Wheelabrator North Broward
A Waste Management Company
2600 Wiles Road
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January 17, 2014

CERTIFIED MAIL #70051160000234573426

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

Re: Wheelabrator North Broward
F.A.C. 62-296.416 Quarterly Mercury Stack Testing
Fourth Quarter of 2013, Report Submittal

Dear Mr. Lurix:

As required by F.A.C. 62-296.416, please find enclosed the 2013 fourth quarter report on mercury stack testing which was conducted on Unit #1.

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

If there are any questions, please contact this office at (954) 971-8701.

Sincerely,

Jim Epsilantis

Jim Epsilantis
Plant Manager

cc: USEPA, Region IV, Pesticides and Toxics Management Division, Air & EPCRA Enforcement Branch, Air Enforcement Section CERTIFIED MAIL #70051160000234573396
FDEP, Tallahassee, Bureau of Air Regulation, New Source Review Section, CERTIFIED MAIL #70051160000234573402
Broward County Department of Planning and Environmental Protection, Air Quality Division CERTIFIED MAIL #70051160000234573419
Chuck Faller (with)
Rob French – MPI - (with)
Ram Tewari – BCWRS (without)

WM
WASTE MANAGEMENT

CleanAir.

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

REPORT ON MERCURY TESTING

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

Client Reference No: Service Agreement
CleanAir Project No: 12218-7
Revision 0: January 15, 2014

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
Senior Project Manager
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Reviewed by,

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REVISION HISTORY

REPORT ON MERCURY TESTING

DRAFT REPORT REVISION HISTORY

Revision:	Date	Pages	Comments
D0a	01/10/14	All	Draft version of original document.

FINAL REPORT REVISION HISTORY

Revision:	Date	Pages	Comments
0	01/15/14	All	Final version of original document.

CONTENTS

PROJECT OVERVIEW

INTRODUCTION

Wheelabrator North Broward, Inc. operates a refuse-to-energy facility, located in Pompano Beach, Florida. The facility's emission levels are regulated by the Florida Department of Environmental Protection (DEP). Wheelabrator North Broward contracted Clean Air Engineering (CleanAir) to perform a compliance test program at its municipal waste combustor (MWC) facility in Pompano Beach, Florida. Testing was conducted in accordance with 40 CFR 60, Subpart Cb, and applicable sections of PSD-FL-112(B) and PA86-22. The sampling was conducted at the Unit 1 Fabric Filter (FF) Outlet on December 10 and 11, 2013.

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

Key Project Participants

Individuals responsible for coordinating and conducting the test program were:

C. Faller – Wheelabrator North Broward, Inc.
D. Dreska – 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 1 FF Outlet	USEPA Method 29	Mercury	12/10/13	12:24	14:34
2	Unit 1 FF Outlet	USEPA Method 29	Mercury	12/11/13	08:09	10:21
3	Unit 1 FF Outlet	USEPA Method 29	Mercury	12/11/13	10:42	12:54
4	Unit 1 FF Outlet	USEPA Method 29	Mercury	12/11/13	13:14	15:25

Results Summary

Table 1-2 summarizes the results of the test program. A more detailed presentation of the test conditions and results of analysis are shown in Tables 2-1 and 2-2 on pages 2-1 and 2-2.

Table 1-2:
Summary of Test Results

Source Constituent	Sampling Method	Average Emission	Permit Limit[1]
Unit 1 FF Outlet			
Mercury (µg/dscm @7% O_2)	EPA M29	6.6	50

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

During the compliance testing, Unit 1 was operated within 10% of the 186,000 lb/hr maximum steam flow rating. The Unit 3 boiler and air pollution control equipment are in a well-maintained operating condition. Normal operating parameters for the fabric filters are a pressure drop of 2 to 7 inches of water and scrubber dilution water flow varies from 0 to 40 gallons per minute (gpm). The equipment operated within these ranges during compliance testing. Table 2-1 on the following page presents the boiler's steam output for every test run.

Four Method 29 test runs for mercury were performed at the Unit 1 FF Outlet, and all four runs were averaged to determine compliance with the permit limit. An audit sample was shipped and analyzed, along with the test run samples. The analytical results of the audit sample passed all requirements and are presented in Appendix G.

End of Section 1 – Project Overview

RESULTS

Table 2-1:
Unit 1 FF Outlet – Mercury

Run No.		1	2	3	4	Average
Date (2013)		Dec 10	Dec 11	Dec 11	Dec 11	
Start Time (approx.)		12:24	08:09	10:42	13:14	
Stop Time (approx.)		14:34	10:21	12:54	15:25	
Process Conditions						
R_P	Steam Production Rate - (klbs/hour)	179.5	180.1	180.2	180.4	**180.0**
P_i	Fabric Filter Inlet Temperature - (°F)	321	320	320	320	**320**
Gas Conditions						
O_2	Oxygen (dry volume %)	10.2	9.8	10.0	9.8	**10.0**
CO_2	Carbon dioxide (dry volume %)	9.0	9.2	8.8	9.0	**9.0**
T_s	Sample temperature (°F)	311	310	310	310	**310**
B_w	Actual water vapor in gas (% by volume)	22.4	22.6	23.1	22.7	**22.7**
Gas Flow Rate						
Q_a	Volumetric flow rate, actual (acfm)	202,000	198,000	207,000	208,000	**204,000**
Q_{std}	Volumetric flow rate, dry standard (dscfm)	105,000	103,000	107,000	108,000	**106,000**
Sampling Data						
V_{mstd}	Volume metered, standard (dscf)	83.54	83.24	86.38	86.61	**84.94**
%I	Isokinetic sampling (%)	98.5	100.1	100.3	99.7	**99.7**
Laboratory Data						
$m_{n\text{-}1b}$	Fraction 1B Prorated (µg)	<0.1000	<0.1000	<0.1000	<0.1000	
$m_{n\text{-}2b}$	Fraction 2B Prorated (µg)	2.3378	18.2270	16.2002	13.8613	
$m_{n\text{-}3a}$	Fraction 3A Prorated (µg)	<0.2000	<0.2000	<0.2000	<0.2000	
$m_{n\text{-}3b}$	Fraction 3B Prorated (µg)	<0.5000	<0.5000	<0.5000	<0.5000	
$m_{n\text{-}3c}$	Fraction 3C Prorated (µg)	<0.4000	<0.4000	<0.4000	<0.4000	
m_n	Total matter corrected for allowable blanks (µg)	2.3378	18.2270	16.2002	13.8613	
Mercury Results - Total						
C_{sd}	Concentration (µg/dscm)	1.0	7.7	6.6	5.7	**5.2**
C_{sd7}	Concentration @7% O_2 (µg/dscm)	1.3	9.7	8.4	7.1	**6.6**
C_{sd}	Concentration (mg/dscm)	0.0010	0.0077	0.0066	0.0057	**0.0052**
C_{sd7}	Concentration @7% O_2 (mg/dscm)	0.0013	0.0097	0.0084	0.0071	**0.0066**
$E_{lb/hr}$	Rate (lb/hr)	3.9E-04	3.0E-03	2.7E-03	2.3E-03	**2.1E-03**
E_{Fd}	Rate - Fd-based (lb/MMBtu)	1.2E-06	8.7E-06	7.6E-06	6.4E-06	**6.0E-06**

RESULTS

Table 2-2:
Quality Assurance and Quality Control

Run Number		FH Front Half	BH H_2O_2/HNO_3	A Empty Impinger	B KMnO4	C HCl
Mercury RPD RESULTS						
U1-R1		NA	1.5%	NA	NA	NA
U1-R2		NA	2.3%	NA	NA	NA
U1-R3		NA	1.3%	NA	NA	NA
U1-R4		NA	0.2%	NA	NA	NA
Field Blank		NA	NA	NA	NA	NA
Reagent Blank		NA	NA	NA	NA	NA
Mercury Sample Spike and Recovery						
U1-R3	#1	112%	90%	95%	93%	95%
	#2	114%	88%	94%	91%	93%
Blanks						
Field Blank	#1	< 0.1	< 0.3	< 0.2	< 0.5	< 0.4
	#2	< 0.1	< 0.3	< 0.2	< 0.5	< 0.4
Reagent Blank	#1	< 0.1	< 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 for the control of particulate emissions.

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

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

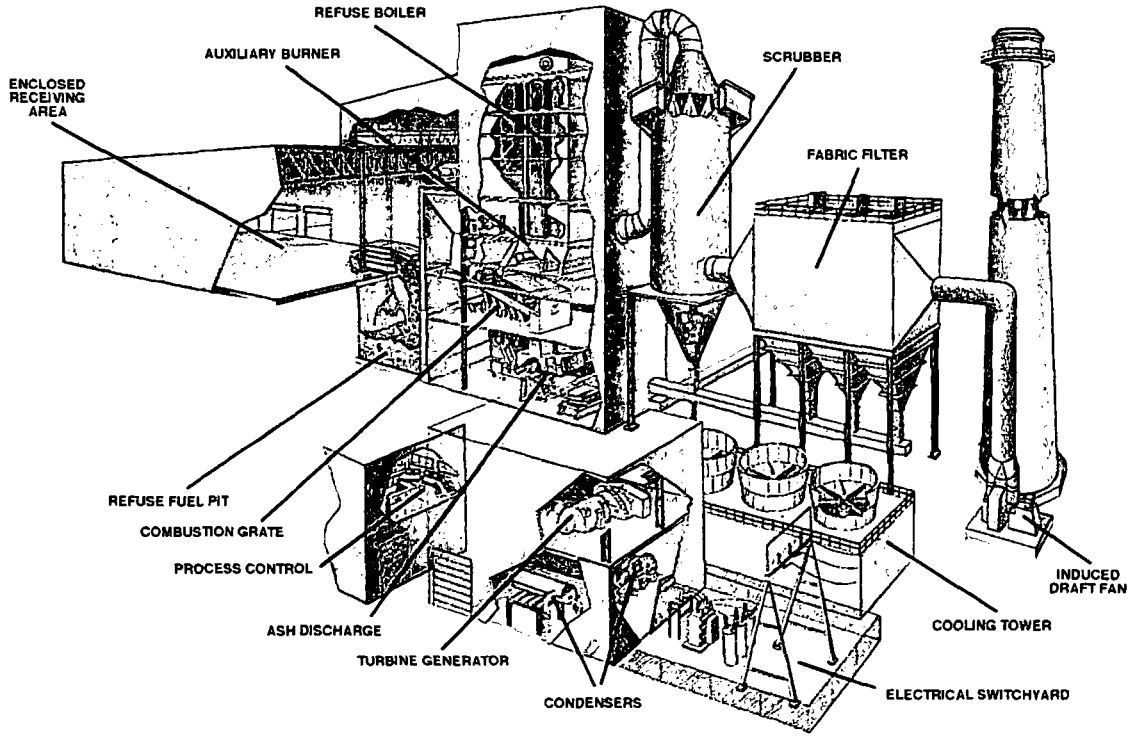


Figure 3-1: General Process Schematic

DESCRIPTION OF INSTALLATION

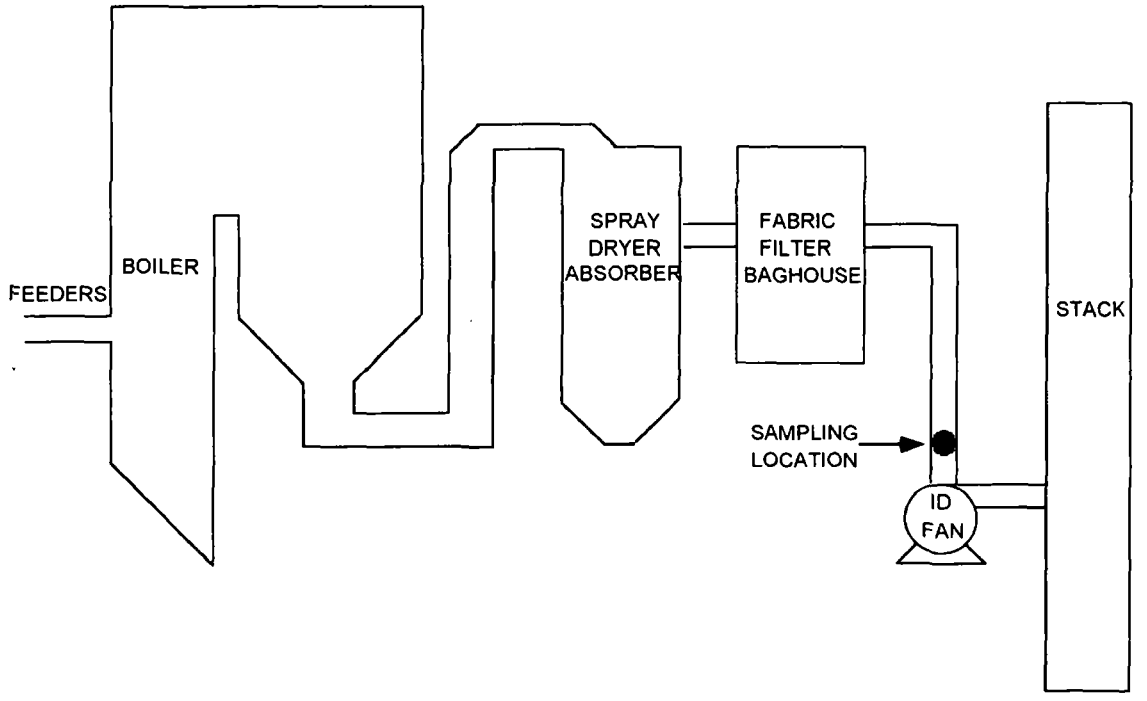


Figure 3-2: Process Schematic

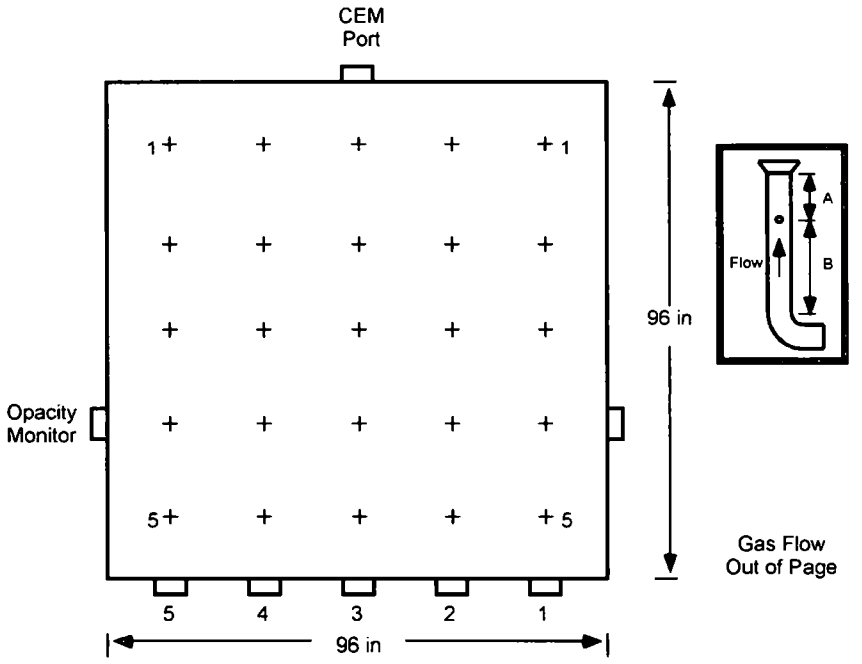
DESCRIPTION OF INSTALLATION

DESCRIPTION OF SAMPLING LOCATION

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

Table 3-1:
Sampling Points

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



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

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

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

End of Section 3 – Description of Installation

METHODOLOGY

Clean Air Engineering followed procedures as detailed in US 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 hereby certify that all pages contained within this Appendix have been reviewed and, to the best of my ability, verified as accurate.

QA/QC Initials: MK

Date: 1/15/14

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Specification Sheet for EPA Method 29

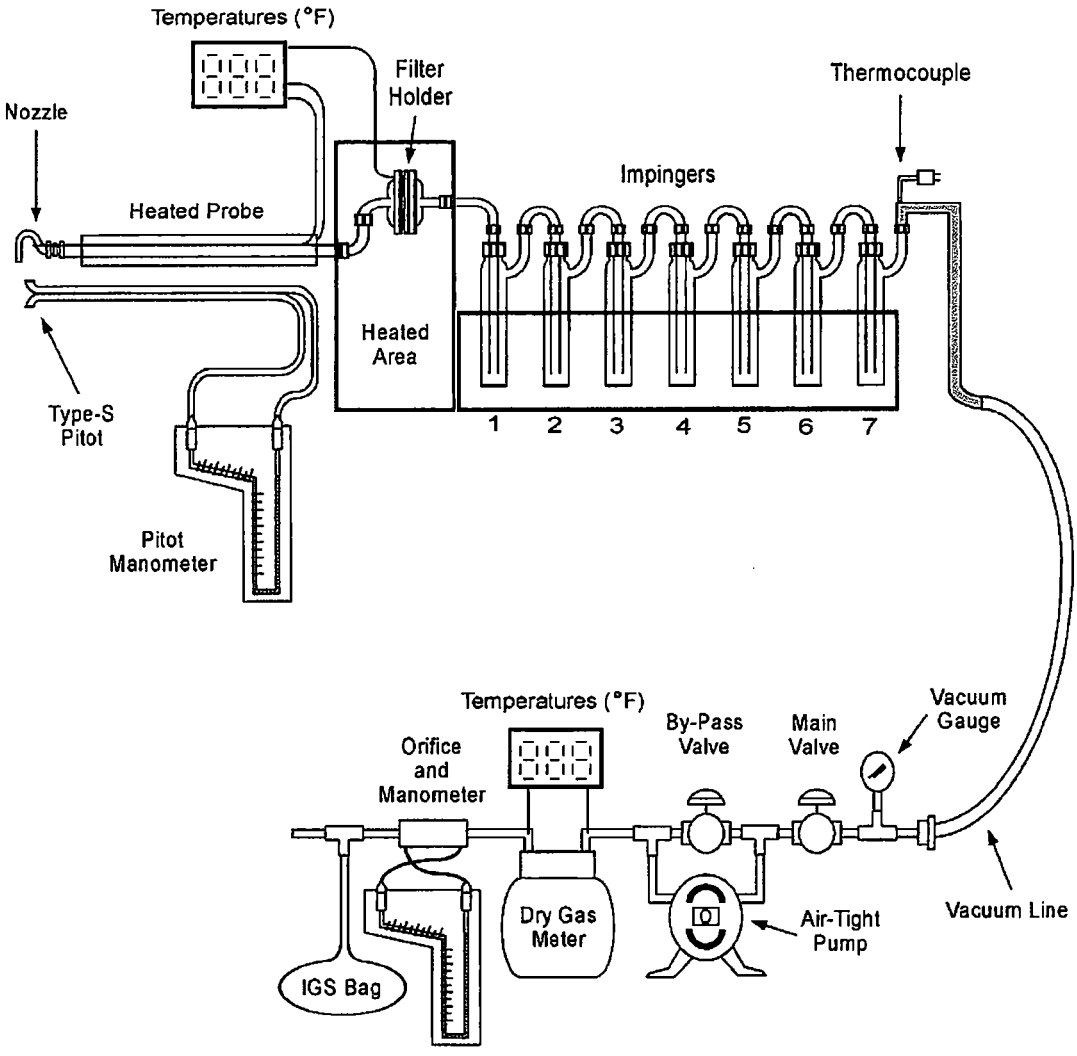
Source Location Name(s)	Unit 1 FF Outlet
Pollutant(s) to be Determined	Mercury
Other Parameters to be Determined from Train	Gas Density, Moisture, Flow Rate

	Standard Method Specification	Actual Specification Used
Pollutant Sampling Information		
Duration of Run	N/A	125 minutes
No. of Sample Traverse Points	N/A	25
Sample Time per Point	N/A	5 minutes
Sampling Rate	Isokinetic (90-110%)	Isokinetic (90-110%)
Sampling Probe		
Nozzle Material	Borosilicate or Quartz Glass	Borosilicate Glass
Nozzle Design	Button-Hook or Elbow	Button-Hook
Probe Liner Material	Borosilicate or Quartz Glass	Borosilicate Glass
Effective Probe Length	N/A	8 feet
Probe Temperature Set-Point	248°F±25°F	248°F±25°F
Velocity Measuring Equipment		
Pitot Tube Design	Type S	Type S
Pitot Tube Coefficient	N/A	0.814
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

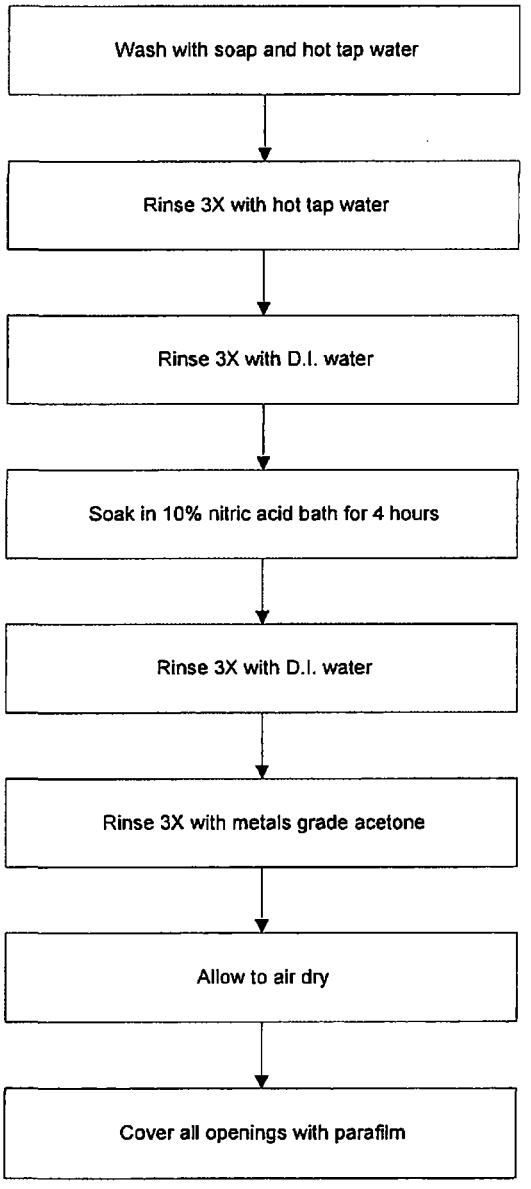
	Standard Method Specification	Actual Specification Used
Impinger Train Description		
Type of Glassware Connections	Ground Glass or Equivalent	Screw Joint with Silicone Gasket
Connection to Probe or Filter by	Direct Glass Connection	Direct Glass Connection
Number of Impingers	7	7
Impinger Stem Types		
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 HNO_3

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 HNO_3

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 HNO_3

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 HNO_3

Container 8B
Water Blank
250 ml Plastic

100 ml of water

Container 9
5%HNO_3/10%H_2O_2 Blank
500 ml Plastic

200 ml of absorbing solution

Container 10*
Permanganate Blank
500 ml Glass

100 ml $KMnO_4$ solution

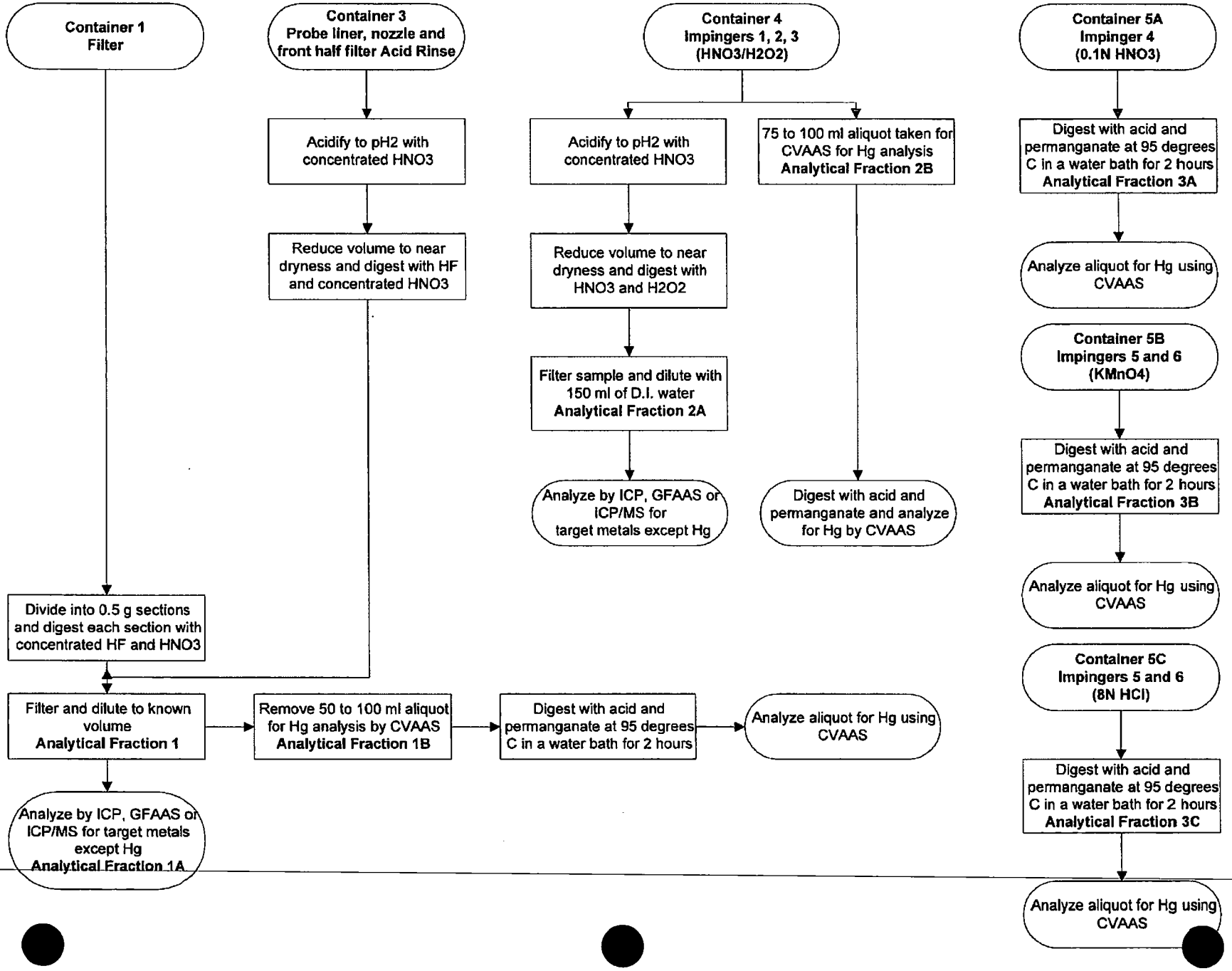
Container 11
HCl Rinse Blank
250 ml Glass

200 ml water, add 25 ml of 8N HCl. Mix well and seal

Container 12
Filter Blanks
Petri Dish

3 clean, unused filters

EPA Method 29
Analytical Flowchart
(includes Mercury)



SAMPLE CALCULATIONS

B

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

QA/QC Initials: MC

Date: 1/15/14

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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.

010314 123749
0

1. Volume of water collected (wscf)

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

Where:

V_{lc}	= total volume of liquid collected in impingers and silica gel (ml)	=	513.5	ml
0.04706	= ideal gas conversion factor (ft^3 water vapor/ml or gm)	=	0.04706	ft^3/ml
V_{wstd}	= volume of water vapor collected at standard conditions (ft^3)	=	24.17	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)	=	30.14	in. Hg
T_m	= average dry gas meter temperature (°F)	=	96.40	°F
V_m	= volume of gas sample through the dry gas meter at meter conditions (dcf)	=	86.82	dcf
Y_d	= gas meter correction factor (dimensionless)	=	1.0031	
ΔH	= average pressure drop across meter box orifice (in. H_2O)	=	1.60	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)	=	83.538	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)	=	30.14	in. Hg
P_g	= sample gas static pressure (in. H_2O)	=	-10.60	in. H_2O
13.6	= conversion factor (in. H_2O/in. Hg)	=	13.6	in. H_2O/in. Hg
P_s	= absolute sample gas pressure (in. Hg)	=	29.36	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)	=	310.60	°F
18.3036	= Antoine coefficient	=	18.3036	°K
3816.44	= Antoine coefficient	=	3816.44	°K
273.15	= temperature conversion factor	=	273.15	°K
46.13	= Antoine coefficient	=	46.13	°K
25.4	= conversion factor	=	25.4	mm Hg/in. Hg
5/9	= Fahrenheit to Celsius conversion factor	=	5/9	°C/°F
32	= temperature conversion (°F)	=	32	°F
P_v	= vapor pressure, actual (in. Hg)	=	29.36	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)	=	29.36	in. Hg
P_v	= water vapor pressure, actual (in. Hg)	=	29.36	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)	=	83.538	dscf
V_{wstd}	= volume of water collected at standard conditions (scf)	=	24.17	scf
B_{wo}	= proportion of water measured in the gas stream by volume	=	0.2244	
		=	22.44	%

7. Saturated moisture content (% by volume)

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

Where:

P_s	= absolute sample gas pressure (in. Hg)	=	29.36	in. Hg
P_v	= water vapor pressure, actual (in. Hg)	=	29.36	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	=	0.2244	
B_w	= actual water vapor in gas	=	0.2244	
		=	22.44	%

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

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

Where:

CO_2	= proportion of carbon dioxide in the gas stream by volume (%)	=	10.2	%
O_2	= proportion of oxygen in the gas stream by volume (%)	=	9.0	%
100	= conversion factor (%)	=	100	%
N_2+CO	= proportion of nitrogen and CO in the gas stream by volume (%)	=	80.80	%

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

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

Where:

M_{CO2}	= molecular weight of carbon dioxide (lb/lb·mole)	=	44.00	lb/lb·mole
M_{O2}	= molecular weight of oxygen (lb/lb·mole)	=	32.00	lb/lb·mole
M_{N2+CO}	= molecular weight of nitrogen and carbon monoxide (lb/lb·mole)	=	28.00	lb/lb·mole
CO_2	= proportion of carbon dioxide in the gas stream by volume (%)	=	10.2	%
O_2	= proportion of oxygen in the gas stream by volume (%)	=	9.0	%
N_2+CO	= proportion of nitrogen and CO in the gas stream by volume (%)	=	80.8	%
100	= conversion factor (%)	=	100	%
M_d	= dry molecular weight of sample gas (lb/lb·mole)	=	29.99	lb/lb·mole

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

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

Where:

B_w	= proportion of water vapor in the gas stream by volume	=	0.2244	
M_d	= dry molecular weight of sample gas (lb/lb·mole)	=	29.99	lb/lb·mole
M_{H2O}	= molecular weight of water (lb/lb·mole)	=	18.00	lb/lb·mole
M_s	= molecular weight of sample gas, wet basis (lb/lb·mole)	=	27.30	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	=	0.81	
M_s	= wet molecular weight of sample gas, wet basis (lb/lb·mole)	=	27.30	lb/lb·mole
P_s	= absolute sample gas pressure (in. Hg)	=	29.36	in. Hg
T_s	= average sample gas temperature (°F)	=	310.60	°F
$\sqrt{\Delta P}$	= average square roots of velocity heads of sample gas (in. H_2O)	=	0.769	$\sqrt{}$in. H_2O
460	= °F to °R conversion constant	=	460	
V_s	= sample gas velocity (ft/sec)	=	52.49	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)	=	52.49	ft/sec
60	conversion factor (sec/min)	=	60	sec/min
Q_a	= volumetric flow rate at actual conditions (acfm)	=	201,572	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)	=	201,572	acfm
P_s	= absolute sample gas pressure (in. Hg)	=	29.36	in. Hg
29.92	= standard pressure (in. Hg)	=	29.92	in. Hg
T_s	= average sample gas temperature (°F)	=	310.6	°F
68	= standard temperature (°F)	=	68	°F
460	= °F to °R conversion constant	=	460	
Q_s	= volumetric flow rate at standard conditions, wet basis (scfm)	=	135,531	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	=	0.2244	
Q_s	= volumetric flow rate at standard conditions, wet basis (scfm)	=	135,531	scfm
Q_{std}	= volumetric flow rate at standard conditions, dry basis (dscfm)	=	105,122	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)	=	105,122	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)	=	89,997	dscfm

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

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

Where

$Q_{std-min}$	= volumetric flow rate, english units (ft^3/min)	=	105,122	dscfm
60	= conversion factor (min/hr)	=	60	min/hr
Q_{std-hr}	= volumetric flow rate, hourly basis (dscf/hr)	=	6,307,325	dscf/hr

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

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

Where:

$Q_{std-english}$	= volumetric flow rate, english units (ft^3/min)	=	105,122	dscfm
35.31	= conversion factor (ft^3/m^3)	=	35.31	ft^3/m^3
60	= conversion factor (min/hr)	=	60	min/hr
$Q_{std-metric}$	= volumetric flow rate, metric units (m^3/hr)	=	178,627	dry std m^3/hr

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

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

Where:

$Q_{std-metric}$	= volumetric flow rate, metric units (dry std m^3/hr)	=	178,627	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)	=	166,448	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	=	0.2244	
P_s	= absolute sample gas pressure (in. Hg)	=	29.36	in. Hg
T_s	= average sample gas temperature (°F)	=	310.6	°F
V_{mstd}	= volume of gas sample through the dry gas meter at standard conditions (dscf)	=	83.538	dscf
V_s	= sample gas velocity (ft/sec)	=	52.49	ft/sec
θ	= total sampling time (min)	=	125	min
0.0945	= conversion constant	=	0.0945	
460	= °F to °R conversion constant	=	460	
I	= percent of isokinetic sampling (%)	=	98.70	%

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)	=	86.82	dcf
T_m	= average dry gas meter temperature (°F)	=	96.40	°F
$\Delta H_@$	= dry gas meter orifice coefficient	=	1.7992	
P_{bar}	= barometric pressure (in. Hg)	=	30.14	in. Hg
ΔH	= average pressure drop across meter box orifice (in. H_2O)	=	1.600	in. H_2O
M_d	= dry molecular weight of sample gas (lb/lb·mole)	=	29.99	lb/lb·mole
$\sqrt{\Delta H_{avg}}$	= average of square root of pressure drop across meter orifice	=	1.262	√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	=	1.0198	

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.

010314 123749
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	=	2.3378	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	=	2.3378	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	=	2.3378	µg
0.05 x $m_{total-S}$	= 5% of $m_{total-S}$	=	0.1169	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	=	2.3378	µg
$m_{T-B-allow}$	= total allowable blank correction	=	0.0000	µg
m_n	= total mercury in sample corrected for allowable blank	=	2.3378	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	=	2.3378	µg
m_{1b-S}	= mercury amount in sample for Fraction 1b	=	<0.1000	µg
m_{2b-S}	= mercury amount in sample for Fraction 2b	=	2.3378	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	=	2.3378	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	=	2.3378	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.

010914 140047
P_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)	=	2.3378	µg
V_{mstd}	= volume metered, standard (dscf)	=	83.5383	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)	=	6.1706E-11	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)	=	2.3378	µg
V_{mstd}	= volume metered, standard (dscf)	=	83.5383	dscf
35.31	= conversion factor (dscf/dscm)	=	35.31	dscf/dscm
C_{sd}	= mercury concentration (µg/dscm)	=	9.8813E-01	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)	=	2.3378	µg
V_{mstd}	= volume metered, standard (dscf)	=	83.5383	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)	=	9.8813E-04	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)	=	2.3378	µg
V_{mstd}	= volume metered, standard (dscf)	=	83.5383	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)	=	1.0604E+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)	=	6.1706E-11	lb/dscf
x	= oxygen content of corrected gas (%)	=	7.0	%
O_2	= proportion of oxygen in the gas stream by volume (%)	=	10.2	%
20.9	= oxygen content of ambient air (%)	=	20.9	%
C_{sdx}	= mercury concentration corrected to x% oxygen (lb/dscf)	=	8.0160E-11	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)	=	6.1706E-11	lb/dscf
y	= carbon dioxide content of corrected gas (%)	=	12.0	%
CO_2	= proportion of carbon dioxide in the gas stream by volume (%)	=	9.0	%
C_{sdy}	= mercury conc. corrected to y% carbon dioxide (lb/dscf)	=	8.2275E-11	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)	=	6.1706E-11	lb/dscf
Q_{std}	= volumetric flow rate at standard conditions, dry basis (dscfm)	=	105,338	dscfm
Q_a	= volumetric flow rate at actual conditions (acfm)	=	201,986	acfm
C_a	= *mercury concentration at actual gas conditions (lb/acf)*	=	3.2180E-11	lb/acf

8. Mercury emission rate (lb/hr)

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

Where:

m_n	= mercury collected in sample (total µg)	=	2.3378	µg
V_{mstd}	= volume metered, standard (dscf)	=	83.5383	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)	=	105,338	dscfm
60	= conversion factor (min/hr)	=	60	min/hr
$E_{lb/hr}$	= mercury emission rate (lb/hr)	=	3.9000E-04	lb/hr

9. Mercury emission rate (g/s)

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

Where:

m_n	= mercury collected in sample (total µg)	=	2.3378	µg
V_{mstd}	= volume metered, standard (dscf)	=	83.5383	dscf
Q_{std}	= volumetric flow rate at standard conditions, dry basis (dscfm)	=	105,338	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)	=	4.9131E-05	g/s

10. Mercury emission rate (Ton/yr)

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

Where:

m_n	= mercury collected in sample (total µg)	=	2.3378	µg
V_{mstd}	= volume metered, standard (dscf)	=	83.5383	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)	=	105,338	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)	=	1.7082E-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)	=	2.3378	µg
V_{mstd}	= volume metered, standard (dscf)	=	83.5383	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 (%)	=	10.2	%
20.9	= oxygen content of ambient air (%)	=	20.9	%
E_{Fd}	= mercury emission rate - Fd-based (lb/MMBtu)	=	1.1535E-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)	=	2.3378	µg
V_{mstd}	= volume metered, standard (dscf)	=	83.5383	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 (%)	=	9.0	%
100	= conversion factor	=	100	
E_{Fc}	= mercury emission rate - Fc-based (lb/MMBtu)	=	1.2478E-06	lb/MMBtu

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PARAMETERS

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

QA/QC Initials: ME

Date: 1/15/14

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Wheelabrator North Broward, Inc.
Clean Air Project No: 12218
Unit 1 FF Outlet

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

Run No.		1	2	3	4	Average
Date (2013)		Dec 10	Dec 11	Dec 11	Dec 11	
Start Time (approx.)		12:24	08:09	10:42	13:14	
Stop Time (approx.)		14:34	10:21	12:54	15:25	
Sampling Conditions						
Y_d	Dry gas meter correction factor	1.0031	1.0031	1.0031	1.0031	
C_p	Pitot tube coefficient	0.8140	0.8140	0.8140	0.8140	
P_g	Static pressure (in. H_2O)	-10.6000	-9.5000	-11.2000	-11.2000	
A_s	Sample location area (ft^2)	64.0000	64.0000	64.0000	64.0000	
P_{bar}	Barometric pressure (in. Hg)	30.14	30.16	30.16	30.16	**30.1550**
D_n	Nozzle diameter (in.)	0.2750	0.2750	0.2750	0.2750	
O_2	Oxygen (dry volume %)	10.2000	9.8000	10.0000	9.8000	**9.9500**
CO_2	Carbon dioxide (dry volume %)	9.0000	9.2000	8.8000	9.0000	**9.0000**
N_2+CO	Nitrogen plus carbon monoxide (dry volume %)	80.8000	81.0000	81.2000	81.2000	**81.0500**
V_{lc}	Total Liquid collected (ml)	513.50	517.60	551.40	540.80	
V_m	Volume metered, meter conditions (ft^3)	86.8150	84.6500	89.4800	89.6000	
T_m	Dry gas meter temperature (°F)	96.4000	84.7600	95.1000	94.3800	
T_s	Sample temperature (°F)	310.6000	310.0400	309.6400	310.3600	**310.1600**
ΔH	Meter box orifice pressure drop (in. H_2O)	1.6000	1.5440	1.6800	1.6920	
θ	Total sampling time (min)	125.0	125.0	125.0	125.0	
Flow Results						
V_{wstd}	Volume of water collected (ft^3)	24.1653	24.3583	25.9489	25.4500	**24.9806**
V_{mstd}	Volume metered, standard (dscf)	83.5383	83.2391	86.3782	86.6089	**84.9411**
P_s	Sample gas pressure, absolute (in. Hg)	29.3606	29.4615	29.3365	29.3365	**29.3738**
P_v	Vapor pressure, actual (in. Hg)	29.3606	29.4615	29.3365	29.3365	**29.3738**
B_{wo}	Moisture measured in sample (% by volume)	22.4369	22.6383	23.1012	22.7113	**22.7219**
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)	22.4369	22.6383	23.1012	22.7113	**22.7219**
$\sqrt{\Delta P}$	Velocity head ($\sqrt{}$in. H_2O)	0.7693	0.7546	0.7865	0.7900	**0.7751**
M_d	MW of sample gas, dry (lb/lb-mole)	29.8480	29.8640	29.8080	29.8320	**29.8380**
M_s	MW of sample gas, wet (lb/lb-mole)	27.1897	27.1782	27.0802	27.1448	**27.1482**
V_s	Velocity of sample (ft/sec)	52.6005	51.4974	53.8693	54.0721	**53.0098**
%I	Isokinetic sampling (%)	98.4995	100.0932	100.2655	99.7444	**99.6507**
Q_a	Volumetric flow rate, actual (acfm)	201,986	197,750	206,858	207,637	**203,558**
Q_s	Volumetric flow rate, standard (scfm)	135,809	133,515	139,144	139,537	**137,001**
Q_{std}	Volumetric flow rate, dry standard (dscfm)	105,338	103,289	107,000	107,847	**105,868**
Q_{std7}	Volumetric flow rate, dry std@7%O_2 (dscfm)	81,087	82,483	83,907	86,122	**83,400**
Q_a	Volumetric flow rate, actual (acf/hr)	12,119,144	11,864,991	12,411,491	12,458,201	**12,213,457**
Q_s	Volumetric flow rate, standard (scf/hr)	8,148,544	8,010,892	8,348,655	8,372,243	**8,220,083**
Q_{std}	Volumetric flow rate, dry standard (dscf/hr)	6,320,266	6,197,360	6,420,017	6,470,797	**6,352,110**
Q_a	Volumetric flow rate, actual (m^3/hr)	343,221	336,024	351,501	352,824	**345,892**
Q_s	Volumetric flow rate, standard (m^3/hr)	230,772	226,873	236,439	237,107	**232,798**
Q_{std}	Volumetric flow rate, dry standard (dry m^3/hr)	178,994	175,513	181,819	183,257	**179,895**
Q_{std7}	Volumetric flow rate, dry std@7%O_2 (dry m^3/hr)	137,786	140,158	142,577	146,342	**141,716**
Q_s	Volumetric flow rate, normal (Nm^3/hr)	215,037	211,405	220,318	220,940	**216,925**
Q_{std}	Volumetric flow rate, dry normal (Nm^3/hr)	166,790	163,546	169,422	170,762	**167,630**
Q_{std7}	Volumetric flow rate, dry normal @7%O_2 (Nm^3/hr)	128,392	130,602	132,856	136,364	**132,053**

Comments:
Average Includes 4 runs.

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Wheelabrator North Broward, Inc.
Clean Air Project No: 12218
Unit 1 FF Outlet

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

Run No.		1	2	3	4	Average
Date (2013)		Dec 10	Dec 11	Dec 11	Dec 11	
Start Time (approx.)		12:24	08:09	10:42	13:14	
Stop Time (approx.)		14:34	10:21	12:54	15:25	
Process Conditions						
R_P	Steam Production Rate - (klbs/hour)	179.5	180.1	180.2	180.4	**180.0**
P_1	Fabric Filter Inlet Temperature - (°F)	321	320	320	320	**320**
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 %)	10.2000	9.8000	10.0000	9.8000	**9.9500**
CO_2	Carbon dioxide (dry volume %)	9.0000	9.2000	8.8000	9.0000	**9.0000**
T_s	Sample temperature (°F)	310.6000	310.0400	309.6400	310.3600	**310.1600**
B_w	Actual water vapor in gas (% by volume)	22.4369	22.6383	23.1012	22.7113	**22.7219**
Gas Flow Rate						
Q_a	Volumetric flow rate, actual (acfm)	201,986	197,750	206,858	207,637	**203,558**
Q_s	Volumetric flow rate, standard (scfm)	135,809	133,515	139,144	139,537	**137,001**
Q_{std}	Volumetric flow rate, dry standard (dscfm)	105,338	103,269	107,000	107,847	**105,868**
Sampling Data						
V_{mstd}	Volume metered, standard (dscf)	83.5383	83.2391	86.3782	86.6089	**84.9411**
%I	Isokinetic sampling (%)	98.4995	100.0932	100.2655	99.7444	**99.6507**
Laboratory Data						
$m_{n\text{-}1b}$	Fraction 1B (µg)	<0.1000	<0.1000	<0.1000	<0.1000	
$m_{n\text{-}2b}$	Fraction 2B (µg)	2.3378	18.2270	16.2002	13.8613	
$m_{n\text{-}3a}$	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)	2.3378	18.2270	16.2002	13.8613	
Mercury Results - Total						
C_{sd}	Concentration (lb/dscf)	6.1706E-11	4.8283E-10	4.1355E-10	3.5290E-10	**3.2775E-10**
C_{sd7}	Concentration @7% O_2 (lb/dscf)	8.0160E-11	6.0463E-10	5.2737E-10	4.4192E-10	**4.1352E-10**
C_{sd12}	Concentration @12% CO_2 (lb/dscf)	8.2275E-11	6.2978E-10	5.6393E-10	4.7053E-10	**4.3663E-10**
C_a	Concentration (lb/acf)	3.2180E-11	2.5219E-10	2.1391E-10	1.8330E-10	**1.7040E-10**
C_{sd}	Concentration (µg/dscm)	9.8813E-01	7.7319E+00	6.6224E+00	5.6512E+00	**5.2484E+00**
C_{sd7}	Concentration @7% O_2 (µg/dscm)	1.2837E+00	9.6823E+00	8.4450E+00	7.0767E+00	**6.6219E+00**
C_{sd12}	Concentration @12% CO_2 (µg/dscm)	1.3175E+00	1.0085E+01	9.0305E+00	7.5349E+00	**6.9920E+00**
C_{sd}	Concentration (mg/dscm)	9.8813E-04	7.7319E-03	6.6224E-03	5.6512E-03	**5.2484E-03**
C_{sd7}	Concentration @7% O_2 (mg/dscm)	1.2837E-03	9.6823E-03	8.4450E-03	7.0767E-03	**6.6219E-03**
C_{sd12}	Concentration @12% CO_2 (mg/dscm)	1.3175E-03	1.0085E-02	9.0305E-03	7.5349E-03	**6.9920E-03**
C_a	Concentration (µg/m^3 (actual,wet))	5.1532E-01	4.0385E+00	3.4255E+00	2.9352E+00	**2.7287E+00**
C_{sd}	Concentration (µg/Nm^3 dry)	1.0604E+00	8.2976E+00	7.1069E+00	6.0647E+00	**5.6324E+00**
C_{sd7}	Concentration @7% O_2 (µg/Nm^3 dry)	1.3776E+00	1.0391E+01	9.0630E+00	7.5945E+00	**7.1064E+00**
C_{sd12}	Concentration @12% CO_2 (µg/Nm^3 dry)	1.4139E+00	1.0823E+01	9.6913E+00	8.0863E+00	**7.5036E+00**
$E_{lb/hr}$	Rate (lb/hr)	3.9000E-04	2.9923E-03	2.6550E-03	2.2835E-03	**2.0802E-03**
$E_{g/s}$	Rate (g/s)	4.9131E-05	3.7696E-04	3.3446E-04	2.8767E-04	**2.6206E-04**
$E_{T/yr}$	Rate (Ton/yr)	1.7082E-03	1.3106E-02	1.1629E-02	1.0002E-02	**9.1113E-03**
E_{Fd}	Rate - Fd-based (lb/MMBtu)	1.1535E-06	8.7002E-06	7.5885E-06	6.3590E-06	**5.9503E-06**
E_{Fc}	Rate - Fc-based (lb/MMBtu)	1.2478E-06	9.5517E-06	8.5529E-06	7.1364E-06	**6.6222E-06**

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SS Metals-1 Version 2006-12c

Wheelabrator North Broward, Inc.
Clean Air Project No: 12218
Unit 1 FF Outlet

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

Run No.		1	2	3	4	Average
Date (2013)		Dec 10	Dec 11	Dec 11	Dec 11	
Start Time (approx.)		12:24	08:09	10:42	13:14	
Stop Time (approx.)		14:34	10:21	12:54	15:25	
Mercury Results - Front Half						
C_{sd}	Concentration (lb/dscf)	<2.6395E-12	<2.6490E-12	<2.5527E-12	<2.5459E-12	**<2.5968E-12**
C_{sd7}	Concentration @7% O_2 (lb/dscf)	<3.4289E-12	<3.3172E-12	<3.2553E-12	<3.1881E-12	**<3.2974E-12**
C_{sd12}	Concentration @12% CO_2 (lb/dscf)	<3.5193E-12	<3.4552E-12	<3.4810E-12	<3.3946E-12	**<3.4625E-12**
C_a	Concentration (lb/acf)	<1.3765E-12	<1.3836E-12	<1.3204E-12	<1.3224E-12	**<1.3507E-12**
C_{sd}	Concentration (µg/dscm)	<4.2268E-02	<4.2420E-02	<4.0878E-02	<4.0769E-02	**<4.1584E-02**
C_{sd7}	Concentration @7% O_2 (µg/dscm)	<5.4909E-02	<5.3120E-02	<5.2129E-02	<5.1054E-02	**<5.2803E-02**
C_{sd12}	Concentration @12% CO_2 (µg/dscm)	<5.6357E-02	<5.5330E-02	<5.5743E-02	<5.4359E-02	**<5.5448E-02**
C_{sd}	Concentration (mg/dscm)	<4.2268E-05	<4.2420E-05	<4.0878E-05	<4.0769E-05	**<4.1584E-05**
C_{sd7}	Concentration @7% O_2 (mg/dscm)	<5.4909E-05	<5.3120E-05	<5.2129E-05	<5.1054E-05	**<5.2803E-05**
C_{sd12}	Concentration @12% CO_2 (mg/dscm)	<5.6357E-05	<5.5330E-05	<5.5743E-05	<5.4359E-05	**<5.5448E-05**
C_a	Concentration (µg/m^3 (actual,wet))	<2.2043E-02	<2.2157E-02	<2.1145E-02	<2.1176E-02	**<2.1630E-02**
C_{sd}	Concentration (µg/Nm^3 dry)	<4.5361E-02	<4.5524E-02	<4.3869E-02	<4.3753E-02	**<4.4627E-02**
C_{sd7}	Concentration @7% O_2 (µg/Nm^3 dry)	<5.8927E-02	<5.7007E-02	<5.5944E-02	<5.4789E-02	**<5.6667E-02**
C_{sd12}	Concentration @12% CO_2 (µg/Nm^3 dry)	<6.0481E-02	<5.9379E-02	<5.9822E-02	<5.8337E-02	**<5.9505E-02**
$E_{lb/hr}$	Rate (lb/hr)	<1.6682E-05	<1.6417E-05	<1.6389E-05	<1.6474E-05	**<1.6490E-05**
$E_{g/s}$	Rate (g/s)	<2.1016E-06	<2.0681E-06	<2.0646E-06	<2.0754E-06	**<2.0774E-06**
$E_{T/yr}$	Rate (Ton/yr)	<7.3069E-05	<7.1905E-05	<7.1782E-05	<7.2157E-05	**<7.2228E-05**
E_{Fd}	Rate - Fd-based (lb/MMBtu)	<4.9340E-08	<4.7733E-08	<4.6842E-08	<4.5876E-08	**<4.7448E-08**
E_{Fc}	Rate - Fc-based (lb/MMBtu)	<5.3377E-08	<5.2404E-08	<5.2795E-08	<5.1484E-08	**<5.2515E-08**

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Wheelabrator North Broward, Inc.
Clean Air Project No: 12218
Unit 1 FF Outlet

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

Run No.		1	2	3	4	Average
Date (2013)		Dec 10	Dec 11	Dec 11	Dec 11	
Start Time (approx.)		12:24	08:09	10:42	13:14	
Stop Time (approx.)		14:34	10:21	12:54	15:25	
Mercury Results - Impingers 1-3 Solution						
C_{sd}	Concentration (lb/dscf)	6.1706E-11	4.8283E-10	4.1355E-10	3.5290E-10	**3.2775E-10**
C_{sd7}	Concentration @7% O_2 (lb/dscf)	8.0160E-11	6.0463E-10	5.2737E-10	4.4192E-10	**4.1352E-10**
C_{sd12}	Concentration @12% CO_2 (lb/dscf)	8.2275E-11	6.2978E-10	5.6393E-10	4.7053E-10	**4.3663E-10**
C_a	Concentration (lb/acf)	3.2180E-11	2.5219E-10	2.1391E-10	1.8330E-10	**1.7040E-10**
C_{sd}	Concentration (µg/dscm)	9.8813E-01	7.7319E+00	6.6224E+00	5.6512E+00	**5.2484E+00**
C_{sd7}	Concentration @7% O_2 (µg/dscm)	1.2837E+00	9.6823E+00	8.4450E+00	7.0767E+00	**6.6219E+00**
C_{sd12}	Concentration @12% CO_2 (µg/dscm)	1.3175E+00	1.0085E+01	9.0305E+00	7.5349E+00	**6.9920E+00**
C_{sd}	Concentration (mg/dscm)	9.8813E-04	7.7319E-03	6.6224E-03	5.6512E-03	**5.2484E-03**
C_{sd7}	Concentration @7% O_2 (mg/dscm)	1.2837E-03	9.6823E-03	8.4450E-03	7.0767E-03	**6.6219E-03**
C_{sd12}	Concentration @12% CO_2 (mg/dscm)	1.3175E-03	1.0085E-02	9.0305E-03	7.5349E-03	**6.9920E-03**
C_a	Concentration (µg/m^3 (actual,wet))	5.1532E-01	4.0385E+00	3.4255E+00	2.9352E+00	**2.7287E+00**
C_{sd}	Concentration (µg/Nm^3 dry)	1.0604E+00	8.2976E+00	7.1069E+00	6.0647E+00	**5.6324E+00**
C_{sd7}	Concentration @7% O_2 (µg/Nm^3 dry)	1.3776E+00	1.0391E+01	9.0630E+00	7.5945E+00	**7.1064E+00**
C_{sd12}	Concentration @12% CO_2 (µg/Nm^3 dry)	1.4139E+00	1.0823E+01	9.6913E+00	8.0863E+00	**7.5036E+00**
$E_{lb/hr}$	Rate (lb/hr)	3.9000E-04	2.9923E-03	2.6550E-03	2.2835E-03	**2.0802E-03**
$E_{g/s}$	Rate (g/s)	4.9131E-05	3.7696E-04	3.3446E-04	2.8767E-04	**2.6206E-04**
$E_{T/yr}$	Rate (Ton/yr)	1.7082E-03	1.3106E-02	1.1629E-02	1.0002E-02	**9.1113E-03**
E_{Fd}	Rate - Fd-based (lb/MMBtu)	1.1535E-06	8.7002E-06	7.5885E-06	6.3590E-06	**5.9503E-06**
E_{Fc}	Rate - Fc-based (lb/MMBtu)	1.2478E-06	9.5517E-06	8.5529E-06	7.1364E-06	**6.6222E-06**

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Wheelabrator North Broward, Inc.
Clean Air Project No: 12218
Unit 1 FF Outlet

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

Run No.		1	2	3	4	Average
Date (2013)		Dec 10	Dec 11	Dec 11	Dec 11	
Start Time (approx.)		12:24	08:09	10:42	13:14	
Stop Time (approx.)		14:34	10:21	12:54	15:25	
Mercury Results - Impinger 4 Solution						
C_{sd}	Concentration (lb/dscf)	<5.2790E-12	<5.2980E-12	<5.1055E-12	<5.0919E-12	**<5.1936E-12**
C_{sd7}	Concentration @7% O_2 (lb/dscf)	<6.8578E-12	<6.6344E-12	<6.5106E-12	<6.3763E-12	**<6.5948E-12**
C_{sd12}	Concentration @12% CO_2 (lb/dscf)	<7.0387E-12	<6.9104E-12	<6.9620E-12	<6.7891E-12	**<6.9251E-12**
C_a	Concentration (lb/acf)	<2.7531E-12	<2.7673E-12	<2.6409E-12	<2.6447E-12	**<2.7015E-12**
C_{sd}	Concentration (µg/dscm)	<8.4536E-02	<8.4840E-02	<8.1757E-02	<8.1539E-02	**<8.3168E-02**
C_{sd7}	Concentration @7% O_2 (µg/dscm)	<1.0982E-01	<1.0624E-01	<1.0426E-01	<1.0211E-01	**<1.0561E-01**
C_{sd12}	Concentration @12% CO_2 (µg/dscm)	<1.1271E-01	<1.1066E-01	<1.1149E-01	<1.0872E-01	**<1.1090E-01**
C_{sd}	Concentration (mg/dscm)	<8.4536E-05	<8.4840E-05	<8.1757E-05	<8.1539E-05	**<8.3168E-05**
C_{sd7}	Concentration @7% O_2 (mg/dscm)	<1.0982E-04	<1.0624E-04	<1.0426E-04	<1.0211E-04	**<1.0561E-04**
C_{sd12}	Concentration @12% CO_2 (mg/dscm)	<1.1271E-04	<1.1066E-04	<1.1149E-04	<1.0872E-04	**<1.1090E-04**
C_a	Concentration (µg/m^3 (actual,wet))	<4.4086E-02	<4.4314E-02	<4.2290E-02	<4.2351E-02	**<4.3260E-02**
C_{sd}	Concentration (µg/Nm^3 dry)	<9.0722E-02	<9.1048E-02	<8.7739E-02	<8.7505E-02	**<8.9253E-02**
C_{sd7}	Concentration @7% O_2 (µg/Nm^3 dry)	<1.1785E-01	<1.1401E-01	<1.1189E-01	<1.0958E-01	**<1.1333E-01**
C_{sd12}	Concentration @12% CO_2 (µg/Nm^3 dry)	<1.2096E-01	<1.1876E-01	<1.1964E-01	<1.1667E-01	**<1.1901E-01**
$E_{lb/hr}$	Rate (lb/hr)	<3.3365E-05	<3.2834E-05	<3.2777E-05	<3.2948E-05	**<3.2981E-05**
$E_{g/s}$	Rate (g/s)	<4.2032E-06	<4.1362E-06	<4.1291E-06	<4.1507E-06	**<4.1548E-06**
$E_{T/yr}$	Rate (Ton/yr)	<1.4614E-04	<1.4381E-04	<1.4356E-04	<1.4431E-04	**<1.4446E-04**
E_{Fd}	Rate - Fd-based (lb/MMBtu)	<9.8680E-08	<9.5465E-08	<9.3684E-08	<9.1751E-08	**<9.4895E-08**
E_{Fc}	Rate - Fc-based (lb/MMBtu)	<1.0675E-07	<1.0481E-07	<1.0559E-07	<1.0297E-07	**<1.0503E-07**

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Wheelabrator North Broward, Inc.
Clean Air Project No: 12218
Unit 1 FF Outlet

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

Run No.		1	2	3	4	Average
Date (2013)		Dec 10	Dec 11	Dec 11	Dec 11	
Start Time (approx.)		12:24	08:09	10:42	13:14	
Stop Time (approx.)		14:34	10:21	12:54	15:25	
Mercury Results - Filtered Permanganate Solution						
C_{sd}	Concentration (lb/dscf)	<1.3198E-11	<1.3245E-11	<1.2764E-11	<1.2730E-11	**<1.2984E-11**
C_{sd7}	Concentration @7% O_2 (lb/dscf)	<1.7144E-11	<1.6586E-11	<1.6277E-11	<1.5941E-11	**<1.6487E-11**
C_{sd12}	Concentration @12% CO_2 (lb/dscf)	<1.7597E-11	<1.7276E-11	<1.7405E-11	<1.6973E-11	**<1.7313E-11**
C_a	Concentration (lb/acf)	<6.8827E-12	<6.9182E-12	<6.6022E-12	<6.6118E-12	**<6.7537E-12**
C_{sd}	Concentration (µg/dscm)	<2.1134E-01	<2.1210E-01	<2.0439E-01	<2.0385E-01	**<2.0792E-01**
C_{sd7}	Concentration @7% O_2 (µg/dscm)	<2.7454E-01	<2.6560E-01	<2.6065E-01	<2.5527E-01	**<2.6402E-01**
C_{sd12}	Concentration @12% CO_2 (µg/dscm)	<2.8179E-01	<2.7665E-01	<2.7872E-01	<2.7180E-01	**<2.7724E-01**
C_{sd}	Concentration (mg/dscm)	<2.1134E-04	<2.1210E-04	<2.0439E-04	<2.0385E-04	**<2.0792E-04**
C_{sd7}	Concentration @7% O_2 (mg/dscm)	<2.7454E-04	<2.6560E-04	<2.6065E-04	<2.5527E-04	**<2.6402E-04**
C_{sd12}	Concentration @12% CO_2 (mg/dscm)	<2.8179E-04	<2.7665E-04	<2.7872E-04	<2.7180E-04	**<2.7724E-04**
C_a	Concentration (µg/m^3 (actual,wet))	<1.1022E-01	<1.1078E-01	<1.0572E-01	<1.0588E-01	**<1.0815E-01**
C_{sd}	Concentration (µg/Nm^3 dry)	<2.2680E-01	<2.2762E-01	<2.1935E-01	<2.1876E-01	**<2.2313E-01**
C_{sd7}	Concentration @7% O_2 (µg/Nm^3 dry)	<2.9463E-01	<2.8504E-01	<2.7972E-01	<2.7395E-01	**<2.8333E-01**
C_{sd12}	Concentration @12% CO_2 (µg/Nm^3 dry)	<3.0241E-01	<2.9689E-01	<2.9911E-01	<2.9168E-01	**<2.9752E-01**
$E_{lb/hr}$	Rate (lb/hr)	<8.3412E-05	<8.2084E-05	<8.1943E-05	<8.2371E-05	**<8.2452E-05**
$E_{g/s}$	Rate (g/s)	<1.0508E-05	<1.0341E-05	<1.0323E-05	<1.0377E-05	**<1.0387E-05**
$E_{T/yr}$	Rate (Ton/yr)	<3.6534E-04	<3.5953E-04	<3.5891E-04	<3.6078E-04	**<3.6114E-04**
E_{Fd}	Rate - Fd-based (lb/MMBtu)	<2.4670E-07	<2.3866E-07	<2.3421E-07	<2.2938E-07	**<2.3724E-07**
E_{Fc}	Rate - Fc-based (lb/MMBtu)	<2.6688E-07	<2.6202E-07	<2.6398E-07	<2.5742E-07	**<2.6258E-07**
Mercury Results - HCl Rinse + HCl/MnO2 Precipitate						
C_{sd}	Concentration (lb/dscf)	<1.0558E-11	<1.0596E-11	<1.0211E-11	<1.0184E-11	**<1.0387E-11**
C_{sd7}	Concentration @7% O_2 (lb/dscf)	<1.3716E-11	<1.3269E-11	<1.3021E-11	<1.2753E-11	**<1.3190E-11**
C_{sd12}	Concentration @12% CO_2 (lb/dscf)	<1.4077E-11	<1.3821E-11	<1.3924E-11	<1.3578E-11	**<1.3850E-11**
C_a	Concentration (lb/acf)	<5.5061E-12	<5.5345E-12	<5.2817E-12	<5.2894E-12	**<5.4030E-12**
C_{sd}	Concentration (µg/dscm)	<1.6907E-01	<1.6968E-01	<1.6351E-01	<1.6308E-01	**<1.6634E-01**
C_{sd7}	Concentration @7% O_2 (µg/dscm)	<2.1964E-01	<2.1248E-01	<2.0852E-01	<2.0421E-01	**<2.1121E-01**
C_{sd12}	Concentration @12% CO_2 (µg/dscm)	<2.2543E-01	<2.2132E-01	<2.2297E-01	<2.1744E-01	**<2.2179E-01**
C_{sd}	Concentration (mg/dscm)	<1.6907E-04	<1.6968E-04	<1.6351E-04	<1.6308E-04	**<1.6634E-04**
C_{sd7}	Concentration @7% O_2 (mg/dscm)	<2.1964E-04	<2.1248E-04	<2.0852E-04	<2.0421E-04	**<2.1121E-04**
C_{sd12}	Concentration @12% CO_2 (mg/dscm)	<2.2543E-04	<2.2132E-04	<2.2297E-04	<2.1744E-04	**<2.2179E-04**
C_a	Concentration (µg/m^3 (actual,wet))	<8.8173E-02	<8.8628E-02	<8.4580E-02	<8.4703E-02	**<8.6521E-02**
C_{sd}	Concentration (µg/Nm^3 dry)	<1.8144E-01	<1.8210E-01	<1.7548E-01	<1.7501E-01	**<1.7851E-01**
C_{sd7}	Concentration @7% O_2 (µg/Nm^3 dry)	<2.3571E-01	<2.2803E-01	<2.2377E-01	<2.1916E-01	**<2.2667E-01**
C_{sd12}	Concentration @12% CO_2 (µg/Nm^3 dry)	<2.4192E-01	<2.3752E-01	<2.3929E-01	<2.3335E-01	**<2.3802E-01**
$E_{lb/hr}$	Rate (lb/hr)	<6.6730E-05	<6.5667E-05	<6.5554E-05	<6.5897E-05	**<6.5962E-05**
$E_{g/s}$	Rate (g/s)	<8.4063E-06	<8.2725E-06	<8.2583E-06	<8.3014E-06	**<8.3096E-06**
$E_{T/yr}$	Rate (Ton/yr)	<2.9228E-04	<2.8762E-04	<2.8713E-04	<2.8863E-04	**<2.8891E-04**
E_{Fd}	Rate - Fd-based (lb/MMBtu)	<1.9736E-07	<1.9093E-07	<1.8737E-07	<1.8350E-07	**<1.8979E-07**
E_{Fc}	Rate - Fc-based (lb/MMBtu)	<2.1351E-07	<2.0962E-07	<2.1118E-07	<2.0594E-07	**<2.1006E-07**

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QA/QC DATA

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I hereby 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: 1/15/14

CleanAir.

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Wheelabrator North Broward, Inc.
Clean Air Project No: 12218
Unit 1 FF Outlet

USEPA Method 29 (Mercury)
QA/QC Results

Run No.		1	2	3	4	
Date (2013)		Dec 10	Dec 11	Dec 11	Dec 11	
Start Time (approx.)		12:24	08:09	10:42	13:14	
Stop Time (approx.)		14:34	10:21	12:54	15:25	
Total Duration of Test Run (min.)		130	132	132	131	
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:	66-8-1	66-8-1	66-8-1	66-8-1	
C_p	Pitot Coefficient:	0.814	0.814	0.814	0.814	
	Meter Box ID. No:	66-20	66-20	66-20	66-20	
Y_d	Meter Box Yd - Field Sheet	1.0031	1.0031	1.0031	1.0031	
	Meter Box Yd - Database	1.0031	1.0031	1.0031	1.0031	
	Meter Box ΔH@ - Field Sheet	1.7992	1.7992	1.7992	1.7992	
	Meter Box ΔH@ - Database	1.7992	1.7992	1.7992	1.7992	
QA/QC						
	Final Leak Check					
	(a) 4% of Sampling Rate (cfm)	0.0278	0.0271	0.0286	0.0287	
	(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)	0.0050	0.0030	0.0040	0.0030	
	Sample Volume					
	Minimum Volume Required (dscf)	60.00	60.00	60.00	60.00	
V_{mstd}	Actual Sample Volume (dscf)	83.538	83.239	86.378	86.609	
	Alternative Method 5 Post-Test Calibration (EPA ALT-009)					
$\sqrt{\Delta H_{avg}}$	Average of Square Root of ΔH (in. W.C.)	1.2623	1.2402	1.2929	1.2966	
Y_{qa}	Alternative Meter Calibration Factor	1.0198	1.0174	1.0125	1.0154	**Average**
	Variation from full-test Y_d (average ≤ ±5%)	1.7%	1.4%	0.9%	1.2%	**1.3%**
	Mean Isokinetic Sampling Rate Variation					
	Minimum Allowable (%)	90	90	90	90	
	Maximum Allowable (%)	110	110	110	110	
%I	Actual Variation (%)	98.70	100.20	100.47	99.74	
	Point-by-Point Isokinetic Variation					
	Number of points <90%	0	0	0	0	
	Number of points >110%	0	0	0	0	
	Number of points <80%	0	0	0	0	
	Number of points >120%	0	0	0	0	

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Nozzle Calibration Sheet

Client	Wheelabrator NORTH	Project Number	12218
Calibrated by	D²	Unit	1
Date	12/11/13	Runs	ALL

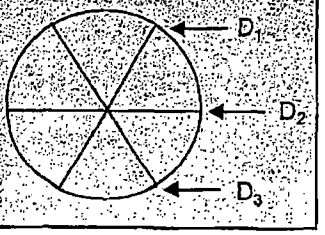
Nozzle Identification	D_1 (inches)	D_2 (inches)	D_3 (inches)	ΔD (inches)	D_{ave} (inches)
.275-1	0.275	0.276	0.275	0.001	0.275

D_1, D_2, D_3 = three nozzle diameter measurements

ΔD = maximum difference between any two diameters

ΔD = 0.004 inches*

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



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

QA/QC D²

Date 12/10/13

CleanAir ENGINEERING

Clean Air Engineering - Meter Box Full Test Calibration

Client:	Source	**Reviewed By:**	R. REDEL	**Calibration Signature:**	
ID No:	66-20	**Calibrated By:**	J. Ivens	**Meter Box Yd:**	1.0031
Dept No:	66	**Date of Calibration:**	03/12/13	**Meter Box ΔH@:**	1.7992
Meter Box Serial No:	66-20	**Due Date of Calibration:**	03/13/13	**Barometer Serial No:**	W12637
Manufacturer Part No:	0028	**Meter Box Vacuum:**	1.0 in. H_2O	**Barometric Pressure:**	29.10 in. Hg

				Standard Meter Gas Volume (ft^3)			Meter Box Gas Volume (ft^3)			Std. Meter Temperature (°F)			Meter Box Temperature (°F)			Time (min.)	Calibration Results	
Q	ΔH	ΔP	Y_{ds}	Initial	Final	V_{ds} Net	Initial	Final	V_d Net	T_{is} In	T_{os} Out	T_{ds} Avg.	T_i In	T_o Out	T_d Avg.	Θ	Y_d	ΔH@
0.389	0.50	-1.20	1.0000	0.000	5.000	5.000	207.700	212.795	5.095	65.0	65.0	65.00	82.0	80.0	81.00	12.58	1.0069	1.7710
0.389	0.50	-1.20	1.0000	0.000	5.000	5.000	212.795	217.883	5.088	65.0	65.0	65.00	82.0	79.0	80.50	12.57	1.0074	1.7714
0.669	1.50	-1.50	1.0000	0.000	10.000	10.000	231.600	241.831	10.231	65.0	65.0	65.00	86.0	80.0	83.00	14.61	1.0033	1.7915
0.669	1.50	-1.50	1.0000	0.000	10.000	10.000	241.831	252.066	10.235	65.0	65.0	65.00	86.0	80.0	83.00	14.61	1.0029	1.7915
0.936	3.00	-1.80	1.0000	0.000	10.000	10.000	176.902	187.162	10.260	64.0	64.0	64.00	88.0	80.0	84.00	10.47	0.9997	1.8331
0.935	3.00	-1.80	1.0000	0.000	10.000	10.000	187.162	197.433	10.271	64.0	64.0	64.00	88.0	80.0	84.00	10.48	0.9986	1.8366
																Averages	1.00313	1.79918

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)

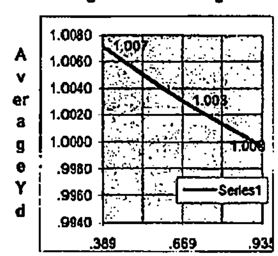
Equations

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

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

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

Average YD vs. Average CFM



Average CFM

Vacuum Gauge

Standard (in.Hg)	Gauge (in.Hg)
4.5	5.0
9.4	10.0
14.0	15.0
19.0	20.0
24.0	25.0

Calibration Reference Information (Standard Meter)

Reference Used:	Wet Test Meter	Serial No:	11AG9
Calibrated By:	Martin Vaquero	Date Calibrated:	7/22/2012
Percent Error:	0.245%	Calibration Due Date:	7/23/2013

Meter Box Pre-Calibration Inspection

Positive Leak Check:	Pass	Electrical Check:	Pass
Negative Leak Check:	Pass	Pyrometer Checl	Pass
Vacuum Gauge Check	Pass	YD Tolerance:	Pass

CleanAir ENGINEERING

Meter Box - Pyrometer Calibration Sheet

Meter Box No: 66-20 Office: n/a

Calibrated by: J. Ivens Client: n/a

Date: 3/12/13 Job No: n/a

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

Calibration Reference Settings (°F)	Pyrometer Reading for each Channel (°F)						
	1 Stack	2 Probe	3 Filter	4 Imp Out	5 Aux	6	7
50	52	51	50	52	52		
100	102	101	100	102	102		
150	152	151	150	152	152		
200	202	201	200	202	202		
250	252	251	250	252	252		
300	302	301	300	302	302		
350	352	351	350	352	352		
400	402	401	400	402	402		
450	452	451	450	452	452		
500	502	501	500	502	502		
550	552	551	550	552	552		
600	602	601	600	602	602		

Tolerance = ±2°F difference from reference setting.

Calibration Reference Information

Reference Used: Omega CL23A Serial No: T-225950

Calibrated By: JH Metrology Date Calibrated: 10/18/2012

Calibration Report No: 1000164938 Calibration Due Date: 10/18/2013

Sample Probe Calibration

Probe Type: M5 with S-Type Pitot

I.D. Number: 66-8-1

Project Number: Browards

Thermocouple Calibration

Reference Type: Thermocouple Reference I.D. No: 15-078-39 Pyrometer I.D. No: 80512890 Units: °F

Point No.	Target Temp.	Reference Temp.	Indicated Temp.	Temp. Difference	% Difference*	Specification
1	Ambient	69	69	0	0.00%	
2	200°F-250°F	248	249	-1	0.14%	%Difference ≤ 1.5

* Based on Absolute Temperature (Rankine)

Does thermocouple assembly meet specifications? ⟶ YES

Pitot Tube Calibration (Wind Tunnel Method @ 60 ft/sec)

Reference Pitot I.D. No: Wind Tunnel Reference Pitot Cp: 0.99

Pitot Side 'A' :

Trial No.	Reference ΔP	Probe ΔP	Probe $C_{p(S)}$*	Abs. Deviation from Avg. $C_{p(A)}$**
1	0.559	0.823	0.816	0.001
2	0.555	0.823	0.813	0.001
3	0.555	0.820	0.815	0.000
	Side 'A' Average Probe $C_{p(A)}$=		0.8145	0.0009

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	0.557	0.821	0.815	0.002
2	0.555	0.822	0.814	0.001
3	0.552	0.824	0.810	0.003
	Side 'B' Average Probe $C_{p(B)}$=		0.8130	0.0019

Specification: Avg. C_p Deviations ≤ 0.01

'A' Average C_p		'B' Average C_p		Difference	Specification
0.814	—	0.813	=	0.001	|Difference| ≤ 0.01

Does assembly meet specifications? YES ⟶ **If "Yes", C_p= Average of Side 'A' and 'B' Cp values. If "No", Pitot must be replaced.**

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

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

Probe Cp= 0.814 Calibrated by: S DOOLEY Date: 03/13/2013

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METROLOGY

Certificate of Calibration

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Customer Information

On Site Calibration
CleanAir Engineering, Inc.
500 W. Wood Street
Palatine, IL 60067

PO #: 04854-64-65800
Reference #: 1334648dd
Account #: 09352MT
SO #: 34648

Instrument Identification

Instrument Id: **8028101133**
Location:
Noun: Scale, 4100/0.1 Gram Digital
Model: AV4101C
Mfr: Ohaus
Serial #: 8028101133
Accuracy: ±0.1 Gram repeatability, ±0.3 Linearity

Certification Information

Reason For Service: Calibration with Data
Type Of Calibration: Normal
As Found Condition: In Tolerance
As Left Condition: Left As Found
Procedure: 33K6-4-41-1 : Scales

Technician: Oscar Trinidad, Jr
Cal Date: 22 JUL 13
Cal Due: 22 JUL 14
Temperature: 26.0 °C
Humidity: 46.0 %

Calibration Data

✓ In Tolerance ✗ Out of Tolerance

Range	Nominal	As Found		As Left		Min	Max
Plate Repeatability							
Center	5.0	5.0	✓	As Found		4.9	5.1
Left Rear	5.0	5.0	✓	As Found		4.9	5.1
Right Rear	5.0	5.0	✓	As Found		4.9	5.1

No sampling plan or other procedure was used for this calibration. Measurements and information on this certificate are valid at time of calibration only and any number of factors may cause calibration to drift out of tolerance prior to calibration due date.

This instrument has been calibrated using standards with accuracies traceable to the National Institute of Standards and Technology, derived from natural physical constants, from ratio measurements, or compared to consensus standards.

The expanded uncertainty of the measurement process has not exceeded 25% of the tolerance allowed for the individual characteristics measured, unless otherwise stated. The uncertainties are based on a 95% confidence level, K=2.

J.H. Metrology Co., Inc's Calibration Control System complies with applicable requirements of ANSI Z540-1-1994, ISO 9001, and ISO/IEC 17025-2005.

The results contained herein relate only to the item calibrated. This certificate shall not be reproduced except in full, without the written approval of J.H. Metrology Co., Inc.

Approved by: Vice President

Date: Jul 29, 2013

Printed: 7/31/2013 13:46:42

METROLOGY

Certificate of Calibration

2032001831

✓ In Tolerance ✗ Out of Tolerance

Calibration Data

Range	Nominal	As Found		As Left		Min	Max
Plate Repeatability							
Left Front	5.0	5.0	✓	As Found		4.9	5.1
Right Front	5.0	5.0	✓	As Found		4.9	5.1
Center	5.0	5.0	✓	As Found		4.9	5.1
Linearity							
4100 Grams	100.0	100.0	✓	As Found		99.7	100.3
	2000.0	1999.9	✓	As Found		1999.7	2000.3
	4000.0	3999.8	✓	As Found		3999.7	4000.3

End of Datasheet

Calibration Standards

NIST Traceable #	Instrument ID#	Description	Model	Calibration Date	Date Due
1000166191	00941	Metric Weight Set, 12 Piece, Class 2	Unknown	19 MAR 2013	31 MAR 2015
1000166195	01088	Weight Set, 1mg - 200g, Class 1	Unknown	19 MAR 2013	31 MAR 2015
1000168221	01195	RH/Temperature Data Logger	EL-USB-2-LCD	20 MAY 2013	31 MAY 2014

No sampling plan or other procedure was used for this calibration. Measurements and information on this certificate are valid at time of calibration only and any number of factors may cause calibration to drift out of tolerance prior to calibration due date.

This instrument has been calibrated using standards with accuracies traceable to the National Institute of Standards and Technology, derived from natural physical constants, from ratio measurements, or compared to consensus standards.

The expanded uncertainty of the measurement process has not exceeded 25% of the tolerance allowed for the individual characteristics measured, unless otherwise stated. The uncertainties are based on a 95% confidence level, K=2.

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Approved by: Vice President

Date: Jul 29, 2013

Printed: 7/31/2013 13:46:42

JH Metrology Co, Inc. • 1801 Hicks Road, Unit E • Rolling Meadows, Illinois 60008 • Phone: (847) 991-0290 • Fax: (847) 991-0348

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FIELD DATA

E

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

QA/QC Initials: WVL

Date: 1/15/14

CleanAir

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

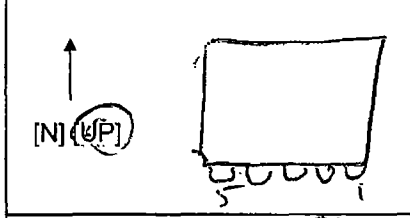
UNIT: 1 RUN: 1

FIELD DATA SHEET

Client	Whitelaborator	Project No.	12218
Plant	N Broward	Date	12/10/13
Meter Operator			R. Bihyn
Probe Operator			R. Bihyn

Meter Box	66-20	Sample Box No.	M11
Meter Y_d	1.0031	Meter $\Delta H_@$	1.7952
K Factor	2.70	Pitot C_p	0.814
Leak Rate Before	.0004 (cfm) [Lpm] @	15	(in. Hg)
Leak Rate After	.005 (cfm) [Lpm] @	15	(in. Hg)
Pitot Leak Check Before: ☒	After: Good ☒	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]
-10.6	10.0		

Amb. Temp. (°F)	83	Bar. Press.	30.14 (in. Hg) [mbar]
Probe I.D. No.			106-S-1
Liner Material			Glass

Filter No.	N/A		
Thimble No.	N/A		
Nozzle Diameter	0.271	Nozzle I.D.	271-1

Start Time:	12:24	Stop Time:	14:34

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] 749.200	Stack Temp. Ts (°F)	Probe T_p (°F) Set Points 250	Filter T_f (°F) Set Points 252	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	0.46	1.2	752.24	311	251	252	66	89	87	6.5	10.0	N/A	
2	10	0.54	1.5	755.61	311	250	252	66	89	87	7.5	10.0		
3	15	0.54	1.5	758.91	309	253	250	65	92	88	7.5	10.0		
4	20	0.65	1.8	762.60	311	251	250	65	94	88	9.0	9.5		
5	25	0.60	1.6	766.125	311	251	254	65	97	89	8.5	8.5		766.225 -0.10
4-1	30	0.57	1.5	769.60	311	249	249	65	96	90	7.5	9.7		
2	35	0.53	1.4	772.87	311	248	253	57	98	90	7.5	8.9		
3	40	0.57	1.5	776.24	310	251	250	55	98	90	8.0	9.0		
4	45	0.68	1.8	779.94	310	251	249	55	100	91	9.0	9.8		
5	50	0.68	1.8	783.600	310	251	249	56	101	92	9.0	9.0		783.665
3-1	55	0.60	1.6	787.11	310	249	251	59	100	93	8.5	8.9		-0.065
2	60	0.52	1.4	790.41	310	249	248	65	101	93	8.0	10.2	↓	
	Total	18.60		86.815	3725									
	Average	0.7440	1.6000		310.4000				96.4000					

Sum of square roots. SB 1/3/14 Circle correct bracketed units on data sheet. 2233

QA/QC RB
Date 12/10/13

FDS005-General.xls, December 2006

CleanAir ENGINEERING

O2 - 10.2
CO2 - 9.0

E-3

TEST LOCATION: FF Baghouse **TESTING** Mercury **METHOD:** 29 **PAGE** 2 **OF** 2

UNIT: 1 **RUN:** 1

FIELD DATA SHEET

Client	Wheelabrator	Project No.	12215
Plant	Ft. Bysard	Date	12/10/13
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 210	Filter T_f (°F) Set Points 252	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	0.76	1.5	793.79	311	250	250	62	102	94	8.0	10.1	NM	
4	70	0.70	1.9	797.54	313	251	250	64	102	94	10.0	10.5		
5	75	0.70	1.9	801.34	313	250	249	64	103	95	10.0	10.3		801.435
2-1	80	0.61	1.7	804.96	311	250	251	66	102	95	8.5	10.3		-0.09
2	85	0.52	1.4	808.22	311	248	249	64	103	95	8.0	9.9		
3	90	0.57	1.5	811.58	311	251	249	62	102	95	8.1	9.4		
4	95	0.62	1.7	815.14	310	252	249	63	103	95	9.0	9.7		
5	100	0.68	1.8	818.850	311	250	249	64	104	96	10.0	9.7		818.345
1-1	105	0.62	1.7	822.50	308	249	251	62	103	96	9.0	10.7		-0.095
2	110	0.65	1.8	826.20	311	250	251	58	105	96	10.0	10.5		
3	115	0.45	1.2	829.30	310	251	250	60	106	97	7.5	10.7		
4	120	0.52	1.4	832.58	310	250	250	62	105	97	8.0	10.5		
5	125	0.70	1.9	836.345	310	249	251	63	105	97	10.0	10.3		
	Total	*												
	Average													

* Sum of square roots.

Circle correct bracketed units on data sheet.

CleanAir ENGINEERING

QA/QC KB

Date 12/10/13

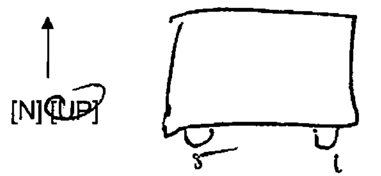
TEST LOCATION: FF Outlet Mercury **TESTING** **METHOD:** 29 **PAGE** 1 **OF** 2

UNIT: 1 **RUN:** 2

FIELD DATA SHEET

Client	Wheelabrator
Project No.	12218
Plant	N. Broward
Date	12/11/13
Meter Operator	P. Bihary
Probe Operator	P. Bihary
Meter Box	66-20
Sample Box No.	M10
Meter Y_d	1.0031
Meter $\Delta H_@$	1.7992
K Factor	2.7
Pitot C_p	0.814
Leak Rate Before	0.003 [cfm] [Lpm] @ 15 (in. Hg)
Leak Rate After	0.003 [cfm] [Lpm] @ 15 (in. Hg)
Pitot Leak Check Before:	☑ After: Good ☑ Bad ☐

Cross-Section of Test Location



Duct Dimensions (in.)	96x96
Static Pres ($in. H_2O$)	-9.5
Port Len. (in.)	10.0
Gas Flow [In] [Out] of page	In
First point all the way [In] [Out]	In

Amb. Temp. (°F)	75
Bar. Press.	30.16 [in. Hg] [mbar]
Probe I.D. No.	66-8-1
Liner Material	Glass
Filter No.	N/A
Thimble No.	N/A
Nozzle Diameter	0.225
Nozzle I.D.	225-1
Start Time:	8:09
Stop Time:	10:21

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] 836.770	Stack Temp. Ts (°F)	Probe T_p (°F) Set Point 250	Filter T_f (°F) Set Point 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 Filler ☐ Dioxin Trap ☐	Notes
5-1	5	0.48	1.3	839.96	310	247	248	67	75	75	8.0	10.6	N/A	
2	10	0.55	1.5	843.23	310	248	249	60	78	76	5.5	9.5	↓	
3	15	0.60	1.6	846.67	311	248	243	60	81	77	9.5	10.5		
4	20	0.60	1.6	850.10	310	247	251	59	84	78	10.0	9.4		
5	25	0.62	1.7	853.605	311	248	247	59	88	79	10.0	9.7		853.695
4-1	30	0.52	1.4	856.94	309	249	248	60	84	78	8.5	9.7		-0.09
2	35	0.49	1.3	860.10	310	249	247	60	85	80	8.0	10.1		
3	40	0.53	1.4	863.36	309	249	249	61	86	80	8.5	10.5		
4	45	0.58	1.6	866.80	311	249	257	60	86	80	9.5	9.0		
5	50	0.67	1.8	870.380	310	247	249	61	86	81	10.0	9.7		870.465
3-1	55	0.55	1.5	873.81	309	250	250	63	86	81	9.0	9.0		-0.085
2	60	0.47	1.3	877.09	310	250	250	64	86	81	8.0	10.6		
Total		18.8	38.6	~~85.005~~	7251				4238					
Average		0.7546	1.5440	~~SB.834~~	310.0400				84.7600					

Sum of square roots. 18.0 84.650 3720 1948

Circle correct bracketed units on data sheet

QA/QC PB
Date 12/11/13

CleanAir ENGINEERING

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

UNIT: 1 **RUN:** 2

FIELD DATA SHEET

Client	Wheelabrator Frackville	Project No.	17218
Plant	N. Brownsville	Date	12/11/13
Meter Operator		P. Bilyeu	
Probe Operator		P. Bilyeu	

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 Elapsed Time	Velocity Head ΔP ($in. H_2O$)	Orifice Setting ΔH ($in. H_2O$)	Gas Sample Volume V_m Init. Vol. [ft^3] [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	0.57	1.5	880.40	311	249	249	51	88	82	8.5	9.7	N/A	
4	70	0.67	1.8	888.02	310	247	248	51	87	82	10.0	9.4		
5	75	0.70	1.9	897.740	310	245	249	53	90	82	11.0	9.7		887.835
2-1	80	0.59	1.6	891.28	310	249	251	57	89	83	9.5	9.8		-0.09
2	85	0.46	1.2	894.33	311	249	243	59	91	84	8.0	10.6		
3	90	0.55	1.5	897.63	310	248	246	61	91	86	9.0	8.9		
4	95	0.63	1.7	901.18	311	247	248	62	94	86	10.0	9.3		
5	100	0.70	1.9	904.920	311	247	246	64	94	86	11.0	10.3		905.005
(-1	105	0.53	1.4	908.27	309	249	248	62	90	87	8.5	10.1		-0.08
2	110	0.54	1.4	911.52	309	249	251	61	91	87	8.5	9.5		
3	115	0.50	1.4	914.77	309	251	250	61	92	87	8.5	9.0		
4	120	0.55	1.5	918.11	310	251	249	62	93	87	9.0	9.3	↓	
5	125	0.61	1.8	921.775	310	250	250	63	94	87	11.0	8.8		
	Total	*												
	Average													

* Sum of square roots.

Circle correct bracketed units on data sheet.

CleanAir ENGINEERING

QA/QC CB

Date 12/11/13

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

UNIT: 1 **RUN:** 3

FIELD DATA SHEET

Client	Wheelabrator	Project No.	12218
Plant	N. Broward	Date	12/11/13
Meter Operator	P. Bihun		
Probe Operator	P. Bihun		

Meter Box	66-20	Sample Box No.	M11
Meter Y_d	1.0031	Meter $\Delta H_@$	1.7992
K Factor	2.70	Pitot C_p	0.814
Leak Rate Before	0.003 [cfm] [Lpm]	@	15 (in. Hg)
Leak Rate After	0.004 [cfm] [Lpm]	@	15 (in. Hg)
Pitot Leak Check Before: ☑		After: Good ☒	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]
-11.2	10.0		

Amb. Temp. (°F)	28	Bar. Press.	30.16 [in. Hg] [mbar]
Probe I.D. No.		66-8-1	
Liner Material		Glass	

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

Start Time:	10:42	Stop Time:	12:54

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)	Filter T_f (°F)	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
				922.100		Set Points 250	250							
1-1	5	0.53	1.4	925.42	311	256	255	64	91	91	6.5	10.2	N/A	
2	10	0.57	1.4	928.70	309	254	257	66	93	90	6.5	9.6	↓	
3	15	0.42	1.1	931.58	307	251	250	60	94	90	5.5	8.9		
4	20	0.52	1.4	934.86	306	257	251	61	96	91	6.5	9.6		
5	25	0.70	1.9	938.675	310	250	251	63	97	92	8.0	10.3		938.750
2-1	30	0.72	1.9	942.61	310	250	253	64	97	92	8.0	9.7		-0.075
2	35	0.55	1.5	946.07	310	248	250	65	98	92	7.0	9.8		
3	40	0.58	1.6	949.58	309	251	251	62	98	92	7.0	9.2		
4	45	0.62	1.7	953.17	310	257	250	58	101	93	7.5	9.0		
5	50	0.72	1.9	956.965	311	250	251	59	102	93	8.0	9.3		957.035
3-1	55	0.66	1.8	960.93	309	249	250	62	101	93	8.0	10.2		-0.07
2	60	0.60	1.6	964.24	310	250	250	63	100	92	7.5	9.5		
Total		*19.1620		89.480	3716				4755					
Average		0.7865	1.6800		309.6400				95.1000					

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

19.2 3712 2269

QA/QC PB

Date 12/11/13

89.575

CleanAir ENGINEERING

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

UNIT: 1 **RUN:** 3

FIELD DATA SHEET

Client	Wheelabrator	Project No.	2218
Plant	N. Broward	Date	12/11/13
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 ☐	

Duct Dimensions (in.)

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

Filter No.			
Thimble No.			
Nozzle Diameter		Nozzle I.D.	
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	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)	Oxygen Indicator, approx (%,dv)	☐ Amb Filter ☐ Dioxin Trap ☐	Notes
						250	250							
3	65	0.62	1.7	967.85	310	250	249	63	99	92	7.5	9.7	P114	
4	70	0.70	1.9	971.65	310	251	249	64	99	92	8.5	9.2		925, 5leP
5	75	0.72	1.9	975.470	310	251	250	64	100	92	8.5	9.7		0,085
4-1	80	0.58	1.6	979.07	310	250	250	64	98	92	7.0	9.9		
2	85	0.55	1.5	982.49	310	251	249	60	99	92	7.0	9.5		
3	90	0.63	1.7	986.08	309	251	249	60	99	92	7.5	9.6		
4	95	0.73	2.0	989.96	308	250	250	61	98	92	9.0	9.7		
5	100	0.72	1.9	993.760	310	251	250	62	99	91	8.5	10.6		993 845
5-1	105	0.55	1.5	997.21	310	249	250	64	99	92	7.5	9.5		0,085
2	110	0.53	1.4	1000.51	311	249	249	64	99	92	7.5	9.4		
3	115	0.65	1.8	1004.22	310	251	249	62	99	92	8.5	9.9		
4	120	0.70	1.9	1008.01	311	250	250	62	101	92	9.0	10.3		
5	125	0.73	2.0	1011.90	310	249	248	62	102	92	9.0	10.1		
	Total	*												
	Average													

* Sum of square roots.

Circle correct bracketed units on data sheet.

CleanAir ENGINEERING

QA/QC PB

Date 12/11/13

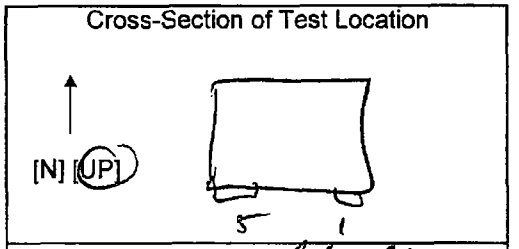
TEST LOCATION: FF Outlet Mercury **TESTING METHOD:** 29 **PAGE** 1 **OF** 2

UNIT: 1 **RUN:** 4

FIELD DATA SHEET

Client	Manufacturer
Plant	Al Broward
Meter Operator	P. Bishop
Probe Operator	P. Bishop
Project No.	72718
Date	12/11/13

Cross-Section of Test Location



Amb. Temp. (°F)	78
Bar. Press.	30.16 (in. Hg) [mbar]
Probe I.D. No.	6.6-F-1
Liner Material	Glass

Meter Box	6.6-20	Sample Box No.	M1D
Meter Y_d	1.0031	Meter $\Delta H_@$	1.7992
K Factor	2.70	Pitot C_p	0.814
Leak Rate Before	0.003 [cfm] [Lpm]	@	15 (in. Hg)
Leak Rate After	0.003 [cfm] [Lpm]	@	15 (in. Hg)
Pitot Leak Check Before:	☒	After: Good ☒	Bad ☐

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

Static Pres (in. H_2O)	Port Len. (in.)	Gas Flow [In] [Out] of page	First point all the way [In] [Out]
-11.2	10.0		

Duct Dimensions (in.) 96 x 96

Start Time:	13:14
Stop Time:	15:25

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. [ft^3] [L]	Stack Temp. Ts (°F)	Probe T_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)	Oxygen Indicator, approx (%,dv)	☐ Amb Filter ☐ Dioxin Trap ☐ ____	Notes
				12.545		280	280							
5-1	5	0.63	1.7	16.21	311	256	251	67	93	90	9.5	10.2	N/A	
2	10	0.60	1.6	19.70	311	254	253	65	94	90	9.0	9.8		
3	15	0.70	1.9	23.49	311	252	255	60	95	90	10.5	10.5		
4	20	0.73	2.0	27.35	310	247	249	60	96	90	11.0	9.7		
5	25	0.73	2.0	31.275	311	250	249	62	96	90	11.0	10.5		31.350
4-1	30	0.57	1.5	34.75	310	250	250	64	96	90	9.0	9.4		-0.075
2	35	0.58	1.6	38.24	310	249	251	64	96	90	9.5	9.6		
3	40	0.70	1.9	42.01	310	251	249	60	97	90	11.0	10.0		
4	45	0.73	2.10	45.90	311	251	250	58	98	90	11.0	10.6		
5	50	0.71	1.9	49.735	312	250	250	58	97	90	11.5	10.5		49.825
3-1	55	0.72	1.9	53.66	311	249	250	61	97	90	11.5	10.4		-0.09
2	60	0.59	1.6	57.23	312	250	252	61	98	91	10.0	10.2		
	Total	19.7503	42.3	89.6010					4719					
	Average	0.7900	1.6920		3103.6000				94.3800					

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

21.6 3730 .2234

QA/QC PB

Date 12/11/13

CleanAir ENGINEERING

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

UNIT: 1 **RUN:** 4

FIELD DATA SHEET

Client	Project No. 12248
Plant	Date 12/11/13
Meter Operator	P. Bilyeu
Probe Operator	P. Bilyeu

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 ☐

Duct Dimensions (in.)

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

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

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)	Oxygen Indicator, approx (%,dv)	☐ Amb Filter ☐ Dioxin Trap ☐	Notes
3	60	0.60	1.6	60.78	312	252	249	61	98	91	10.0	8.7	N/M	
4	70	0.65	1.8	64.48	310	251	250	62	98	91	10.5	8.2		
5	75	0.73	2.0	68.310	309	250	251	62	99	91	12.0	9.3		68.440
2-1	80	0.69	1.7	71.98	309	250	254	64	99	92	10.0	9.5		-0.09
2	85	0.52	1.4	75.32	309	250	251	64	100	92	9.0	9.7		
3	90	0.45	1.2	78.45	309	250	246	65	100	92	8.5	9.2		
4	95	0.57	1.5	81.81	310	250	251	66	100	92	9.5	10.2		
5	100	0.73	2.0	85.565	312	249	250	63	101	93	11.5	9.9		85.635
1-1	105	0.53	1.4	88.92	309	250	253	63	99	92	9.0	10.2		-0.07
2	110	0.60	1.6	92.39	310	250	247	58	99	92	10.0	10.5		
3	115	0.42	1.1	95.36	310	251	250	59	100	92	8.0	9.9		
4	120	0.53	1.4	98.62	310	250	248	60	99	92	9.0	9.3		
5	125	0.73	2.0	102.470	310	250	250	60	99	92	12.0	9.5	✓	
	Total	*												
	Average													

* Sum of square roots.

Circle correct bracketed units on data sheet.

CleanAir ENGINEERING

QA/QC PB
Date 12/11/13

Impinger Weight Sheet

Client	Wheelabrator			Unit Name / Location	Unit 1 FF Outlet
Plant	North Broward	Job No.	12118	Method	29

Balance Calibration Check			
Balance ID	8023101133	Reference Weight Mass	1000.0
Reference Weight ID	68152	Reference Weight Reading	1000.0

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	Filter Type	Quartz		Sample Box No.	M11
Date	12/10/13	Lot No.	NA		pH	NA
Analyst	D^2	Filter No.	Untared		Rinse	NA

	Contents	Gross Weight (gm)	Tare Weight (gm)	Net Weight Gain (gm)
Impinger 1	Empty	778.4	440.8	337.6
Impinger 2	100 ml 5%HNO_3/10%H_2O_2	674.3	552.1	122.2
Impinger 3	100 ml 5%HNO_3/10%H_2O_2	588.3	~~546.2~~ 563.6	24.7
Impinger 4	Empty	457.4	452.0	5.4
Impinger 5	100 ml 4%$KMnO_4$/10%H_2SO_4	550.8	547.9	2.9
Impinger 6	100 ml 4%$KMnO_4$/10%H_2SO_4	552.4	551.0	1.4
Impinger 7	≈ 250 g Silica Gel	772.5	753.2	19.3

QA/QC	D^2
Date	12/10

Total Weight (gm)
494.2
513.5

Run No.	2	Filter Type	Quartz		Sample Box No.	M10
Date	12/11/13	Lot No.	NA		pH	NA
Analyst	D^2	Filter No.	Untared		Rinse	NA

	Contents	Gross Weight (gm)	Tare Weight (gm)	Net Weight Gain (gm)
Impinger 1	Empty	775.3	436.9	338.4
Impinger 2	100 ml 5%HNO_3/10%H_2O_2	669.0	544.8	124.2
Impinger 3	100 ml 5%HNO_3/10%H_2O_2	550.6	525.2	25.4
Impinger 4	Empty	444.7	439.1	5.6
Impinger 5	100 ml 4%$KMnO_4$/10%H_2SO_4	556.9	553.8	3.1
Impinger 6	100 ml 4%$KMnO_4$/10%H_2SO_4	535.7	534.4	1.3
Impinger 7	≈ 250 g Silica Gel	721.3	701.7	19.6

QA/QC	D^2
Date	12/11

Total Weight (gm)
498
517.6

Run No.	3	Filter Type	Quartz		Sample Box No.	M11
Date	12/11/13	Lot No.	NA		pH	NA
Analyst	D^2	Filter No.	Untared		Rinse	NA

	Contents	Gross Weight (gm)	Tare Weight (gm)	Net Weight Gain (gm)	
Impinger 1	Empty	776.1	442.2	333.9	0
Impinger 2	100 ml 5%HNO_3/10%H_2O_2	693.1	540.1	153.0	0
Impinger 3	100 ml 5%HNO_3/10%H_2O_2	578.7	549.9	28.8	0
Impinger 4	Empty	460.7	453.2	7.5	0
Impinger 5	100 ml 4%$KMnO_4$/10%H_2SO_4	557.5	553.3	4.2	0
Impinger 6	100 ml 4%$KMnO_4$/10%H_2SO_4	556.4	552.8	3.6	0
Impinger 7	≈ 250 g Silica Gel	777.2	756.8	20.4	0

QA/QC	D^2
Date	12/11

Total Weight (gm)	
531	0
551.4	0

QA/QC D^2
Date 12/11/13

CleanAir ENGINEERING

Impinger Weight Sheet

Client Wheelabrator		Unit Name / Location Unit 1 FF Outlet
Plant North Broward	Job No. 12118	Method 29

Balance Calibration Check			
Balance ID	80281011137	Reference Weight Mass	1010.2
Reference Weight ID	60152	Reference Weight Reading	1000.1

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. M10
Date 12/11/13	Lot No. NA	pH NA
Analyst D^2	Filter No. Untared	Rinse NA

	Contents	Gross Weight (gm)	Tare Weight (gm)	Net Weight Gain (gm)	
Impinger 1	100 ml 0.1 N H2SO4	785.9	437.9	348.0	
Impinger 2	100 ml 0.1 N H2SO4	709.1	549.1	160.0	QA/QC D^2
Impinger 3	Empty	536.6	525.4	11.2	Date 12/11
Impinger 4	Empty	443.5	440.6	2.9	
Impinger 5	100 ml 4%$KMnO_4$/10%H_2SO_4	542.6	543.0	-.4	Total Weight (gm)
Impinger 6	100 ml 4%$KMnO_4$/10%H_2SO_4	557.5	554.9	2.6	524.3
Impinger 7	≈ 250 g Silica Gel	737.4	720.9	16.5	540.8

Run No.	Filter Type	Sample Box No.
Date	Lot No.	pH
Analyst D^2	Filter No.	Rinse

	Contents	Gross Weight (gm)	Tare Weight (gm)	Net Weight Gain (gm)	
Impinger 1					
Impinger 2					QA/QC
Impinger 3					Date
Impinger 4					
Impinger 5					Total Weight (gm)
Impinger 6					
Impinger 7					

Run No.	Filter Type	Sample Box No.
Date	Lot No.	pH
Analyst D^2	Filter No.	Rinse

	Contents	Gross Weight (gm)	Tare Weight (gm)	Net Weight Gain (gm)	
Impinger 1				0	
Impinger 2				0	QA/QC
Impinger 3				0	Date
Impinger 4				0	
Impinger 5				0	Total Weight (gm)
Impinger 6				0	0
Impinger 7				0	0

QA/QC D^2

Date 12/11/13

CleanAir ENGINEERING

ORSAT READINGS

TEST LOCATION: UNIT 1 FF outlet **PAGE** 1 **OF** 1

Client Wheelabrator, NORTH	Project Number 12218	$Fo = \frac{20.9 - \%O_2}{\%CO_2}$
Plant NORTH	Unit 1	
Orsat ID #6	Fuel Type mw	Leak Check Passed ☑

Run Number	Method Number	Trial	Percent CO_2	Percent O_2+CO_2	Percent O_2	F_O	Analyst	Analysis Date	Analysis Time
1	m29	1	9.0	19.2	10.2		D²	12/10	1537
		2	9.0	19.2	10.2				
		3	9.0	19.2	10.2				
		Avg.	9.0		10.2				
2	m29	1	9.2	19.0	9.8		D²	12/11	1131
		2	9.2	19.0	9.8				
		3	9.2	19.0	9.8				
		Avg.	9.2		9.8				
3	m29	1	8.8	18.8	10.0		D²	12/11	1452
		2	8.8	18.8	10.0				
		3	8.8	18.8	10.0				
		Avg.	8.8		10.0				
4	m29	1	9.0	18.8	9.8		D²	12/11	1547
		2	9.0	18.8	9.8				
		3	9.0	18.8	9.8				
		Avg.	9.0		9.8				
		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 D²
Date 12/11/13

CleanAir ENGINEERING

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FIELD DATA PRINTOUTS

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I hereby 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: 1/18/14

CleanAir.

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Field Data Printout

			Test Method:		**USEPA Method 29**
Location:	Unit 1 FF Outlet		**Analyte:**		**Mercury**
Test Run:	1				
Client:	Wheelabrator North Broward, Inc.		Bar. Press. (in. Hg):	30.14	Nozzle ID No: 275-1
Project No:	12218		Static P:	-10.6	Nozzle Diameter (D_n): 0.275
Source Area (ft^2):	64.00000		O_2 (dry volume %):	10.20	Probe ID No: 66-8-1
Meter Operator:	P. Bihun	505	CO_2 (dry volume %):	9.00	Pitot C_p: 0.814
Probe Operator:	P. Bihun	505	N_2+CO (dry volume %):	80.80	Pitot Leak Check: ☑Pass ☐Fail
Test Date:	12/10/13				
Start Time:	12:24				
Stop Time:	14:34		H_2O (condensate, ml or gm):	494.2	Meter Box ID. No: 66-20
Leak Rate Before:	0.004 cfm	@ 15 "Hg	H_2O (silica, g):	19.3	Meter ΔH@: 1.79920
Leak Rate After:	0.005 cfm	@ 15 "Hg	Actual Moisture (%):	22.44	Meter Y_d: 1.00310

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			749.200						
5-01	5.0	0.46	1.20	752.260	311	89	87	0.68	3.06	99.9
5-02	10.0	0.54	1.50	755.610	311	89	87	0.73	3.35	101.0
5-03	15.0	0.54	1.50	758.950	309	92	88	0.73	3.34	100.2
5-04	20.0	0.65	1.80	762.600	311	94	88	0.81	3.65	99.8
5-05	25.0	0.60	1.60	766.125	311	97	89	0.77	3.52	99.9
LEAK CHECK	25.0			766.225						
4-01	30.0	0.57	1.50	769.600	311	96	90	0.75	3.38	98.2
4-02	35.0	0.54	1.40	772.870	311	98	90	0.74	3.27	97.2
4-03	40.0	0.57	1.50	776.240	310	98	90	0.75	3.37	97.8
4-04	45.0	0.68	1.80	779.940	310	100	91	0.82	3.70	98.1
4-05	50.0	0.68	1.80	783.600	310	101	92	0.82	3.66	96.8
LEAK CHECK	50.0			783.665						
3-01	55.0	0.60	1.60	787.110	310	100	93	0.77	3.45	97.0
3-02	60.0	0.52	1.40	790.410	310	101	93	0.72	3.30	99.7
3-03	65.0	0.56	1.50	793.790	311	102	94	0.75	3.38	98.3
3-04	70.0	0.70	1.90	797.540	313	102	94	0.84	3.75	97.8
3-05	75.0	0.70	1.90	801.345	313	103	95	0.84	3.81	99.0
LEAK CHECK	75.0			801.435						
2-01	80.0	0.61	1.70	804.960	311	102	95	0.78	3.53	98.2
2-02	85.0	0.52	1.40	808.220	311	103	95	0.72	3.26	98.2
2-03	90.0	0.57	1.50	811.580	311	102	95	0.75	3.36	96.8
2-04	95.0	0.62	1.70	815.140	310	103	95	0.79	3.56	98.2
2-05	100.0	0.68	1.80	818.850	311	104	96	0.82	3.71	97.6
LEAK CHECK	100.0			818.945						
1-01	105.0	0.62	1.70	822.500	308	103	96	0.79	3.55	97.8
1-02	110.0	0.65	1.80	826.200	311	105	96	0.81	3.70	99.5
1-03	115.0	0.45	1.20	829.300	310	106	97	0.67	3.10	99.8
1-04	120.0	0.52	1.40	832.580	310	105	97	0.72	3.28	98.4
1-05	125.0	0.70	1.90	836.365	310	105	97	0.84	3.78	97.9
Final	125.0		1.60000	86.81500	310.60000	96.40000		0.76934	86.81500	
25 points sampled		Sq.Rt.ΔP								
QC-Check: Field Averages		0.7690	1.6000	86.8150	310.6000	96.4000				
		☑Avg. OK	☑Avg. OK	☑Avg. OK	☑Avg. OK	☑Avg. OK				

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P

Prepared by Clean Air Engineering Proprietary Software
SS ISOKINETIC Version 2008-13e

Field Data Printout

Test Method: USEPA Method 29
Analyte: Mercury

Location: Unit 1 FF Outlet
Test Run: 2
Client: Wheelabrator North Broward, Inc.
Project No: 12218
Source Area (ft^2): 64.00000
Meter Operator: P. Bihun 505
Probe Operator: P. Bihun 505
Test Date: 12/11/13
Start Time: 08:09
Stop Time: 10:21
Leak Rate Before: 0.003 cfm @ 15 "Hg
Leak Rate After: 0.003 cfm @ 15 "Hg

Bar. Press. (in. Hg): 30.16
Static P: -9.5
O_2 (dry volume %): 9.80
CO_2 (dry volume %): 9.20
N_2+CO (dry volume %): 81.00
H_2O (condensate, ml or gm): 498.0
H_2O (silica, g): 19.6
Actual Moisture (%): 22.64

Nozzle ID No: 275-1
Nozzle Diameter (D_n): 0.275
Probe ID No: 66-8-1
Pitot C_p: 0.814
Pitot Leak Check: ☑Pass ☐Fail
Meter Box ID. No: 66-20
Meter ΔH@: 1.79920
Meter Y_d: 1.00310

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)	$\sqrt{\Delta P_c}$ (calculated) ($\sqrt{}$in. H_2O)	Volume (calculated) (ft^3)	Isokinetics (calculated) (%)
	0.0			836.770						
5-01	5.0	0.48	1.30	839.960	310	75	75	0.69	3.19	104.5
5-02	10.0	0.55	1.50	843.230	310	78	76	0.74	3.27	99.8
5-03	15.0	0.60	1.60	846.670	311	81	77	0.77	3.44	100.2
5-04	20.0	0.60	1.60	850.100	310	84	78	0.77	3.43	99.5
5-05	25.0	0.62	1.70	853.605	311	85	79	0.79	3.51	99.9
LEAK CHECK	25.0			853.695						
4-01	30.0	0.52	1.40	856.940	309	84	78	0.72	3.25	101.0
4-02	35.0	0.49	1.30	860.100	310	85	80	0.70	3.16	101.1
4-03	40.0	0.53	1.40	863.360	309	86	80	0.73	3.26	100.1
4-04	45.0	0.58	1.60	866.800	311	86	80	0.76	3.44	101.2
4-05	50.0	0.67	1.80	870.380	310	86	81	0.82	3.58	97.8
LEAK CHECK	50.0			870.465						
3-01	55.0	0.55	1.50	873.810	309	86	81	0.74	3.34	100.8
3-02	60.0	0.47	1.30	877.090	310	86	81	0.69	3.28	106.9
3-03	65.0	0.57	1.50	880.400	311	88	82	0.75	3.31	97.8
3-04	70.0	0.67	1.80	884.020	310	87	82	0.82	3.62	98.8
3-05	75.0	0.70	1.90	887.740	310	90	82	0.84	3.72	99.0
LEAK CHECK	75.0			887.835						
2-01	80.0	0.59	1.60	891.280	310	89	83	0.77	3.44	99.8
2-02	85.0	0.46	1.20	894.330	311	91	84	0.68	3.05	99.8
2-03	90.0	0.55	1.50	897.630	310	91	86	0.74	3.30	98.6
2-04	95.0	0.63	1.70	901.180	311	94	86	0.79	3.55	98.9
2-05	100.0	0.70	1.90	904.920	311	94	86	0.84	3.74	98.9
LEAK CHECK	100.0			905.005						
1-01	105.0	0.53	1.40	908.270	309	90	87	0.73	3.26	99.3
1-02	110.0	0.51	1.40	911.520	309	91	87	0.71	3.25	100.6
1-03	115.0	0.50	1.40	914.770	309	92	87	0.71	3.25	101.5
1-04	120.0	0.55	1.50	918.110	310	93	87	0.74	3.34	99.5
1-05	125.0	0.67	1.80	921.775	310	94	87	0.82	3.66	98.9
Final	125.0		1.54400	84.65000	310.04000	84.76000		0.75462	84.65000	
25 points sampled		Sq.Rt.ΔP								
QC-Check: Field Averages		0.7546	1.5440	84.6500	310.0400	84.7600				
		☑Avg. OK	☑Avg. OK	☑Avg. OK	☑Avg. OK	☑Avg. OK				

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Field Data Printout

			Test Method:		**USEPA Method 29**
Location:	Unit 1 FF Outlet		**Analyte:**		**Mercury**
Test Run:	3				
Client:	Wheelabrator North Broward, Inc.		Bar. Press. (in. Hg):	30.16	Nozzle ID No: 275-1
Project No:	12218		Static P:	-11.2	Nozzle Diameter (D_n): 0.275
Source Area (ft^2):	64.00000		O_2 (dry volume %):	10.00	Probe ID No: 66-8-1
Meter Operator:	P. Bihun	505	CO_2 (dry volume %):	8.80	Pitot C_p: 0.814
Probe Operator:	P. Bihun	505	N_2+CO (dry volume %):	81.20	Pitot Leak Check: ☑ Pass ☐ Fail
Test Date:	12/11/13				
Start Time:	10:42				
Stop Time:	12:54		H_2O (condensate, ml or gm):	531.0	Meter Box ID. No: 66-20
Leak Rate Before:	0.003 cfm	@ 15 "Hg	H_2O (silica, g):	20.4	Meter ΔH@: 1.79920
Leak Rate After:	0.004 cfm	@ 15 "Hg	Actual Moisture (%):	23.10	Meter Y_d: 1.00310

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			922.100						
1-01	5.0	0.53	1.40	925.420	311	91	91	0.73	3.32	101.2
1-02	10.0	0.51	1.40	928.700	309	93	90	0.71	3.28	101.7
1-03	15.0	0.42	1.10	931.580	307	94	90	0.65	2.88	98.2
1-04	20.0	0.52	1.40	934.860	306	96	91	0.72	3.28	100.2
1-05	25.0	0.70	1.90	938.675	310	97	92	0.84	3.81	100.6
LEAK CHECK	25.0			938.750						
2-01	30.0	0.72	1.90	942.610	310	97	92	0.85	3.86	100.4
2-02	35.0	0.55	1.50	946.070	310	98	92	0.74	3.46	102.8
2-03	40.0	0.58	1.60	949.580	309	98	92	0.76	3.51	101.5
2-04	45.0	0.62	1.70	953.170	310	101	93	0.79	3.59	100.1
2-05	50.0	0.72	1.90	956.965	311	102	93	0.85	3.80	98.3
LEAK CHECK	50.0			957.035						
3-01	55.0	0.66	1.80	960.930	309	101	93	0.81	3.89	105.3
3-02	60.0	0.60	1.60	964.240	310	100	92	0.77	3.31	94.0
3-03	65.0	0.62	1.70	967.850	310	99	92	0.79	3.61	101.0
3-04	70.0	0.70	1.90	971.650	310	99	92	0.84	3.80	100.1
3-05	75.0	0.72	1.90	975.470	310	100	92	0.85	3.82	99.1
LEAK CHECK	75.0			975.565						
4-01	80.0	0.58	1.60	979.070	310	98	92	0.76	3.51	101.4
4-02	85.0	0.55	1.50	982.490	310	99	92	0.74	3.42	101.5
4-03	90.0	0.63	1.70	986.080	309	99	92	0.79	3.59	99.5
4-04	95.0	0.73	2.00	989.960	308	98	92	0.85	3.88	100.0
4-05	100.0	0.72	1.90	993.760	310	99	91	0.85	3.80	98.8
LEAK CHECK	100.0			993.845						
5-01	105.0	0.55	1.50	997.210	310	99	92	0.74	3.37	99.9
5-02	110.0	0.53	1.40	1000.510	311	99	92	0.73	3.30	99.8
5-03	115.0	0.65	1.80	1004.220	310	99	92	0.81	3.71	101.4
5-04	120.0	0.70	1.90	1008.010	311	101	92	0.84	3.79	99.7
5-05	125.0	0.73	2.00	1011.905	310	102	92	0.85	3.89	100.2
Final	125.0		1.68000	89.48000	309.64000	95.10000		0.78648	89.48000	
25 points sampled		Sq.Rt.ΔP								
QC-Check: Field Averages		0.7865	1.6800	89.4800	309.6400	95.1000				
		☑ Avg. OK	☑ Avg. OK	☑ Avg. OK	☑ Avg. OK	☑ Avg. OK				

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Field Data Printout

Location:	Unit 1 FF Outlet		Test Method:	USEPA Method 29	
Test Run:	4		Analyte:	Mercury	
Client:	Wheelabrator North Broward, Inc.		Bar. Press. (in. Hg):	30.16	Nozzle ID No: 275-1
Project No:	12218		Static P:	-11.2	Nozzle Diameter (D_n): 0.275
Source Area (ft^2):	64.00000		O_2 (dry volume %):	9.80	Probe ID No: 66-8-1
Meter Operator:	P. Bihun	505	CO_2 (dry volume %):	9.00	Pitot C_p: 0.814
Probe Operator:	P. Bihun	505	N_2+CO (dry volume %):	81.20	Pitot Leak Check: ☑ Pass ☐ Fail
Test Date:	12/11/13				
Start Time:	13:14				
Stop Time:	15:25		H_2O (condensate, ml or gm):	524.3	Meter Box ID. No: 66-20
Leak Rate Before:	0.003 cfm	@ 15 "Hg	H_2O (silica, g):	16.5	Meter ΔH@: 1.79920
Leak Rate After:	0.003 cfm	@ 18 "Hg	Actual Moisture (%):	22.71	Meter Y_d: 1.00310

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			12.545						
5-01	5.0	0.63	1.70	16.210	311	93	90	0.79	3.67	102.1
5-02	10.0	0.60	1.60	19.700	311	94	90	0.77	3.49	99.5
5-03	15.0	0.70	1.90	23.490	311	95	90	0.84	3.79	100.0
5-04	20.0	0.73	2.00	27.380	310	96	90	0.85	3.89	100.4
5-05	25.0	0.73	2.00	31.275	311	96	90	0.85	3.90	100.6
LEAK CHECK	25.0			31.350						
4-01	30.0	0.57	1.50	34.750	310	96	90	0.75	3.40	99.2
4-02	*35.0*	*0.58*	*1.60*	*38.240*	*310*	*96*	*90*	0.76	3.49	101.0
4-03	40.0	0.70	1.90	42.010	310	97	90	0.84	3.77	99.3
4-04	45.0	0.73	2.00	45.900	311	98	90	0.85	3.89	100.3
4-05	50.0	0.71	1.90	49.735	312	97	90	0.84	3.84	100.4
LEAK CHECK	50.0			49.825						
3-01	55.0	0.72	1.90	53.660	311	97	90	0.85	3.83	99.6
3-02	60.0	0.59	1.60	57.230	312	98	91	0.77	3.57	102.3
3-03	65.0	0.60	1.60	60.780	312	98	91	0.77	3.55	100.8
3-04	70.0	0.65	1.80	64.480	310	98	91	0.81	3.70	100.9
3-05	75.0	0.73	2.00	68.350	309	99	91	0.85	3.87	99.5
LEAK CHECK	75.0			68.440						
2-01	80.0	0.64	1.70	71.980	309	99	92	0.80	3.54	97.0
2-02	85.0	0.52	1.40	75.320	309	100	92	0.72	3.34	101.4
2-03	90.0	0.45	1.20	78.450	309	100	92	0.67	3.13	102.1
2-04	95.0	0.57	1.50	81.810	310	100	92	0.75	3.36	97.5
2-05	100.0	0.73	2.00	85.565	312	101	93	0.85	3.76	96.3
LEAK CHECK	100.0			85.635						
1-01	105.0	0.53	1.40	88.920	309	99	92	0.73	3.29	98.9
1-02	110.0	0.60	1.60	92.390	310	99	92	0.77	3.47	98.3
1-03	115.0	0.42	1.10	95.360	310	100	92	0.65	2.97	100.3
1-04	120.0	0.53	1.40	98.620	310	99	92	0.73	3.26	98.2
1-05	125.0	0.73	2.00	102.470	310	99	92	0.85	3.85	98.9
Final	125.0		1.69200	89.60000	310.36000	94.38000		0.79001	89.60000	
25 points sampled		Sq.Rt.ΔP								
QC-Check: Field Averages		0.7900	1.6920	89.6000	310.3600	94.3800				
		☑ Avg. OK	☑ Avg. OK	☑ Avg. OK	☑ Avg. OK	☑ Avg. OK				

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USEPA Method 4 Laboratory Data

Location: Unit 1 FF Outlet
Client: Wheelabrator North Broward, Inc.
Project No: 12218

Test Method: USEPA Method 29
Analyte: Mercury
Analyst: D. Dreska
Analyst Emp No: 364

Test Run: 1

	Contents	Gross (gm)	Tare (gm)	Net (gm)
Impinger 1	Empty	778.4	440.8	337.6
Impinger 2	5%HNO3/10%H2O2	674.3	552.1	122.2
Impinger 3	5%HNO3/10%H2O2	588.3	563.6	24.7
Impinger 4	Empty	457.4	452.0	5.4
Impinger 5	4%KMnO4/10%H2SO4	550.8	547.9	2.9
Impinger 6	4%KMnO4/10%H2SO4	552.4	551.0	1.4
Impinger 7	Silica Gel	772.5	753.2	19.3
Impinger 8				

Rinse: (ml or gm)

		Field Data Check	
494.2	Liquid (gm)		
0.0	less rinse (gm)		
494.2	Net Liquid (gm)	494.2	☑ QA/QC OK
+ 19.3	Silica Gel (gm)	19.3	☑ QA/QC OK
513.5	Total Vlc (gm)	513.5	☑ QA/QC OK

Test Run: 2

	Contents	Gross (gm)	Tare (gm)	Net (gm)
Impinger 1	Empty	775.3	436.9	338.4
Impinger 2	5%HNO3/10%H2O2	669.0	544.8	124.2
Impinger 3	5%HNO3/10%H2O2	550.6	525.2	25.4
Impinger 4	Empty	444.7	439.1	5.6
Impinger 5	4%KMnO4/10%H2SO4	556.9	553.8	3.1
Impinger 6	4%KMnO4/10%H2SO4	535.7	534.4	1.3
Impinger 7	Silica Gel	721.3	701.7	19.6
Impinger 8				

Rinse: (ml or gm)

		Field Data Check	
498.0	Liquid (gm)		
0.0	less rinse (gm)		
498.0	Net Liquid (gm)	498.0	☑ QA/QC OK
+ 19.6	Silica Gel (gm)	19.6	☑ QA/QC OK
517.6	Total Vlc (gm)	517.6	☑ QA/QC OK

Test Run: 3

	Contents	Gross (gm)	Tare (gm)	Net (gm)
Impinger 1	Empty	776.1	442.2	333.9
Impinger 2	5%HNO3/10%H2O2	693.1	540.1	153.0
Impinger 3	5%HNO3/10%H2O2	578.7	549.9	28.8
Impinger 4	Empty	460.7	453.2	7.5
Impinger 5	4%KMnO4/10%H2SO4	557.5	553.3	4.2
Impinger 6	4%KMnO4/10%H2SO4	556.4	552.8	3.6
Impinger 7	Silica Gel	777.2	756.8	20.4
Impinger 8				

Rinse: (ml or gm)

		Field Data Check	
531.0	Liquid (gm)		
0.0	less rinse (gm)		
531.0	Net Liquid (gm)	531.0	☑ QA/QC OK
+ 20.4	Silica Gel (gm)	20.4	☑ QA/QC OK
551.4	Total Vlc (gm)	551.4	☑ QA/QC OK

Test Run: 4

	Contents	Gross (gm)	Tare (gm)	Net (gm)
Impinger 1	Empty	785.9	437.9	348.0
Impinger 2	5%HNO3/10%H2O2	709.1	549.1	160.0
Impinger 3	5%HNO3/10%H2O2	536.6	525.4	11.2
Impinger 4	Empty	443.5	440.6	2.9
Impinger 5	4%KMnO4/10%H2SO4	542.6	543.0	-0.4
Impinger 6	4%KMnO4/10%H2SO4	557.5	554.9	2.6
Impinger 7	Silica Gel	737.4	720.9	16.5
Impinger 8				

Rinse: (ml or gm)

		Field Data Check	
524.3	Liquid (gm)		
0.0	less rinse (gm)		
524.3	Net Liquid (gm)	524.3	☑ QA/QC OK
+ 16.5	Silica Gel (gm)	16.5	☑ QA/QC OK
540.8	Total Vlc (gm)	540.8	☑ QA/QC OK

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USEPA Method 3 Laboratory Data

Test Method: USEPA Method 29
Analyte: Mercury

Location: Unit 1 FF Outlet
Client: Wheelabrator North Broward, Inc.
Project No: 12218
Method: EPA Method 3A
Fuel Type: Municipal Waste
F_o for Fuel: 1.03 to 1.3

Analyst: D. Dreska
Analyst Emp No: 364

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: CEM
1	1							
	2							
	3							
	Avg.							
CEM or Other Avg:		9.00000		10.20000	80.80000	29.84800	1.18889	☑ Fo value within expected range.
2	1							
	2							
	3							
	Avg.							
CEM or Other Avg:		9.20000		9.80000	81.00000	29.86400	1.20652	☑ Fo value within expected range.
3	1							
	2							
	3							
	Avg.							
CEM or Other Avg:		8.80000		10.00000	81.20000	29.80800	1.23864	☑ Fo value within expected range.
4	1							
	2							
	3							
	Avg.							
CEM or Other Avg:		9.00000		9.80000	81.20000	29.83200	1.23333	☑ Fo value within expected range.

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LABORATORY DATA

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I hereby 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: 1/15/14

CleanAir

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Wheelabrator North Broward, Inc.
Clean Air Project No: 12218
Unit 1 FF Outlet

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

Detection Limits		
m_{1b-DL}	Fraction 1B Detection Limit (µg)	0.1000
m_{2b-DL}	Fraction 2B Detection Limit (µg)	0.2000
m_{3a-DL}	Fraction 3A Detection Limit (µg)	0.2000
m_{3b-DL}	Fraction 3B Detection Limit (µg)	0.5000
m_{3c-DL}	Fraction 3C Detection Limit (µg)	0.4000
Blank Analysis		
m_{1b-B}	Fraction 1B Blank (µg)	<0.1000
m_{2b-B}	Fraction 2B Blank (µg)	<0.2000
m_{3a-B}	Fraction 3A Blank (µg)	<0.2000
m_{3b-B}	Fraction 3B Blank (µg)	<0.5000
m_{3c-B}	Fraction 3C Blank (µg)	<0.4000
$m_{total-B}$	Total Blank Amount (µg)	<1.4000

Run No.		**1**	**2**	**3**	**4**
Date (2013)		Dec 10	Dec 11	Dec 11	Dec 11
Start Time (approx.)		12:24	08:09	10:42	13:14
Stop Time (approx.)		14:34	10:21	12:54	15:25
Sample Analysis					
m_{1b-S}	Fraction 1B Sample (µg)	<0.1000	<0.1000	<0.1000	<0.1000
m_{2b-S}	Fraction 2B Sample (µg)	2.3378	18.2270	16.2002	13.8613
m_{3a-S}	Fraction 3A Sample (µg)	<0.2000	<0.2000	<0.2000	<0.2000
m_{3b-S}	Fraction 3B Sample (µg)	<0.5000	<0.5000	<0.5000	<0.5000
m_{3c-S}	Fraction 3C Sample (µg)	<0.4000	<0.4000	<0.4000	<0.4000
$m_{total-S}$	Total Sample Amount (µg)	2.3378	18.2270	16.2002	13.8613
Allowable Blank					
$m_{T-B-allow}$	Total Allowable Blank (µg)	0.0000	0.0000	0.0000	0.0000
Sample Corrected for Blank					
m_n	Total Sample Amount (µg)	2.3378	18.2270	16.2002	13.8613
Sample Corrected for Blank - Prorated Fractions					
m_{n-1b}	Fraction 1B Prorated (µg)	<0.1000	<0.1000	<0.1000	<0.1000
m_{n-2b}	Fraction 2B Prorated (µg)	2.3378	18.2270	16.2002	13.8613
m_{n-3a}	Fraction 3A Prorated (µg)	<0.2000	<0.2000	<0.2000	<0.2000
m_{n-3b}	Fraction 3B Prorated (µg)	<0.5000	<0.5000	<0.5000	<0.5000
m_{n-3c}	Fraction 3C Prorated (µg)	<0.4000	<0.4000	<0.4000	<0.4000

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Clean Air Engineering, Inc.

500 West Wood Street
Palatine, IL 60067

Project Number: 12218

Mercury

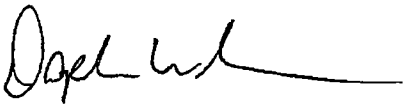
EPA Method 29 Analysis

Analytical Report
21650

Element One, Inc.
6319-D Carolina Beach Rd., Wilmington, NC 28412
910-793-0128 FAX: 910-792-6853 e1lab@e1lab.com

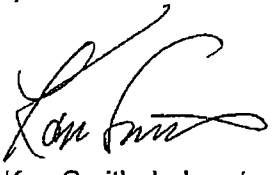
The following data for Analytical Report 21650
has been reviewed for completeness, accuracy,
adherence to method protocol,
and compliance with quality assurance guidelines.

Review by:



Daphne Woodman, Chemist
December 30, 2013

Report Reviewed and Finalized By:



Ken Smith, Laboratory Director
December 30, 2013

SUMMARY OF RESULTS

Summary of Analysis

Unit 1 - Summary of Method 29 Mercury Analysis

Run Number		Average Total Catch, µg	Front Half µg	H_2O_2 /HNO_3 µg	Empty Impinger µg	$KMnO_4$ µg	HCl µg
U1 FF Outlet R1	#1	2.34	< 0.1	2.32	< 0.2	< 0.5	< 0.4
	#2		< 0.1	2.36	< 0.2	< 0.5	< 0.4
U1 FF Outlet R2	#1	18.2	< 0.1	18.4	< 0.2	< 0.5	< 0.4
	#2		< 0.1	18.0	< 0.2	< 0.5	< 0.4
U1 FF Outlet R3	#1	16.2	< 0.1	16.1	< 0.2	< 0.5	< 0.4
	#2		< 0.1	16.3	< 0.2	< 0.5	< 0.4
U1 FF Outlet R4	#1	13.9	< 0.1	13.8	< 0.2	< 0.5	< 0.4
	#2		< 0.1	13.9	< 0.2	< 0.5	< 0.4
Field Blank	#1	< 0.5	< 0.1	< 0.3	< 0.2	< 0.5	< 0.4
	#2		< 0.1	< 0.3	< 0.2	< 0.5	< 0.4
Reagent Blank	#1	< 0.5	< 0.1	< 0.2	< 0.2	< 0.5	< 0.4
	#2		< 0.1	< 0.2	< 0.2	< 0.5	< 0.4

Summary of Analysis

Audit - Summary of Method 29 Mercury Analysis

Element	120613L- Cat 1427 Audit e21650-7 Total µg	120613L- Cat 1428 Audit e21650-8 ng/mL
Mercury	47.1	53.0

ANALYTICAL NARRATIVE

Element One Analytical Narrative

Client:	Clean Air, IL	Element One #:	21650
Client ID:	12218 / Wheelabrator Pompano Beach, FL	Analyst:	JWL
Method:	Method 29	Dates Received:	12/12/13
Analytes:	Hg	Dates Analyzed:	12/17-24/13

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.

The audit results for the Stationary Source Audit Program have been reported to ERA for Project #120613L. Copies of the audit reporting forms are included in the analytical data section of this report.

Additional Comments

The reported results have not been corrected for any blank values or spike recovery values.
This is the first revision to this report; the samples were labeled "Inlet" instead of "FF Outlet".

QUALITY CONTROL SUMMARY

Summary of Quality Control Data

Mercury Duplicate Analysis RPD

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

Run Number	Front Half	H_2O_2/HNO_3	Empty Imp	$KMnO_4$	HCl
U1 Inlet R1	NA	1.5%	NA	NA	NA
U1 Inlet R2	NA	2.3%	NA	NA	NA
U1 Inlet R3	NA	1.3%	NA	NA	NA
U1 Inlet R4	NA	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: 75-125% for Spike Recoveries)

Run Number		Front Half	H_2O_2/HNO_3	Empty Imp	$KMnO_4$	HCl
U1 Inlet R3	#1	112%	90%	95%	93%	95%
	#2	114%	88%	94%	91%	93%

SAMPLE CUSTODY

21650

66-12218-11

CLIENT	Wheelabrator	PROJECT	12218
PLANT	Pompano Beach, FL	DEPT.	66
PROJECT MANAGER	S. Brown		

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

CleanAir Engineering
500 West Wood Street
Palatine, IL 60067
630-627-0033 (phone)
847-991-3385 (fax)

LAB ID NUMBER	DATE (2013)	TEST LOCATION	RUN NUMBER	SAMPLE MATRIX	NUMBER OF CONTAINERS	CONTAINER SEALED? LIQUID LEVEL MARKED?	ANALYSIS REQUESTED			ADDITIONAL INFORMATION
								Mercury	Archive	
	12/10	Unit 1	1	Quartz Filter, 250 mL HDPE	1	X	X			
	12/11	Unit 1	2	Quartz Filter, 250 mL HDPE	1	X	X			
	↓	Unit 1	3	Quartz Filter, 250 mL HDPE	1	X	X			
		Unit 1	4	Quartz Filter, 250 mL HDPE	1	X	X			
		Unit 1	Field Blank	Quartz Filter, 250 mL HDPE	1	X	X			
	↓	Audit Sample			1	X	X			

Report From and Back Hall Separately

FORWARDING LAB
Element One, Inc.
6319C Carolina Beach Rd
Wilmington, NC 28412
910-793-0128 (phone)
Ken Smith

Relinquished By: (signature)	Date / Time	Relinquished By: (signature)	Date / Time	Relinquished By: (signature)	Date / Time	This form completed by:
D^2	6-5-13 @17:00					R. Vicere
Received By: (signature)	**Date / Time**	**Received By: (signature)**	**Date / Time**	**Relinquished By: (signature)**	**Date / Time**	**Signature / Date**
Lisa Bratton	12.12.13 1149					

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

21650

66-12218-12

CLIENT	Wheelabrator	PROJECT	12218
PLANT	Pompano Beach, FL	DEPT.	66
PROJECT MANAGER	S. Brown		

CleanAir. Engineering
500 West Wood Street
Palatine, IL 60067
800-627-0333 (phone)
847-991-3365 (fax)

ANALYTICAL METHOD	CONTAINER NUMBER	SAMPLE FRACTION
USEPA M-29	3	FRONT HALF HNO_3 RINSE 250 mL HDPE

FORWARDING LAB
Element One, Inc
6319C Carolina Beach Rd
Wilmington, NC 28412
910-793-0126 (phone)
Ken Smith

LAB ID NUMBER	DATE (2013)	TEST LOCATION	RUN NUMBER	SAMPLE MATRIX	NUMBER OF CONTAINERS	CONTAINER SEALED? LIQUID LEVEL MARKED?	ANALYSIS REQUESTED: Mercury	ANALYSIS REQUESTED: Archive	ADDITIONAL INFORMATION
	12/10	Unit:	Train Proof	Front Half HNO_3 Rinse, 250 mL HDPE	1	X		X	
		Unit:							
	12/10	Unit:	1	Front Half HNO_3 Rinse, 250 mL HDPE	1	X	X		
	12/11	Unit:	2	Front Half HNO_3 Rinse, 250 mL HDPE	1	X	X		
	"	Unit:	3	Front Half HNO_3 Rinse, 250 mL HDPE	1	X	X		
	"	Unit:	4	Front Half HNO_3 Rinse, 250 mL HDPE	1	X	X		
	12/10	Unit:	Field Blank	Front Half HNO_3 Rinse, 250 mL HDPE	1	X	X		
									Report Front and Back Half
									Separately

Relinquished By: (signature)	Date / Time	Relinquished By: (signature)	Date / Time	Relinquished By: (signature)	Date / Time	This form completed by:
D^2	6-5-13 @17:00					R. Vicero
Received By: (signature)	**Date / Time**	**Received By: (signature)**	**Date / Time**	**Relinquished By: (signature)**	**Date / Time**	**Signature / Date**
	6.12.13 1100					

21650

CLIENT	Wheelabrator	PROJECT	12218
PLANT	Pompano Beach, FL	DEPT.	66
PROJECT MANAGER	S. Brown		66-12218-13

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

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

ANALYSIS REQUESTED

FORWARDING LAB
Element One, Inc.
6319C Carolina Beach Rd
Wilmington, NC 28412
910-793-0128 (phone)
Ken Smith

LAB ID NUMBER	DATE (2013)	TEST LOCATION	RUN NUMBER	SAMPLE MATRIX	NUMBER OF CONTAINERS	CONTAINER SEALED? LIQUID LEVEL MARKED?		Mercury		Archive	ADDITIONAL INFORMATION
	12/10	Unit 1	1	Impingers 1-3 Catch and Rinse, 1000 mL HDPE	1	X		X			
	12/11	Unit 1	2	Impingers 1-3 Catch and Rinse, 1000 mL HDPE	1	X		X			
	↓	Unit 1	3	Impingers 1-3 Catch and Rinse, 1000 mL HDPE	1	X		X			
	↓	Unit 1	4	Impingers 1-3 Catch and Rinse, 1000 mL HDPE	1	X		X			
	12/10	Unit 1	Field Blank	Impingers 1-3 Catch and Rinse, 1000 mL HDPE	1	X		X			
											Report Front and Back Half
											Separately

Relinquished By: (signature)	Date / Time	Relinquished By: (signature)	Date / Time	Relinquished By: (signature)	Date / Time	This form completed by:
D^2	6-5-13 @17:00					R. Vicoro
Received By: (signature)	**Date / Time**	**Received By: (signature)**	**Date / Time**	**Relinquished By: (signature)**	**Date / Time**	**Signature Date**
Lisa Brinton	12-12-13 1100					

21650

CLIENT: Wheelabrator			PROJECT: 12218								66-12218-14	
PLANT: Pompano Beach, FL			DEPT.: 66									
PROJECT MANAGER: S. Brown			CleanAir. Engineering, 503 West Wood Street, Palatine, IL 60067, 800-627-0033 (phone), 847-991-3385 (fax)									
ANALYTICAL METHOD	CONTAINER NUMBER	SAMPLE FRACTION									FORWARDING LAB	
USEPA M-29	6A	IMPINGER 4 CATCH AND RINSE 250 mL HDPE									Element One, Inc. 6319C Carolina Beach Rd Wilmington, NC 28412 910-793-0128 (phone) Ken Smith	
LAB ID NUMBER	DATE (2013)	TEST LOCATION	RUN NUMBER	SAMPLE MATRIX	NUMBER OF CONTAINERS	CONTAINER SEALED?	LIQUID LEVEL MARKED?	ANALYSIS REQUESTED	Mercury	Archive	ADDITIONAL INFORMATION	
	12/10	Unit 1	1	Impinger 4 Catch and Rinse, 250 mL HDPE	1	X		X				
	12/11	Unit 1	2	Impinger 4 Catch and Rinse, 250 mL HDPE	1	X		X				
	↓	Unit 1	3	Impinger 4 Catch and Rinse, 250 mL HDPE	1	X		X				
	↓	Unit 1	4	Impinger 4 Catch and Rinse, 250 mL HDPE	1	X		X				
	12/10	Unit 1	Field Blank	Impinger 4 Catch and Rinse, 250 mL HDPE	1	X		X				
											Report Front and Back Hg	
											Separately	

Relinquished By: (signature)	Date / Time	Relinquished By: (signature)	Date / Time	Relinquished By: (signature)	Date / Time	This form completed by:
D^2	6-5-13 @17:00					R. Vicere
Received By: (signature)	Date / Time	Received By: (signature)	Date / Time	Relinquished By: (signature)	Date / Time	Signature / Date
Lisa Preston	12-12-13 1100					

21650

CLIENT	Wheelabrator	PROJECT	12218		66-12218-16
PLANT	Pompano Beach, FL	DEPT.	66		
PROJECT MANAGER	S. Brown				

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

FORWARDING LAB
Element One, Inc.
6319C Carolina Beach Rd
Wilmington, NC 28412
910-793-0128 (phone)
Ken Smith

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

ANALYSIS REQUESTED

LAB ID NUMBER	DATE (2013)	TEST LOCATION	RUN NUMBER	SAMPLE MATRIX	NUMBER OF CONTAINERS	CONTAINER SEALED? LIQUID LEVEL MARKED?		Mercury		Archive	ADDITIONAL INFORMATION
	12/10	Unit 1	1	Impingers 5-6 Catch and Rinse, 950 mL Amber Glass	1	X		X			
	12/11	Unit 1	2	Impingers 5-6 Catch and Rinse, 950 mL Amber Glass	1	X		X			
	↓	Unit 1	3	Impingers 5-6 Catch and Rinse, 950 mL Amber Glass	1	X		X			
	↓	Unit 1	4	Impingers 5-6 Catch and Rinse, 950 mL Amber Glass	1	X		X			
	12/10	Unit 1	Field Blank	Impingers 5-6 Catch and Rinse, 950 mL Amber Glass	1	X		X			
											Report Front and Back Half
											Separately

Relinquished By: (signature)	Date / Time	Relinquished By: (signature)	Date / Time	Relinquished By: (signature)	Date / Time	This form completed by:
D^2	6-5-13 @17:00	[signature]				R. Vicere
Received By: (signature)	Date / Time	Received By: (signature)	Date / Time	Relinquished By: (signature)	Date / Time	Signature / Date
[signature] Lisa Bratton	12-12-13 1100					

21650

CLIENT	Wheelabrator	PROJECT	12218
PLANT	Pompano Beach, FL	DEPT.	66
PROJECT MANAGER	S. Brown		66-12218-15

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

ANALYTICAL METHOD	CONTAINER NUMBER	SAMPLE FRACTION
USEPA M-29	0	IMPINGERS 5-6 CATCH AND RINSE 250 mL AMBER GLASS

FORWARDING LAB
Element One, Inc.
6319C Carolina Beach Rd
Wilmington, NC 28412
910-793-0128 (phone)
Ken Smith

ANALYSIS REQUESTED: Mercury, Archive

LAB ID NUMBER	DATE (2013)	TEST LOCATION	RUN NUMBER	SAMPLE MATRIX	NUMBER OF CONTAINERS	CONTAINER SEALED? LIQUID LEVEL MARKED?		Mercury		Archive	ADDITIONAL INFORMATION
	12/10	Unit 1	1	Impinger 5-6 8N HCl + DI Water, Container: 250 mL Amber Glass	1	X		X			
	12/11	Unit 1	2	Impinger 5-6 8N HCl + DI Water, Container: 250 mL Amber Glass	1	X		X			
	↓	Unit 1	3	Impinger 5-6 8N HCl + DI Water, Container: 250 mL Amber Glass	1	X		X			
		Unit 1	4	Impinger 5-6 8N HCl + DI Water, Container: 250 mL Amber Glass	1	X		X			
	12/10	Unit 1	Field Blank	Impinger 5-6 8N HCl + DI Water, Container: 250 mL Amber Glass	1	X		X			
											Report Front and Back Half Separately

Relinquished By: (signature)	Date / Time	Relinquished By: (signature)	Date / Time	Relinquished By: (signature)	Date / Time	This form completed by:
D^2	12/11 ~~6-5-13~~ @17:00	[signature]				R. Vicere
Received By: (signature)	**Date / Time**	**Received By: (signature)**	**Date / Time**	**Relinquished By: (signature)**	**Date / Time**	**Signature / Date**
Lisa Bratton	12-12-13 1100					

21650

CLIENT	Wheelabrator	PROJECT	12218
PLANT	Pompano Beach, FL	DEPT.	68
PROJECT MANAGER	S. Brown		66-12218-17

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

CleanAir. ENGINEERING
500 West Wood Street
Palatine, IL 60067
800-527-9633 (phone)
847-991-3305 (fax)

LAB ID NUMBER	DATE (2013)	TEST LOCATION	RUN NUMBER	SAMPLE MATRIX	NUMBER OF CONTAINERS	CONTAINER SEALED? LIQUID LEVEL MARKED?	ANALYSIS REQUESTED				ADDITIONAL INFORMATION
								Mercury		Archive	
	12/10	Unit 1	All	0.1 N HNO_3 (300 mL), Container 8A: 500 mL HDPE	1	X		X			
		Unit 1	All	DI Water (100 mL), Container 8B: 250 mL HDPE	1	X		X			
		Unit 1	All	5% HNO_3 / 10% H_2O_2 (200 mL), Container 9: 250 mL HDPE	1	X		X			
		Unit 1	All	4% $KMnO_4$ / 10% H_2SO_4 (100 mL), Container 10: 250 mL Amber Glass	1	X		X			
		Unit 1	All	DI Water (200 mL) / 8N HCl (25 mL), Container 11: 250 mL Amber Glass	1	X		X			
	12/10	Reagent Blank	All	Quartz Filters (3), Container 12: 250 mL HDPE	1	X		X			

Relinquished By: (signature)	Date / Time	Relinquished By: (signature)	Date / Time	Relinquished By: (signature)	Date / Time	This form completed by:
D^2	12/11 ~~0:6-13~~ @17:00					R. Vicere
Received By: (signature)	**Date / Time**	**Received By: (signature)**	**Date / Time**	**Relinquished By: (signature)**	**Date / Time**	**Signature / Date**
Lisa Bruton	12-12-13 1140					

ANALYTICAL DATA

Analytical Calculations

Mercury-

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

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-

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

Where-

Spike Result = Raw sample concentration (µg)---*Hg Data Sheet*

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

Spike Amount—*Hg Run Sheet*

Duplicate Analysis RPD-

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

Where-

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

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

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

elementOne **AIR TESTING SAMPLE SUBMISSION FORM** **Lab ID 21650**

Analysis Due Date 12.19.13
QA/QC/Report Due Date 12.23.13

Client	Clean Air IL
Project No	12218

Date Rec	12.12.13
Time Rec	1100

HNO_3 Lot: 111340	HF Lot: 60800 55115	HCl Lot: 411102	**Ref. Method:**
Volume Marked Y / N	Volume Loss Y / N / ?		**29**

Sample Identification

1	U1-M29-R1	5	Field Blank	7	120613L-Cat 1427
2	U1-M29-R2	6	Reagent Blank	8	120613L-Cat 1428
3	U1-M29-R2 Duplicate U1-M29-R3				
4	U1-M29-R3 Spike U1-M29-R4				

Analyses Requested Samples 1-8 Hg

Runs / FB	Fil / Ace (FH) pH <2.0 Y / N		HNO_3 (FH) pH <2.0 Y / N		5% HNO_3/10% H_2O_2 (BH) pH <2.0 Y / N			HNO_3 (A) pH <2.0 Y / N		$KMnO_4$ (B) pH <2.0 Y / N		HCl (C) 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			180	100	850			114	200	390	500	230	400
2.D			230		840			126		380		250	
3 S			200		860			116		420		270	
4			134		910			103		400		290	
5			164	↓	320			106	↓	390	↓	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	300	100	used 100 ml
	C-8A	A	0.1N HNO_3	300	—	
	C-8B	B	DI H_2O	110	100/33	used 33 ml
	C-9	BH	5% HNO_3/10% H_2O_2	200	—	
	C-10	B	4% $KMnO_4$/10%H_2SO_4	230	100/33	used 100 ml
	C-11	C	8N HCl DI H_2O	230	400	
	C-12	FH	Filter	-		

Audits **See Attached Audit Instructions**

Sample ID		Analyses Requested	Prep By / Date
7	120613L-Cat 1427	Hg	JWL 12-19-13
8	120613L-Cat 1428	Hg	JWL 12-16-13

Lab Communications

LCBH (FH+BH) spiked w/ 100 µl of std A @ 25 ppm

M29: Recolyse C1, C3, C4; C5A, C5B, C5C; RB C12, C8A, C8B, C9, C10, C11; 2 Audits— Archive Train Proof --12.12.13 LLB

SS Page 1 of 1
12/12/2013 3:13:31 PM
SS by
Labeled By/Date JWL 12-13-13

FH Prep By/Date JWL 12-18-13
BH Prep By/Date —
BH/FH Prep By/Date —
PM Prep By / Date —
BV Bl? JWL 12-16-13

A Prep By/Date JWL 12-16-13
B Prep By/Date JWL 12-16-13
C Prep By/Date JWL 12-17-13
ID Verification By/Date KLS 12-13-13

21650

ERA
A Waters Company

Stationary Source Audit Program Data Reporting Form
Project #: 120613L

Lab Name: Clean Air Engineering **ERA Customer Number: C144861**

INSTRUCTIONS:
Please fill in the results, methods references and analysis dates for the analyte(s) you wish to report for Project #120613L. Questions? See the Data Reporting Instructions section of your Data Package or call ERA at 1-800-372-0122. Please photocopy this form if you are reporting multiple methods.

Stationary Source Audit Program Mercury on Filter Paper (cat# 1127)

Method Description: EPA 29 Rev/Ed:

Analysis Date (mm-dd): 12 - 23 Analyst: JWL Workgroup:

TNI Code	Analyte	Units	PTRL	Concentration Range	Reported Value
1095	Mercury	µg/Filter	0.750	1.00 to 75.0	47.1

16341 Table Mountain Pkwy • Golden, CO 80403 • 800.372.0122 • 303.431.8454 • fax 303.421.0159 • www.eraqc.com

21650

ERA
A Waters Company

Stationary Source Audit Program Data Reporting Form
Project #: 120613L

Lab Name: Clean Air Engineering **ERA Customer Number: C144861**

INSTRUCTIONS:
Please fill in the results, methods references and analysis dates for the analyte(s) you wish to report for Project #120613L. Questions? See the Data Reporting Instructions section of your Data Package or call ERA at 1-800-372-0122. Please photocopy this form if you are reporting multiple methods.

Stationary Source Audit Program Mercury in Impinger Solution (cat# 1128)

Method Description: EPA 29 Rev/Ed:

Analysis Date (mm-dd): 12 - 19 Analyst: JWL Workgroup:

TNI Code	Analyte	Units	PTRL	Concentration Range	Reported Value
1095	Mercury	ng/mL	0.680	0.900 to 200	53.0

16341 Table Mountain Pkwy • Golden, CO 80403 • 800.372.0122 • 303.431.8454 • fax 303.421.0159 • www.eraqc.com

elementOne **Method 29 Microwave Worksheet** Lab ID # e 21650

Client: Clean Air

Date Digested: 12.19.13 Initials: JWL Worksheet Prepared by: JWL

Auto Sample Loc.	Sample Lab ID	Sample Weight (g)	# of filters digested	Spike	Prep Volume (ml)	Weight In Micro / Weight Out Micro	Units
1	LCB				100		
2	LCB+			100 ml Std A			
4	-1		1				
5	-2						
6	-3						
8	-4						
9	-5						
10	-6						
12	-7			40 ml Concentrate			
13	BLK						
14	BLK						
16	BLK						
LCB+ Spiked w/ 100 ml of Std A @ 25 ppm							
21650-7 Transferred 100 ml of Concentrate onto filter + digested							

Element One, Inc. Form 104 - Revision 1.0

HF Lot # 0000055115

2 ml

HNO_3 Lot # 113040

Come

elementOne **MERCURY BATCH DIGESTION - RUN WORKSHEET**

Date Prepared/Digested: 12-16-13 Prep By: JWL SIF File #: ~~12-16-1~~ 121713-1
Block #1 Temperature: 93.93 Start Time: 5:55 Machine ID: #1
Block #2 Temperature: 95.55 Stop Time: 8:10 Batch Analyst: JWL
Block #3 Temperature: — Typed By: JWL Verified By: PDT

A/S	Curve & QC's	0.4ug/ml working std		BV, ml	FV, ml	Standard Lot Numbers
						Standard #1 (for working std)
1	Lab BLK (3/ batch)	0		40	40	Lot #: 1316504
2	0.004 ug	0.01ml		40	40	Working Standard
3	0.04 ug	0.10ml		40	40	Lot #: 121613-1 by: JWL
4	0.08 ug	0.20ml		40	40	Standard #2 (QC #2):
5	0.16 ug	0.40ml		40	40	Lot #: 121613-2
6	0.20ug	0.50ml		40	40	Standard #3 (QC #3):
						Lot #: 121613-3
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: JWL

Initial Review By: JWL Date: 12-17-13 Time: 11:00
Final QC Review By: DCW Date: 12/17/13 Time: 1303
Comments: 21648-3+ @ 2 mL

A/S	LAB #	Client	Wt/FV	Ali Used	ml used	Sample Vol, ml	Spike µg
9	21648 3				5	1	
10	-3+				↓	↓	
11	21600 -6				20	1	
12	-6+						
13	-9						
14	-9+				↓	↓	
15	21652 -1B				4	500	
16	-2B						
17	-2BD						
18	-3B						
19	-3B+				↓	↓	

NOTES: Lab blanks and spikes must be prepared with each batch digestion
Spike for Hg, Use calibration [illegible] 0.5ug/ml standard at the rate of 0.20ml per 40ml sample.
Digestion chemicals to be added [illegible] at the following rate per 40ml volumes.
H_2SO_4 @ 2.0ml..... HNO_3 [illegible].0ml..... Persulfate @ 3.0ml..... $KMnO_4$ @ 6.0ml

H_2SO_4 Lot # 5137 H_2O Lot # 1113040 HCl Lot #: 411102
Persulfate Lot # 120613-3 $KMnO_4$ Lot # 111413-5 Hydrox Lot#: 122213-6
Clear samples after digestion with 3.2ml of Hydroxylamine solution.

elementOne MERCUR[illegible] TCI DIGESTION - RUN WORKSHEET

SIF File #: _____

A/S	LAB #	Client	V. FV	Ali Used	ml used	Sample Vol, ml	Spike µg
20	21650 - 4B				4	500	
21	- 5B				↓	↓	
22	- 6B				↓	↓	
23	21650 - 1A				4	200	
24	- 2A				↓	↓	
25	- 2AD				↓	↓	
26	- 3A				↓	↓	
27	- 3A +				↓	↓	
28	- 4A				↓	↓	
29	- 5A				↓	↓	
30	- 6A				↓	↓	
31	21650 - 1BH				4	850	
32	- 2BH				↓	840	
33	- 2BHD				↓	↓	
34	- 3BH				↓	840	
35	- 3BH +				↓	↓	
36	- 4BH				↓	910	
37	- 5BH				↓	320	
38	- 6BH				↓	200	
39	21650 - 5				.05	5	
40	- 8				- 1	↓	
41	- 8				- 2	↓	
42	21659 - 1A				4	200	
43	- 1AD				↓	↓	
44	- 1A +				↓	↓	
45	- 1B				4	600	
46	- 1BD				↓	↓	
47	- 1B +				↓	↓	
48	- 1BH				4	1410	
49	- 1BHD				↓	↓	
50	- 1BH +				↓	↓	
51	21329 BLK				1	1	
52	BLK +				↓	↓	
53	- Filter				↓	↓	
54	- Petr				↓		

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elementOne **MERCURY BATCH DIGESTION - RUN WORKSHEET**

Date Prepared/Digested: 12-17-13 Prep By: JWL SIF File #: 121813-1
Block #1 Temperature: 95.56 Start Time: 5:55 Machine ID: #1
Block #2 Temperature: 94.92 Stop Time: 8:10 Batch Analyst: JWL
Block #3 Temperature: — Typed By: JWL Verified By: MCB

A/S	Curve & QC's	0.4ug/ml working std		BV, ml	FV, ml	Standard Lot Numbers
						Standard #1 (for working std)
1	Lab BLK (3/ batch)	0		40	40	Lot #: 1310504
2	0.004 ug	0.01ml		40	40	Working Standard
3	0.04 ug	0.10ml		40	40	Lot #: 121613-1 by: JWL
4	0.08 ug	0.20ml		40	40	Standard #2 (QC #2):
5	0.16 ug	0.40ml		40	40	Lot #: 121613-2
6	0.20ug	0.50ml		40	40	Standard #3 (QC #3):
						Lot #: 121613-3
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: JWL

Initial Review By: JWL Date: 12-18-13 Time: 1:00
Final QC Review By: DBL Date: 12/19/13 Time: 1205
Comments: 21650-8 @ 2ml from dilution 21617-17 @ 4ml

A/S	LAB #	Client	Wt/FV	Ali Used	ml used	Sample Vol, ml	Spike µg
✓ 9	21648-3				2	1	
10	-3+				↓	↓	
11	-3				1		
12	-3+				↓	↓	
✓ 13	21553/574 BLK				20	1	
14	BLK+				↓	↓	
✓ 15	21655/656 BLK						
16	BLK+						
✓ 17	21658/659/662/663 BLK						
18	BLK+						
✓ 19	21655 A				↓	↓	

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 # 51312 HNO_3 Lot # 111340 HCl Lot #: 41111 02

Persulfate Lot # 121613-3 $KMnO_4$ Lot # 111413-5 Hydrox Lot#: 122213-6

Clear samples add 3.2ml of Hydroxylamine solution.

elementOne **MERCURY BATCH DIGESTION - RUN WORKSHEET**

SIF File #: _____

A/S	LAB #	Client	V UFV	Ali Used	ml used	Sample Vol, ml	Spike µg
✓ 20	21655 4 L				20	1	
21	- B						
✓ 22	- C						
✓ 23	21656 - 1						
24	- 2						
25	- 2D						
26	- 3						
27	- 4						
28	- 5						
29	- 6						
30	- 7						
✓ 31	- 7 L						
✓ 32	21661						
✓ 33	- Dup						
✓ 34	21662						
✓ 35	21663 - 1						
36	- 2						
✓ 37	- 2D						
✓ 38	21553 - 1						
39	- 1 L						
40	- 1 D						
41	- 5						
✓ 42	- 5D						
✓ 43	21574 - 2						
44	- 2D						
45	- 4						
46	- 4D						
47	- 1						
48	- 7D				↓	↓	
49	21650 - 1C				4	400	
50	- 2C						
51	- 2CD						
52	- 3C						
53	- 3C L						
54	- 4C				↓	↓	

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elementOne MERC'' BATCH D'CT TION - RUN WORKSHEET

SIF File #: _____

A/S	LAB #	Cli	W/FV	fi Used	ml used	Sample Vol. ml	Spike µg
55	21650 - 5C				4	400	
56	- 6C				↓	↓	
57	21650 - 8				.2	1000	
58	- 8				.5	↓	
59	21650 8				1	↓	
60	21659 - 1C				4	400	
61	- 1C D				↓	↓	
62	- 1C +				↓	↓	
✓ 63	21291 - 30 QC				.1	5	
64	LL QC				1	1	
65	21663 LAS (TOT)				SWD 4	1	
✓ 66	(TOT) LCS +				4.2	↓	
67	- 1		.5027/50	4	.0402	1	
68	- 1 +		↓	↓	↓		
69	- 2		0.5194/50		.0416		
70	- 2 D		0.4935/50	↓	.0395		
71	(TOT) 21657 LCS				SWD 4		
72	LCS +				4.2		
73	21657 - 1		0.5041/50	4	.0403		
74	- 1D		0.5009/50	↓	.0401		
75	- 2		0.5049/50	4	.0404		
76	- 2 +		↓	↓	↓	↓	
✓ 77	21329 - 025047				1	50	
78	- 025047 +				↓	↓	
79	21617 - LAB FH				4	100	
80	- LAB FH +				1.0		
81	- 1 FH				4		
82	- 2 FH						
83	- 2 FH D						
84	- 3 FH						
85	- 3 FH +						
86	- 4 FH						
87	- 5 FH						
88	- 5 FH D						
89	- 6 FH				↓	↓	

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elementOne **MERCURY BATCH DIGESTION - RUN WORKSHEET**

Date Prepared/Digested: 12.19.13 Prep By: JWL SIF File #: 122013 - 1
Block #1 Temperature: 94.91 Start Time: 5:55 Machine ID: #1
Block #2 Temperature: 95.95 Stop Time: 8:10 Batch Analyst: JWL
Block #3 Temperature: — Typed By: JWL Verified By: LAL

A/S	Curve & QC's	0.4ug/ml working std		BV, ml	FV, ml	Standard Lot Numbers
						Standard #1 (for working std)
1	Lab BLK (3/ batch)	0		40	40	Lot #: 131029
2	0.004 ug	0.01ml		40	40	Working Standard
3	0.04 ug	0.10ml		40	40	Lot #: 121613-1 by: JWL
4	0.08 ug	0.20ml		40	40	Standard #2 (QC #2):
5	0.16 ug	0.40ml		40	40	Lot #: 121613-2
6	0.20ug	0.50ml		40	40	Standard #3 (QC #3):
						Lot #: 121613 - 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: JWL

Initial Review By: JWL Date: 12.20.13 Time: 12:45
Final QC Review By: KS Date: 12.20.13 Time: 1100
Comments: 21667 - 3+ @ 10 + 5mL 21659 LKB FH+ @ 10 mL

A/S	LAB #	Client	Wt/FV	Ali Used	ml used	Sample Vol. ml	Spike µg
9	21665 - 3				10	1	
10	- 3+				↓	↓	
11	- 3				5	↓	
12	- 3+				↓	↓	
13	21666 - 3				10	↓	
14	- 3+				↓	↓	
15	- 3				5	↓	
16	- 3+				↓	↓	
17	21667 BLK				20	1	
18	BLK+				↓	↓	
19	21667 - 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 # 51312 HNO_3 Lot # 1113040 HCl Lot #: 411102

Persulfate Lot # 120613-3 $KMnO_4$ Lot # 111413-5 Hydrox Lot#: 120213-6

Clear samples after digestion with 3.2ml of Hydroxylamine solution.

elementOne **MERCURY BATCH DIGESTION - RUN WORKSHEET**

SIF File #: 122013-1

A/S	LAB #	Client	Wt/FV	Ali Used	ml used	Sample Vol. ml	Spike µg
20	21667 - 2				20	1	
21	- 2D						
22	- 3						
23	- 3H						
24	- 4						
25	21650 LCS FH				4	100	
26	LCSFH+				1.6		
27	- 1 FH				4		
28	- 2FH						
29	- 2FHD						
30	- 3FH						
31	- 3FH+						
32	- 4FH						
33	- 5FH						
34	- 6FH						
35	- 7				.5		
36	- 7				1		
37	- 7				2		
38	21659 LCS FH				4	100	
39	LCSFH+				1.6		
40	- 1 FH				4		
41	- 1 FHD						
42	- 1 FH+						
43	21664 - 16				4	500	
44	- 2B						
45	- 2BD						
46	- 3B						
47	- 3B+						
48	- 4B						
49	- 5B						
50	21665(TOT)LCS				4	1	
51	LCSH				.2		
52	- 1		0.4991/50	4	0.8319		
53	- 2		0.5266/50		.0421		
54	- 2D		0.4810/50		.0315		

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elementOne **MERCURY BATCH DIGESTION - RUN WORKSHEET**

Date Prepared/Digested: 12-23-13 Prep By: JWL/LAL SIF File #: 122313-1
Block #1 Temperature: 94.14 Start Time: 8:06 Machine ID: #1
Block #2 Temperature: 95.05 Stop Time: 10:15 Batch Analyst: JWL
Block #3 Temperature: Typed By: JWL Verified By: LAL

A/S	Curve & QC's	0.4ug/ml working std		BV, ml	FV, ml	Standard Lot Numbers
						Standard #1 (for working std)
1	Lab BLK (3/ batch)	0		40	40	Lot #: 131650H
2	0.004 ug	0.01ml		40	40	Working Standard
3	0.04 ug	0.10ml		40	40	Lot #: 122313-1 by: JWL
4	0.08 ug	0.20ml		40	40	Standard #2 (QC #2):
5	0.16 ug	0.40ml		40	40	Lot #: 122313-2
6	0.20ug	0.50ml		40	40	Standard #3 (QC #3):
						Lot #: 122313-3
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: JWL

Initial Review By: LAL Date: 12-23-13 Time: 3:02
Final QC Review By: Date: Time:
Comments: 21667-3t @ 2.5mL, 21659LRBFH+

A/S	LAB #	Client	Wt/FV	Aliquot	Digested	Sample Vol. ml	Spike µg
9	21667-3				10	1	
10	-3t				↓	↓	
11	-3				5	↓	
12	-3t				↓	↓	
13	21659 LRBFH				4	100	
14	LRBFH+				1.6	↓	
15	21664-4A				4	200	
16	21664-1C				4	400	
17	-2C				↓	↓	
18	2CD				↓	↓	
19	-3C				↓	↓	

NOTES: Lab blanks and spikes must be prepared with each batch digestion
Spike for Hg, Use calibration working 0.4ug/ml standard @ 0.20ml per 40ml sample.
Digestion chemicals to be added in order at the following volumes.
H_2SO_4 @ 2.0ml..... HNO_3 @ 1.0ml..... Persulfate @ 3.0ml..... ... $KMnO_4$ @ 6.0ml

H_2SO_4 Lot # 52151 HNO_3 Lot # 113040 HCl Lot #: 35187
Persulfate Lot # 120613-3 $KMnO_4$ Lot # 11413-5 Hydrox Lot#: 120213-6
Clear samples after digestion with ... solution.

elementOne MERCURY BATCH DIGESTIO[illegible] HEET

IF File #: 122313-1

A/S	LAB #	Client	Wt/FV	Aliquot	Sample Vol. ml	Spike µg
✓ 20	21664 - 3C +			4	400	
21	-4C			↓	↓	
22	-5C					
✓ 23	21682 BLK			20		
24	BLK +					
✓ 25	21682 - 1					
26	-2					
27	-2D					
✓ 28	-3					
✓ 29	-3 +			↓	↓	
✓ 30	21650 LABFIL			4	100	
31	-7			2	100	
32	-7			↓	↓	
✓ 33	21492-1A			20		
34	-1B					
35	-1C					
✓ 36	-1D					
✓ 37	21492-2A					
38	-2B					
39	-2C					
40	-2D					
41	-3A					
42	-3B					
43	-3C					
44	-3C +					
45	-3D					
46	-4A					
47	-4B					
48	-4C					
49	-4D					
50	-5A					
51	-5B					
52	-5C					
53	-5D					
54	-6A			↓	↓	

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PerkinElmer FIMS-100 CVAA Mercury Analyzer

Sample_ID	Date	Time	Mean_Sig	Mean_Rd	Mean_Rt	Units	Alq.	Vol.	Sig 1	Reading-1	Result-1	Sig 2	Reading-2	Result-2
Calib Blank	12/17/2013	8:48:20 AM	-2.65E-06			µg			5.21E-06			-1.05E-05		
STD1 = .004ug	12/17/2013	8:50:01 AM	0.0009873			µg			0.000982			0.0009926		
STD2 = .04ug	12/17/2013	8:51:42 AM	0.0100748			µg			0.0101002			0.0100495		
STD3 = .08ug	12/17/2013	8:53:35 AM	0.0205835			µg			0.020897			0.0202699		
STD4 = .16ug	12/17/2013	8:55:30 AM	0.0400284			µg			0.0401091			0.0399478		
STD5 = .2ug	12/17/2013	8:57:24 AM	0.050074			µg			0.0513032			0.0488448		
Reagent Blank	12/17/2013	8:59:17 AM	8.43E-05	0.000336	0.000336	µg			4.58E-05	0.0001826	0.0001826	0.0001228	0.0004894	0.0004894
0.004ug = DL	12/17/2013	9:00:57 AM	0.0010543	0.0042013	0.0042013	µg			0.0010456	0.0041664	0.0041664	0.0010631	0.0042362	0.0042362
0.080ug = QC STD 2	12/17/2013	9:02:40 AM	0.0197926	0.0788699	0.0788699	µg			0.0200609	0.0799391	0.0799391	0.0195243	0.0778008	0.0778008
0.080ug = QC STD 3	12/17/2013	9:04:37 AM	0.0197128	0.0785518	0.0785518	µg			0.019775	0.0787997	0.0787997	0.0196506	0.0783039	0.0783039
Reagent Blank	12/17/2013	9:06:32 AM	6.00E-05	0.0002391	0.0002391	µg			5.08E-05	0.0002022	0.0002022	6.92E-05	0.0002759	0.0002759
21650-1B	12/17/2013	9:19:01 AM	0.0001063	8.77E-05	0.0109605	µg	4	500	0.0001255	0.0001639	0.0204885	8.72E-05	1.15E-05	0.0014325
21650-2B	12/17/2013	9:20:47 AM	0.0002533	0.0006734	0.0841713	µg	4	500	0.0002659	0.0007234	0.0904256	0.0002407	0.0006233	0.0779171
21650-2B DUP	12/17/2013	9:22:29 AM	0.0002446	0.0006387	0.079837	µg	4	500	0.0002514	0.000666	0.083247	0.0002378	0.0006114	0.076427
21650-3B	12/17/2013	9:24:09 AM	0.0001301	0.0001825	0.0228092	µg	4	500	0.0001424	0.0002315	0.0289364	0.0001178	0.0001335	0.0166819
0.004ug = DL	12/17/2013	9:25:49 AM	0.0010352	0.0041253	0.0041253	µg			0.0010488	0.0041794	0.0041794	0.0010217	0.0040712	0.0040712
0.080ug = QC STD 2	12/17/2013	9:27:33 AM	0.0186955	0.0744983	0.0744983	µg			0.0187008	0.0745193	0.0745193	0.0186903	0.0744774	0.0744774
Reagent Blank	12/17/2013	9:29:27 AM	9.48E-05	0.0003778	0.0003778	µg			9.40E-05	0.0003744	0.0003744	9.57E-05	0.0003812	0.0003812
21650-3B SPK	12/17/2013	9:31:07 AM	0.0185998	0.0737808	9.2226021	µg	4	500	0.0187638	0.0744342	9.3042772	0.0184358	0.0731274	9.140927
21650-4B	12/17/2013	9:32:58 AM	0.0001885	0.0004153	0.0519072	µg	4	500	0.0001906	0.0004235	0.0529381	0.0001865	0.000407	0.0508762
21650-5B	12/17/2013	9:34:39 AM	0.0001376	0.0002122	0.0265299	µg	4	500	0.0001533	0.0002749	0.0343661	0.0001219	0.0001496	0.0186938
21650-6B	12/17/2013	9:36:20 AM	9.35E-05	3.67E-05	0.0045827	µg	4	500	0.0001065	8.83E-05	0.0110336	8.06E-05	-1.49E-05	-0.0018682
21650-1A	12/17/2013	9:38:02 AM	0.0001498	0.000261	0.0130484	µg	4	200	0.0001543	0.0002788	0.0139413	0.0001453	0.0002431	0.0121555
21650-2A	12/17/2013	9:39:44 AM	0.0002512	0.0006648	0.0332423	µg	4	200	0.0002352	0.0006014	0.030068	0.0002671	0.0007283	0.0364166
21650-2A DUP	12/17/2013	9:41:26 AM	0.0002494	0.0006576	0.0328812	µg	4	200	0.0002564	0.0006859	0.0342938	0.0002423	0.0006294	0.0314686
21650-3A	12/17/2013	9:43:10 AM	0.0003228	0.0009501	0.0475066	µg	4	200	0.0003174	0.0009288	0.0464376	0.0003281	0.0009715	0.0485755
21650-3A SPK	12/17/2013	9:44:54 AM	0.0191307	0.0758962	3.7948079	µg	4	200	0.0192053	0.0761937	3.8096835	0.019056	0.0755986	3.7799323
21650-4A	12/17/2013	9:46:49 AM	0.0002088	0.000496	0.0247997	µg	4	200	0.000209	0.000497	0.0248503	0.0002085	0.000495	0.0247491
0.004ug = DL	12/17/2013	9:48:32 AM	0.0010511	0.0041885	0.0041885	µg			0.0010862	0.0043284	0.0043284	0.001016	0.0040486	0.0040486
0.080ug = QC STD 2	12/17/2013	9:50:15 AM	0.0187478	0.0747066	0.0747066	µg			0.0188868	0.0752606	0.0752606	0.0186088	0.0741526	0.0741526
Reagent Blank	12/17/2013	9:52:09 AM	0.0001451	0.0005783	0.0005783	µg			0.0001442	0.0005748	0.0005748	0.000146	0.0005817	0.0005817
21650-5A	12/17/2013	9:53:51 AM	0.000165	0.0003215	0.0160762	µg	4	200	0.0001572	0.0002802	0.0145105	0.0001729	0.0003528	0.017642
21650-6A	12/17/2013	9:55:37 AM	0.0001807	0.0003842	0.0192078	µg	4	200	0.0001776	0.0003716	0.0185775	0.0001839	0.0003968	0.0198382
21650-1BH	12/17/2013	9:57:22 AM	0.0028451	0.0110013	2.337782	µg	4	850	0.0028243	0.0109181	2.3201053	0.002866	0.0110845	2.3554586
21650-2BH	12/17/2013	9:59:04 AM	0.0218658	0.0867951	18.226976	µg	4	840	0.0221205	0.0878101	18.440128	0.0216111	0.0857801	18.013823
21650-2BH DUP	12/17/2013	10:00:54 AM	0.0218551	0.0867527	18.21807	µg	4	840	0.0220342	0.0874662	18.367897	0.0216761	0.0860392	18.068242
21650-3BH	12/17/2013	10:02:44 AM	0.0189935	0.0753496	16.200166	µg	4	860	0.0188741	0.0748737	16.097849	0.0191129	0.0758255	16.302484
21650-3BH SPK	12/17/2013	10:04:34 AM	0.0368433	0.1464778	31.492733	µg	4	860	0.037108	0.1475325	31.719484	0.0365786	0.1454232	31.265983
21650-4BH	12/17/2013	10:06:25 AM	0.0153746	0.060929	13.861338	µg	4	910	0.0153603	0.060872	13.848389	0.0153889	0.0609859	13.874288
21650-5BH	12/17/2013	10:08:16 AM	0.0001965	0.000447	0.0357572	µg	4	320	0.0001911	0.0004253	0.0340245	0.0002019	0.0004686	0.0374899
21650-6BH	12/17/2013	10:09:58 AM	0.0001974	0.0004505	0.0225228	µg	4	200	0.0002033	0.0004741	0.0237032	0.0001914	0.0004268	0.0213425
0.004ug = DL	12/17/2013	10:15:01 AM	0.0010738	0.0042789	0.0042789	µg			0.0010983	0.0043767	0.0043767	0.0010493	0.0041812	0.0041812
0.080ug = QC STD 2	12/17/2013	10:16:45 AM	0.018596	0.0741017	0.0741017	µg			0.0184802	0.0736404	0.0736404	0.0187118	0.074563	0.074563
Reagent Blank	12/17/2013	10:18:38 AM	0.0001501	0.0005981	0.0005981	µg			0.0001497	0.0005966	0.0005966	0.0001505	0.0005995	0.0005995
Calib Blank	12/18/2013	9:04:55 AM	3.31E-05			µg			1.70E-05			4.93E-05		
STD1 = .004ug	12/18/2013	9:06:35 AM	0.0009697			µg			0.0009631			0.0009762		
STD2 = .04ug	12/18/2013	9:08:16 AM	0.0099189			µg			0.010091			0.0097468		
STD3 = .08ug	12/18/2013	9:10:10 AM	0.0203436			µg			0.0204998			0.0201873		
STD4 = .16ug	12/18/2013	9:12:04 AM	0.0409107			µg			0.0415003			0.0403211		
STD5 = .2ug	12/18/2013	9:13:59 AM	0.0490001			µg			0.0490456			0.0489546		
Reagent Blank	12/18/2013	9:15:53 AM	1.69E-05	6.77E-05	6.77E-05	µg			1.30E-05	5.19E-05	5.19E-05	2.08E-05	8.35E-05	8.35E-05
0.004ug = DL	12/18/2013	9:17:33 AM	0.0009972	0.0039938	0.0039938	µg			0.0009971	0.0039934	0.0039934	0.0009973	0.0039942	0.0039942
0.080ug = QC STD 2	12/18/2013	9:19:16 AM	0.0198256	0.079399	0.079399	µg			0.0197441	0.0790725	0.0790725	0.0199072	0.0797255	0.0797255
0.080ug = QC STD 3	12/18/2013	9:21:13 AM	0.0200994	0.0804954	0.0804954	µg			0.0205375	0.0822498	0.0822498	0.0196613	0.0787409	0.0787409
Reagent Blank	12/18/2013	9:23:07 AM	5.68E-05	0.0002273	0.0002273	µg			4.74E-05	0.0001898	0.0001898	6.61E-05	0.0002648	0.0002648
0.004ug = DL	12/18/2013	10:53:42 AM	0.000984	0.0039408	0.0039408	µg			0.0009982	0.0039977	0.0039977	0.0009698	0.0038839	0.0038839
0.080ug = QC STD 2	12/18/2013	10:55:25 AM	0.0191768	0.0768005	0.0768005	µg			0.0190531	0.0763052	0.0763052	0.0193005	0.0772958	0.0772958
Reagent Blank	12/18/2013	10:57:19 AM	9.01E-05	0.0003607	0.0003607	µg			7.86E-05	0.000315	0.000315	0.0001015	0.0004065	0.0004065
21650-1C	12/18/2013	10:58:58 AM	0.000195	0.0007131	0.071307	µg	4	400	0.0001824	0.0006627	0.0662685	0.0002075	0.0007635	0.0763455
21650-2C	12/18/2013	11:00:37 AM	0.0003053	0.0011549	0.115493	µg	4	400	0.0002977	0.0011246	0.1124611	0.0003129	0.0011852	0.1185248
21650-2C DUP	12/18/2013	11:02:16 AM	0.0002681	0.0010058	0.1005789	µg	4	400	0.0002651	0.0009938	0.0993826	0.000271	0.0010178	0.1017753
21650-3C	12/18/2013	11:03:56 AM	0.0004863	0.0018798	0.1879777	µg	4	400	0.0004753	0.0018358	0.1835843	0.0004973	0.0019237	0.1923711
21650-3C SPK	12/18/2013	11:05:36 AM	0.0188687	0.0754988	7.5498755	µg	4	400	0.0190863	0.0763704	7.6370384	0.018651	0.0746271	7.4627126
21650-4C	12/18/2013	11:07:27 AM	0.0003082	0.0011666	0.1166608	µg	4	400	0.0003103	0.0011752	0.1175173	0.0003061	0.001158	0.1158043
21650-5C	12/18/2013	11:09:09 AM	0.0001616	0.0005794	0.0579412	µg	4	400	0.0001826	0.0006634	0.0663401	0.0001406	0.0004954	0.0495422
21650-6C	12/18/2013	11:10:51 AM	0.0001341	0.0004692	0.0469156	µg	4	400	0.0001363	0.0004783	0.0478344	0.0001318	0.00046	0.0459968
0.004ug = DL	12/18/2013	11:15:58 AM	0.0010226	0.0040953	0.0040953	µg			0.0010084	0.0040385	0.0040385	0.0010368	0.0041522	0.0041522
0.080ug = QC STD 2	12/18/2013	11:17:42 AM	0.0188328	0.0754227	0.0754227	µg			0.018735	0.0750313	0.0750313	0.0189305	0.0758141	0.0758141
Reagent Blank	12/18/2013	11:19:36 AM	7.88E-05	0.0003156	0.0003156	µg			5.70E-05	0.0002284	0.0002284	0.0001006	0.0004029	0.0004029
Calib Blank	12/19/2013	10:25:05 AM	0.00015			µg			0.0001459			0.0001541		
STD1 = .004ug	12/19/2013	10:26:45 AM	0.0009746			µg			0.0009858			0.0009635		
STD2 = .04ug	12/19/2013	10:28:26 AM	0.0098621			µg			0.0099067			0.0098175		
STD3 = .08ug	12/19/2013	10:30:19 AM	0.0195948			µg			0.0198428			0.0193467		
STD4 = .16ug	12/19/2013	10:32:14 AM	0.0384747			µg			0.0384255			0.0385238		
STD5 = .2ug	12/19/2013	10:34:09 AM	0.0489516			µg			0.0489228			0.0489804		
Reagent Blank	12/19/2013	10:36:02 AM	-2.55E-05	-0.0001047	-0.0001047	µg			-2.09E-05	-8.60E-05	-8.60E-05	-3.00E-05	-0.0001234	-0.0001234

PerkinElmer FIMS-100 CVAA Mercury Analyzer

Sample_ID	Date	Time	Mean_Sig	Mean_Rd	Mean_Rt	Units	Aliq.	Vol.	Sig 1	Reading-1	Result-1	Sig 2	Reading-2	Result-2
0.004ug = DL	12/19/2013	10:37:42 AM	0.0009904	0.0040702	0.0040702	µg			0.0010037	0.0041246	0.0041246	0.0009772	0.0040158	0.0040158
0.080ug = QC STD 2	12/19/2013	10:39:25 AM	0.0194374	0.0798781	0.0798781	µg			0.0195788	0.0804595	0.0804595	0.0192959	0.0792967	0.0792967
Reagent Blank	12/19/2013	10:41:19 AM	-1.92E-05	-7.90E-05	-7.90E-05	µg			-3.57E-05	-0.0001467	-0.0001467	-2.74E-06	-1.12E-05	-1.12E-05
0.004ug = DL	12/19/2013	11:00:05 AM	0.0009679	0.0039774	0.0039774	µg			0.0009764	0.0040123	0.0040123	0.0009594	0.0039425	0.0039425
0.080ug = QC STD 2	12/19/2013	11:01:48 AM	0.0198633	0.0816284	0.0816284	µg			0.019809	0.0814054	0.0814054	0.0199175	0.0818514	0.0818514
Reagent Blank	12/19/2013	11:03:42 AM	-4.60E-05	-0.000189	-0.000189	µg			-3.19E-05	-0.0001312	-0.0001312	-6.01E-05	-0.0002468	-0.0002468
21650-8	12/19/2013	11:18:00 AM	0.0257519	0.1059325	52.966235	µg	2	1000	0.0257523	0.1059343	52.967155	0.0257514	0.1059306	52.965314
0.004ug = DL	12/19/2013	11:23:28 AM	0.0009251	0.0038015	0.0038015	µg			0.0009292	0.0038186	0.0038186	0.0009209	0.0037844	0.0037844
0.080ug = QC STD 2	12/19/2013	11:25:12 AM	0.0196335	0.0806843	0.0806843	µg			0.0195089	0.080172	0.080172	0.0197582	0.0811966	0.0811966
Reagent Blank	12/19/2013	11:27:06 AM	-3.35E-05	-0.0001377	-0.0001377	µg			-3.18E-05	-0.0001308	-0.0001308	-3.52E-05	-0.0001445	-0.0001445
Calib Blank	12/20/2013	9:54:29 AM	0.0001709			µg			0.0001684			0.0001734		
STD1 = .004ug	12/20/2013	9:56:10 AM	0.0008571			µg			0.0008793			0.0008349		
STD2 = .04ug	12/20/2013	9:57:51 AM	0.0091288			µg			0.0093286			0.008929		
STD3 = .08ug	12/20/2013	9:59:44 AM	0.0187422			µg			0.0187316			0.0187528		
STD4 = .16ug	12/20/2013	10:01:38 AM	0.0364318			µg			0.0368332			0.0360303		
STD5 = .2ug	12/20/2013	10:03:34 AM	0.0458814			µg			0.0467634			0.0449994		
Reagent Blank	12/20/2013	10:05:27 AM	0.0001289	0.0005622	0.0005622	µg			0.0001581	0.0006895	0.0006895	9.97E-05	0.0004349	0.0004349
0.004ug = DL	12/20/2013	10:07:07 AM	0.0009516	0.0041516	0.0041516	µg			0.0009518	0.0041523	0.0041523	0.0009515	0.0041509	0.0041509
0.080ug = QC STD 2	12/20/2013	10:08:50 AM	0.0182821	0.0797577	0.0797577	µg			0.0183524	0.0800644	0.0800644	0.0182118	0.079451	0.079451
Reagent Blank	12/20/2013	10:10:44 AM	6.12E-05	0.0002671	0.0002671	µg			7.22E-05	0.0003149	0.0003149	5.03E-05	0.0002194	0.0002194
21650 LRB FH	12/20/2013	10:22:45 AM	-4.38E-05	-0.0007534	-0.0188356	µg	4	100	-2.46E-05	-0.0006697	-0.0167423	-6.30E-05	-0.0008372	-0.0209288
21650 LRB FH SPK	12/20/2013	10:24:28 AM	0.0152239	0.0658537	4.1158589	µg	1.6	100	0.0153961	0.066605	4.1628135	0.0150517	0.0651025	4.0689042
21650-1FH	12/20/2013	10:26:22 AM	-5.88E-06	-0.0005879	-0.0146983	µg	4	100	-2.27E-05	-0.0006612	-0.0165308	1.09E-05	-0.0005146	-0.0128657
21650-2FH	12/20/2013	10:28:06 AM	0.0002054	0.000334	0.0083498	µg	4	100	0.0002122	0.0003635	0.0090869	0.0001987	0.0003045	0.0076128
0.004ug = DL	12/20/2013	10:29:49 AM	0.0009621	0.0041972	0.0041972	µg			0.0009408	0.0041041	0.0041041	0.0009834	0.0042903	0.0042903
0.080ug = QC STD 2	12/20/2013	10:31:32 AM	0.0181598	0.0792239	0.0792239	µg			0.0182427	0.0795858	0.0795858	0.0180768	0.0788621	0.0788621
Reagent Blank	12/20/2013	10:33:26 AM	-1.28E-05	-5.58E-05	-5.58E-05	µg			-1.12E-05	-4.89E-05	-4.89E-05	-1.43E-05	-6.26E-05	-6.26E-05
21650-2FH DUP	12/20/2013	10:35:08 AM	5.89E-05	-0.0003053	-0.0076328	µg	4	100	5.84E-05	-0.0003077	-0.0076914	5.94E-05	-0.000303	-0.0075743
21650-3FH	12/20/2013	10:36:53 AM	7.66E-06	-0.0005288	-0.0132204	µg	4	100	1.37E-05	-0.0005026	-0.0125652	1.65E-06	-0.000555	-0.0138755
21650-3FH SPK	12/20/2013	10:38:38 AM	0.0208923	0.0905826	2.2645642	µg	4	100	0.0206828	0.0896688	2.2417197	0.0211017	0.0914963	2.2874087
21650-4FH	12/20/2013	10:40:31 AM	4.03E-05	-0.0003863	-0.0096575	µg	4	100	5.76E-05	-0.000311	-0.0077747	2.31E-05	-0.0004616	-0.0115404
21650-5FH	12/20/2013	10:42:10 AM	4.21E-05	-0.0003788	-0.0094692	µg	4	100	4.15E-05	-0.0003812	-0.0095294	4.26E-05	-0.0003764	-0.009409
21650-6FH	12/20/2013	10:43:50 AM	-4.44E-05	-0.0007561	-0.0189029	µg	4	100	-3.09E-05	-0.0006973	-0.0174313	-5.79E-05	-0.000815	-0.0203745
0.004ug = DL	12/20/2013	10:52:44 AM	0.0009102	0.0039708	0.0039708	µg			0.0009031	0.00394	0.00394	0.0009172	0.0040016	0.0040016
0.080ug = QC STD 2	12/20/2013	10:54:28 AM	0.0185348	0.0808602	0.0808602	µg			0.0184598	0.0805328	0.0805328	0.0186099	0.0811876	0.0811876
Reagent Blank	12/20/2013	10:56:21 AM	-2.46E-05	-0.0001074	-0.0001074	µg			-3.32E-06	-1.45E-05	-1.45E-05	-4.59E-05	-0.0002004	-0.0002004
Calib Blank	12/23/2013	11:00:27 AM	-8.13E-06			µg			1.27E-05			-2.89E-05		
STD1 = .004ug	12/23/2013	11:02:07 AM	0.0011768			µg			0.0011626			0.0011909		
STD2 = .04ug	12/23/2013	11:03:48 AM	0.0113154			µg			0.011049			0.0115819		
STD3 = .08ug	12/23/2013	11:05:41 AM	0.0234453			µg			0.0233786			0.023512		
STD4 = .16ug	12/23/2013	11:07:35 AM	0.0460205			µg			0.0459325			0.0461084		
STD5 = .2ug	12/23/2013	11:09:30 AM	0.0554668			µg			0.054886			0.0560476		
Reagent Blank	12/23/2013	11:11:23 AM	3.75E-05	0.0001328	0.0001328	µg			3.62E-05	0.0001281	0.0001281	3.89E-05	0.0001376	0.0001376
0.004ug = DL	12/23/2013	11:13:04 AM	0.0011871	0.0042019	0.0042019	µg			0.0012124	0.0042915	0.0042915	0.0011618	0.0041123	0.0041123
0.080ug = QC STD 2	12/23/2013	11:14:47 AM	0.0226767	0.0802646	0.0802646	µg			0.0227222	0.0804256	0.0804256	0.0226312	0.0801035	0.0801035
0.080ug = QC STD 3	12/23/2013	11:16:44 AM	0.0231828	0.0820559	0.0820559	µg			0.0240586	0.085156	0.085156	0.0223069	0.0789559	0.0789559
Reagent Blank	12/23/2013	11:18:38 AM	9.91E-05	0.0003508	0.0003508	µg			0.0001051	0.0003721	0.0003721	9.31E-05	0.0003295	0.0003295
0.004ug = DL	12/23/2013	12:00:51 PM	0.001145	0.0040527	0.0040527	µg			0.0011407	0.0040375	0.0040375	0.0011493	0.0040678	0.0040678
0.080ug = QC STD 2	12/23/2013	12:02:35 PM	0.0216477	0.0766226	0.0766226	µg			0.0218963	0.0775025	0.0775025	0.0213992	0.0757428	0.0757428
Reagent Blank	12/23/2013	12:04:28 PM	7.01E-05	0.0002481	0.0002481	µg			7.17E-05	0.0002539	0.0002539	6.85E-05	0.0002423	0.0002423
21650-7	12/23/2013	12:09:52 PM	0.027115	0.0958414	47.920684	µg	0.2	100	0.0275976	0.0975495	48.774728	0.0266324	0.0941333	47.066639
0.004ug = DL	12/23/2013	12:23:37 PM	0.0012127	0.0042924	0.0042924	µg			0.0011643	0.0041211	0.0041211	0.0012611	0.0044638	0.0044638
0.080ug = QC STD 2	12/23/2013	12:25:20 PM	0.0209385	0.0741122	0.0741122	µg			0.0204823	0.0724976	0.0724976	0.0213947	0.0757269	0.0757269
Reagent Blank	12/23/2013	12:27:13 PM	0.0001041	0.0003685	0.0003685	µg			9.98E-05	0.0003531	0.0003531	0.0001085	0.0003839	0.0003839

PLANT DATA

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

QA/QC Initials: MK

Date: 1/15/14

CleanAir.

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

UNIT #1

Date	Test	Method #	Run #	Steam (klb/hr)	Run Length (hr)	Trash Processed (tons)
12/10/2013	Mercury	29	1	179.5	2.17	74.9
12/11/2013	Mercury	29	2	180.1	2.20	76.2
12/11/2013	Mercury	29	3	180.2	2.18	75.5
12/11/2013	Mercury	29	4	180.4	2.18	75.6

Wheelabrator
NORTH BROWARD
Emission Test Log

Date: 12/10/13
Start Time: 12:24
End Time: 14:34

	Test	SDA INLET TEMP	SDA OUTLET TEMP	TOTAL SLURRY FL	DIL WATER FLOW	TOTAL LIME	LIME CONC	FF OUT TEMP	FF DP	ID INLET PRESS
		DEG F	DEG F	GPM	GPM	GPM	%	DEG F	" H2O	" H2O
Unit 1	29 run 1	434.15	320.68	44.10	35.29	8.81	19.96	304.64	6.59	-11.11
Unit 2		459.93	320.02	25.34	15.72	9.62	34.86	262.29	6.16	0.00
Unit 3		490.00	319.05	31.30	22.27	9.02	28.19	307.79	6.13	-5.26

	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	179.59	885.74	831.52	78.76	-0.10	252.73	1152.76	4.52	179.51
Unit 2	157.49	881.68	832.94	79.11	-0.10	263.80	1000.06	2.71	150.34
Unit 3	154.98	883.01	812.22	67.22	-0.09	262.66	1058.36	1.48	151.01

U1 lime (#/hr)	585.12	
U2 lime (#/hr)	638.56	
U3 lime (#/hr)	599.13	
Specific Gravity	1.106	
Round Down	1.100	1.050
Round Up	1.110	1.150

Wheelabrator
NORTH BROWARD
Emission Test Log

Date: 12/11/13
Start Time: 8:09
End Time: 10:21

	Test	SDA INLET TEMP	SDA OUTLET TEMP	TOTAL SLURRY FL	DIL WATER FLOW	TOTAL LIME	LIME CONC	FF OUT TEMP	FF DP	ID INLET PRESS
		DEG F	DEG F	GPM	GPM	GPM	%	DEG F	" H2O	" H2O
Unit 1	29 run 2	424.56	320.10	43.21	34.02	9.19	21.24	303.14	6.54	-11.12
Unit 2		468.76	319.76	26.79	16.83	9.95	34.29	289.86	6.03	0.00
Unit 3		502.17	319.98	35.75	26.38	9.37	25.74	308.52	6.44	-3.87

	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	181.20	888.53	843.26	75.87	-0.10	252.13	1145.56	4.54	180.07
Unit 2	156.55	883.79	826.98	85.43	-0.10	263.62	1013.02	5.99	150.39
Unit 3	154.86	885.25	812.77	69.70	-0.10	262.59	1089.16	2.73	150.56

U1 lime (#/hr)	579.22	
U2 lime (#/hr)	627.16	
U3 lime (#/hr)	590.27	
Specific Gravity	1.100	
Round Down	1.100	1.050
Round Up	1.110	1.150

Wheelabrator
NORTH BROWARD
Emission Test Log

Date: 12/11/13
Start Time: 10:43
End Time: 12:54

	Test	SDA INLET TEMP	SDA OUTLET TEMP	TOTAL SLURRY FL	DIL WATER FLOW	TOTAL LIME	LIME CONC	FF OUT TEMP	FF DP	ID INLET PRESS
		DEG F	DEG F	GPM	GPM	GPM	%	DEG F	" H2O	" H2O
Unit 1	29 run 3	439.39	320.31	47.78	37.41	10.37	19.14	303.67	6.64	-11.36
Unit 2		458.12	319.87	24.83	15.17	9.66	36.87	289.32	6.04	0.00
Unit 3		503.02	320.13	35.67	26.34	9.33	25.55	308.31	6.41	-4.05

	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	180.83	888.03	836.49	80.97	-0.10	252.50	1141.13	5.93	180.19
Unit 2	156.24	883.36	830.23	85.19	-0.10	263.52	995.12	5.99	149.64
Unit 3	155.72	885.26	822.90	70.10	-0.10	262.47	1102.57	1.67	150.22

U1 lime (#/hr)	655.45	
U2 lime (#/hr)	610.69	
U3 lime (#/hr)	590.24	
~~Specific Gravity~~	~~1.100~~	
Round Down	1.100	1.050
Round Up	1.110	1.150

Wheelabrator
NORTH BROWARD
Emission Test Log

Date: 12/11/13
Start Time: 13:14
End Time: 15:25

	Test	SDA INLET TEMP	SDA OUTLET TEMP	TOTAL SLURRY FL	DIL WATER FLOW	TOTAL LIME	LIME CONC	FF OUT TEMP	FF DP	ID INLET PRESS
		DEG F	DEG F	GPM	GPM	GPM	%	DEG F	" H2O	" H2O
Unit 1	29 run 4	441.68	319.82	49.06	34.87	14.19	18.64	304.31	6.69	-11.47
Unit 2		460.78	319.99	25.71	16.13	9.57	35.62	290.67	6.00	0.00
Unit 3		505.61	319.97	36.62	27.30	9.32	24.94	308.40	6.42	-5.08

	FEED H2O FLOW	SH OUT STM PRESS	FINAL STM TEMP	TOT AIR FLOW	FURNACE DRAFT	ECONO OUT TEMP	SH ROLL AVG	SNCR CHEM FLOW	STEAM FLOW
	KLBs/hr	DEG F	DEG F	KSCFM	" H2O	DEG F	DEG F	GPH	KLBs/hr
Unit 1	179.85	887.88	827.68	80.14	-0.10	252.44	1149.35	6.56	180.38
Unit 2	157.73	884.04	835.97	84.56	-0.10	263.39	1011.43	5.99	150.46
Unit 3	155.05	885.37	820.12	68.23	-0.10	262.37	1111.37	3.62	149.96

U1 lime (#/hr)	899.94	
U2 lime (#/hr)	607.27	
U3 lime (#/hr)	591.06	
Specific Gravity	1.101	
Round Down	1.100	1.050
Round Up	1.110	1.150

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