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

October 28, 2013

CERTIFIED MAIL #70051160000234575598

Office of Permitting and Compliance
Division of Air Resource Management – DEP
2600 Blair Stone Road, Mail Stop 5500
Tallahassee, FL 32399
Attention: Syed Arif

Re: Wheelabrator North Broward
Powdered Activated Carbon Injection System – Completion of Construction

Dear Mr. Arif:

As per Air Permit No. 0112120-012-AC/PSD-FL-112D, Wheelabrator North Broward completed construction of the powdered activated carbon system on October 23, 2013.

Construction commenced on August 2, 2013 with the initial removal of asphalt for the silo foundation. Delivery piping was installed in September 6, 2013. The silo foundation was completed with the silo set in place on September 9, 2013. Electrical and control wiring was terminated in September 25, 2013. Diverter valves, lances, silo equipment and accessories were installed on September 27, 2013. Carbon was placed in the silo on October 15, 2013 and the final signal tie in to the CEMS system was completed on October 23, 2013.

The facility shall continue doing shake down/start up activities on the system throughout the remainder of 2013. Compliance demonstration shall be completed in conjunction with the 2014 annual compliance stack testing, which will be completed in March of 2014.

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, or if further information is required, please feel free to contact me at (954) 971-8701, ext. 212.

Sincerely,

Jim Epsilantis
Plant Manager

cc:
Chuck Faller
Rob French – MPI
Ram Tewari – BCWRS

WM
WASTE MANAGEMENT

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

October 28, 2013

CERTIFIED MAIL #70073020000226892288

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

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

Dear Mr. Lurix:

As required by F.A.C. 62-296.416, please find enclosed the 2013 third quarter report on mercury stack testing which was conducted on Unit #2.

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

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

Sincerely,

Jim Epsilantis
Plant Manager

cc: USEPA, Region IV, Pesticides and Toxics Management Division, Air & EPCRA Enforcement Branch, Air Enforcement Section CERTIFIED MAIL #70051160000234575567
FDEP, Tallahassee, Bureau of Air Regulation, New Source Review Section, CERTIFIED MAIL #70051160000234575574
Broward County Department of Planning and Environmental Protection, Air Quality Division CERTIFIED MAIL #70051160000234575581
Chuck Faller (with)
Rob French – MPI - (with)
Ram Tewari – BCWRS (without)

WASTE MANAGEMENT

CleanAir.

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

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

REPORT ON MERCURY TESTING

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

Client Reference No: Service Agreement
CleanAir Project No: 12218-6
Revision 0: October 23, 2013

To the best of our knowledge, the data presented in this report are accurate, complete, error free, legible and representative of the actual emissions during the test program. Clean Air Engineering operates in conformance with the requirements of ASTM D7036-04 Standard Practice for Competence of Air Emission Testing Bodies.

Submitted by,

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

Reviewed by,

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

REVISION HISTORY

REPORT ON MERCURY TESTING

DRAFT REPORT REVISION HISTORY

Revision:	Date	Pages	Comments
D0a	10/22/13	All	Draft version of original document.

FINAL REPORT REVISION HISTORY

Revision:	Date	Pages	Comments
0	10/23/13	All	Final version of original document.

CONTENTS

PROJECT OVERVIEW

INTRODUCTION

Wheelabrator North Broward, Inc. operates a refuse-to-energy facility, located in Pompano Beach, Florida. The facility's emission levels are regulated by the Florida Department of Environmental Protection (DEP). Wheelabrator North Broward contracted Clean Air Engineering (CleanAir) to perform a compliance test program at its municipal waste combustor (MWC) facility in Pompano Beach, Florida. Testing was conducted in accordance with 40 CFR 60, Subpart Cb, and applicable sections of PSD-FL-112(B) and PA86-22. The sampling was conducted at the Unit 2 Fabric Filter (FF) Outlet on September 25 and 26, 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.
S. Brown – 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 Sean Dooley, and all equipment utilized for testing was manufactured by CleanAir.

PROJECT OVERVIEW

TEST PROGRAM SYNOPSIS

Test Schedule

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

Table 1-1:
Schedule of Activities

Run Number	Location	Method	Analyte	Date	Start Time	End Time
1	Unit 2 FF Outlet	USEPA Method 29	Mercury	09/25/13	10:06	12:27
2	Unit 2 FF Outlet	USEPA Method 29	Mercury	09/25/13	12:45	15:14
3	Unit 2 FF Outlet	USEPA Method 29	Mercury	09/26/13	07:41	09:58
4	Unit 2 FF Outlet	USEPA Method 29	Mercury	09/26/13	10:18	12:40

Results Summary

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

Table 1-2:
Summary of Test Results

Source Constituent	Sampling Method	Average Emission	Permit Limit[1]
Unit 2 FF Outlet			
Mercury (µg/dscm @7% O_2)	EPA M29	8.2	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 2 was operated within 10% of the 186,000 lb/hr maximum steam flow rating. The Unit 2 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 page 2-1 presents the boiler's steam output for every test run.

Four Method 29 test runs for mercury were performed at the Unit 2 FF Outlet, and all four runs were averaged to determine compliance with the permit limit.

PROJECT OVERVIEW

An attempt was made to perform this testing on September 10 and 11, 2013. However, due to the lack of dry garbage and the plant's subsequent inability to hold the unit above 50% of its rated steam flow, the testing was rescheduled for September 25. A single 125-minute test run was completed during the initial mobilization. The samples created from this test run have been archived at Element One in Wilmington, North Carolina.

End of Section 1 – Project Overview

RESULTS

Table 2-1:
Unit 2 FF Outlet – Mercury

Run No.		1	2	3	4	Average
Date (2013)		Sep 25	Sep 25	Sep 26	Sep 26	
Start Time (approx.)		10:06	12:45	07:41	10:18	
Stop Time (approx.)		12:27	15:14	09:58	12:40	
Process Conditions						
R_P	Steam Production Rate - (Klbs/hour)	180.5	179.8	183.1	184.1	**181.8**
P_1	Fabric Filter Inlet Temperature - (°F)	280	283	292	292	**287**
Gas Conditions						
O_2	Oxygen (dry volume %)	8.4	8.7	8.5	8.5	**8.6**
CO_2	Carbon dioxide (dry volume %)	10.8	10.6	10.6	10.5	**10.6**
T_s	Sample temperature (°F)	273	272	286	285	**279**
B_w	Actual water vapor in gas (% by volume)	27.42	27.75	28.08	28.63	**27.97**
Gas Flow Rate						
Q_a	Volumetric flow rate, actual (acfm)	179,000	183,000	184,000	180,000	**181,000**
Q_{std}	Volumetric flow rate, dry standard (dscfm)	91,000	92,800	91,100	88,600	**90,900**
Sampling Data						
V_{mstd}	Volume metered, standard (dscf)	74.29	75.01	72.77	72.89	**73.74**
%I	Isokinetic sampling (%)	101.4	100.4	99.2	102.2	**100.8**
Laboratory Data						
$m_{n\text{-}1b}$	Fraction 1B Prorated (µg)	0.134	0.124	0.115	<0.100	
$m_{n\text{-}2b}$	Fraction 2B Prorated (µg)	11.911	21.145	12.061	10.652	
$m_{n\text{-}3a}$	Fraction 3A Prorated (µg)	<0.200	<0.200	<0.200	<0.200	
$m_{n\text{-}3b}$	Fraction 3B Prorated (µg)	<0.500	<0.500	<0.500	<0.500	
$m_{n\text{-}3c}$	Fraction 3C Prorated (µg)	1.178	2.475	0.466	0.462	
m_n	Total matter corrected for allowable blanks (µg)	13.224	23.744	12.642	11.114	
Mercury Results - Total						
C_{sd}	Concentration (µg/dscm)	6.3	11.2	6.1	5.38	**7.2**
C_{sd7}	Concentration @7% O_2 (µg/dscm)	7.0	12.8	6.9	6.0	**8.2**
$E_{lb/hr}$	Rate (lb/hr)	2.1E-03	3.9E-03	2.1E-03	1.8E-03	**2.5E-03**
E_{Fd}	Rate - Fd-based (lb/MMBtu)	6.3E-06	1.1E-05	6.2E-06	5.4E-06	**7.3E-06**

RESULTS

Table 2-2:
Quality Assurance and Quality Control

Run Number		FH Front Half	BH H_2O_2/HNO_4	A Empty Impinger	B $KMnO_4$	C HCl
		RPD RESULTS				
U2 Run 1		2.8%	0.8%	NA	NA	0.8%
U2 Run 2		2.4%	0.1%	NA	NA	0.8%
U2 Run 3		3.6%	0.3%	NA	NA	0.5%
U2 Run 4		NA	0.9%	NA	NA	0.9%
Field Blank		NA	NA	NA	NA	NA
Reagent Blank		NA	NA	NA	NA	NA
		Sample Spike and Recovery				
U2 Run 3	**#1**	101%	99%	100%	89%	95%
	#2	100%	98%	100%	89%	95%
		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 2 FF Outlet, as shown in Figure 3-2 on page 3-2.

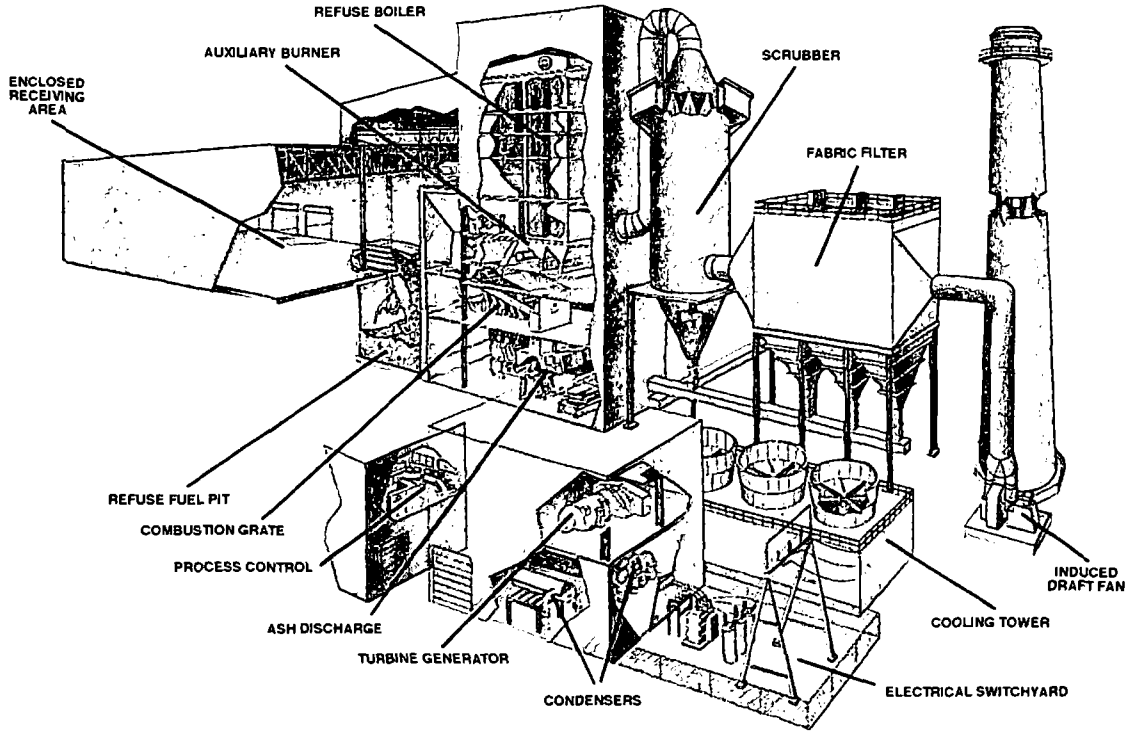


Figure 3-1: General Process Schematic

DESCRIPTION OF INSTALLATION

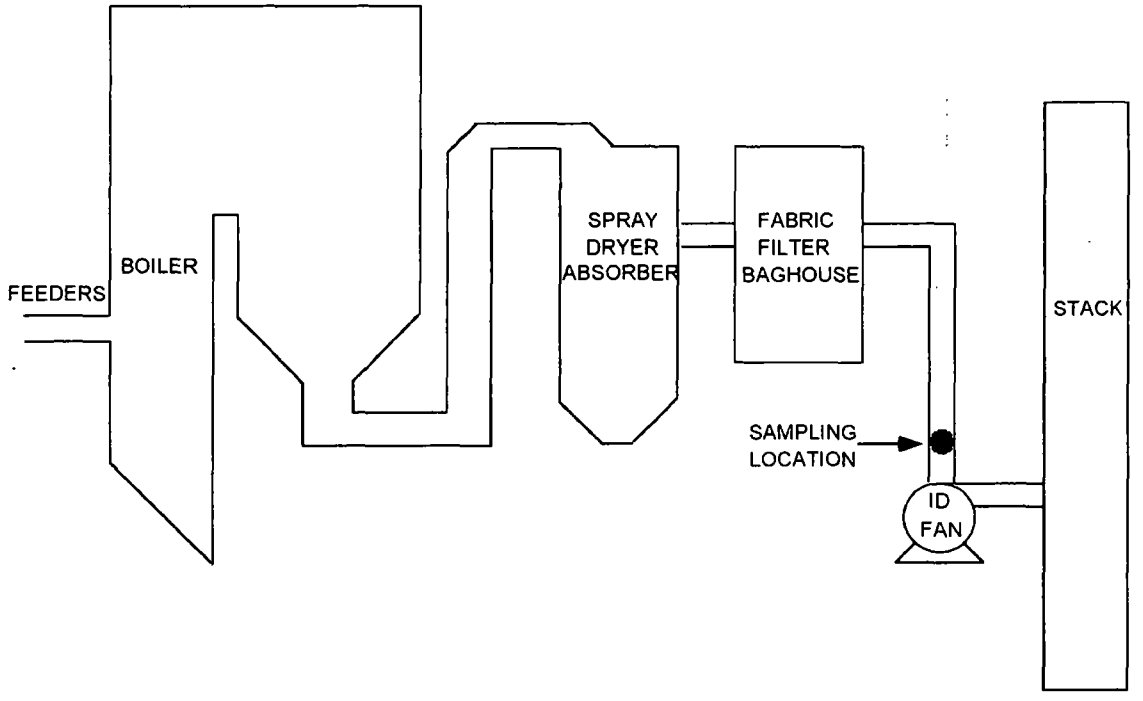


Figure 3-2: Process Schematic

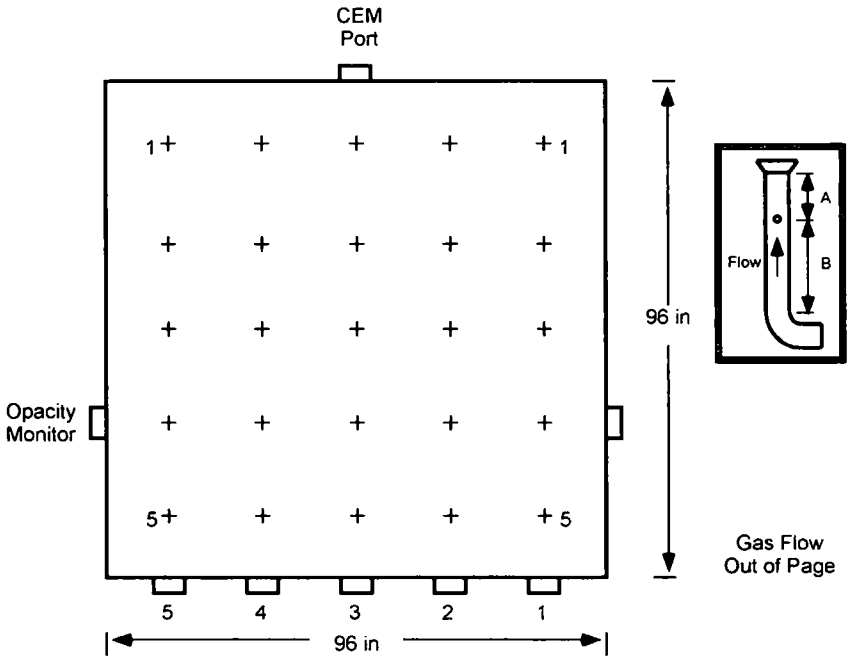
DESCRIPTION OF INSTALLATION

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 2 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 2 FF Outlet Sampling Point Determination (EPA Method 1)

End of Section 3 – Description of Installation

METHODOLOGY

Clean Air Engineering followed procedures as detailed in 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: SB

Date: 10/23

CleanAir

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Specification Sheet for EPA Method 29

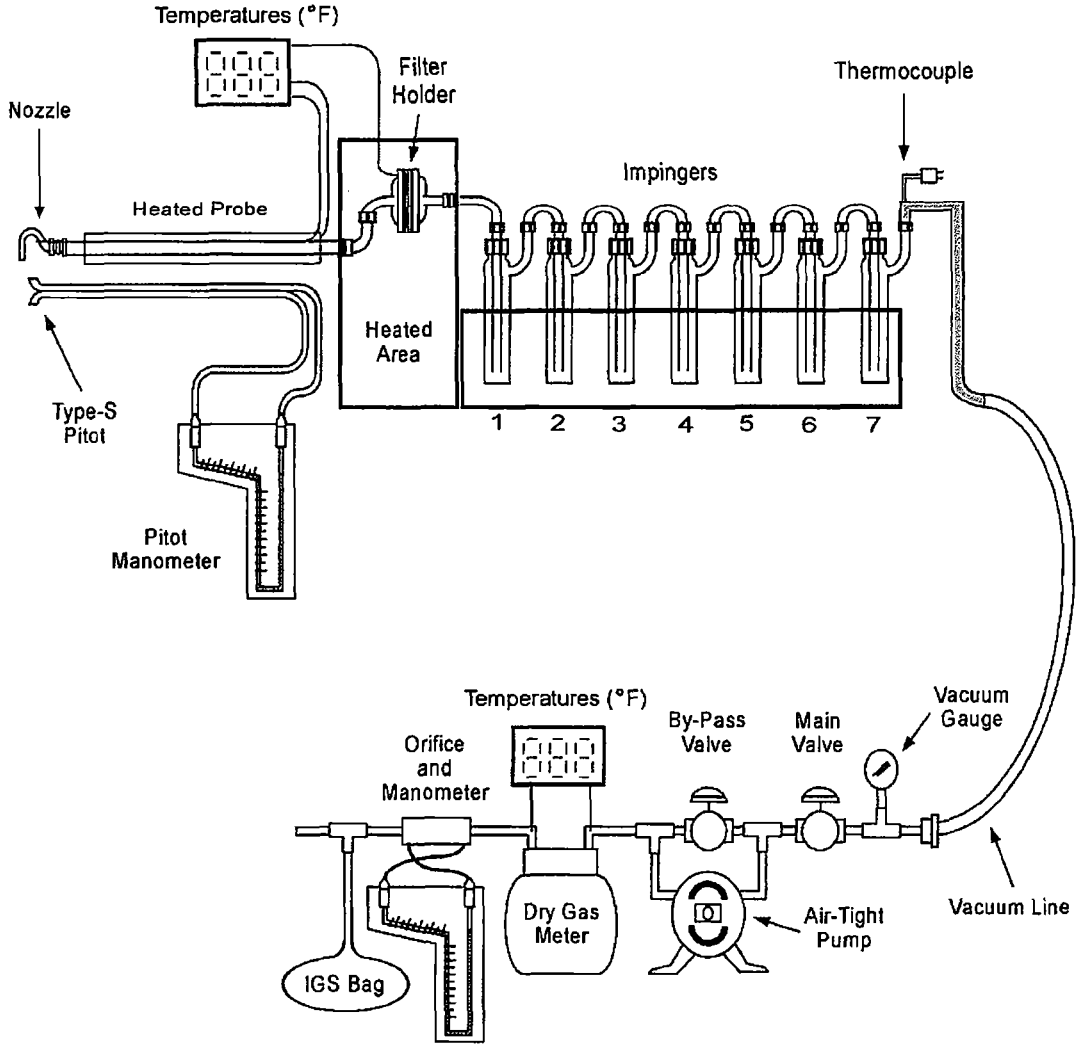
Source Location Name(s)	Unit 2 FF Outlet
Pollutant(s) to be Determined	Mercury
Other Parameters to be Determined from Train	Gas Density, Moisture, Flow Rate

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

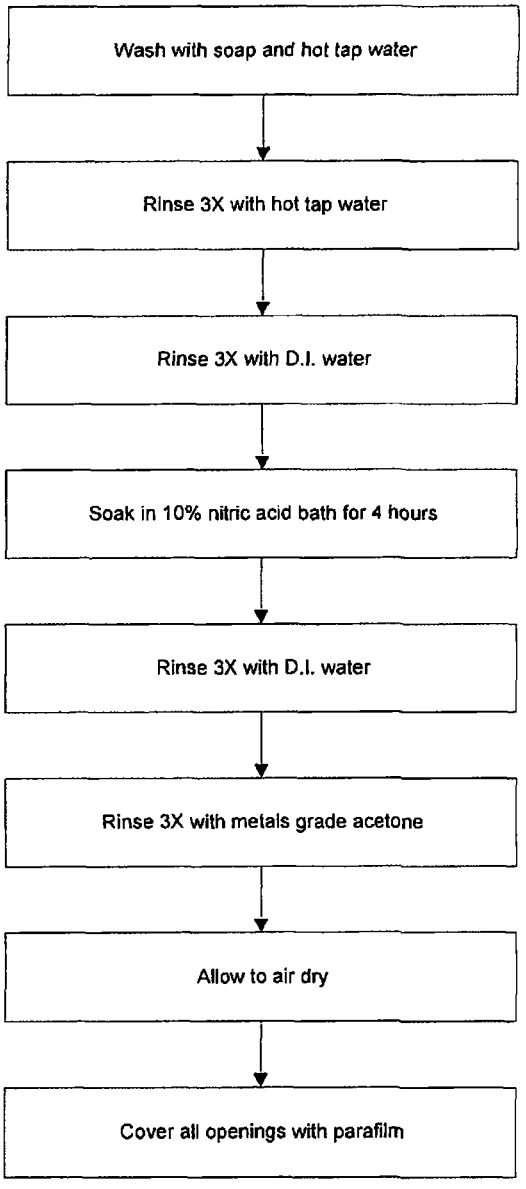
	Standard Method Specification	Actual Specification Used
Impinger Train Description		
Type of Glassware Connections	Ground Glass or Equivalent	Screw Joint with Silicone Gasket
Connection to Probe or Filter by	Direct Glass Connection	Direct Glass Connection
Number of Impingers	7	7
Impinger Stem Types	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

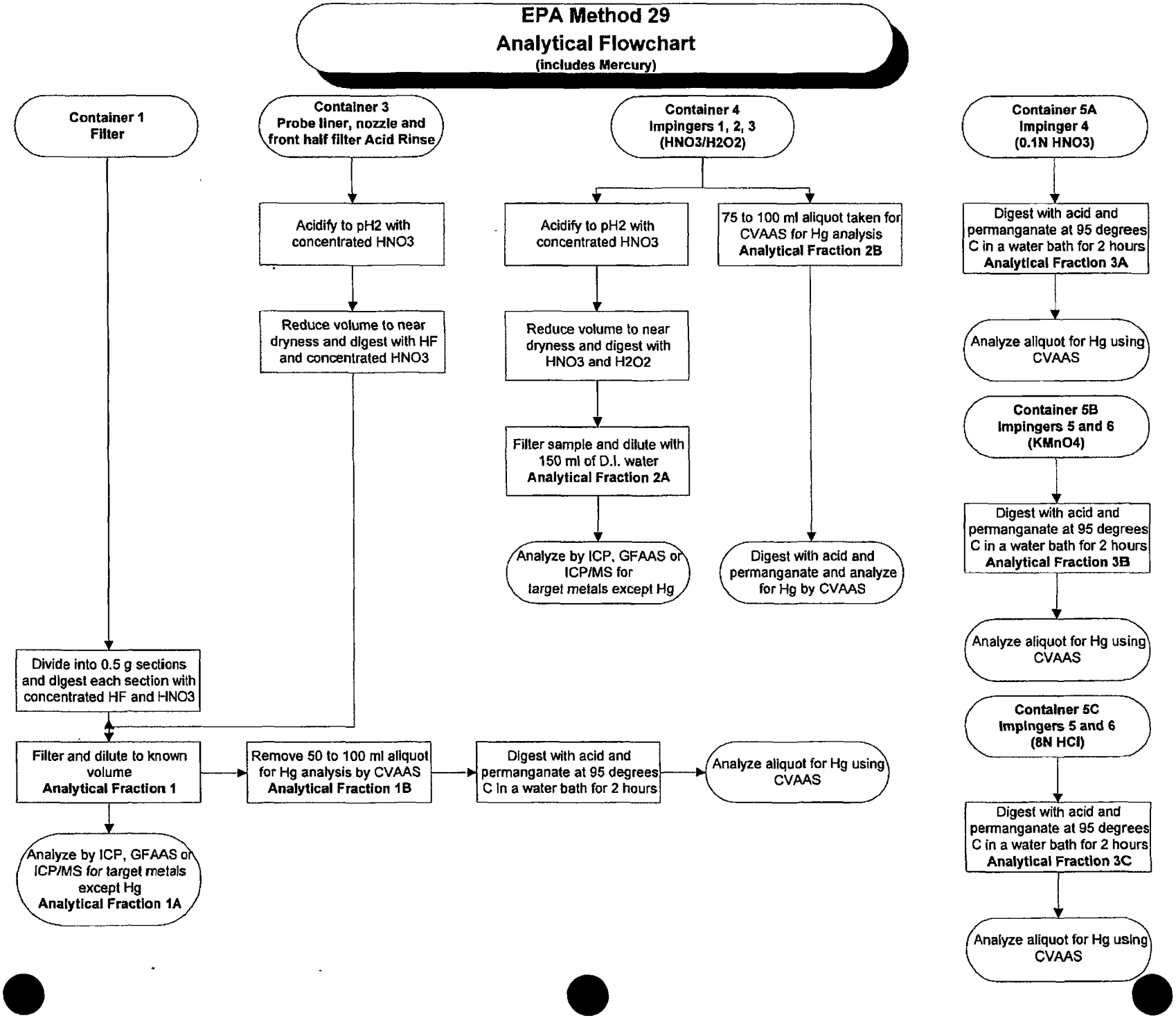
100 ml $KMnO_4$ solution

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

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: SB

Date: 10/23

CleanAir

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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.

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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)	=	596.4	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)	=	28.07	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)	=	29.90	in. Hg
T_m	= average dry gas meter temperature (°F)	=	95.46	°F
V_m	= volume of gas sample through the dry gas meter at meter conditions (dcf)	=	77.75	dcf
Y_d	= gas meter correction factor (dimensionless)	=	1.0031	
ΔH	= average pressure drop across meter box orifice (in. H_2O)	=	1.26	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)	=	74.286	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)	=	29.90	in. Hg
P_g	= sample gas static pressure (in. H_2O)	=	-10.00	in. H_2O
13.6	= conversion factor (in. H_2O/in. Hg)	=	13.6	in. H_2O/in. Hg
P_s	= absolute sample gas pressure (in. Hg)	=	29.16	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)	=	272.68	°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)	=	29.16	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)	=	29.16	in. Hg
P_v	= water vapor pressure, actual (in. Hg)	=	29.16	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)	=	74.286	dscf
V_{wstd}	= volume of water collected at standard conditions (scf)	=	28.07	scf
B_{wo}	= proportion of water measured in the gas stream by volume	=	0.2742	
		=	27.42	%

7. *Saturated moisture content (% by volume)*

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

Where:

P_s	= absolute sample gas pressure (in. Hg)	=	29.16	in. Hg
P_v	= water vapor pressure, actual (in. Hg)	=	29.16	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	=	0.2742	
B_w	= actual water vapor in gas	=	0.2742	
		=	27.42	%

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 (%)	=	10.8	%
O_2	= proportion of oxygen in the gas stream by volume (%)	=	8.4	%
100	= conversion factor (%)	=	100	%
N_2+CO	= proportion of nitrogen and CO in the gas stream by volume (%)	=	80.77	%

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 (%)	=	10.8	%
O_2	= proportion of oxygen in the gas stream by volume (%)	=	8.4	%
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)	=	30.07	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	=	0.2742	
M_d	= dry molecular weight of sample gas (lb/lb·mole)	=	30.07	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)	=	26.76	lb/lb·mole

12. Velocity of sample gas (ft/sec)

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

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)	=	26.76	lb/lb·mole
P_s	= absolute sample gas pressure (in. Hg)	=	29.16	in. Hg
T_s	= average sample gas temperature (°F)	=	272.68	°F
$\sqrt{\Delta P}$	= average square roots of velocity heads of sample gas (in. H_2O)	=	0.690	$\sqrt{}$in. H_2O
460	= °F to °R conversion constant	=	460	
V_s	= sample gas velocity (ft/sec)	=	46.50	ft/sec

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

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

Where:

A_s	= cross sectional area of sampling location (ft^2)	=	64.00	ft^2
V_s	= sample gas velocity (ft/sec)	=	46.50	ft/sec
60	conversion factor (sec/min)	=	60	sec/min
Q_a	= volumetric flow rate at actual conditions (acfm)	=	178,542	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)	=	178,542	acfm
P_s	= absolute sample gas pressure (in. Hg)	=	29.16	in. Hg
29.92	= standard pressure (in. Hg)	=	29.92	in. Hg
T_s	= average sample gas temperature (°F)	=	272.7	°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)	=	125,417	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	=	0.2742	
Q_s	= volumetric flow rate at standard conditions, wet basis (scfm)	=	125,417	scfm
Q_{std}	= volumetric flow rate at standard conditions, dry basis (dscfm)	=	91,026	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)	=	91,026	dscfm
O_2	= proportion of oxygen in the gas stream by volume (%)	=	8.4	%
20.9	= oxygen content of ambient air (%)	=	20.9	%
7	= oxygen content of corrected gas (%)	=	7.0	%
Q_{std7}	= volumetric flow rate at STP and 7%O_2, dry basis (dscfm)	=	81,639	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)	=	91,026	dscfm
60	= conversion factor (min/hr)	=	60	min/hr
Q_{std-hr}	= volumetric flow rate, hourly basis (dscf/hr)	=	5,461,545	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)	=	91,026	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)	=	154,674	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)	=	154,674	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)	=	144,128	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	=	0.2742	
P_s	= absolute sample gas pressure (in. Hg)	=	29.16	in. Hg
T_s	= average sample gas temperature (°F)	=	272.7	°F
V_{mstd}	= volume of gas sample through the dry gas meter at standard conditions (dscf)	=	74.286	dscf
V_s	= sample gas velocity (ft/sec)	=	46.50	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 (%)	=	101.36	%

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)	=	77.75	dcf
T_m	= average dry gas meter temperature (°F)	=	95.46	°F
$\Delta H_@$	= dry gas meter orifice coefficient	=	1.7992	
P_{bar}	= barometric pressure (in. Hg)	=	29.90	in. Hg
ΔH	= average pressure drop across meter box orifice (in. H_2O)	=	1.264	in. H_2O
M_d	= dry molecular weight of sample gas (lb/lb·mole)	=	30.07	lb/lb·mole
$\sqrt{\Delta H_{avg}}$	= average of square root of pressure drop across meter orifice	=	1.124	√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	=	1.0160	

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.

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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	=	0.1344	µg
m_{2b-S}	= mercury amount in sample for Fraction 2b	=	11.9109	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	=	1.1783	µg
$m_{total-S}$	= total amount of mercury in sample	=	13.2236	µg

3. Allowable blank correction (µg)

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

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

Where:

$m_{total-B}$	= total amount of mercury in blank	=	<1.4000	µg
$m_{total-S}$	= total amount of mercury in sample	=	13.2236	µg
0.05 x $m_{total-S}$	= 5% of $m_{total-S}$	=	0.6612	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	=	13.2236	µg
$m_{T-B-allow}$	= total allowable blank correction	=	0.0000	µg
m_n	= total mercury in sample corrected for allowable blank	=	13.2236	µg

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

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

Where:

m_n	= total mercury in sample corrected for allowable blank	=	13.2236	µg
m_{1b-S}	= mercury amount in sample for Fraction 1b	=	0.1344	µg
m_{2b-S}	= mercury amount in sample for Fraction 2b	=	11.9109	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	=	1.1783	µg
$m_{total-S}$	= total amount of mercury in sample	=	13.2236	µg
m_{n-1b}	= mercury corrected for blank - prorated for Fraction 1b	=	0.1344	µg
m_{n-2b}	= mercury corrected for blank - prorated for Fraction 2b	=	11.9109	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	=	1.1783	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.

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M_M

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)	=	13.2236	µg
V_{mstd}	= volume metered, standard (dscf)	=	74.2864	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)	=	3.9251E-10	lb/dscf

2. Mercury concentration (µg/dscm)

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

Where:

m_n	= mercury collected in sample (total µg)	=	13.2236	µg
V_{mstd}	= volume metered, standard (dscf)	=	74.2864	dscf
35.31	= conversion factor (dscf/dscm)	=	35.31	dscf/dscm
C_{sd}	= mercury concentration (µg/dscm)	=	6.2855E+00	µg/dscm

3. Mercury concentration (mg/dscm)

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

Where:

m_n	= mercury collected in sample (total µg)	=	13.2236	µg
V_{mstd}	= volume metered, standard (dscf)	=	74.2864	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)	=	6.2855E-03	mg/dscm

4. Mercury concentration (µg/Nm3 dry)

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

Where:

m_n	= mercury collected in sample (total µg)	=	13.2236	µg
V_{mstd}	= volume metered, standard (dscf)	=	74.2864	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)	=	6.7454E+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)	=	3.9251E-10	lb/dscf
x	= oxygen content of corrected gas (%)	=	7.0	%
O_2	= proportion of oxygen in the gas stream by volume (%)	=	8.4	%
20.9	= oxygen content of ambient air (%)	=	20.9	%
C_{sdx}	= mercury concentration corrected to x% oxygen (lb/dscf)	=	4.3764E-10	lb/dscf @ x%O_2

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

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

Where:

C_{sd}	= mercury concentration (lb/dscf)	=	3.9251E-10	lb/dscf
y	= carbon dioxide content of corrected gas (%)	=	12.0	%
CO_2	= proportion of carbon dioxide in the gas stream by volume (%)	=	10.8	%
C_{sdy}	= mercury conc. corrected to y% carbon dioxide (lb/dscf)	=	4.3612E-10	lb/dscf @ y%CO_2

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

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

Where:

C_{sd}	= mercury concentration (lb/dscf)	=	3.9251E-10	lb/dscf
Q_{std}	= volumetric flow rate at standard conditions, dry basis (dscfm)	=	91,026	dscfm
Q_a	= volumetric flow rate at actual conditions (acfm)	=	178,542	acfm
C_a	= mercury concentration at actual gas conditions (lb/acf)	=	2.0011E-10	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)	=	13.2236	µg
V_{mstd}	= volume metered, standard (dscf)	=	74.2864	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)	=	91,026	dscfm
60	= conversion factor (min/hr)	=	60	min/hr
$E_{lb/hr}$	= mercury emission rate (lb/hr)	=	2.1437E-03	lb/hr

9. Mercury emission rate (g/s)

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

Where:

m_n	= mercury collected in sample (total µg)	=	13.2236	µg
V_{mstd}	= volume metered, standard (dscf)	=	74.2864	dscf
Q_{std}	= volumetric flow rate at standard conditions, dry basis (dscfm)	=	91,026	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)	=	2.7006E-04	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)	=	13.2236	µg
V_{mstd}	= volume metered, standard (dscf)	=	74.2864	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)	=	91,026	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)	=	9.3894E-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)	=	13.2236	µg
V_{mstd}	= volume metered, standard (dscf)	=	74.2864	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 (%)	=	8.4	%
20.9	= oxygen content of ambient air (%)	=	20.9	%
E_{Fd}	= mercury emission rate - Fd-based (lb/MMBtu)	=	6.2973E-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)	=	13.2236	µg
V_{mstd}	= volume metered, standard (dscf)	=	74.2864	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 (%)	=	10.8	%
100	= conversion factor	=	100	
E_{Fc}	= mercury emission rate - Fc-based (lb/MMBtu)	=	6.6145E-06	lb/MMBtu

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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.

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Date: 10/23

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Wheelabrator
Clean Air Project No: 12218
Unit 2 FF Outlet

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

Run No.		1	2	3	4	Average
Date (2013)		Sep 25	Sep 25	Sep 26	Sep 26	
Start Time (approx.)		10:06	12:45	07:41	10:18	
Stop Time (approx.)		12:27	15:14	09:58	12:40	
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)	-10.0000	-10.0000	-11.0000	-11.0000	
A_s	Sample location area (ft^2)	64.0000	64.0000	64.0000	64.0000	
P_{bar}	Barometric pressure (in. Hg)	29.90	29.90	29.90	29.90	**29.9000**
D_n	Nozzle diameter (in.)	0.2750	0.2750	0.2750	0.2750	
O_2	Oxygen (dry volume %)	8.4333	8.7333	8.5333	8.5000	**8.5500**
CO_2	Carbon dioxide (dry volume %)	10.8000	10.6000	10.6000	10.5333	**10.6333**
N_2+CO	Nitrogen plus carbon monoxide (dry volume %)	80.7667	80.6667	80.8667	80.9667	**80.8167**
V_{lc}	Total Liquid collected (ml)	596.40	612.20	603.70	621.30	
V_m	Volume metered, meter conditions (ft^3)	77.7500	78.8300	75.8100	76.8000	
T_m	Dry gas meter temperature (°F)	95.4600	97.7800	92.8200	99.1400	
T_s	Sample temperature (°F)	272.6800	272.0000	286.0000	285.3200	**279.0000**
ΔH	Meter box orifice pressure drop (in. H_2O)	1.2640	1.2840	1.1880	1.2280	
θ	Total sampling time (min)	125.0	125.0	125.0	125.0	
Flow Results						
V_{wstd}	Volume of water collected (ft^3)	28.0666	28.8101	28.4101	29.2384	**28.6313**
V_{mstd}	Volume metered, standard (dscf)	74.2864	75.0087	72.7652	72.8894	**73.7374**
P_a	Sample gas pressure, absolute (in. Hg)	29.1647	29.1647	29.0912	29.0912	**29.1279**
P_v	Vapor pressure, actual (in. Hg)	29.1647	29.1647	29.0912	29.0912	**29.1279**
B_{wo}	Moisture measured in sample (% by volume)	27.4214	27.7504	28.0801	28.6292	**27.9703**
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)	27.4214	27.7504	28.0801	28.6292	**27.9703**
$\sqrt{\Delta P}$	Velocity head ($\sqrt{in.}$ H_2O)	0.6895	0.7053	0.7026	0.6867	**0.6960**
M_d	MW of sample gas, dry (lb/lb-mole)	30.0653	30.0453	30.0373	30.0253	**30.0433**
M_s	MW of sample gas, wet (lb/lb-mole)	26.7569	26.7027	26.6572	26.5826	**26.6748**
V_s	Velocity of sample (ft/sec)	46.4953	47.5828	47.9529	46.9119	**47.2357**
%I	Isokinetic sampling (%)	101.3626	100.3712	99.1669	102.2284	**100.7823**
Q_a	Volumetric flow rate, actual (acfm)	178,542	182,718	184,139	180,142	**181,385**
Q_s	Volumetric flow rate, standard (scfm)	125,417	128,469	126,719	124,081	**126,171**
Q_{std}	Volumetric flow rate, dry standard (dscfm)	91,026	92,819	91,136	88,557	**90,884**
Q_{std7}	Volumetric flow rate, dry std@7%O_2 (dscfm)	81,639	81,244	81,083	79,001	**80,742**
Q_a	Volumetric flow rate, actual (acf/hr)	10,712,506	10,963,068	11,048,340	10,808,494	**10,883,102**
Q_s	Volumetric flow rate, standard (scf/hr)	7,525,003	7,708,164	7,603,120	7,444,851	**7,570,285**
Q_{std}	Volumetric flow rate, dry standard (dscf/hr)	5,461,545	5,569,119	5,468,157	5,313,449	**5,453,067**
Q_a	Volumetric flow rate, actual (m^3/hr)	303,384	310,481	312,896	306,103	**308,216**
Q_s	Volumetric flow rate, standard (m^3/hr)	213,113	218,300	215,325	210,843	**214,395**
Q_{std}	Volumetric flow rate, dry standard (dry m^3/hr)	154,674	157,721	154,861	150,480	**154,434**
Q_{std7}	Volumetric flow rate, dry std@7%O_2 (dry m^3/hr)	138,725	138,053	137,778	134,241	**137,199**
Q_s	Volumetric flow rate, normal (Nm^3/hr)	198,582	203,416	200,644	196,467	**199,777**
Q_{std}	Volumetric flow rate, dry normal (Nm^3/hr)	144,128	146,967	144,303	140,220	**143,904**
Q_{std7}	Volumetric flow rate, dry normal @7%O_2 (Nm^3/hr)	129,266	128,640	128,384	125,088	**127,845**

Comments:

Average includes 4 runs.

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Wheelabrator
Clean Air Project No: 12218
Unit 2 FF Outlet

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

Run No.		1	2	3	4	Average
Date (2013)		Sep 25	Sep 25	Sep 26	Sep 26	
Start Time (approx.)		10:06	12:45	07:41	10:18	
Stop Time (approx.)		12:27	15:14	09:58	12:40	
Process Conditions						
R_P	Steam Production Rate - (Klbs/hour)	180.5	179.8	183.1	184.1	**181.8**
P_1	Fabric Filter Inlet Temperature - (°F)	280	283	292	292	**287**
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 %)	8.4333	8.7333	8.5333	8.5000	**8.5500**
CO_2	Carbon dioxide (dry volume %)	10.8000	10.6000	10.6000	10.5333	**10.6333**
T_s	Sample temperature (°F)	272.6800	272.0000	286.0000	285.3200	**279.0000**
B_w	Actual water vapor in gas (% by volume)	27.4214	27.7504	28.0801	28.6292	**27.9703**
Gas Flow Rate						
Q_a	Volumetric flow rate, actual (acfm)	178,542	182,718	184,139	180,142	**181,385**
Q_s	Volumetric flow rate, standard (scfm)	125,417	128,469	126,719	124,081	**126,171**
Q_{std}	Volumetric flow rate, dry standard (dscfm)	91,026	92,819	91,136	88,557	**90,884**
Sampling Data						
V_{mstd}	Volume metered, standard (dscf)	74.2864	75.0087	72.7652	72.8894	**73.7374**
%I	Isokinetic sampling (%)	101.3626	100.3712	99.1669	102.2284	**100.7823**
Laboratory Data						
$m_{n\text{-}1b}$	Fraction 1B (µg)	0.1344	0.1242	0.1150	<0.1000	
$m_{n\text{-}2b}$	Fraction 2B (µg)	11.9109	21.1451	12.0615	10.6516	
$m_{n\text{-}3a}$	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)	1.1783	2.4750	0.4655	0.4625	
m_n	Total matter corrected for allowable blanks (µg)	13.2236	23.7443	12.6420	11.1140	
Mercury Results - Total						
C_{sd}	Concentration (lb/dscf)	3.9251E-10	6.9800E-10	3.8309E-10	3.3621E-10	**4.5245E-10**
C_{sd7}	Concentration @7% O_2 (lb/dscf)	4.3764E-10	7.9744E-10	4.3059E-10	3.7688E-10	**5.1064E-10**
C_{sd12}	Concentration @12% CO_2 (lb/dscf)	4.3612E-10	7.9019E-10	4.3369E-10	3.8303E-10	**5.1076E-10**
C_a	Concentration (lb/acf)	2.0011E-10	3.5458E-10	1.8960E-10	1.6528E-10	**2.2739E-10**
C_{sd}	Concentration (µg/dscm)	6.2855E+00	1.1178E+01	6.1347E+00	5.3840E+00	**7.2454E+00**
C_{sd7}	Concentration @7% O_2 (µg/dscm)	7.0081E+00	1.2770E+01	6.8953E+00	6.0353E+00	**8.1772E+00**
C_{sd12}	Concentration @12% CO_2 (µg/dscm)	6.9839E+00	1.2654E+01	6.9449E+00	6.1337E+00	**8.1790E+00**
C_{sd}	Concentration (mg/dscm)	6.2855E-03	1.1178E-02	6.1347E-03	5.3840E-03	**7.2454E-03**
C_{sd7}	Concentration @7% O_2 (mg/dscm)	7.0081E-03	1.2770E-02	6.8953E-03	6.0353E-03	**8.1772E-03**
C_{sd12}	Concentration @12% CO_2 (mg/dscm)	6.9839E-03	1.2654E-02	6.9449E-03	6.1337E-03	**8.1790E-03**
C_a	Concentration (µg/m^3 (actual,wet))	3.2045E+00	5.6781E+00	3.0362E+00	2.6468E+00	**3.6414E+00**
C_{sd}	Concentration (µg/Nm^3 dry)	6.7454E+00	1.1995E+01	6.5835E+00	5.7779E+00	**7.7756E+00**
C_{sd7}	Concentration @7% O_2 (µg/Nm^3 dry)	7.5209E+00	1.3704E+01	7.3998E+00	6.4769E+00	**8.7755E+00**
C_{sd12}	Concentration @12% CO_2 (µg/Nm^3 dry)	7.4949E+00	1.3580E+01	7.4531E+00	6.5825E+00	**8.7775E+00**
$E_{lb/hr}$	Rate (lb/hr)	2.1437E-03	3.8873E-03	2.0948E-03	1.7865E-03	**2.4781E-03**
$E_{g/s}$	Rate (g/s)	2.7006E-04	4.8970E-04	2.6389E-04	2.2505E-04	**3.1218E-04**
$E_{T/yr}$	Rate (Ton/yr)	9.3894E-03	1.7026E-02	9.1752E-03	7.8247E-03	**1.0854E-02**
E_{Fd}	Rate - Fd-based (lb/MMBtu)	6.2973E-06	1.1475E-05	6.1959E-06	5.4232E-06	**7.3478E-06**
E_{Fc}	Rate - Fc-based (lb/MMBtu)	6.6145E-06	1.1985E-05	6.5776E-06	5.8093E-06	**7.7465E-06**

Wheelabrator
Clean Air Project No: 12218
Unit 2 FF Outlet

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

Run No.		1	2	3	4	Average
Date (2013)		Sep 25	Sep 25	Sep 26	Sep 26	
Start Time (approx.)		10:06	12:45	07:41	10:18	
Stop Time (approx.)		12:27	15:14	09:58	12:40	
Mercury Results - Front Half						
C_{sd}	Concentration (lb/dscf)	3.9891E-12	3.6505E-12	3.4844E-12	<3.0251E-12	**<3.5373E-12**
C_{sd7}	Concentration @7% O_2 (lb/dscf)	4.4477E-12	4.1706E-12	3.9165E-12	<3.3911E-12	**<3.9815E-12**
C_{sd12}	Concentration @12% CO_2 (lb/dscf)	4.4323E-12	4.1327E-12	3.9446E-12	<3.4464E-12	**<3.9890E-12**
C_a	Concentration (lb/acf)	2.0338E-12	1.8544E-12	1.7246E-12	<1.4872E-12	**<1.7750E-12**
C_{sd}	Concentration (µg/dscm)	6.3880E-02	5.8458E-02	5.5798E-02	<4.8443E-02	**<5.6645E-02**
C_{sd7}	Concentration @7% O_2 (µg/dscm)	7.1224E-02	6.6786E-02	6.2717E-02	<5.4303E-02	**<6.3758E-02**
C_{sd12}	Concentration @12% CO_2 (µg/dscm)	7.0978E-02	6.6179E-02	6.3168E-02	<5.5189E-02	**<6.3878E-02**
C_{sd}	Concentration (mg/dscm)	6.3880E-05	5.8458E-05	5.5798E-05	<4.8443E-05	**<5.6645E-05**
C_{sd7}	Concentration @7% O_2 (mg/dscm)	7.1224E-05	6.6786E-05	6.2717E-05	<5.4303E-05	**<6.3758E-05**
C_{sd12}	Concentration @12% CO_2 (mg/dscm)	7.0978E-05	6.6179E-05	6.3168E-05	<5.5189E-05	**<6.3878E-05**
C_a	Concentration (µg/m^3 (actual,wet))	3.2568E-02	2.9696E-02	2.7616E-02	<2.3815E-02	**<2.8424E-02**
C_{sd}	Concentration (µg/Nm^3 dry)	6.8554E-02	6.2736E-02	5.9881E-02	<5.1988E-02	**<6.0790E-02**
C_{sd7}	Concentration @7% O_2 (µg/Nm^3 dry)	7.6436E-02	7.1673E-02	6.7306E-02	<5.8277E-02	**<6.8423E-02**
C_{sd12}	Concentration @12% CO_2 (µg/Nm^3 dry)	7.6171E-02	7.1021E-02	6.7790E-02	<5.9227E-02	**<6.8552E-02**
$E_{lb/hr}$	Rate (lb/hr)	2.1787E-05	2.0330E-05	1.9053E-05	<1.6074E-05	**<1.9311E-05**
$E_{g/s}$	Rate (g/s)	2.7446E-06	2.5611E-06	2.4003E-06	<2.0249E-06	**<2.4327E-06**
$E_{T/yr}$	Rate (Ton/yr)	9.5425E-05	8.9046E-05	8.3454E-05	<7.0404E-05	**<8.4582E-05**
E_{Fd}	Rate - Fd-based (lb/MMBtu)	6.4000E-08	6.0013E-08	5.6356E-08	<4.8796E-08	**<5.7291E-08**
E_{Fc}	Rate - Fc-based (lb/MMBtu)	6.7224E-08	6.2679E-08	5.9827E-08	<5.2270E-08	**<6.0500E-08**

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Wheelabrator
Clean Air Project No: 12218
Unit 2 FF Outlet

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

Run No.		1	2	3	4	Average
Date (2013)		Sep 25	Sep 25	Sep 26	Sep 26	
Start Time (approx.)		10:06	12:45	07:41	10:18	
Stop Time (approx.)		12:27	15:14	09:58	12:40	
Mercury Results - Impingers 1-3 Solution						
C_{sd}	Concentration (lb/dscf)	3.5354E-10	6.2159E-10	3.6550E-10	3.2222E-10	**4.1571E-10**
C_{sd7}	Concentration @7% O_2 (lb/dscf)	3.9419E-10	7.1015E-10	4.1082E-10	3.6120E-10	**4.6909E-10**
C_{sd12}	Concentration @12% CO_2 (lb/dscf)	3.9283E-10	7.0369E-10	4.1377E-10	3.6709E-10	**4.6934E-10**
C_a	Concentration (lb/acf)	1.8025E-10	3.1576E-10	1.8090E-10	1.5840E-10	**2.0883E-10**
C_{sd}	Concentration (µg/dscm)	5.6615E+00	9.9540E+00	5.8529E+00	5.1600E+00	**6.6571E+00**
C_{sd7}	Concentration @7% O_2 (µg/dscm)	6.3124E+00	1.1372E+01	6.5787E+00	5.7841E+00	**7.5118E+00**
C_{sd12}	Concentration @12% CO_2 (µg/dscm)	6.2906E+00	1.1269E+01	6.6260E+00	5.8784E+00	**7.5159E+00**
C_{sd}	Concentration (mg/dscm)	5.6615E-03	9.9540E-03	5.8529E-03	5.1600E-03	**6.6571E-03**
C_{sd7}	Concentration @7% O_2 (mg/dscm)	6.3124E-03	1.1372E-02	6.5787E-03	5.7841E-03	**7.5118E-03**
C_{sd12}	Concentration @12% CO_2 (mg/dscm)	6.2906E-03	1.1269E-02	6.6260E-03	5.8784E-03	**7.5159E-03**
C_a	Concentration (µg/m^3 (actual,wet))	2.8864E+00	5.0565E+00	2.8968E+00	2.5366E+00	**3.3441E+00**
C_{sd}	Concentration (µg/Nm^3 dry)	6.0758E+00	1.0682E+01	6.2812E+00	5.5375E+00	**7.1442E+00**
C_{sd7}	Concentration @7% O_2 (µg/Nm^3 dry)	6.7743E+00	1.2204E+01	7.0600E+00	6.2074E+00	**8.0615E+00**
C_{sd12}	Concentration @12% CO_2 (µg/Nm^3 dry)	6.7508E+00	1.2093E+01	7.1108E+00	6.3086E+00	**8.0658E+00**
$E_{lb/hr}$	Rate (lb/hr)	1.9309E-03	3.4617E-03	1.9986E-03	1.7121E-03	**2.2758E-03**
$E_{g/s}$	Rate (g/s)	2.4325E-04	4.3610E-04	2.5178E-04	2.1569E-04	**2.8670E-04**
$E_{T/yr}$	Rate (Ton/yr)	8.4573E-03	1.5162E-02	8.7539E-03	7.4991E-03	**9.9682E-03**
E_{Fd}	Rate - Fd-based (lb/MMBtu)	5.6722E-06	1.0219E-05	5.9114E-06	5.1975E-06	**6.7499E-06**
E_{Fc}	Rate - Fc-based (lb/MMBtu)	5.9579E-06	1.0673E-05	6.2755E-06	5.5675E-06	**7.1184E-06**

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Wheelabrator
Clean Air Project No: 12218
Unit 2 FF Outlet

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

Run No.		1	2	3	4	Average
Date (2013)		Sep 25	Sep 25	Sep 26	Sep 26	
Start Time (approx.)		10:06	12:45	07:41	10:18	
Stop Time (approx.)		12:27	15:14	09:58	12:40	
Mercury Results - Impinger 4 Solution						
C_{sd}	Concentration (lb/dscf)	<5.9365E-12	<5.8793E-12	<6.0606E-12	<6.0503E-12	**<5.9817E-12**
C_{sd7}	Concentration @7% O_2 (lb/dscf)	<6.6190E-12	<6.7169E-12	<6.8120E-12	<6.7822E-12	**<6.7325E-12**
C_{sd12}	Concentration @12% CO_2 (lb/dscf)	<6.5961E-12	<6.6558E-12	<6.8610E-12	<6.8927E-12	**<6.7514E-12**
C_a	Concentration (lb/acf)	<3.0266E-12	<2.9866E-12	<2.9996E-12	<2.9743E-12	**<2.9968E-12**
C_{sd}	Concentration (µg/dscm)	<9.5064E-02	<9.4149E-02	<9.7052E-02	<9.6887E-02	**<9.5788E-02**
C_{sd7}	Concentration @7% O_2 (µg/dscm)	<1.0599E-01	<1.0756E-01	<1.0909E-01	<1.0861E-01	**<1.0781E-01**
C_{sd12}	Concentration @12% CO_2 (µg/dscm)	<1.0563E-01	<1.0658E-01	<1.0987E-01	<1.1038E-01	**<1.0811E-01**
C_{sd}	Concentration (mg/dscm)	<9.5064E-05	<9.4149E-05	<9.7052E-05	<9.6887E-05	**<9.5788E-05**
C_{sd7}	Concentration @7% O_2 (mg/dscm)	<1.0599E-04	<1.0756E-04	<1.0909E-04	<1.0861E-04	**<1.0781E-04**
C_{sd12}	Concentration @12% CO_2 (mg/dscm)	<1.0563E-04	<1.0658E-04	<1.0987E-04	<1.1038E-04	**<1.0811E-04**
C_a	Concentration (µg/m^3 (actual,wet))	<4.8467E-02	<4.7827E-02	<4.8034E-02	<4.7629E-02	**<4.7989E-02**
C_{sd}	Concentration (µg/Nm^3 dry)	<1.0202E-01	<1.0104E-01	<1.0415E-01	<1.0398E-01	**<1.0280E-01**
C_{sd7}	Concentration @7% O_2 (µg/Nm^3 dry)	<1.1375E-01	<1.1543E-01	<1.1707E-01	<1.1655E-01	**<1.1570E-01**
C_{sd12}	Concentration @12% CO_2 (µg/Nm^3 dry)	<1.1336E-01	<1.1438E-01	<1.1791E-01	<1.1845E-01	**<1.1603E-01**
$E_{lb/hr}$	Rate (lb/hr)	<3.2422E-05	<3.2743E-05	<3.3140E-05	<3.2148E-05	**<3.2613E-05**
$E_{g/s}$	Rate (g/s)	<4.0844E-06	<4.1248E-06	<4.1749E-06	<4.0499E-06	**<4.1085E-06**
$E_{T/yr}$	Rate (Ton/yr)	<1.4201E-04	<1.4341E-04	<1.4515E-04	<1.4081E-04	**<1.4285E-04**
E_{Fd}	Rate - Fd-based (lb/MMBtu)	<9.5244E-08	<9.6653E-08	<9.8021E-08	<9.7591E-08	**<9.6877E-08**
E_{Fc}	Rate - Fc-based (lb/MMBtu)	<1.0004E-07	<1.0095E-07	<1.0406E-07	<1.0454E-07	**<1.0240E-07**

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Wheelabrator
Clean Air Project No: 12218
Unit 2 FF Outlet

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

Run No.		1	2	3	4	Average
Date (2013)		Sep 25	Sep 25	Sep 26	Sep 26	
Start Time (approx.)		10:06	12:45	07:41	10:18	
Stop Time (approx.)		12:27	15:14	09:58	12:40	
Mercury Results - Filtered Permanganate Solution						
C_{sd}	Concentration (lb/dscf)	<1.4841E-11	<1.4698E-11	<1.5151E-11	<1.5126E-11	**<1.4954E-11**
C_{sd7}	Concentration @7% O_2 (lb/dscf)	<1.6548E-11	<1.6792E-11	<1.7030E-11	<1.6955E-11	**<1.6831E-11**
C_{sd12}	Concentration @12% CO_2 (lb/dscf)	<1.6490E-11	<1.6640E-11	<1.7153E-11	<1.7232E-11	**<1.6879E-11**
C_a	Concentration (lb/acf)	<7.5665E-12	<7.4666E-12	<7.4989E-12	<7.4358E-12	**<7.4919E-12**
C_{sd}	Concentration (µg/dscm)	<2.3766E-01	<2.3537E-01	<2.4263E-01	<2.4222E-01	**<2.3947E-01**
C_{sd7}	Concentration @7% O_2 (µg/dscm)	<2.6499E-01	<2.6891E-01	<2.7271E-01	<2.7152E-01	**<2.6953E-01**
C_{sd12}	Concentration @12% CO_2 (µg/dscm)	<2.6407E-01	<2.6646E-01	<2.7468E-01	<2.7594E-01	**<2.7029E-01**
C_{sd}	Concentration (mg/dscm)	<2.3766E-04	<2.3537E-04	<2.4263E-04	<2.4222E-04	**<2.3947E-04**
C_{sd7}	Concentration @7% O_2 (mg/dscm)	<2.6499E-04	<2.6891E-04	<2.7271E-04	<2.7152E-04	**<2.6953E-04**
C_{sd12}	Concentration @12% CO_2 (mg/dscm)	<2.6407E-04	<2.6646E-04	<2.7468E-04	<2.7594E-04	**<2.7029E-04**
C_a	Concentration (µg/m^3 (actual,wet))	<1.2117E-01	<1.1957E-01	<1.2008E-01	<1.1907E-01	**<1.1997E-01**
C_{sd}	Concentration (µg/Nm^3 dry)	<2.5505E-01	<2.5260E-01	<2.6038E-01	<2.5994E-01	**<2.5699E-01**
C_{sd7}	Concentration @7% O_2 (µg/Nm^3 dry)	<2.8438E-01	<2.8858E-01	<2.9267E-01	<2.9138E-01	**<2.8925E-01**
C_{sd12}	Concentration @12% CO_2 (µg/Nm^3 dry)	<2.8339E-01	<2.8596E-01	<2.9477E-01	<2.9613E-01	**<2.9006E-01**
$E_{lb/hr}$	Rate (lb/hr)	<8.1056E-05	<8.1857E-05	<8.2851E-05	<8.0369E-05	**<8.1533E-05**
$E_{g/s}$	Rate (g/s)	<1.0211E-05	<1.0312E-05	<1.0437E-05	<1.0125E-05	**<1.0271E-05**
$E_{T/yr}$	Rate (Ton/yr)	<3.5502E-04	<3.5853E-04	<3.6289E-04	<3.5202E-04	**<3.5712E-04**
E_{Fd}	Rate - Fd-based (lb/MMBtu)	<2.3811E-07	<2.4163E-07	<2.4505E-07	<2.4398E-07	**<2.4219E-07**
E_{Fc}	Rate - Fc-based (lb/MMBtu)	<2.5010E-07	<2.5237E-07	<2.6015E-07	<2.6135E-07	**<2.5599E-07**
Mercury Results - HCl Rinse + HCl/MnO2 Precipitate						
C_{sd}	Concentration (lb/dscf)	3.4976E-11	7.2756E-11	1.4107E-11	1.3990E-11	**3.3957E-11**
C_{sd7}	Concentration @7% O_2 (lb/dscf)	3.8997E-11	8.3121E-11	1.5856E-11	1.5683E-11	**3.8414E-11**
C_{sd12}	Concentration @12% CO_2 (lb/dscf)	3.8862E-11	8.2365E-11	1.5970E-11	1.5938E-11	**3.8284E-11**
C_a	Concentration (lb/acf)	1.7832E-11	3.6959E-11	6.9820E-12	6.8776E-12	**1.7163E-11**
C_{sd}	Concentration (µg/dscm)	5.6009E-01	1.1651E+00	2.2590E-01	2.2403E-01	**5.4378E-01**
C_{sd7}	Concentration @7% O_2 (µg/dscm)	6.2448E-01	1.3311E+00	2.5391E-01	2.5113E-01	**6.1515E-01**
C_{sd12}	Concentration @12% CO_2 (µg/dscm)	6.2232E-01	1.3190E+00	2.5574E-01	2.5523E-01	**6.1306E-01**
C_{sd}	Concentration (mg/dscm)	5.6009E-04	1.1651E-03	2.2590E-04	2.2403E-04	**5.4378E-04**
C_{sd7}	Concentration @7% O_2 (mg/dscm)	6.2448E-04	1.3311E-03	2.5391E-04	2.5113E-04	**6.1515E-04**
C_{sd12}	Concentration @12% CO_2 (mg/dscm)	6.2232E-04	1.3190E-03	2.5574E-04	2.5523E-04	**6.1306E-04**
C_a	Concentration (µg/m^3 (actual,wet))	2.8555E-01	5.9185E-01	1.1181E-01	1.1013E-01	**2.7484E-01**
C_{sd}	Concentration (µg/Nm^3 dry)	6.0107E-01	1.2503E+00	2.4243E-01	2.4043E-01	**5.8357E-01**
C_{sd7}	Concentration @7% O_2 (µg/Nm^3 dry)	6.7018E-01	1.4285E+00	2.7249E-01	2.6951E-01	**6.6016E-01**
C_{sd12}	Concentration @12% CO_2 (µg/Nm^3 dry)	6.6785E-01	1.4155E+00	2.7445E-01	2.7390E-01	**6.5792E-01**
$E_{lb/hr}$	Rate (lb/hr)	1.9102E-04	4.0519E-04	7.7139E-05	7.4336E-05	**1.8692E-04**
$E_{g/s}$	Rate (g/s)	2.4064E-05	5.1044E-05	9.7177E-06	9.3646E-06	**2.3548E-05**
$E_{T/yr}$	Rate (Ton/yr)	8.3667E-04	1.7747E-03	3.3787E-04	3.2559E-04	**8.1871E-04**
E_{Fd}	Rate - Fd-based (lb/MMBtu)	5.6114E-07	1.1961E-06	2.2816E-07	2.2566E-07	**5.5276E-07**
E_{Fc}	Rate - Fc-based (lb/MMBtu)	5.8941E-07	1.2492E-06	2.4221E-07	2.4173E-07	**5.8064E-07**

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: SB

Date: 10/23

CleanAir

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Wheelabrator
Clean Air Project No: 12218
Unit 2 FF Outlet

USEPA Method 29 (Mercury)
QA/QC Results

Run No.		1	2	3	4	
Date (2013)		Sep 25	Sep 25	Sep 26	Sep 26	
Start Time (approx.)		10:06	12:45	07:41	10:18	
Stop Time (approx.)		12:27	15:14	09:58	12:40	
Total Duration of Test Run (min.)		141	149	137	142	
Net Sampling Time (min.)		125	125	125	125	
Sampling System Calibration Summary						
	Nozzle ID No:	0.275-1	0.275-1	0.275-1	0.275-1	
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:	0.8140	0.8140	0.8140	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)	0.0249	0.0252	0.0243	0.0246	
	(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	0.0010	0.0010	
	Sample Volume					
	Minimum Volume Required (dscf)	30.00	30.00	30.00	30.00	
V_{mstd}	Actual Sample Volume (dscf)	74.286	75.009	72.765	72.889	
	Alternative Method 5 Post-Test Calibration (EPA ALT-009)					
$\sqrt{\Delta H}_{avg}$	Average of Square Root of ΔH (in. W.C.)	1.1236	1.1330	1.0895	1.1075	
Y_{qa}	Alternative Meter Calibration Factor	1.0160	1.0128	1.0085	1.0178	**Average**
	Variation from full-test Y_d (average ≤ ±5%)	1.3%	1.0%	0.5%	1.5%	**1.1%**
	Mean Isokinetic Sampling Rate Variation					
	Minimum Allowable (%)	90	90	90	90	
	Maximum Allowable (%)	110	110	110	110	
%I	Actual Variation (%)	101.36	100.37	99.17	102.23	
	Point-by-Point Isokinetic Variation					
	Number of points <90%	1	2	0	1	
	Number of points >110%	2	2	0	2	
	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 Broward	Project Number 12218
Calibrated by S. Brown	Unit 2
Date 9/10-11/2013	Runs 1-4

Nozzle Identification	D_1 (inches)	D_2 (inches)	D_3 (inches)	ΔD (inches)	D_{ave} (inches)
0.273-1	0.2735	0.2730	0.2725	0.0010	0.2730
0.275-1	0.2755	2745	2.2950	0.001	SB 0.2750
0.3168-1	0.3165	0.3165	0.3175	0.001	0.3168
0.275-2	0.2750	0.2750	0.2750	0.000	0.275

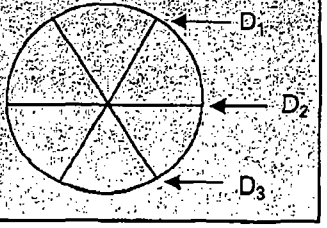
Cal per 12156068

D_1, D_2, D_3 = three nozzle diameter measurements

ΔD = maximum difference between any two diameters

$\Delta D \leq 0.004$ inches*

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



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

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QA/QC_____
Date_____

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_{ds} In	T_{ds} 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)

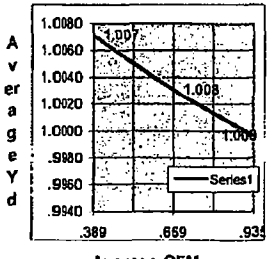
Equations

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

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

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

Average YD vs. Average CFM



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 Check	Pass
Vacuum Gauge Check	Pass	YD Tolerance:	Pass

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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 @ 50 ft/sec)

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

Pitot Side 'A' :

Trial No.	Reference ΔP	Probe ΔP	Probe $C_{p(S)}$*	Abs. Deviation from Avg. $C_{p(A)}$**
1	0.559	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.

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

All specifications are from EPA-600/9-76-005, section 3.7

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

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Caliper Calibration Sheet

Calibrated by	D.Leishman		
Calibration Date	June 17, 2013	Expiration Date	June 18, 2014

Caliper ID	12156068

Standard Caliper ID	101460021

Inside Jaw Check		
Standard Caliper Setting (in)	Caliper Reading (in)	Deviation (ΔD)
0.150	0.1500	0.0000
0.300	0.3005	0.0005
0.500	0.5000	0.0000

Outside Jaw Check		
Standard Caliper Setting (in)	Caliper Reading (in)	Deviation (ΔD)
0.150	0.1500	0.0000
0.300	0.3005	0.0005
0.500	0.5000	0.0000

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

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QA/QC [signature]
Date 6/17/13

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: SB

Date: 10/23

CleanAir.

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

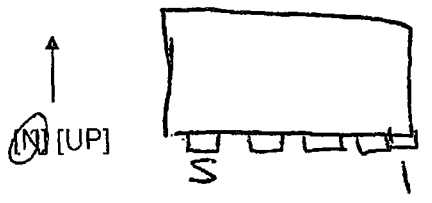
UNIT: 2 RUN: 1

FIELD DATA SHEET

Client Wheelabrator	Project No. 12218
Plant N. Brewards	Date 9/25/13
Meter Operator	S Dooley
Probe Operator	S Dooley

Meter Box 66-20	Sample Box No.
Meter Y_d 1.0031	Meter $\Delta H_@$ 1.7992
K Factor 2.65	Pitot C_p 0.814
Leak Rate Before 0.005 [cfm] [Lpm] @ 15 (in. Hg)	
Leak Rate After 0.005 [cfm] [Lpm] @ 7 (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]
-10.0	12.0		

Amb. Temp. (°F) 87	Bar. Press. 29.90 [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: 10:06 Stop Time: 12:27

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)	XAD Trap Temp. (°F)	Notes
				420.830		250	250					72	
1-1	5	0.42	1.1	423.69	273	253	255	60	87	85	4	8.7	
2	10	0.42	1.1	426.59	273	251	256	60	89	86	4	7.9	
3	15	0.45	1.2	429.57	275	253	252	60	90	86	4	8.9	
4	20	0.47	1.2	432.50	273	251	252	59	91	87	4	8.3	
5	25	0.50	1.3	435.64	272	253	253	58	93	89	4	8.8	436.22
2-1	30	0.43	1.2	439.35	273	254	252	57	93	89	5	8.8	
2	35	0.52	1.4	442.56	273	251	249	58	94	90	5	8.9	
3	40	0.50	1.3	445.73	273	250	251	58	95	90	5	8.8	
4	45	0.50	1.3	448.89	273	252	252	58	95	91	5	8.8	
5	50	0.53	1.4	451.99	272	253	252	59	96	90	5	8.9	452.47
3-1	55	0.50	1.3	455.69	273	251	255	59	96	91	5	9.0	
2	60	0.49	1.3	458.75	272	250	250	59	97	92	5	8.7	
	Total	*	15.1	38.2800	3275								
	Average	0.4895	1.2680		272.60				97.1800				

* Sum of square roots. 1.264 SB 10/10

SB 10/10 272.60 Circle correct bracketed units on data sheet.

QA/QC SB Date 9/25/13

E-3

1.29

FDS005-Gaussian, Feb 2002

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

UNIT: 2 RUN: 1

FIELD DATA SHEET

Client Wheelabrator	Project No. 1228
Plant N. Browards	Date 9/25/13
Meter Operator	S Dooley
Probe Operator	S Dooley

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	Filter T_f (°F) Set Points	Cond. Temp. T_c (°F)	DGM Inlet $T_{m\,in}$ (°F)	DGM Outlet $T_{m\,out}$ (°F)	Pump Vacuum (in.Hg)	XAD Trap Temp. T_t (°F)	Notes
						250	250						
3-3	65	0.51	1.3	461.93 ~~455.69~~	272	251	252	60	100	93	5	8.7	
4	70	0.50	1.3	465.12	272	252	252	60	103	94	5	8.6	
5	75	0.49	1.3	468.20	273	250	252	61	103	95	5	8.8	468.89
4-1	80	0.42	1.1	472.07	272	254	~~253~~	57	104	95	5	8.9	
-2	85	0.45	1.2	~~475.99~~ 474.99	273	251	251	58	104	96	5	8.6	
3	90	0.45	1.2	478.32	272	250	254	58	104	96	5	8.8	
4	95	0.45	1.2	481.48	272	250	253	60	105	96	5	8.9	* K Factor: 2.70
5	100	0.47	1.3	484.63	272	250	250	61	105	96	5	8.7	
5-1	105	0.48	1.3	~~488.48~~ 489.10	273	250	250	62	103	96	5	8.7	485.88
2	110	0.46	1.3	492.47	272	253	252	64	103	97	5	8.8	
3	115	0.49	1.3	495.62	273	252	251	57	103	97	5	8.9	
4	120	0.50	~~1.35~~ 1.4	498.95	272	251	250	58	103	98	5	8.8	
5	125	0.50	1.4	502.110	273	255	250	61	103	99	5	8.9	
	Total	*	16.6		3541				2591				
	Average												

* Sum of square roots.

Circle correct bracketed units on data sheet.

QA/QC [illegible]

Date [illegible] 9/26/13

CleanAir ENGINEERING

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

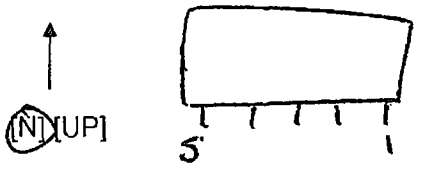
UNIT: 2 RUN: 2

FIELD DATA SHEET

Client	Wheelabrator	Project No.	12218
Plant	N Broward's	Date	9/25/13
Meter Operator	S Dooley		
Probe Operator	S Dooley		

Meter Box	#6-20	Sample Box No.	M10
Meter Y_d	1.0031	Meter $\Delta H_@$	1.7972
K Factor	270 2.55	Pitot C_p	0.814
Leak Rate Before	0.005 [cfm] [Lpm]	@	15 (in. Hg)
Leak Rate After	0.00 [cfm] [Lpm]	@	8 (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]
-10.0	12		

Amb. Temp. (°F)	87	Bar. Press. 29.90 [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:	12:45
Stop Time:	15:14

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	Filter T_f (°F) Set Points	Cond. Temp. T_c (°F)	DGM Inlet $T_{m\,in}$ (°F)	DGM Outlet $T_{m\,out}$ (°F)	Pump Vacuum (in.Hg)	XAD Trap Temp. T_t (°F) O_2	Notes
5-1	5	0.45	1.2	306.44	272	251	253	60	94	91	5	8.9	
2	10	0.45	1.2	309.44	272	253	254	57	94	91	5	8.8	* K factor 2.55
3	15	0.80	1.3	312.62	272	251	255	56	96	92	5	8.7	
4	20	0.51	1.3	315.91	272	251	254	53	97	92	5	8.8	
5	25	0.52	1.3	319.90	273	253	254	55	98	92	5	8.8	320.00 L
4-1	30	0.50	1.3	323.30	272	251	253	56	100	93	5	9.5	
2	35	0.50	1.3	526.44	272	253	255	57	100	93	5	9.2	
3	40	0.52	1.3	529.11	272	252	255	59	101	94	5	9.0	
4	45	0.53	1.4	532.95	272	252	255	61	102	94	5	9.1	
5	50	0.49	1.2	535.86	271	252	250	63	102	95	5	9.1	* 0.20
3-1	55	0.51	1.3	539.03	272	255	251	59	103	95	5	9.0	
-2	60	0.51	1.3	541.81	272	250	250	55	103	94	5	9.0	
			1.5M			251 SD			2306				
	Total	*	1.3900	78,836	3264								
	Average	0.7053			272.0000				97,7400				

* Sum of square roots. 1.284 SB 10/10

Circle correct bracketed units on data sheet. 97.780 SB 10/10

QA/QC SD Date 9/25/13

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

UNIT: 2 RUN: 2

FIELD DATA SHEET

Client Wheelabrator	Project No. 12218
Plant N. Broward's	Date 9/25/13
Meter Operator S Dooley	
Probe Operator S Dooley	

Cross-Section of Test Location

[N] [UP]

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

Meter Box 66-20	Sample Box No.
Meter Y_d 1.0031	Meter $\Delta H_@$ 1.7992
K Factor	Pitot C_p 0.814
Leak Rate Before [cfm] [Lpm] @ (in. Hg)	
Leak Rate After [cfm] [Lpm] @ (in. Hg)	
Pitot Leak Check Before: ☐	After: Good ☐ Bad ☐

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

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

Start Time:	Stop Time:

Traverse Point Number	Min/pt Elapsed Time	Velocity Head ΔP (H_2O)	Orifice Setting ΔH (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)	XAD Trap Temp. T_t (°F)	Notes
						250	250						
3-3	65	0.51	1.3	544.90	272	251	252	56	102	94	5	8.5	
-4	70	0.50	1.3	547.94	272	251	252	55	102	94	5	8.8	
5	75	0.49	1.3	551.10	272	252	252	53	102	95	5	8.4	553522.42
2-1	80	0.50	1.3	556.89	273	253	250	55	103	94	5	8.7	
2	85	0.50	1.3	559.91	273	253	251	56	103	95	5	8.7	
3	90	0.51	1.3	563.09	271	252	252	58	103	95	5	8.6	
4	95	0.49	1.3	566.27	272	255	252	58	104	95	5	9.0	
5	100	0.49	1.3	569.45	272	251	252	60	104	95	5	8.9	570.19 0.74
1-1	105	0.48	1.2	573.63	272	253	252	61	105	96	5	8.8	
2	50 110	0.47	1.2	576.79	272	252	251	54	105	95	5	8.7	
3	55 115	0.51	1.3	580.10	272	251	251	55	105	95	5	8.9	
4	60 120	0.50	1.3	583.42	271	255	251	59	105	95	5	9.0	
5	125	0.50	1.3	586.62	272	253	252	61	106	96	5	9.1	
	Total	*											
	Average												

* Sum of square roots.

Circle correct bracketed units on data sheet.

QA/QC [illegible]

Date [illegible]

CleanAir ENGINEERING

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

UNIT: 2 RUN: 3

FIELD DATA SHEET

Client	Wheelabrator	Project No.	12218
Plant	N. Broward	Date	9/26/13
Meter Operator	S Dooley		
Probe Operator	S Dooley		

Meter Box	66-20	Sample Box No.	M11
Meter Y_d	1.0031	Meter $\Delta H_@$	1.7992
K Factor	2.5	Pitot C_p	0.841
Leak Rate Before	0.001 [cfm] [Lpm]	@	15 (in. Hg)
Leak Rate After	0.00 [cfm] [Lpm]	@	9 (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]
-11.6	12		

Amb. Temp. (°F)	85	Bar. Press.	29.90 [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.	275-2

Start Time:	7:41	Stop Time:	9:58

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)	XAD Trap Temp. T_t (°F) O_2	Notes
				588.10		250	250						
1-1	5	0.45	1.1	591.10	288	251	252	60	85	84	5	8.4	
2	10	0.45	1.1	594.05	287	253	250	61	87	85	5	8.1	
3	15	0.46	1.1	596.99	287	251	252	57	89	85	5	7.6	
4	20	0.50	1.2	600.00	286	252	252	58	90	85	5	8.2	
5	25	0.49	1.2	603.00	287	250	253	59	91	86	5	8.4	603.80
2-1	30	0.46	1.1	606.92	285	251	252	62	92	87	5	8.8	
2	35	0.49	1.2	609.95	285	251	251	55	93	87	5	8.8	
3	40	0.51	1.2	612.97	286	250	252	56	95	88	5	8.8	
4	45	0.50	1.2	615.98	285	251	250	57	96	89	5	8.9	
5	50	0.51	1.2	618.97	285	250	250	59	97	89	5	9.1	619.60
3-1	55	0.52	1.2	622.70	286	253	252	61	99	90	5	8.7	
2	60	0.53	1.3	625.75	286	254	253	59	100	90	5	8.8	
			14.1		2137				2159				
	Total	*		75.810	25								
	Average	.7026	1.1880		286.000				92.8200				

Sum of square roots.

Circle correct bracketed units on data sheet.

QA/QC SD

Date 9/28/13

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CleanAir ENGINEERING

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TEST LOCATION: F **Metals TESTING** **METHOD:** 29 **PAGE** 2 **OF** 2

UNIT: 2 **RUN:** 3

FIELD DATA SHEET

Client Wheelabrator	Project No. 12218
Plant	Date 9/26/13
Meter Operator	
Probe Operator	

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 5 Elapsed Time	Velocity Head ΔP (in. H_2O)	Orifice Setting ΔH (in. H_2O)	Gas Sample Volume V_m Init. Vol. [ft³] [L]	Stack Temp. Ts (°F)	Probe T_p (°F) Set Points 250	Filter T_f (°F) Set Points 250	Cond. Temp. T_c (°F)	DGM Inlet T_{min} (°F)	DGM Outlet T_{mout} (°F)	Pump Vacuum (in.Hg)	XAD Trap Temp. T_t (°F)	Notes
3-3	65	0.45	1.1	628.78	285	251	252	60	98	90	5	8.6	
4	70	0.47	1.1	631.74	286	253	250	59	98	90	5	8.5	
5	75	0.53	1.3	634.71	287	251	250	55	98	90	5	8.2	635.23 .92
4-1	80	0.55	1.3	638.78	286	252	252	57	99	91	5	8.3	
2	85	0.50	1.2	641.81	286	252	253	59	99	90	5	8.7	
3	90	0.51	1.2	644.80	287	251	254	60	100	91	5	8.8	
4	95	0.49	1.2	647.80	285	253	253	61	100	91	5	8.9	
5	100	0.46	1.1	650.74	285	251	251	62	100	91	5	8.9	651.23 .89
5-1	105	0.48	1.2	654.23	286	250	251	60	100	92	5	8.7	
2	110	0.51	1.2	657.31	287	249	250	58	101	92	5	8.6	
3	115	0.53	1.3	660.37	286	250	253	57	101	92	5	8.5	
4	120	0.50	1.2	663.39	285	251	253	59	102	92	5	8.6	
5	125	0.50	1.2	666.350	286	252	253	60	102	92	5	8.6	
	Total	*											
	Average												

* Sum of square roots.

Circle correct bracketed units on data sheet.

QA/QC

Date 9/26/13

CleanAir ENGINEERING

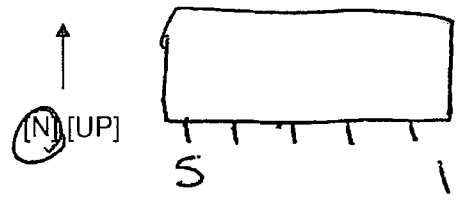
TEST LOCATION: FF Outlet Metals TESTING METHOD: ~~26~~ 29 PAGE 1 OF 2

UNIT: 2 RUN: 4

FIELD DATA SHEET

Client Wheelabrator	Project No. 12218
Plant N. Broward	Date 9/26/13
Meter Operator S Dooley	
Probe Operator S Dooley	

Cross-Section of Test Location



Amb. Temp. (°F) 88	Bar. Press. 29.90 [in. Hg] [mbar]
Probe I.D. No. 66-8-1	
Liner Material Glass	

Meter Box 66-20	Sample Box No. M10	
Meter Y_d 1.0031	Meter $\Delta H@$ 1.7992	
K Factor 2.6	Pitot C_p 0.814	
Leak Rate Before 0.00 [cfm] [Lpm] @ 15 (in. Hg)		
Leak Rate After 0.00 [cfm] [Lpm] @ 8 (in. Hg)		
Pitot Leak Check Before: ☒	After: Good ☒ Bad ☐	

Filter No. NA			
Thimble No. NA			
Nozzle Diameter 0.275	Nozzle I.D.	275-2	

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]
-11.0	12.0		

Start Time: 10:18	Stop Time: 12:40

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. 669.34 [ft³] [L] 869.34	Stack Temp. Ts (°F)	Probe T_p (°F) Set Points 250	Filter T_f (°F) Set Points 250	Cond. Temp. T_c (°F)	DGM Inlet $T_{m\,in}$ (°F)	DGM Outlet $T_{m\,out}$ (°F)	Pump Vacuum (in.Hg)	XAD Trap Temp. T_t (°F)	Notes
1-1	5	0.42	1.1	672.27	285	255	255	63	97	93	5	7.4	
2	10	0.43	1.1	675.22	284	257	255	62	99	94	5	8.1	
3	15	0.42	1.1	678.21	285	251	252	60	99	94	5	8.0	
4	20	0.50	1.3	681.24	287	252	251	57	100	94	5	8.2	
5	25	0.51	1.3	684.36	286	254	251	57	101	94	5	8.5	685.08 372
2-1	30	0.43	1.1	688.23	286	254	251	59	101	94	5	8.1	
2	35	0.47	1.2	691.33	286	251	252	61	101	96	5	8.7	
3	40	0.46	1.2	694.37	286	252	252	55	102	95	5	8.9	
4	45	0.47	1.2	697.45	285	252	250	58	102	94	5	8.3	
5	50	0.49	1.3	700.49	286	250	250	62	102	95	5	8.4	701.02 353
3-1	55	0.50	1.3	704.21	284	249	251	60	103	95	5	8.5	
2	60	0.42	1.1	707.27	285	255	252	61	103	95	5	8.6	
			14.3	179.1700	3425	2			2342				
	Total	*											
	Average	0.6867	1.2280	76,800 SB	285.3200				99.1200				

Sum of square roots. Circle ~~correct~~ bracketed units on data sheet. 99.140 10/10

QA/QC SD

Date 9/26/13

CleanAir ENGINEERING

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

UNIT: 2 RUN: 4

FIELD DATA SHEET

Client	Wheelabrator
Plant	
Meter Operator	S Dooley
Probe Operator	S Dooley
Project No.	12218
Date	9/26/13

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 5 Elapsed Time	Velocity Head ΔP (in. H_2O)	Orifice Setting ΔH (in. H_2O)	Gas Sample Volume V_m Init. Vol. 0 [ft³] [L]	Stack Temp. Ts (°F)	Probe T_p (°F) Set Points 250	Filter T_f (°F) Set Points 250	Cond. Temp. T_c (°F)	DGM Inlet $T_{m\,in}$ (°F)	DGM Outlet $T_{m\,out}$ (°F)	Pump Vacuum (in.Hg)	XAD Trap Temp. T_t (°F) 92	Notes
3-3	65	0.49	1.3	710.27	286	251	252	60	102	95	5	8.1	
4	70	0.50	1.3	713.38	285	250	252	60	103	95	5	8.7	
5	75	0.51	1.3	716.53	287	251	256	61	104	96	5	8.6	717.15 0.62
4-1	80	0.50	1.3	720.00	284	251	251	63	104	96	5	8.5	
2	85	0.51	1.3	723.45	286	252	251	60	104	96	5	8.8	
3	90	0.49	1.3	726.20	286	253	251	55	104	96	5	8.9	
4	95	0.45	1.1	729.34	285	250	250	57	104	96	5	8.7	
5	100	0.49	1.3	732.42	284	255	250	59	105	97	5	8.6	732.92 0.50
5-1	105	0.45	1.2	736.06	285	251	250	60	106	97	5	8.4	
2	110	0.46	1.2	739.20	286	253	250	60	106	97	5	8.5	
3	115	0.46	1.2	742.31	284	252	253	62	106	97	5	8.7	
4	120	0.48	1.3	745.42	285	250	251	63	107	97	5	8.8	
5	125	0.49	1.3	748.51	285	249	251	63	107	97	5	8.9	
	Total	*											
	Average												

* Sum of square roots.

Circle correct bracketed units on data sheet.

QA/QC SD

Date 9/26/13

CleanAir ENGINEERING

Impinger Weight Sheet

Client Wheelabrator		Unit Name / Location Unit 2 FF Outlet
Plant North Broward	Job No. 12118	Method 29

Balance Calibration Check			
Balance ID	802830 1068	Reference Weight Mass	500
Reference Weight ID	60150	Reference Weight Reading	499.8

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 9/25	Lot No. NA		pH NA
Analyst S Brown	Filter No. Untared		Rinse NA

	Contents	Gross Weight (gm)	Tare Weight (gm)	Net Weight Gain (gm)	
Impinger 1	Empty	779.2	451.4	327.8	
Impinger 2	100 ml 5%HNO_3/10%H_2O_2	769.6	544.1	223.5	QA/QC SB
Impinger 3	100 ml 5%HNO_3/10%H_2O_2	558.1	536.5	21.6	Date 9/25
Impinger 4	Empty	440.0	438.1	1.9	
Impinger 5	100 ml 4%$KMnO_4$/10%H_2SO_4	539.2	537.0	2.2	Total Weight (gm)
Impinger 6	100 ml 4%$KMnO_4$/10%H_2SO_4	536.3	536.5	-0.2	576.8
Impinger 7	≈ 250 g Silica Gel	763.5	743.9	19.6	596.4

Run No. 2	Filter Type Quartz		Sample Box No. M10
Date 9/25	Lot No. NA		pH NA
Analyst S. Brown	Filter No. Untared		Rinse NA

	Contents	Gross Weight (gm)	Tare Weight (gm)	Net Weight Gain (gm)	
Impinger 1	Empty	793.4	439.3	354.1	
Impinger 2	100 ml 5%HNO_3/10%H_2O_2	758.1	550.7	207.4	QA/QC SB
Impinger 3	100 ml 5%HNO_3/10%H_2O_2	566.7	541.7	25.0	Date 9/25
Impinger 4	Empty	439.4	436.3	3.1	
Impinger 5	100 ml 4%$KMnO_4$/10%H_2SO_4	537.1	534.5	2.6	Total Weight (gm)
Impinger 6	100 ml 4%$KMnO_4$/10%H_2SO_4	523.1	521.2	1.9	594.1
Impinger 7	≈ 250 g Silica Gel	781.7	763.6	18.1	612.2

Run No. 3	Filter Type Quartz		Sample Box No. M11
Date	Lot No. NA		pH NA
Analyst	Filter No. Untared		Rinse NA

	Contents	Gross Weight (gm)	Tare Weight (gm)	Net Weight Gain (gm)		
Impinger 1	Empty	775.6	452.9	322.7	0	
Impinger 2	100 ml 5%HNO_3/10%H_2O_2	784.5	545.9	238.6	0	QA/QC SB
Impinger 3	100 ml 5%HNO_3/10%H_2O_2	557.6	537.0	3.3 20.6	0	Date 9/26
Impinger 4	Empty	442.0	438.7	SB 3.3	0	
Impinger 5	100 ml 4%$KMnO_4$/10%H_2SO_4	552.8	SB 539.1 552.0	0.8	0	Total Weight (gm)
Impinger 6	100 ml 4%$KMnO_4$/10%H_2SO_4	535.5	535.1	0.4	0	586.4 0
Impinger 7	≈ 250 g Silica Gel	780.6	763.3	17.3	0	603.7 0

QA/QC SB
Date 9/26

CleanAir ENGINEERING

Impinger Weight Sheet

Client Wheelabrator			Unit Name / Location Unit 2 FF Outlet
Plant North Broward	Job No. 12118		Method 29

Balance Calibration Check			
Balance ID		Reference Weight Mass	
Reference Weight ID		Reference Weight Reading	

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.
Date	9/26/13 ~~9/6/2012~~	Lot No. NA		pH NA
Analyst	S.B R. Vicere S. Brown 9/26	Filter No. Untared		Rinse NA

	Contents	Gross Weight (gm)	Tare Weight (gm)	Net Weight Gain (gm)	
Impinger 1	100 ml 0.1 N H2SO4	817.7	439.8	377.9	
Impinger 2	100 ml 0.1 N H2SO4	753.3	553.1	200.2	QA/QC SB
Impinger 3	Empty	563.2	545.5	17.7	Date 9/26
Impinger 4	Empty	440.8	436.7	4.1	
Impinger 5	100 ml 4%$KMnO_4$/10%H_2SO_4	540.1	537.4	2.7	Total Weight (gm)
Impinger 6	100 ml 4%$KMnO_4$/10%H_2SO_4	524.6	523.6	1.0	603.6
Impinger 7	≈ 250 g Silica Gel	798.9	781.2	17.7	621.3

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

	Contents	Gross Weight (gm)	Tare Weight (gm)	Net Weight Gain (gm)	
Impinger 1					
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	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 SB
Date 9/26

CleanAir. ENGINEERING

ORSAT READINGS

TEST LOCATION: Unit 2 FF outlet **PAGE** 1 **OF** 1

Client	Wheelabrator	Project Number	12218	$Fo = \frac{20.9 - \%O_2}{\%CO_2}$	
Plant	North Broward	Unit	2		
Orsat ID		Fuel Type	MSW	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							
		2							
		3							
		Avg.							
2	29	1	8.6	19.3	10.7		S. Brown	9/11	12:07
		2	8.5	19.2	10.7				
		3	8.6	19.2	10.6				
		Avg.	(8.6)	19.3	(10.7)				
1	29	1	10.8	19.0	8.2		S. Brown	9/25	14:16
		2	10.8	19.0	8.2				
		3	10.8	19.0	8.2				
		Avg	(10.8)	19.0	(8.2)				
2	29	1	10.6	19.3	8.7		S. Brown	9/25	14:50
		2	10.6	19.4	8.8				
		3	10.6	19.3	8.7				
		Avg	(10.6)	(19.3)	(8.7)				
3	29	1	10.6	19.2	8.6		S. Brown	9/26	11:10
		2	10.5	19.1	8.4				
		3	10.7	19.1	8.6				
		Avg.	(10.5)	19.1	(8.6)				
4	29	1	10.5	19.0	8.5		S. Brown	9/26	13:45
		2	10.6	19.1	8.5				
		3	10.5	19.0	8.5				
		Avg.	(10.5)	19.0	(8.5)				

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 JB
Date 10/27/06

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: SB

Date: 10/23

CleanAir

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Field Data Printout

Location:	Unit 2 FF Outlet		Test Method:	USEPA Method 29	
Test Run:	1		Analyte:	Mercury	
Client:	Wheelabrator		Bar. Press. (in. Hg):	29.90	Nozzle ID No: 0.275-1
Project No:	12218		Static P:	-10.0	Nozzle Diameter (D_n): 0.275
Source Area (ft^2):	64.00000		O_2 (dry volume %):	8.43	Probe ID No: 66-8-1
Meter Operator:	S. Dooley	593	CO_2 (dry volume %):	10.80	Pitot C_p: 0.814
Probe Operator:	S. Dooley	593	N_2+CO (dry volume %):	80.77	Pitot Leak Check: ☑ Pass ☐ Fail
Test Date:	9/25/13				
Start Time:	10:06				
Stop Time:	12:27		H_2O (condensate, ml or gm):	576.8	Meter Box ID. No: 66-20
Leak Rate Before:	0.008 cfm	@ 15 "Hg	H_2O (silica, g):	19.6	Meter ΔH@: 1.79920
Leak Rate After:	0.005 cfm	@ 7 "Hg	Actual Moisture (%):	27.42	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			420.830						
1-01	5.0	0.42	1.1	423.690	273	87	85	0.65	2.86	100.9
1-02	10.0	0.42	1.1	426.590	273	89	86	0.65	2.90	102.0
1-03	15.0	0.45	1.2	429.570	275	90	86	0.67	2.98	101.3
1-04	20.0	0.47	1.2	432.500	273	91	87	0.69	2.93	97.2
1-05	25.0	0.50	1.3	435.640	272	93	89	0.71	3.14	100.6
				436.220						
2-01	30.0	0.43	1.2	439.350	273	93	89	0.66	3.13	108.1
2-02	35.0	0.52	1.4	442.560	273	94	90	0.72	3.21	100.7
2-03	40.0	0.50	1.3	445.730	273	95	90	0.71	3.17	101.3
2-04	45.0	0.50	1.3	448.890	273	95	91	0.71	3.16	100.9
2-05	50.0	0.53	1.4	451.990	273	96	90	0.73	3.10	96.2
				452.470						
3-01	55.0	0.50	1.3	455.690	273	96	91	0.71	3.22	102.7
3-02	60.0	0.49	1.3	458.750	272	97	92	0.70	3.06	98.4
3-03	65.0	0.51	1.3	461.930	272	100	93	0.71	3.18	99.8
3-04	70.0	0.50	1.3	465.120	272	103	94	0.71	3.19	100.8
3-05	75.0	0.49	1.3	468.200	273	103	95	0.70	3.08	98.3
				468.890						
4-01	80.0	0.42	1.1	472.070	272	104	95	0.65	3.18	109.4
4-02	85.0	0.45	1.2	474.990	273	104	96	0.67	2.92	97.0
4-03	90.0	0.45	1.2	478.320	272	104	96	0.67	3.33	110.6*
4-04	95.0	0.45	1.2	481.480	272	105	96	0.67	3.16	104.8
4-05	100.0	0.47	1.3	484.100	272	105	96	0.69	2.62	85.1*
				485.880						
5-01	105.0	0.48	1.3	489.100	273	103	96	0.69	3.22	103.7
5-02	110.0	0.46	1.3	492.470	272	103	97	0.68	3.37	110.7*
5-03	115.0	0.49	1.4	495.620	273	103	97	0.70	3.15	100.4
5-04	120.0	0.50	1.3	498.950	272	103	98	0.71	3.33	104.8
5-05	125.0	0.50	1.3	502.110	273	103	99	0.71	3.16	99.5
Final	125.0		1.26400	77.75000	272.68000	95.46000		0.68954	77.75000	
25 points sampled		Sq.Rt.ΔP								
QC-Check: Field Averages		0.6895	1.2640	77.7500	272.6800	95.4600				
		☑ Avg. OK	☑ Avg. OK	☑ Avg. OK	☑ Avg. OK	☑ Avg. OK				

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Field Data Printout

			Test Method:		**USEPA Method 29**
Location:	Unit 2 FF Outlet		**Analyte:**		**Mercury**
Test Run:	2				
Client:	Wheelabrator		Bar. Press. (in. Hg):	29.90	Nozzle ID No: 0.275-1
Project No:	12218		Static P:	-10.0	Nozzle Diameter (D_n): 0.275
Source Area (ft^2):	64.00000		O_2 (dry volume %):	8.73	Probe ID No: 66-8-1
Meter Operator:	S. Dooley	593	CO_2 (dry volume %):	10.60	Pitot C_p: 0.814
Probe Operator:	S. Dooley	593	N_2+CO (dry volume %):	80.67	Pitot Leak Check: ☑Pass ☐Fail
Test Date:	9/25/13				
Start Time:	12:45				
Stop Time:	15:14		H_2O (condensate, ml or gm):	594.1	Meter Box ID. No: 66-20
Leak Rate Before:	0.005 cfm	@ 15 "Hg	H_2O (silica, g):	18.1	Meter ΔH@: 1.79920
Leak Rate After:	0.003 cfm	@ 8 "Hg	Actual Moisture (%):	27.75	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			503.330						
5-01	5.0	0.45	1.2	506.440	272	94	91	0.67	3.11	105.1
5-02	10.0	0.45	1.2	509.440	272	94	91	0.67	3.00	101.3
5-03	15.0	0.50	1.3	512.620	272	96	92	0.71	3.18	101.7
5-04	20.0	0.51	1.3	515.910	272	97	92	0.71	3.29	104.0
5-05	25.0	0.52	1.3	518.900	273	98	92	0.72	2.99	93.6
				520.000						
4-01	30.0	0.50	1.3	523.300	272	100	93	0.71	3.30	105.0
4-02	35.0	0.50	1.3	526.440	272	100	93	0.71	3.14	99.9
4-03	40.0	0.52	1.3	529.110	272	101	94	0.72	2.67	83.2*
4-04	45.0	0.53	1.4	532.650	272	102	94	0.73	3.74	115.3*
4-05	50.0	0.49	1.2	535.860	271	102	95	0.70	3.01	96.3
				536.060						
3-01	55.0	0.51	1.3	539.030	272	103	95	0.71	2.97	93.2
3-02	60.0	0.51	1.3	541.810	272	103	94	0.71	2.78	87.3*
3-03	65.0	0.51	1.3	544.900	272	102	94	0.71	3.09	97.1
3-04	70.0	0.50	1.3	547.940	272	102	94	0.71	3.04	96.5
3-05	75.0	0.49	1.3	551.100	272	102	95	0.70	3.16	101.2
				553.520						
2-01	80.0	0.50	1.3	556.890	273	103	94	0.71	3.37	106.9
2-02	85.0	0.50	1.3	559.910	273	103	95	0.71	3.02	95.7
2-03	90.0	0.51	1.3	563.090	271	103	95	0.71	3.18	99.7
2-04	95.0	0.49	1.3	566.270	272	104	95	0.70	3.18	101.7
2-05	100.0	0.49	1.3	569.450	272	104	95	0.70	3.18	101.7
				570.190						
1-01	105.0	0.48	1.2	573.630	272	105	96	0.69	3.44	110.9*
1-02	110.0	0.47	1.2	576.790	272	105	95	0.69	3.16	103.0
1-03	115.0	0.51	1.3	580.100	272	105	95	0.71	3.31	103.6
1-04	120.0	0.50	1.3	583.420	271	105	95	0.71	3.32	104.9
1-05	125.0	0.50	1.3	586.620	272	106	96	0.71	3.20	101.0
Final	125.0		1.28400	78.83000	272.00000	97.78000		0.70528	78.83000	
25 points sampled		Sq.Rt.ΔP								
QC-Check: Field Averages		0.7053	1.2840	78.8300	272.0000	97.7800				
		☑Avg. OK	☑Avg. OK	☑Avg. OK	☑Avg. OK	☑Avg. OK				

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SS ISOKINETIC Version 2006-13e

Field Data Printout

Location:	Unit 2 FF Outlet		Test Method:	USEPA Method 29	
Test Run:	3		Analyte:	Mercury	
Client:	Wheelabrator		Bar. Press. (in. Hg):	29.90	Nozzle ID No: 0.275-1
Project No:	12218		Static P:	-11.0	Nozzle Diameter (D_n): 0.275
Source Area (ft^2):	64.00000		O_2 (dry volume %):	8.53	Probe ID No: 66-8-1
Meter Operator:	S. Dooley	593	CO_2 (dry volume %):	10.60	Pitot C_p: 0.814
Probe Operator:	S. Dooley	593	N_2+CO (dry volume %):	80.87	Pitot Leak Check: ☑ Pass ☐ Fail
Test Date:	9/26/13				
Start Time:	07:41				
Stop Time:	09:58		H_2O (condensate, ml or gm):	586.4	Meter Box ID. No: 66-20
Leak Rate Before:	0.001 cfm	@ 15 "Hg	H_2O (silica, g):	17.3	Meter ΔH@: 1.79920
Leak Rate After:	0.001 cfm	@ 9 "Hg	Actual Moisture (%):	28.08	Meter Y_d: 1.00310

Traverse Point	Run Time 5.0 min/read	Pitot ΔP_s	Sample ΔH	Metered	Stack	Dry Gas Meter		$\sqrt{\Delta P_s}$	Volume	Isokinetics
				(dcf)	T_s	$T_{m\text{-}in}$	$T_{m\text{-}out}$	(calculated)	(calculated)	(calculated)
	0.0	(in. H_2O)	(in. H_2O)	588.100	(°F)	(°F)	(°F)	($\sqrt{}$in. H_2O)	(ft^3)	(%)
1-01	5.0	0.45	1.1	591.100	288	85	84	0.67	3.00	104.4
1-02	10.0	0.45	1.1	594.050	287	87	85	0.67	2.95	102.3
1-03	15.0	0.46	1.1	596.990	287	89	85	0.68	2.94	100.7
1-04	20.0	0.50	1.2	600.000	286	90	85	0.71	3.01	98.8
1-05	25.0	0.49	1.2	603.000	287	91	86	0.70	3.00	99.3
				603.800						
2-01	30.0	0.46	1.1	606.920	285	92	87	0.68	3.12	106.2
2-02	35.0	0.49	1.2	609.950	285	93	87	0.70	3.03	99.9
2-03	40.0	0.51	1.2	612.970	286	95	88	0.71	3.02	97.4
2-04	45.0	0.50	1.2	615.980	285	96	89	0.71	3.01	97.8
2-05	50.0	0.51	1.2	618.970	285	97	89	0.71	2.99	96.1
				619.600						
3-01	55.0	0.52	1.2	622.700	286	99	90	0.72	3.10	98.5
3-02	60.0	0.53	1.3	625.750	286	100	90	0.73	3.05	95.9
3-03	65.0	0.45	1.1	628.780	285	98	90	0.67	3.03	103.5
3-04	70.0	0.47	1.1	631.740	286	98	90	0.69	2.96	99.0
3-05	75.0	0.53	1.3	634.710	287	98	90	0.73	2.97	93.6
				635.230						
4-01	80.0	0.55	1.3	638.780	286	99	91	0.74	3.55	109.6
4-02	85.0	0.50	1.2	641.810	286	99	90	0.71	3.03	98.2
4-03	90.0	0.51	1.2	644.800	287	100	91	0.71	2.99	95.8
4-04	95.0	0.49	1.2	647.800	285	100	91	0.70	3.00	97.9
4-05	100.0	0.46	1.1	650.740	285	100	91	0.68	2.94	99.0
				651.230						
5-01	105.0	0.48	1.2	654.230	286	100	92	0.69	3.00	98.9
5-02	110.0	0.51	1.2	657.310	287	101	92	0.71	3.08	98.5
5-03	115.0	0.53	1.3	660.370	286	101	92	0.73	3.06	96.0
5-04	120.0	0.50	1.2	663.390	285	102	92	0.71	3.02	97.3
5-05	125.0	0.50	1.2	666.350	286	102	92	0.71	2.96	95.5
Final	125.0		1.18800	75.81000	286.00000	92.82000		0.70258	75.81000	
25 points sampled		Sq.Rt.ΔP								
QC-Check: Field Averages		0.7026	1.1880	75.8100	286.0000	92.8200				
		☑ Avg. OK	☑ Avg. OK	☑ Avg. OK	☑ Avg. OK	☑ Avg. OK				

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Field Data Printout

Location:	Unit 2 FF Outlet	**Test Method:**	**USEPA Method 29**
Test Run:	4	**Analyte:**	**Mercury**
Client:	Wheelabrator	Bar. Press. (in. Hg):	29.90
Project No:	12218	Static P:	-11.0
Source Area (ft^2):	64.00000	O_2 (dry volume %):	8.50
Meter Operator:	S. Dooley 593	CO_2 (dry volume %):	10.53
Probe Operator:	S. Dooley 593	N_2+CO (dry volume %):	80.97
Test Date:	9/26/13		
Start Time:	10:18		
Stop Time:	12:40	H_2O (condensate, ml or gm):	603.6
Leak Rate Before:	0.004 cfm @ 15 "Hg	H_2O (silica, g):	17.7
Leak Rate After:	0.001 cfm @ 8 "Hg	Actual Moisture (%):	28.63

Nozzle ID No:	0.275-1
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)	$\sqrt{\Delta P_s}$ (calculated) ($\sqrt{in.}$ H_2O)	Volume (calculated) (ft^3)	Isokinetics (calculated) (%)
	0.0			669.340						
1-01	5.0	0.42	1.10	672.270	285	97	93	0.65	2.93	104.0
1-02	10.0	0.43	1.10	675.220	284	99	94	0.66	2.95	103.2
1-03	15.0	0.42	1.10	678.210	285	99	94	0.65	2.99	105.9
1-04	20.0	0.50	1.30	681.240	287	100	94	0.71	3.03	98.4
1-05	25.0	0.51	1.30	684.360	286	101	94	0.71	3.12	100.2
				685.080						
2-01	30.0	0.43	1.10	688.230	286	101	94	0.66	3.15	110.1*
2-02	35.0	0.47	1.20	691.330	286	102	95	0.69	3.10	103.5
2-03	40.0	0.46	1.20	694.370	286	102	94	0.68	3.04	102.7
2-04	45.0	0.47	1.20	697.450	285	102	95	0.69	3.08	102.7
2-05	50.0	0.49	1.30	700.490	286	102	95	0.70	3.04	99.4
				701.020						
3-01	55.0	0.50	1.30	704.210	284	103	95	0.71	3.19	103.0
3-02	60.0	0.42	1.10	707.270	285	103	95	0.65	3.06	107.9
3-03	65.0	0.49	1.30	710.270	286	102	95	0.70	3.00	98.1
3-04	70.0	0.50	1.30	713.380	285	103	95	0.71	3.11	100.5
3-05	75.0	0.51	1.30	716.530	287	104	96	0.71	3.15	100.8
				717.150						
4-01	80.0	0.50	1.30	720.000	284	104	96	0.71	2.85	91.9
4-02	85.0	0.51	1.30	723.450	286	104	96	0.71	3.45	110.3*
4-03	90.0	0.49	1.30	726.200	286	104	96	0.70	2.75	89.7*
4-04	95.0	0.45	1.10	729.340	285	104	96	0.67	3.14	106.7
4-05	100.0	0.49	1.30	732.420	284	105	97	0.70	3.08	100.1
				732.920						
5-01	105.0	0.45	1.20	736.060	285	106	97	0.67	3.14	106.5
5-02	110.0	0.46	1.20	739.200	286	106	97	0.68	3.14	105.4
5-03	115.0	0.46	1.20	742.310	284	106	97	0.68	3.11	104.2
5-04	120.0	0.48	1.30	745.420	285	107	97	0.69	3.11	102.0
5-05	125.0	0.49	1.30	748.510	285	107	97	0.70	3.09	100.4
Final	125.0		1.22800	76.80000	285.32000	99.14000		0.68667	76.80000	
25 points sampled		Sq.Rt.ΔP								
QC-Check: Field Averages		0.6867	1.2280	76.8000	285.3200	99.1400				
		☑Avg. OK	☑Avg. OK	☑Avg. OK	☑Avg. OK	☑Avg. OK				

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USEPA Method 3 Laboratory Data

Test Method: USEPA Method 29
Analyte: Mercury

Location: Unit 2 FF Outlet
Client: Wheelabrator
Project No: 12218
Method: EPA Method 3
Fuel Type: Municipal Waste
F_o for Fuel: 1.03 to 1.3

Analyst: S. Brown
Analyst Emp No: 433

Run Number	Trial	Percent CO_2	Percent O_2+CO_2	Percent O_2	Percent N_2	Dry Mol. Weight	F_o	Method of Analysis: Orsat
1	1	10.8	19.3	8.5	80.7	30.07		
	2	10.8	19.2	8.4	80.8	30.06		
	3	10.8	19.2	8.4	80.8	30.06		
	Avg.	10.80000		8.43333	80.76667	30.07	1.15432	*All measurements in spec.*
CEM or Other Avg:								☑ Fo value within expected range.

Run Number	Trial	Percent CO_2	Percent O_2+CO_2	Percent O_2	Percent N_2	Dry Mol. Weight	F_o	Method of Analysis: Orsat
2	1	10.6	19.3	8.7	80.7	30.04		
	2	10.6	19.4	8.8	80.6	30.05		
	3	10.6	19.3	8.7	80.7	30.04		
	Avg.	10.60000		8.73333	80.66667	30.05	1.14780	*All measurements in spec.*
CEM or Other Avg:								☑ Fo value within expected range.

Run Number	Trial	Percent CO_2	Percent O_2+CO_2	Percent O_2	Percent N_2	Dry Mol. Weight	F_o	Method of Analysis: Orsat
3	1	10.6	19.2	8.6	80.8	30.04		
	2	10.5	19.1	8.6	80.9	30.02		
	3	10.7	19.1	8.4	80.9	30.05		
	Avg.	10.60000		8.53333	80.86667	30.04	1.16667	*All measurements in spec.*
CEM or Other Avg:								☑ Fo value within expected range.

Run Number	Trial	Percent CO_2	Percent O_2+CO_2	Percent O_2	Percent N_2	Dry Mol. Weight	F_o	Method of Analysis: Orsat
4	1	10.5	19.0	8.5	81.0	30.02		
	2	10.6	19.1	8.5	80.9	30.04		
	3	10.5	19.0	8.5	81.0	30.02		
	Avg.	10.53333		8.50000	80.96667	30.03	1.17722	*All measurements in spec.*
CEM or Other Avg:								☑ Fo value within expected range.

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USEPA Method 4 Laboratory Data

Location: Unit 2 FF Outlet
Client: Wheelabrator
Project No: 12218

Test Method: USEPA Method 29
Analyte: Mercury
Analyst: S. Brown
Analyst Emp No: 433

Test Run: 1

	Contents	Gross (gm)	Tare (gm)	Net (gm)
Impinger 1	Empty	779.2	451.4	327.8
Impinger 2	5%HNO3/10%H2O2	767.6	544.1	223.5
Impinger 3	5%HNO3/10%H2O2	558.1	536.5	21.6
Impinger 4	Empty	440.0	438.1	1.9
Impinger 5	4%KMnO4/10%H2SO4	539.2	537.0	2.2
Impinger 6	4%KMnO4/10%H2SO4	536.3	536.5	-0.2
Impinger 7	Silica Gel	763.5	743.9	19.6
Impinger 8				

Rinse: (ml or gm)

		Field Data Check	
576.8	Liquid (gm)		
0.0	less rinse (gm)		
576.8	Net Liquid (gm)	576.8	☑ QA/QC OK
+ 19.6	Silica Gel (gm)	19.6	☑ QA/QC OK
596.4	Total Vlc (gm)	596.4	☑ QA/QC OK

Test Run: 2

	Contents	Gross (gm)	Tare (gm)	Net (gm)
Impinger 1	Empty	793.4	439.3	354.1
Impinger 2	5%HNO3/10%H2O2	758.1	550.7	207.4
Impinger 3	5%HNO3/10%H2O2	566.7	541.7	25.0
Impinger 4	Empty	439.4	436.3	3.1
Impinger 5	4%KMnO4/10%H2SO4	537.1	534.5	2.6
Impinger 6	4%KMnO4/10%H2SO4	523.1	521.2	1.9
Impinger 7	Silica Gel	781.7	763.6	18.1
Impinger 8				

Rinse: (ml or gm)

		Field Data Check	
594.1	Liquid (gm)		
0.0	less rinse (gm)		
594.1	Net Liquid (gm)	594.1	☑ QA/QC OK
+ 18.1	Silica Gel (gm)	18.1	☑ QA/QC OK
612.2	Total Vlc (gm)	612.2	☑ QA/QC OK

Test Run: 3

	Contents	Gross (gm)	Tare (gm)	Net (gm)
Impinger 1	Empty	775.6	452.9	322.7
Impinger 2	5%HNO3/10%H2O2	784.5	545.9	238.6
Impinger 3	5%HNO3/10%H2O2	557.6	537.0	20.6
Impinger 4	Empty	442.0	438.7	3.3
Impinger 5	4%KMnO4/10%H2SO4	552.8	552.0	0.8
Impinger 6	4%KMnO4/10%H2SO4	535.5	535.1	0.4
Impinger 7	Silica Gel	780.6	763.3	17.3
Impinger 8				

Rinse: (ml or gm)

		Field Data Check	
586.4	Liquid (gm)		
0.0	less rinse (gm)		
586.4	Net Liquid (gm)	586.4	☑ QA/QC OK
+ 17.3	Silica Gel (gm)	17.3	☑ QA/QC OK
603.7	Total Vlc (gm)	603.7	☑ QA/QC OK

Test Run: 4

	Contents	Gross (gm)	Tare (gm)	Net (gm)
Impinger 1	Empty	817.7	439.8	377.9
Impinger 2	5%HNO3/10%H2O2	753.3	553.1	200.2
Impinger 3	5%HNO3/10%H2O2	563.2	545.5	17.7
Impinger 4	Empty	440.8	436.7	4.1
Impinger 5	4%KMnO4/10%H2SO4	540.1	537.4	2.7
Impinger 6	4%KMnO4/10%H2SO4	524.6	523.6	1.0
Impinger 7	Silica Gel	798.9	781.2	17.7
Impinger 8				

Rinse: (ml or gm)

		Field Data Check	
603.6	Liquid (gm)		
0.0	less rinse (gm)		
603.6	Net Liquid (gm)	603.6	☑ QA/QC OK
+ 17.7	Silica Gel (gm)	17.7	☑ QA/QC OK
621.3	Total Vlc (gm)	621.3	☑ QA/QC OK

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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: SG

Date: 10/23

CleanAir

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Wheelabrator
Clean Air Project No: 12218
Unit 2 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)		Sep 25	Sep 25	Sep 26	Sep 26
Start Time (approx.)		10:06	12:45	07:41	10:18
Stop Time (approx.)		12:27	15:14	09:58	12:40
Sample Analysis					
m_{1b-S}	Fraction 1B Sample (µg)	0.1344	0.1242	0.1150	<0.1000
m_{2b-S}	Fraction 2B Sample (µg)	11.9109	21.1451	12.0615	10.6516
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)	1.1783	2.4750	0.4655	0.4625
$m_{total-S}$	Total Sample Amount (µg)	13.2236	23.7443	12.6420	11.1140
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)	13.2236	23.7443	12.6420	11.1140
Sample Corrected for Blank - Prorated Fractions					
m_{n-1b}	Fraction 1B (µg)	0.1344	0.1242	0.1150	<0.1000
m_{n-2b}	Fraction 2B (µg)	11.9109	21.1451	12.0615	10.6516
m_{n-3a}	Fraction 3A (µg)	<0.2000	<0.2000	<0.2000	<0.2000
m_{n-3b}	Fraction 3B (µg)	<0.5000	<0.5000	<0.5000	<0.5000
m_{n-3c}	Fraction 3C (µg)	1.1783	2.4750	0.4655	0.4625

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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
21230

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 21230
has been reviewed for completeness, accuracy,
adherence to method protocol,
and compliance with quality assurance guidelines.

Review by:

Daphne Woodman, Chemist
October 9, 2013

Report Reviewed and Finalized By:

Ken Smith, Laboratory Director
October 9, 2013

SUMMARY OF RESULTS

Summary of Analysis

Summary of Method 29 Mercury Analysis

Run Number		Average Total Catch, µg	Front Half µg	H_2O_2 /HNO_3 µg	Empty Impinger µg	$KMnO_4$ µg	HCl µg
U2 Run 1	#1	13.2	0.136	12.0	< 0.2	< 0.5	1.17
	#2		0.132	11.9	< 0.2	< 0.5	1.18
U2 Run 2	#1	23.7	0.123	21.2	< 0.2	< 0.5	2.48
	#2		0.126	21.1	< 0.2	< 0.5	2.47
U2 Run 3	#1	12.6	0.117	12.1	< 0.2	< 0.5	0.464
	#2		0.113	12.0	< 0.2	< 0.5	0.467
U2 Run 4	#1	11.1	< 0.1	10.6	< 0.2	< 0.5	0.460
	#2		< 0.1	10.7	< 0.2	< 0.5	0.465
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

ANALYTICAL NARRATIVE

Element One Analytical Narrative

Client:	Clean Air, IL	Element One #:	21230
Client ID:	12218 Wheelabrator Pompano Beach, FL	Analyst:	LAL & JWL
Method:	Method 29	Dates Received:	09/27/13
Analytes:	Hg	Dates Analyzed:	10/01-04/13

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.

Additional Comments

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

QUALITY CONTROL SUMMARY

Summary of Quality Control Data

Mercury Duplicate Analysis RPD

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

Run Number	Front Half	H_2O_2/HNO_3	Empty Imp	$KMnO_4$	HCl
U2 Run 1	2.8%	0.8%	NA	NA	0.8%
U2 Run 2	2.4%	0.1%	NA	NA	0.8%
U2 Run 3	3.6%	0.3%	NA	NA	0.5%
U2 Run 4	NA	0.9%	NA	NA	0.9%
Field Blank	NA	NA	NA	NA	NA
Reagent Blank	NA	NA	NA	NA	NA

Mercury Spike Recoveries

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

Run Number		Front Half	H_2O_2/HNO_3	Empty Imp	$KMnO_4$	HCl
U2 Run 3	#1	101%	99%	100%	89%	95%
	#2	100%	98%	100%	89%	95%

SAMPLE CUSTODY

21230

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

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

CleanAir
500 West Wood Street
Palatine, IL 60067
800-627-0833 (phone)
847-991-3385 (fax)

66-12218-1

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?	ANALYSIS REQUESTED	Mercury	Archive	ADDITIONAL INFORMATION
	9/25	Unit 2	1	Quartz Filter, 250 mL HDPE	1	X	X			
	9/25	Unit 2	2	Quartz Filter, 250 mL HDPE	1	X	X			
	9/26	Unit 2	3	Quartz Filter, 250 mL HDPE	1	X	X			Note: There are two Run 2's
	9/26	Unit 2	4	Quartz Filter, 250 mL HDPE	1	X	X			Only analyze the run 2 from 9/25
	9/25	Unit 2	Field Blank	Quartz Filter, 250 mL HDPE	1	X	X			Run 2 from 9/11 is archived.
	9/11	Unit 2	2	Quartz Filter, 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:
S. Brown	9/24/13 15:00					S. Brown
Received By: (signature)	**Date / Time**	**Received By: (signature)**	**Date / Time**	**Relinquished By: (signature)**	**Date / Time**	**Signature / Date**
Lisa Bratton	9/27/13 1038					26-Sep

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

21230

66-12218-2

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

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

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

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?	ANALYSIS REQUESTED:	Mercury		Archive	ADDITIONAL INFORMATION
	9/25	Unit 2	Train Prod	Front Half HNO_3 Rinse, 250 mL HDPE	1	X				X	
	9/25	Unit 2	1	Front Half HNO_3 Rinse, 250 mL HDPE	1	X		X			Note. There are two Run 2's
	9/26	Unit 2	2	Front Half HNO_3 Rinse, 250 mL HDPE	1	X		X			Only analyze the run 2 from 9/25
	9/26	Unit 2	3	Front Half HNO_3 Rinse, 250 mL HDPE	1	X		X			Run 2 from 9/11 is archived.
	9/26	Unit 2	4	Front Half HNO_3 Rinse, 250 mL HDPE	1	X		X			
	9/25	Unit 2	Field Blank	Front Half HNO_3 Rinse, 250 mL HDPE	1	X		X			
	9/11	Unit 2	2	Front Half HNO_3 Rinse, 250 mL HDPE	1	X		X		X	

Relinquished By: (signature)	Date / Time	Relinquished By: (signature)	Date / Time	Relinquished By: (signature)	Date / Time	This form completed by:
S. Brown	9/26/13 15:00					S. Brown
Received By: (signature)	**Date / Time**	**Received By: (signature)**	**Date / Time**	**Relinquished By: (signature)**	**Date / Time**	**Signature / Date**
Lisa Bruton	9/27/13 1038					9/26/2013

21230

CLIENT	Wheelebrator			PROJECT	12218							66-12218-3	
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)									
ANALYTICAL METHOD	CONTAINER NUMBER	SAMPLE FRACTION											
USEPA M-29	4	IMPINGERS 1-3 CATCH AND RINSE 1000 mL HDPE											
LAB ID NUMBER	DATE (2013)	TEST LOCATION	RUN NUMBER	SAMPLE MATRIX	NUMBER OF CONTAINERS	CONTAINER SEALED? LIQUID LEVEL MARKED?		ANALYSIS REQUESTED				FORWARDING LAB	
									Mercury		Archive		
	9/25	Unit 2	1	Impingers 1-3 Catch and Rinse, 1000 mL HDPE	1	X		X				Element One, Inc. 6319C Carolina Beach Rd Wilmington, NC 28412 910-793-0128 (phone) Ken Smith	
	9/25	Unit 2	2	Impingers 1-3 Catch and Rinse, 1000 mL HDPE	1	X		X					
	9/26	Unit 2	3	Impingers 1-3 Catch and Rinse, 1000 mL HDPE	1	X		X					Note: There are two Run 2's
	9/26	Unit 2	4	Impingers 1-3 Catch and Rinse, 1000 mL HDPE	1	X		X					Only analyze the run 2 from 9/25
	9/25	Unit 2	Field Blank	Impingers 1-3 Catch and Rinse, 1000 mL HDPE	1	X		X					Run 2 from 9/11 is archived.
	9/11	Unit 2	2	Impingers 1-3 Catch and Rinse, 1000 mL HDPE	1	X					X		

Relinquished By: (signature)	Date / Time	Relinquished By: (signature)	Date / Time	Relinquished By: (signature)	Date / Time	This form completed by:
S. Brown	9/26/13 15:00					S. Brown
Received By: (signature)	**Date / Time**	**Received By: (signature)**	**Date / Time**	**Relinquished By: (signature)**	**Date / Time**	**Signature** / **Date**
Lisa Bruton	9/27/13 1038					9/26/2013

21230

CLIENT	Wheelabrator			PROJECT	12218							66-12218-4	
PLANT	Pompano Beach, FL			DEPT.	66								
PROJECT MANAGER	S. Brown												
ANALYTICAL METHOD	CONTAINER NUMBER	SAMPLE FRACTION		CleanAir 500 West Wood Street Palatine, IL 60067 800-627-8033 (phone) 847-991-3385 (fax)								FORWARDING LAB Element One, Inc. 6319C Carolina Beach Rd Wilmington, NC 28412 910-799-0128 (phone) Ken Smith	
USEPA M-29	5A	IMPINGER 4 CATCH AND RINSE 250 mL HDPE											
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
	9/25	Unit 2	1	Impinger 4 Catch and Rinse, 250 mL HDPE			1	X		X			
	9/25	Unit 2	2	Impinger 4 Catch and Rinse, 250 mL HDPE			1	X		X			
	9/26	Unit 2	3	Impinger 4 Catch and Rinse, 250 mL HDPE			1	X		X			Note: There are two Run 2's
	9/26	Unit 2	4	Impinger 4 Catch and Rinse, 250 mL HDPE			1	X		X			Only analyze the run 2 from 9/25
	9/25	Unit 2	Field Blank	Impinger 4 Catch and Rinse, 250 mL HDPE			1	X		X			Run 2 from 9/11 is archived
	9/11	Unit 2	2	Impinger 4 Catch and Rinse, 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:	
S. Brown	9/26/13 17:00											S. Brown	
Received By: (signature)	Date / Time	Received By: (signature)		Date / Time	Relinquished By: (signature)					Date / Time		Signature	Date
Lisa Bruton	9/27/13 1038												9/26/2013

21230

CLIENT: Wheelabrator				PROJECT: 12218							66-12218-5	
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)								
ANALYTICAL METHOD	CONTAINER NUMBER	SAMPLE FRACTION										
USEPA M-29	5B	IMPINGERS 5-6 CATCH AND RINSE 950 mL AMBER GLASS										
LAB ID NUMBER	DATE (2013)	TEST LOCATION	RUN NUMBER	SAMPLE MATRIX	NUMBER OF CONTAINERS	CONTAINER SEALED? LIQUID LEVEL MARKED?		ANALYSIS REQUESTED	Mercury	Archive	FORWARDING LAB Element One, Inc. 6319C Carolina Beach Rd Wilmington, NC 28412 910-793-0128 (phone) Ken Smith ADDITIONAL INFORMATION	
	9/25	Unit 2	1	Impingers 5-6 Catch and Rinse, 950 mL Amber Glass	1	X		X				
	9/26	Unit 2	2	Impingers 5-6 Catch and Rinse, 950 mL Amber Glass	1	X		X				
	9/26	Unit 2	3	Impingers 5-6 Catch and Rinse, 950 mL Amber Glass	1	X		X			Note There are two Run 2's	
	9/26	Unit 2	4	Impingers 5-6 Catch and Rinse, 950 mL Amber Glass	1	X		X			Only analyze the run 2 from 9/26	
	9/25	Unit 2	Field Blank	Impingers 5-6 Catch and Rinse, 950 mL Amber Glass	1	X		X			Run 2 from 9/11 is archived.	
	9/11	Unit 2	2	Impingers 5-6 Catch and Rinse, 950 mL Amber Glass						X		

Relinquished By: (signature)	Date / Time	Relinquished By: (signature)	Date / Time	Relinquished By: (signature)	Date / Time	This form completed by:
S. Brown	9/27/13 1511					S. Brown
Received By: (signature)	**Date / Time**	**Received By: (signature)**	**Date / Time**	**Relinquished By: (signature)**	**Date / Time**	**Signature / Date**
Lisa Bratton	9/27/13 1038					9/26/2013

21230

CLIENT: Wheelabrator
PLANT: Pompano Beach, FL
PROJECT MANAGER: S. Brown

PROJECT: 12218
DEPT.: 66

66-12218-6

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

CleanAir
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

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
	9/25	Unit 2	1	Impinger 5-6 8N HCl + DI Water, Container: 250 mL Amber Glass	1	X		X		
	9/25	Unit 2	2	Impinger 5-6 8N HCl + DI Water, Container: 250 mL Amber Glass	1	X		X		
	9/26	Unit 2	3	Impinger 5-6 8N HCl + DI Water, Container: 250 mL Amber Glass	1	X		X		
	9/26	Unit 2	4	Impinger 5-6 8N HCl + DI Water, Container: 250 mL Amber Glass	1	X		X		
	9/25	Unit 2	Field Blank	Impinger 5-6 8N HCl + DI Water, Container: 250 mL Amber Glass	1	X		X		

Relinquished By: (signature)	Date / Time	Relinquished By: (signature)	Date / Time	Relinquished By: (signature)	Date / Time	This form completed by:
S. Brown	9/26/13 15:50					S. Brown
Received By: (signature)	**Date / Time**	**Received By: (signature)**	**Date / Time**	**Relinquished By: (signature)**	**Date / Time**	**Signature / Date**
Lisa Burton	9/27/13 1038					9/26/2013

21230

CLIENT: Wheelabrator			PROJECT: 12218									66-12218-7	
PLANT: Pompano Beach, FL			DEPT.: 66										
PROJECT MANAGER: S. Brown			CleanAir ENGINEERING 500 West Wood Street Palatine, IL 60067 800-527-0833 (phone) 847-991-3365 (fax)										
ANALYTICAL METHOD	CONTAINER NUMBER	SAMPLE FRACTION											
USEPA M-29	SEE BELOW (IF APPLICABLE)	REAGENT BLANKS											
LAB ID NUMBER	DATE (2013)	TEST LOCATION	RUN NUMBER	SAMPLE MATRIX	NUMBER OF CONTAINERS	CONTAINER SEALED? LIQUID LEVEL MARKED?		ANALYSIS REQUESTED	Mercury		Archive	FORWARDING LAB Element One, Inc 6319C Carolina Beach Rd Wilmington, NC 28412 910-793-0128 (phone) Ken Smith ADDITIONAL INFORMATION	
	9/25	Reagent Blank	All	0.1 N HNO_3 (300 mL), Container 8A: 500 mL HDPE	1	x		X					
	9/25	Reagent Blank	All	DI Water (100 mL), Container 8B: 250 mL HDPE	1	x		X					
	9/26	Reagent Blank	All	5% HNO_3 / 10% H_2O_2 (200 mL), Container 9: 250 mL HDPE	1	x		X					
	9/25	Reagent Blank	All	4% $KMnO_4$ / 10% H_2SO_4 (100 mL), Container 10: 250 mL Amber Glass	1	x		X					
	9/25	Reagent Blank	All	DI Water (200 mL) / 6N HCl (25 mL), Container 11: 250 mL Amber Glass	1	x		X					
	9/25	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:
S. Brown	9/26/13 1500					S. Brown
Received By: (signature)	**Date / Time**	**Received By: (signature)**	**Date / Time**	**Relinquished By: (signature)**	**Date / Time**	**Signature / Date**
Lea Bruton	9/27/13 1038					9/26/2013

ANALYTICAL DATA

Analytical Calculations

Mercury-

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

Where-

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

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

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

Analytical Calculations

Spike Recovery-

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

Where-

Spike Result = Raw sample concentration (ppb)--*ICP-Data Sheet*

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

Spike Amount--*ICP-MS Spike Table*

Duplicate Analysis RPD-

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

Where-

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

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

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

elementOne **AIR TESTING SAMPLE SUBMISSION FORM** **Lab ID 21230**

Analysis Due Date 10.07.13
QA/QC/Report Due Date 10.09.13

Client	Clean Air IL
Project No	12218

Date Rec	09.27.13
Time Rec	1038

HNO_3 Lot 53094	HF Lot: 000005115	HCl Lot: 411201C	**Ref. Method: 29**
Volume Marked Y / N	Volume Loss Y / N / ?		

Sample Identification

1	U2-M29-R1	5	Field Blank
2	U2-M29-R2	6	Reagent Blank
	U2-M29-R2 Duplicate		
3	U2-M29-R3		
	U2-M29-R3 Spike		
4	U2-M29-R4		

Analyses Requested Samples 1-6 Hg

Runs / FB	Fil / Ace (FH)		HNO_3 (FH)		5% HNO_3/10% H_2O_2 (BH)			HNO_3 (A)		$KMnO_4$ (B)		HCl (C)	
	pH <2.0 Y / N		pH <2.0 Y / N		pH <2.0 Y / N			pH <2.0 Y / N		pH <2.0 Y / N		pH <2.0 Y / N	
Lab ID	Fil ID	BV ml	BV ml	FV ml	BV ml	Used	FV ml	BV ml	FV ml	BV ml	FV ml	BV ml	FV ml
1			172	100	560			102	200	350	500	230	400
2.D			128		510			104		360		230	
3.S			150		585			104		330		230	
4			138		410			104		380		220	
5			100		310			104		370		220	

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	100	100/33	used 33 ml
	C-9	BH	5% HNO_3/10% H_2O_2	200	–	Comb. vol 200 ml CH w/ 100 ml FH = 150 ml
	C-10	B	4% $KMnO_4$/10%H_2SO_4	100	100/33	used 100 ml
	C-11	C	6N HCl DI H_2O	225	400	
	C-12	FH	Filter			

Lab Communications

LRB + Spiked w/ 100 µL of Std. A @ 25 ppm (FH)

M29: Received C1, C3, C4; C5A, C5B, C5C; RB C12, C8A, C8B, C9, C10, C11— Archive Train Proof & R2 from 09.11.13—09.27.13 LLB

SS Page 1 of 1
9/27/2013 3:43:40 PM
SS by _____
Labeled By/Date TMSC 9/30/13

FH Prep By/Date JWL 10-3 13 A Prep By/Date JWL 9.30 13
BH Prep By/Date JWL 10 1 13 B Prep By/Date JWL 9.30 13
BH/FH Prep By/Date JWL 10 3.13 C Prep By/Date JWL 10 1 13
PM Prep By / Date — ID Verification By/Date JWL 9.30.13

elementOne **Method 29 Microwave Worksheet** Lab ID # e 21230 / 21231

Client:

Date Digested: 10 · 3 · 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	21230 LRB				100		
2	LRB+			100 uL Std A			
3	- 1		1				
4	- 2						
5	- 3						
6	- 4						
7	- 5						
8	- 6						
9	21231 LRB						
10	LRB+			100 uL Std A			
11	1		1				
12	2						
13	3						
14	4						

LRB + Spiked w/ 100 uL Std. A (@ 25ppm

(21230 & 21231)

Element One, Inc. Form 104 - Revision 1.0

HF Lot # 0000055115 2nd

HNO_3 Lot # 53099 1 mL

100113-1 (9-18) sent to 21200B Inst # 7
~~19~~ 19 - 64 sent to 21200 100113-2 (Inst #3)

elementOne **MERCURY BATCH DIGESTION - RUN WORKSHEET** 100113-1 -2

Date Prepared/Digested: ~~10-10-13~~ 093013 Prep By: JWL SIF File #: 100113-1
Block #1 Temperature: 94.27 Start Time: 5 55 Machine ID: #1
Block #2 Temperature: 94.78 Stop Time: 8:10 Batch Analyst: JWL
Block #3 Temperature: — Typed By: JWL Verified By: [illegible]

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 #: 13116504
2	0.004 ug	0.01ml		40	40	Working Standard
3	0.04 ug	0.10ml		40	40	Lot #: 093013-1 by: JWL
4	0.08 ug	0.20ml		40	40	Standard #2 (QC #2):
5	0.16 ug	0.40ml		40	40	Lot #: 093013-2
6	0.20ug	0.50ml		40	40	Standard #3 (QC #3):
						Lot #: 093013-3
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/LAL Date: 10-1-13 Time: 1:45
Final QC Review By: [illegible] Date: 10/2/13 Time: 1157
Comments: 21200 - 3BH+ @ .5 ml 21192 - L2BFH+ @ 1.4ml

A/S	LAB #	Client	Wt/FV	Ali Used	ml used	Sample Vol. ml	Spike µg
✓ 9	21200 - 1BH				1	460	
10	- 2BH				.5	490	
11	- 2BHD				↓	↓	
12	- 3BH				.1	440	
13	- 3BH+				↓	↓	
14	- 4BH				2	440	
15	- 5BH				2	440	
16	- 5BHD				↓		
17	- 6BH				2		
18	- 6BH+				↓		
✓ 19	21230 - 1A				4	200	

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 # 52851 *HNO_3 Lot #* 53099 *HCl Lot #:* 4112670

Persulfate Lot # 093013-3 *$KMnO_4$ Lot #* 093013-3 *Hydrox Lot#:* 093013-5

Clear samples after digestion with 3.2ml of Hydroxylamine solution.

elementOne **MERCURY BATCH DIGESTION - RUN WORKSHEET**

SIF File #: 100113-2

A/S	LAB #	Client	Wt/FV	Ali Used	ml used	Sample Vol. ml	Spike µg
20	21230 -2A				4	200	
21	-2AD						
22	-3A						
23	-3A+						
24	-4A						
25	-5A						
26	-6A					"	
27	-1B					500	
28	-2B						
29	-2BD						
30	-3B						
31	-3B+						
32	-4B						
33	-5B						
34	-6B					"	
35	21201-3				2	1	
36	-3F				"	"	
37	21192 LAB FB				4	100	
38	-LAB FB+				1.6		
39	-4FB				4		
40	-5FB						
41	-5FBD						
42	-6FB						
43	-6FB+						
44	-10FB						
45	-11FB						
46	-11FBD						
47	-12FB						
48	-12FB+						
49	-13FB						
50	-14FB				"	"	
51	21159-3 QC				1	10	
52	L/L LRC				1	1	
53	21203-2,4				5	250	
54	-2,4 TRP				"	"	

elementOne **MERCURY BATCH DIGESTION - RUN WORKSHEET**

Date Prepared/Digested: 10.1.13 Prep By: JWL/LAL SIF File #: 100213-1
Block #1 Temperature: 96.67 Start Time: 5:55 Machine ID: #3
Block #2 Temperature: 93 33 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
1	Lab BLK (3/ batch)	0		40	40	Standard #1 (for working std) Lot #: 1316504
2	0.004 ug	0.01ml		40	40	Working Standard
3	0.04 ug	0.10ml		40	40	Lot #: 093013-1 by: JWL
4	0.08 ug	0.20ml		40	40	Standard #2 (QC #2):
5	0.16 ug	0.40ml		40	40	Lot #: 093013-2
6	0.20ug	0.50ml		40	40	Standard #3 (QC #3):
						Lot #: 093013-3
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: Date: Time:
Final QC Review By: DBL Date: 10/2/13 Time: 1232
Comments:

A/S	LAB #	Client	Wt/FV	Ali Used	ml used	Sample Vol, ml	Spike µg
9	21203-25.1				10	500	
10	-26.1				↓	↓	
11	-26.1 Dup						
12	-27.1						
13	-28.1						
14	-28.1 L				↓	↓	
15	21203-25.2				20	200	
16	26.2				↓	200	
17	26.2D					↓	
18	-27.2					300	
19	-28.2				↓	200	

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 # 52151 HNO_3 Lot # 53097 HCl Lot #: 4112070

Persulfate Lot # 091813-3 $KMnO_4$ Lot # 071513-6 Hydrox Lot#: 091813-5

Clear samples after digestion with 3.2ml of Hydroxylamine solution.

elementOne **MERCURY BATCH DIGESTION - RUN WORKSHEET**

SIF File #: _____

A/S	LAB #	Client	Wt/FV	Ali Used	ml used	Sample Vol. ml	Spike µg
20	21203-28.2H				20	200	
21	21203-25.3				10	700	
22	-26.3					700	
23	-26.3Trip					↓	
24	-27.3					600	
25	-28.3					600	
26	-28.3+				↓	↓	
27	21203-25.4				20	250	
28	-26.4						
29	-26.4trip						
30	-27.4						
31	-28.4						
32	-28.4+				↓	↓	
33	21203-25.5				20	600	
34	-26.5					600	
35	-26.5trip					↓	
36	-27.5					600	
37	-28.5					700	
38	-28.5+				↓	↓	
39	21200-3BH				.5	490	
40	-3BH+				↓	↓	
41	21192-LRBFH				4	100	
42	-LRBFH+				1.6	↓	
43	21230-1C				4	400	
44	-2C						
45	-2CD						
46	-3C						
47	-3C+						
48	-4C						
49	-5C						
50	-6C					↓	
51	21230-1BH					760	
52	-2BH					870	
53	-2BHD					↓	
54	-3BH				↓	825	

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elementOne **MERCURY BATCH DIGESTION - RUN WORKSHEET**

SIF File #: _____

A/S	LAB #	Client	Wt/FV	Ali Used	ml used	Sample Vol, ml	Spike µg
55	21230 30H+				4	985	
56	- 40H				↓	910	
57	-50H				↓	310	
58	- 60H				↓	200	
59	21232/33/34 BLK				20	1	
60	BLK +				↓	↓	
61	21232				↓	↓	
62	- Dup				↓	↓	
63	21233				↓	↓	
64	- SPK				↓	↓	
65	21234				↓	↓	
66	20151-3 DC				1	10	
67	LCS QC				1	1	
68							
69							
70							
71							
72							
73							
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89							

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elementOne **MERCURY BATCH DIGESTION - RUN WORKSHEET**

Date Prepared/Digested: 10 3 13 Prep By: JWL SIF File #: 100413-1
Block #1 Temperature: — Start Time: 5:55 Machine ID: #1
Block #2 Temperature: — 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
1	Lab BLK (3/ batch)	0		40	40	Standard #1 (for working std) Lot #: 1316504
2	0.004 ug	0.01ml		40	40	Working Standard
3	0.04 ug	0.10ml		40	40	Lot #: 093013-1 by: JWL
4	0.08 ug	0.20ml		40	40	Standard #2 (QC #2):
5	0.16 ug	0.40ml		40	40	Lot #: 093013-2
6	0.20ug	0.50ml		40	40	Standard #3 (QC #3):
						Lot #: 093013-3
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/LAL Date: 10-9-13 Time: 11:45
Final QC Review By: LLS Date: 10.11.13 Time: 1340
Comments: ~~20223~~ 21223 - 1DC @ 8mL 21233 (TOTALS) CRBT@ .2mL
(21223) ; Suttern States Typed as 20223 on Run

A/S	LAB #	Client	Wt/FV	Ali Used	ml used	Sample Vol, ml	Spike µg
9	21200-URBFH				4	100	
10	-URBFH	+			1.6	↓	
11	21244				10	1	
12	-SPK				↓	↓	
13	21200-URBH				1	440	
14	-URBH+				↓	↓	
15	21230-URBFH				4	100	
16	-URBFH	+			1.6	↓	
17	-1FH				4	|	
18	-2FH				|	|	
19	-2FHD				↓	↓	

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 # 52151 HNO_3 Lot # 530419 HCl Lot #: 41120716

Persulfate Lot # 091513-3 $KMnO_4$ Lot # 071513-6 Hydrox Lot#: 091113-5

Clear samples after digestion with 3.2ml of Hydroxylamine solution.

elementOne **MERCURY BATCH DIGESTION - RUN WORKSHEET**

SIF File #: 100413-1

A/S	LAB #	Client	Wt/FV	Ali Used	ml used	Sample Vol, ml	Spike µg
✓ 20	21230-3FH				4	100	
21	-3FH +				↓	↓	
22	-4FH						
23	-5FH						
24	-6FH				↓	↓	
✓ 25	21231-1RBFH				4	100	
26	-1RBFH +				1.6	↓	
27	-1FH				4		
28	-2FH				↓		
29	-2FHD						
30	-3FH						
31	-3FH +						
32	-4FH				↓	↓	
33	21231-1A				4	200	
34	-2A				↓	↓	
35	-2AD						
36	-3A						
37	-3A +						
38	-4A				↓	↓	
39	21231-1BH				4	970	
40	-2BH				↓	910	
41	-2BHD					↓	
42	-3BH					760	
43	-3BH +					↓	
44	-4BH				↓	200	
45	21231-1B				4	500	
46	-2B				↓	↓	
47	-2BD						
48	-3B						
49	-3B+						
50	-4B				↓	↓	
51	20139-3QC				.1	10	
52	L/L QC				1	1	
✓ 53	21223-1		10.0 g/100	8	.8015	1	
54	-1D		↓	↓	↓	↓	

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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	10/1/2013	11:08:31	0.0005698			µg			0.0005698					
STD1=.004ug	10/1/2013	11:09:46	0.0009659			µg			0.0009659					
STD2=.04ug	10/1/2013	11:11:03	0.0097989			µg			0.0097989					
STD3=.08ug	10/1/2013	11:12:19	0.0200178			µg			0.0200178					
STD4=.16ug	10/1/2013	11:13:37	0.0386912			µg			0.0386912					
STD5=.2ug	10/1/2013	11:14:56	0.0503652			µg			0.0503652					
Reagent Blank	10/1/2013	11:16:44	-0.0000907	-0.0003655	-0.0003655	µg			-0.0000828	-0.0003338	-0.0003338	-0.0000985	-0.0003971	-0.0003971
0.004ug = DL	10/1/2013	11:17:58	0.0010958	0.004416	0.004416	µg			0.0010958	0.004416	0.004416			
0.080ug = STD.2	10/1/2013	11:19:16	0.0196847	0.0793277	0.0793277	µg			0.0196847	0.0793277	0.0793277			
0.080ug = QC STD 3	10/1/2013	11:20:36	0.0206123	0.0830659	0.0830659	µg			0.0206123	0.0830659	0.0830659			
REAGENT BLANK	10/1/2013	11:21:52	-0.0000178	-0.000072	-0.000072	µg			-0.0000178	-0.000072	-0.000072			
21230-1A	10/1/2013	11:23:39	0.0002144	0.000864	0.0431975	µg	4	200	0.0002568	0.0010351	0.0517526	0.0001719	0.0006928	0.0346425
21230-2A	10/1/2013	11:25:24	0.0003254	0.0013112	0.0655584	µg	4	200	0.000348	0.0014025	0.0701252	0.0003027	0.0012198	0.0609915
21230-2A DUP	10/1/2013	11:27:10	0.0002123	0.0008554	0.0427693	µg	4	200	0.0001919	0.0007735	0.0386738	0.0002326	0.0009373	0.0468648
21230-3A	10/1/2013	11:28:57	0.0001396	0.0005626	0.0281305	µg	4	200	0.0001431	0.0005766	0.0288291	0.0001361	0.0005486	0.0274318
21230-3A SPK	10/1/2013	11:30:45	0.0198426	0.0799642	3.9982121	µg	4	200	0.0199285	0.0803104	4.0155183	0.0197568	0.0796181	3.980906
21230-4A	10/1/2013	11:32:33	0.0004172	0.0016815	0.0840731	µg	4	200	0.000391	0.0015755	0.0787762	0.0004435	0.0017874	0.0893701
21230-5A	10/1/2013	11:34:22	0.0002425	0.0009774	0.0488699	µg	4	200	0.0001998	0.0008052	0.0402589	0.0002853	0.0011496	0.057481
21230-6A	10/1/2013	11:36:10	-0.0000108	-0.0000438	-0.0021922	µg	4	200	3.183E-05	0.0001283	0.0064156	-0.0000535	-0.000216	-0.0108
21230-1B	10/1/2013	11:38:01	0.0006203	0.0024998	0.3124715	µg	4	500	0.0006335	0.002553	0.3191203	0.0006071	0.0024466	0.3058227
21230-2B	10/1/2013	11:39:51	0.0008641	0.0034822	0.4352797	µg	4	500	0.0008613	0.003471	0.4338791	0.0008669	0.0034934	0.4366802
0.004ug = DL	10/1/2013	11:43:35	0.0010616	0.0042781	0.0042781	µg	4	500	0.0010616	0.0042781	0.0042781			
0.080ug = STD.2	10/1/2013	11:44:53	0.0188962	0.07615	0.07615	µg	4	500	0.0188962	0.07615	0.07615			
REAGENT BLANK	10/1/2013	11:46:10	-0.0000431	-0.0001736	-0.0001736	µg	4	500	-0.0000431	-0.0001736	-0.0001736			
21230-2B DUP	10/1/2013	11:47:57	0.0007877	0.0031744	0.3967956	µg	4	500	0.0007909	0.0031873	0.3984119	0.0007845	0.0031614	0.3951794
21230-3B	10/1/2013	11:49:48	0.0007607	0.0030657	0.3832099	µg	4	500	0.0007914	0.0031894	0.3986746	0.00073	0.002942	0.3677453
21230-3B SPK	10/1/2013	11:51:39	0.0175955	0.0709086	8.8635724	µg	4	500	0.0175981	0.0709187	8.86484	0.017593	0.0708984	8.8623047
21230-4B	10/1/2013	11:53:27	0.0008451	0.0034056	0.425701	µg	4	500	0.0007811	0.0031479	0.3934867	0.000909	0.0036633	0.4579152
21230-5B	10/1/2013	11:55:12	0.0002598	0.001047	0.1308708	µg	4	500	0.0001933	0.0007791	0.0973843	0.0003263	0.0013149	0.1643572
Reagent Blank	10/1/2013	11:58:35	-0.0000357	-0.0001442	-0.0001442	µg	4	500	-0.0000288	-0.0001163	-0.0001163	-0.0000426	-0.000172	-0.000172
0.004ug = DL	10/1/2013	12:02:17	0.0010225	0.0041208	0.0041208	µg	4	500	0.0010225	0.0041208	0.0041208			
0.080ug = STD.2	10/1/2013	12:03:35	0.0194032	0.0781932	0.0781932	µg	4	500	0.0194032	0.0781932	0.0781932			
0.080ug = QC STD 3	10/1/2013	12:04:54	0.0204805	0.0825349	0.0825349	µg	4	500	0.0204805	0.0825349	0.0825349			
REAGENT BLANK	10/1/2013	12:06:11	-0.0001107	-0.0004465	-0.0004465	µg	4	500	-0.0001107	-0.0004465	-0.0004465			
21230-6B	10/1/2013	12:07:56	0.0003007	0.0012118	0.1514733	µg	4	500	0.0003301	0.0013303	0.1662869	0.0002713	0.0010933	0.1366596
0.004ug = DL	10/1/2013	12:25:20	0.0010796	0.0043507	0.0043507	µg	4	100	0.0010796	0.0043507	0.0043507			
0.080ug = STD.2	10/1/2013	12:26:37	0.0194307	0.0783043	0.0783043	µg	4	100	0.0194307	0.0783043	0.0783043			
REAGENT BLANK	10/1/2013	12:27:53	3.998E-05	0.0001611	0.0001611	µg	4	100	3.998E-05	0.0001611	0.0001611			
Calib Blank	10/2/2013	9:17:30	0.000151			µg			0.000151					
STD1=.004ug	10/2/2013	9:18:45	0.0010229			µg			0.0010229					
STD2=.04ug	10/2/2013	9:20:00	0.0097008			µg			0.0097008					
STD3=.08ug	10/2/2013	9:21:18	0.0206059			µg			0.0206059					
STD4=.16ug	10/2/2013	9:22:36	0.0408727			µg			0.0408727					
STD5=.2ug	10/2/2013	9:23:55	0.0498901			µg			0.0498901					
Reagent Blank	10/2/2013	9:25:43	-0.0000595	-0.000236	-0.000236	µg			-0.0000691	-0.0002743	-0.0002743	-0.0000498	-0.0001977	-0.0001977
0.004ug = DL	10/2/2013	9:26:57	0.0009176	0.003639	0.003639	µg			0.0009176	0.003639	0.003639			
0.080ug = STD.2	10/2/2013	9:28:15	0.0199769	0.0792281	0.0792281	µg			0.0199769	0.0792281	0.0792281			
REAGENT BLANK	10/2/2013	9:29:32	-0.0000864	-0.0003426	-0.0003426	µg			-0.0000864	-0.0003426	-0.0003426			
0.080ug = STD.2	10/2/2013	9:30:48	0.0203091	0.0805456	0.0805456	µg			0.0203091	0.0805456	0.0805456			
0.080ug = QC STD 3	10/2/2013	9:32:07	0.0210825	0.0836128	0.0836128	µg			0.0210825	0.0836128	0.0836128			
REAGENT BLANK	10/2/2013	9:33:24	-0.0000917	-0.0003637	-0.0003637	µg			-0.0000917	-0.0003637	-0.0003637			
0.004ug = DL	10/2/2013	10:36:17	0.0010635	0.0042179	0.0042179	µg	20	700	0.0010635	0.0042179	0.0042179			
0.080ug = STD.2	10/2/2013	10:37:34	0.0201093	0.0797533	0.0797533	µg	20	700	0.0201093	0.0797533	0.0797533			
REAGENT BLANK	10/2/2013	10:38:51	1.84E-06	7.31E-06	7.31E-06	µg	20	700	1.84E-06	7.31E-06	7.31E-06			
21230-1C	10/2/2013	10:47:53	0.0029711	0.0117833	1.1783306	µg	4	400	0.0029593	0.0117363	1.1736342	0.0029829	0.0118303	1.1830269
21230-2C	10/2/2013	10:49:43	0.0062405	0.0247499	2.4749877	µg	4	400	0.0062644	0.0248444	2.4844443	0.0062167	0.0246553	2.465531
21230-2C DUP	10/2/2013	10:51:33	0.0064673	0.0256492	2.5649171	µg	4	400	0.0065056	0.0258012	2.5801166	0.006429	0.0254972	2.5497176
21230-3C	10/2/2013	10:53:23	0.0011738	0.0046553	0.4655315	µg	4	400	0.0011708	0.0046435	0.4643468	0.0011768	0.0046672	0.4667161
21230-3C SPK	10/2/2013	10:55:15	0.0203572	0.0807363	8.073633	µg	4	400	0.0203787	0.0808218	8.0821756	0.0203357	0.0806509	8.0650904
21230-4C	10/2/2013	10:57:03	0.0011661	0.0046247	0.4624662	µg	4	400	0.0011607	0.0046034	0.4603424	0.0011714	0.0046459	0.46459
0.004ug = DL	10/2/2013	10:58:17	0.0010209	0.0040489	0.0040489	µg	4	400	0.0010209	0.0040489	0.0040489			
0.080ug = STD.2	10/2/2013	10:59:33	0.0201089	0.0797514	0.0797514	µg	4	400	0.0201089	0.0797514	0.0797514			
REAGENT BLANK	10/2/2013	11:00:50	-0.0000006	-0.0000025	-0.0000025	µg	4	400	-0.0000006	-0.0000025	-0.0000025			
21230-5C	10/2/2013	11:02:36	9.052E-05	0.000359	0.0359021	µg	4	400	8.687E-05	0.0003446	0.0344551	9.417E-05	0.0003735	0.0373491
21230-6C	10/2/2013	11:04:20	7.138E-05	0.0002831	0.0283123	µg	4	400	7.646E-05	0.0003033	0.0303256	6.631E-05	0.000263	0.0262989
21230-1BH	10/2/2013	11:06:06	0.0139686	0.0553994	11.910873	µg	4	860	0.0140221	0.0556114	11.95645	0.0139152	0.0551874	11.865296
21230-2BH	10/2/2013	11:07:51	0.0239623	0.0950343	21.145123	µg	4	890	0.0239754	0.0950862	21.156681	0.0239492	0.0949823	21.133565
21230-2BH DUP	10/2/2013	11:09:37	0.025635	0.101668	22.621129	µg	4	890	0.0255679	0.1014018	22.561907	0.0257021	0.1019342	22.680351
21230-3BH	10/2/2013	11:11:25	0.0137457	0.0545152	12.061484	µg	4	885	0.0137689	0.0546074	12.081878	0.0137224	0.054423	12.04109
21230-3BH SPK	10/2/2013	11:13:12	0.0335739	0.1331537	29.460248	µg	4	885	0.0336176	0.1333267	29.498538	0.0335303	0.1329806	29.421959
21230-4BH	10/2/2013	11:15:00	0.0118054	0.04682	10.651551	µg	4	910	0.0117543	0.0466174	10.605454	0.0118565	0.0470226	10.697648
21230-5BH	10/2/2013	11:16:48	0.0001496	0.0005935	0.0459955	µg	4	310	0.0001518	0.0006021	0.0466604	0.0001475	0.0005849	0.0453305
21230-6BH	10/2/2013	11:18:35	0.0000708	0.0002808	0.0140401	µg	4	200	8.021E-05	0.0003181	0.0159057	6.139E-05	0.0002435	0.01217
0.004ug = DL	10/2/2013	11:19:50	0.0010106	0.004008	0.004008	µg	4	200	0.0010106	0.004008	0.004008			
0.080ug = STD.2	10/2/2013	11:21:08	0.0201371	0.0798635	0.0798635	µg	4	200	0.0201371	0.0798635	0.0798635			
REAGENT BLANK	10/2/2013	11:22:24	-0.0000045	-0.000018	-0.000018	µg	4	200	-0.0000045	-0.000018	-0.000018			

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	10/4/2013	9:20:52	0.0001124			µg	4	100	0.0001124					
STD1=.004ug	10/4/2013	9:22:06	0.0010786			µg	4	100	0.0010786					
STD2=.04ug	10/4/2013	9:23:22	0.0108475			µg	4	100	0.0108475					
STD3=.08ug	10/4/2013	9:24:38	0.02164			µg	4	100	0.02164					
STD4=.16ug	10/4/2013	9:25:55	0.0429366			µg	4	100	0.0429366					
STD5=.2ug	10/4/2013	9:27:13	0.0537432			µg	4	100	0.0537432					
Reagent Blank	10/4/2013	9:28:59	3.172E-05	0.000118	0.000118	µg	4	100	4.375E-05	0.0001628	0.0001628	1.969E-05	7.328E-05	7.328E-05
0.004ug = DL	10/4/2013	9:30:12	0.0010636	0.0039567	0.0039567	µg	4	100	0.0010636	0.0039567	0.0039567			
0.080ug = STD.2	10/4/2013	9:31:27	0.0213559	0.0794487	0.0794487	µg	4	100	0.0213559	0.0794487	0.0794487			
REAGENT BLANK	10/4/2013	9:32:43	0.0002499	0.0009298	0.0009298	µg	4	100	0.0002499	0.0009298	0.0009298			
0.080ug = STD.2	10/4/2013	9:33:59	0.0212713	0.0791342	0.0791342	µg	4	100	0.0212713	0.0791342	0.0791342			
REAGENT BLANK	10/4/2013	9:35:15	0.0002386	0.0008878	0.0008878	µg	4	100	0.0002386	0.0008878	0.0008878			
21230-LRB FH	10/4/2013	9:47:39	3.523E-05	0.0001311	0.0032773	µg	4	100	2.688E-05	0.0001	0.0025008	4.358E-05	0.0001622	0.0040538
21230-LRB FH SPK	10/4/2013	9:49:29	0.0170829	0.0635522	3.9720117	µg	1.6	100	0.0171776	0.0639046	3.9940396	0.0169881	0.0631997	3.9499838
21230-1 FH	10/4/2013	9:51:15	0.001445	0.0053757	0.1343926	µg	4	100	0.0014654	0.0054518	0.1362941	0.0014245	0.0052996	0.132491
21230-2 FH	10/4/2013	9:52:58	0.0013352	0.0049673	0.1241821	µg	4	100	0.001319	0.0049072	0.1226789	0.0013514	0.0050274	0.1256853
0.004ug = DL	10/4/2013	9:54:11	0.0010737	0.0039943	0.0039943	µg	4	100	0.0010737	0.0039943	0.0039943			
0.080ug = STD.2	10/4/2013	9:55:27	0.0205922	0.0766077	0.0766077	µg	4	100	0.0205922	0.0766077	0.0766077			
REAGENT BLANK	10/4/2013	9:56:43	0.0002312	0.0008601	0.0008601	µg	4	100	0.0002312	0.0008601	0.0008601			
21230-2 FH DUP	10/4/2013	9:58:27	0.0015139	0.0056319	0.1407967	µg	4	100	0.0015258	0.0056761	0.1419035	0.0015019	0.0055876	0.1396898
21230-3 FH	10/4/2013	10:00:11	0.0012363	0.0045995	0.1149866	µg	4	100	0.0012585	0.0046818	0.1170444	0.0012142	0.0045172	0.1129289
21230-3FH SPK	10/4/2013	10:01:55	0.0229057	0.0852143	2.1303583	µg	4	100	0.0230451	0.0857329	2.1433215	0.0227663	0.0846958	2.1173951
21230-4FH	10/4/2013	10:03:41	0.0008588	0.0031948	0.0798697	µg	4	100	0.0008646	0.0032163	0.0804081	0.000853	0.0031733	0.0793313
21230-5FH	10/4/2013	10:05:27	1.699E-05	6.323E-05	0.0015808	µg	4	100	1.215E-05	4.523E-05	0.0011308	2.183E-05	8.123E-05	0.0020309
21230-6FH	10/4/2013	10:07:13	5.324E-05	0.0001981	0.0049519	µg	4	100	4.895E-05	0.0001821	0.004553	5.753E-05	0.000214	0.0053508
0.004ug = DL	10/4/2013	10:15:36	0.0010451	0.0038879	0.0038879	µg	4	100	0.0010451	0.0038879	0.0038879			
0.080ug = STD.2	10/4/2013	10:16:52	0.0206102	0.0766746	0.0766746	µg	4	100	0.0206102	0.0766746	0.0766746			
REAGENT BLANK	10/4/2013	10:18:08	0.0002698	0.0010038	0.0010038	µg	4	100	0.0002698	0.0010038	0.0010038			

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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: SOJ

Date: 10/23

CleanAir.

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Wheelabrator
NORTH BROWARD
Emission Test Log

Date: 09/25/13
Start Time: 10:06
End Time: 12:27

	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		487.40	279.30	47.28	35.46	11.82	23.65	263.56	6.41	-10.65
Unit 2	29 run 1	493.63	280.33	47.22	35.89	11.32	23.64	258.57	6.60	1.61
Unit 3		86.83	88.69	0.07	0.01	0.06	90.00	92.00	0.77	1.41

	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	173.27	875.96	829.06	85.16	-0.10	235.99	1072.60	4.49	175.34
Unit 2	190.66	878.20	834.50	89.27	-0.10	246.62	1223.94	6.97	180.48
Unit 3	0.00	4.45	496.87	0.43	-0.02	92.27	86.82	0.00	0.00

U1 lime (#/hr)	639.28	
U2 lime (#/hr)	612.40	
U3 lime (#/hr)	3.21	
Specific Gravity	1.086	
Round Down	1.080	0.833
Round Up	1.090	0.941

Wheelabrator
NORTH BROWARD
Emission Test Log

Date: 09/25/13
Start Time: 12:45
End Time: 15:14

	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		483.00	280.11	43.95	33.03	10.92	24.70	264.04	6.50	-10.70
Unit 2	29 run 2	500.80	283.40	49.44	38.47	10.97	21.97	259.92	6.72	1.61
Unit 3		86.58	88.26	0.08	0.01	0.07	90.00	91.45	0.75	1.42

	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	173.01	875.70	829.12	80.68	-0.10	235.87	1069.83	4.47	175.00
Unit 2	189.31	877.62	827.14	91.29	-0.10	246.44	1196.65	10.11	179.78
Unit 3	0.00	4.47	496.87	0.43	-0.01	91.35	86.58	0.00	0.00

U1 lime (#/hr)	603.14	
U2 lime (#/hr)	605.69	
U3 lime (#/hr)	3.95	
Specific Gravity	1.088	
Round Down	1.080	0.833
Round Up	1.090	0.941

Wheelabrator
NORTH BROWARD
Emission Test Log

Date: 09/26/13
Start Time: 7:41
End Time: 9:58

	Test	SDA INLET TEMP	SDA OUTLET TEMP	TOTAL SLURRY FL	DIL WATER FLOW	TOTAL LIME	LIME CONC	FF OUT TEMP	FF DP	ID INLET PRESS
		DEG F	DEG F	GPM	GPM	GPM	%	DEG F	" H2O	" H2O
Unit 1		486.47	293.16	44.12	33.02	11.10	25.21	275.65	6.27	-10.60
Unit 2	29 run 3	499.87	292.05	45.28	34.09	11.19	24.57	256.75	6.74	1.61
Unit 3		88.60	89.66	0.20	0.01	0.19	90.00	93.21	0.79	1.42

	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	172.18	875.81	832.17	87.52	-0.10	235.85	1070.98	5.55	173.87
Unit 2	192.51	878.53	826.55	86.90	-0.09	246.54	1200.96	7.36	183.05
Unit 3	0.00	4.45	496.87	0.43	-0.01	90.22	88.32	0.00	0.00

U1 lime (#/hr)	603.56	
U2 lime (#/hr)	608.42	
U3 lime (#/hr)	10.42	
Specific Gravity	1.087	
Round Down	1.080	0.833
Round Up	1.090	0.941

Wheelabrator
NORTH BROWARD
Emission Test Log

Date: 09/26/13
Start Time: 10:18
End Time: 12:40

	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		483.93	292.07	41.24	29.92	11.33	27.68	273.73	6.37	-10.35
Unit 2	29 run 4	507.42	292.19	48.13	36.64	11.49	23.69	270.91	6.73	1.61
Unit 3		88.52	90.02	0.10	0.04	0.06	90.00	93.72	0.79	1.41

	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	173.44	876.36	831.67	82.27	-0.10	236.72	1077.60	5.97	174.94
Unit 2	194.47	879.31	830.78	89.14	-0.10	247.28	1229.20	11.39	184.05
Unit 3	0.00	4.46	496.87	0.45	-0.03	90.09	88.18	0.00	0.00

U1 lime (#/hr)	602.15	
U2 lime (#/hr)	610.91	
U3 lime (#/hr)	3.06	
Specific Gravity	1.085	
Round Down	1.080	0.833
Round Up	1.090	0.941