4%KMnO4/10%H2SO4	540.0	538.0	2.0
Impinger 7	Silica Gel	755.4	739.2	16.2

Rinse: (ml or gm)

		Field Data Check	
419.1	Liquid (gm)		
0.0	less rinse (gm)		
419.1	Net Liquid (gm)	419.1	☑ QA/QC OK
+ 16.2	Silica Gel (gm)	16.2	☑ QA/QC OK
435.3	Total Vlc (gm)	435.3	☑ QA/QC OK

Test Run: 2

	Contents	Gross (gm)	Tare (gm)	Net (gm)
Impinger 1	Empty	773.4	447.5	325.9
Impinger 2	5%HNO3/10%H2O2	628.5	531.1	97.4
Impinger 3	5%HNO3/10%H2O2	574.8	556.6	18.2
Impinger 4	Empty	460.6	457.8	2.8
Impinger 5	4%KMnO4/10%H2SO4	536.4	534.3	2.1
Impinger 6	4%KMnO4/10%H2SO4	553.4	552.7	0.7
Impinger 7	Silica Gel	765.2	748.1	17.1

Rinse: (ml or gm)

		Field Data Check	
447.1	Liquid (gm)		
0.0	less rinse (gm)		
447.1	Net Liquid (gm)	447.1	☑ QA/QC OK
+ 17.1	Silica Gel (gm)	17.1	☑ QA/QC OK
464.2	Total Vlc (gm)	464.2	☑ QA/QC OK

Test Run: 3

	Contents	Gross (gm)	Tare (gm)	Net (gm)
Impinger 1	Empty	777.7	474.1	303.6
Impinger 2	5%HNO3/10%H2O2	656.6	564.0	92.6
Impinger 3	5%HNO3/10%H2O2	590.8	567.1	23.7
Impinger 4	Empty	443.9	440.7	3.2
Impinger 5	4%KMnO4/10%H2SO4	549.5	545.6	3.9
Impinger 6	4%KMnO4/10%H2SO4	537.3	537.2	0.1
Impinger 7	Silica Gel	735.7	718.7	17.0

Rinse: (ml or gm)

		Field Data Check	
427.1	Liquid (gm)		
0.0	less rinse (gm)		
427.1	Net Liquid (gm)	427.1	☑ QA/QC OK
+ 17.0	Silica Gel (gm)	17.0	☑ QA/QC OK
444.1	Total Vlc (gm)	444.1	☑ QA/QC OK

Test Run: 4

	Contents	Gross (gm)	Tare (gm)	Net (gm)
Impinger 1	Empty	796.8	452.2	344.6
Impinger 2	5%HNO3/10%H2O2	596.8	531.8	65.0
Impinger 3	5%HNO3/10%H2O2	568.9	557.9	11.0
Impinger 4	Empty	461.5	459.2	2.3
Impinger 5	4%KMnO4/10%H2SO4	540.3	537.1	3.2
Impinger 6	4%KMnO4/10%H2SO4	556.8	555.9	0.9
Impinger 7	Silica Gel	756.1	739.8	16.3

Rinse: (ml or gm)

		Field Data Check	
427.0	Liquid (gm)		
0.0	less rinse (gm)		
427.0	Net Liquid (gm)	427.0	☑ QA/QC OK
+ 16.3	Silica Gel (gm)	16.3	☑ QA/QC OK
443.3	Total Vlc (gm)	443.3	☑ QA/QC OK

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MINL

Impinger Weight Sheet

Client	Wheelabrator			Unit Name / Location	FF outlet 1
Plant	N. Broward	Job No.	11414	Method	29

Balance Calibration Check

Balance ID	802810135	Reference Weight Mass	500.0 g
Reference Weight ID	1000622549	Reference Weight Reading	499.7 g

Check must be performed once per day. Reference Weight Mass must agree with Reference Weight Reading to within ±0.5 g.

Run No.	1	Filter Type	Quartz	Sample Box No.	M10
Date	12-4-12	Lot No.	—	pH	—
Analyst	AO	Filter No.	—	Rinse	—

	Contents	Gross Weight (gm)	Tare Weight (gm)	Net Weight Gain (gm)	
Impinger 1	Empty	716.5	472.0	244.5	
Impinger 2	100 ml 5%HNO_3/10%H_2O_2	679.6	562.3	117.3	QA/QC @
Impinger 3	100 ml 5%HNO_3/10%H_2O_2	602.2	562.5	39.7	Date 12/4
Impinger 4	Empty	447.1	439.4	7.7	
Impinger 5	100 ml 4%$KMnO_4$/10%H_2SO_4	550.5	542.6	7.9	Total Weight (gm)
Impinger 6	100 ml 4%$KMnO_4$/10%H_2SO_4	540.0	538.0	2.0	419.1
Impinger 7	≈250 g Silica Gel	755.4	739.2	16.2	435.3

Run No.	2	Filter Type	Quartz	Sample Box No.	M11
Date	12-5-12	Lot No.	—	pH	—
Analyst	AO	Filter No.	—	Rinse	—

	Contents	Gross Weight (gm)	Tare Weight (gm)	Net Weight Gain (gm)	
Impinger 1	Empty	773.4	447.5	325.9	
Impinger 2	100 ml 5%HNO_3/10%H_2O_2	628.5	531.1	97.4	QA/QC @
Impinger 3	100 ml 5%HNO_3/10%H_2O_2	574.8	556.6	18.2	Date 12/5
Impinger 4	Empty	460.6	457.8	2.8	
Impinger 5	100 ml 4%$KMnO_4$/10%H_2SO_4	536.4	534.3	2.1	Total Weight (gm)
Impinger 6	100 ml 4%$KMnO_4$/10%H_2SO_4	553.4	552.7	0.7	447.1
Impinger 7	≈250 g Silica Gel	765.2	748.1	17.1	464.2

Run No.	3	Filter Type	Quartz	Sample Box No.	M10
Date	12-5-12	Lot No.	—	pH	—
Analyst	AO	Filter No.	—	Rinse	—

	Contents	Gross Weight (gm)	Tare Weight (gm)	Net Weight Gain (gm)	
Impinger 1	Empty	777.7	474.1	303.6	
Impinger 2	100 ml 5%HNO_3/10%H_2O_2	656.6	564.0	92.6	QA/QC @
Impinger 3	100 ml 5%HNO_3/10%H_2O_2	590.8	567.1	23.7	Date 12/5
Impinger 4	Empty	443.9	440.7	3.2	
Impinger 5	100 ml 4%$KMnO_4$/10%H_2SO_4	549.5	545.6	3.9	Total Weight (gm)
Impinger 6	100 ml 4%$KMnO_4$/10%H_2SO_4	537.3	537.2	0.1	427.1
Impinger 7	≈250 g Silica Gel	735.7	718.7	17.0	444.1

QA/QC @
Date 12/5

CleanAir ENGINEERING

Impinger Weight Sheet

Client	Wheelabrator	Unit Name / Location	1 / FF outlet
Plant	N. Broward	Job No. 11-114	Method 29

Balance Calibration Check			
Balance ID	B028101135	Reference Weight Mass	500.0 g
Reference Weight ID	100002254 9	Reference Weight Reading	499.7 g

Check must be performed once per day. Reference Weight Mass must agree with Reference Weight Reading to within ±0.5 g.

Run No.	4	Filter Type	Quartz	Sample Box No.	M11
Date	12-5-12	Lot No.	—	pH	—
Analyst	AC	Filter No.	—	Rinse	—

	Contents	Gross Weight (gm)	Tare Weight (gm)	Net Weight Gain (gm)	
Impinger 1	Empty	796.8	452.2	344.6	
Impinger 2	100 ml 5%HNO_3/10%H_2O_2	596.8	531.8	65.0	QA/QC @
Impinger 3	100 ml 5%HNO_3/10%H_2O_2	568.9	557.9	11.0	Date 12/5
Impinger 4	Empty	461.5	459.2	2.3	
Impinger 5	100 ml 4%$KMnO_4$/10%H_2SO_4	540.3	537.1	3.2	Total Weight (gm)
Impinger 6	100 ml 4%$KMnO_4$/10%H_2SO_4	556.8	555.9	0.9	427.0
Impinger 7	≈250 g Silica Gel	756.1	739.8	16.3	443.3

Run No.		Filter Type		Sample Box No.	
Date		Lot No.		pH	
Analyst		Filter No.		Rinse	

	Contents	Gross Weight (gm)	Tare Weight (gm)	Net Weight Gain (gm)	
Impinger 1	Empty				
Impinger 2	100 ml 5%HNO_3/10%H_2O_2				QA/QC
Impinger 3	100 ml 5%HNO_3/10%H_2O_2				Date
Impinger 4	Empty				
Impinger 5	100 ml 4%$KMnO_4$/10%H_2SO_4				Total Weight (gm)
Impinger 6	100 ml 4%$KMnO_4$/10%H_2SO_4				
Impinger 7	≈250 g Silica Gel				

Run No.		Filter Type		Sample Box No.	
Date		Lot No.		pH	
Analyst		Filter No.		Rinse	

	Contents	Gross Weight (gm)	Tare Weight (gm)	Net Weight Gain (gm)	
Impinger 1	Empty				
Impinger 2	100 ml 5%HNO_3/10%H_2O_2				QA/QC
Impinger 3	100 ml 5%HNO_3/10%H_2O_2				Date
Impinger 4	Empty				
Impinger 5	100 ml 4%$KMnO_4$/10%H_2SO_4				Total Weight (gm)
Impinger 6	100 ml 4%$KMnO_4$/10%H_2SO_4				
Impinger 7	≈250 g Silica Gel				

QA/QC @
Date 12/5

CleanAir ENGINEERING

LABORATORY DATA

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I herby certify that all pages contained within this Appendix have been reviewed and, to the best of my ability, verified as accurate.

QA/QC Initials: MK

Date: 1/17/13

CleanAir.

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Wheelabrator
Clean Air Project No: 11414
Unit 1 FF Outlet

USEPA Method 29 (Trace Metals)
Mercury (Hg) Laboratory Parameters

Detection Limits		
$m_{1b\text{-}DL}$	Fraction 1B Detection Limit (µg)	0.1000
$m_{2b\text{-}DL}$	Fraction 2B Detection Limit (µg)	0.1950
$m_{3a\text{-}DL}$	Fraction 3A Detection Limit (µg)	0.2000
$m_{3b\text{-}DL}$	Fraction 3B Detection Limit (µg)	0.5000
$m_{3c\text{-}DL}$	Fraction 3C Detection Limit (µg)	0.4000
Blank Analysis		
$m_{1b\text{-}B}$	Fraction 1B Blank (µg)	<0.1000
$m_{2b\text{-}B}$	Fraction 2B Blank (µg)	<0.1950
$m_{3a\text{-}B}$	Fraction 3A Blank (µg)	<0.2000
$m_{3b\text{-}B}$	Fraction 3B Blank (µg)	<0.5000
$m_{3c\text{-}B}$	Fraction 3C Blank (µg)	<0.4000
$m_{total\text{-}B}$	Total Blank Amount (µg)	<1.3950

Run No.		**1**	**2**	**3**	**4**
Date (2012)		Dec 4	Dec 5	Dec 5	Dec 5
Start Time (approx.)		13:14	07:44	10:30	13:12
Stop Time (approx.)		15:28	09:58	12:45	15:26
Sample Analysis					
$m_{1b\text{-}S}$	Fraction 1B Sample (µg)	<0.1000	<0.1000	<0.1000	<0.1000
$m_{2b\text{-}S}$	Fraction 2B Sample (µg)	8.6394	6.2753	7.1601	1.7814
$m_{3a\text{-}S}$	Fraction 3A Sample (µg)	<0.2000	<0.2000	<0.2000	<0.2000
$m_{3b\text{-}S}$	Fraction 3B Sample (µg)	<0.5000	<0.5000	<0.5000	<0.5000
$m_{3c\text{-}S}$	Fraction 3C Sample (µg)	<0.4000	<0.4000	<0.4000	<0.4000
$m_{total\text{-}S}$	Total Sample Amount (µg)	8.6394	6.2753	7.1601	1.7814
Allowable Blank					
$m_{T\text{-}B\text{-}allow}$	Total Allowable Blank (µg)	0.0000	0.0000	0.0000	0.0000
Sample Corrected for Blank					
m_n	Total Sample Amount (µg)	8.6394	6.2753	7.1601	1.7814
Sample Corrected for Blank - Prorated Fractions					
$m_{n\text{-}1b}$	Fraction 1B (µg)	<0.1000	<0.1000	<0.1000	<0.1000
$m_{n\text{-}2b}$	Fraction 2B (µg)	8.6394	6.2753	7.1601	1.7814
$m_{n\text{-}3a}$	Fraction 3A (µg)	<0.2000	<0.2000	<0.2000	<0.2000
$m_{n\text{-}3b}$	Fraction 3B (µg)	<0.5000	<0.5000	<0.5000	<0.5000
$m_{n\text{-}3c}$	Fraction 3C (µg)	<0.4000	<0.4000	<0.4000	<0.4000

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Clean Air Engineering, Inc.

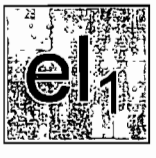
500 West Wood Street
Palatine, IL 60067

Project Number: 11414-North Broward

Mercury

EPA Methods 29 Analysis

Analytical Report
19737



Element One, Inc.
5022-C Wrightsville Av., Wilmington, NC 28403
910-793-0128 FAX: 910-792-6853 e1lab@e1lab.com

The following data for Analytical Report 19737
has been reviewed for completeness, accuracy,
adherence to method protocol,
and compliance with quality assurance guidelines.

Review by:

Katie Strickland, Chemist
December 13, 2012

Report Reviewed and Finalized By:

Ken Smith, Laboratory Director
December 13, 2012

SUMMARY OF RESULTS

Summary of Analysis

Unit 1 - Summary of Method 29 Mercury Analysis

Run Number		Average Total Catch, µg	Front Half µg	H_2O_2 /HNO_3 µg	Empty Impinger µg	$KMnO_4$ µg	HCl µg
U1 FF Outlet R1	#1	8.64	< 0.1	8.66	< 0.2	< 0.5	< 0.4
	#2		< 0.1	8.62	< 0.2	< 0.5	< 0.4
U1 FF Outlet R2	#1	6.28	< 0.1	6.28	< 0.2	< 0.5	< 0.4
	#2		< 0.1	6.27	< 0.2	< 0.5	< 0.4
U1 FF Outlet R3	#1	7.16	< 0.1	7.15	< 0.2	< 0.5	< 0.4
	#2		< 0.1	7.17	< 0.2	< 0.5	< 0.4
U1 FF Outlet R4	#1	1.78	< 0.1	1.79	< 0.2	< 0.5	< 0.4
	#2		< 0.1	1.78	< 0.2	< 0.5	< 0.4
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	< 0.195	< 0.2	< 0.5	< 0.4
	#2		< 0.1	< 0.195	< 0.2	< 0.5	< 0.4

ANALYTICAL NARRATIVE

Element One Analytical Narrative

Client:	Clean Air, IL	Element One #:	19737
Client ID:	11414 – North Broward	Analyst:	LAL
Method:	Methods 29	Dates Received:	12/06/12
Analytes:	Hg	Dates Analyzed:	12/12/12

Summary of Analysis

The Method 29 samples were digested, prepared, and analyzed according to Method 29 protocol. Samples were analyzed for mercury on a PerkinElmer FIMS-100 CVAA mercury analyzer.

Detection Limits

The FIMS-100 CVAA instrument reporting limit for mercury was 0.004 µg per aliquot analyzed.

Analysis QA/QC

Duplicate analyses relative percent difference (RPD) and spike sample recovery data are summarized in the Quality Control Section. All QA/QC data was within the criteria of the method.

Additional Comments

The reported results have not been corrected for any blank values or spike recovery values.

QUALITY CONTROL SUMMARY

Summary of Quality Control Data

Mercury Duplicate Analysis RPD

(Method 29 QC limits: < 10% for RPD)

Run Number	Front Half	H_2O_2/HNO_3	Empty Imp	$KMnO_4$	HCl
U1 FF Outlet R1	NA	0.4%	NA	NA	NA
U1 FF Outlet R2	NA	0.3%	NA	NA	NA
U1 FF Outlet R3	NA	0.4%	NA	NA	NA
U1 FF Outlet R4	NA	0.4%	NA	NA	NA
Field Blank	NA	NA	NA	NA	NA
Reagent Blank	NA	NA	NA	NA	NA

Mercury Spike Recoveries

(Method 29 QC limits: ± 25% for Spike Recoveries)

Run Number		Front Half	H_2O_2/HNO_3	Empty Imp	$KMnO_4$	HCl
U1 FF Outlet R3	#1	108%	94%	102%	101%	103%
	#2	108%	93%	101%	101%	102%

SAMPLE CUSTODY

Style F051.B / F071.B

19737

66-11414-1

CLIENT Wheelabrator
PLANT North Broward
PROJECT MANAGER S. Brown

PROJECT 11414
DEPT. 66

CleanAir.
500 West Wood Street
Palatine, IL 60067
800-627-0033 (phone)
847-991-3385 (fax)

ANALYTICAL METHOD	CONTAINER NUMBER	SAMPLE FRACTION
USEPA M-29	1	QUARTZ FILTER 250 mL HDPE

FORWARDING LAB
Element One, Inc.
5022-C Wrightsville Avenue
Wilmington, NC 28403
910-793-0128 (phone)
Ken Smith

LAB ID NUMBER	DATE (2012)	TEST LOCATION	RUN NUMBER	SAMPLE MATRIX	NUMBER OF CONTAINERS	CONTAINER SEALED? LIQUID LEVEL MARKED?	ANALYSIS REQUESTED: Metals	Mercury	Archive	ADDITIONAL INFORMATION
	12/4	Unit 1 FF Outlet	1	Quartz Filter, 250 mL HDPE	1		X			
	12/5	Unit 1 FF Outlet	2	Quartz Filter, 250 mL HDPE	1		X			
	12/5	Unit 1 FF Outlet	3	Quartz Filter, 250 mL HDPE	1		X			
	12/5	Unit 1 FF Outlet	4	Quartz Filter, 250 mL HDPE	1		X			
	12/5	Unit 1 FF Outlet	Field Blank	Quartz Filter, 250 mL HDPE	1		X			

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Lisa Bratton	12/6/12 1010					12-7

Samples received in good condition in Fisherbrand + QEC Level 2 containers. No empty containers.

Style F05LB ; F07LB

19737

CLIENT	Wheelabrator			PROJECT	11414								66-11414-2
PLANT	North Broward			DEPT.	66								
PROJECT MANAGER	S. Brown			CleanAir. ENGINEERING 500 West Wood Street Palatine, IL 60067 800-627-0033 (phone) 847-991-3385 (fax)									
ANALYTICAL METHOD	CONTAINER NUMBER	SAMPLE FRACTION											
USEPA M-29	3	FRONT HALF HNO_3 RINSE 250 mL HDPE											
LAB ID NUMBER	DATE (2012)	TEST LOCATION	RUN NUMBER	SAMPLE MATRIX	NUMBER OF CONTAINERS	CONTAINER SEALED? LIQUID LEVEL MARKED?		ANALYSIS REQUESTED: Metals	Mercury	Archive	FORWARDING LAB: Element One, Inc 5022-C Wrightsville Avenue Wilmington, NC 28403 910-793-0128 (phone) Ken Smith		
	12/4	Unit 1 FF Outlet	Train Proof	Front Half HNO3 Rinse, 250 mL HDPE	1					X			
	12/4	Unit 1 FF Outlet	1	Front Half HNO3 Rinse, 250 mL HDPE	1			X					
	12/5	Unit 1 FF Outlet	2	Front Half HNO3 Rinse, 250 mL HDPE	1			X					
	12/5	Unit 1 FF Outlet	3	Front Half HNO3 Rinse, 250 mL HDPE	1			X					
	12/5	Unit 1 FF Outlet	4	Front Half HNO3 Rinse, 250 mL HDPE	1			X					
	12/5	Unit 1 FF Outlet	Field Blank	Front Half HNO3 Rinse, 250 mL HDPE	1			X					

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Lisa Bretton	12/6/12 1010					12-5

Style F05LB / F07LB

19737

66-11414-3

CLIENT Wheelabrator
PLANT North Broward
PROJECT MANAGER S. Brown

PROJECT 11414
DEPT. 66

CleanAir Engineering
500 West Wood Street
Palatine, IL 60067
800-627-0033 (phone)
847-991-3385 (fax)

ANALYTICAL METHOD	CONTAINER NUMBER	SAMPLE FRACTION
USEPA M-29	4	IMPINGERS 1-3 CATCH AND RINSE 1000 mL HDPE

FORWARDING LAB
Element One, Inc.
5022-C Wrightsville Avenue
Wilmington, NC 28403
910-793-0128 (phone)
Ken Smith

LAB ID NUMBER	DATE (2012)	TEST LOCATION	RUN NUMBER	SAMPLE MATRIX	NUMBER OF CONTAINERS	CONTAINER SEALED? LIQUID LEVEL MARKED?	ANALYSIS REQUESTED: Metals	Mercury	Archive	ADDITIONAL INFORMATION
	12/4	Unit 1 FFOutlet	1	Impingers 1-3 Catch and Rinse, 1000 mL HDPE	1		X			
	12/5	Unit 1 FFOutlet	2	Impingers 1-3 Catch and Rinse, 1000 mL HDPE	1		X			
	12/5	Unit 1 FFOutlet	3	Impingers 1-3 Catch and Rinse, 1000 mL HDPE	1		X			
	12/5	Unit 1 FFOutlet	4	Impingers 1-3 Catch and Rinse, 1000 mL HDPE	1		X			
	12/5	Unit 1 FFOutlet	Field Blank	Impingers 1-3 Catch and Rinse, 1000 mL HDPE	1		X			

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Lisa Braton	12/6/12 1010					12-5

Style F05LB / F07LB

19737

CLIENT: Wheelabrator
PLANT: North Broward
PROJECT MANAGER: S. Brown
PROJECT: 11414
DEPT.: 66

66-11414-4

CleanAir Engineering
500 West Wood Street
Palatine, IL 60067
800-827-0033 (phone)
847-991-3385 (fax)

ANALYTICAL METHOD	CONTAINER NUMBER	SAMPLE FRACTION
USEPA M-29	5A	IMPINGER 4 CATCH AND RINSE 250 mL HDPE

FORWARDING LAB
Element One, Inc.
5022-C Wrightsville Avenue
Wilmington, NC 28403
910-793-0126 (phone)
Ken Smith

LAB ID NUMBER	DATE (2012)	TEST LOCATION	RUN NUMBER	SAMPLE MATRIX	NUMBER OF CONTAINERS	CONTAINER SEALED? LIQUID LEVEL MARKED?	ANALYSIS REQUESTED: Metals	Mercury	Archive	ADDITIONAL INFORMATION
	12/4	Unit 1 FF Outlet	1	Impinger 4 Catch and Rinse, 250 mL HDPE	1		X			
	12/5	Unit 1 FF Outlet	2	Impinger 4 Catch and Rinse, 250 mL HDPE	1		X			
	12/5	Unit 1 FF Outlet	3	Impinger 4 Catch and Rinse, 250 mL HDPE	1		X			
	12/5	Unit 1 FF Outlet	4	Impinger 4 Catch and Rinse, 250 mL HDPE	1		X			
	12/5	Unit 1 FF Outlet	Field Blank	Impinger 4 Catch and Rinse, 250 mL HDPE	1		X			

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A. Obuchowski	12-5 / 1400					A. Obuchowski
Received By: (signature)	**Date / Time**	**Received By: (signature)**	**Date / Time**	**Relinquished By: (signature)**	**Date / Time**	**Signature / Date**
Lisa Braxton	12/6/12 1010					12-5

Style F05LB / F07LB

19737

CLIENT Wheelabrator
PLANT North Broward
PROJECT MANAGER S. Brown

PROJECT 11414
DEPT. 66

66-11414-5

ANALYTICAL METHOD	CONTAINER NUMBER	SAMPLE FRACTION
USEPA M-29	5B	IMPINGERS 5-6 CATCH AND RINSE 950 mL AMBER GLASS

CleanAir Technologies
500 West Wood Street
Palatine, IL 60067
800-827-0033 (phone)
847-991-3385 (fax)

LAB ID NUMBER	DATE (2012)	TEST LOCATION	RUN NUMBER	SAMPLE MATRIX	NUMBER OF CONTAINERS	CONTAINER SEALED? LIQUID LEVEL MARKED?	ANALYSIS REQUESTED: Metals	Mercury	Archive	ADDITIONAL INFORMATION
	12/4	Unit 1 FF Outlet	1	Impingers 5-6 Catch and Rinse, 950 mL Amber Glass	1		X			
	12/5	Unit 1 FF Outlet	2	Impingers 5-6 Catch and Rinse, 950 mL Amber Glass	1		X			
	12/5	Unit 1 FF Outlet	3	Impingers 5-6 Catch and Rinse, 950 mL Amber Glass	1		X			
	12/5	Unit 1 FF Outlet	Field Blank	Impingers 5-6 Catch and Rinse, 950 mL Amber Glass	1		X			

FORWARDING LAB
Element One, Inc.
5022-C Wrightsville Avenue
Wilmington, NC 28403
910-793-0128 (phone)
Ken Smith

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A. Obuchowski	12-5 / 1400					A. Obuchowski
Received By: (signature)	**Date / Time**	**Received By: (signature)**	**Date / Time**	**Relinquished By: (signature)**	**Date / Time**	**Signature / Date**
Lisa Bratton	12/6/12 1010					12-5

19737

CLIENT Wheelabrator
PLANT North Broward
PROJECT MANAGER S. Brown
PROJECT 11414
DEPT. 66

66-11414-6

ANALYTICAL METHOD	CONTAINER NUMBER	SAMPLE FRACTION
USEPA M-29	5C	IMPINGERS 5-6 8N HCL RINSE 250 mL AMBER GLASS

CleanAir. ENGINEERING
500 West Wood Street
Palatine, IL 60067
800-627-0033 (phone)
847-991-3385 (fax)

LAB ID NUMBER	DATE (2012)	TEST LOCATION	RUN NUMBER	SAMPLE MATRIX	NUMBER OF CONTAINERS	CONTAINER SEALED? LIQUID LEVEL MARKED?	ANALYSIS REQUESTED: Metals			Archive	ADDITIONAL INFORMATION
	12/4	Unit 1 FF Outlet	1	Impingers 5-6 8N HCl Rinse, 250 mL Amber Glass	1			X			
	12/5	Unit 1 FF Outlet	2	Impingers 5-6 8N HCl Rinse, 250 mL Amber Glass	1			X			
	12/5	Unit 1 FF Outlet	3	Impingers 5-6 8N HCl Rinse, 250 mL Amber Glass	1			X			
	12/5	Unit 1 FF Outlet	4	Impingers 5-6 8N HCl Rinse, 250 mL Amber Glass	1			X			
	12/5	Unit 1 FF Outlet	Field Blank	Impingers 5-6 8N HCl Rinse, 250 mL Amber Glass	1			X			

FORWARDING LAB
Element One, Inc
5022-C Wrightsville Avenue
Wilmington, NC 28403
910-793-0128 (phone)
Ken Smith

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A. Obuchowski	12-5-12					A. Obuchowski
Received By: (signature)	Date / Time	Received By: (signature)	Date / Time	Relinquished By: (signature)	Date / Time	Signature / Date
Lisa Barton	12/6/12 1010					12-5

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CLIENT Wheelabrator
PLANT North Broward
PROJECT MANAGER S. Brown

PROJECT 11414
DEPT. 66

66-11414-7

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500 West Wood Street
Palatine, IL 60067
800-627-0033 (phone)
847-991-3385 (fax)

ANALYTICAL METHOD	CONTAINER NUMBER	SAMPLE FRACTION
USEPA M-29	SEE BELOW (IF APPLICABLE)	REAGENT BLANKS

FORWARDING LAB
Element One, Inc.
5022-C Wrightsville Avenue
Wilmington, NC 28403
910-793-0128 (phone)
Ken Smith

LAB ID NUMBER	DATE (2012)	TEST LOCATION	RUN NUMBER	SAMPLE MATRIX	NUMBER OF CONTAINERS	CONTAINER SEALED? LIQUID LEVEL MARKED?	ANALYSIS REQUESTED: Metals	Mercury	Archive	ADDITIONAL INFORMATION
	12/5	Reagent Blank	All	0.1 N HNO_3 (300 mL), Container 8A: 1000 mL HDPE	1		X	X		Metals include: Antimony (Sb), Arsenic (As), Barium (Ba), Beryllium (Be), Cadmium (Cd), Chromium (Cr), Cobalt (Co), Copper (Cu), Lead (Pb), Manganese (Mn), Nickel (Ni), Phosphorus (P), Selenium (Se), Silver (Ag), Thallium (Tl), Zinc (Zn)
	12/5	Reagent Blank	All	DI Water (100 mL), Container 6B: 250 mL HDPE	1		X	X		
	12/5	Reagent Blank	All	5% HNO_3 / 10% H_2O_2 (200 mL), Container 9: 250 mL HDPE	1		X	X		
	12/5	Reagent Blank	All	4% $KMnO_4$ / 10% H_2SO_4 (100 mL), Container 10: 250 mL Amber Glass	1			X		
	12/5	Reagent Blank	All	DI Water (200 mL) / 8N HCl (25 mL), Container 11: 250 mL Amber Glass	1			X		
	12/5	Reagent Blank	All	Quartz Filters (3), Container 12: 250 mL HDPE	1		X	X		

Per Scott via phone, do not analyze for metals list-only Hg. LRB 12.7.12

Relinquished By: (signature)	Date / Time	Relinquished By: (signature)	Date / Time	Relinquished By: (signature)	Date / Time	This form completed by:
A. Obuchowski	12/5/12 CC					A. Obuchowski
Received By: (signature)	**Date / Time**	**Received By: (signature)**	**Date / Time**	**Relinquished By: (signature)**	**Date / Time**	**Signature / Date**
Lisa Bratton	12/6/12 1010					12-5

Style F05LB / F07LB

ANALYTICAL DATA

Analytical Calculations

Mercury-

$$\textbf{Mercury Results (µg)} = \frac{\textbf{CVAA Results (µg)}}{\textbf{Aliquot (ml)}} * \textbf{Final Volume (ml)}$$

Where-

CVAA Results= Raw sample reading (µg)--*Hg-Data Sheet*

Aliquot= Sample Aliquot (Alq.)--*Hg-Data Sheet*

Final Volume=Final Volume (FV)*--*Sample Submission*
* With the exception of the BH fraction where-
=Received Volume (BV)--*Sample Submission*

Analytical Calculations

Spike Recovery-

$$\textbf{Spike (\%)} = \frac{\textbf{(Spiked Result (µg/L) – Sample Result (µg/L))}}{\textbf{Spike Amount (µg/L)}} \quad \textbf{X100}$$

Where-

Spike Result = Raw sample concentration (ppb)—*Hg Data Sheet*

Sample Result = Raw sample concentration (ppb) -- *Hg Data Sheet*

Spike Amount-- *Hg Data Sheet*

Duplicate Analysis RPD-

$$\textbf{RPD (\%)} = \frac{\textbf{(Duplicate Result (µg/L) - Sample Result (µg/L))}}{\textbf{Average (µg/L)}} \quad \textbf{X100}$$

Where-

Sample Result =Raw sample concentration (ppb) -- *Hg Data Sheet*

Duplicate Results=Raw sample concentration (ppb) -- *Hg Data Sheet*

Average= $\frac{\textit{(Duplicate + Sample Results)}}{2}$

elementOne **AIR TESTING SAMPLE SUBMISSION FORM** **Lab ID** **19737**

Analysis Due Date 12.14.12
QA/QC/Report Due Date 12.18.12

Client	Clean Air IL
Project No	11414—N Broward

Date Received	12.06.12
Time Received	1010

HNO_3 Lot: |||||	HF Lot: 511093	HCl Lot: 411111	**Ref. Method: 29**
Volume Marked Y / (N)	Volume Loss Y / N / (?)		

Sample Identification

1	U1 FF Outlet-M29-R1	5	Field Blank		
2	U1 FF Outlet-M29-R2	6	Reagent Blank		
	U1 FF Outlet-M29-R2 Duplicate	7	Train Proof		
3	U1 FF Outlet-M29-R3				
	U1 FF Outlet-M29-R3 Spike				
4	U1 FF Outlet-M29-R4				

Analyses Requested

Samples 1-6	Hg
Sample 7	Archive

Runs / FB	Fil / Ace (FH)		HNO_3 (FH)		5% HNO_3/10% H_2O_2 (BH)			HNO_3 (A)		$KMnO_4$ (B)		HCl (C)	
	pH <2.0 Y / N		pH <2.0 (Y) / N		pH <2.0 (Y) / N			pH <2.0 (Y) N		pH <2.0 (Y) N		pH <2.0 (Y) N	
Lab ID	Fil ID	BV ml	BV ml	FV ml	BV ml	Used	FV ml	BV ml	FV ml	BV ml	FV ml	BV ml	FV ml
1			105	100	685			106	200	380	500	240	400
2.D			105	↓	735			109	↓	370	↓	240	↓
3.S			105		720			107		380		240	
4			105		720			105		380		230	
5			105	↓	300		↓	106	↓	380	↓	230	↓

M-29 Reagent Blank

Lab ID	Fraction			BV, ml	FV, ml	Comments
6	C 7	FH	Acetone Blank			
	C 8A	FH	0.1N HNO_3	305	100	used 100 mL
	C 8A	A	0.1N HNO_3	305	—	
	C 8B	B	DI H_2O	104	100/33	used 100mL $KMnO_4$, 33 mL DI
	C 9	BH	5% HNO_3/10% H_2O_2	195	—	
	C 10	B	4% $KMnO_4$ /10% H_2SO_4	100	100/33	used 100 mL $KMnO_4$, 33 mL DI
	C 11	C	8N HCl DI H_2O	240	400	
	C 12	FH	Filter			

Lab Communications

M29: Received C1, C3, C4, C5A, C5B, C5C; RB C12, C8A, C8B, C9, C10, C11—12.06.12 LLB

SS Page 1 of 1
12/7/2012 9:00:32 AM
SS by KAB
Labeled By/Date LAL 12.7.12

FH Prep By/Date KLS 12.11.12
BH Prep By/Date KLS 12.10.12
BH/FH Prep By/Date —
PM Prep By / Date —

A Prep By/Date KLS 12-10-12
B Prep By/Date LAL 12.10.12
C Prep By/Date LAL 12.11.12
ID Verification By/Date KAB 12.10.12

elementOne **Method 29 Microwave Worksheet** Lab ID # e 19737 19712

Client: CAE

Date Digested: 12-11-12 Initials: JWL Worksheet Prepared by: JWL

Auto Sample Loc.	Sample Lab ID 19737	Sample Weight (g)	# of filters digested	Spike	Prep Volume (ml)	Weight In Micro / Weight Out Micro	Units
	LRB						
	LRB+			100 ml std A			
	-1		1				
	-2		↓				
	-3						
	-4						
	-5						
	-6		↓				
	19712-LRB						
	-LRB+			100 ml std A,B,C			
	-1		1				
	-2		↓				
	-3						
	-4						
	-5		↓				
	BLK						

19737 LRB+ spiked w/ 100 ml of std A @ 25 ppm

19712 LRB+ spiked w/ 100 ml of std A, B, C @ 25 ppm

Element One, Inc. Form 104 - Revision 1.0

HNO_3 Lot # 1112030 (6 ml)

HF Lot # 5111093 (2 ml)

elementOne **MERCURY BATCH DIGESTION - RUN WORKSHEET**

Block #3 Temp 93.3

Date Prepared/Digested: 12.11.12 Prep By: LAL / JWL SIF File #: 121212-1
Block #1 Temperature: 95.1 Start Time: 5:55 Machine ID: 3
Block #2 Temperature: 93.9 Stop Time: 8:10 Batch Analyst: LAL

A/S	Curve & QC's	0.4ug/ml working std		BV, ml	FV, ml	Standard Lot Numbers
1	(3/ batch)	Lab BLK		40	40	Standard #1 (for working std) Lot #: 42054104
2	0.004 ug	0.01ml		40	40	Working Standard
3	0.04 ug	0.10ml		40	40	Lot #: 121012-1 by: LAL
4	0.08 ug	0.20ml		40	40	Standard #2 (QC #2):
5	0.16 ug	0.40ml		40	40	Lot #: 121012-2
6	0.20ug	0.50ml		40	40	Standard #3 (QC #3):
						Lot #: 121012-3
7	QC #2= 0.08ug	0.2ml #2 std		40	40	
8	QC #3= 0.08ug	0.2ml #3 std		40	40	Curve prepared by: LAL

Submitted for Review By LAL 12.12.12
Initial Review By: LAL Date: 12.12.12 Time:
Final QC Review By: KLS Date: 12.13.12 Time: 800
Comments: 19711 LRB1, 10, 13

A/S	LAB #	Client	Wt/FV	Ali Used	ml used	Sample Vol, ml	Spike µg
✓ 9	19742-6				10	1	
10	-6				↓		
11	-6				5		
12	-6				↓	↓	
✓ 13	19712-LRBFH				4	100	
14	-LRBFHH				1.6	1	
15	-1FH				4		
16	-2FH				↓		
17	-2FHD						
18	-3FH						
19	-3FH				↓	↓	

NOTES: Lab blanks and spikes must be prepared with each batch digestion

Spike for Hg, Use calibration working 0.4ug/ml standard at the rate of 0.20ml per 40ml sample.

Digestion chemicals to be added in order at the following rate per 40ml volumes.

H_2SO_4 @ 2.0ml..... HNO_3 @ 1.0ml..... Persulfate @ 3.0ml..... $KMnO_4$ @ 6.0ml

H_2SO_4 Lot # 52055 *HNO_3 Lot #* 1111111 *HCl Lot #:* 1111111

Persulfate Lot # 111512-6 *$KMnO_4$ Lot #* 103012-3 *Hydrox Lot#:* 110512-5

Clear samples after digestion with 3.2ml of Hydroxylamine solution.

elementOne **MERCURY BATCH DIGESTION - RUN WORKSHEET**

SIF File #: 121212-1

A/S	LAB #	Client	Wt/FV	Ali Used	ml used	Sample Vol, ml	Spike µg
20	19712-4FH				4	100	
21	-5FH				↓	↓	
22	19712-1BH				4	770	
23	-2BH					810	
24	[illegible]					↓	
25	-3BH					750	
26	-3BHT					↓	
27	-4BH					330	
28	-5BH				↓	290	
29	19712-1A				4	200	
30	-2A						
31	-2AD						
32	-3A						
33	-3AT						
34	-4A						
35	-5A					↓	
36	19712-1B					500	
37	-2B						
38	-2BD						
39	-3B						
40	-3BT						
41	-4B						
42	-5B					↓	
43	19712-1C					400	
44	-2C						
45	-2CD						
46	-3C						
47	-3CT						
48	-4C						
49	-5C				↓	↓	
✓ 50	19737-LRBFH				4	100	
51	-LRBFHT				1.6		
52	-1FH				4		
53	-2FH						
54	-2FHD				↓	↓	

elementOne **MERCURY BATCH DIGESTION - RUN WORKSHEET**

SIF File #: 121212-1

A/S	LAB #	Client	W/FV	Ali Used	ml used	Sample Vol, ml	Spike µg
55	19737-3FH				4	100	
56	-3FH+				↓	↓	
57	-4FH						
58	-5FH				↓	↓	
59	-6FH				4	↓	
60	19737-1BH					685	
61	-2BH					735	
62	-2BHD					↓	
63	-3BH					720	
64	-3BH+					↓	
65	-4BH					720	
66	-5BH					300	
67	-6BH				↓	195	
68	19737-1A				4	200	
69	-2A				↓	↓	
70	-2A D				↓	↓	
71	-3A				↓	↓	
72	-3A+				↓	↓	
73	-4A				↓	↓	
74	-5A				↓	↓	
75	-6A				↓	↓	
76	19737-1B				↓	500	
77	-2B				↓	↓	
78	-2BD				↓	↓	
79	-3B				↓	↓	
80	-3B+				↓	↓	
81	-4B				↓	↓	
82	-5B				↓	↓	
83	-6B				↓	↓	
84	19737-1C				↓	400	
85	-2C				↓	↓	
86	-2CD				↓	↓	
87	-3C				↓	↓	
88	-3C+				↓	↓	
89	-4C				↓	↓	

elementOne **MERCURY BATCH DIGESTION - RUN WORKSHEET**

SIF File #: 12112-1

A/S	LAB #	Client	W/V/FV	Ali Used	ml used	Sample Vol, ml	Spike µg
90	19737-5C				4	400	
91	-6C				↓	↓	
92	18365-3QC				.1 ~~.5~~	~~.1~~ 10	
93	19711 LRB				10	1	
94	LRBT				↓		
95	-8		.2242/50	10	.0448		
96	-9		.2129/50		.0426		
97	-9D		.2911/50		.0582		
98	-10		.1785/50		.0357		
99	-10T		.1923/50		.0385		
100	-11		.1958/50		.0392		
101	-12		.2220/50		.0444		
102	-12D		.2135/50		.0427		
103	-13		.1952/50		.0390		
104	-13T		.1982/50		.0396	↓	
105							
106							

Element One, Inc form 128-Revision 7.0

Page 4 of 4

PerkinElmer FIMS-100 CVAA Mercury Analyzer

Sample_ID	Date	Time	Mean_Sig	Mean_Rd	Mean_Rt	Units	Alq.	Vol.	Sig 1	Reading-1	Result-1	Sig 2	Reading-2	Result-2
Calib Blank	12/12/2012	10:00:48	0.0010514			µg			0.0010514					
STD1=.004ug	12/12/2012	10:02:03	0.0004949			µg			0.0004949					
STD2=.04ug	12/12/2012	10:03:18	0.0105733			µg			0.0105733					
STD3=.08ug	12/12/2012	10:04:35	0.0221203			µg			0.0221203					
STD4=.16ug	12/12/2012	10:05:54	0.0451062			µg			0.0451062					
STD5=.2ug	12/12/2012	10:07:13	0.0559235			µg			0.0559235					
Reagent Blank	12/12/2012	10:09:01	-0.0000728	-0.0002603	-0.0002603	µg			-0.0000278	-0.0000994	-0.0000994	-0.0001178	-0.0004212	-0.0004212
0.004ug = DL	12/12/2012	10:11:29	0.0010059	0.0035948	0.0035948	µg			0.0010059	0.0035948	0.0035948			
0.080ug = STD.2	12/12/2012	10:12:46	0.0219542	0.0784568	0.0784568	µg			0.0219542	0.0784568	0.0784568			
REAGENT BLANK	12/12/2012	10:14:03	-0.0000824	-0.0002948	-0.0002948	µg			-0.0000824	-0.0002948	-0.0002948			
0.080ug = STD.2	12/12/2012	10:15:20	0.0219549	0.0784591	0.0784591	µg			0.0219549	0.0784591	0.0784591			
0.080ug = QC STD 3	12/12/2012	10:16:40	0.0218762	0.0781778	0.0781778	µg			0.0218762	0.0781778	0.0781778			
REAGENT BLANK	12/12/2012	10:17:57	-0.0000135	-0.0000482	-0.0000482	µg			-0.0000135	-0.0000482	-0.0000482			
0.004ug = DL	12/12/2012	11:44:10	0.0011087	0.0039623	0.0039623	µg	4	400	0.0011087	0.0039623	0.0039623			
0.080ug = STD.2	12/12/2012	11:45:27	0.0228464	0.0816451	0.0816451	µg	4	400	0.0228464	0.0816451	0.0816451			
REAGENT BLANK	12/12/2012	11:46:44	-0.0000464	-0.000166	-0.000166	µg	4	400	-0.0000464	-0.000166	-0.000166			
19737-LRB FH	12/12/2012	11:50:14	-0.0002499	-0.0008931	-0.0223291	µg	4	100	-0.0002449	-0.0008755	-0.0218876	-0.0002548	-0.0009108	-0.0227706
19737-LRB FH SPK	12/12/2012	11:52:00	0.0212527	0.0759499	4.7468684	µg	1.6	100	0.0212932	0.0760946	4.755912	0.0212122	0.0758052	4.7378247
19737-1 FH	12/12/2012	11:53:46	0.000434	0.0015511	0.0387769	µg	4	100	0.0004628	0.001654	0.0413498	0.0004052	0.0014482	0.0362039
19737-2 FH	12/12/2012	11:55:32	-0.0001775	-0.0006346	-0.0158666	µg	4	100	-0.000166	-0.0005933	-0.0148334	-0.0001891	-0.0006759	-0.0168998
19737-2 FH DUP	12/12/2012	11:57:18	-0.0003813	-0.0013628	-0.034071	µg	4	100	-0.0003774	-0.0013489	-0.0337241	-0.0003852	-0.0013767	-0.0344179
19737-3 FH	12/12/2012	11:59:05	-0.0002412	-0.000862	-0.021551	µg	4	100	-0.0002488	-0.0008893	-0.0222347	-0.0002335	-0.0008346	-0.0208672
19737-3 FH SPK	12/12/2012	12:00:53	0.0241437	0.0862813	2.1570323	µg	4	100	0.0241537	0.0863169	2.1579218	0.0241338	0.0862457	2.1561427
19737-4 FH	12/12/2012	12:02:41	-0.0001911	-0.0006831	-0.0170784	µg	4	100	-0.000165	-0.0005897	-0.0147446	-0.0002172	-0.0007764	-0.0194122
19737-5 FH	12/12/2012	12:04:29	-0.0003936	-0.0014067	-0.0351684	µg	4	100	-0.0003904	-0.0013952	-0.0348811	-0.0003968	-0.0014182	-0.0354558
0.004ug = DL	12/12/2012	12:05:44	0.0011467	0.004098	0.004098	µg	4	100	0.0011467	0.004098	0.004098			
0.080ug = STD.2	12/12/2012	12:07:01	0.0231618	0.0827722	0.0827722	µg	4	100	0.0231618	0.0827722	0.0827722			
REAGENT BLANK	12/12/2012	12:08:18	-0.0000061	-0.0000219	-0.0000219	µg	4	100	-0.0000061	-0.0000219	-0.0000219			
19737-6 FH	12/12/2012	12:10:06	-0.0002925	-0.0010455	-0.0261382	µg	4	100	-0.0002942	-0.0010516	-0.0262911	-0.0002908	-0.0010394	-0.0259853
19737-1 BH	12/12/2012	12:11:56	0.0141169	0.0504491	8.6394051	µg	4	685	0.0141476	0.0505587	8.6581784	0.0140863	0.0503395	8.6206318
19737-2 BH	12/12/2012	12:13:46	0.0095564	0.0341512	6.2752848	µg	4	735	0.0095711	0.0342038	6.2849435	0.0095417	0.0340986	6.2656261
19737-2 BH DUP	12/12/2012	12:15:36	0.0097233	0.0347478	6.3849007	µg	4	735	0.0097397	0.0348062	6.3956373	0.009707	0.0346893	6.3741641
19737-3 BH	12/12/2012	12:17:24	0.011131	0.0397782	7.1600714	µg	4	720	0.0111092	0.0397003	7.1460586	0.0111527	0.039856	7.1740842
19737-3 BH SPK	12/12/2012	12:19:09	0.0320602	0.114572	20.622967	µg	4	720	0.03212	0.1147857	20.661419	0.0320004	0.1143584	20.584516
19737-4 BH	12/12/2012	12:20:53	0.0090633	0.0323889	1.781391	µg	4	220	0.0090834	0.032461	1.7853535	0.0090431	0.0323169	1.7774284
19737-5 BH	12/12/2012	12:22:37	-0.0002484	-0.000888	-0.0666005	µg	4	300	-0.0002409	-0.0008608	-0.064567	-0.000256	-0.0009151	-0.068634
19737-6 BH	12/12/2012	12:24:23	-0.0003067	-0.0010961	-0.0534383	µg	4	195	-0.0003072	-0.0010981	-0.0535339	-0.0003061	-0.0010942	-0.0533427
19737-1A	12/12/2012	12:26:09	-0.0001122	-0.0004012	-0.0200649	µg	4	200	-0.0001209	-0.0004323	-0.0216168	-0.0001036	-0.0003702	-0.018513
0.004ug = DL	12/12/2012	12:27:23	0.0012163	0.0043465	0.0043465	µg	4	200	0.0012163	0.0043465	0.0043465			
0.080ug = STD.2	12/12/2012	12:28:40	0.0232329	0.0830264	0.0830264	µg	4	200	0.0232329	0.0830264	0.0830264			
REAGENT BLANK	12/12/2012	12:29:57	5.904E-05	0.000211	0.000211	µg	4	200	5.904E-05	0.000211	0.000211			
19737-2A	12/12/2012	12:31:43	-0.000319	-0.0011402	-0.0570117	µg	4	200	-0.0003159	-0.0011291	-0.0564584	-0.0003221	-0.0011513	-0.057565
19737-2A DUP	12/12/2012	12:33:30	-0.000362	-0.0012939	-0.0846986	µg	4	200	-0.000353	-0.0012617	-0.0630893	-0.000371	-0.0013261	-0.066308
19737-3A	12/12/2012	12:35:18	-0.0001817	-0.0006495	-0.0324774	µg	4	200	-0.000174	-0.0006218	-0.0310913	-0.0001895	-0.0006772	-0.0338635
19737-3A SPK	12/12/2012	12:37:06	0.0227377	0.0812568	4.0628387	µg	4	200	0.022796	0.081465	4.0732501	0.0226795	0.0810485	4.0524274
19737-4A	12/12/2012	12:38:54	-0.0002822	-0.0010085	-0.0504279	µg	4	200	-0.0002798	-0.0010001	-0.0500056	-0.0002845	-0.001017	-0.0508503
19737-5A	12/12/2012	12:40:43	-0.0003682	-0.0013161	-0.0658078	µg	4	200	-0.0003643	-0.0013019	-0.0650978	-0.0003722	-0.0013303	-0.0665179
19737-6A	12/12/2012	12:42:33	-0.0004552	-0.0016269	-0.081347	µg	4	200	-0.0004501	-0.0016086	-0.0804345	-0.0004603	-0.0016451	-0.0822595
19737-1B	12/12/2012	12:44:23	-0.0002502	-0.0008942	-0.1117792	µg	4	500	-0.0002394	-0.0008557	-0.1069735	-0.0002609	-0.0009326	-0.1165848
19737-2B	12/12/2012	12:46:13	9.876E-05	0.000353	0.044119	µg	4	500	9.443E-05	0.0003375	0.0421829	0.0001031	0.0003684	0.046055
19737-2B DUP	12/12/2012	12:47:59	-0.0003827	-0.0013678	-0.1709762	µg	4	500	-0.0003739	-0.0013364	-0.1670578	-0.0003915	-0.0013991	-0.1748946
0.004ug = DL	12/12/2012	12:49:12	0.0012109	0.0043273	0.0043273	µg	4	500	0.0012109	0.0043273	0.0043273			
0.080ug = STD.2	12/12/2012	12:50:29	0.0231504	0.0827315	0.0827315	µg	4	500	0.0231504	0.0827315	0.0827315			
REAGENT BLANK	12/12/2012	12:51:46	-0.000359	-0.001283	-0.001283	µg	4	500	-0.000359	-0.001283	-0.001283			
19737-3B	12/12/2012	12:53:31	-0.000403	-0.0014405	-0.1800668	µg	4	500	-0.0004028	-0.0014397	-0.1799639	-0.0004033	-0.0014413	-0.1801697
19737-3B SPK	12/12/2012	12:55:15	0.0225528	0.0805959	10.074493	µg	4	500	0.0225879	0.0807214	10.09017	0.0225177	0.0804705	10.058816
19737-4B	12/12/2012	12:57:00	-0.0003784	-0.0013523	-0.1690389	µg	4	500	-0.0003893	-0.0013915	-0.1739456	-0.0003674	-0.001313	-0.1641323
19737-5B	12/12/2012	12:58:46	-0.0003233	-0.0011557	-0.1444635	µg	4	500	-0.0003292	-0.0011764	-0.1470564	-0.0003175	-0.0011349	-0.1418705
19737-6B	12/12/2012	13:00:32	-0.0003345	-0.0011956	-0.1494531	µg	4	500	-0.0003315	-0.0011849	-0.1481147	-0.0003375	-0.0012063	-0.1507914
19737-1C	12/12/2012	13:02:18	0.0002221	0.0007937	0.0793651	µg	4	400	0.0002192	0.0007832	0.0783235	0.000225	0.0008041	0.0804068
19737-2C	12/12/2012	13:04:04	0.0004093	0.0014626	0.1462579	µg	4	400	0.0004215	0.0015062	0.150622	0.0003971	0.0014189	0.1418939
19737-2C DUP	12/12/2012	13:05:50	6.218E-05	0.0002222	0.022224	µg	4	400	7.168E-05	0.0002562	0.0256193	5.268E-05	0.0001883	0.0188288
19737-3C	12/12/2012	13:07:39	-0.0001103	-0.0003942	-0.0394258	µg	4	400	-0.0001103	-0.0003944	-0.0394434	-0.0001102	-0.000394	-0.0394082
19737-3C SPK	12/12/2012	13:09:27	0.0229975	0.0821851	8.2185053	µg	4	400	0.0230536	0.0823857	8.2385708	0.0229413	0.0819844	8.1984397
0.004ug = DL	12/12/2012	13:11:58	0.0010079	0.0036019	0.0036019	µg	4	400	0.0010079	0.0036019	0.0036019			
0.080ug = STD.2	12/12/2012	13:13:15	0.0226796	0.081049	0.081049	µg	4	400	0.0226796	0.081049	0.081049			
REAGENT BLANK	12/12/2012	13:14:32	-0.0003442	-0.0012301	-0.0012301	µg	4	400	-0.0003442	-0.0012301	-0.0012301			
19737-4C	12/12/2012	13:16:19	-0.0001352	-0.0004831	-0.0483158	µg	4	400	-0.0001428	-0.0005103	-0.0510323	-0.0001275	-0.0004559	-0.0455994
19737-5C	12/12/2012	13:18:07	-0.0004121	-0.001473	-0.1473044	µg	4	400	-0.0004086	-0.0014605	-0.1460516	-0.0004157	-0.0014855	-0.1485572
19737-6C	12/12/2012	13:19:57	-0.0005651	-0.0020195	-0.2019555	µg	4	400	-0.0005736	-0.0020498	-0.2049867	-0.0005566	-0.0019892	-0.1989243
0.004ug = DL	12/12/2012	13:33:28	0.0010058	0.0035945	0.0035945	µg	0	1	0.0010058	0.0035945	0.0035945			
0.080ug = STD.2	12/12/2012	13:34:45	0.0222561	0.0795355	0.0795355	µg	0	1	0.0222561	0.0795355	0.0795355			
REAGENT BLANK	12/12/2012	13:36:02	-0.0003505	-0.0012525	-0.0012525	µg	0	1	-0.0003505	-0.0012525	-0.0012525			

PLANT DATA

G

I herby certify that all pages contained within this Appendix have been reviewed and, to the best of my ability, verified as accurate.

QA/QC Initials: MF

Date: 1/7/13

CleanAir.

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WHEELABRATOR NORTH BROWARD
TONS OF REFUSE PROCESSED PER STACK TEST RUN LOG

UNIT #1

Date	Test	Method #	Run #	Steam (klb/hr)	Run Length (hr)	Trash Processed (tons)
12/4/2012	Mercury	29	1	183.7	2.23	78.8
12/5/2012	Mercury	29	2	183.9	2.23	78.9
12/5/2012	Mercury	29	3	183.5	2.25	79.4
12/5/2012	Mercury	29	4	184.1	2.23	79.0

Wheelabrator
NORTH BROWARD
Emission Test Log

Date: 12/04/12
Start Time: 13:14
End Time: 15:28

	Test	SDA INLET TEMP	SDA OUTLET TEMP	TOTAL SLURRY FL	DIL WATER FLOW	TOTAL LIME	LIME CONC	FF OUT TEMP	FF DP	ID INLET PRESS
		DEG F	DEG F	GPM	GPM	GPM	%	DEG F	" H2O	" H2O
Unit 1	29 run 1	507.39	320.53	36.06	28.05	8.01	31.85	302.92	6.38	-8.55
Unit 2		507.84	320.20	37.84	30.69	7.15	30.57	290.78	6.32	-10.96
Unit 3		521.92	321.72	44.46	35.82	8.64	26.18	309.72	6.57	-10.74

	FEED H2O FLOW	SH OUT STM PRESS	FINAL STM TEMP	TOT AIR FLOW	FURNACE DRAFT	ECONO OUT TEMP	SH ROLL AVG	SNCR CHEM FLOW	STEAM FLOW
	KLBs/hr	DEG F	DEG F	KSCFM	" H2O	DEG F	DEG F	GPH	KLBs/hr
Unit 1	189.46	890.01	826.70	79.66	-0.08	262.15	1215.26	6.88	183.72
Unit 2	187.53	889.25	829.35	74.63	-0.09	272.01	1175.45	1.80	180.14
Unit 3	186.73	892.24	830.21	75.83	-0.09	282.57	1286.89	7.03	179.76

U1 lime (#/hr)	398.76
U2 lime (#/hr)	356.03
U3 lime (#/hr)	430.19
Specific Gravity	1.085

Wheelabrator
NORTH BROWARD
Emission Test Log

Date: 12/05/12
Start Time: 7:44
End Time: 9:58

	Test	SDA INLET TEMP	SDA OUTLET TEMP	TOTAL SLURRY FL	DIL WATER FLOW	TOTAL LIME	LIME CONC	FF OUT TEMP	FF DP	ID INLET PRESS
		DEG F	DEG F	GPM	GPM	GPM	%	DEG F	" H2O	" H2O
Unit 1	29 run 2	503.04	322.55	33.34	28.10	5.24	34.94	303.95	6.42	-8.52
Unit 2		513.85	321.18	39.52	24.68	14.84	28.48	293.63	6.22	-10.98
Unit 3		509.36	321.06	43.26	30.09	13.17	25.64	308.03	6.50	-10.71

	FEED H2O FLOW	SH OUT STM PRESS	FINAL STM TEMP	TOT AIR FLOW	FURNACE DRAFT	ECONO OUT TEMP	SH ROLL AVG	SNCR CHEM FLOW	STEAM FLOW
	KLBs/hr	DEG F	DEG F	KSCFM	" H2O	DEG F	DEG F	GPH	KLBs/hr
Unit 1	190.07	889.08	828.64	75.93	-0.10	262.24	1207.83	6.87	183.90
Unit 2	186.31	890.33	825.78	74.87	-0.10	271.59	1204.75	13.14	179.17
Unit 3	184.33	892.12	831.89	74.49	-0.10	282.28	1268.02	4.28	177.05

U1 lime (#/hr)	287.40
U2 lime (#/hr)	813.95
U3 lime (#/hr)	722.58
Specific Gravity	1.088

Wheelabrator
NORTH BROWARD
Emission Test Log

Date: 12/05/12
Start Time: 10:30
End Time: 12:45

	Test	SDA INLET TEMP	SDA OUTLET TEMP	TOTAL SLURRY FL	DIL WATER FLOW	TOTAL LIME	LIME CONC	FF OUT TEMP	FF DP	ID INLET PRESS
		DEG F	DEG F	GPM	GPM	GPM	%	DEG F	" H2O	" H2O
Unit 1	29 run 3	506.77	319.72	36.14	28.25	7.89	28.14	301.88	6.31	-8.37
Unit 2		512.99	320.80	39.91	31.41	8.50	25.50	291.08	6.29	-11.01
Unit 3		512.65	320.24	43.05	32.41	10.64	23.56	307.44	6.55	-10.38

	FEED H2O FLOW	SH OUT STM PRESS	FINAL STM TEMP	TOT AIR FLOW	FURNACE DRAFT	ECONO OUT TEMP	SH ROLL AVG	SNCR CHEM FLOW	STEAM FLOW
	KLBs/hr	DEG F	DEG F	KSCFM	" H2O	DEG F	DEG F	GPH	KLBs/hr
Unit 1	189.33	888.86	826.15	75.27	-0.10	263.05	1216.26	17.58	183.49
Unit 2	187.49	890.63	831.56	74.72	-0.09	272.29	1190.22	13.15	179.78
Unit 3	186.04	892.45	829.59	71.81	-0.10	282.83	1294.93	4.47	179.29

U1 lime (#/hr)	456.90
U2 lime (#/hr)	492.23
U3 lime (#/hr)	616.30
Specific Gravity	1.092

Wheelabrator
NORTH BROWARD
Emission Test Log

Date: 12/05/12
Start Time: 13:12
End Time: 15:26

	Test	SDA INLET TEMP	SDA OUTLET TEMP	TOTAL SLURRY FL	DIL WATER FLOW	TOTAL LIME	LIME CONC	FF OUT TEMP	FF DP	ID INLET PRESS
		DEG F	DEG F	GPM	GPM	GPM	%	DEG F	" H2O	" H2O
Unit 1	29 run 4	507.24	320.13	35.98	27.92	8.06	31.54	302.08	6.40	-8.43
Unit 2		505.28	320.13	38.18	30.83	7.34	29.74	289.45	6.35	-11.10
Unit 3		519.39	320.05	44.90	38.03	6.87	25.21	306.88	6.51	-10.68

	FEED H2O FLOW	SH OUT STM PRESS	FINAL STM TEMP	TOT AIR FLOW	FURNACE DRAFT	ECONO OUT TEMP	SH ROLL AVG	SNCR CHEM FLOW	STEAM FLOW
	KLBs/hr	DEG F	DEG F	KSCFM	" H2O	DEG F	DEG F	GPH	KLBs/hr
Unit 1	190.37	889.28	830.28	76.83	-0.10	262.92	1238.43	17.79	184.14
Unit 2	188.32	890.99	832.77	75.99	-0.10	272.08	1152.15	13.11	180.60
Unit 3	181.81	891.56	827.74	74.29	-0.09	282.68	1291.83	7.15	175.06

U1 lime (#/hr)	431.26
U2 lime (#/hr)	392.69
U3 lime (#/hr)	367.43
Specific Gravity	1.085

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