Wheelabrator North Broward Inc.
A Waste Management Company
2600 Wiles Road
Pompano Beach, FL 33073
(954) 971-8701 Tel
(954) 971-8703 Fax

October 18, 2012

CERTIFIED MAIL #70073020000226913099

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
Third Quarter of 2012, Report Submittal

Dear Mr. Lurix:

As required by F.A.C. 62-296.416, please find enclosed the 2012 third quarter report on mercury stack testing which was conducted on Unit #2.

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 #70073020000226913105
FDEP, Tallahassee, Bureau of Air Regulation, New Source Review Section, CERTIFIED MAIL #70073020000226913112
Broward County Department of Planning and Environmental Protection, Air Quality Division CERTIFIED MAIL #70073020000226913129
Chuck Faller (with)
Rob French – MPI - (with)
Ram Tewari – BCWRS (without)

WASTE MANAGEMENT

CleanAir.

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

October 12, 2012

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

Dear Mr. Faller:

Enclosed are six copies of the final report prepared by Clean Air Engineering for Wheelabrator North Broward, Inc. on quarterly mercury testing (Unit 2) performed at the Pompano Beach, FL facility on September 5 and 6, 2012.

You can reach me at (800) 627-0033 ext. 4544 if you have any questions about the data or comments about the report.

Respectfully submitted,

CLEAN AIR ENGINEERING

Scott Brown
Project Manager

SAB/nsl

CleanAir.

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

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

REPORT ON MERCURY TESTING

Performed for:
WHEELABRATOR NORTH BROWARD, INC.
UNIT 2 FF OUTLET
POMPANO BEACH, FL

Client Reference No: Service Agreement
CleanAir Project No: 11414-7
Revision 0: October 12, 2012

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,

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

Reviewed by,

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

REVISION HISTORY

REPORT ON MERCURY TESTING

DRAFT REPORT REVISION HISTORY

Revision:	Date	Pages	Comments
D0a	10/02/12	All	Draft version of original document.

FINAL REPORT REVISION HISTORY

Revision:	Date	Pages	Comments
0	10/12/12	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 2 Fabric Filter (FF) Outlet on September 5 and 6, 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.
R. Vicere – 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 H.

The CleanAir test crew consisted of Paul Bihun, 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 2 FF Outlet	USEPA Method 29	Mercury	09/05/12	12:55	15:09
2	Unit 2 FF Outlet	USEPA Method 29	Mercury	09/06/12	07:35	09:46
3	Unit 2 FF Outlet	USEPA Method 29	Mercury	09/06/12	10:12	12:24
4	Unit 2 FF Outlet	USEPA Method 29	Mercury	09/06/12	12:45	14:57

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 2 FF Outlet			
Mercury (µg/dscm @7% O_2)	EPA M29	4.8	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 2 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 2 FF Outlet – Mercury

Run No.		1	2	3	4	Average
Date (2012)		Sep 5	Sep 6	Sep 6	Sep 6	
Start Time (approx.)		12:55	07:35	10:12	12:45	
Stop Time (approx.)		15:09	09:46	12:24	14:57	
Process Conditions						
R_P	Production rate - (units/hour)	184	185	183	184	**184**
P_1	Fabric Filter Inlet Temperature (°F)	320	327	324	323	**323**
F_d	Oxygen-based F-factor (dscf/MMBtu)	9,570	9,570	9,570	9,570	**9,570**
Gas Conditions						
O_2	Oxygen (dry volume %)	9.0	9.0	9.0	7.7	**8.7**
CO_2	Carbon dioxide (dry volume %)	9.9	10.0	10.1	10.9	**10.2**
T_s	Sample temperature (°F)	311	320	316	319	**316**
B_w	Actual water vapor in gas (% by volume)	24.2	27.5	26.8	28.4	**26.7**
Gas Flow Rate						
Q_a	Volumetric flow rate, actual (acfm)	191,000	204,000	195,000	199,000	**197,000**
Q_s	Volumetric flow rate, standard (scfm)	128,000	134,000	129,000	132,000	**131,000**
Q_{std}	Volumetric flow rate, dry standard (dscfm)	96,800	97,200	94,500	94,300	**95,700**
Sampling Data						
V_{mstd}	Volume metered, standard (dscf)	79.73	82.77	76.25	79.65	**79.60**
%I	Isokinetic sampling (%)	102.3	105.8	100.2	105.0	**103.3**
Laboratory Data						
m_n	Total matter corrected for allowable blanks (µg)	7.9273	11.5223	9.8867	8.3686	
Mercury Results - Total						
C_{sd}	Concentration (µg/dscm)	3.5	4.9	4.6	3.7	**4.2**
C_{sd7}	Concentration @7% O_2 (µg/dscm)	4.1	5.8	5.3	3.9	**4.8**
$E_{lb/hr}$	Rate (lb/hr)	1.3E-03	1.8E-03	1.6E-03	1.3E-03	**1.5E-03**
E_{Fd}	Rate - Fd-based (lb/MMBtu)	3.7E-06	5.2E-06	4.8E-06	3.5E-06	**4.3E-06**

RESULTS

Table 2-2:
Quality Assurance and Quality Control

RPD RESULTS

Run Number	FH Front Half	BH H_2O_2/HNO4	A Empty Impinger	B KMnO4	C HCl
U2 FF Outlet R1	NA	0.1%	NA	NA	NA
U2 FF Outlet R2	NA	0.3%	NA	NA	NA
U2 FF Outlet R3	NA	0.4%	NA	NA	NA
U2 FF Outlet R4	2.5%	0.2%	NA	NA	NA
Field Blank	NA	NA	NA	NA	NA
Reagent Blank	NA	NA	NA	NA	NA

Sample Spike and Recovery

Run Number		Front Half	H_2O_2/HNO4	Empty Impinger	KMnO4	HCl
U2 FF Outlet R3	#1	116%	101%	100%	111%	97%
	#2	107%	100%	92%	110%	97%

Blanks

Field Blank	#1	< 0.1	< 0.1	< 0.2	< 0.5	< 0.4
	#2	< 0.1	< 0.1	< 0.2	< 0.5	< 0.4
Reagent Blank	#1	< 0.1	< 0.2	< 0.2	< 0.5	< 0.4
	#2	< 0.1	< 0.2	< 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 2 FF Outlet as shown in Figure 3-2 on page 3-2.

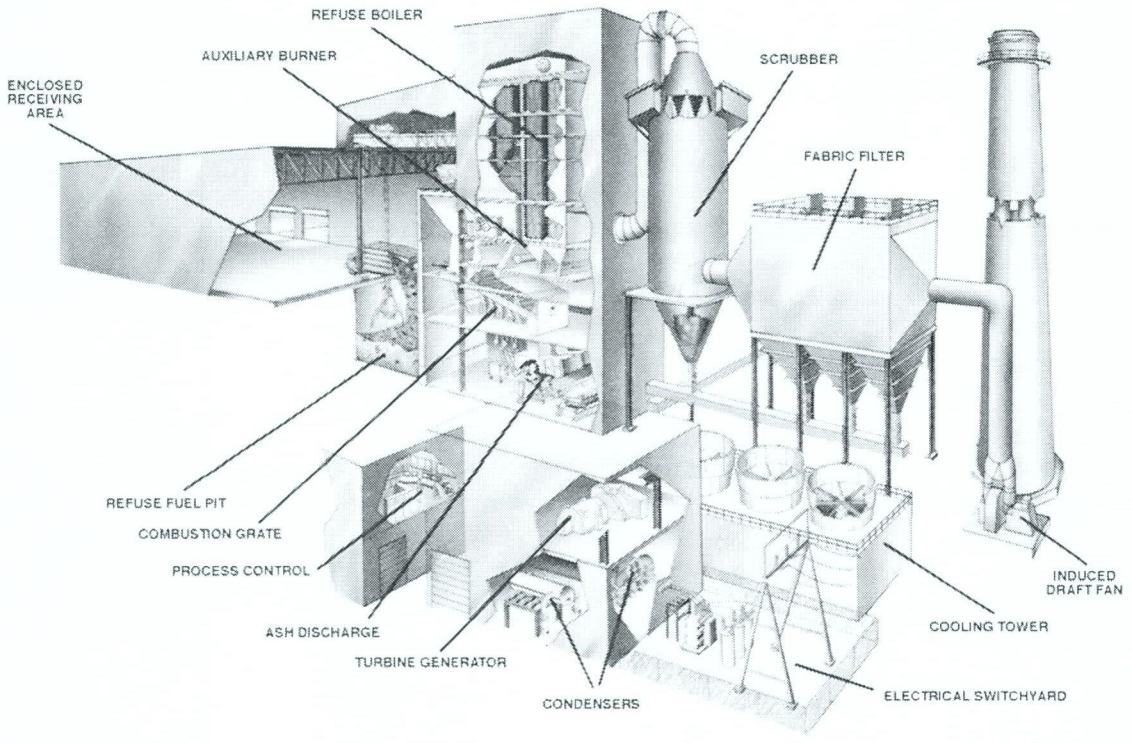


Figure 3-1: General Process Schematic

DESCRIPTION OF INSTALLATION

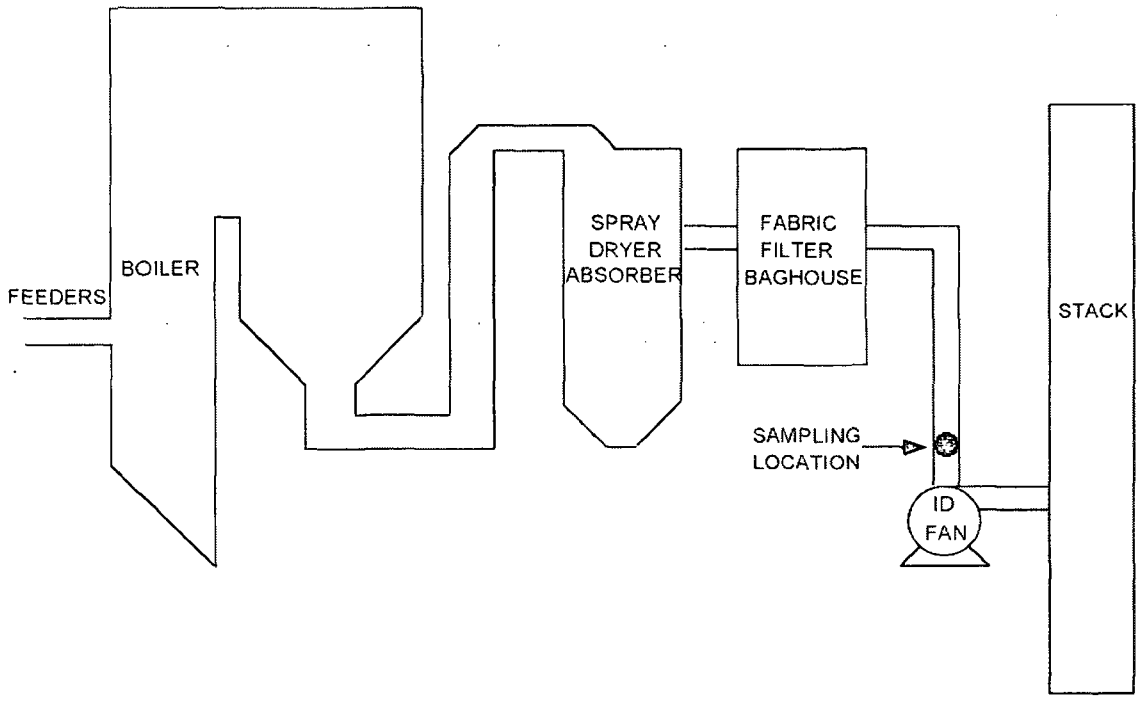


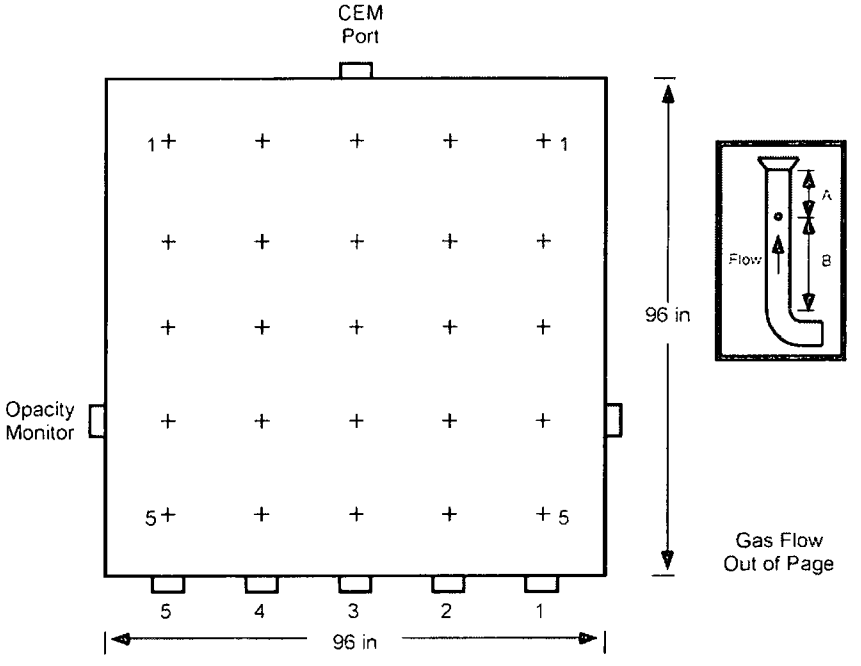
Figure 3-2: Process Schematic

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 2 FF Outlet	Mercury	29	1-3	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 2 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: KH

Date: 10/10/12

CleanAir.

Specification Sheet for EPA Method 29

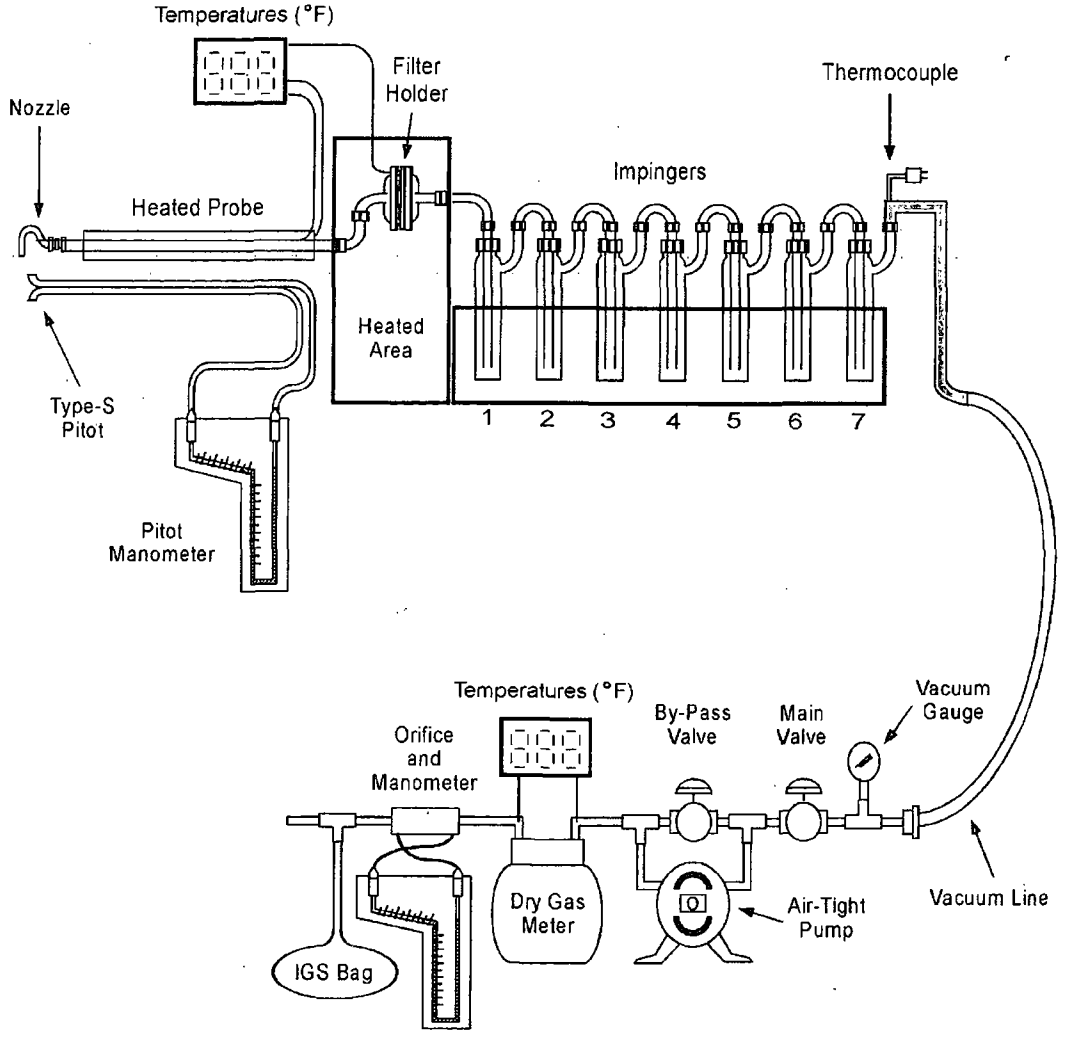
Source Location Name(s)	Unit 2 FF Outlet
Pollutant(s) to be Determined	Mercury
Other Parameters to be Determined from Train	Gas Density, Moisture, Flow Rate

	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

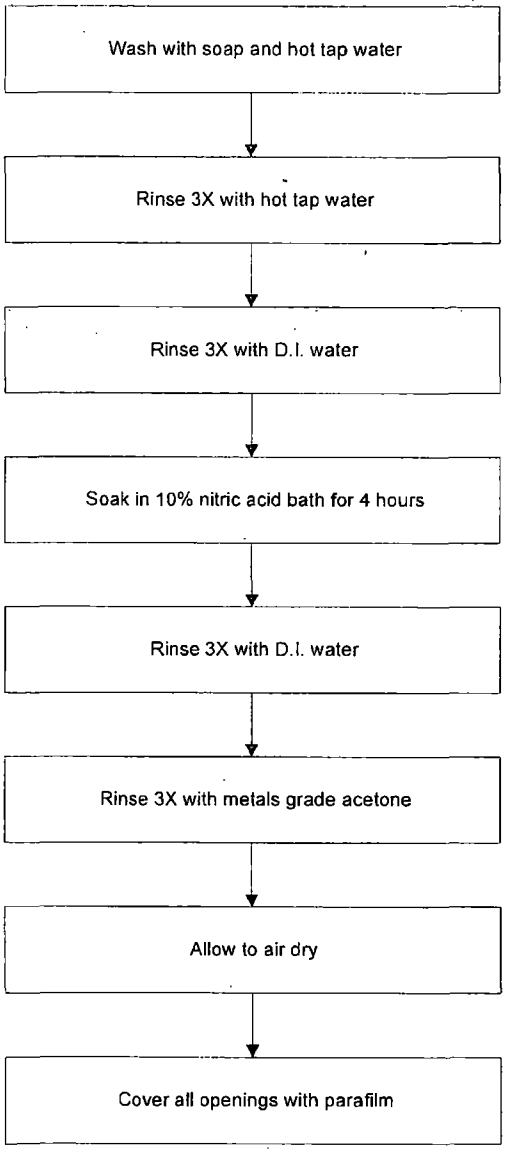
	Standard Method Specification	Actual Specification Used
Impinger Train Description		
Type of Glassware Connections	Ground Glass or Equivalent	Screw Joint with Silicone Gasket
Connection to Probe or Filter by	Direct Glass Connection	Direct Glass Connection
Number of Impingers	7	7
Impinger Stem Types	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

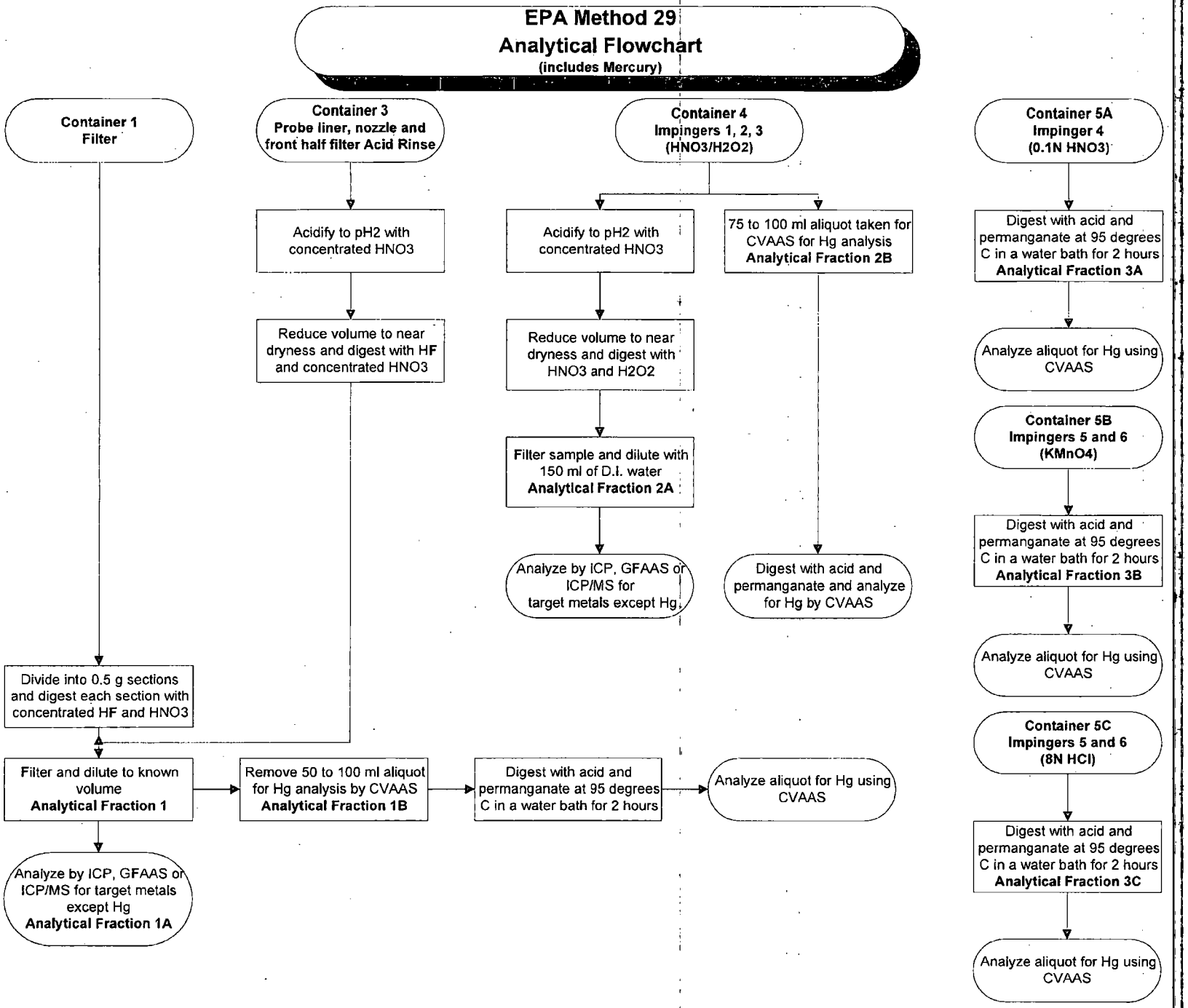
100 ml KMnO4 solution

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



End of Appendix

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: NK

Date: 10/10/12

CleanAir

USEPA Method 29 (Mercury)
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.

092012 152213
K

1. Volume of water collected (wscf)

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

Where:

V_{lc}	= total volume of liquid collected in impingers and silica gel (ml)	=	541.6	ml
0.04706	= ideal gas conversion factor (ft^3 water vapor/ml or gm)	=	0.04706	ft^3/ml
V_{wstd}	= volume of water vapor collected at standard conditions (ft^3)	=	25.49	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)	=	30.02	in. Hg
T_m	= average dry gas meter temperature (°F)	=	95.06	°F
V_m	= volume of gas sample through the dry gas meter at meter conditions (dcf)	=	83.64	dcf
Y_d	= gas meter correction factor (dimensionless)	=	0.9958	
ΔH	= average pressure drop across meter box orifice (in. H_2O)	=	1.41	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)	=	79.731	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)	=	30.02	in. Hg
P_g	= sample gas static pressure (in. H_2O)	=	-11.40	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)	=	29.18	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)	=	310.92	°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)	=	29.18	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)	=	29.18	in. Hg
P_v	= water vapor pressure, actual (in. Hg)	=	29.18	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)	=	79.731	dscf
V_{wstd}	= volume of water collected at standard conditions (scf)	=	25.49	scf
B_{wo}	= proportion of water measured in the gas stream by volume	=	0.2422	
		=	24.22	%

7. Saturated moisture content (% by volume)

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

Where:

P_s	= absolute sample gas pressure (in. Hg)	=	29.18	in. Hg
P_v	= water vapor pressure, actual (in. Hg)	=	29.18	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	=	0.2422	
B_w	= actual water vapor in gas	=	0.2422	
		=	24.22	%

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 (%)	=	9.0	%
100	= conversion factor (%)	=	100	%
N_2+CO	= proportion of nitrogen and CO in the gas stream by volume (%)	=	81.03	%

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 (%)	=	9.0	%
N_2+CO	= proportion of nitrogen and CO in the gas stream by volume (%)	=	81.0	%
100	= conversion factor (%)	=	100	%
M_d	= dry molecular weight of sample gas (lb/lb·mole)	=	29.95	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	=	0.2422	
M_d	= dry molecular weight of sample gas (lb/lb·mole)	=	29.95	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)	=	27.06	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)	=	27.06	lb/lb·mole
P_s	= absolute sample gas pressure (in. Hg)	=	29.18	in. Hg
T_s	= average sample gas temperature (°F)	=	310.92	°F
$\sqrt{\Delta P}$	= average square roots of velocity heads of sample gas (in. H_2O)	=	0.713	$\sqrt{}$in. H_2O
460	= °F to °R conversion constant	=	460	
V_s	= sample gas velocity (ft/sec)	=	49.83	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)	=	49.83	ft/sec
60	conversion factor (sec/min)	=	60	sec/min
Q_a	= volumetric flow rate at actual conditions (acfm)	=	191,329	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)	=	191,329	acfm
P_s	= absolute sample gas pressure (in. Hg)	=	29.18	in. Hg
29.92	= standard pressure (in. Hg)	=	29.92	in. Hg
T_s	= average sample gas temperature (°F)	=	310.9	°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)	=	127,807	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	=	0.2422	
Q_s	= volumetric flow rate at standard conditions, wet basis (scfm)	=	127,807	scfm
Q_{std}	= volumetric flow rate at standard conditions, dry basis (dscfm)	=	96,848	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)	=	96,848	dscfm
O_2	= proportion of oxygen in the gas stream by volume (%)	=	9.0	%
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)	=	82,680	dscfm

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

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

Where

$Q_{std\text{-}min}$	= volumetric flow rate, english units (ft^3/min)	=	96,848	dscfm
60	= conversion factor (min/hr)	=	60	min/hr
$Q_{std\text{-}hr}$	= volumetric flow rate, hourly basis (dscf/hr)	=	5,810,855	dscf/hr

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

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

Where:

$Q_{std\text{-}english}$	= volumetric flow rate, english units (ft^3/min)	=	96,848	dscfm
35.31	= conversion factor (ft^3/m^3)	=	35.31	ft^3/m^3
60	= conversion factor (min/hr)	=	60	min/hr
$Q_{std\text{-}metric}$	= volumetric flow rate, metric units (m^3/hr)	=	164,567	dry std m^3/hr

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

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

Where:

$Q_{std\text{-}metric}$	= volumetric flow rate, metric units (dry std m^3/hr)	=	164,567	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)	=	153,346	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)	=	0.275	in.
B_w	= proportion of water vapor in the gas stream by volume	=	0.2422	
P_s	= absolute sample gas pressure (in. Hg)	=	29.18	in. Hg
T_s	= average sample gas temperature (°F)	=	310.9	°F
V_{mstd}	= volume of gas sample through the dry gas meter at standard conditions (dscf)	=	79.731	dscf
V_s	= sample gas velocity (ft/sec)	=	49.83	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 (%)	=	102.25	%

21. Alternative Method 5 Post-Test Meter Calibration Factor

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

Where:

θ	= total sampling time (min)	=	125	min
V_m	= volume of gas sample through the dry gas meter at meter conditions (dcf)	=	83.64	dcf
T_m	= average dry gas meter temperature (°F)	=	95.06	°F
$\Delta H_@$	= dry gas meter orifice coefficient	=	1.8117	
P_{bar}	= barometric pressure (in. Hg)	=	30.02	in. Hg
ΔH	= average pressure drop across meter box orifice (in. H_2O)	=	1.408	in. H_2O
M_d	= dry molecular weight of sample gas (lb/lb·mole)	=	29.95	lb/lb·mole
$\sqrt{\Delta H_{avg}}$	= average of square root of pressure drop across meter orifice	=	1.184	√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	=	0.9913	

LOGIC FOR TREATING DETECTION LIMITS

(mercury only)

1. Logic for Determining Total Blank ($m_{Total\text{-}B}$) 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	$m_{Total\text{-}B}$ = Sum D, 1-5	$m_{Total\text{-}B}$ = Sum D	$m_{Total\text{-}B}$ = < Sum ND
ND=1x	$m_{Total\text{-}B}$ = Sum D, 1-5	$m_{Total\text{-}B}$ = Sum D	$m_{Total\text{-}B}$ = < Sum ND
ND=0.5x	$m_{Total\text{-}B}$ = Sum D, 1-5	$m_{Total\text{-}B}$ = Sum D	$m_{Total\text{-}B}$ = < 0.5 Sum ND

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

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

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

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

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

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

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

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.

USEPA Method 29 (Mercury)
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.

092012 152213
O

1. Total blank amount (µg)

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

Where:

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

2. Total sample amount (µg)

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

Where:

m_{1b-S}	= mercury amount in sample for Fraction 1b	=	<0.1000	µg
m_{2b-S}	= mercury amount in sample for Fraction 2b	=	7.9273	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	=	7.9273	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	=	<1.4000	µg
$m_{total-S}$	= total amount of mercury in sample	=	7.9273	µg
$0.05 \times m_{total-S}$	= 5% of $m_{total-S}$	=	0.3964	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	=	7.9273	µg
$m_{T-B-allow}$	= total allowable blank correction	=	0.0000	µg
m_n	= total mercury in sample corrected for allowable blank	=	7.9273	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	=	7.9273	µg
m_{1b-S}	= mercury amount in sample for Fraction 1b	=	<0.1000	µg
m_{2b-S}	= mercury amount in sample for Fraction 2b	=	7.9273	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	=	7.9273	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	=	7.9273	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 (Mercury)
Mercury Sample Calculations

Sample data taken from Run 1

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

092012 152213
K_O

1. Mercury concentration (lb/dscf)

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

Where:

m_n	= mercury collected in sample (total µg)	=	7.9273	µg
V_{mstd}	= volume metered, standard (dscf)	=	79.7305	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)	=	2.1923E-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)	=	7.9273	µg
V_{mstd}	= volume metered, standard (dscf)	=	79.7305	dscf
35.31	= conversion factor (dscf/dscm)	=	35.31	dscf/dscm
C_{sd}	= mercury concentration (µg/dscm)	=	3.5107E+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)	=	7.9273	µg
V_{mstd}	= volume metered, standard (dscf)	=	79.7305	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)	=	3.5107E-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)	=	7.9273	µg
V_{mstd}	= volume metered, standard (dscf)	=	79.7305	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)	=	3.7676E+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)	=	2.1923E-10	lb/dscf
x	= oxygen content of corrected gas (%)	=	7.0	%
O_2	= proportion of oxygen in the gas stream by volume (%)	=	9.0	%
20.9	= oxygen content of ambient air (%)	=	20.9	%
C_{sdx}	= mercury concentration corrected to x% oxygen (lb/dscf)	=	2.5680E-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)	=	2.1923E-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)	=	2.6485E-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)	=	2.1923E-10	lb/dscf
Q_{std}	= volumetric flow rate at standard conditions, dry basis (dscfm)	=	96,848	dscfm
Q_a	= volumetric flow rate at actual conditions (acfm)	=	191,329	acfm
C_a	= mercury concentration at actual gas conditions (lb/acf)	=	1.1097E-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)	=	7.9273	µg
V_{mstd}	= volume metered, standard (dscf)	=	79.7305	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)	=	96,848	dscfm
60	= conversion factor (min/hr)	=	60	min/hr
$E_{lb/hr}$	= mercury emission rate (lb/hr)	=	1.2739E-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)	=	7.9273	µg
V_{mstd}	= volume metered, standard (dscf)	=	79.7305	dscf
Q_{std}	= volumetric flow rate at standard conditions, dry basis (dscfm)	=	96,848	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)	=	1.6049E-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)	=	7.9273	µg
V_{mstd}	= volume metered, standard (dscf)	=	79.7305	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)	=	96,848	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)	=	5.5799E-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)	=	7.9273	µg
V_{mstd}	= volume metered, standard (dscf)	=	79.7305	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 (%)	=	9.0	%
20.9	= oxygen content of ambient air (%)	=	20.9	%
E_{Fd}	= mercury emission rate - Fd-based (lb/MMBtu)	=	3.6952E-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)	=	7.9273	µg
V_{mstd}	= volume metered, standard (dscf)	=	79.7305	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)	=	4.0168E-06	lb/MMBtu

This Page Intentionally Left Blank

PARAMETERS

C

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: NL

Date: 10/10/12

CleanAir

Wheelabrator North Broward, Inc.
Clean Air Project No: 11414
Unit 2 FF Outlet

USEPA Method 29 (Mercury)
Sampling, Velocity and Moisture Parameters

Run No.		1	2	3	4	Average
Date (2012)		Sep 5	Sep 6	Sep 6	Sep 6	
Start Time (approx.)		12:55	07:35	10:12	12:45	
Stop Time (approx.)		15:09	09:46	12:24	14:57	
Sampling Conditions						
Y_d	Dry gas meter correction factor	0.9958	0.9958	0.9958	0.9958	
C_p	Pitot tube coefficient	0.8270	0.8270	0.8270	0.8270	
P_g	Static pressure (in. H_2O)	-11.4000	-12.2000	-11.3000	-11.0000	
A_s	Sample location area (ft^2)	64.0000	64.0000	64.0000	64.0000	
P_{bar}	Barometric pressure (in. Hg)	30.02	30.00	30.00	30.00	**30.0050**
D_n	Nozzle diameter (in.)	0.2750	0.2750	0.2750	0.2750	
O_2	Oxygen (dry volume %)	9.0333	9.0333	9.0000	7.7000	**8.6917**
CO_2	Carbon dioxide (dry volume %)	9.9333	10.0000	10.0667	10.9000	**10.2250**
N_2+CO	Nitrogen plus carbon monoxide (dry volume %)	81.0333	80.9667	80.9333	81.4000	**81.0833**
V_{lc}	Total Liquid collected (ml)	541.60	667.10	593.10	671.80	
V_m	Volume metered, meter conditions (ft^3)	83.6350	85.9550	79.9500	82.7250	
T_m	Dry gas meter temperature (°F)	95.0600	89.2600	94.2600	89.1000	
T_s	Sample temperature (°F)	310.9200	319.8400	315.9600	319.0000	**316.4300**
ΔH	Meter box orifice pressure drop (in. H_2O)	1.4080	1.4760	1.2776	1.3480	
θ	Total sampling time (min)	125.0	125.0	125.0	125.0	
Flow Results						
V_{wstd}	Volume of water collected (ft^3)	25.4877	31.3937	27.9113	31.6149	**29.1019**
V_{mstd}	Volume metered, standard (dscf)	79.7305	82.7663	76.2526	79.6544	**79.6010**
P_s	Sample gas pressure, absolute (in. Hg)	29.1818	29.1029	29.1691	29.1912	**29.1613**
P_v	Vapor pressure, actual (in. Hg)	29.1818	29.1029	29.1691	29.1912	**29.1613**
B_{wo}	Moisture measured in sample (% by volume)	24.2236	27.4998	26.7955	28.4130	**26.7330**
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)	24.2236	27.4998	26.7955	28.4130	**26.7330**
$\sqrt{\Delta P}$	Velocity head ($\sqrt{}$in. H_2O)	0.7132	0.7479	0.7190	0.7326	**0.7282**
M_d	MW of sample gas, dry (lb/lb-mole)	29.9507	29.9613	29.9707	30.0520	**29.9837**
M_s	MW of sample gas, wet (lb/lb-mole)	27.0558	26.6720	26.7631	26.6277	**26.7796**
V_s	Velocity of sample (ft/sec)	49.8252	53.0009	50.6806	51.8506	**51.3393**
%I	Isokinetic sampling (%)	102.2512	105.7860	100.2122	104.9630	**103.3031**
Q_a	Volumetric flow rate, actual (acfm)	191,329	203,524	194,613	199,106	**197,143**
Q_s	Volumetric flow rate, standard (scfm)	127,807	134,035	129,101	131,665	**130,652**
Q_{std}	Volumetric flow rate, dry standard (dscfm)	96,848	97,176	94,508	94,255	**95,697**
Q_{std7}	Volumetric flow rate, dry std@7%O_2 (dscfm)	82,680	82,961	80,909	89,509	**84,015**
Q_a	Volumetric flow rate, actual (acf/hr)	11,479,733	12,211,412	11,676,809	11,946,384	**11,828,585**
Q_s	Volumetric flow rate, standard (scf/hr)	7,668,428	8,042,103	7,746,053	7,899,925	**7,839,127**
Q_{std}	Volumetric flow rate, dry standard (dscf/hr)	5,810,855	5,830,544	5,670,455	5,655,322	**5,741,794**
Q_a	Volumetric flow rate, actual (m^3/hr)	325,113	345,834	330,694	338,329	**334,992**
Q_s	Volumetric flow rate, standard (m^3/hr)	217,174	227,757	219,373	223,731	**222,009**
Q_{std}	Volumetric flow rate, dry standard (dry m^3/hr)	164,567	165,124	160,591	160,162	**162,611**
Q_{std7}	Volumetric flow rate, dry std@7%O_2 (dry m^3/hr)	140,494	140,970	137,484	152,096	**142,761**
Q_s	Volumetric flow rate, normal (Nm^3/hr)	202,367	212,228	204,416	208,476	**206,872**
Q_{std}	Volumetric flow rate, dry normal (Nm^3/hr)	153,346	153,866	149,641	149,242	**151,524**
Q_{std7}	Volumetric flow rate, dry normal @7%O_2 (Nm^3/hr)	130,914	131,358	128,110	141,726	**133,027**

Comments:
Average includes 4 runs.

092012 152213
KLOJ

Wheelabrator North Broward, Inc.
Clean Air Project No: 11414
Unit 2 FF Outlet

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

Run No.		1	2	3	4	Average
Date (2012)		Sep 5	Sep 6	Sep 6	Sep 6	
Start Time (approx.)		12:55	07:35	10:12	12:45	
Stop Time (approx.)		15:09	09:46	12:24	14:57	
Process Conditions						
R_P	Steam Production Rate - (Klbs/hour)	184.3	184.6	183.2	183.9	**184.0**
P_1	Fabric Filter Inlet Temperature (°F)	320	327	324	323	**323**
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 %)	9.0333	9.0333	9.0000	7.7000	**8.6917**
CO_2	Carbon dioxide (dry volume %)	9.9333	10.0000	10.0667	10.9000	**10.2250**
T_s	Sample temperature (°F)	310.9200	319.8400	315.9600	319.0000	**316.4300**
B_w	Actual water vapor in gas (% by volume)	24.2236	27.4998	26.7955	28.4130	**26.7330**
Gas Flow Rate						
Q_a	Volumetric flow rate, actual (acfm)	191,329	203,524	194,613	199,106	**197,143**
Q_s	Volumetric flow rate, standard (scfm)	127,807	134,035	129,101	131,665	**130,652**
Q_{std}	Volumetric flow rate, dry standard (dscfm)	96,848	97,176	94,508	94,255	**95,697**
Sampling Data						
V_{mstd}	Volume metered, standard (dscf)	79.7305	82.7663	76.2526	79.6544	**79.6010**
%I	Isokinetic sampling (%)	102.2512	105.7860	100.2122	104.9630	**103.3031**
Laboratory Data						
$m_{n\text{-}1b}$	Fraction 1B (µg)	<0.1000	<0.1000	<0.1000	0.1296	
$m_{n\text{-}2b}$	Fraction 2B (µg)	7.9273	11.5223	9.8867	8.2391	
$m_{n\text{-}3a}$	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)	7.9273	11.5223	9.8867	8.3686	
Mercury Results - Total						
C_{sd}	Concentration (lb/dscf)	2.1923E-10	3.0697E-10	2.8589E-10	2.3166E-10	**2.6094E-10**
C_{sd7}	Concentration @7% O_2 (lb/dscf)	2.5680E-10	3.5957E-10	3.3394E-10	2.4395E-10	**2.9856E-10**
C_{sd12}	Concentration @12% CO_2 (lb/dscf)	2.6485E-10	3.6836E-10	3.4080E-10	2.5504E-10	**3.0726E-10**
C_a	Concentration (lb/acf)	1.1097E-10	1.4657E-10	1.3883E-10	1.0967E-10	**1.2651E-10**
C_{sd}	Concentration (µg/dscm)	3.5107E+00	4.9157E+00	4.5782E+00	3.7097E+00	**4.1786E+00**
C_{sd7}	Concentration @7% O_2 (µg/dscm)	4.1123E+00	5.7580E+00	5.3476E+00	3.9065E+00	**4.7811E+00**
C_{sd12}	Concentration @12% CO_2 (µg/dscm)	4.2412E+00	5.8988E+00	5.4574E+00	4.0841E+00	**4.9204E+00**
C_{sd}	Concentration (mg/dscm)	3.5107E-03	4.9157E-03	4.5782E-03	3.7097E-03	**4.1786E-03**
C_{sd7}	Concentration @7% O_2 (mg/dscm)	4.1123E-03	5.7580E-03	5.3476E-03	3.9065E-03	**4.7811E-03**
C_{sd12}	Concentration @12% CO_2 (mg/dscm)	4.2412E-03	5.8988E-03	5.4574E-03	4.0841E-03	**4.9204E-03**
C_a	Concentration (µg/m^3 (actual,wet))	1.7771E+00	2.3471E+00	2.2232E+00	1.7562E+00	**2.0259E+00**
C_{sd}	Concentration (µg/Nm^3 dry)	3.7676E+00	5.2754E+00	4.9132E+00	3.9812E+00	**4.4843E+00**
C_{sd7}	Concentration @7% O_2 (µg/Nm^3 dry)	4.4132E+00	6.1793E+00	5.7389E+00	4.1923E+00	**5.1309E+00**
C_{sd12}	Concentration @12% CO_2 (µg/Nm^3 dry)	4.5515E+00	6.3304E+00	5.8568E+00	4.3829E+00	**5.2804E+00**
$E_{lb/hr}$	Rate (lb/hr)	1.2739E-03	1.7898E-03	1.6211E-03	1.3101E-03	**1.4987E-03**
$E_{g/s}$	Rate (g/s)	1.6049E-04	2.2547E-04	2.0423E-04	1.6504E-04	**1.8881E-04**
$E_{T/yr}$	Rate (Ton/yr)	5.5799E-03	7.8393E-03	7.1006E-03	5.7383E-03	**6.5645E-03**
E_{Fd}	Rate - Fd-based (lb/MMBtu)	3.6952E-06	5.1740E-06	4.8053E-06	3.5102E-06	**4.2962E-06**
E_{Fc}	Rate - Fc-based (lb/MMBtu)	4.0168E-06	5.5868E-06	5.1688E-06	3.8681E-06	**4.6601E-06**

092012 152213
KLOJ_O

Prepared by Clean Air Engineering Proprietary Software
SS Metals-1 Version 2008-12c

Wheelabrator North Broward, Inc.
Clean Air Project No: 11414
Unit 2 FF Outlet

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

Run No.		1	2	3	4	Average
Date (2012)		Sep 5	Sep 6	Sep 6	Sep 6	
Start Time (approx.)		12:55	07:35	10:12	12:45	
Stop Time (approx.)		15:09	09:46	12:24	14:57	
Mercury Results - Front Half						
C_{sd}	Concentration (lb/dscf)	<2.7656E-12	<2.6641E-12	<2.8917E-12	3.5868E-12	**<2.9770E-12**
C_{sd7}	Concentration @7% O_2 (lb/dscf)	<3.2394E-12	<3.1206E-12	<3.3777E-12	3.7770E-12	**<3.3787E-12**
C_{sd12}	Concentration @12% CO_2 (lb/dscf)	<3.3410E-12	<3.1970E-12	<3.4471E-12	3.9488E-12	**<3.4834E-12**
C_a	Concentration (lb/acf)	<1.3999E-12	<1.2720E-12	<1.4043E-12	1.6980E-12	**<1.4435E-12**
C_{sd}	Concentration (µg/dscm)	<4.4287E-02	<4.2662E-02	<4.6307E-02	5.7438E-02	**<4.7673E-02**
C_{sd7}	Concentration @7% O_2 (µg/dscm)	<5.1875E-02	<4.9972E-02	<5.4089E-02	6.0483E-02	**<5.4105E-02**
C_{sd12}	Concentration @12% CO_2 (µg/dscm)	<5.3501E-02	<5.1195E-02	<5.5200E-02	6.3234E-02	**<5.5782E-02**
C_{sd}	Concentration (mg/dscm)	<4.4287E-05	<4.2662E-05	<4.6307E-05	5.7438E-05	**<4.7673E-05**
C_{sd7}	Concentration @7% O_2 (mg/dscm)	<5.1875E-05	<4.9972E-05	<5.4089E-05	6.0483E-05	**<5.4105E-05**
C_{sd12}	Concentration @12% CO_2 (mg/dscm)	<5.3501E-05	<5.1195E-05	<5.5200E-05	6.3234E-05	**<5.5782E-05**
C_a	Concentration (µg/m^3 (actual,wet))	<2.2417E-02	<2.0370E-02	<2.2487E-02	2.7190E-02	**<2.3116E-02**
C_{sd}	Concentration (µg/Nm^3 dry)	<4.7527E-02	<4.5784E-02	<4.9695E-02	6.1640E-02	**<5.1162E-02**
C_{sd7}	Concentration @7% O_2 (µg/Nm^3 dry)	<5.5671E-02	<5.3629E-02	<5.8047E-02	6.4909E-02	**<5.8064E-02**
C_{sd12}	Concentration @12% CO_2 (µg/Nm^3 dry)	<5.7415E-02	<5.4941E-02	<5.9239E-02	6.7861E-02	**<5.9864E-02**
$E_{lb/hr}$	Rate (lb/hr)	<1.6070E-05	<1.5533E-05	<1.6397E-05	2.0284E-05	**<1.7071E-05**
$E_{g/s}$	Rate (g/s)	<2.0245E-06	<1.9568E-06	<2.0657E-06	2.5554E-06	**<2.1506E-06**
$E_{T/yr}$	Rate (Ton/yr)	<7.0388E-05	<6.8036E-05	<7.1820E-05	8.8846E-05	**<7.4773E-05**
E_{Fd}	Rate - Fd-based (lb/MMBtu)	<4.6614E-08	<4.4904E-08	<4.8603E-08	5.4349E-08	**<4.8617E-08**
E_{Fc}	Rate - Fc-based (lb/MMBtu)	<5.0671E-08	<4.8487E-08	<5.2280E-08	5.9890E-08	**<5.2832E-08**

092012 152213
KLOJ_0

Wheelabrator North Broward, Inc.
Clean Air Project No: 11414
Unit 2 FF Outlet

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

Run No.		1	2	3	4	Average
Date (2012)		Sep 5	Sep 6	Sep 6	Sep 6	
Start Time (approx.)		12:55	07:35	10:12	12:45	
Stop Time (approx.)		15:09	09:46	12:24	14:57	
Mercury Results - Impingers 1-3 Solution						
C_{sd}	Concentration (lb/dscf)	2.1923E-10	3.0697E-10	2.8589E-10	2.2807E-10	**2.6004E-10**
C_{sd7}	Concentration @7% O_2 (lb/dscf)	2.5680E-10	3.5957E-10	3.3394E-10	2.4017E-10	**2.9762E-10**
C_{sd12}	Concentration @12% CO_2 (lb/dscf)	2.6485E-10	3.6836E-10	3.4080E-10	2.5109E-10	**3.0628E-10**
C_a	Concentration (lb/acf)	1.1097E-10	1.4657E-10	1.3883E-10	1.0797E-10	**1.2609E-10**
C_{sd}	Concentration (µg/dscm)	3.5107E+00	4.9157E+00	4.5782E+00	3.6523E+00	**4.1642E+00**
C_{sd7}	Concentration @7% O_2 (µg/dscm)	4.1123E+00	5.7580E+00	5.3476E+00	3.8460E+00	**4.7660E+00**
C_{sd12}	Concentration @12% CO_2 (µg/dscm)	4.2412E+00	5.8988E+00	5.4574E+00	4.0209E+00	**4.9046E+00**
C_{sd}	Concentration (mg/dscm)	3.5107E-03	4.9157E-03	4.5782E-03	3.6523E-03	**4.1642E-03**
C_{sd7}	Concentration @7% O_2 (mg/dscm)	4.1123E-03	5.7580E-03	5.3476E-03	3.8460E-03	**4.7660E-03**
C_{sd12}	Concentration @12% CO_2 (mg/dscm)	4.2412E-03	5.8988E-03	5.4574E-03	4.0209E-03	**4.9046E-03**
C_a	Concentration (µg/m^3 (actual,wet))	1.7771E+00	2.3471E+00	2.2232E+00	1.7290E+00	**2.0191E+00**
C_{sd}	Concentration (µg/Nm^3 dry)	3.7676E+00	5.2754E+00	4.9132E+00	3.9195E+00	**4.4689E+00**
C_{sd7}	Concentration @7% O_2 (µg/Nm^3 dry)	4.4132E+00	6.1793E+00	5.7389E+00	4.1274E+00	**5.1147E+00**
C_{sd12}	Concentration @12% CO_2 (µg/Nm^3 dry)	4.5515E+00	6.3304E+00	5.8568E+00	4.3151E+00	**5.2634E+00**
$E_{lb/hr}$	Rate (lb/hr)	1.2739E-03	1.7898E-03	1.6211E-03	1.2898E-03	**1.4937E-03**
$E_{g/s}$	Rate (g/s)	1.6049E-04	2.2547E-04	2.0423E-04	1.6249E-04	**1.8817E-04**
$E_{T/yr}$	Rate (Ton/yr)	5.5799E-03	7.8393E-03	7.1006E-03	5.6495E-03	**6.5423E-03**
E_{Fd}	Rate - Fd-based (lb/MMBtu)	3.6952E-06	5.1740E-06	4.8053E-06	3.4559E-06	**4.2826E-06**
E_{Fc}	Rate - Fc-based (lb/MMBtu)	4.0168E-06	5.5868E-06	5.1688E-06	3.8082E-06	**4.6452E-06**

092012 152213
KLDJ_O

Wheelabrator North Broward, Inc.
Clean Air Project No: 11414
Unit 2 FF Outlet

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

Run No.		1	2	3	4	Average
Date (2012)		Sep 5	Sep 6	Sep 6	Sep 6	
Start Time (approx.)		12:55	07:35	10:12	12:45	
Stop Time (approx.)		15:09	09:46	12:24	14:57	
Mercury Results - Impinger 4 Solution						
C_{sd}	Concentration (lb/dscf)	<5.5311E-12	<5.3283E-12	<5.7834E-12	<5.5364E-12	**<5.5448E-12**
C_{sd7}	Concentration @7% O_2 (lb/dscf)	<6.4789E-12	<6.2412E-12	<6.7554E-12	<5.8300E-12	**<6.3264E-12**
C_{sd12}	Concentration @12% CO_2 (lb/dscf)	<6.6819E-12	<6.3939E-12	<6.8941E-12	<6.0951E-12	**<6.5163E-12**
C_a	Concentration (lb/acf)	<2.7998E-12	<2.5441E-12	<2.8085E-12	<2.6209E-12	**<2.6933E-12**
C_{sd}	Concentration (µg/dscm)	<8.8573E-02	<8.5325E-02	<9.2613E-02	<8.8658E-02	**<8.8792E-02**
C_{sd7}	Concentration @7% O_2 (µg/dscm)	<1.0375E-01	<9.9945E-02	<1.0818E-01	<9.3360E-02	**<1.0131E-01**
C_{sd12}	Concentration @12% CO_2 (µg/dscm)	<1.0700E-01	<1.0239E-01	<1.1040E-01	<9.7605E-02	**<1.0435E-01**
C_{sd}	Concentration (mg/dscm)	<8.8573E-05	<8.5325E-05	<9.2613E-05	<8.8658E-05	**<8.8792E-05**
C_{sd7}	Concentration @7% O_2 (mg/dscm)	<1.0375E-04	<9.9945E-05	<1.0818E-04	<9.3360E-05	**<1.0131E-04**
C_{sd12}	Concentration @12% CO_2 (mg/dscm)	<1.0700E-04	<1.0239E-04	<1.1040E-04	<9.7605E-05	**<1.0435E-04**
C_a	Concentration (µg/m^3 (actual,wet))	<4.4834E-02	<4.0740E-02	<4.4975E-02	<4.1970E-02	**<4.3130E-02**
C_{sd}	Concentration (µg/Nm^3 dry)	<9.5054E-02	<9.1568E-02	<9.9390E-02	<9.5145E-02	**<9.5289E-02**
C_{sd7}	Concentration @7% O_2 (µg/Nm^3 dry)	<1.1134E-01	<1.0726E-01	<1.1609E-01	<1.0019E-01	**<1.0872E-01**
C_{sd12}	Concentration @12% CO_2 (µg/Nm^3 dry)	<1.1483E-01	<1.0988E-01	<1.1848E-01	<1.0475E-01	**<1.1198E-01**
$E_{lb/hr}$	Rate (lb/hr)	<3.2141E-05	<3.1067E-05	<3.2795E-05	<3.1310E-05	**<3.1828E-05**
$E_{g/s}$	Rate (g/s)	<4.0490E-06	<3.9137E-06	<4.1313E-06	<3.9443E-06	**<4.0096E-06**
$E_{T/yr}$	Rate (Ton/yr)	<1.4078E-04	<1.3607E-04	<1.4364E-04	<1.3714E-04	**<1.3941E-04**
E_{Fd}	Rate - Fd-based (lb/MMBtu)	<9.3227E-08	<8.9808E-08	<9.7206E-08	<8.3891E-08	**<9.1033E-08**
E_{Fc}	Rate - Fc-based (lb/MMBtu)	<1.0134E-07	<9.6974E-08	<1.0456E-07	<9.2443E-08	**<9.8830E-08**

092012 152213
K L O J_O

Wheelabrator North Broward, Inc.
Clean Air Project No: 11414
Unit 2 FF Outlet

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

Run No.		1	2	3	4	Average
Date (2012)		Sep 5	Sep 6	Sep 6	Sep 6	
Start Time (approx.)		12:55	07:35	10:12	12:45	
Stop Time (approx.)		15:09	09:46	12:24	14:57	
Mercury Results - Filtered Permanganate Solution						
C_{sd}	Concentration (lb/dscf)	<1.3828E-11	<1.3321E-11	<1.4459E-11	<1.3841E-11	**<1.3862E-11**
C_{sd7}	Concentration @7% O_2 (lb/dscf)	<1.6197E-11	<1.5603E-11	<1.6889E-11	<1.4575E-11	**<1.5816E-11**
C_{sd12}	Concentration @12% CO_2 (lb/dscf)	<1.6705E-11	<1.5985E-11	<1.7235E-11	<1.5238E-11	**<1.6291E-11**
C_a	Concentration (lb/acf)	<6.9994E-12	<6.3602E-12	<7.0213E-12	<6.5522E-12	**<6.7333E-12**
C_{sd}	Concentration (µg/dscm)	<2.2143E-01	<2.1331E-01	<2.3153E-01	<2.2164E-01	**<2.2198E-01**
C_{sd7}	Concentration @7% O_2 (µg/dscm)	<2.5938E-01	<2.4986E-01	<2.7045E-01	<2.3340E-01	**<2.5327E-01**
C_{sd12}	Concentration @12% CO_2 (µg/dscm)	<2.6750E-01	<2.5597E-01	<2.7600E-01	<2.4401E-01	**<2.6087E-01**
C_{sd}	Concentration (mg/dscm)	<2.2143E-04	<2.1331E-04	<2.3153E-04	<2.2164E-04	**<2.2198E-04**
C_{sd7}	Concentration @7% O_2 (mg/dscm)	<2.5938E-04	<2.4986E-04	<2.7045E-04	<2.3340E-04	**<2.5327E-04**
C_{sd12}	Concentration @12% CO_2 (mg/dscm)	<2.6750E-04	<2.5597E-04	<2.7600E-04	<2.4401E-04	**<2.6087E-04**
C_a	Concentration (µg/m^3 (actual,wet))	<1.1209E-01	<1.0185E-01	<1.1244E-01	<1.0492E-01	**<1.0782E-01**
C_{sd}	Concentration (µg/Nm^3 dry)	<2.3764E-01	<2.2892E-01	<2.4847E-01	<2.3786E-01	**<2.3822E-01**
C_{sd7}	Concentration @7% O_2 (µg/Nm^3 dry)	<2.7835E-01	<2.6814E-01	<2.9023E-01	<2.5048E-01	**<2.7180E-01**
C_{sd12}	Concentration @12% CO_2 (µg/Nm^3 dry)	<2.8708E-01	<2.7470E-01	<2.9619E-01	<2.6187E-01	**<2.7996E-01**
$E_{lb/hr}$	Rate (lb/hr)	<8.0351E-05	<7.7667E-05	<8.1986E-05	<7.8276E-05	**<7.9570E-05**
$E_{g/s}$	Rate (g/s)	<1.0122E-05	<9.7842E-06	<1.0328E-05	<9.8609E-06	**<1.0024E-05**
$E_{T/yr}$	Rate (Ton/yr)	<3.5194E-04	<3.4018E-04	<3.5910E-04	<3.4285E-04	**<3.4852E-04**
E_{Fd}	Rate - Fd-based (lb/MMBtu)	<2.3307E-07	<2.2452E-07	<2.4302E-07	<2.0973E-07	**<2.2758E-07**
E_{Fc}	Rate - Fc-based (lb/MMBtu)	<2.5336E-07	<2.4244E-07	<2.6140E-07	<2.3111E-07	**<2.4708E-07**
Mercury Results - HCl Rinse + HCl/MnO2 Precipitate						
C_{sd}	Concentration (lb/dscf)	<1.1062E-11	<1.0657E-11	<1.1567E-11	<1.1073E-11	**<1.1090E-11**
C_{sd7}	Concentration @7% O_2 (lb/dscf)	<1.2958E-11	<1.2482E-11	<1.3511E-11	<1.1660E-11	**<1.2653E-11**
C_{sd12}	Concentration @12% CO_2 (lb/dscf)	<1.3364E-11	<1.2788E-11	<1.3788E-11	<1.2190E-11	**<1.3033E-11**
C_a	Concentration (lb/acf)	<5.5995E-12	<5.0881E-12	<5.6170E-12	<5.2418E-12	**<5.3866E-12**
C_{sd}	Concentration (µg/dscm)	<1.7715E-01	<1.7065E-01	<1.8523E-01	<1.7732E-01	**<1.7758E-01**
C_{sd7}	Concentration @7% O_2 (µg/dscm)	<2.0750E-01	<1.9989E-01	<2.1636E-01	<1.8672E-01	**<2.0262E-01**
C_{sd12}	Concentration @12% CO_2 (µg/dscm)	<2.1400E-01	<2.0478E-01	<2.2080E-01	<1.9521E-01	**<2.0870E-01**
C_{sd}	Concentration (mg/dscm)	<1.7715E-04	<1.7065E-04	<1.8523E-04	<1.7732E-04	**<1.7758E-04**
C_{sd7}	Concentration @7% O_2 (mg/dscm)	<2.0750E-04	<1.9989E-04	<2.1636E-04	<1.8672E-04	**<2.0262E-04**
C_{sd12}	Concentration @12% CO_2 (mg/dscm)	<2.1400E-04	<2.0478E-04	<2.2080E-04	<1.9521E-04	**<2.0870E-04**
C_a	Concentration (µg/m^3 (actual,wet))	<8.9669E-02	<8.1479E-02	<8.9949E-02	<8.3940E-02	**<8.6259E-02**
C_{sd}	Concentration (µg/Nm^3 dry)	<1.9011E-01	<1.8314E-01	<1.9878E-01	<1.9029E-01	**<1.9058E-01**
C_{sd7}	Concentration @7% O_2 (µg/Nm^3 dry)	<2.2268E-01	<2.1452E-01	<2.3219E-01	<2.0038E-01	**<2.1744E-01**
C_{sd12}	Concentration @12% CO_2 (µg/Nm^3 dry)	<2.2966E-01	<2.1976E-01	<2.3696E-01	<2.0949E-01	**<2.2397E-01**
$E_{lb/hr}$	Rate (lb/hr)	<6.4281E-05	<6.2133E-05	<6.5589E-05	<6.2620E-05	**<6.3656E-05**
$E_{g/s}$	Rate (g/s)	<8.0979E-06	<7.8273E-06	<8.2627E-06	<7.8887E-06	**<8.0191E-06**
$E_{T/yr}$	Rate (Ton/yr)	<2.8155E-04	<2.7214E-04	<2.8728E-04	<2.7428E-04	**<2.7881E-04**
E_{Fd}	Rate - Fd-based (lb/MMBtu)	<1.8645E-07	<1.7962E-07	<1.9441E-07	<1.6778E-07	**<1.8207E-07**
E_{Fc}	Rate - Fc-based (lb/MMBtu)	<2.0268E-07	<1.9395E-07	<2.0912E-07	<1.8489E-07	**<1.9766E-07**

092012 152213
KLOJ_O

QA/QC DATA

D

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: 10/10/12

CleanAir.

Wheelabrator North Broward, Inc.
Clean Air Project No: 11414
Unit 2 FF Outlet

USEPA Method 29 (Mercury)
QA/QC Results

Run No.		1	2	3	4	
Date (2012)		Sep 5	Sep 6	Sep 6	Sep 6	
Start Time (approx.)		12:55	07:35	10:12	12:45	
Stop Time (approx.)		15:09	09:46	12:24	14:57	
Total Duration of Test Run (min.)		134	131	132	132	
Net Sampling Time (min.)		125	125	125	125	
Sampling System Calibration Summary						
	Nozzle ID No:	275-1	275-1	275-1	275-1	
D_n	Nozzle Diameter (in):	0.275	0.275	0.275	0.275	
	Probe ID No:	67-8-10	67-8-10	67-8-10	67-8-10	
C_p	Pitot Coefficient:	0.8270	0.8270	0.8270	0.827	
	Meter Box ID. No:	85-2	85-2	85-2	85-2	
Y_d	Meter Box Yd - Field Sheet	0.9958	0.9958	0.9958	0.9958	
	Meter Box Yd - Database	0.9958	0.9958	0.9958	0.9958	
	Meter Box ΔH@ - Field Sheet	1.8117	1.8117	1.8117	1.8117	
	Meter Box ΔH@ - Database	1.8117	1.8117	1.8117	1.8117	
QA/QC						
	Final Leak Check					
	(a) 4% of Sampling Rate (cfm)	0.0268	0.0275	0.0256	0.0265	
	(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)	0.0030	0.0030	0.0030	0.0020	
	Sample Volume					
	Minimum Volume Required (dscf)	30.00	30.00	30.00	30.00	
V_{mstd}	Actual Sample Volume (dscf)	79.731	82.766	76.253	79.654	
	Alternative Method 5 Post-Test Calibration (EPA ALT-009)					
$\sqrt{\Delta H_{avg}}$	Average of Square Root of ΔH (in. W.C.)	1.1841	1.2130	1.1280	1.1592	
Y_{qa}	Alternative Meter Calibration Factor	0.9913	0.9829	0.9873	0.9746	**Average**
	Variation from full-test Y_d (average ≤ ±5%)	-0.5%	-1.3%	-0.9%	-2.1%	**-1.2%**
	Mean Isokinetic Sampling Rate Variation					
	Minimum Allowable (%)	90	90	90	90	
	Maximum Allowable (%)	110	110	110	110	
%I	Actual Variation (%)	102.25	105.79	100.21	104.96	
	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	

092012 152213
KLOJ

Nozzle Calibration Sheet

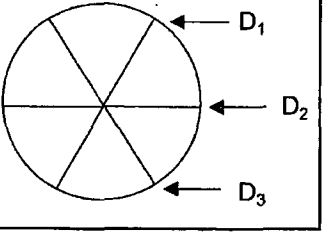
Client Wheelabrator	Project Number 11414
Calibrated by R. Vicere	Caliper ID 11314595
Date 9/5/12	Unit / Runs FF Outlet / Unit 2 R- 1-4

Nozzle Identification	D_1 (inches)	D_2 (inches)	D_3 (inches)	ΔD (inches)	D_{ave} (inches)
0.275-1	0.2745	0.2755	0.2750	0.001	0.2750

D_1, D_2, D_3 = three nozzle diameter measurements

ΔD = maximum difference between any two diameters
$\Delta D \leq 0.004$ inches*

D_{ave} = average of D_1, D_2, D_3



* (40 CFR 60, Appendix A, Method 5, Section 5.1)

QA/QC RV
Date 9/5/12

CleanAir ENGINEERING

Caliper Calibration Sheet

Calibrated by	D Leishman		
Calibration Date	4-16-12	Expiration Date	4-16-13

Caliper ID	11314595

Standard Caliper ID	1014600021

Inside Jaw Check		
Standard Caliper Setting (in)	Caliper Reading (in)	Deviation (ΔD)
0.150	0.1505	0.0005
0.300	0.3005	0.0005
0.500	0.5005	0.0005

Outside Jaw Check		
Standard Caliper Setting (in)	Caliper Reading (in)	Deviation (ΔD)
0.150	0.1505	0.0005
0.300	0.3005	0.0005
0.500	0.5005	0.0005

ΔD = maximum deviation between standard and caliper being calibrated
ΔD ≤ 0.001 inch for every reading

CleanAir ENGINEERING

CDS005G-Caliper.xls,

CERTIFICATE OF INSPECTION / 検査成績書

発行No./Issue No. : 4070112164

Product name/品名	Digimatic Caliper/ﾃﾞｼﾞﾏﾁｯｸｷｬﾘﾊﾟ
Model No./符号	CD-4"CSX
Code No./ コードNo.	500-195-20
Serial No./製造No.	11314595
Measuring range/測定範囲	0-100mm / 0-4inch
Minimum indication/最小表示量	0.01mm / 0.0005inch
Standard Temperature/標準温度	20℃
QC Manager M.Sato	M.Sato

Inspection standard : Mitutoyo standard
Based on : JISB7507:1993,DIN862:1988
Traceable to : NMIJ/AIST by JCSS No.0030, NIST via 821/276375-08, PTB via 4937 PTB 06

Mitutoyo Corporation

(1)Inspection result/検査結果

Measuring length 測定長		Permissible values 許容値	errors/器差 External/外側	errors/器差 Internal/内側
Unit : mm 単位 : mm	φ4	0.01 -0.03	—	-0.02
	0	±0.02	0.00	—
	50		0.00	0.00
	100		0.01	0.00
	150	※	—	—
	200	※	—	—
Unit : inch 単位 : inch	φ0.16	0.0005 -0.0015	—	-0.0010
	0	±0.0010	0.0000	—
	2		0.0000	0.0000
	4		0.0005	0.0000
	6		—	—
	8		—	—

(2)Judgment/判定 : Passed/合格

※DIN 862,1988 : 0.03

この検査成績書には安心してご利用いただけますよう出荷時の検査データを記載していますが、校正証明書取得用にはご利用できません。

U0049-00180(1)

Clean Air Engineering - Meter Box Full Test Calibration

Client:	Source	**Reviewed By:**	M.Vaquero	**Calibration Signature:**	
ID No:	85-2	**Calibrated By:**	O.Lavrov	**Meter Box Yd:**	0.9958
Dept No:	66	**Date of Calibration:**	12/06/11	**Meter Box ΔH@:**	1.8117
Meter Box Serial No:	85-2	**Due Date of Calibration:**	12/06/12	**Barometer Serial No:**	W12637
Manufacturer Part No:	0028	**Meter Box Vacuum:**	1.0 in. H_2O	**Barometric Pressure:**	29.38 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_{ls} In	T_{os} Out	T_{ds} Avg.	T_i In	T_o Out	T_d Avg.	Θ	Y_d	ΔH@
0.390	0.50	-1.10	1.0000	0.000	5.000	5.000	252.918	257.934	5.016	70.5	70.5	70.50	82.0	70.0	76.00	12.51	1.0031	1.8046
0.390	0.50	-1.10	1.0000	0.000	5.000	5.000	257.934	262.963	5.029	70.5	70.5	70.50	82.0	71.0	76.50	12.53	1.0015	1.8070
0.676	1.50	-1.40	1.0000	0.000	10.000	10.000	277.357	287.501	10.144	70.5	70.5	70.50	87.0	70.0	78.50	14.45	0.9934	1.8058
0.674	1.50	-1.40	1.0000	0.000	10.000	10.000	287.501	297.638	10.137	70.5	70.5	70.50	86.0	68.0	77.00	14.50	0.9914	1.8252
0.956	3.00	-1.80	1.0000	0.000	10.000	10.000	228.526	238.625	10.097	70.0	70.0	70.00	83.0	71.0	77.00	10.23	0.9915	1.8033
0.951	3.00	-1.80	1.0000	0.000	10.000	10.000	238.625	248.708	10.083	70.0	70.0	70.00	85.0	70.0	77.50	10.26	0.9938	1.8244
																Averages	0.99578	1.81170

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)

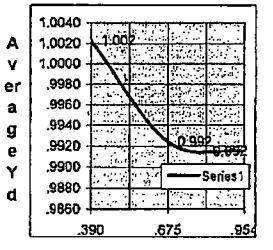
Equations

$$Y_d = (Y_{ds})\left[\frac{V_{ds}}{V_d}\right]\left[\frac{T_d + 460}{T_{ds} + 460}\right]\left[\frac{P_b + \Delta P/13.6}{P_b + \Delta H/13.6}\right]$$

$$\Delta H@ = \frac{(0.0319)(\Delta H)}{P_b(T_o + 460)}\left[\frac{(T_{ds} + 460)\Theta}{(V_{ds})(Y_{ds})}\right]^2$$

$$Q = \frac{17.64(V_{ds})(P_b)}{(T_{ds} + 460)(\Theta)}$$

Average YD vs. Average CFM



Vacuum Gauge

Standard (in.Hg)	Gauge (in.Hg)
5.0	5.0
10.1	10.0
15.2	15.0
20.3	20.0
25.1	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:	0.196%	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

CleanAir ENGINEERING

Meter Box - Pyrometer Calibration Sheet

Meter Box No: 85-1 Office: _____

Calibrated by: O.Lavrov Client: SOURCE 66

Date: 12/6/11 Job No: _____

Temperature Scale Used: Fahrenheit Type of Calibration: Full-Test

Calibration Reference Settings (°F)	Pyrometer Reading for each Channel (°F)						
	1 Stack	2 Probe	3 Filter	4	5	6	7
50	50	51	51				
100	101	101	101				
150	151	151	151				
200	201	201	201				
250	251	252	252				
300	301	302	302				
350	351	352	351				
400	401	401	401				
450	451	451	451				
500	501	501	501				
550	551	551	550				
600	601	601	600				

Tolerance = ±2°F difference from reference setting.

Calibration Reference Information

Reference Used: Omega CL23A Serial No: T-279500

Calibrated By: JH Metrology Date Calibrated: 8/18/2011

Calibration Report No: 1000157180 Calibration Due Date: 8/18/2012

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

For Scale S/N 802810135

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

FIELD DATA

E

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: 10/10/12

CleanAir.

TEST LOCATION: FF Outlet **TESTING** Metals **METHOD:** 29 **PAGE** 1 **OF** 2

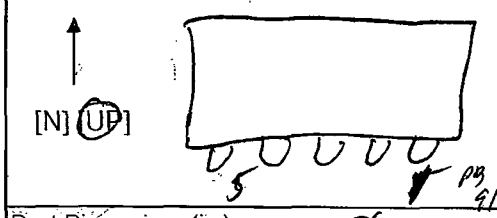
UNIT: 2 **RUN:** 1

FIELD DATA SHEET

Client	Wheelabrator	Project No.	1414
Plant	N. Brunswick	Date	9/5/12
Meter Operator	P. Bihun		
Probe Operator	P. Bihun		

Meter Box	85-2	Sample Box No.	M17
Meter Y_d	0.9958	Meter $\Delta H_@$	1.8117
K Factor	2.80	Pitot C_p	0.827
Leak Rate Before	0.003 [cfm] [Lpm]	@ 15	(in. Hg)
Leak Rate After	0.003 [cfm] [Lpm]	@ 10	(in. Hg)
Pitot Leak Check Before	X	After: Good X	Bad ☐

Cross-Section of Test Location



Duct Dimensions (in.)	96 x 96		
Static Pres (in. H_2O)	Port Len. (in.)	Gas Flow [In] [Out] of page	First point all the way [In] [Out]
-11.4	10.0		

Amb. Temp. (°F)	88	Bar. Press.	30.02 [in. Hg] [mbar]
Probe I.D. No.	47-8-10		
Liner Material	Glass		

Filter No.	N/A		
Thimble No.	N/A		
Nozzle Diameter	0.225	Nozzle I.D.	225-1

Start Time:	12:55	Stop Time:	15:09

Traverse Point Number	Min/pt 5 Elapsed Time	Velocity Head ΔP (in. H_2O)	Orifice Setting ΔH (in. H_2O)	Gas Sample Volume V_m Init. Vol. 310.385 [ft³] [L]	Stack Temp. Ts (°F)	Probe T_p (°F) Set Points 280	Filter T_f (°F) Set Points 250	Cond. Temp. T_c (°F)	DGM Inlet $T_{m\,in}$ (°F)	DGM Outlet $T_{m\,out}$ (°F)	Pump Vacuum (in.Hg)	XAD Trap Temp. PB 9/5/12 (°F)	Notes
5-1	5	0.47	1.3	313.61	312	247	247	66	91	92	3.5	8.4	K=2.75
2	10	0.53	1.5	317.00	311	246	248	66	90	93	3.1	8.2	
3	15	0.55	1.5	320.36	311	248	249	65	92	93	3.5	8.7	
4	20	0.62	1.7	323.98	310	249	248	65	94	93	4.0	8.7	
5	25	0.61	1.7	327.65	311	248	248	65	95	93	4.0	8.9	327.710 -0.065
4-1	30	0.49	1.4	331.03	312	247	249	65	95	93	3.5	9.8	
2	35	0.43	1.2	334.10	311	247	250	62	97	94	3.1	8.4	
3	40	0.51	1.4	337.43	311	249	249	61	97	94	4.0	8.1	
4	45	0.54	1.5	340.92	311	249	249	63	98	94	4.0	8.9	
5	50	0.53	1.5	344.38	311	249	251	64	98	94	4.0	8.8	344.445 -0.060
3-1	55	0.46	1.3	347.47	310	248	249	65	98	94	3.5	9.0	
2	60	0.44	1.2	350.78	311	248	250	62	98	94	3.5	8.8	
	Total	17.8749		83.635									
	Average	0.7132	1.4080		310.9200						PB 9/5/12		

Sum of square roots. 17.12

Circle correct bracketed units on data sheet. 3732

QA/QC PB

Date 9/5/12

94.4038 - 7264 = 95.0600

CleanAir ENGINEERING

TEST LOCATION: FF Outlet Method 5 TESTING METHOD: 29 PAGE 2 OF 2

UNIT: 2 RUN: 1

FIELD DATA SHEET

Client	Wheelabrator	Project No.	11414
Plant	N. Broward	Date	8/5/12
Meter Operator			P. Bihun
Probe Operator			P. Bihun

Meter Box		Sample Box No.	
Meter Y_d		Meter $\Delta H_@$	
K Factor		Pitot C_p	
Leak Rate Before	[cfm] [Lpm]	@	(in. Hg)
Leak Rate After	[cfm] [Lpm]	@	(in. Hg)
Pitot Leak Check Before ☐	After: Good ☐	Bad ☐	

Cross-Section of Test Location

[N] [UP]

Duct Dimensions (in.)

Static Pres (in. H_2O)	Port Len. (in.)	Gas Flow [In] [Out] of page	First point all the way [In] [Out]

Amb. Temp. (°F)	Bar. Press. [in. Hg] [mbar]
Probe I.D. No.	
Liner Material	

Filter No.		
Thimble No.		
Nozzle Diameter	Nozzle I.D.	

Start Time:	Stop Time:

Traverse Point Number	Min/pt 5 Elapsed Time	Velocity Head ΔP (in. H_2O)	Orifice Setting ΔH (in. H_2O)	Gas Sample Volume V_m Init. Vol. [ft³] [L]	Stack Temp. Ts (°F)	Probe T_p (°F) Set Points 280	Filter T_f (°F) Set Points 250	Cond. Temp. T_c (°F)	DGM Inlet $T_{m\,in}$ (°F)	DGM Outlet $T_{m\,out}$ (°F)	Pump Vacuum (in.Hg)	XAD Trap Temp. (°F)	Notes
3	65	0.48	1.3	354.05	311	249	250	57	99	94	4.0	9.2	
4	70	0.50	1.4	357.43	311	249	251	59	99	94	4.0	8.3	
5	75	0.48	1.3	360.670	311	249	250	61	99	95	4.0	9.1	360.748
2-1	80	0.58	1.6	364.32	312	249	251	64	98	94	4.5	8.5	-0.075
2	85	0.48	1.3	367.54	313	250	250	64	99	94	4.0	7.9	
3	90	0.44	1.2	370.65	311	250	251	64	99	94	4.0	8.8	
4	95	0.56	1.5	374.13	311	250	251	65	99	94	4.5	9.0	
5	100	0.63	1.7	377.885	312	250	251	65	100	94	4.5	9.0	377.955
1-1	105	0.47	1.3	381.17	310	249	249	65	98	93	4.0	8.8	-0.07
2	110	0.46	1.3	384.38	311	250	248	63	98	91	4.0	8.3	
3	115	0.40	1.1	387.32	309	250	249	62	98	90	3.0	8.2	
4	120	0.45	1.2	390.44	309	249	249	63	98	90	4.0	8.1	
5	125	0.66	1.8	394.280	310	250	250	64	98	90	5.0	8.2	
	Total	*											
	Average												

* Sum of square roots.

Circle correct bracketed units on data sheet.

2489

QA/QC PB

Date 8/7/12

CleanAir ENGINEERING

TEST LOCATION: FF Outlet Metals TESTING METHOD: 29 PAGE 1 OF 2

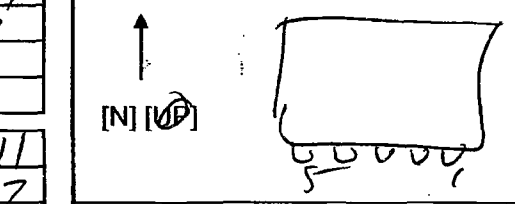
UNIT: 2 RUN: 2

FIELD DATA SHEET

Client	Wheelabrator	Project No.	10414
Plant	N. Broward	Date	9/6/12
Meter Operator			R. Bishop
Probe Operator			R. Bishop

Meter Box	88-2	Sample Box No.	N11
Meter Y_d	0.9858	Meter $\Delta H_@$	1.5417
K Factor	2.161	Pitot C_p	0.827
Leak Rate Before	0.002 [cfm] [Lpm]	@	15 (in. Hg)
Leak Rate After	0.003 [cfm] [Lpm]	@	10 (in. Hg)
Pitot Leak Check Before:	X	After: Good X	Bad ☐

Cross-Section of Test Location



Duct Dimensions (in.)	96x96		
Static Pres (in. H_2O)	Port Len. (in.)	Gas Flow [In] [Out] of page	First point all the way [In] [Out]
-12.2	10.0	Out	In

Amb. Temp. (°F)	83	Bar. Press.	30.00 [in. Hg] [mbar]
Probe I.D. No.			67-F-10
Liner Material			Glass

Filter No.	N/A		
Thimble No.	N/A		
Nozzle Diameter	0.275	Nozzle I.D.	225-1

Start Time:	7:35	Stop Time:	9:46

Traverse Point Number	Min/pt Elapsed Time	Velocity Head ΔP (in. H_2O)	Orifice Setting ΔH (in. H_2O)	Gas Sample Volume V_m Init. Vol. [ft³] [L]	Stack Temp. Ts (°F)	ProbeT$_p$ (°F) Set Points	Filter T$_f$ (°F) Set Points	Cond. Temp. T_c (°F)	DGM Inlet $T_{m\,in}$ (°F)	DGM Outlet $T_{m\,out}$ (°F)	Pump Vacuum (in.Hg)	XAD Trap Temp. (°F)	Notes
				395.570		280	280					68 9/6/12	
5-1	5	0.46	1.2	398.68	315	248	247	65	82	82	3.5	8.4	
2	10	0.50	1.3	401.87	314	246	280	61	83	82	3.5	8.5	
3	15	0.53	1.4	405.17	314	247	280	56	86	83	4.0	7.6	
4	20	0.65	1.7	408.83	316	248	249	55	88	83	5.0	8.8	412.488
5	25	0.60	1.6	412.410	316	248	251	57	91	83	5.0	9.3	-0.078
4-1	30	0.60	1.6	416.07	322	247	249	62	90	83	5.0	8.2	
2	35	0.65	1.7	419.80	328	247	249	63	92	82	5.0	7.5	
3	40	0.54	1.4	423.16	330	249	280	63	94	83	4.5	8.7	
4	45	0.55	1.4	426.54	327	249	280	64	94	85	4.5	7.1	
5	50	0.50	1.3	429.790	325	249	249	65	95	84	4.5	7.2	429.882
3-1	55	0.49	1.3	433.12	321	248	251	65	94	83	4.0	8.2	-0.06
2	60	0.52	1.4	436.48	321	248	249	63	95	83	4.5	7.3	
	Total	*18.6780		85.955									
	Average	0.7479	1.4760		319.8400					89.2600			

*Sum of square roots. 17.3

Circle correct bracketed units on data sheet. 3849 2080

QA/QC RB

Date 9/6/12

CleanAir ENGINEERING

TEST LOCATION: FF Outlet Metals TESTING METHOD: 29 PAGE 2 OF 2

UNIT: 2 RUN: 2

FIELD DATA SHEET

Client	Whitehouse	Project No.	11414
Plant	N. Brunswick	Date	9/6/12
Meter Operator		P. Bihun	
Probe Operator		P. Bihun	

Cross-Section of Test Location

[N] [UP]

Amb. Temp. (°F)	Bar. Press.		[in. Hg] [mbar]
Probe I.D. No.			
Liner Material			

Meter Box	Sample Box No.		
Meter Y_d	Meter $\Delta H_@$		
K Factor	Pitot C_p		
Leak Rate Before	[cfm] [Lpm] @		(in. Hg)
Leak Rate After	[cfm] [Lpm] @		(in. Hg)
Pitot Leak Check Before: ☐	After: Good ☐ Bad ☐		

Filter No.			
Thimble No.			
Nozzle Diameter	Nozzle I.D.		

Duct Dimensions (in.)

Static Pres ($in. H_2O$)	Port Len. (in.)	Gas Flow [In] [Out] of page	First point all the way [In] [Out]

Start Time:	Stop Time:

Traverse Point Number	Min/pt Elapsed Time	Velocity Head ΔP ($in. H_2O$)	Orifice Setting ΔH ($in. H_2O$)	Gas Sample Volume V_m Init. Vol. [ft³] [L]	Stack Temp. Ts (°F)	Probe T_p (°F) Set Points 250	Filter T_f (°F) Set Points 250	Cond. Temp. T_c (°F)	DGM Inlet $T_{m\,in}$ (°F)	DGM Outlet $T_{m\,out}$ (°F)	Pump Vacuum (in.Hg)	XAD Trap Temp. (°F) 13 9/6/12	Notes
3	45	0.54	1.4	439.85	320	249	250	58	96	83	4.5	8.5	
4	70	0.56	1.5	443.33	319	250	251	56	97	84	4.5	9.0	
5	75	0.63	1.6	446.930	320	250	249	57	98	86	5.0	9.1	447.005
2-1	80	0.57	1.5	450.47	322	248	249	60	96	87	4.5	8.6	-0.075
2	85	0.50	1.3	453.75	322	248	249	59	98	86	4.5	8.6	
3	90	0.56	1.5	457.20	320	250	250	60	98	85	4.5	8.8	
4	95	0.63	1.6	460.81	319	250	249	60	99	84	5.0	9.0	
5	100	0.67	1.8	464.680	320	250	250	62	100	85	5.5	7.7	464.765
1-1	105	0.52	1.4	468.11	319	249	251	64	99	86	4.5	5.8	-0.085
2	110	0.48	1.3	471.31	317	249	250	64	99	86	4.5	8.3	
3	115	0.48	1.3	474.50	316	249	249	64	98	85	4.5	8.6	
4	120	0.62	1.6	478.04	316	250	250	65	98	86	5.0	8.0	
5	125	0.68	1.8	481.820	317	250	249	65	98	86	5.1	8.2	
	Total	*											
	Average												

* Sum of square roots.

Circle correct bracketed units on data sheet.

QA/QC PB

Date 9/6/12

CleanAir ENGINEERING

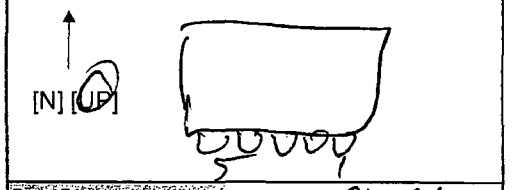
TEST LOCATION: FF Outlet Nichols TESTING METHOD: 29 PAGE 1 OF 2

UNIT: 2 RUN: 3

FIELD DATA SHEET

Client	Manufacturer	Project No	11414
Plant	W. Brownsville	Date	9/6/12
Meter Operator			B. Bilgren
Probe Operator			B. Bilgren

Cross-Section of Test Location



Meter Box	55-2	Sample Box No	M10
Meter Y_d	0.995	Meter $\Delta H_@$	1.8117
K Factor	7.61	Pitot C_p	0.827
Leak Rate Before	0.003 [cfm] [Lpm]	@ 15	(in. Hg)
Leak Rate After	0.003 [cfm] [Lpm]	@ 10	(in. Hg)
Pitot Leak Check Before ☒	After Good ☒	Bad ☐	

Duct Dimensions (in.)	96x96

Static Pres (in. H_2O)	Port Len (in.)	Gas Flow [In] [Out]	First point all the way in [Out]
-4.3	10.0	of page	

Amb. Temp. (°F)	87	Bar. Press.	30.60 [in. Hg] [mbar]
Probe I.D. No:		67-8-10	
Liner Material		Glass	

Filter No.	N/A		
Thimble No.	N/A		
Nozzle Diameter	0.275	Nozzle I.D.	275-1

Start Time	10:12	Stop Time	12:24

Traverse Point Number	Min/pt 5 Elapsed Time	Velocity Head ΔP (in. H_2O)	Orifice Setting ΔH (in. H_2O)	Gas Sample Volume V_m Init. Vol. 482.220 [ft³] [L]	Stack Temp T_s (°F)	Probe T_p (°F) Set Points 280	Filter T_f (°F) 250	Cond Temp T_c (°F)	DGM Inlet $T_{m\,in}$ (°F)	DGM Outlet $T_{m\,out}$ (°F)	Pump Vacuum (in Hg)	Oxygen Indicator approx (%dv)	☐ Amb Filter ☐ Dioxin Trap ☐	Notes
5-1	5	0.49	1.3	485.52	317	245	247	66	91	88	3.5	8.3	N/A	
2	10	0.48	1.3	488.67	316	245	249	66	93	87	3.5	7.2		
3	15	0.51	1.5	492.17	315	247	249	65	94	88	4.0	7.6		
4	20	0.55	1.4	495.57	316	247	250	64	96	90	4.0	7.6		498.875
5	25	0.50	1.3	498.810	315	247	251	60	97	90	3.5	8.3		-0.065
4-1	30	0.46	1.1	501.88	314	246	249	63	96	91	3.5	8.6		K=2.42
2	35	0.42	1.0	504.69	314	246	250	62	97	91	3.5	8.0		
3	40	0.46	1.1	507.70	314	248	250	62	98	93	3.5	8.6		
4	45	0.58	1.4	511.11	315	248	251	63	98	92	3.5	8.8		
5	50	0.58	1.4	514.470	316	247	251	63	98	90	3.5	8.9		514.540
3-1	55	0.39	0.94	517.23	315	247	250	65	96	90	3.0	8.1		-0.07
2	60	0.44	1.1	520.21	315	248	252	68	96	89	3.5	7.8		
	Total	27.9775		79.9800										
	Average	0.7993	1.2776		315.9600				94.7600					

Sum of square roots. 14.89

Circle correct bracketed units on data sheet. 3782

2229 94.2600 PB 9/6/12

QA/QC PB
Date 9/6/12

CleanAir ENGINEERING

TEST LOCATION: FF Outlet Metals TESTING METHOD: 29 PAGE 2 OF 2

UNIT: 2 RUN: 3

FIELD DATA SHEET

Client	Ultrafabrics	Project No.	11414
Plant	N. Broward	Date	9/6/12
Meter Operator		P. Bihun	
Probe Operator		P. Bihun	

Meter Box		Sample Box No.	
Meter Y_d		Meter $\Delta H@$	
K Factor		Pitot C_p	
Leak Rate Before	[cfm] [Lpm]	@	(in. Hg)
Leak Rate After	[cfm] [Lpm]	@	(in. Hg)
Pitot Leak Check Before ☐	After: Good ☐	Bad ☐	

Cross Section of Test Location

[N] [UP]

Duct Dimensions (in.)

Static Pres ($in. H_2O$)	Port Len (in.)	Gas Flow [In] [Out] of page	First point all the way [In] [Out]

Amb. Temp. (°F)		Bar. Press.	[in. Hg] [mbar]
Probe I.D. No.			
Liner Material			

Filter No.		
Thimble No.		
Nozzle Diameter	Nozzle I.D.	

Start Time: Stop Time:

Traverse Point Number	Min/pt 5 / Elapsed Time	Velocity Head ΔP ($in. H_2O$)	Orifice Setting ΔH ($in. H_2O$)	Gas Sample Volume V_m Init. Vol. (ft³) [L]	Stack Temp Ts (°F)	Probe T_p (°F) Set Points 250	Filter T_c (°F) Set Points 250	Cond. Temp T_c (°F)	DGM Inlet T_{min} (°F)	DGM Outlet T_{mout} (°F)	Pump Vacuum (in Hg)	Oxygen Indicator approx (% dv)	☐ Amb. Filter ☐ Dioxin Trap ☐	Notes
3	65	0.47	1.2	523.21	316	249	249	64	97	91	3.5	7.6		
4	70	0.55	1.3	526.50	315	250	249	65	98	92	4.0	8.0		529.640
5	75	0.50	1.2	529.580	315	249	249	65	99	93	3.5	8.7		-0.016
2-1	80	0.47	1.1	532.60	314	249	252	64	97	93	3.5	8.6		
2	85	0.47	1.1	535.53	314	248	250	64	98	93	3.5	8.0		
3	90	0.60	1.5	539.00	314	250	250	64	99	94	4.0	8.4		
4	95	0.60	1.5	542.50	315	250	249	63	1100	93	4.0	8.2		545.940
5	100	0.57	1.4	545.820	316	250	250	64	100	93	4.0	9.2		-0.09
1-1	105	0.53	1.3	549.15	315	249	248	66	98	92	4.0	8.1		
2	110	0.53	1.3	552.38	319	249	250	66	99	92	4.0	8.1		
3	115	0.57	1.4	555.70	317	250	251	66	99	92	4.5	8.8		
4	120	0.54	1.3	558.93	322	250	250	66	99	92	4.0	8.4		
5	125	0.63	1.5	562.455	325	251	249	66	99	92	4.5	8.1		
	Total	*												
	Average													

* Sum of square roots.

Circle correct bracketed units on data sheet.

CleanAir ENGINEERING

QA/QC PB
Date 9/6/12

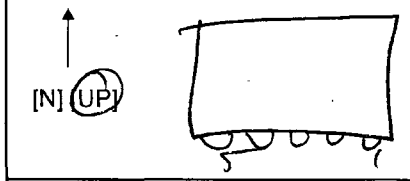
TEST LOCATION: FF Outlet Metals TESTING METHOD: 29 PAGE 1 OF 2

UNIT: 2 RUN: 4

FIELD DATA SHEET

Client	Wheelabrator	Project No	11414
Plant	Broward	Date	9/6/12
Meter Operator		P. Bishop	
Probe Operator		P. Bishop	

Cross-Section of Test Location



Amb. Temp. (°F)	90	Bar. Press.	30.00 (in. Hg) [mbar]
Probe I.D. No.		67-8-10	
Liner Material		Glass	

Meter Box	8F-2	Sample Box No.	M11
Meter ΔH@	0.9958	Meter ΔHo	1.8117
K Factor	2.41	Pitot Cp	0.827
Leak Rate Before	0.003 (cfm) [Lpm]	@	15 (in. Hg)
Leak Rate After	0.002 (cfm) [Lpm]	@	10 (in. Hg)
Pitot Leak Check Before	X	After	Good X Bad

Filter No.	N/A		
Thimble No.	N/A		
Nozzle Diameter	0.275	Nozzle I.D.	275-1

Duct Dimensions (in.)	96 x 96		
Static Pres (in. H_2O)	Port Len (in.)	Gas Flow [In] (Out)	First point all the way (In) [Out]
-11.0	10.0	of page	

Start Time	12:45	Stop Time	14:57

Traverse Point Number	Min/pt Elapsed Time	Velocity Head ΔP (in. H_2O)	Orifice Setting ΔH (in. H_2O)	Gas Sample Volume V_m Init. Vol (ft³) [L]	Stack Temp. Ts (°F)	Probe T. (°F) Set Points	Filter T. (°F) Set Points	Cond. Temp. T_c (°F)	DGM Inlet T_{min} (°F)	DGM Outlet T_{mout} (°F)	Pump Vacuum (in. Hg)	Oxygen Indicator approx (%dv)	Amb. Filter, Dioxin Trap	Notes
				562.795		280	250							
5-1	5	0.52	1.3	566.14	332	244	248	65	92	88	3.1	7.8	N/A	
2	10	0.50	1.2	569.25	328	245	250	62	91	81	3.5	7.8		
3	15	0.52	1.3	572.41	326	246	246	57	89	87	3.5	7.7		
4	20	0.50	1.3	575.60	324	246	251	56	86	75	3.5	7.9		K=2.49
5	25	0.47	1.2	578.75	322	247	249	57	86	76	3.5	8.1		578.80 -0.05
4-1	30	0.52	1.3	582.05	321	246	250	62	86	78	3.1	8.2		
2	35	0.53	1.3	585.32	321	246	250	61	88	77	3.5	8.0		
3	40	0.49	1.2	588.42	320	248	250	59	90	78	3.5	7.7		
4	45	0.55	1.4	591.79	319	248	252	60	92	79	3.5	7.10		
5	50	0.52	1.3	595.015	317	248	250	61	94	81	3.5	8.0		595.00 -0.015
3-1	55	0.47	1.2	598.21	316	248	252	62	94	83	3.5	7.10		
2	60	0.47	1.2	601.31	315	248	250	57	95	84	3.5	8.3		
	Total			52.725										
	Average	0.1326	1.348		319.000				89.100					

Sum of square roots. Circle correct bracketed units on data sheet

151200 3841 2037

QA/QC PB
Date 9/6/12

CleanAir ENGINEERING

TEST LOCATION: FF Outlet Metals TESTING METHOD: 29 PAGE 2 OF 2

UNIT: 2 RUN: 4

FIELD DATA SHEET

Client	Wheelabrator	Project No.	11414
Plant	N. Broward	Date	9/6/12
Meter Operator		P. Bohan	
Probe Operator		P. Bohan	

Meter Box		Sample Box No.	
Meter Y		Meter ΔH@	
K Factor		Pitot C_p	
Leak Rate Before	[cfm] [Lpm]	@	(in. Hg)
Leak Rate After	[cfm] [Lpm]	@	(in. Hg)
Pitot Leak Check Before ☐	After Good ☐	Bad ☐	

Cross-Section of Test Location

[N] [UP]

Duct Dimensions (in.)			
Static Pres ($in. H_2O$)	Port Len. (in.)	Gas Flow [In] [Out] of page	First point all the way [In] [Out]

Amb. Temp. (°F)		Bar. Press.	[in. Hg] [mbar]
Probe I.D. No.			
Liner Material			

Filter No.			
Thimble No.			
Nozzle Diameter		Nozzle I.D.	

Start Time	Stop Time

Traverse Point Number	Min/pt. 5 Elapsed Time	Velocity Head ΔP ($in. H_2O$)	Orifice Setting ΔH ($in. H_2O$)	Gas Sample Volume V_m Init. Vol (ft³) [L]	Stack Temp. Ts (°F)	Probe T_p (°F) Set Points 250	Filter T_f (°F) Set Points 250	Cond. Temp T_c (°F)	DGM Inlet $T_{m\,in}$ (°F)	DGM Outlet $T_{m\,out}$ (°F)	Pump Vacuum (in. Hg)	Oxygen Indicator approx. (% dv)	☐ Amb. Filter ☐ Dioxin Trap ☐	Notes
3	65	0.50	1.3	604.61	316	250	248	52	95	84	3.5	7.7	n/a	
4	70	0.55	1.4	608.02	316	250	249	54	95	84	4.0	7.4		
1	75	0.60	1.5	611.525	316	250	251	55	95	85	4.0	8.0		611.585
2-1	80	0.58	1.4	614.91	318	249	250	62	93	88	4.0	7.8		-0.060
2	85	0.48	1.2	618.03	319	249	250	62	95	90	3.5	8.1		
3	90	0.58	1.4	621.42	317	250	250	62	96	91	4.0	7.7		
4	95	0.67	1.7	625.20	317	250	250	63	96	91	4.5	8.6		
5	100	0.70	1.7	628.980	318	250	249	64	98	91	4.5	8.2		629.055
1-1	105	0.52	1.3	632.32	315	250	252	65	97	91	4.0	7.5		-0.075
2	110	0.45	1.1	635.28	316	249	249	65	98	92	3.5	8.1		
3	115	0.54	1.4	638.62	315	251	250	65	98	93	4.0	8.8		
4	120	0.60	1.5	642.11	315	250	249	64	98	93	4.5	7.5		
5	125	0.63	1.6	645.750	316	250	249	64	98	93	4.5	7.7		
	Total													
	Average													

* Sum of square roots.

Circle correct bracketed units on data sheet.

248

CleanAir ENGINEERING

QA/QC PB

Date 9/6/12

Impinger Weight Sheet

Client Wheelabrator		Unit Name / Location RV ~~Unit 3~~ FF Outlet Unit 2
Plant North Broward	Job No. 11414	Method 29

	S/N 8028101135	Balance Calibration Check	
Balance ID	CAETL07-2	Reference Weight Mass	500.0
Reference Weight ID	22549	Reference Weight Reading	499.5

Check must be performed at least Once per Method per Job — Reference Weight Mass must agree with Reference Weight Reading to within ±0.5 g.

Run No. 1	1	Filter Type Quartz		Sample Box No. M10
Date 9/5/12		Lot No. NA		pH NA
Analyst R. Vicere		Filter No. NA		Rinse NA

	Contents	Gross Weight (gm)	Tare Weight (gm)	Net Weight Gain (gm)	
Impinger 1	Empty	731.6	440.3	291.3	
Impinger 2	100 ml 5%HNO_3/10%H_2O_2	716.6	539.5	177.1	QA/QC RV
Impinger 3	100 ml 5%HNO_3/10%H_2O_2	588.9	544.0	44.9	Date 9/5/12
Impinger 4	Empty	536.1	527.9	8.2	
Impinger 5	100 ml 4%$KMnO_4$/10%H_2SO_4	540.3	537.0	3.3	Total Weight (gm)
Impinger 6	100 ml 4%$KMnO_4$/10%H_2SO_4	536.0	535.4	0.6	525.4
Impinger 7	≈ 250 g Silica Gel	737.3	721.1	16.2	541.6

Run No. 2	2	Filter Type Quartz		Sample Box No. M11
Date 9/6/12		Lot No. NA		pH NA
Analyst R. Vicere		Filter No. NA		Rinse NA

	Contents	Gross Weight (gm)	Tare Weight (gm)	Net Weight Gain (gm)	
Impinger 1	Empty	790.4	441.2	349.2	
Impinger 2	100 ml 5%HNO_3/10%H_2O_2	755.3	547.0	208.3	QA/QC RV
Impinger 3	100 ml 5%HNO_3/10%H_2O_2	623.8	561.3	62.5	Date 9/6/12
Impinger 4	Empty	476.7	461.1	15.6	
Impinger 5	100 ml 4%$KMnO_4$/10%H_2SO_4	547.4	538.3	9.1	Total Weight (gm)
Impinger 6	100 ml 4%$KMnO_4$/10%H_2SO_4	573.4	570.4	3.0	647.7
Impinger 7	≈ 250 g Silica Gel	741.8	722.4	19.4	667.1

Run No. 3	3	Filter Type Quartz		Sample Box No. M10
Date 9/6/12		Lot No. NA		pH NA
Analyst R. Vicere		Filter No. NA		Rinse NA

	Contents	Gross Weight (gm)	Tare Weight (gm)	Net Weight Gain (gm)	
Impinger 1	Empty	736.2	442.5	293.7	
Impinger 2	100 ml 5%HNO_3/10%H_2O_2	779.7	547.3	232.4	QA/QC RV
Impinger 3	100 ml 5%HNO_3/10%H_2O_2	585.1	543.8	41.3	Date 9/6/12
Impinger 4	Empty	535.5	529.2	6.3	
Impinger 5	100 ml 4%$KMnO_4$/10%H_2SO_4	542.2	539.3	2.9	Total Weight (gm)
Impinger 6	100 ml 4%$KMnO_4$/10%H_2SO_4	540.6	540.6	0	576.6
Impinger 7	≈ 250 g Silica Gel	755.1	738.6	16.5	593.1

QA/QC RV
Date 9/6/12

CleanAir. ENGINEERING

Impinger Weight Sheet

Client Wheelabrator		Unit Name / Location RV Unit 3 FF Outlet Unit 2
Plant North Broward	Job No. 11414	Method 29

	SN 8028101135	Balance Calibration Check	
Balance ID	CAE TL-02	Reference Weight Mass	500.0
Reference Weight ID	22549	Reference Weight Reading	499.5

Check must be performed at least Once per Method per Job — 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 9/6/12	Lot No. NA		pH NA
Analyst R. Vicere	Filter No. NA		Rinse NA

	Contents	Gross Weight (gm)	Tare Weight (gm)	Net Weight Gain (gm)	
Impinger 1	Empty	758.1	443.2	314.9	
Impinger 2	100 ml 5%HNO_3/10%H_2O_2	851.1	551.7	299.4	QA/QC RV
Impinger 3	100 ml 5%HNO_3/10%H_2O_2	607.2	569.9	37.3	Date 9/6/12
Impinger 4	Empty	464.0	462.3	1.7	
Impinger 5	100 ml 4%$KMnO_4$/10%H_2SO_4	544.2	543.9	0.3	Total Weight (gm)
Impinger 6	100 ml 4%$KMnO_4$/10%H_2SO_4	577.7	576.9	0.8	654.4
Impinger 7	≈250 g Silica Gel	737.6	720.2	17.4	671.8

Run No. 2	Filter Type Quartz		Sample Box No.
Date	Lot No.		pH NA
Analyst	Filter No.		Rinse NA

	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. 3	Filter Type Quartz		Sample Box No.
Date	Lot No.		pH NA
Analyst	Filter No.		Rinse NA

	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 RV
Date 9/6/12

CleanAir ENGINEERING

ORSAT READINGS

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

Client	Wheelabrator	Project Number	11414
Plant	N. Broward	Unit	2
Orsat ID	#6	Fuel Type	Municipal Solid Waste

$$Fo = \frac{20.9 - \%O_2}{\%CO_2}$$

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	3	1	9.9	19.0	9.1	1.191	P Bihun/R Vrana	9/5/12	16:00
		2	9.9	18.9	9.0				
		3	10.0	19.0	9.0				
		Avg.	9.9	19.0	9.1				
2	3	1	10.0	19.1	9.1	1.190	R. Vrana	9/6/12	11:15
		2	10.0	19.0	9.0				
		3	10.0	19.0	9.0				
		Avg.	10.0	19.0	9.0				
3	3	1	10.0	19.0	9.0	1.192	R. Vrana	9/6/12	13:20
		2	10.1	19.1	9.0				
		3	10.1	19.1	9.0				
		Avg.	10.1	19.1	9.0				
4	3	1	10.9	18.6	7.7	1.211	P Bihun	9/6/12	16:15
		2	10.9	18.6	7.7				
		3	10.9	18.6	7.7				
		Avg.	10.9	18.6	7.7				
		1							
		2							
		3							
		Avg.							
		1							
		2							
		3							
		Avg.							

Repeat the analysis procedure until the results of any three analyses differ by no more than 0.2 percent by volume. Average the three acceptable values and report the results to the nearest 0.1 percent. Calculate$_O$ to verify results

Acceptable ranges for F_O:

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 RV
Date 9/16/12

CleanAir ENGINEERING

This Page Intentionally Left Blank

FIELD DATA PRINTOUTS

F

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: 10/10/12

CleanAir.

Field Data Printout

			Test Method:		**USEPA Method 29**
Location:	Unit 2 FF Outlet		**Analyte:**		**Mercury**
Test Run:	1				
Client:	Wheelabrator North Broward, Inc.		Bar. Press. (in. Hg):	30.02	Nozzle ID No: 275-1
Project No:	11414		Static P:	-11.4	Nozzle Diameter (D_n): 0.275
Source Area (ft^2):	64.00000		O_2 (dry volume %):	9.03	Probe ID No: 67-8-10
Meter Operator:	P. Bihun	505	CO_2 (dry volume %):	9.93	Pitot C_p: 0.827
Probe Operator:	P. Bihun	505	N_2+CO (dry volume %):	81.03	Pitot Leak Check: ☑ Pass ☐ Fail
Test Date:	9/05/12				
Start Time:	12:55				
Stop Time:	15:09		H_2O (condensate, ml or gm):	525.4	Meter Box ID. No: 85-2
Leak Rate Before:	0.003 cfm	@ 15 "Hg	H_2O (silica, g):	16.2	Meter ΔH@: 1.81170
Leak Rate After:	0.003 cfm	@ 10 "Hg	Actual Moisture (%):	24.22	Meter Y_d: 0.99580

Traverse Point	Run Time 5.0 min/read	Pitot ΔP_s (in. H_2O)	Sample ΔH (in. H_2O)	Metered (dcf)	Stack T_s (°F)	Dry Gas Meter $T_{m\text{-}in}$ (°F)	Dry Gas Meter $T_{m\text{-}out}$ (°F)	$\sqrt{\Delta P_s}$ (calculated) ($\sqrt{}$in. H_2O)	Volume (calculated) (ft^3)	Isokinetics (calculated) (%)
	0.0			310.385						
5-01	5.0	0.47	1.30	313.610	312	91	92	0.69	3.23	103.3
5-02	10.0	0.53	1.50	317.000	311	90	93	0.73	3.39	102.2
5-03	15.0	0.55	1.50	320.360	311	92	93	0.74	3.36	99.2
5-04	20.0	0.62	1.70	323.980	310	94	93	0.79	3.62	100.5
5-05	25.0	0.61	1.70	327.655	311	95	93	0.78	3.67	102.8
LEAK CHECK	25.0			327.710						
4-01	30.0	0.49	1.40	331.030	312	95	93	0.70	3.32	103.7
4-02	35.0	0.43	1.20	334.100	311	97	94	0.66	3.07	101.9
4-03	40.0	0.51	1.40	337.430	311	97	94	0.71	3.33	101.6
4-04	45.0	0.54	1.50	340.920	311	98	94	0.73	3.49	103.4
4-05	50.0	0.53	1.50	344.385	311	98	94	0.73	3.46	103.6
LEAK CHECK	50.0			344.445						
3-01	55.0	0.46	1.30	347.670	310	98	94	0.68	3.23	103.4
3-02	60.0	0.44	1.20	350.780	311	98	94	0.66	3.11	102.0
3-03	65.0	0.48	1.30	354.050	311	99	94	0.69	3.27	102.6
3-04	70.0	0.50	1.40	357.430	311	99	94	0.71	3.38	103.9
3-05	75.0	0.48	1.30	360.670	311	99	95	0.69	3.24	101.6
LEAK CHECK	75.0			360.745						
2-01	80.0	0.58	1.60	364.320	312	98	94	0.76	3.57	102.3
2-02	85.0	0.48	1.30	367.540	313	99	94	0.69	3.22	101.2
2-03	90.0	0.44	1.20	370.650	311	99	94	0.66	3.11	101.9
2-04	95.0	0.56	1.50	374.130	311	99	94	0.75	3.48	101.1
2-05	100.0	0.63	1.70	377.885	312	100	94	0.79	3.76	102.9
LEAK CHECK	100.0			377.955						
1-01	105.0	0.47	1.30	381.170	310	98	93	0.69	3.22	102.1
1-02	110.0	0.46	1.30	384.380	311	98	91	0.68	3.21	103.3
1-03	115.0	0.40	1.10	387.320	309	98	90	0.63	2.94	101.3
1-04	120.0	0.45	1.20	390.440	309	98	90	0.67	3.12	101.4
1-05	125.0	0.66	1.80	394.280	310	98	90	0.81	3.84	103.3
Final	125.0		1.40800	83.63500	310.92000	95.06000		0.71320	83.63500	
25 points sampled		Sq.Rt.ΔP								
QC-Check: Field Averages		0.7132	1.4080	83.6350	310.9200	95.0600				
		☑ Avg. OK	☑ Avg. OK	☑ Avg. OK	☑ Avg. OK	☑ Avg. OK				

092012 152213
K

Field Data Printout

Test Method: **USEPA Method 29**
Analyte: **Mercury**

Location: Unit 2 FF Outlet
Test Run: 2
Client: Wheelabrator North Broward, Inc.
Project No: 11414
Source Area (ft^2): 64.00000

Meter Operator:		P. Bihun	505
Probe Operator:		P. Bihun	505
Test Date:	9/06/12		
Start Time:	07:35		
Stop Time:	09:46		
Leak Rate Before:	0.002	cfm	@ 15 "Hg
Leak Rate After:	0.003	cfm	@ 10 "Hg

Bar. Press. (in. Hg): 30.00
Static P: -12.2
O_2 (dry volume %): 9.03
CO_2 (dry volume %): 10.00
N_2+CO (dry volume %): 80.97

H_2O (condensate, ml or gm): 647.7
H_2O (silica, g): 19.4
Actual Moisture (%): 27.50

Nozzle ID No: 275-1
Nozzle Diameter (D_n): 0.275
Probe ID No: 67-8-10
Pitot C_p: 0.827
Pitot Leak Check: ☑ Pass ☐ Fail

Meter Box ID. No: 85-2
Meter ΔH@: 1.81170
Meter Y_d: 0.99580

Traverse Point	Run Time 5.0 min/read	Pitot ΔP_s (in. H_2O)	Sample ΔH (in. H_2O)	Metered (dcf)	Stack T_s (°F)	Dry Gas Meter $T_{m\text{-}in}$ (°F)	Dry Gas Meter $T_{m\text{-}out}$ (°F)	$\sqrt{\Delta P_s}$ (calculated) ($\sqrt{}$in. H_2O)	Volume (calculated) (ft^3)	Isokinetics (calculated) (%)
	0.0			395.570						
5-01	5.0	0.46	1.20	398.680	315	82	82	0.68	3.11	106.5
5-02	10.0	0.50	1.30	401.870	314	83	82	0.71	3.19	104.7
5-03	15.0	0.53	1.40	405.170	314	86	83	0.73	3.30	104.8
5-04	20.0	0.65	1.70	408.830	316	88	83	0.81	3.66	105.0
5-05	25.0	0.60	1.60	412.410	316	91	83	0.77	3.58	106.6
LEAK CHECK	25.0			412.485						
4-01	30.0	0.60	1.60	416.070	322	90	83	0.77	3.58	107.2
4-02	35.0	0.65	1.70	419.800	328	92	82	0.81	3.73	107.5
4-03	40.0	0.54	1.40	423.160	330	94	83	0.73	3.36	106.0
4-04	45.0	0.55	1.40	426.540	327	94	85	0.74	3.38	105.3
4-05	50.0	0.50	1.30	429.790	325	95	84	0.71	3.25	106.0
LEAK CHECK	50.0			429.850						
3-01	55.0	0.49	1.30	433.120	321	94	83	0.70	3.27	107.7
3-02	60.0	0.52	1.40	436.420	321	95	83	0.72	3.30	105.4
3-03	65.0	0.54	1.40	439.850	320	96	83	0.73	3.43	107.4
3-04	70.0	0.56	1.50	443.330	319	97	84	0.75	3.48	106.7
3-05	75.0	0.63	1.60	446.930	320	98	86	0.79	3.60	103.9
LEAK CHECK	75.0			447.005						
2-01	80.0	0.57	1.50	450.470	322	96	87	0.75	3.47	105.3
2-02	85.0	0.50	1.30	453.750	322	98	86	0.71	3.28	106.3
2-03	90.0	0.56	1.50	457.200	320	98	85	0.75	3.45	105.7
2-04	95.0	0.63	1.60	460.810	319	99	84	0.79	3.61	104.2
2-05	100.0	0.67	1.80	464.680	320	100	85	0.82	3.87	108.3
LEAK CHECK	100.0			464.765						
1-01	105.0	0.52	1.40	468.110	319	99	86	0.72	3.35	106.0
1-02	110.0	0.48	1.30	471.310	317	99	86	0.69	3.20	105.4
1-03	115.0	0.48	1.30	474.500	316	98	85	0.69	3.19	105.2
1-04	120.0	0.62	1.60	478.040	316	98	86	0.79	3.54	102.7
1-05	125.0	0.68	1.80	481.820	317	98	86	0.82	3.78	104.9
Final	125.0		1.47600	85.95500	319.84000	89.26000		0.74792	85.95500	
25 points sampled		Sq.Rt.ΔP								
QC-Check: Field Averages		0.7479	1.4760	85.9550	319.8400	89.2600				
		☑ Avg. OK	☑ Avg. OK	☑ Avg. OK	☑ Avg. OK	☑ Avg. OK				

092012 152213
L

Field Data Printout

			Test Method:	**USEPA Method 29**	
Location:	Unit 2 FF Outlet		**Analyte:**	**Mercury**	
Test Run:	3				
Client:	Wheelabrator North Broward, Inc.		Bar. Press. (in. Hg):	30.00	Nozzle ID No: 275-1
Project No:	11414		Static P:	-11.3	Nozzle Diameter (D_n): 0.275
Source Area (ft^2):	64.00000		O_2 (dry volume %):	9.00	Probe ID No: 67-8-10
Meter Operator:	P. Bihun	505	CO_2 (dry volume %):	10.07	Pitot C_p: 0.827
Probe Operator:	P. Bihun	505	N_2+CO (dry volume %):	80.93	Pitot Leak Check: ☑ Pass ☐ Fail
Test Date:	9/06/12				
Start Time:	10:12				
Stop Time:	12:24		H_2O (condensate, ml or gm):	576.6	Meter Box ID. No: 85-2
Leak Rate Before:	0.003 cfm	@ 15 "Hg	H_2O (silica, g):	16.5	Meter ΔH@: 1.81170
Leak Rate After:	0.003 cfm	@ 10 "Hg	Actual Moisture (%):	26.80	Meter Y_d: 0.99580

Traverse Point	Run Time 5.0 min/read	Pitot ΔP_s	Sample ΔH	Metered	Stack	Dry Gas Meter		$\sqrt{\Delta P_s}$	Volume	Isokinetics
				(dcf)	T_s	$T_{m\text{-}in}$	$T_{m\text{-}out}$	(calculated)	(calculated)	(calculated)
	0.0	(in. H_2O)	(in. H_2O)	482.220	(°F)	(°F)	(°F)	($\sqrt{in.}$ H_2O)	(ft^3)	(%)
5-01	5.0	0.49	1.30	485.520	317	91	88	0.70	3.30	107.2
5-02	10.0	0.48	1.30	488.670	316	93	87	0.69	3.15	103.2
5-03	15.0	0.58	1.50	492.170	315	94	88	0.76	3.50	104.1
5-04	20.0	0.55	1.40	495.550	316	96	90	0.74	3.38	103.0
5-05	25.0	0.50	1.30	498.810	315	97	90	0.71	3.26	104.0
LEAK CHECK	25.0			498.875						
4-01	30.0	0.46	1.10	501.880	314	96	91	0.68	3.01	99.8
4-02	35.0	0.42	1.00	504.690	314	97	91	0.65	2.81	97.5
4-03	40.0	0.46	1.10	507.700	314	98	93	0.68	3.01	99.6
4-04	45.0	0.58	1.40	511.110	315	98	92	0.76	3.41	100.7
4-05	50.0	0.58	1.40	514.470	316	98	90	0.76	3.36	99.5
LEAK CHECK	50.0			514.540						
3-01	55.0	0.39	0.94	517.230	315	96	90	0.62	2.69	97.1
3-02	60.0	0.44	1.10	520.210	315	96	89	0.66	2.98	101.4
3-03	65.0	0.48	1.20	523.210	316	97	91	0.69	3.00	97.6
3-04	70.0	0.55	1.30	526.500	315	98	92	0.74	3.29	99.8
3-05	75.0	0.50	1.20	529.580	315	99	93	0.71	3.08	97.8
LEAK CHECK	75.0			529.640						
2-01	80.0	0.47	1.10	532.600	314	97	93	0.69	2.96	97.0
2-02	85.0	0.47	1.10	535.530	314	98	93	0.69	2.93	95.9
2-03	90.0	0.60	1.50	539.000	314	99	94	0.77	3.47	100.5
2-04	95.0	0.60	1.50	542.500	315	100	93	0.77	3.50	101.4
2-05	100.0	0.57	1.40	545.820	316	100	93	0.75	3.32	98.7
LEAK CHECK	100.0			545.910						
1-01	105.0	0.53	1.30	549.150	315	98	92	0.73	3.24	100.1
1-02	110.0	0.53	1.30	552.380	319	99	92	0.73	3.23	99.9
1-03	115.0	0.57	1.40	555.700	317	99	92	0.75	3.32	99.0
1-04	120.0	0.54	1.30	558.930	322	99	92	0.73	3.23	99.2
1-05	125.0	0.63	1.50	562.455	325	99	92	0.79	3.53	100.5
Final	125.0		1.27760	79.95000	315.96000	94.26000		0.71900	79.95000	
25 points sampled		Sq.Rt.ΔP								
QC-Check: Field Averages		0.7190	1.2776	79.9500	315.9600	94.2600				
		☑ Avg. OK	☑ Avg. OK	☑ Avg. OK	☑ Avg. OK	☑ Avg. OK				

092012 152213
O

Field Data Printout

Test Method: **USEPA Method 29**
Analyte: **Mercury**

Location: Unit 2 FF Outlet
Test Run: 4
Client: Wheelabrator North Broward, Inc.
Project No: 11414
Source Area (ft^2): 64.00000

Meter Operator:	P. Bihun	505	
Probe Operator:	P. Bihun	505	
Test Date:	9/06/12		
Start Time:	12:45		
Stop Time:	14:57		
Leak Rate Before:	0.003	cfm	@ 15 "Hg
Leak Rate After:	0.002	cfm	@ 10 "Hg

Bar. Press. (in. Hg): 30.00
Static P: -11.0
O_2 (dry volume %): 7.70
CO_2 (dry volume %): 10.90
N_2+CO (dry volume %): 81.40
H_2O (condensate, ml or gm): 654.4
H_2O (silica, g): 17.4
Actual Moisture (%): 28.41

Nozzle ID No: 275-1
Nozzle Diameter (D_n): 0.275
Probe ID No: 67-8-10
Pitot C_p: 0.827
Pitot Leak Check: ☑ Pass ☐ Fail
Meter Box ID. No: 85-2
Meter ΔH@: 1.81170
Meter Y_d: 0.99580

Traverse Point	Run Time 5.0 min/read	Pitot ΔP_s (in. H_2O)	Sample ΔH (in. H_2O)	Metered (dcf)	Stack T_s (°F)	Dry Gas Meter $T_{m\text{-}in}$ (°F)	Dry Gas Meter $T_{m\text{-}out}$ (°F)	$\sqrt{\Delta P_s}$ (calculated) ($\sqrt{}$in. H_2O)	Volume (calculated) (ft^3)	Isokinetics (calculated) (%)
	0.0			562.795						
5-01	5.0	0.52	1.30	566.160	332	92	85	0.72	3.37	109.4
5-02	10.0	0.50	1.20	569.250	328	91	81	0.71	3.09	102.7
5-03	15.0	0.52	1.30	572.410	326	89	77	0.72	3.16	103.4
5-04	20.0	0.50	1.30	575.600	324	86	75	0.71	3.19	106.8
5-05	25.0	0.47	1.20	578.755	322	86	76	0.69	3.15	108.7
LEAK CHECK	25.0			578.805						
4-01	30.0	0.52	1.30	582.050	321	86	78	0.72	3.25	106.1
4-02	35.0	0.53	1.30	585.320	321	88	77	0.73	3.27	105.8
4-03	40.0	0.49	1.20	588.420	320	90	78	0.70	3.10	103.9
4-04	45.0	0.55	1.40	591.790	319	92	79	0.74	3.37	106.3
4-05	50.0	0.52	1.30	595.015	317	94	81	0.72	3.23	104.1
LEAK CHECK	50.0			595.060						
3-01	55.0	0.47	1.20	598.210	316	94	83	0.69	3.15	106.6
3-02	60.0	0.47	1.20	601.310	315	95	84	0.69	3.10	104.7
3-03	65.0	0.50	1.30	604.610	316	95	84	0.71	3.30	108.1
3-04	70.0	0.55	1.40	608.020	316	95	84	0.74	3.41	106.6
3-05	75.0	0.60	1.50	611.525	316	95	85	0.77	3.51	104.8
LEAK CHECK	75.0			611.585						
2-01	80.0	0.58	1.40	614.910	318	93	88	0.76	3.32	101.1
2-02	85.0	0.48	1.20	618.030	319	95	90	0.69	3.12	104.0
2-03	90.0	0.58	1.40	621.420	317	96	91	0.76	3.39	102.5
2-04	95.0	0.67	1.70	625.200	317	96	91	0.82	3.78	106.4
2-05	100.0	0.70	1.70	628.980	318	98	91	0.84	3.78	104.0
LEAK CHECK	100.0			629.055						
1-01	105.0	0.52	1.30	632.320	315	97	91	0.72	3.27	104.0
1-02	110.0	0.45	1.10	635.280	316	98	92	0.67	2.96	101.2
1-03	115.0	0.54	1.40	638.620	315	98	93	0.73	3.34	104.1
1-04	120.0	0.60	1.50	642.110	315	98	93	0.77	3.49	103.3
1-05	125.0	0.63	1.60	645.750	316	98	93	0.79	3.64	105.2
Final	125.0		1.34800	82.72500	319.00000	89.10000		0.73258	82.72500	
25 points sampled		Sq.Rt.ΔP								
QC-Check: Field Averages		0.7326	1.3480	82.7250	319.0000	89.1000				
		☑ Avg. OK	☑ Avg. OK	☑ Avg. OK	☑ Avg. OK	☑ Avg. OK				

092012 152213

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

USEPA Method 4 Laboratory Data

Location: Unit 2 FF Outlet
Client: Wheelabrator North Broward, Inc.
Project No: 11414

Test Method: USEPA Method 29
Analyte: Mercury
Analyst: R. Vicere
Analyst Emp No: 563

Test Run: 1

	Contents	Gross (gm)	Tare (gm)	Net (gm)
Impinger 1	Empty	731.6	440.3	291.3
Impinger 2	5%HNO3/10%H2O2	716.6	539.5	177.1
Impinger 3	5%HNO3/10%H2O2	588.9	544.0	44.9
Impinger 4	Empty	536.1	527.9	8.2
Impinger 5	4%KMnO4/10%H2SO4	540.3	537.0	3.3
Impinger 6	4%KMnO4/10%H2SO4	536.0	535.4	0.6
Impinger 7	Silica Gel	737.3	721.1	16.2
Impinger 8				

Rinse: (ml or gm)

		Field Data Check	
525.4	Liquid (gm)		
0.0	less rinse (gm)		
525.4	Net Liquid (gm)	525.4	☑ QA/QC OK
+ 16.2	Silica Gel (gm)	16.2	☑ QA/QC OK
541.6	Total Vlc (gm)	541.6	☑ QA/QC OK

Test Run: 2

	Contents	Gross (gm)	Tare (gm)	Net (gm)
Impinger 1	Empty	790.4	441.2	349.2
Impinger 2	5%HNO3/10%H2O2	755.3	547.0	208.3
Impinger 3	5%HNO3/10%H2O2	623.8	561.3	62.5
Impinger 4	Empty	476.7	461.1	15.6
Impinger 5	4%KMnO4/10%H2SO4	547.4	538.3	9.1
Impinger 6	4%KMnO4/10%H2SO4	573.4	570.4	3.0
Impinger 7	Silica Gel	741.8	722.4	19.4
Impinger 8				

Rinse: (ml or gm)

		Field Data Check	
647.7	Liquid (gm)		
0.0	less rinse (gm)		
647.7	Net Liquid (gm)	647.7	☑ QA/QC OK
+ 19.4	Silica Gel (gm)	19.4	☑ QA/QC OK
667.1	Total Vlc (gm)	667.1	☑ QA/QC OK

Test Run: 3

	Contents	Gross (gm)	Tare (gm)	Net (gm)
Impinger 1	Empty	736.2	442.5	293.7
Impinger 2	5%HNO3/10%H2O2	779.7	547.3	232.4
Impinger 3	5%HNO3/10%H2O2	585.1	543.8	41.3
Impinger 4	Empty	535.5	529.2	6.3
Impinger 5	4%KMnO4/10%H2SO4	542.2	539.3	2.9
Impinger 6	4%KMnO4/10%H2SO4	540.6	540.6	0.0
Impinger 7	Silica Gel	755.1	738.6	16.5
Impinger 8				

Rinse: (ml or gm)

		Field Data Check	
576.6	Liquid (gm)		
0.0	less rinse (gm)		
576.6	Net Liquid (gm)	576.6	☑ QA/QC OK
+ 16.5	Silica Gel (gm)	16.5	☑ QA/QC OK
593.1	Total Vlc (gm)	593.1	☑ QA/QC OK

Test Run: 4

	Contents	Gross (gm)	Tare (gm)	Net (gm)
Impinger 1	Empty	758.1	443.2	314.9
Impinger 2	5%HNO3/10%H2O2	851.1	551.7	299.4
Impinger 3	5%HNO3/10%H2O2	607.2	569.9	37.3
Impinger 4	Empty	464.0	462.3	1.7
Impinger 5	4%KMnO4/10%H2SO4	544.2	543.9	0.3
Impinger 6	4%KMnO4/10%H2SO4	577.7	576.9	0.8
Impinger 7	Silica Gel	737.6	720.2	17.4
Impinger 8				

Rinse: (ml or gm)

		Field Data Check	
654.4	Liquid (gm)		
0.0	less rinse (gm)		
654.4	Net Liquid (gm)	654.4	☑ QA/QC OK
+ 17.4	Silica Gel (gm)	17.4	☑ QA/QC OK
671.8	Total Vlc (gm)	671.8	☑ QA/QC OK

09/20/12 15:22:13
K L O J

USEPA Method 3 Laboratory Data

Test Method: USEPA Method 29
Analyte: Mercury

Location: Unit 2 FF Outlet
Client: Wheelabrator North Broward, Inc.
Project No: 11414
Method: EPA Method 3
Fuel Type: Municipal Waste
F_o for Fuel: 1.03 to 1.3

Analyst: P. Bihun
Analyst Emp No: 505

Run Number	Trial	Percent CO_2	Percent O_2+CO_2	Percent O_2	Percent N_2	Dry Mol. Weight	F_o	Method of Analysis: Orsat
1	1	9.9	19.0	9.1	81.0	29.95		
	2	9.9	18.9	9.0	81.1	29.94		
	3	10.0	19.0	9.0	81.0	29.96		
	Avg.	9.93333		9.03333	81.03333	29.95	1.19463	*All measurements in spec.*
CEM or Other Avg:								☑ Fo value within expected range.

Run Number	Trial	Percent CO_2	Percent O_2+CO_2	Percent O_2	Percent N_2	Dry Mol. Weight	F_o	Method of Analysis: Orsat
2	1	10.0	19.1	9.1	80.9	29.96		
	2	10.0	19.0	9.0	81.0	29.96		
	3	10.0	19.0	9.0	81.0	29.96		
	Avg.	10.00000		9.03333	80.96667	29.96	1.18667	*All measurements in spec.*
CEM or Other Avg:								☑ Fo value within expected range.

Run Number	Trial	Percent CO_2	Percent O_2+CO_2	Percent O_2	Percent N_2	Dry Mol. Weight	F_o	Method of Analysis: Orsat
3	1	10.0	19.0	9.0	81.0	29.96		
	2	10.1	19.1	9.0	80.9	29.98		
	3	10.1	19.1	9.0	80.9	29.98		
	Avg.	10.06667		9.00000	80.93333	29.97	1.18212	*All measurements in spec.*
CEM or Other Avg:								☑ Fo value within expected range.

Run Number	Trial	Percent CO_2	Percent O_2+CO_2	Percent O_2	Percent N_2	Dry Mol. Weight	F_o	Method of Analysis: Orsat
4	1	10.9	18.6	7.7	81.4	30.05		
	2	10.9	18.6	7.7	81.4	30.05		
	3	10.9	18.6	7.7	81.4	30.05		
	Avg.	10.90000		7.70000	81.40000	30.05	1.21101	*All measurements in spec.*
CEM or Other Avg:								☑ Fo value within expected range.

092012 152213
KLOJ

LABORATORY 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: MK

Date: 10/10/12

CleanAir

Wheelabrator North Broward, Inc.
Clean Air Project No: 11414
Unit 2 FF Outlet

USEPA Method 29 (Mercury)
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)	0.2000
$m_{3a\text{-}DL}$	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)	<0.2000
$m_{3a\text{-}B}$	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)	<1.4000

Run No.		**1**	**2**	**3**	**4**
Date (2012)		Sep 5	Sep 6	Sep 6	Sep 6
Start Time (approx.)		12:55	07:35	10:12	12:45
Stop Time (approx.)		15:09	09:46	12:24	14:57
Sample Analysis					
$m_{1b\text{-}S}$	Fraction 1B Sample (µg)	<0.1000	<0.1000	<0.1000	0.1296
$m_{2b\text{-}S}$	Fraction 2B Sample (µg)	7.9273	11.5223	9.8867	8.2391
$m_{3a\text{-}S}$	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)	7.9273	11.5223	9.8867	8.3686
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)	7.9273	11.5223	9.8867	8.3686
Sample Corrected for Blank - Prorated Fractions					
$m_{n\text{-}1b}$	Fraction 1B (µg)	<0.1000	<0.1000	<0.1000	0.1296
$m_{n\text{-}2b}$	Fraction 2B (µg)	7.9273	11.5223	9.8867	8.2391
$m_{n\text{-}3a}$	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

092012 152213
O

Clean Air Engineering, Inc.

500 West Wood Street
Palatine, IL 60067

Project Number: 11414NB

Mercury

EPA Methods 29 Analysis

Analytical Report
19281

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 19281
has been reviewed for completeness, accuracy,
adherence to method protocol,
and compliance with quality assurance guidelines.

Review by:

Daphne Woodman, Chemist
September 18, 2012

Report Reviewed and Finalized By:

Ken Smith, Laboratory Director
September 18, 2012

SUMMARY OF RESULTS

Summary of Analysis

Unit 2 - 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
U2 FF Outlet R1	#1	7.93	< 0.1	7.92	< 0.2	< 0.5	< 0.4
	#2		< 0.1	7.93	< 0.2	< 0.5	< 0.4
U2 FF Outlet R2	#1	11.5	< 0.1	11.5	< 0.2	< 0.5	< 0.4
	#2		< 0.1	11.5	< 0.2	< 0.5	< 0.4
U2 FF Outlet R3	#1	9.89	< 0.1	9.87	< 0.2	< 0.5	< 0.4
	#2		< 0.1	9.90	< 0.2	< 0.5	< 0.4
U2 FF Outlet R4	#1	8.37	0.131	8.23	< 0.2	< 0.5	< 0.4
	#2		0.128	8.25	< 0.2	< 0.5	< 0.4
Field Blank	#1	< 0.5	< 0.1	< 0.1	< 0.2	< 0.5	< 0.4
	#2		< 0.1	< 0.1	< 0.2	< 0.5	< 0.4
Reagent Blank	#1	< 0.5	< 0.1	< 0.2	< 0.2	< 0.5	< 0.4
	#2		< 0.1	< 0.2	< 0.2	< 0.5	< 0.4

ANALYTICAL NARRATIVE

Element One Analytical Narrative

Client:	Clean Air, IL	Element One #:	19281
Client ID:	11414NB – N Broward	Analyst:	KLS & LAL
Method:	Methods 29	Dates Received:	09/07-10/12
Analytes:	Hg	Dates Analyzed:	09/12-17/12

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
U2 FF Outlet R1	NA	0.1%	NA	NA	NA
U2 FF Outlet R2	NA	0.3%	NA	NA	NA
U2 FF Outlet R3	NA	0.4%	NA	NA	NA
U2 FF Outlet R4	2.5%	0.2%	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
U2 FF Outlet R3	#1	116%	101%	100%	111%	97%
	#2	107%	100%	92%	110%	97%

SAMPLE CUSTODY

e 19281

Chain Of Custody

CleanAir ENGINEERING

Project Information

Client	Wheelabrator Environmental Services
Plant	Wheelabrator
Project Manager	Scott Brown
Project No.	11414
Team	66

Forwarding Lab

Element One, Inc.
5022-C Wrightsville Avenue
Wilmington, NC 28403
910-792-6853 (fax)
910-793-0128 (phone)
Ken Smith

Clean Air Engineering
500 West Wood Street

Palatine, IL 60067
Phone: 847-991-3300
Fax:

Lab ID	Date	Archive	Test Location	Run	Description	Container	Vol/Filter	Method	Notes
	09/05/2012		Reagent Blank - 3 Tared Filters		Quartz Fiber Filter	250 ml HDPE			
	09/05/2012		Reagent Blank - 200ml 0.1N HNO3		0.1 N HNO3	250 ml HDPE	200.0g		
	09/05/2012		Reagent Blank - 200ml 5%		5% HNO3/10% H2O2	250 ml HDPE	200.0g		
	09/05/2012		Reagent Blank - 100ml 4%		4% KMnO4/10% H2SO4	250 ml Amber GJ	100.3g		
	09/05/2012		Reagent Blank - 100ml DI H2O		DI Water	250 ml HDPE	100.1g		
	09/05/2012		Reagent Blank - 200ml DI H2O +		8N HCL	250 ml Amber GJ	225.8g		
	09/05/2012		Train Proof - Front Half 0.1N HNO3		0.1 N HNO3	250 ml HDPE	63.3g		
	09/05/2012		Unit 2 FF Outlet NB	1	Quartz Filter	250 ml HDPE		EPA Method 29	
	09/05/2012		Unit 2 FF Outlet NB	1	FH 0.1N HNO3	250 ml HDPE	152.3g	EPA Method 29	
	09/05/2012		Unit 2 FF Outlet NB	1	BH Filter, Imp 1-3, 0.1N HNO3	1000 ml HDPE	825.0g	EPA Method 29	
	09/05/2012		Unit 2 FF Outlet NB	1	Imp 4, 0.1N HNO3	250 ml HDPE	100.9g	EPA Method 29	
	09/05/2012		Unit 2 FF Outlet NB	1	Imp 5-6 4% KMnO4/10% H2SO4 + DI H2O	950 ml Amber GJ	399.6g	EPA Method 29	

All samples rec'd in good condition. in Fisherbrand & QEC Level 2 containers.
No empty containers. KLS 9/10/12
Per Scott via phone, analyze for Hg only. ~~FH/BH combined~~ 9-11-12 - LKB 9.11.12
Archive Train proof.

9/6/2012 4:31 PM

e19281

Chain Of Custody

Project Information

Client: Wheelabrator Environmental Services
Project No.: 11414

Forwarding Lab

Element One, Inc.

CleanAir ENGINEERING

Lab ID	Date	Archive	Test Location	Run	Description	Container	Vol/Filter	Method	Notes
	09/05/2012		Unit 2 FF Outlet NB	1	Imp 5-6 8N HCl + DI H2O	250 ml Amber GJ	226.1g	EPA Method 29	
	09/05/2012			Field B	Imp 5-6 8N HCl + DI H2O	250 ml Amber GJ	226.1g		
	09/05/2012			Field B	Imp 5-6 4% KMnO4/10% H2SO4 + DI H2O	950 ml Amber GJ	403.8g		
	09/05/2012			Field B	Imp 4, 0.1N HNO3	250 ml HDPE	100.8g		
	09/05/2012			Field B	BH Filter, Imp 1-3, 0.1N HNO3	1000 ml HDPE	301.9g		
	09/05/2012			Field B	FH 0.1N HNO3	250 ml HDPE	133.5g		
	09/05/2012			Field B	Quartz Filter	250 ml HDPE			
	09/06/2012		Unit 2 FF Outlet NB	2	Quartz Filter	250 ml HDPE		EPA Method 29	
	09/06/2012		Unit 2 FF Outlet NB	2	FH 0.1N HNO3	250 ml HDPE	131.8g	EPA Method 29	
	09/06/2012		Unit 2 FF Outlet NB	2	BH Filter, Imp 1-3, 0.1N HNO3	1000 ml HDPE	915.2g	EPA Method 29	
	09/06/2012		Unit 2 FF Outlet NB	2	Imp 4, 0.1N HNO3	250 ml HDPE	118.5g	EPA Method 29	
	09/06/2012		Unit 2 FF Outlet NB	2	Imp 5-6 4% KMnO4/10% H2SO4 + DI H2O	950 ml Amber GJ	402.7g	EPA Method 29	
	09/06/2012		Unit 2 FF Outlet NB	2	Imp 5-6 8N HCl + DI H2O	250 ml Amber GJ	223.4g	EPA Method 29	
	09/06/2012		Unit 2 FF Outlet NB	3	Quartz Filter	250 ml HDPE		EPA Method 29	
	09/06/2012		Unit 2 FF Outlet NB	3	FH 0.1N HNO3	250 ml HDPE	129.6g	EPA Method 29	

9/6/2012 4:31 PM

e19281

Chain Of Custody

CleanAir ENGINEERING

Project Information

Client: Wheelabrator Environmental Services
Project No.: 11414

Forwarding Lab

Element One, Inc.

Lab ID	Date	Archive	Test Location	Run	Description	Container	Vol/Filter	Method	Notes
	09/06/2012		Unit 2 FF Outlet NB	3	BH Filter, Imp 1-3, 0.1N HNO3	1000 ml HDPE	877.3g	EPA Method 29	
	09/06/2012		Unit 2 FF Outlet NB	3	Imp 4, 0.1N HNO3	250 ml HDPE	186.3g	EPA Method 29	
	09/06/2012		Unit 2 FF Outlet NB	3	Imp 5-6 4% KMnO4/10% H2SO4 + DI H2O	950 ml Amber GJ	403.4g	EPA Method 29	
	09/06/2012		Unit 2 FF Outlet NB	3	Imp 5-6 8N HCl + DI H2O	250 ml Amber GJ	225.5g	EPA Method 29	
	09/06/2012		Unit 2 FF Outlet NB	4	Quartz Filter	250 ml HDPE		EPA Method 29	
	09/06/2012		Unit 2 FF Outlet NB	4	FH 0.1N HNO3	250 ml HDPE	158.4g	EPA Method 29	
	09/06/2012		Unit 2 FF Outlet NB	4	BH Filter, Imp 1-3, 0.1N HNO3	1000 ml HDPE	954.1g	EPA Method 29	
	09/06/2012		Unit 2 FF Outlet NB	4	Imp 4, 0.1N HNO3	250 ml HDPE	182.2g	EPA Method 29	
	09/06/2012		Unit 2 FF Outlet NB	4	Imp 5-6 4% KMnO4/10% H2SO4 + DI H2O	950 ml Amber GJ	407.4g	EPA Method 29	
	09/06/2012		Unit 2 FF Outlet NB	4	Imp 5-6 8N HCl + DI H2O	250 ml Amber GJ	229.6g	EPA Method 29	

[redacted]

9/6/2012 4:31 PM

e19281

Project No. 11414
Client Wheelabrator Environmental Services

CleanAir ENGINEERING

Custody Transfer Log

	Name	Company	Date/Time
Relinquished By:	Raina Vicere	Clean Air	9/6/12 16:30
Accepted By:		e1	9/7/12 @ 914 9/10/12
Relinquished By:			
Accepted By:			
Relinquished By:			
Accepted By:			
Relinquished By:			
Accepted By:			
Relinquished By:			
Accepted By:			

9/6/2012 4:31 PM

e19281

Sample Receipt Checklist

Project Number 11414

Client Wheelabrator Environmental Services

CleanAir ENGINEERING

Receiving Packaging

A1	Shipping container/cooler in good condition?	(Y) / N / NA
A2	Custody seals intact on shipping container/cooler?	(Y) / N / NA
A3	Custody seals intact on sample bottles?	(Y) / N / NA
A4	Shipping container/cooler temperature in compliance?	(Y) / N / (NA)
	Temp Value?	*C/F*

Chain of Custody

B1	Chain of custody present?	(Y) / N / NA
B2	Chain of custody signed when relinquished and received?	(Y) / N / NA
B3	Chain of custody description agrees with sample labels?	(Y) / N / NA
B4	Chain of custody accounts for all samples received?	(Y) / N / NA

Sample Containers

C1	Sample containers free of visible sample loss?	(Y) / N / NA
C2	Samples in proper container/bottle?	(Y) / N / NA

Analysis

D1	Sufficient sample volume for indicated test?	(Y) / N / NA
D2	All samples received within the holding times?	(Y) / N / NA
D3	(VOA vials) Vials have zero headspace?	Y / N / (NA)
D4	(M26A) pH acceptable upon receipt?	Y / N / (NA)

Explanations

9/10/12 @ 914

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-

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

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-

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

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 19281**

FH/BH Combined

Analysis Due Date 09.18.12
QA/QC/Report Due Date 09.20.12

Client	Clean Air IL
Project No	11414—N Broward

Date Rec	09.07 & 10.12
Time Rec	1008 & 0914

HNO_3 Lot: 111138	HF Lot: 5111093	HCl Lot: 4111111
Volume Marked Y / N	Volume Loss Y / N ?	

Ref. Method: 29

Sample Identification

1	U2 FF Outlet-M29-R1	5	Field Blank
2	U2 FF Outlet-M29-R2	6	Reagent Blank
	U2 FF Outlet-M29-R2 Duplicate	7	Train Proof
3	U2 FF Outlet-M29-R3		
	U2 FF Outlet-M29-R3 Spike		
4	U2 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			154	100	820			104	200	360	500	230	400
2.D			132		910			120		370		225	
3.S			130		880			108		370		230	
4			160		950			104		380		225	
5			140		300			102		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	100		
	C-8A	A	0.1N HNO_3	100	202	used 16 mL of DI LAL 9.13.12
	C-8B	B	DI H_2O	102	50/16	used 16 mL of DI
	C-9	BH	5% HNO_3/10% H_2O_2	190		
	C-10	B	4% $KMnO_4$/10%H_2SO_4	90	50/16	used 50mL of $KMnO_4$ & 16mL of DI
	C-11	C	8N HCl DI H_2O	230	400	
	C-12	FH	Filter			

Lab Communications

Reagent blank w/ 10.0 uL of Stk A (FH)

Per client via phone, analyze for Hg only. FH / BH Combined. Archive Train Proof—09.11.12 LLB

M29: Received C1, C3, C4, C5a, C5b, C5c; RB C12, C8a, C8b, C9, C10, C11—09.10.12 LLB

SS Page 1 of 1
9/11/2012 10:35:02 AM
SS by JAB
Labeled By/Date RAN 9/11/12

FH Prep By/Date RAN 9.12.12 A Prep By/Date RAN 9/11/12
BH Prep By/Date RAN 9/11/12 B Prep By/Date PAT 9-12-12
BH/FH Prep By/Date RAN-9.12.12 C Prep By/Date RAN 9-13-12
PM Prep By / Date — ID Verification By/Date LAL 9.11.12

elementOne **Method 29 Microwave Worksheet** Lab ID # e 19281

Client: CAE

Date Digested: 9/12/12 Initials: ADS Worksheet Prepared by: ADS

Auto Sample Loc.	Sample Lab ID	Sample Weight (g)	# of filters digested	Spike	Prep Volume (ml)	Weight In Micro / Weight Out Micro	Units
1	LRB						
3	LRB +			.1mL A			
5	19281-1		1				
7	-2						
9	-3						
11	-4						
13	-5						
15	-6						

ADS

LRB + spiked w/ .1mL of 25ppm Std A (02H12-A) ADS

6mLs HNO_3 (111122) 2mL HF (5111093)

*-6 contain 3 filters, digested middle.

Element One, Inc. Form 104 - Revision 1.0

Sent to 19274

elementOne **MERCURY BATCH DIGESTION - RUN WORKSHEET**

Date Prepared/Digested: 9-11-12 Prep By: LAL SIF File #: 091212-1
Block #1 Temperature: 110 Start Time: 5:30 Machine ID: 1
Block #2 Temperature: ↓ Stop Time: 7:45 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 0		40	40	Standard #1 (for working std) Lot #: 4205419
2	0.004 ug	0.01ml		40	40	Working Standard
3	0.04 ug	0.10ml		40	40	Lot #: 091012-1 by: LAL
4	0.08 ug	0.20ml		40	40	Standard #2 (QC #2):
5	0.16 ug	0.40ml		40	40	Lot #: 091012-2
6	0.20ug	0.50ml		40	40	Standard #3 (QC #3):
						Lot #: 091012-3
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
Initial Review By: LAL Date: 9.12.12 Time: 12:30
Final QC Review By: Date: Time:
Comments: 19274-1 @ 20mL, 19277-3+ @ 10mL

A/S	LAB # (Lab 9.11.12)	Client	Wt/FV	Ali Used	ml used	Sample Vol, ml	Spike µg
19274 9	~~19347~~ 19274-3				20	1	
10	-3+				↓	↓	
11	19268/277/279 BLK				20	1	
12	BLK+						
13	19274-1 BLK						
14	BLK+						
15	19268-						
16	-SPK						
17	19268-Dup						
18	19274-1						
19	19277-1				↓	↓	

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 #* 111112 *HCl Lot #:* 111111
Persulfate Lot # 083012-2 *$KMnO_4$ Lot #* 080212-5 *Hydrox Lot#:* 083012-3
Clear samples after digestion with 3.2ml of Hydroxylamine solution.

Element One, Inc form 128-Revision 7.0 Page 1 of 4

elementOne **MERCURY BATCH DIGESTION - RUN WORKSHEET**

SIF File #: 091212-1

A/S	LAB #	Client	Wt/FV	Ali Used	ml used	Sample Vol, ml	Spike µg
20	19277-2				20	1	
21	-2 Dup						
22	-3						
23	-3+						
24	-4						
25	19279						
26	-Dup				↓	↓	
27	19285-A				4	200	
28	-3A						
29	-3AD						
30	-3A						
31	-3A+						
32	-4A						
33	-5A						
34	-5AD						
35	-6A						
36	-6A+						
37	-7A						
38	-8A						
39	-8AD						
40	-9A						
41	-9A+						
42	-10A						
43	-11A						
44	-11AD						
45	-12A						
46	-12A+						
47	-13A						
48	-14A						
49	-14AD						
50	-15A						
51	-15A+						
52	-16A						
53	-17A						
54	-17AD				↓	↓	

Element One, Inc form 128-Revision 7.0 Page 2 of 4

elementOne **MERCURY BATCH DIGESTION - RUN WORKSHEET**

SIF File #: 091212-1

A/S	LAB #	Client	Wt/FV	Ali Used	ml used	Sample Vol, ml	Spike µg
55	19285-18A				4	200	
56	-18A+				↓	↓	
57	-19A						
58	-20A				↓	↓	
59	19286-11A				4	200	
60	-2A				↓		
61	-2AD					↓	
62	-3A						
63	-3A+						
64	-4A						
65	-5A						
66	-5AD						
67	-6A						
68	-6A+						
69	-7A				↓	↓	
70	19286-1BH				4	520	
71	-2BH					480	
72	-2BHD					↓	
73	-3BH					500	
74	-3BH+					↓	
75	-4BH					540	
76	-5BH					510	
77	-5BHD					↓	
78	-6BH					540	
79	-6BH+					↓	
80	-7BH				↓	200	
81	18365-3QC				.1	10	
82	19281-1A				4	200	
83	-2A				↓	↓	
84	-2AD						
85	-3A						
86	-3A+						
87	-4A						
88	-5A						
89	-6A				↓	↓	

Sent to 19284

elementOne **MERCURY BATCH DIGESTION - RUN WORKSHEET**

Date Prepared/Digested: 9-13-12 Prep By: LAL/KLS SIF File #: 091312-2
Block #1 Temperature: 110 Start Time: 8:00 Machine ID: 1
Block #2 Temperature: ↓ Stop Time: 10:15 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 #: 7205419
2	0.004 ug	0.01ml		40	40	Working Standard
3	0.04 ug	0.10ml		40	40	Lot #: 091012-1 by: LAL
4	0.08 ug	0.20ml		40	40	Standard #2 (QC #2):
5	0.16 ug	0.40ml		40	40	Lot #: 091012-2
6	0.20ug	0.50ml		40	40	Standard #3 (QC #3):
						Lot #: 091012-3
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: KLS

Submitted for Review By
Initial Review By: LAL Date: 9-13-12 Time: 2:19
Final QC Review By: DRW Date: 9/14/12 Time: 8:46
Comments: 19285-5CD@4mL, 19286-6C+@4mL, 19286-5CD @4mL

A/S	LAB #	Client	Wt/FV	Ali Used	ml used	Sample Vol, ml	Spike µg
9	19285-14BH				4	560	
10	14BHD				↓	↓	
11	-1C				4	400	
12	-2C						
13	-2C dup						
14	-3C						
15	-3C+						
16	-4C						
17	-5C						
18	-5C dup						
19	-6C				↓	↓	

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 #* 111122 *HCl Lot #:* 911111

Persulfate Lot # 083012-2 *$KMnO_4$ Lot #* 081712-4 *Hydrox Lot#:* 083012-3

Clear samples after digestion with 3.2ml of Hydroxylamine solution.

Element One, Inc form 128-Revision 7.0 Page 1 of 3

elementOne **MERCURY BATCH DIGESTION - RUN WORKSHEET**

SIF File #: 091312-2

A/S	LAB #	Client	Wt/FV	Ali Used	ml used	Sample Vol, ml	Spike µg
20	9285-6C+				4	400	
21	-7C						
22	-8C						
23	-8C dup						
24	-9C						
25	-9C +						
26	-10C						
27	-11C						
28	-11C dup						
29	-12C						
30	-12C +						
31	-13C						
32	-14C						
33	-14C dup						
34	-15C						
35	-15C +						
36	-16C						
37	-17C						
38	-17C dup						
39	-18C						
40	-18C spk						
41	-19C						
42	-20C						
43	9286-1C						
44	-2C						
45	-2C dup						
46	-3C						
47	-3C +						
48	-4C						
49	-5C						
50	-5C dup						
51	-6C						
52	-6C +						
53	-7C				↓	↓	
✓ 54	9297-1				40	1	

Element One, Inc form 128-Revision 7.0 Page 2 of 3

elementOne **MERCURY BATCH DIGESTION - RUN WORKSHEET**

SIF File #: 091312-2

A/S	LAB #	Client	Wt/FV	Ali Used	ml used	Sample Vol, ml	Spike µg
✓ 55	19297-1 +				40	1	
56	18365-3 QC				.1	10	
57	19281 LCS FH				4	100	
58	LRB + FH				1.6		
59	19281-1 FH				4		
60	-2FH						
61	-2 FHD						
62	-3 FH						
63	-3 FHT						
64	-4 FH						
65	-5FH						
66	-6FH				↓	↓	
67							
68							
69							
70							
71							
72							
73							
74							
75							
76							
77							
78							
79							
80							
81							
82							
83							
84							
85							
86							
87							
88							
89							

Element One, Inc form 128-Revision 7.0 Page 3 of 3

saved under 19274

elementOne **MERCURY BATCH DIGESTION - RUN WORKSHEET**

Date Prepared/Digested: 091212 Prep By: LAL/KBS SIF File #: 091312-1
Block #1 Temperature: 110 Start Time: 5:30 Machine ID: 2
Block #2 Temperature: ↓ Stop Time: 7:45 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 #: 4205419
2	0.004 ug	0.01ml		40	40	Working Standard
3	0.04 ug	0.10ml		40	40	Lot #: 091012-1 by: LAL
4	0.08 ug	0.20ml		40	40	Standard #2 (QC #2):
5	0.16 ug	0.40ml		40	40	Lot #: 091012-2
6	0.20ug	0.50ml		40	40	Standard #3 (QC #3):
						Lot #: 091012-3
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
Initial Review By: LAL Date: 9.13.12 Time: 1:38
Final QC Review By: DBL Date: 9/14/12 Time: 9:15
Comments: 19285-2BHD @ 4mL, 19285-6BHD @ 4mL, 19273-9+@ 20mL
19291-8HD+ @ 2mL, 19291-1BD+@.5mL, 19286-5BD @ 4mL

A/S	LAB #	Client	Wt/FV	Ali Used	ml used	Sample Vol, ml	Spike µg
✓ 9	19294-1				20	1	
✓ 10	19277-3				10	1	
11	-3+				↓	↓	
12	19285-1FH				.1	100	
13	-2FH						
14	-2FHD						
15	-3FH						
16	-3FH+						
17	-7FH						
18	-8FH						
19	-8FHD				↓	↓	

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 # ~~100~~ 111122 HCl Lot #: 911111
Persulfate Lot # 083012-2 $KMnO_4$ Lot # 081712-4 Hydrox Lot#: 083012-3

Clear samples after digestion with 3.2ml of Hydroxylamine solution.

Element One, Inc form 128-Revision 7.0 Page 1 of 4

elementOne **MERCURY BATCH DIGESTION - RUN WORKSHEET**

SIF File #: _____

A/S	LAB #	Client	Wt/FV	Ali Used	ml used	Sample Vol, ml	Spike µg
20	19285-9FH				.1	100	
21	-9FH Y				↓	↓	
22	-13FH						
23	-14FH						
24	-14FHD						
25	-15FH						
26	-15FH Y				↓	↓	
27	19285-19B				4	500	
28	-20B				↓	↓	
29	-1BH				2	540	
30	-2BH				↓	530	
31	-2BHD				↓	↓	
32	-3BH				↓	540	
33	-3BHY				↓	↓	
34	-4BH				4	690	
35	-5BH				↓	600	
36	-5BHD				↓	↓	
√37	19273(1-8)BLK				20	↓	
38	BLK				↓		
√39	19273(9-10)/245(1-10)BLK				↓		
40	19273/245 BLK				↓		
√41	19245-5				↓		
42	-6				↓		
43	-6D				↓		
44	-7				↓		
45	-7 Y				↓		
46	-8				↓		
47	-9				↓		
√48	-10				↓		
√49	19273-2				↓		
50	-2D				↓		
51	-3				↓		
52	-3H				↓		
53	-4				↓		
54	-5				8	↓	

Element One, Inc form 128-Revision 7.0 Page 2 of 4

elementOne **MERCURY BATCH DIGESTION - RUN WORKSHEET**

SIF File #: _____

A/S	LAB #	Client	W/FV	Ali Used	ml used	Sample Vol, ml	Spike µg
V 55	19273-6				20	1	
56	-6 +				↓	↓	
57	-7						
58	-8						
59	-9						
60	-9 +						
61	-10				↓	↓	
62	19291-1 BH				4	360	
63	-1 BHD				↓	↓	
64	-1 BH +				↓	↓	
65	19291-1A				4	200	
66	-1AD				↓	↓	
67	-1A+				↓	↓	
68	19291-1B				4	500	
69	-1BD				↓	↓	
70	-1B+				↓	↓	
71	19292-				40	1	
72	SPK				↓	↓	
73	19286-1B				4	500	
74	-2B				↓	↓	
75	-2BD				↓	↓	
76	-3B				↓	↓	
77	-3B+				↓	↓	
78	-4B				↓	↓	
79	-5B				↓	↓	
80	-5BD				↓	↓	
81	-6B				↓	↓	
82	-6B+				↓	↓	
83	-7B				↓	↓	
84	19281-1BH				4	820	
85	-2BH				↓	910	
86	-2BHD				↓	↓	
87	-3BH				↓	880	
88	-3BH+				↓	↓	
89	-4BH				↓	950	

Element One, Inc form 128-Revision 7.0 Page 3 of 4

elementOne **MERCURY BATCH DIGESTION - RUN WORKSHEET**

SIF File #: _____

A/S	LAB #	Client	Wt/FV	Ali Used	ml used	Sample Vol, ml	Spike µg
90	19281-5BH				4	140	
91	-6BH				↓	190	
92	19281-1B				4	500	
93	-2B						
94	-2BD						
95	-3B						
96	-3BT						
97	-4B						
98	-5B						
99	-6B				↓	↓	
100	19365-3QC				.1	10	
101	19273-1				20	1	
102							
103							
104							
105							
106							

elementOne **MERCURY BATCH DIGESTION - RUN WORKSHEET**

Date Prepared/Digested: 9.13.12 Prep By: BAN SIF File #: 091412-1
Block #1 Temperature: 110 Start Time: 5:30 Machine ID: 2
Block #2 Temperature: ↓ Stop Time: 7:45 Batch Analyst: LAC

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 #: 4205419
2	0.004 ug	0.01ml		40	40	Working Standard
3	0.04 ug	0.10ml		40	40	Lot #: 091012-1 by: LAC
4	0.08 ug	0.20ml		40	40	Standard #2 (QC #2):
5	0.16 ug	0.40ml		40	40	Lot #: 091012-2
6	0.20ug	0.50ml		40	40	Standard #3 (QC #3):
						Lot #: 091012-3
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: LAC

Submitted for Review By
Initial Review By: LAC Date: 9.14.12 Time: 12:30
Final QC Review By: DBW Date: 9114112 Time: 1248
Comments: 19273-9+ @ 10mL, 19275-4+ @ 10mL, 19291-1C Dil + @ .1mL & .05 mL

A/S	LAB #	Client	Wt/FV	Ali Used	ml used	Sample Vol. ml	Spike µg
9	19286-2BH				4	480	
10	2BHD				↓	↓	
11	-3BH				4	500	
12	-3BH+				↓	↓	
13	19285-2BH				4	490	
14	-2BHD				↓	↓	
15	-5BH				4	600	
16	-5BHD				↓	↓	
17	19273-9				20	1	
18	-9+				↓	↓	
19	19291-1BH				2	360	

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 # 111112 HCl Lot #: 911111
Persulfate Lot # 083012-2 $KMnO_4$ Lot # 081712-4 Hydrox Lot#: 083012-3

Clear samples after digestion with 3.2ml of Hydroxylamine solution.

Element One, Inc form 128-Revision 7.0 Page 1 of 43

elementOne **MERCURY BATCH DIGESTION - RUN WORKSHEET**

SIF File #: 091412-1

A/S	LAB #	Client	Wt/FV	Ali Used	ml used	Sample Vol, ml	Spike µg
20	19291-1BH				2	360	
21	-1BH+				↓	↓	
22	19291-1B				.5	500	
23	-1BD				↓	↓	
24	-1B+				↓	↓	
25	19286-5B				4	500	
26	-5BD				↓	↓	
27	19285-5C				4	400	
28	-5CD				↓	↓	
29	19286-6C				4	400	
30	-6C+				↓	↓	
31	19286-5C				4	400	
32	-5CD				↓	↓	
33	19249		.5390/50	4	.0431	1	
34	19273		.5303/50	4	.0424	1	
35	-Dup		↓	↓	↓	↓	
36	19277		.4967/50	4	.0397	↓	
37	-SPK		↓	↓	↓	↓	
38	19245/284/278 BLK				20	1	
39	BLK+				↓	↓	
40	19275 BLK						
41	BLK+						
42	19245-11						
43	-12						
44	-13						
45	-14						
46	19275-1						
47	-2						
48	-3						
49	-3D						
50	-4						
51	-4+						
52	-5						
53	-6						
54	-7				↓	↓	

Element One, Inc form 128-Revision 7.0

Page 2 of 3

elementOne **MERCURY BATCH DIGESTION - RUN WORKSHEET**

SIF File #: 0914|2-1

A/S	LAB #	Client	Wt/FV	Ali Used	ml used	Sample Vol, ml	Spike µg
55	19275-8				20	1	
56	~~BD~~	9			↓	↓	
57	19278-1						
58	-1+						
59	-2				↓	↓	
60	19284				20	1	
61	Dup				↓	↓	
62	19281-1C				4	400	
63	-2C				↓	↓	
64	-2CD						
65	-3C						
66	-3C+						
67	-4C						
68	-5C						
69	-6C				↓	↓	
70	19291-1C				4	400	
71	-1CD				↓	↓	
72	-1C+				↓	↓	
73	19291-1C				2	400	
74	-1CD				↓	↓	
75	-1C+				↓	↓	
76	18365-3 QC	TV= 10.2 ppb			.1	10	
77	19279/278/277 ~~BD~~	LCB			4 ~~2~~	1	
78	LRB+				.2↓	↓	
79	19293		.4734/50	4	~~.4734/50~~ .0378	4-1	LxL 9.14.12
80	~~BD~~ CPK		↓	↓	.0378	1	
81	~~BD~~ Dup		.4853/50	4	.0388	1	
82	19291-1C				1	400	
83	-1CD				↓	↓	
84	-1C+				↓	↓	
85							
86							
87							
88							
89							

Element One, Inc form 126-Revision 7.0 Page 3 of ~~5~~ 3

elementOne **MERCURY BATCH DIGESTION - RUN WORKSHEET**

Date Prepared/Digested: 9.17.12 Prep By: HS | PAT | LAL SIF File #: 091712-1
Block #1 Temperature: 110 Start Time: 8:30 Machine ID: HG-2 1
Block #2 Temperature: ↓ Stop Time: 10:15 Batch Analyst: LAL

A/S	Curve & QC's	0.4ug/ml working std		BV, ml	FV, ml	Standard Lot Numbers
						Standard #1 (for working std)
1	(3/ batch)	Lab BLK		40	40	Lot #: 9205419
2	0.004 ug	0.01ml		40	40	Working Standard
3	0.04 ug	0.10ml		40	40	Lot #: 091712-1 by: LAL
4	0.08 ug	0.20ml		40	40	Standard #2 (QC #2):
5	0.16 ug	0.40ml		40	40	Lot #: 091712-2
6	0.20ug	0.50ml		40	40	Standard #3 (QC #3):
						Lot #: 091712-3
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
Initial Review By: LAL Date: 9.17.12 Time: 4:00
Final QC Review By: DBL Date: 9/18/12 Time: 8:50
Comments: 19275-4T @ 5mL, 19285-3CT @ 4mL, 19276-3T @ 10mL
19276-11T @ 10mL

A/S	LAB #	Client	Wt/FV	Ali Used	ml used	Sample Vol, ml	Spike µg
9	19273-9				10	1	
10	-9 1				↓	↓	
11	19275-4				10	1	
12	-4T				↓	↓	
13	19285-7BH				4	560	
14	-13BH				4	560	
15	-14BH				4	570	
16	-14BHD				↓	↓	
17	19285-1C				4	400	
18	-3C				4	↓	
19	-3CT				↓	↓	

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 # S2055 HNO_3 Lot # 111122 HCl Lot #: 4111111

Persulfate Lot # 083012-2 $KMnO_4$ Lot # 081712-4 Hydrox Lot#: 083012-3

Clear samples after digestion with 3.2ml of Hydroxylamine solution.

elementOne **MERCURY BATCH DIGESTION - RUN WORKSHEET**

SIF File #: 091712-1

A/S	LAB #	Client	W/FV	Ali Used	ml used	Sample Vol, ml	Spike µg
20	19285-8C				4	400	
21	-8CD				↓	↓	
22	-9C				4	400	
23	-9C+				↓	↓	
24	-15C				4	400	
25	-15C+				↓	↓	
26	19286-3C				4	400	
27	-3C+				↓	↓	
28	-4C				4	400	
29	-5C						
30	-5CD				↓	↓	
31	19281-2FH				4	100	
32	-2FHD				↓	↓	
33	19285-5BH				4	600	
34	-5BHD				↓	↓	
35	19281-HFH				4	100	
36	19291-1C				.1	400	
37	-1C+				↓	↓	
38	-1C				.05	400	
39	-1C+				↓	↓	
40	19276(1-8)BLK				20	1	
41	BLK+						
42	19276(9-12)BLK						
43	BLK+						
44	19276-1						
45	-2						
46	-2D						
47	-3						
48	-3+						
49	-4						
50	-5						
51	-6						
52	-7						
53	-8						
54	-9						

Element One, Inc form 128-Revision 7.0 Page 2 of 4

elementOne **MERCURY BATCH DIGESTION - RUN WORKSHEET**

SIF File #: 091712-1

A/S	LAB #	Client	Wt/FV	Ali Used	ml used	Sample Vol, ml	Spike µg
55	19276-10				20	1	
56	-10D				↓	↓	
57	-11						
58	-12						
59	-13						
60	-14						
61	-15						
62	-16						
63	-17						
64	19286-LRBFH				4	1	
65	-LRBFH+				1.6	↓	
66	-1FH				4		
67	-2FH				↓		
68	-2FHD						
69	-3FH						
70	-3FH+						
71	-4FH						
72	-5FH						
73	-6FH						
74	-7FH						
75	19306-1BH				4	830	
76	-2BH				↓	950	
77	-2BHD					↓	
78	-3BH					900	
79	-3BH+					↓	
80	-4BH					835	
81	-5BH					590	
82	-6BH					620	
83	-7BH					880	
84	-8BH					830	
85	-9BH					205	
86	19306-1A				4	200	
87	-2A				↓	↓	
88	-2AD						
89							

Element One, Inc form 128-Revision 7.0 Page 3 of 4

elementOne **MERCURY BATCH DIGESTION - RUN WORKSHEET**

SIF File #: 091712-1

A/S	LAB #	Client	Wt/FV	Ali Used	ml used	Sample Vol, ml	Spike µg
90	19306-3A				4	200	
91	-3A+				↓	↓	
92	-4A						
93	-5A						
94	-6A						
95	-7A						
96	-8A						
97	-9A				↓	↓	
98	18365-3 QC				.1	10	
99	19291-1CD				.1	400	
100	-1CD				.05	↓	
101	~~19276-REO~~ 11	19262-11		10	~~10~~	~~1~~	1 UAL
102	~~11+~~	-11+		↓	~~↓~~	~~↓~~	↓ 9.27.12
103							
104							
105							
106							

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	9/12/2012	9:09:39	0.0010986			µg			0.0010986					
STD1=.004ug	9/12/2012	9:10:53	0.0020205			µg			0.0020205					
STD2=.04ug	9/12/2012	9:12:09	0.0127421			µg			0.0127421					
STD3=.08ug	9/12/2012	9:13:26	0.023536			µg			0.023536					
STD4=.16ug	9/12/2012	9:14:43	0.0485388			µg			0.0485388					
STD5=.2ug	9/12/2012	9:16:01	0.0590755			µg			0.0590755					
Reagent Blank	9/12/2012	9:17:47	-0.0001517	-0.000508	-0.000508	µg			-0.0000525	-0.0001758	-0.0001758	-0.000251	-0.0008402	-0.0008402
0.004ug = DL	9/12/2012	9:19:00	0.0012432	0.0041617	0.0041617	µg			0.0012432	0.0041617	0.0041617			
0.080ug = STD.2	9/12/2012	9:22:54	0.0230514	0.0771686	0.0771686	µg			0.0230514	0.0771686	0.0771686			
0.080ug = QC STD 3	9/12/2012	9:24:13	0.0228549	0.076511	0.076511	µg			0.0228549	0.076511	0.076511			
REAGENT BLANK	9/12/2012	9:25:29	-0.0000166	-0.0000557	-0.0000557	µg			-0.0000166	-0.0000557	-0.0000557			
0.004ug = DL	9/12/2012	11:53:48	0.0011655	0.0039016	0.0039016	µg	4	540	0.0011655	0.0039016	0.0039016			
0.080ug = STD.2	9/12/2012	11:56:21	0.0229746	0.0769117	0.0769117	µg	4	540	0.0229746	0.0769117	0.0769117			
REAGENT BLANK	9/12/2012	11:57:37	0.0001862	0.0006232	0.0006232	µg	4	540	0.0001862	0.0006232	0.0006232			
19281-1A	9/12/2012	12:04:28	0.0006609	0.0022123	0.1106169	µg	4	200	0.0006942	0.0023241	0.116204	0.0006275	0.0021006	0.1050299
19281-2A	9/12/2012	12:06:12	0.0005582	0.0018686	0.0934292	µg	4	200	0.0005952	0.0019926	0.0996322	0.0005211	0.0017445	0.0872262
19281-2A DUP	9/12/2012	12:07:56	0.0006305	0.0021108	0.105541	µg	4	200	0.0006674	0.0022343	0.1117173	0.0005936	0.0019873	0.0993647
19281-3A	9/12/2012	12:09:40	0.0002572	0.0008609	0.0430472	µg	4	200	0.0002941	0.0009845	0.0492233	0.0002203	0.0007374	0.0368712
19281-3A SPK	9/12/2012	12:11:24	0.0229399	0.0767954	3.839768	µg	4	200	0.0237949	0.0796577	3.982885	0.0220848	0.073933	3.696651
19281-4A	9/12/2012	12:13:10	0.000559	0.0018713	0.0935661	µg	4	200	0.0006106	0.0020442	0.1022087	0.0005074	0.0016985	0.0849235
19281-5A	9/12/2012	12:14:56	0.0003918	0.0013115	0.0655766	µg	4	200	0.0004257	0.001425	0.0712521	0.0003579	0.001198	0.0599012
0.004ug = DL	9/12/2012	12:16:10	0.0011248	0.0037654	0.0037654	µg	4	200	0.0011248	0.0037654	0.0037654			
0.080ug = STD.2	9/12/2012	12:17:26	0.0220946	0.0739657	0.0739657	µg	4	200	0.0220946	0.0739657	0.0739657			
REAGENT BLANK	9/12/2012	12:18:42	0.000102	0.0003416	0.0003416	µg	4	200	0.000102	0.0003416	0.0003416			
19281-6A	9/12/2012	12:20:28	0.0004412	0.001477	0.0738477	µg	4	200	0.0004748	0.0015895	0.079474	0.0004076	0.0013644	0.0682213
0.004ug = DL	9/12/2012	12:24:11	0.0011104	0.0037171	0.0037171	µg	4	200	0.0011104	0.0037171	0.0037171			
0.080ug = QC STD 3	9/12/2012	12:25:28	0.0243975	0.0816752	0.0816752	µg	4	200	0.0243975	0.0816752	0.0816752			
REAGENT BLANK	9/12/2012	12:26:44	0.0004297	0.0014386	0.0014386	µg	4	200	0.0004297	0.0014386	0.0014386			
Calib Blank	9/13/2012	13:19:50	0.0008069			µg	1.6	100	0.0008069					
STD1=.004ug	9/13/2012	13:21:04	0.0012499			µg	1.6	100	0.0012499					
STD2=.04ug	9/13/2012	13:22:19	0.0102916			µg	1.6	100	0.0102916					
STD3=.08ug	9/13/2012	13:23:35	0.0211611			µg	1.6	100	0.0211611					
STD4=.16ug	9/13/2012	13:24:51	0.0415337			µg	1.6	100	0.0415337					
STD5=.2ug	9/13/2012	13:26:09	0.0521189			µg	1.6	100	0.0521189					
Reagent Blank	9/13/2012	13:27:55	-0.0000067	-0.0000257	-0.0000257	µg	1.6	100	2.038E-05	7.822E-05	7.822E-05	-0.0000337	-0.0001297	-0.0001297
0.004ug = DL	9/13/2012	13:30:21	0.0010139	0.0038918	0.0038918	µg	1.6	100	0.0010139	0.0038918	0.0038918			
0.080ug = STD.2	9/13/2012	13:32:56	0.0213789	0.0820581	0.0820581	µg	1.6	100	0.0213789	0.0820581	0.0820581			
0.080ug = QC STD 3	9/13/2012	13:34:15	0.0210352	0.080739	0.080739	µg	1.6	100	0.0210352	0.080739	0.080739			
REAGENT BLANK	9/13/2012	13:35:31	-0.0000153	-0.000059	-0.000059	µg	1.6	100	-0.0000153	-0.000059	-0.000059			
19281 LRB FH	9/13/2012	13:51:09	9.371E-05	0.0003597	0.0089924	µg	4	100	0.0001583	0.0006076	0.0151899	2.912E-05	0.0001118	0.0027949
19281 LRB FH SPK	9/13/2012	13:52:55	0.0206758	0.0793596	4.9599762	µg	1.6	100	0.0216039	0.0829218	5.1826109	0.0197478	0.0757975	4.7373414
0.004ug = DL	9/13/2012	13:55:22	0.0010122	0.0038852	0.0038852	µg	1.6	100	0.0010122	0.0038852	0.0038852			
0.080ug = STD.2	9/13/2012	13:56:38	0.0208761	0.0801285	0.0801285	µg	1.6	100	0.0208761	0.0801285	0.0801285			
REAGENT BLANK	9/13/2012	13:57:54	-0.000032	-0.000123	-0.000123	µg	1.6	100	-0.000032	-0.000123	-0.000123			
19281-1 FH	9/13/2012	13:59:40	0.0004975	0.0019094	0.0477355	µg	4	100	0.00059	0.0022644	0.05661	0.000405	0.0015544	0.0388611
19281-3 FH	9/13/2012	14:05:22	0.000724	0.0027788	0.069469	µg	4	100	0.0007528	0.0028893	0.0722327	0.0006952	0.0026682	0.0667053
19281-3 FH SPK	9/13/2012	14:07:07	0.0232113	0.0890914	2.2272847	µg	4	100	0.0241941	0.0928638	2.321596	0.0222284	0.0853189	2.1329735
19281-5 FH	9/13/2012	14:10:31	0.0002268	0.0008704	0.0217612	µg	4	100	0.0002799	0.0010744	0.0268612	0.0001736	0.0006665	0.0166613
19281-6 FH	9/13/2012	14:12:14	0.0002877	0.0011041	0.0276021	µg	4	100	0.0003558	0.0013657	0.0341427	0.0002195	0.0008425	0.0210615
0.004ug = DL	9/13/2012	14:14:40	0.0010137	0.003891	0.003891	µg	4	100	0.0010137	0.003891	0.003891			
0.080ug = QC STD 3	9/13/2012	14:15:57	0.0205099	0.0787228	0.0787228	µg	4	100	0.0205099	0.0787228	0.0787228			
REAGENT BLANK	9/13/2012	14:17:13	0.0000122	4.686E-05	4.686E-05	µg	4	100	0.0000122	4.686E-05	4.686E-05			
Calib Blank	9/13/2012	9:38:04	0.0010791			µg			0.0010791					
STD1=.004ug	9/13/2012	9:39:19	0.0007031			µg			0.0007031					
STD2=.04ug	9/13/2012	9:40:35	0.0093337			µg			0.0093337					
STD3=.08ug	9/13/2012	9:41:52	0.0192564			µg			0.0192564					
STD4=.16ug	9/13/2012	9:43:10	0.038178			µg			0.038178					
STD5=.2ug	9/13/2012	9:44:29	0.0496305			µg			0.0496305					
Reagent Blank	9/13/2012	9:46:17	5.283E-05	0.0002166	0.0002166	µg			7.002E-05	0.0002871	0.0002871	3.564E-05	0.0001461	0.0001461
0.004ug = DL	9/13/2012	9:47:31	0.000997	0.0040871	0.0040871	µg			0.000997	0.0040871	0.0040871			
0.080ug = STD.2	9/13/2012	9:48:48	0.0200999	0.0823945	0.0823945	µg			0.0200999	0.0823945	0.0823945			
0.080ug = QC STD 3	9/13/2012	9:52:42	0.0209325	0.0858073	0.0858073	µg			0.0209325	0.0858073	0.0858073			
REAGENT BLANK	9/13/2012	9:53:59	-0.0000434	-0.000178	-0.000178	µg			-0.0000434	-0.000178	-0.000178			
0.004ug = DL	9/13/2012	12:26:18	0.0010094	0.004138	0.004138	µg	4	500	0.0010094	0.004138	0.004138			
0.080ug = STD.2	9/13/2012	12:27:34	0.0213456	0.087501	0.087501	µg	4	500	0.0213456	0.087501	0.087501			
REAGENT BLANK	9/13/2012	12:28:51	5.933E-05	0.0002432	0.0002432	µg	4	500	5.933E-05	0.0002432	0.0002432			
19281 - 1 BH	9/13/2012	12:39:24	0.0094334	0.0386697	7.9272872	µg	4	820	0.0094293	0.0386528	7.9238283	0.0094375	0.0386866	7.930746
19281 - 2 BH	9/13/2012	12:41:10	0.0123553	0.0506474	11.522288	µg	4	910	0.0123749	0.0507278	11.540568	0.0123357	0.0505671	11.504008
19281 - 2 BH DUP	9/13/2012	12:42:58	0.0143678	0.0588971	13.399089	µg	4	910	0.0144395	0.059191	13.465953	0.0142961	0.0586032	13.332226
19281 - 3 BH	9/13/2012	12:44:46	0.0109629	0.0449395	9.8866933	µg	4	880	0.0109433	0.0448592	9.8690269	0.0109825	0.0450198	9.9043597
19281 - 3 BH SPK	9/13/2012	12:46:34	0.0305102	0.1250689	27.515149	µg	4	880	0.0306337	0.1255748	27.626447	0.0303868	0.124563	27.403851
0.004ug = DL	9/13/2012	12:47:50	0.0010543	0.004322	0.004322	µg	4	880	0.0010543	0.004322	0.004322			
0.080ug = STD.2	9/13/2012	12:49:07	0.0208942	0.0856505	0.0856505	µg	4	880	0.0208942	0.0856505	0.0856505			
REAGENT BLANK	9/13/2012	12:50:24	8.648E-05	0.0003545	0.0003545	µg	4	880	8.648E-05	0.0003545	0.0003545			
19281 - 4 BH	9/13/2012	12:52:12	0.0084627	0.0346908	8.2390567	µg	4	950	0.0084546	0.0346573	8.2311075	0.0084709	0.0347242	8.2470058
19281 - 5 BH	9/13/2012	12:54:00	0.0004334	0.0017765	0.0621782	µg	4	140	0.0004346	0.0017814	0.062348	0.0004322	0.0017717	0.0620083
19281 - 6 BH	9/13/2012	12:55:50	0.0003985	0.0016336	0.0775972	µg	4	190	0.0004179	0.0017132	0.0813785	0.0003791	0.001554	0.0738158
19281 - 1 B	9/13/2012	12:57:37	-0.0002585	-0.0010598	-0.1324839	µg	4	500	-0.0009581	-0.0039278	-0.4909763	0.0004411	0.0018081	0.2260084

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
19281 - 2 B	9/13/2012	12:59:21	0.0002825	0.001158	0.1447469	µg	4	500	0.0002746	0.0011255	0.1406936	0.0002904	0.0011904	0.1488001
19281 - 2 DUP	9/13/2012	13:01:06	0.0002205	0.0009041	0.1130099	µg	4	500	0.0002142	0.0008781	0.1097643	0.0002269	0.00093	0.1162555
19281 - 3 B	9/13/2012	13:02:52	0.0001457	0.0005975	0.0746817	µg	4	500	0.0001473	0.0006038	0.0754716	0.0001442	0.0005911	0.0738919
19281 - 3 B SPK	9/13/2012	13:04:41	0.0216158	0.0886083	11.076041	µg	4	500	0.0216668	0.0888176	11.102197	0.0215647	0.0883991	11.049885
19281 - 4 B	9/13/2012	13:06:26	2.121E-05	8.697E-05	0.0108725	µg	4	500	4.057E-05	0.0001663	0.0207884	1.86E-06	7.65E-06	0.0009566
19281 - 5 B	9/13/2012	13:08:12	0.0002258	0.0009258	0.1157207	µg	4	500	0.0002424	0.0009935	0.1241876	0.0002093	0.000858	0.1072539
0.004ug = DL	9/13/2012	13:09:26	0.0009525	0.0039046	0.0039046	µg	4	500	0.0009525	0.0039046	0.0039046			
0.080ug = STD.2	9/13/2012	13:10:43	0.0207131	0.0849078	0.0849078	µg	4	500	0.0207131	0.0849078	0.0849078			
REAGENT BLANK	9/13/2012	13:12:00	5.231E-05	0.0002145	0.0002145	µg	4	500	5.231E-05	0.0002145	0.0002145			
19281 - 6 B	9/13/2012	13:13:47	2.503E-05	0.0001026	0.012827	µg	4	500	4.209E-05	0.0001725	0.0215682	7.97E-06	3.268E-05	0.0040857
0.004ug = DL	9/13/2012	13:18:01	0.0008777	0.0035977	0.0035977	µg	0.1	10	0.0008777	0.0035977	0.0035977			
0.080ug = QC STD 3	9/13/2012	13:20:38	0.020436	0.0837723	0.0837723	µg	0.1	10	0.020436	0.0837723	0.0837723			
REAGENT BLANK	9/13/2012	13:22:16	3.054E-05	0.0001252	0.0001252	µg	0.1	10	3.054E-05	0.0001252	0.0001252			
Calib Blank	9/14/2012	8:52:10	0.0007489			µg			0.0007489					
STD1=.004ug	9/14/2012	8:53:25	0.0008993			µg			0.0008993					
STD2=.04ug	9/14/2012	8:54:41	0.0114725			µg			0.0114725					
STD3=.08ug	9/14/2012	8:55:58	0.0229678			µg			0.0229678					
STD4=.16ug	9/14/2012	8:57:15	0.0445202			µg			0.0445202					
STD5=.2ug	9/14/2012	8:58:35	0.056649			µg			0.056649					
Reagent Blank	9/14/2012	9:00:23	9.994E-05	0.0003545	0.0003545	µg			6.488E-05	0.0002301	0.0002301	0.000135	0.0004789	0.0004789
0.004ug = DL	9/14/2012	9:01:37	0.0011258	0.003993	0.003993	µg			0.0011258	0.003993	0.003993			
0.080ug = STD.2	9/14/2012	9:02:54	0.0222212	0.078815	0.078815	µg			0.0222212	0.078815	0.078815			
0.080ug = QC STD 3	9/14/2012	9:04:14	0.0232676	0.0825267	0.0825267	µg			0.0232676	0.0825267	0.0825267			
REAGENT BLANK	9/14/2012	9:05:31	8.722E-05	0.0003094	0.0003094	µg			8.722E-05	0.0003094	0.0003094			
0.004ug = DL	9/14/2012	10:54:17	0.0011421	0.004051	0.004051	µg	20	1	0.0011421	0.004051	0.004051			
0.080ug = STD.2	9/14/2012	10:55:34	0.0216736	0.0768728	0.0768728	µg	20	1	0.0216736	0.0768728	0.0768728			
REAGENT BLANK	9/14/2012	10:56:51	8.558E-05	0.0003036	0.0003036	µg	20	1	8.558E-05	0.0003036	0.0003036			
19281-1c	9/14/2012	11:04:09	0.0008441	0.0029939	0.2993888	µg	4	400	0.0008515	0.0030201	0.3020095	0.0008367	0.0029677	0.2967681
19281-2c	9/14/2012	11:05:56	0.0004976	0.0017651	0.1765086	µg	4	400	0.0005102	0.0018097	0.1809669	0.0004851	0.0017205	0.1720503
19281-2c dup	9/14/2012	11:07:40	0.0004729	0.0016774	0.1677408	µg	4	400	0.0004694	0.0016649	0.1664934	0.0004764	0.0016899	0.1689882
19281-3c	9/14/2012	11:09:25	0.0009124	0.0032362	0.3236205	µg	4	400	0.0008971	0.0031818	0.3181806	0.0009278	0.0032906	0.3290605
19281-3c spk	9/14/2012	11:11:10	0.0218176	0.0773835	7.738349	µg	4	400	0.0217958	0.0773063	7.7306335	0.0218393	0.0774606	7.7460644
19281-4c	9/14/2012	11:12:56	0.0007284	0.0025836	0.2583574	µg	4	400	0.000725	0.0025713	0.2571333	0.0007319	0.0025958	0.2595815
19281-5c	9/14/2012	11:14:42	2.123E-05	7.531E-05	0.0075315	µg	4	400	7.74E-06	2.748E-05	0.0027482	3.472E-05	0.0001231	0.0123149
0.004ug = DL	9/14/2012	11:15:56	0.0010308	0.0036563	0.0036563	µg	4	400	0.0010308	0.0036563	0.0036563			
0.080ug = STD.2	9/14/2012	11:17:13	0.0219152	0.07773	0.07773	µg	4	400	0.0219152	0.07773	0.07773			
REAGENT BLANK	9/14/2012	11:18:30	6.51E-06	2.311E-05	2.311E-05	µg	4	400	6.51E-06	2.311E-05	2.311E-05			
19281-6c	9/14/2012	11:20:16	0.0004183	0.0014838	0.1483758	µg	4	400	0.0004133	0.0014658	0.1465824	0.0004234	0.0015017	0.1501693
0.004ug = DL	9/14/2012	11:38:58	0.0010112	0.0035866	0.0035866	µg	0.2	1	0.0010112	0.0035866	0.0035866			
0.080ug = QC STD 3	9/14/2012	11:40:15	0.0233261	0.0827342	0.0827342	µg	0.2	1	0.0233261	0.0827342	0.0827342			
REAGENT BLANK	9/14/2012	11:41:32	4.973E-05	0.0001764	0.0001764	µg	0.2	1	4.973E-05	0.0001764	0.0001764			
Calib Blank	9/17/2012	11:23:38	0.0007452			µg			0.0007452					
STD1=.004ug	9/17/2012	11:24:51	0.001429			µg			0.001429					
STD2=.04ug	9/17/2012	11:26:05	0.0113972			µg			0.0113972					
STD3=.08ug	9/17/2012	11:27:22	0.0227259			µg			0.0227259					
STD4=.16ug	9/17/2012	11:28:37	0.0445077			µg			0.0445077					
STD5=.2ug	9/17/2012	11:29:56	0.05612			µg			0.05612					
Reagent Blank	9/17/2012	11:31:41	-0.0000505	-0.0001802	-0.0001802	µg			-0.0000415	-0.0001482	-0.0001482	-0.0000594	-0.0002122	-0.0002122
0.004ug = DL	9/17/2012	11:35:20	0.0011742	0.0041909	0.0041909	µg			0.0011742	0.0041909	0.0041909			
0.080ug = STD.2	9/17/2012	11:36:36	0.0214787	0.0766589	0.0766589	µg			0.0214787	0.0766589	0.0766589			
0.080ug = QC STD 3	9/17/2012	11:37:55	0.0219034	0.0781746	0.0781746	µg			0.0219034	0.0781746	0.0781746			
REAGENT BLANK	9/17/2012	11:39:11	-0.0000152	-0.0000543	-0.0000543	µg			-0.0000152	-0.0000543	-0.0000543			
0.004ug = DL	9/17/2012	12:19:31	0.0010856	0.0038746	0.0038746	µg	4	400	0.0010856	0.0038746	0.0038746			
0.080ug = STD.2	9/17/2012	12:20:48	0.0203811	0.0727415	0.0727415	µg	4	400	0.0203811	0.0727415	0.0727415			
REAGENT BLANK	9/17/2012	12:22:04	-0.0000818	-0.000292	-0.000292	µg	4	400	-0.0000818	-0.000292	-0.000292			
19281-2fh	9/17/2012	12:27:29	0.000783	0.0027947	0.0698665	µg	4	100	0.0007883	0.0028136	0.0703391	0.0007777	0.0027758	0.069394
19281-2fh dup	9/17/2012	12:29:14	0.0007944	0.0028352	0.0708811	µg	4	100	0.0007857	0.0028043	0.0701063	0.0008031	0.0028662	0.0716559
19281-4fh	9/17/2012	12:34:22	0.0014522	0.0051828	0.1295711	µg	4	100	0.00147	0.0052466	0.1311644	0.0014343	0.0051191	0.1279778
0.004ug = DL	9/17/2012	12:40:48	0.0011451	0.0040868	0.0040868	µg	0.1	400	0.0011451	0.0040868	0.0040868			
0.080ug = STD.2	9/17/2012	12:42:05	0.0205482	0.0733379	0.0733379	µg	0.1	400	0.0205482	0.0733379	0.0733379			
REAGENT BLANK	9/17/2012	12:43:21	-0.0000346	-0.0001237	-0.0001237	µg	0.1	400	-0.0000346	-0.0001237	-0.0001237			

End of Appendix

PLANT DATA

H

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: MR

Date: 10/10/12

CleanAir.

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

UNIT #2

Date	Test	Method #	Run #	Steam (klb/hr)	Run Length (hr)	Trash Processed (tons)
9/5/2012	Mercury	29	1	184.3	2.23	79.0
9/6/2012	Mercury	29	2	184.6	2.18	77.4
9/6/2012	Mercury	29	3	183.2	2.20	77.5
9/6/2012	Mercury	29	4	183.9	2.20	77.8

Wheelabrator
NORTH BROWARD
Emission Test Log

Date: 09/05/12
Start Time: 12:55
End Time: 15:09

	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		530.11	319.27	49.18	39.36	9.82	18.85	289.99	6.68	-11.69
Unit 2	29 run 1	493.88	319.77	46.10	39.63	6.47	19.99	296.85	6.46	-11.20
Unit 3		520.25	319.72	39.70	34.12	5.58	23.19	308.64	6.61	-8.48

	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	186.77	887.32	829.93	81.52	0.50	261.08	1189.89	11.31	183.99
Unit 2	190.70	889.57	828.68	87.80	-0.10	269.75	1257.25	11.43	184.27
Unit 3	188.47	891.59	828.53	79.57	-0.09	280.61	1168.83	10.67	184.80

U1 lime (#/hr)	468.59	
U2 lime (#/hr)	308.72	
U3 lime (#/hr)	266.36	
Specific Gravity	1.076	
Round Down	1.070	0.732
Round Up	1.080	0.833

Wheelabrator
NORTH BROWARD
Emission Test Log

Date: 09/06/12
Start Time: 7:35
End Time: 9:46

	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		528.68	319.97	51.39	42.31	9.08	17.45	304.22	6.78	-12.19
Unit 2	29 run 2	497.11	326.55	49.80	43.76	6.04	18.00	305.05	6.76	-12.06
Unit 3		522.96	320.03	41.45	35.30	6.15	21.60	308.15	6.66	-8.69

	FEED H2O FLOW	SH OUT STM PRESS	FINAL STM TEMP	TOT AIR FLOW	FURNACE DRAFT	ECONO OUT TEMP	SH ROLL AVG	SNCR CHEM FLOW	STEAM FLOW
	KLBs/hr	DEG F	DEG F	KSCFM	" H2O	DEG F	DEG F	GPH	KLBs/hr
Unit 1	187.22	887.45	830.85	83.28	0.51	260.46	1205.91	9.90	184.39
Unit 2	191.50	889.99	832.26	89.11	-0.08	269.44	1255.24	12.23	184.64
Unit 3	189.29	892.04	837.69	80.22	-0.09	280.34	1179.70	9.24	184.31

U1 lime (#/hr)	443.75	
U2 lime (#/hr)	295.02	
U3 lime (#/hr)	300.58	
Specific Gravity	1.078	
Round Down	1.070	0.732
Round Up	1.080	0.833

Wheelabrator
NORTH BROWARD
Emission Test Log

Date: 09/06/12
Start Time: 10:12
End Time: 12:24

	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		514.53	320.90	46.80	36.87	9.92	19.47	303.19	6.67	-11.46
Unit 2	29 run 3	496.12	323.53	48.75	42.59	6.16	18.73	301.30	6.73	-11.84
Unit 3		516.34	320.00	40.29	32.42	7.87	22.54	308.39	6.68	-8.66

	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	186.54	886.99	831.80	82.96	0.50	260.23	1181.58	10.09	183.65
Unit 2	189.74	889.11	830.17	88.11	-0.10	268.91	1267.53	13.21	183.18
Unit 3	188.17	891.26	836.73	80.27	-0.08	279.88	1153.40	8.59	183.33

U1 lime (#/hr)	480.65	
U2 lime (#/hr)	298.42	
U3 lime (#/hr)	381.13	
Specific Gravity	1.077	
Round Down	1.070	0.732
Round Up	1.080	0.833

Wheelabrator
NORTH BROWARD
Emission Test Log

Date: 09/06/12
Start Time: 12:45
End Time: 14:57

	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		525.92	321.06	52.00	42.12	9.88	16.15	305.02	6.83	-12.39
Unit 2	29 run 4	492.91	323.20	49.85	39.46	10.39	16.80	303.71	6.60	-11.70
Unit 3		516.69	319.97	41.86	34.68	7.19	20.04	308.33	6.70	-9.21

	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	185.56	886.76	825.92	86.16	0.51	260.43	1182.25	7.40	183.47
Unit 2	190.76	889.33	830.10	85.51	-0.09	269.17	1250.08	11.52	183.94
Unit 3	188.20	891.34	831.77	84.06	-0.09	280.13	1155.60	6.80	183.85

U1 lime (#/hr)	510.87	
U2 lime (#/hr)	537.18	
U3 lime (#/hr)	371.62	
Specific Gravity	1.083	
Round Down	1.080	0.833
Round Up	1.090	0.941

This Page Intentionally Left Blank