

**Results of the September 6-7, 2017 Baseline Mercury  
Emissions Tests Performed at Hibbing Taconite  
Company's Taconite Processing Facility Located in  
Hibbing, Minnesota**

Pellet Indurating Furnace Line 2

SV025-SV028, EU021  
(STRU032-STRU035)

***Agency Interest ID: 1146***

***Air Emissions Permit No. 13700061-007***

***Barr Project No. 23691428.72***

Prepared for  
Hibbing Taconite Company  
Hibbing, Minnesota

April 2018



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## Report Certification

### Certification of Sampling Procedures:

I certify under penalty of law that the sampling procedures were performed in accordance with the approved test plan and that the data presented in this test report are, to the best of my knowledge and belief, true, accurate, and complete. All exceptions are listed and explained below.



Thomas Leier  
Senior Air Quality Technician  
Barr Engineering Co.

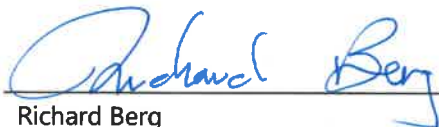


Date

### Certification of Analytical Procedures:

I certify under penalty of law that the analytical procedures were performed in accordance with the requirements of the test methods and that the data presented for use in the test report were, to the best of my knowledge and belief, true, accurate, and complete. All exceptions are listed and explained below.

1. Element One, Inc. performed analysis for mercury using ASTM D6784-16 Ontario Hydro method.



Richard Berg  
Senior Air Quality Technician  
Barr Engineering Co.



Date

### Certification of Test Report by Testing Company:

I certify under penalty of law that this test report and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the test information submitted. Based on my inquiry of the person or persons who performed sampling and analysis relating to the performance test, the information submitted in this test report is, to the best of my knowledge and belief, true, accurate, and complete. All exceptions are listed and explained below.



Tom Kuchinski  
Stack Testing Services Coordinator  
Barr Engineering Company



Date

**Certification of Test Report by Owner or Operator of Emission Facility:**

I certify under penalty of law that the information submitted in this test report accurately reflects the operating conditions at the emission facility during this performance test and describes the date and nature of all operational and maintenance activities that were performed on the process and control equipment during the month prior to the performance test. Based on my inquiry of the person or persons who performed the operational and maintenance activities, the information submitted in this test report is, to the best of my knowledge and belief, true, accurate, and complete. All exceptions are listed and explained below.

*Julie C. Lucas*

Julie Lucas  
Area Manager - Environmental  
Hibbing Taconite Co.

*3/5/2018*

Date

## Executive Summary

Barr Engineering Company performed mercury emissions tests on September 6-7, 2017 at the Hibbing Taconite Company's taconite facility located in Hibbing, Minnesota. Emissions tests were performed on the Pellet Indurating Furnace Line 2 (EU021) stacks (SV025-SV028) to measure speciated and total mercury emissions from each stack using the ASTM D6784-16 Ontario Hydro test method. The results will be used to establish baseline mercury emissions data.

Stack vent identification numbers, emission unit identification numbers and test results are presented in Tables ES-1.

**Table ES-1      Executive Summary Table**

Average Test Results – Baseline Testing				
Test Parameter ASTM D6784-16 Ontario Hydro	Pellet Indurating Furnace Line 2			
Air Emissions Permit Group	GP003			
Stack Vent Number	SV025	SV026	SV027	SV028
Emission Unit	EU021			
Test Date	9/7/2017	9/7/2017	9/6/2017	9/6/2017
<b>Mercury Concentrations, µg/dscm</b>				
Particulate Hg	0.029	0.022	0.016	0.013
Oxidized Hg	0.71	0.61	0.40	0.28
Elemental Hg	6.3	5.0	2.6	1.3
Total Mercury	7.1	5.6	3.0	1.5
<b>Mercury Emission Rate, lb/hr</b>				
Particulate Hg	$1.6 \times 10^{-5}$	$1.3 \times 10^{-5}$	$9.8 \times 10^{-6}$	$8.3 \times 10^{-6}$
Oxidized Hg	$3.9 \times 10^{-4}$	$3.6 \times 10^{-4}$	$2.5 \times 10^{-4}$	$1.8 \times 10^{-4}$
Elemental Hg	$3.5 \times 10^{-3}$	$3.0 \times 10^{-3}$	$1.6 \times 10^{-3}$	$8.3 \times 10^{-4}$
Total Mercury	$3.9 \times 10^{-3}$	$3.4 \times 10^{-3}$	$1.9 \times 10^{-3}$	$1.0 \times 10^{-3}$
Estimated Annual Mercury Emissions, lb/yr <sup>1</sup>	34.2	29.4	16.6	8.9

<sup>1</sup> Annual emissions calculated assuming 8760 operating hours per year

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## 1.0 Introduction

Barr Engineering Company performed mercury emissions tests on September 6-7, 2017 at the Hibbing Taconite Company's taconite processing facility located in Hibbing, Minnesota. Emissions tests were performed on the Pellet Indurating Furnace Line 2 (EU021) stacks (SV025-SV028) to measure speciated and total mercury emissions from each stack using the ASTM D6784-16 Ontario Hydro test method. The results will be used to establish baseline mercury emissions data.

Tom Leier led the Barr test teams. Corie Ekholm of Hibbing Taconite Company provided the coordination of the test team with facility operations. A list of project participants is provided in Appendix F.

Each test consisted of three 120-minute test runs to measure speciated and total mercury emissions. ASTM D6784-16 Ontario Hydro method was used to determine all mercury emissions. Simultaneous tests were performed September 6, 2017 on the Pellet Indurating Furnace Line 2 stacks SV027 and SV028; and September 7, 2017 on SV025 and SV026.



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## 2.0 Results

Mercury results are presented in micrograms per dry standard cubic meter ( $\mu\text{g}/\text{dscm}$ ), pounds per hour ( $\text{lb}/\text{hr}$ ), and pounds per year ( $\text{lb}/\text{yr}$ ).

### 2.1 Pellet Indurating Furnace Line 2 (SV025-SV028)

Results of the September 6-7, 2017 mercury emissions tests for SV025, SV026, SV027 and SV028 are provided in Tables 1-4, respectively.

During run one at SV025 and SV026 on September 7, 2017, testing was paused from 0820-0922 due to process difficulties. No other test abnormalities or process delays were experienced for Pellet Indurating Furnace Line 2.

All sources were operating at normal conditions for this test series. Process data collected during the testing is provided in Appendix E.

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## 3.0 Process Description

Hibbing Taconite Company (HTC) mines iron ore (magnetite) and produces taconite pellets that are shipped to steel producers for processing in blast furnaces.

The Pellet Indurating Furnace Line 2 (EU021) is a straight grate induration furnace with four emission points; SV025, SV026, SV027 and SV028. Particulate emissions are controlled prior to each exhaust stack by a venturi rod deck wet scrubber. Prior to the scrubber, windbox exhaust air is pretreated to remove the coarse particulate matter by a multiclone.

Operating parameters for the process and control devices are provided in Appendix E.

## 4.0 Stack Testing Procedures and Methods

The testing was performed from ports meeting U.S. EPA Method 1 criteria. The U.S. EPA Method 1 criteria data are listed in Table 4-1. Sample port locations and traverse point details are provided in Figures 1-2.

Table 4-1 EPA Method 1 Criteria

Source/Emissions Unit (Plant or process descriptor)	Distance to Upstream Disturbances from Sample Site (In Diameters)	Distance to Downstream Disturbances from Sample Site (In Diameters)	Number of Ports	Number of Points
Pellet Indurating Furnace Line 2 (SV025-SV028)	8.6	1.8	2	12

Volumetric airflow determinations were performed in accordance with U.S. EPA Method 2 using an S type pitot tube. Airflows were determined in conjunction with the ASTM D6784-16 Ontario Hydro tests.

Stack gas oxygen and carbon dioxide compositions were determined using modified U.S. EPA Method 3A in conjunction with the ASTM D6784-16 Ontario Hydro method. An integrated sample of dry stack gas was collected in a Tedlar bag during each test run. The stack gas was analyzed for oxygen and carbon dioxide concentrations using a Servomex Model 1440 analyzer calibrated with EPA protocol gases. Instrument analysis data and calibrations are located in Appendix B. Calibration gas certifications are located in Appendix D.

Stack gas moisture content determinations were performed in accordance with U.S. EPA Method 4, in conjunction with the ASTM D6784-16 Ontario Hydro tests.

Mercury concentrations and emission rates were determined in accordance with ASTM D6784-16 Ontario Hydro. All glassware and reagent preparation was conducted in accordance with the standard and completed by Barr. Potassium permanganate sample reagents were prepared on-site daily. For each test, the samples were recovered in the controlled environment of Barr Engineering Co.'s mobile laboratory. The samples were analyzed by Element One of Wilmington, North Carolina. Element One's certified laboratory report and complete sample chain of custody is located in Appendix C.

The test methods referenced above are found in 40 CFR Part 60, Appendix A and ASTM.

## Tables

**TABLE 1**

**MERCURY TEST RESULTS**

Pellet Indurating Furnace Line 2 - Stack 4 (SV025)  
Baseline

Parameter	Run 1	Run 2	Run 3	Average
Scrubber - Pressure Drop, in. H <sub>2</sub> O	4.0	4.0	4.0	4.0
Scrubber - Water Flow Rate, gpm	434	434	434	434
Test Date	9/7/2017	9/7/2017	9/7/2017	---
Test Period	717 - 1022	1051 - 1255	1326 - 1530	---
Test Duration, min.	120	120	120	120
Avg. Stack Temperature, °F	147	147	147	147
Avg. Moisture Content, %V/V	9.4	10.1	10.3	9.9
Ontario Hydro Mercury Results, µg				
Probe Rinse (0.1 N HNO <sub>3</sub> )	0.023	0.016	0.017	0.019
Filter	0.051	0.034	0.037	0.041
Oxydized Mercury (KCl)	1.41	1.35	1.57	1.44
Elemental Mercury (HNO <sub>3</sub> /H <sub>2</sub> O <sub>2</sub> )	0.074	0.041	0.055	0.056
Elemental Mercury (KMnO <sub>4</sub> )	12.9	12.8	12.4	12.7
Total Mercury	14.5	14.2	14.1	14.3
Air Flow Rate				
acfm	200,000	200,000	200,000	200,000
scfm	164,000	164,000	164,000	164,000
dscfm	149,000	148,000	147,000	148,000
Sample Volume				
acf	75.76	76.07	76.14	75.99
dscf	71.71	71.40	70.97	71.36
dscm	2.03	2.02	2.01	2.02
Isokinetic Variation, %	96.8	96.9	97.0	96.9
Mercury Concentrations, µg/dscm				
Particulate Hg	0.036	0.025	0.027	0.029
Oxidized Hg	0.69	0.67	0.78	0.71
Elemental Hg	6.4	6.3	6.2	6.3
Total Mercury	7.1	7.0	7.0	7.1
Mercury Emission Rate, lb/hr				
Particulate Hg	2.0E-05	1.4E-05	1.5E-05	1.6E-05
Oxidized Hg	3.9E-04	3.7E-04	4.3E-04	3.9E-04
Elemental Hg	3.6E-03	3.5E-03	3.4E-03	3.5E-03
Total Mercury	4.0E-03	3.9E-03	3.9E-03	3.9E-03
Process Data				
Fired Pellets, dry short tons/hr	418	441	442	434
Natural Gas Usage, MCF/hr	82	81	82	82
Estimated Annual Mercury Emissions, lb/yr*				
	35	34	34	34
Total Mercury Emission Factor, lb/dry short ton	9.5E-06	8.8E-06	8.7E-06	9.0E-06

\*8760 hours of operation assumed

**TABLE 2**

**MERCURY TEST RESULTS**

Pellet Indurating Furnace Line 2 - Stack 3 (SV026)  
Baseline

Parameter	Run 1	Run 2	Run 3	Average
Scrubber - Pressure Drop, in. H <sub>2</sub> O	5.0	5.0	5.0	5.0
Scrubber - Water Flow Rate, gpm	394	394	394	394
Test Date	9/7/2017	9/7/2017	9/7/2017	---
Test Period	717 - 1022	1051 - 1255	1326 - 1530	---
Test Duration, min.	120	120	120	120
Avg. Stack Temperature, °F	136	136	137	136
Avg. Moisture Content, %V/V	8.7	9.1	8.5	8.7
Ontario Hydro Mercury Results, µg				
Probe Rinse (0.1 N HNO <sub>3</sub> )	0.037	0.031	< 0.010	0.026
Filter	0.028	0.024	0.017	0.023
Oxydized Mercury (KCl)	1.43	1.22	1.32	1.32
Elemental Mercury (HNO <sub>3</sub> /H <sub>2</sub> O <sub>2</sub> )	0.042	0.030	0.028	0.033
Elemental Mercury (KMnO <sub>4</sub> )	10.5	11.1	11.0	10.8
Total Mercury	12.0	12.4	12.3	12.2
Air Flow Rate				
acfm	203,000	218,000	203,000	208,000
scfm	170,000	182,000	169,000	173,667
dscfm	155,000	166,000	155,000	158,667
Sample Volume				
acf	76.52	82.47	76.83	78.61
dscf	74.76	80.40	74.50	76.55
dscm	2.12	2.28	2.11	2.17
Isokinetic Variation, %	96.8	97.4	96.4	96.9
Mercury Concentrations, µg/dscm				
Particulate Hg	0.030	0.024	0.013	0.022
Oxidized Hg	0.68	0.53	0.63	0.61
Elemental Hg	5.0	4.9	5.2	5.0
Total Mercury	5.7	5.4	5.8	5.6
Mercury Emission Rate, lb/hr				
Particulate Hg	1.8E-05	1.5E-05	7.4E-06	1.3E-05
Oxidized Hg	3.9E-04	3.3E-04	3.6E-04	3.6E-04
Elemental Hg	2.9E-03	3.0E-03	3.0E-03	3.0E-03
Total Mercury	3.3E-03	3.4E-03	3.4E-03	3.4E-03
Process Data				
Fired Pellets, dry short tons/hr	418	441	442	434
Natural Gas Usage, MCF/hr	82	81	82	82
Estimated Annual Mercury Emissions, lb/yr*				
	29	30	30	29
Total Mercury Emission Factor, lb/dry short ton	7.9E-06	7.7E-06	7.7E-06	7.7E-06

\*8760 hours of operation assumed

**TABLE 3**

**MERCURY TEST RESULTS**

Pellet Indurating Furnace Line 2 - Stack 2 (SV027)  
Baseline

Parameter	Run 1	Run 2	Run 3	Average
Scrubber - Pressure Drop, in. H <sub>2</sub> O	5.3	5.3	5.3	5.3
Scrubber - Water Flow Rate, gpm	380	380	379	380
Test Date	9/6/2017	9/6/2017	9/6/2017	---
Test Period	732 - 937	1018 - 1224	1300 - 1505	---
Test Duration, min.	120	120	120	120
Avg. Stack Temperature, °F	122	122	123	122
Avg. Moisture Content, %V/V	7.4	7.4	7.4	7.4
Ontario Hydro Mercury Results, µg				
Probe Rinse (0.1 N HNO <sub>3</sub> )	0.019	0.019	0.023	0.020
Filter	0.017	0.015	0.016	0.016
Oxydized Mercury (KCl)	1.07	0.798	0.848	0.905
Elemental Mercury (HNO <sub>3</sub> /H <sub>2</sub> O <sub>2</sub> )	0.121	0.019	0.018	0.052
Elemental Mercury (KMnO <sub>4</sub> )	6.18	5.47	6.04	5.89
Total Mercury	7.40	6.32	6.94	6.89
Air Flow Rate				
acfm	212,000	204,000	214,000	210,000
scfm	182,000	175,000	184,000	180,000
dscfm	168,000	162,000	170,000	167,000
Sample Volume				
acf	85.95	83.65	89.03	86.21
dscf	81.13	77.80	81.38	80.10
dscm	2.30	2.20	2.30	2.27
Isokinetic Variation, %	96.8	96.1	96.0	96.3
Mercury Concentrations, µg/dscm				
Particulate Hg	0.015	0.015	0.016	0.016
Oxidized Hg	0.47	0.36	0.37	0.40
Elemental Hg	2.7	2.5	2.6	2.6
Total Mercury	3.2	2.9	3.0	3.0
Mercury Emission Rate, lb/hr				
Particulate Hg	9.7E-06	9.3E-06	1.1E-05	9.8E-06
Oxidized Hg	2.9E-04	2.2E-04	2.3E-04	2.5E-04
Elemental Hg	1.7E-03	1.5E-03	1.7E-03	1.6E-03
Total Mercury	2.0E-03	1.7E-03	1.9E-03	1.9E-03
Process Data				
Fired Pellets, dry short tons/hr	440	426	432	432
Natural Gas Usage, MCF/hr	82	82	84	83
Estimated Annual Mercury Emissions, lb/yr*				
Total Mercury Emission Factor, lb/dry short ton	4.6E-06	4.1E-06	4.4E-06	4.4E-06

\*8760 hours of operation assumed

**TABLE 4**

**MERCURY TEST RESULTS**

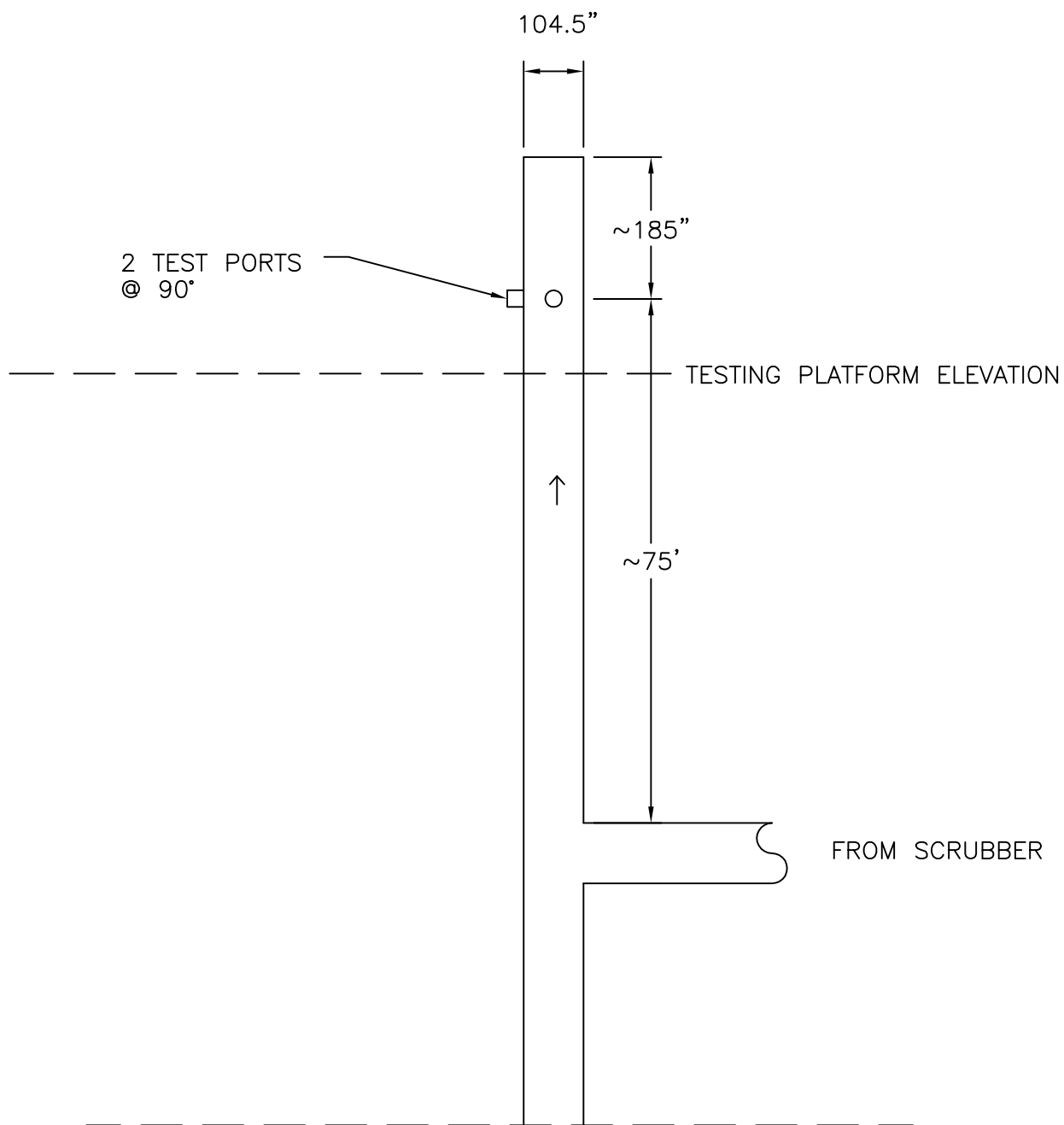
Pellet Indurating Furnace Line 2 - Stack 1 (SV028)  
Baseline

Parameter	Run 1	Run 2	Run 3	Average
Scrubber - Pressure Drop, in. H <sub>2</sub> O	4.3	4.3	4.3	4.3
Scrubber - Water Flow Rate, gpm	528	529	529	529
Test Date	9/6/2017	9/6/2017	9/6/2017	---
Test Period	732 - 937	1018 - 1224	1300 - 1505	---
Test Duration, min.	120	120	120	120
Avg. Stack Temperature, °F	112	110	112	111
Avg. Moisture Content, %V/V	6.6	6.6	6.3	6.5
Ontario Hydro Mercury Results, µg				
Probe Rinse (0.1 N HNO <sub>3</sub> )	0.025	0.020	0.026	0.024
Filter	0.009	< 0.005	0.007	0.007
Oxydized Mercury (KCl)	0.807	0.574	0.605	0.662
Elemental Mercury (HNO <sub>3</sub> /H <sub>2</sub> O <sub>2</sub> )	0.014	< 0.013	0.017	0.015
Elemental Mercury (KMnO <sub>4</sub> )	2.86	3.09	3.07	3.01
Total Mercury	3.71	3.70	3.72	3.71
Air Flow Rate				
acfm	214,000	215,000	216,000	215,000
scfm	187,000	188,000	189,000	188,000
dscfm	175,000	176,000	177,000	176,000
Sample Volume				
acf	88.59	90.30	92.52	90.5
dscf	84.67	84.89	85.13	84.9
dscm	2.40	2.40	2.41	2.40
Isokinetic Variation, %	97.2	96.9	96.7	96.9
Mercury Concentrations, µg/dscm				
Particulate Hg	0.014	0.010	0.013	0.013
Oxidized Hg	0.34	0.24	0.25	0.28
Elemental Hg	1.2	1.3	1.3	1.3
Total Mercury	1.5	1.5	1.5	1.5
Mercury Emission Rate, lb/hr				
Particulate Hg	9.2E-06	6.9E-06	8.8E-06	8.3E-06
Oxidized Hg	2.2E-04	1.6E-04	1.7E-04	1.8E-04
Elemental Hg	7.9E-04	8.5E-04	8.5E-04	8.3E-04
Total Mercury	1.0E-03	1.0E-03	1.0E-03	1.0E-03
Process Data				
Fired Pellets, dry short tons/hr	440	426	432	432
Natural Gas Usage, MCF/hr	82	82	84	83
Estimated Annual Mercury Emissions, lb/yr*				
Total Mercury Emission Factor, lb/dry short tons	8.9	8.9	9.0	8.9
	2.3E-06	2.4E-06	2.4E-06	2.4E-06

\*8760 hours of operation assumed



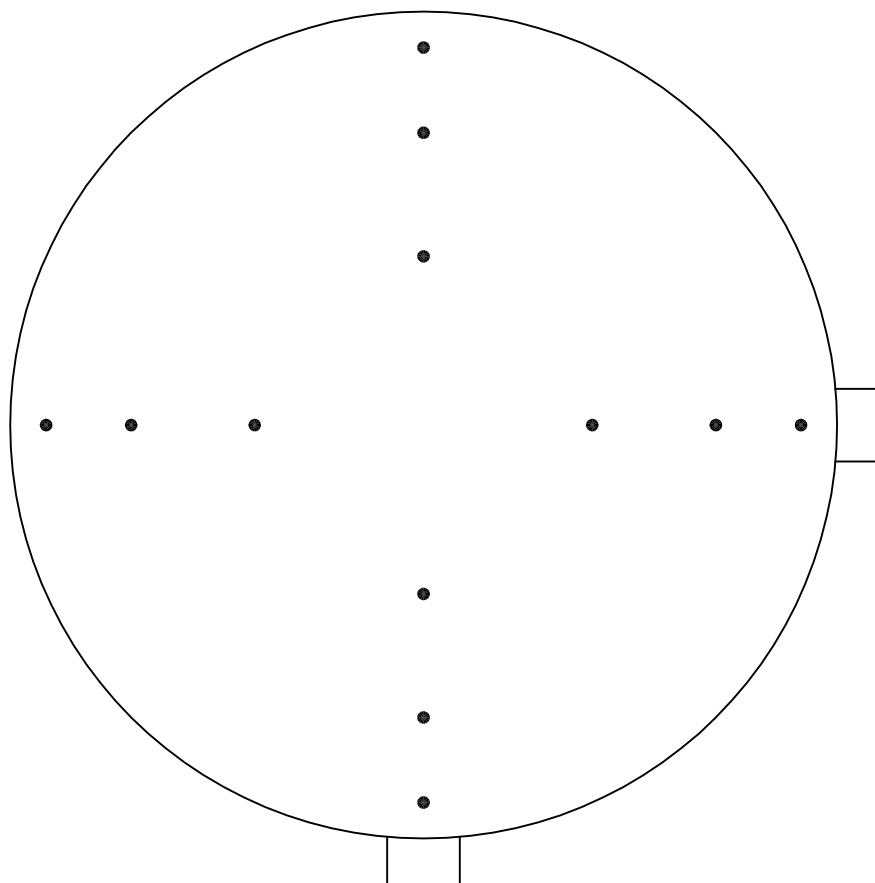
## Figures



TEST PORT LOCATIONS  
HIBBING TACONITE COMPANY  
HIBBING, MINNESOTA  
PELLET INDURATING FURNACE LINE NO 2  
(SV025,026,027,028), (EU021), (CE027,028,029,030)

NOT TO SCALE

FIGURE 1



● M2 POINTS

NO. OF TEST PORTS	2
PORT LENGTH	6.375"
PORT DIAMETER	6"
NO. OF TRAVERSE POINTS	12
DUCT DIAMETER	104.50"

POINT	INSERTION DEPTH IN "
1	4.55
2	15.30
3	30.92
4	73.58
5	89.20
6	99.95

TRAVERSE POINT LOCATIONS  
HIBBING TACONITE COMPANY  
HIBBING, MINNESOTA  
PELLET INDURATING FURNACE LINES 2  
(SV025,026,027,028), (EU021)

FIGURE 2

NOT TO SCALE

## Appendices

## **Appendix A**

### **Report Calculations and Nomenclature**

Determination of Volumetric Air Flow Rate, Gas Composition, Moisture Content, Meter Volume and Isokinetic Sampling  
EPA Methods 2, 3, 4 and Isokinetics by Method  
Pellet Indurating Furnace Line 2 - Stack 4 (SV025)  
Test Baseline

Input Data	Symbol	Units	Run 1	Run 2	Run 3
Test Date	-	-	9/7/2017	9/7/2017	9/7/2017
Test Period	-	-	717 - 1022	1051 - 1255	1326 - 1530
Number of Sample Ports	-	-	2	2	2
Number of Traverse Points	-	-	12	12	12
Duct Dimensions (diameter or Length x Width)	D, L X W	inches	104.50	104.50	104.50
Barometric Pressure	Pbar	in. Hg	28.26	28.26	28.26
Stack Static Pressure	Pg	in. H <sub>2</sub> O	-0.75	-0.75	-0.75
Average Stack Temperature	Tsf	degrees F	147	147	147
Actual Dry Gas Meter Volume	Vm	cubic feet	75.76	76.07	76.14
Dry Gas Meter Calibration Factor	Y	-	0.9923	0.9923	0.9923
Average Orifice Meter Pressure Drop	DH	in H <sub>2</sub> O	1.22	1.23	1.23
Average Meter Temperature	Tmf	degrees F	64	69	72
Pitot Tube Coefficient	Cp	-	0.84	0.84	0.84
Average Square Root of Velocity Head	(DP) <sup>0.5</sup>	-	0.887	0.888	0.884
Mass of Water Vapor Condensed in Impingers	Vwc	g	141	159	157
Mass of Water Vapor Collected in Desiccant	Vwsg	g	16	12	16
Orsat Results, Dry Basis					
Oxygen	%O <sub>2</sub>	%v/v	18.9	18.8	18.9
Carbon Dioxide	%CO <sub>2</sub>	%v/v	0.8	0.8	0.8
Nitrogen + Carbon Monoxide	%N <sub>2</sub> + %CO	%v/v	80.3	80.4	80.3
Nozzle Diameter	Dn	inches	0.213	0.213	0.213
Run Time	theta	minutes	120	120	120
Calculated Data	Symbol	Units	Run 1	Run 2	Run 3
Average Absolute Stack Temperature Tsr = Tsf + 460	Tsr	degrees R	607	607	607
Stack Pressure Ps = Pbar + Pg / 13.6	Ps	in. Hg	28.20	28.20	28.20
Duct Area A = 3.14 x D <sup>2</sup> / (4 x 144) or A = L x W / 144	A	Sq. ft	59.561	59.561	59.561
Meter Volume at Standard Conditions Vmstd = 17.64 x Vm x Y x ((Pbar + (DH / 13.6)) / (Tmf + 460))	Vmstd-Ft3	cubic feet	71.71	71.40	70.97
Meter Volume at Standard Conditions Vmstd-m3 = Vmstd-ft3 x 0.02832	Vmstd-m3	cubic meter	2.03	2.02	2.01
Average Moisture Content of Stack Gas MC = ((0.04175 x Vwc + 0.04715 x Vwsg) / ((0.04175 x Vwc + 0.04715 x Vwsg) + (Vmstd)) x 100	MC	% Vol	9.36	10.10	10.30
Molecular Weight of Stack Gas, dry Md = (0.44 x %CO <sub>2</sub> ) + (0.32 x %O <sub>2</sub> ) + (0.28 x (%N <sub>2</sub> + %CO))	Md	lb/lbmol	28.88	28.88	28.88
Molecular Weight of Stack Gas, wet Ms = Md x (1-(MC/100))+18 x (MC/100)	Ms	lb/lbmol	27.87	27.78	27.76
Average Stack Gas Velocity Vs = 85.49 x Cp x (dP) <sup>0.5</sup> x ((Tsr/(Ps x Ms)) <sup>0.5</sup> )	Vs	ft/sec	55.96	56.10	55.90
Actual Volumetric Air Flow Rate Qa = 60 x Vs x A	Qa	acfm	199,984	200,472	199,773
Volumetric Air Flow Rate at Standard Conditions Qs = Qa x (528 / (Ts + 460)) x (Ps / 29.92)	Qs	scfm	164,029	164,464	163,778
Dry Volumetric Air Flow Rate at Standard Conditions Qd = Qa x (1 - (MC / 100)) x (528 / Tsr) x (Ps / 29.92)	Qd	dscfm	148,681	147,847	146,903
Nozzle Cross-Sectional Area An = (3.14 x Dn <sup>2</sup> ) / (4 x 144)	An	sq. ft	0.000247	0.000247	0.000247
Isokinetic Variation I = (0.0945 x Tsr x Vmstd) / (Ps x Vs x An x theta x (1 - (MC / 100)))	I	%	96.8	96.9	97.0

Determination of Speciated Mercury Concentration and Emissions by Ontario Hydro Method  
ASTM Method D6784 Ontario-Hydro

Pellet Indurating Furnace Line 2 - Stack 4 (SV025)  
Test Baseline

Input Data	Symbol	Units	Run 1	Run 2	Run 3
Test Date	-	-	9/7/2017	9/7/2017	9/7/2017
Test Period	-	-	717 - 1022	1051 - 1255	1326 - 1530
Run Time	theta	min	120	120	120
Meter Volume at Standard Conditions Vmstd	Vmstd-ft3	cubic feet	71.71	71.40	70.97
Meter Volume at Standard Conditions Vmstd	Vmstd-m3	cubic meter	2.03	2.02	2.01
Dry Volumetric Air Flow Rate at Standard Conditions (M2, M4, ISO Calcs)	Qd	DSCFM	148,681	147,847	146,903
Ontario Hydro Mercury Analytical Results					
Probe Rinse (0.1 N HNO <sub>3</sub> )	Hg <sub>pr</sub>	µg	0.023	0.016	0.017
Filter	Hg <sub>filter</sub>	µg	0.051	0.034	0.037
Oxydized Mercury (KCl)	Hg <sub>KCl</sub>	µg	1.41	1.35	1.57
Elemental Mercury (HNO <sub>3</sub> /H <sub>2</sub> O <sub>2</sub> )	Hg <sub>H2O2</sub>	µg	0.074	0.041	0.055
Elemental Mercury (KMnO <sub>4</sub> )	Hg <sub>KMnO4</sub>	µg	12.9	12.8	12.4
Total Mercury	Hg <sub>(total)</sub>	µg	14.5	14.2	14.1
Calculated Data					
	Symbol	Units	Run 1	Run 2	Run 3
Mercury Concentrations					
Particulate Hg: Hg <sup>tp</sup> = (Hg <sub>pr</sub> + Hg <sub>filter</sub> ) / Vmstd-m3	Hg <sup>tp</sup>	µg/dscm	0.036	0.025	0.027
Oxidized Hg: Hg <sup>O</sup> = Hg <sub>KCl</sub> / Vmstd-m3	Hg <sup>O</sup>	µg/dscm	0.692	0.665	0.781
Elemental Hg: Hg <sup>E</sup> = (Hg <sub>H2O2</sub> + Hg <sub>KMnO4</sub> ) / Vmstd-m3	Hg <sup>E</sup>	µg/dscm	6.388	6.350	6.197
Total Hg: Hg <sup>tot</sup> = Hg <sub>(total)</sub> / Vmstd-m3	Hg <sup>tot</sup>	µg/dscm	7.116	7.040	7.005
Mercury Emission Rates					
Particulate Hg: E-Hg <sup>tp</sup> = (Hg <sub>pr</sub> + Hg <sub>filter</sub> ) x 2.2046 x 10 <sup>-9</sup> /Vstd-ft3 x 60 x dscfm	E-Hg <sup>tp</sup>	lb/hr	2.00E-05	1.37E-05	1.48E-05
Oxidized Hg: E-Hg <sup>O</sup> = Hg <sub>KCl</sub> x 2.2046 x 10 <sup>-9</sup> /Vstd-ft3 x 60 x dscfm	E-Hg <sup>O</sup>	lb/hr	3.85E-04	3.68E-04	4.30E-04
Elemental Hg: E-Hg <sup>E</sup> = (Hg <sub>H2O2</sub> + Hg <sub>KMnO4</sub> ) x 2.2046 x 10 <sup>-9</sup> /Vstd-ft3 x 60 x dscfm	E-Hg <sup>E</sup>	lb/hr	3.56E-03	3.52E-03	3.41E-03
Total Hg: E-Hg <sup>tot</sup> = Hg <sub>(total)</sub> x 2.2046 x 10 <sup>-9</sup> /Vstd-ft3 x 60 x dscfm	E-Hg <sup>tot</sup>	lb/hr	3.96E-03	3.90E-03	3.85E-03
Estimated Annual Mercury Emissions					
E-Hg <sup>tot</sup> = 8,760 hr/yr x E-Hg <sup>tot</sup>	E-Hg <sup>tot</sup>	lb/yr	34.72	34.16	33.77

Determination of Volumetric Air Flow Rate, Gas Composition, Moisture Content, Meter Volume and Isokinetic Sampling  
EPA Methods 2, 3, 4 and Isokinetics by Method  
Pellet Indurating Furnace Line 2 - Stack 3 (SV026)  
Test Baseline

Input Data	Symbol	Units	Run 1	Run 2	Run 3
Test Date	-	-	9/7/2017	9/7/2017	9/7/2017
Test Period	-	-	717 - 1022	1051 - 1255	1326 - 1530
Number of Sample Ports	-	-	2	2	2
Number of Traverse Points	-	-	12	12	12
Duct Dimensions (diameter or Length x Width)	D, L X W	inches	104.50	104.50	104.50
Barometric Pressure	Pbar	in. Hg	28.26	28.26	28.26
Stack Static Pressure	Pg	in. H <sub>2</sub> O	-0.77	-0.77	-0.77
Average Stack Temperature	Tsf	degrees F	136	136	137
Actual Dry Gas Meter Volume	Vm	cubic feet	76.52	82.47	76.83
Dry Gas Meter Calibration Factor	Y	-	0.9994	0.9994	0.9994
Average Orifice Meter Pressure Drop	DH	in H <sub>2</sub> O	1.40	1.61	1.40
Average Meter Temperature	Tmf	degrees F	52	53	56
Pitot Tube Coefficient	Cp	-	0.84	0.84	0.84
Average Square Root of Velocity Head	(DP) <sup>0.5</sup>	-	0.910	0.976	0.910
Mass of Water Vapor Condensed in Impingers	Vwc	g	132	146	128
Mass of Water Vapor Collected in Desiccant	Vwsg	g	18	24	19
Orsat Results, Dry Basis					
Oxygen	%O <sub>2</sub>	%v/v	19.1	19.0	19.1
Carbon Dioxide	%CO <sub>2</sub>	%v/v	0.6	0.6	0.5
Nitrogen + Carbon Monoxide	%N <sub>2</sub> + %CO	%v/v	80.3	80.4	80.4
Nozzle Diameter	Dn	inches	0.213	0.213	0.213
Run Time	theta	minutes	120	120	120
Calculated Data	Symbol	Units	Run 1	Run 2	Run 3
Average Absolute Stack Temperature Tsr = Tsf + 460	Tsr	degrees R	596	596	597
Stack Pressure Ps = Pbar + Pg / 13.6	Ps	in. Hg	28.20	28.20	28.20
Duct Area A = 3.14 x D <sup>2</sup> / (4 x 144) or A = L x W / 144	A	Sq. ft	59.561	59.561	59.561
Meter Volume at Standard Conditions Vmstd = 17.64 x Vm x Y x ((Pbar + (DH / 13.6)) / (Tmf + 460))	Vmstd-Ft3	cubic feet	74.76	80.40	74.50
Meter Volume at Standard Conditions Vmstd-m3 = Vmstd-ft3 x 0.02832	Vmstd-m3	cubic meter	2.12	2.28	2.11
Average Moisture Content of Stack Gas MC = ((0.04175 x Vwc + 0.04715 x Vwsg) / ((0.04175 x Vwc + 0.04715 x Vwsg) + (Vmstd))) x 100	MC	% Vol	8.67	9.05	8.51
Molecular Weight of Stack Gas, dry Md = (0.44 x %CO <sub>2</sub> ) + (0.32 x %O <sub>2</sub> ) + (0.28 x (%N <sub>2</sub> + %CO))	Md	lb/lbmol	28.86	28.86	28.84
Molecular Weight of Stack Gas, wet Ms = Md x (1-(MC/100))+18 x (MC/100)	Ms	lb/lbmol	27.92	27.87	27.92
Average Stack Gas Velocity Vs = 85.49 x Cp x (dP) <sup>0.5</sup> x ((Tsr/(Ps x Ms)) <sup>0.5</sup> )	Vs	ft/sec	56.87	61.03	56.89
Actual Volumetric Air Flow Rate Qa = 60 x Vs x A	Qa	acfm	203,218	218,114	203,311
Volumetric Air Flow Rate at Standard Conditions Qs = Qa x (528 / (Ts + 460)) x (Ps / 29.92)	Qs	scfm	169,762	182,117	169,484
Dry Volumetric Air Flow Rate at Standard Conditions Qd = Qa x (1 - (MC / 100)) x (528 / Tsr) x (Ps / 29.92)	Qd	dscfm	155,045	165,634	155,067
Nozzle Cross-Sectional Area An = (3.14 x Dn <sup>2</sup> ) / (4 x 144)	An	sq. ft	0.000247	0.000247	0.000247
Isokinetic Variation I = (0.0945 x Tsr x Vmstd) / (Ps x Vs x An x theta x (1 - (MC / 100)))	I	%	96.8	97.4	96.4



Determination of Speciated Mercury Concentration and Emissions by Ontario Hydro Method  
ASTM Method D6784 Ontario-Hydro

Pellet Indurating Furnace Line 2 - Stack 3 (SV026)  
Test Baseline

Input Data	Symbol	Units	Run 1	Run 2	Run 3
Test Date	-	-	9/7/2017	9/7/2017	9/7/2017
Test Period	-	-	717 - 1022	1051 - 1255	1326 - 1530
Run Time	theta	min	120	120	120
Meter Volume at Standard Conditions Vmstd	Vmstd-ft3	cubic feet	74.76	80.42	74.51
Meter Volume at Standard Conditions Vmstd	Vmstd-m3	cubic meter	2.12	2.28	2.11
Dry Volumetric Air Flow Rate at Standard Conditions (M2, M4, ISO Calcs)	Qd	DSCFM	155,045	165,636	155,068
Ontario Hydro Mercury Analytical Results					
Probe Rinse (0.1 N HNO <sub>3</sub> )	Hg <sub>pr</sub>	µg	0.037	0.031	< 0.010
Filter	Hg <sub>filter</sub>	µg	0.028	0.024	0.017
Oxydized Mercury (KCl)	Hg <sub>KCl</sub>	µg	1.43	1.22	1.32
Elemental Mercury (HNO <sub>3</sub> /H <sub>2</sub> O <sub>2</sub> )	Hg <sub>H2O2</sub>	µg	0.042	0.030	0.028
Elemental Mercury (KMnO <sub>4</sub> )	Hg <sub>KMnO4</sub>	µg	10.5	11.1	11.0
Total Mercury	Hg <sub>(total)</sub>	µg	12.0	12.4	12.3
Calculated Data					
	Symbol	Units	Run 1	Run 2	Run 3
Mercury Concentrations					
Particulate Hg: Hg <sup>tp</sup> = (Hg <sub>pr</sub> + Hg <sub>filter</sub> ) / Vmstd-m3	Hg <sup>tp</sup>	µg/dscm	0.030	0.024	0.013
Oxidized Hg: Hg <sup>O</sup> = Hg <sub>KCl</sub> / Vmstd-m3	Hg <sup>O</sup>	µg/dscm	0.675	0.533	0.626
Elemental Hg: Hg <sup>E</sup> = (Hg <sub>H2O2</sub> + Hg <sub>KMnO4</sub> ) / Vmstd-m3	Hg <sup>E</sup>	µg/dscm	4.956	4.887	5.203
Total Hg: Hg <sup>tot</sup> = Hg <sub>(total)</sub> / Vmstd-m3	Hg <sup>tot</sup>	µg/dscm	5.662	5.444	5.841
Mercury Emission Rates					
Particulate Hg: E-Hg <sup>tp</sup> = (Hg <sub>pr</sub> + Hg <sub>filter</sub> ) x 2.2046 x 10 <sup>-9</sup> /Vstd-ft3 x 60 x dscfm	E-Hg <sup>tp</sup>	lb/hr	1.77E-05	1.48E-05	7.43E-06
Oxidized Hg: E-Hg <sup>O</sup> = Hg <sub>KCl</sub> x 2.2046 x 10 <sup>-9</sup> /Vstd-ft3 x 60 x dscfm	E-Hg <sup>O</sup>	lb/hr	3.92E-04	3.31E-04	3.63E-04
Elemental Hg: E-Hg <sup>E</sup> = (Hg <sub>H2O2</sub> + Hg <sub>KMnO4</sub> ) x 2.2046 x 10 <sup>-9</sup> /Vstd-ft3 x 60 x dscfm	E-Hg <sup>E</sup>	lb/hr	2.88E-03	3.03E-03	3.02E-03
Total Hg: E-Hg <sup>tot</sup> = Hg <sub>(total)</sub> x 2.2046 x 10 <sup>-9</sup> /Vstd-ft3 x 60 x dscfm	E-Hg <sup>tot</sup>	lb/hr	3.29E-03	3.38E-03	3.39E-03
Estimated Annual Mercury Emissions					
E-Hg <sup>tot</sup> = 8,760 hr/vr x E-Hg <sup>tot</sup>	E-Hg <sup>tot</sup>	lb/vr	28.81	29.59	29.72

Determination of Volumetric Air Flow Rate, Gas Composition, Moisture Content, Meter Volume and Isokinetic Sampling  
EPA Methods 2, 3, 4 and Isokinetics by Method  
Pellet Indurating Furnace Line 2 - Stack 2 (SV027)  
Test Baseline

Input Data	Symbol	Units	Run 1	Run 2	Run 3
Test Date	-	-	9/6/2017	9/6/2017	9/6/2017
Test Period	-	-	732 - 937	1018 - 1224	1300 - 1505
Number of Sample Ports	-	-	2	2	2
Number of Traverse Points	-	-	12	12	12
Duct Dimensions (diameter or Length x Width)	D, L X W	inches	104.50	104.50	104.50
Barometric Pressure	Pbar	in. Hg	28.39	28.39	28.39
Stack Static Pressure	Pg	in. H <sub>2</sub> O	-0.80	-0.80	-0.80
Average Stack Temperature	Tsf	degrees F	122	122	123
Actual Dry Gas Meter Volume	Vm	cubic feet	85.95	83.65	89.03
Dry Gas Meter Calibration Factor	Y	-	0.9848	0.9848	0.9848
Average Orifice Meter Pressure Drop	DH	in H <sub>2</sub> O	1.49	1.41	1.56
Average Meter Temperature	Tmf	degrees F	65	72	82
Pitot Tube Coefficient	Cp	-	0.84	0.84	0.84
Average Square Root of Velocity Head	(DP) <sup>0.5</sup>	-	0.964	0.930	0.974
Mass of Water Vapor Condensed in Impingers	Vwc	g	122	112	115
Mass of Water Vapor Collected in Desiccant	Vwsg	g	17	20	23
Orsat Results, Dry Basis					
Oxygen	%O <sub>2</sub>	%v/v	19.9	19.9	19.8
Carbon Dioxide	%CO <sub>2</sub>	%v/v	0.3	0.3	0.3
Nitrogen + Carbon Monoxide	%N <sub>2</sub> + %CO	%v/v	79.8	79.8	79.9
Nozzle Diameter	Dn	inches	0.213	0.213	0.213
Run Time	theta	minutes	120	120	120
Calculated Data	Symbol	Units	Run 1	Run 2	Run 3
Average Absolute Stack Temperature Tsr = Tsf + 460	Tsr	degrees R	582	582	583
Stack Pressure Ps = Pbar + Pg / 13.6	Ps	in. Hg	28.33	28.33	28.33
Duct Area A = 3.14 x D <sup>2</sup> / (4 x 144) or A = L x W / 144	A	Sq. ft	59.561	59.561	59.561
Meter Volume at Standard Conditions Vmstd = 17.64 x Vm x Y x ((Pbar + (DH / 13.6)) / (Tmf + 460))	Vmstd-Ft3	cubic feet	81.13	77.80	81.38
Meter Volume at Standard Conditions Vmstd-m3 = Vmstd-ft3 x 0.02832	Vmstd-m3	cubic meter	2.30	2.20	2.30
Average Moisture Content of Stack Gas MC = ((0.04175 x Vwc + 0.04715 x Vwsg) / ((0.04175 x Vwc + 0.04715 x Vwsg) + (Vmstd))) x 100	MC	% Vol	7.43	7.40	7.38
Molecular Weight of Stack Gas, dry Md = (0.44 x %CO <sub>2</sub> ) + (0.32 x %O <sub>2</sub> ) + (0.28 x (%N <sub>2</sub> + %CO))	Md	lb/lbmol	28.84	28.84	28.84
Molecular Weight of Stack Gas, wet Ms = Md x (1 - (MC/100)) + 18 x (MC/100)	Ms	lb/lbmol	28.04	28.04	28.04
Average Stack Gas Velocity Vs = 85.49 x Cp x (dP) <sup>0.5</sup> x ((Tsr/(Ps x Ms)) <sup>0.5</sup> )	Vs	ft/sec	59.25	57.18	59.90
Actual Volumetric Air Flow Rate Qa = 60 x Vs x A	Qa	acfm	211,745	204,356	214,075
Volumetric Air Flow Rate at Standard Conditions Qs = Qa x (528 / (Ts + 460)) x (Ps / 29.92)	Qs	scfm	181,807	175,437	183,702
Dry Volumetric Air Flow Rate at Standard Conditions Qd = Qa x (1 - (MC / 100)) x (528 / Tsr) x (Ps / 29.92)	Qd	dscfm	168,299	162,451	170,139
Nozzle Cross-Sectional Area An = (3.14 x Dn <sup>2</sup> ) / (4 x 144)	An	sq. ft	0.000247	0.000247	0.000247
Isokinetic Variation I = (0.0945 x Tsr x Vmstd) / (Ps x Vs x An x theta x (1 - (MC / 100)))	I	%	96.8	96.1	96.0

Determination of Speciated Mercury Concentration and Emissions by Ontario Hydro Method  
ASTM Method D6784 Ontario-Hydro

Pellet Indurating Furnace Line 2 - Stack 2 (SV027)  
Test Baseline

Input Data	Symbol	Units	Run 1	Run 2	Run 3
Test Date	-	-	9/6/2017	9/6/2017	9/6/2017
Test Period	-	-	732 - 937	1018 - 1224	1300 - 1505
Run Time	theta	min	120	120	120
Meter Volume at Standard Conditions Vmstd	Vmstd-ft3	cubic feet	81.13	77.82	81.40
Meter Volume at Standard Conditions Vmstd	Vmstd-m3	cubic meter	2.30	2.20	2.31
Dry Volumetric Air Flow Rate at Standard Conditions (M2, M4, ISO Calcs)	Qd	DSCFM	168,299	162,453	170,141
Ontario Hydro Mercury Analytical Results					
Probe Rinse (0.1 N HNO <sub>3</sub> )	Hg <sub>pr</sub>	µg	0.019	0.019	0.023
Filter	Hg <sub>filter</sub>	µg	0.017	0.015	0.016
Oxydized Mercury (KCl)	Hg <sub>KCl</sub>	µg	1.07	0.798	0.848
Elemental Mercury (HNO <sub>3</sub> /H <sub>2</sub> O <sub>2</sub> )	Hg <sub>H2O2</sub>	µg	0.121	0.019	0.018
Elemental Mercury (KMnO <sub>4</sub> )	Hg <sub>KMnO4</sub>	µg	6.18	5.47	6.04
Total Mercury	Hg <sub>(total)</sub>	µg	7.40	6.32	6.94
Calculated Data					
	Symbol	Units	Run 1	Run 2	Run 3
Mercury Concentrations					
Particulate Hg: Hg <sup>tp</sup> = (Hg <sub>pr</sub> + Hg <sub>filter</sub> ) / Vmstd-m3	Hg <sup>tp</sup>	µg/dscm	0.0155	0.0152	0.0165
Oxidized Hg: Hg <sup>O</sup> = Hg <sub>KCl</sub> / Vmstd-m3	Hg <sup>O</sup>	µg/dscm	0.4657	0.3621	0.3676
Elemental Hg: Hg <sup>E</sup> = (Hg <sub>H2O2</sub> + Hg <sub>KMnO4</sub> ) / Vmstd-m3	Hg <sup>E</sup>	µg/dscm	2.7403	2.4905	2.6255
Total Hg: Hg <sup>tot</sup> = Hg <sub>(total)</sub> / Vmstd-m3	Hg <sup>tot</sup>	µg/dscm	3.2215	2.8679	3.0096
Mercury Emission Rates					
Particulate Hg: E-Hg <sup>tp</sup> = (Hg <sub>pr</sub> + Hg <sub>filter</sub> ) x 2.2046 x 10 <sup>-9</sup> /Vstd-ft3 x 60 x dscfm	E-Hg <sup>tp</sup>	lb/hr	9.74E-06	9.25E-06	1.05E-05
Oxidized Hg: E-Hg <sup>O</sup> = Hg <sub>KCl</sub> x 2.2046 x 10 <sup>-9</sup> /Vstd-ft3 x 60 x dscfm	E-Hg <sup>O</sup>	lb/hr	2.94E-04	2.20E-04	2.34E-04
Elemental Hg: E-Hg <sup>E</sup> = (Hg <sub>H2O2</sub> + Hg <sub>KMnO4</sub> ) x 2.2046 x 10 <sup>-9</sup> /Vstd-ft3 x 60 x dscfm	E-Hg <sup>E</sup>	lb/hr	1.73E-03	1.52E-03	1.67E-03
Total Hg: E-Hg <sup>tot</sup> = Hg <sub>(total)</sub> x 2.2046 x 10 <sup>-9</sup> /Vstd-ft3 x 60 x dscfm	E-Hg <sup>tot</sup>	lb/hr	2.03E-03	1.75E-03	1.92E-03
Estimated Annual Mercury Emissions					
E-Hg <sup>tot</sup> = 8,760 hr/vr x E-Hg <sup>tot</sup>	E-Hg <sup>tot</sup>	lb/vr	17.79	15.29	16.80

Determination of Volumetric Air Flow Rate, Gas Composition, Moisture Content, Meter Volume and Isokinetic Sampling  
EPA Methods 2, 3, 4 and Isokinetics by Method  
Pellet Indurating Furnace Line 2 - Stack 1 (SV028)  
Test Baseline

Input Data	Symbol	Units	Run 1	Run 2	Run 3
Test Date	-	-	9/6/2017	9/6/2017	9/6/2017
Test Period	-	-	732 - 937	1018 - 1224	1300 - 1505
Number of Sample Ports	-	-	2	2	2
Number of Traverse Points	-	-	12	12	12
Duct Dimensions (diameter or Length x Width)	D, L X W	inches	104.50	104.50	104.50
Barometric Pressure	Pbar	in. Hg	28.39	28.39	28.39
Stack Static Pressure	Pg	in. H <sub>2</sub> O	-0.80	-0.80	-0.80
Average Stack Temperature	Tsf	degrees F	112	110	112
Actual Dry Gas Meter Volume	Vm	cubic feet	88.59	90.30	92.52
Dry Gas Meter Calibration Factor	Y	-	0.9955	0.9955	0.9955
Average Orifice Meter Pressure Drop	DH	in H <sub>2</sub> O	1.81	1.86	1.91
Average Meter Temperature	Tmf	degrees F	64	73	84
Pitot Tube Coefficient	Cp	-	0.84	0.84	0.84
Average Square Root of Velocity Head	(DP) <sup>0.5</sup>	-	0.986	0.989	0.993
Mass of Water Vapor Condensed in Impingers	Vwc	g	111	104	104
Mass of Water Vapor Collected in Desiccant	Vwsg	g	17	23	18
Orsat Results, Dry Basis					
Oxygen	%O <sub>2</sub>	%v/v	20.0	20.1	20.0
Carbon Dioxide	%CO <sub>2</sub>	%v/v	0.3	0.2	0.3
Nitrogen + Carbon Monoxide	%N <sub>2</sub> + %CO	%v/v	79.7	79.7	79.7
Nozzle Diameter	Dn	inches	0.213	0.213	0.213
Run Time	theta	minutes	120	120	120
Calculated Data	Symbol	Units	Run 1	Run 2	Run 3
Average Absolute Stack Temperature Tsr = Tsf + 460	Tsr	degrees R	572	570	572
Stack Pressure Ps = Pbar + Pg / 13.6	Ps	in. Hg	28.33	28.33	28.33
Duct Area A = 3.14 x D <sup>2</sup> / (4 x 144) or A = L x W / 144	A	Sq. ft	59.561	59.561	59.561
Meter Volume at Standard Conditions Vmstd = 17.64 x Vm x Y x ((Pbar + (DH / 13.6)) / (Tmf + 460))	Vmstd-Ft3	cubic feet	84.67	84.89	85.13
Meter Volume at Standard Conditions Vmstd-m3 = Vmstd-ft3 x 0.02832	Vmstd-m3	cubic meter	2.40	2.40	2.41
Average Moisture Content of Stack Gas MC = ((0.04175 x Vwc + 0.04715 x Vwsg) / ((0.04175 x Vwc + 0.04715 x Vwsg) + (Vmstd))) x 100	MC	% Vol	6.63	6.59	6.29
Molecular Weight of Stack Gas, dry Md = (0.44 x %CO <sub>2</sub> ) + (0.32 x %O <sub>2</sub> ) + (0.28 x (%N <sub>2</sub> + %CO))	Md	lb/lbmol	28.85	28.84	28.85
Molecular Weight of Stack Gas, wet Ms = Md x (1-(MC/100))+18 x (MC/100)	Ms	lb/lbmol	28.13	28.12	28.17
Average Stack Gas Velocity Vs = 85.49 x Cp x (dP) <sup>0.5</sup> x ((Tsr/(Ps x Ms)) <sup>0.5</sup> )	Vs	ft/sec	59.94	60.12	60.37
Actual Volumetric Air Flow Rate Qa = 60 x Vs x A	Qa	acfm	214,218	214,842	215,740
Volumetric Air Flow Rate at Standard Conditions Qs = Qa x (528 / (Ts + 460)) x (Ps / 29.92)	Qs	scfm	187,362	188,333	188,542
Dry Volumetric Air Flow Rate at Standard Conditions Qd = Qa x (1 - (MC / 100)) x (528 / Tsr) x (Ps / 29.92)	Qd	dscfm	174,932	175,923	176,682
Nozzle Cross-Sectional Area An = (3.14 x Dn <sup>2</sup> ) / (4 x 144)	An	sq. ft	0.000247	0.000247	0.000247
Isokinetic Variation I = (0.0945 x Tsr x Vmstd) / (Ps x Vs x An x theta x (1 - (MC / 100)))	I	%	97.2	96.9	96.7

Determination of Speciated Mercury Concentration and Emissions by Ontario Hydro Method  
ASTM Method D6784 Ontario-Hydro

Pellet Indurating Furnace Line 2 - Stack 1 (SV028)  
Test Baseline

Input Data	Symbol	Units	Run 1	Run 2	Run 3
Test Date	-	-	9/6/2017	9/6/2017	9/6/2017
Test Period	-	-	732 - 937	1018 - 1224	1300 - 1505
Run Time	theta	min	120	120	120
Meter Volume at Standard Conditions Vmstd	Vmstd-ft3	cubic feet	84.67	84.90	85.15
Meter Volume at Standard Conditions Vmstd	Vmstd-m3	cubic meter	2.40	2.40	2.41
Dry Volumetric Air Flow Rate at Standard Conditions (M2,M4, ISO Calcs)	Qd	DSCFM	174,932	175,925	176,684
Ontario Hydro Mercury Analytical Results					
Probe Rinse (0.1 N HNO <sub>3</sub> )	Hg <sub>pr</sub>	µg	0.025	0.020	0.026
Filter	Hg <sub>filter</sub>	µg	0.009	< 0.005	0.007
Oxydized Mercury (KCl)	Hg <sub>KCl</sub>	µg	0.807	0.574	0.605
Elemental Mercury (HNO <sub>3</sub> /H <sub>2</sub> O <sub>2</sub> )	Hg <sub>H2O2</sub>	µg	0.014	< 0.013	0.017
Elemental Mercury (KMnO <sub>4</sub> )	Hg <sub>KMnO4</sub>	µg	2.86	3.09	3.07
Total Mercury	Hg <sub>(total)</sub>	µg	3.71	3.70	3.72
Calculated Data					
	Symbol	Units	Run 1	Run 2	Run 3
Mercury Concentrations					
Particulate Hg: Hg <sup>tp</sup> = (Hg <sub>pr</sub> + Hg <sub>filter</sub> ) / Vmstd-m3	Hg <sup>tp</sup>	µg/dscm	0.0140	0.0104	0.0133
Oxidized Hg: Hg <sup>O</sup> = Hg <sub>KCl</sub> / Vmstd-m3	Hg <sup>O</sup>	µg/dscm	0.337	0.239	0.251
Elemental Hg: Hg <sup>E</sup> = (Hg <sub>H2O2</sub> + Hg <sub>KMnO4</sub> ) / Vmstd-m3	Hg <sup>E</sup>	µg/dscm	1.198	1.288	1.280
Total Hg: Hg <sup>tot</sup> = Hg <sub>(total)</sub> / Vmstd-m3	Hg <sup>tot</sup>	µg/dscm	1.549	1.537	1.544
Mercury Emission Rates					
Particulate Hg: E-Hg <sup>tp</sup> = (Hg <sub>pr</sub> + Hg <sub>filter</sub> ) x 2.2046 x 10 <sup>-9</sup> /Vstd-ft3 x 60 x dscfm	E-Hg <sup>tp</sup>	lb/hr	9.16E-06	6.85E-06	8.78E-06
Oxidized Hg: E-Hg <sup>O</sup> = Hg <sub>KCl</sub> x 2.2046 x 10 <sup>-9</sup> /Vstd-ft3 x 60 x dscfm	E-Hg <sup>O</sup>	lb/hr	2.21E-04	1.57E-04	1.66E-04
Elemental Hg: E-Hg <sup>E</sup> = (Hg <sub>H2O2</sub> + Hg <sub>KMnO4</sub> ) x 2.2046 x 10 <sup>-9</sup> /Vstd-ft3 x 60 x dscfm	E-Hg <sup>E</sup>	lb/hr	7.85E-04	8.49E-04	8.47E-04
Total Hg: E-Hg <sup>tot</sup> = Hg <sub>(total)</sub> x 2.2046 x 10 <sup>-9</sup> /Vstd-ft3 x 60 x dscfm	E-Hg <sup>tot</sup>	lb/hr	1.02E-03	1.01E-03	1.02E-03
Estimated Annual Mercury Emissions					
E-Hg <sup>tot</sup> = 8,760 hr/vr x E-Hg <sup>tot</sup>	E-Hg <sup>tot</sup>	lb/vr	8.89	8.88	8.95

## Appendix B

### Field Data Sheets





## Ontario Hydro ASTM D6784 - Field Data Sheet - Run 1

Project	Hibbing Taconite Company		Meter ID	C-3	Probe ID	10-4	Bar.Press.	28.26	in. Hg	Sample Train Leak Rate, cfm:		
Sample Location	Pellet Indurating Furnace Line 2 - Stack 4 SV025		Meter Y	0.9923	Pitot Tube No.	10-4	Stat Press.	-0.8	in. H <sub>2</sub> O	Pretest	0.000	at 10 in. Hg
Date	09/07/17		Orifice dH@	1.7942	Pitot Cp	0.84	CPM TC	NA		Posttest	0.000	at 8 in. Hg
Test	Baseline	Run #	1		Liner Type:	Glass	IMP Out TC	0		Pretest Pitot leak Check Pos	pass	@ >3" w.c
Operators	DJK /LDP2									Posttest Pitot leak Check Neg	pass	@ >3" w.c

Sample Point	Sample Time DT	Actual Meter Vol Vm, ft <sup>3</sup>	Velocity Head DP, in. H <sub>2</sub> O	Orifice DH in. H <sub>2</sub> O	Ideal Point Volume Vm, ft <sup>3</sup>	Ideal Meter Vol Vm, ft <sup>3</sup>	Sample Train Vacuum in. Hg	Stack Temp Ts, °F	Sample Train Temperatures, °F					Moisture Content, %
									Filter	Probe	Impinger Outlet	Meter Inlet	Meter Outlet	
Start Time	717	438.87												
1	5.0	441.78	0.700	1.07	2.96	441.83	*	145	*	*	*	56	54	12.0
2	10.0	444.70	0.710	1.08	2.97	444.80	*	145	*	*	*	60	54	12.0
3	15.0	447.98	0.790	1.20	3.14	447.94	*	146	*	*	*	63	54	12.0
4	20.0	451.05	0.770	1.18	3.11	451.05	*	147	*	*	*	66	55	12.0
5	25.0	454.19	0.820	1.26	3.22	454.27	*	147	*	*	*	68	55	12.0
6	30.0	457.47	0.820	1.26	3.23	457.50	*	147	*	*	*	70	56	12.0
7	35.0	460.83	0.930	1.44	3.45	460.95	*	145	*	*	*	72	57	12.0
8	40.0	464.16	0.900	1.39	3.41	464.36	*	145	*	*	*	73	58	12.0
9	45.0	467.50	0.870	1.35	3.35	467.71	*	146	*	*	*	74	58	12.0
10	50.0	470.82	0.860	1.33	3.34	471.05	*	146	*	*	*	74	59	12.0
11	55.0	473.73	0.640	1.00	2.89	473.94	*	144	*	*	*	75	60	12.0
12	60.0	476.67	0.660	1.03	2.94	476.87	*	145	*	*	*	75	60	12.0
13	65.0	479.52	0.650	1.00	2.90	479.77	*	150	*	*	*	61	60	12.0
14	70.0	482.48	0.650	0.99	2.86	482.64	*	150	*	*	*	64	60	12.0
15	75.0	485.64	0.830	1.27	3.24	485.88	*	150	*	*	*	68	60	12.0
16	80.0	488.95	0.850	1.31	3.30	489.18	*	147	*	*	*	70	60	12.0
17	85.0	492.22	0.870	1.34	3.34	492.52	*	148	*	*	*	72	60	12.0
18	90.0	495.57	0.890	1.38	3.39	495.91	*	148	*	*	*	72	60	12.0
19	95.0	498.92	0.830	1.28	3.28	499.19	*	147	*	*	*	73	60	12.0
20	100.0	502.17	0.870	1.34	3.35	502.54	*	149	*	*	*	74	61	12.0
21	105.0	505.48	0.840	1.30	3.30	505.84	*	148	*	*	*	74	61	12.0
22	110.0	508.68	0.830	1.29	3.28	509.12	*	147	*	*	*	75	61	12.0
23	115.0	511.71	0.680	1.06	2.98	512.10	*	146	*	*	*	74	62	12.0
24	120.0	514.63	0.680	1.06	2.98	515.08	*	146	*	*	*	74	62	12.0
End Time	1022													
Run Time	120		Avg DH=	1.22			Avg Ts=	146.83				Avg Tm=	64.25	

## Integrated Gas Sampling Data :

Bag No. 1  
Bag Vol. 15 liters  
Leak Rate 0 cc/min

Filter No. NA  
Nozzle No. Glass  
Nozzle Dn. 0.213

## MOISTURE RECOVERY DATA :

Impinger  
Final wt., g  
Initial wt., g  
Difference

1	2	3	4	5	6	7	Desiccant	Total
875.3	776.0	805.7	763.6	761.7	754.6	768.8	955.6	
763.4	752.5	800.1	760.1	763.4	755.0	769.8	940.0	
111.9	23.5	5.6	3.5	-1.7	-0.4	-1.0	15.6	157.0

\* Data Recorded on Field Data Sheet



## Ontario Hydro ASTM D6784 - Field Data Sheet - Run 2

Project	Hibbing Taconite Company		Meter ID	C-3	Probe ID	10-4	Bar.Press.	28.26	in. Hg	Sample Train Leak Rate, cfm:		
Sample Location	Pellet Indurating Furnace Line 2 - Stack 4 SV025		Meter Y	0.9923	Pitot Tube No.	10-4	Stat Press.	-0.8	in. H <sub>2</sub> O	Pretest	0.000	at 10 in. Hg
Date	09/07/17		Orifice dH@	1.7942	Pitot Cp	0.84	CPM TC	NA		Posttest	0.000	at 6 in. Hg
Test	Baseline	Run #	2		Liner Type:	Glass	IMP Out TC	0		Pretest Pitot leak Check Pos	pass	@ >3" w.c
Operators	DJK /LDP2									Posttest Pitot leak Check Neg	pass	@ >3" w.c

Sample Point	Sample Time DT	Actual Meter Vol Vm, ft <sup>3</sup>	Velocity Head DP, in. H <sub>2</sub> O	Orifice DH in. H <sub>2</sub> O	Ideal Point Volume Vm, ft <sup>3</sup>	Ideal Meter Vol Vm, ft <sup>3</sup>	Sample Train Vacuum in. Hg	Stack Temp Ts, °F	Sample Train Temperatures, °F					Moisture Content, %
									Filter	Probe	Impinger Outlet	Meter Inlet	Meter Outlet	
Start Time	1051	515.11												
1	5.0	518.07	0.680	1.05	2.95	518.06	*	146	*	*	*	65	61	12.0
2	10.0	521.12	0.700	1.08	2.99	521.05	*	147	*	*	*	70	61	12.0
3	15.0	524.31	0.830	1.28	3.27	524.32	*	149	*	*	*	73	61	12.0
4	20.0	527.60	0.800	1.24	3.22	527.54	*	149	*	*	*	74	61	12.0
5	25.0	530.84	0.880	1.36	3.38	530.92	*	148	*	*	*	75	61	12.0
6	30.0	534.18	0.850	1.32	3.33	534.24	*	147	*	*	*	75	61	12.0
7	35.0	537.42	0.830	1.29	3.29	537.53	*	147	*	*	*	75	62	12.0
8	40.0	540.66	0.880	1.37	3.39	540.92	*	147	*	*	*	75	62	12.0
9	45.0	543.87	0.820	1.28	3.27	544.19	*	146	*	*	*	75	62	12.0
10	50.0	547.11	0.810	1.26	3.25	547.44	*	146	*	*	*	75	63	12.0
11	55.0	550.05	0.640	1.00	2.90	550.35	*	144	*	*	*	75	63	12.0
12	60.0	552.93	0.680	1.06	2.99	553.34	*	144	*	*	*	75	63	12.0
13	65.0	555.86	0.680	1.06	2.99	556.33	*	144	*	*	*	70	63	12.0
14	70.0	558.82	0.700	1.09	3.02	559.34	*	145	*	*	*	75	63	12.0
15	75.0	562.00	0.750	1.17	3.13	562.48	*	147	*	*	*	75	63	12.0
16	80.0	565.21	0.770	1.20	3.17	565.65	*	147	*	*	*	74	63	12.0
17	85.0	568.34	0.810	1.26	3.25	568.90	*	147	*	*	*	74	63	12.0
18	90.0	571.57	0.780	1.21	3.19	572.09	*	147	*	*	*	76	64	12.0
19	95.0	574.91	0.930	1.45	3.49	575.58	*	147	*	*	*	77	64	12.0
20	100.0	578.36	0.900	1.40	3.43	579.01	*	149	*	*	*	77	65	12.0
21	105.0	581.73	0.910	1.42	3.46	582.48	*	147	*	*	*	77	65	12.0
22	110.0	585.20	0.910	1.42	3.46	585.93	*	148	*	*	*	77	65	12.0
23	115.0	588.18	0.730	1.14	3.10	589.04	*	146	*	*	*	77	65	12.0
24	120.0	591.18	0.700	1.09	3.04	592.08	*	147	*	*	*	77	65	12.0
End Time	1255													
Run Time	120		Avg DH=	1.23			Avg Ts=	146.71				Avg Tm=	68.69	

## Integrated Gas Sampling Data :

Bag No. 2  
Bag Vol. 15 liters  
Leak Rate 0 cc/min

Filter No. NA  
Nozzle No. Glass  
Nozzle Dn. 0.213

## MOISTURE RECOVERY DATA :

Impinger  
Final wt., g  
Initial wt., g  
Difference

1	2	3	4	5	6	7	Desiccant	Total
866.6	793.7	781.7	762.5	763.8	805.4	757.9	967.1	
750.5	762.6	775.6	757.7	762.4	805.1	759.1	955.5	
116.1	31.1	6.1	4.8	1.4	0.3	-1.2	11.6	170.2

\* Data Recorded on Field Data Sheet





## Ontario Hydro ASTM D6784 - Field Data Sheet - Run 3

Project	Hibbing Taconite Company		Meter ID	C-3	Probe ID	10-4	Bar.Press.	28.26	in. Hg	Sample Train Leak Rate, cfm:		
Sample Location	Pellet Indurating Furnace Line 2 - Stack 4 SV025		Meter Y	0.9923	Pitot Tube No.	10-4	Stat Press.	-0.8	in. H <sub>2</sub> O	Pretest	0.000	at 10 in. Hg
Date	09/07/17		Orifice dH@	1.7942	Pitot Cp	0.84	CPM TC	NA		Posttest	0.000	at 7 in. Hg
Test	Baseline	Run #	3		Liner Type:	Glass	IMP Out TC	0		Pretest Pitot leak Check Pos	pass	@ >3" w.c
Operators	DJK /LDP2									Posttest Pitot leak Check Neg	pass	@ >3" w.c

Sample Point	Sample Time DT	Actual Meter Vol Vm, ft <sup>3</sup>	Velocity Head DP, in. H <sub>2</sub> O	Orifice DH in. H <sub>2</sub> O	Ideal Point Volume Vm, ft <sup>3</sup>	Ideal Meter Vol Vm, ft <sup>3</sup>	Sample Train Vacuum in. Hg	Stack Temp Ts, °F	Sample Train Temperatures, °F					Moisture Content, %
									Filter	Probe	Impinger Outlet	Meter Inlet	Meter Outlet	
Start Time	1326	591.47												
1	5.0	594.41	0.660	1.02	2.92	594.39	*	146	*	*	*	65	63	12.0
2	10.0	597.30	0.650	1.00	2.89	597.28	*	146	*	*	*	69	63	12.0
3	15.0	600.31	0.710	1.10	3.03	600.31	*	147	*	*	*	73	63	12.0
4	20.0	603.32	0.720	1.12	3.06	603.37	*	148	*	*	*	75	63	12.0
5	25.0	606.46	0.790	1.23	3.21	606.58	*	149	*	*	*	76	64	12.0
6	30.0	609.55	0.780	1.21	3.20	609.78	*	148	*	*	*	77	65	12.0
7	35.0	613.01	0.910	1.42	3.46	613.23	*	149	*	*	*	78	65	12.0
8	40.0	616.54	0.930	1.45	3.50	616.73	*	147	*	*	*	78	65	12.0
9	45.0	619.94	0.940	1.47	3.52	620.25	*	147	*	*	*	78	66	12.0
10	50.0	623.37	0.920	1.44	3.49	623.74	*	147	*	*	*	79	66	12.0
11	55.0	626.36	0.690	1.08	3.03	626.77	*	146	*	*	*	78	66	12.0
12	60.0	629.29	0.680	1.06	3.00	629.77	*	147	*	*	*	79	67	12.0
13	65.0	632.27	0.650	1.02	2.94	632.71	*	146	*	*	*	77	67	12.0
14	70.0	635.20	0.660	1.04	2.96	635.67	*	146	*	*	*	80	67	12.0
15	75.0	638.50	0.800	1.25	3.26	638.93	*	148	*	*	*	80	67	12.0
16	80.0	641.75	0.810	1.27	3.28	642.20	*	149	*	*	*	80	68	12.0
17	85.0	645.00	0.860	1.35	3.38	645.58	*	148	*	*	*	81	68	12.0
18	90.0	648.38	0.870	1.37	3.40	648.99	*	148	*	*	*	81	68	12.0
19	95.0	651.52	0.860	1.35	3.38	652.37	*	148	*	*	*	81	69	12.0
20	100.0	654.83	0.870	1.37	3.41	655.78	*	148	*	*	*	82	69	12.0
21	105.0	658.11	0.830	1.31	3.34	659.11	*	146	*	*	*	83	69	12.0
22	110.0	661.35	0.850	1.34	3.38	662.49	*	146	*	*	*	83	69	12.0
23	115.0	664.58	0.710	1.12	3.09	665.59	*	145	*	*	*	83	70	12.0
24	120.0	667.61	0.680	1.08	3.03	668.62	*	146	*	*	*	83	70	12.0
End Time	1530													
Run Time	120		Avg DH=	1.23			Avg Ts=	147.13				Avg Tm=	72.42	

## Integrated Gas Sampling Data :

Bag No. 3  
Bag Vol. 15 liters  
Leak Rate 0 cc/min

Filter No. NA  
Nozzle No. Glass  
Nozzle Dn. 0.213

## MOISTURE RECOVERY DATA :

Impinger  
Final wt., g  
Initial wt., g  
Difference

1	2	3	4	5	6	7	Desiccant	Total
904.4	775.0	807.3	741.2	761.9	752.5	768.3	892.7	
791.2	745.4	799.9	734.8	762.2	751.3	769.2	876.4	
113.2	29.6	7.4	6.4	-0.3	1.2	-0.9	16.3	172.9

\* Data Recorded on Field Data Sheet



ONTARIO HYRDO D-6784-16 MERCURY TESTING  
FIELD DATA SHEET RY JUV25

Project Hibbing Taconite Company Meter ID C-3 Probe ID 10-Y Bar. Pres 28.26 in Hg  
Smpl Loc F#2 JUV25 Meter Y 0.9923 Pitot No. 10-Y Stat. Pres 20.75 in H<sub>2</sub>O  
Test No. 4 Run 1 Orifice H@ 1.7942 Pitot Cp 0.81 Probe Lgth 10 ft  
Date 9/8/17 Operators OTV/LW Liner Type: ☒ Glass ☐ S.S. ☐ Other Imp TC

Sample Train Leak Rate (cfm)		
Pretest	0.0	at 10 in Hg
Posttest	0.0	at 8 in Hg
Pitot (3 in.)	Pos. <input checked="" type="checkbox"/> Neg. <input type="checkbox"/>	

Sample Point	Sample Time Δt	Meter Volume Vm, ft <sup>3</sup>	Velocity ΔP, in H <sub>2</sub> O	Orifice ΔH, in H <sub>2</sub> O	Ideal Meter Volume	Sample Vacuum, in Hg	Stack Temp. Ts, °F	Sample Train Temperatures, °F					Oxygen Content, %
								Probe	Filter	Impinger Outlet	Meter Inlet	Meter Outlet	
		434.87											
A-6	5	441.78	0.70	1.07		3.5	145	242	250	58	56	58	
6	10	447.70	0.71	1.08		3.5	145	236	253	57	60	57	
5	15	447.98	0.79	1.20		3.5	146	233	244	55	63	54	
5	20	451.05	0.77	1.18		4.0	147	235	250	55	66	55	
4	25	454.14	0.82	1.26		4.0	147	234	246	55	68	55	
4	30	457.47	0.82	1.26		4.0	147	239	250	56	70	56	
3	35	460.83	0.93	1.44		4.5	145	244	255	57	72	57	
3	40	464.16	0.96	1.39		4.0	145	243	251	57	73	58	
2	45	467.50	0.87	1.35		4.0	146	240	248	57	74	58	
2	50	470.82	0.86	1.37		4.0	146	234	256	56	74	59	
1	55	473.73	0.64	1.00		3.5	144	233	247	57	75	60	
1	60	476.67	0.66	1.03		3.5	145	234	252	57	75	60	
B-6	65	479.52	0.65	1.00		3.5	150	241	252	57	61	60	
6	70	482.48	0.65	0.99		3.5	150	240	251	57	64	60	
5	75	485.64	0.83	1.27		4.0	150	240	242	57	68	60	
5	80	488.95	0.85	1.31		4.0	147	237	249	58	70	60	
4	85	492.22	0.87	1.34		4.0	148	235	254	60	72	60	
4	90	495.57	0.89	1.38		4.0	148	239	250	61	72	60	
3	95	498.92	0.83	1.28		4.0	147	234	244	62	73	60	
3	100	502.17	0.87	1.34		4.0	149	238	250	62	74	61	
2	105	505.48	0.84	1.30		4.0	148	233	250	62	74	61	
2	110	508.80	0.83	1.29		4.0	147	234	247	62	75	61	
1	115	511.71	0.68	1.06		3.5	146	233	254	63	74	62	
1	120	514.63	0.68	1.06		3.5	146	239	255	63	74	62	
0=		Vm=75.96	0.79	ΔH=1.22			Ts=146.33					Tm=64.25	

Initialization Values			Test Run Times		ORSAT System			Sample Train Components			Nozzle Calibration	
Meter Temp	Oxygen Content	Moisture Content	Start Time	End Time	Bag No.	Bag Vol	cc/min* at 15 in Hg	Filter No.	Nozzle No.	Nozzle Dn	Tech.	Date
56	19.7	12.0	0717	1022				NA	6.1433	0.243		
Run 1											1	
Run 2											2	
											3	
											Avg. in.	

stop 0821, restart 0924 balling down

Moisture Recovery Data and impinger content information:

Impinger	1	2	3	4	5	6	7	Desiccant	Total
Final wt., g									
Initial wt., g									
Difference									
	1 N KCI		HNO3/H2O2		H2SO4/KMNO4				

Air Flows	
ACFM	DSCFM
199.673	148.450



ONTARIO HYDRO D-6784-16 MERCURY TESTING  
FIELD DATA SHEET

Project Hibbing Taconite Company Meter ID C-3 Probe ID 10-Y Bar. Pres 28.26 in Hg  
Smpl Loc F#2 SU025 Meter Y 0.9923 Pitot No. 10-X Stat. Pres -0.75 in H<sub>2</sub>O  
Test No. 7 Run 2 Orifice H@ 1.7942 Pitot Cp 0.8x Probe Lgth 10 ft  
Date 9/3/17 Operators 07K/L.V. Liner Type: ☐ Glass ☒ S.S. ☐ Other Imp TC

Sample Train Leak Rate (cfm)		
Pretest	<u>5.0</u>	at <u>10</u> in Hg
Posttest	<u>0.5</u>	at <u>6</u> in Hg
Pitot (3 in.)	Pos. <input checked="" type="checkbox"/> Neg. <input checked="" type="checkbox"/>	

Sample Point	Sample Time $\Delta t$	Meter Volume Vm, ft <sup>3</sup>	Velocity $\Delta P$ , in H <sub>2</sub> O	Orifice $\Delta H$ , in H <sub>2</sub> O	Ideal Meter Volume	Sample Vacuum, in Hg	Stack Temp. Ts, °F	Sample Train Temperatures, °F					Oxygen Content, %
								Probe	Filter	Impinger Outlet	Meter Inlet	Meter Outlet	
		<u>515.11</u>		<u>1.05</u>	<u>1.10</u>								
A-6	5	<u>518.07</u>	<u>0.68</u>	<u>1.05</u>	<u>1.10</u>	<u>2.0</u>	<u>146</u>	<u>240</u>	<u>245</u>	<u>57</u>	<u>65</u>	<u>61</u>	
6	10	<u>521.12</u>	<u>0.70</u>	<u>1.08</u>	<u>1.13</u>	<u>2.0</u>	<u>147</u>	<u>240</u>	<u>251</u>	<u>56</u>	<u>70</u>	<u>61</u>	
5	15	<u>524.31</u>	<u>0.83</u>	<u>1.28</u>	<u>1.34</u>	<u>2.5</u>	<u>149</u>	<u>237</u>	<u>252</u>	<u>55</u>	<u>73</u>	<u>61</u>	
5	20	<u>527.60</u>	<u>0.86</u>	<u>1.28</u>	<u>1.30</u>	<u>2.5</u>	<u>149</u>	<u>249</u>	<u>257</u>	<u>55</u>	<u>74</u>	<u>61</u>	
4	25	<u>530.89</u>	<u>0.88</u>	<u>1.36</u>	<u>1.43</u>	<u>3.0</u>	<u>148</u>	<u>249</u>	<u>250</u>	<u>56</u>	<u>75</u>	<u>61</u>	
4	30	<u>534.18</u>	<u>0.85</u>	<u>1.32</u>	<u>1.39</u>	<u>3.0</u>	<u>147</u>	<u>247</u>	<u>250</u>	<u>57</u>	<u>75</u>	<u>61</u>	
3	35	<u>537.42</u>	<u>0.83</u>	<u>1.29</u>	<u>1.35</u>	<u>3.0</u>	<u>147</u>	<u>236</u>	<u>252</u>	<u>58</u>	<u>75</u>	<u>62</u>	
3	40	<u>540.66</u>	<u>0.88</u>	<u>1.37</u>	<u>1.44</u>	<u>3.0</u>	<u>147</u>	<u>231</u>	<u>251</u>	<u>58</u>	<u>75</u>	<u>62</u>	
2	45	<u>543.87</u>	<u>0.92</u>	<u>1.38</u>	<u>1.34</u>	<u>3.0</u>	<u>146</u>	<u>234</u>	<u>248</u>	<u>59</u>	<u>75</u>	<u>62</u>	
2	50	<u>547.11</u>	<u>0.81</u>	<u>1.26</u>	<u>1.33</u>	<u>2.5</u>	<u>146</u>	<u>237</u>	<u>257</u>	<u>60</u>	<u>75</u>	<u>63</u>	
1	55	<u>550.45</u>	<u>0.64</u>	<u>1.20</u>	<u>1.25</u>	<u>2.5</u>	<u>144</u>	<u>240</u>	<u>253</u>	<u>60</u>	<u>75</u>	<u>63</u>	
1	60	<u>552.93</u>	<u>0.68</u>	<u>1.06</u>	<u>1.12</u>	<u>2.5</u>	<u>144</u>	<u>241</u>	<u>252</u>	<u>61</u>	<u>75</u>	<u>63</u>	
B-6	65	<u>555.86</u>	<u>0.68</u>	<u>1.06</u>	<u>1.12</u>	<u>2.5</u>	<u>144</u>	<u>240</u>	<u>252</u>	<u>61</u>	<u>70</u>	<u>63</u>	
6	70	<u>558.82</u>	<u>0.70</u>	<u>1.09</u>	<u>1.14</u>	<u>2.5</u>	<u>145</u>	<u>240</u>	<u>251</u>	<u>61</u>	<u>75</u>	<u>63</u>	
5	75	<u>562.06</u>	<u>0.75</u>	<u>1.17</u>	<u>1.23</u>	<u>2.5</u>	<u>147</u>	<u>244</u>	<u>247</u>	<u>62</u>	<u>75</u>	<u>63</u>	
5	80	<u>565.21</u>	<u>0.77</u>	<u>1.20</u>	<u>1.26</u>	<u>2.5</u>	<u>147</u>	<u>240</u>	<u>244</u>	<u>63</u>	<u>74</u>	<u>63</u>	
4	85	<u>568.38</u>	<u>0.81</u>	<u>1.26</u>	<u>1.32</u>	<u>2.5</u>	<u>147</u>	<u>244</u>	<u>244</u>	<u>65</u>	<u>74</u>	<u>63</u>	
4	90	<u>571.57</u>	<u>0.78</u>	<u>1.21</u>	<u>1.27</u>	<u>2.5</u>	<u>147</u>	<u>235</u>	<u>245</u>	<u>63</u>	<u>76</u>	<u>64</u>	
3	95	<u>574.91</u>	<u>0.93</u>	<u>1.25</u>	<u>1.28</u>	<u>3.0</u>	<u>147</u>	<u>237</u>	<u>247</u>	<u>64</u>	<u>77</u>	<u>64</u>	
3	100	<u>578.36</u>	<u>0.90</u>	<u>1.40</u>	<u>1.47</u>	<u>3.0</u>	<u>144</u>	<u>230</u>	<u>252</u>	<u>59</u>	<u>77</u>	<u>65</u>	
2	105	<u>581.73</u>	<u>0.91</u>	<u>1.42</u>	<u>1.49</u>	<u>3.0</u>	<u>147</u>	<u>234</u>	<u>253</u>	<u>58</u>	<u>77</u>	<u>65</u>	
2	110	<u>585.20</u>	<u>0.91</u>	<u>1.42</u>	<u>1.49</u>	<u>3.0</u>	<u>148</u>	<u>240</u>	<u>242</u>	<u>58</u>	<u>77</u>	<u>65</u>	
1	115	<u>588.18</u>	<u>0.93</u>	<u>1.14</u>	<u>1.20</u>	<u>2.5</u>	<u>146</u>	<u>241</u>	<u>241</u>	<u>58</u>	<u>77</u>	<u>65</u>	
1	120	<u>591.18</u>	<u>0.70</u>	<u>1.09</u>	<u>1.15</u>	<u>2.5</u>	<u>147</u>	<u>242</u>	<u>247</u>	<u>58</u>	<u>77</u>	<u>65</u>	
Σ=		Vm= <u>26.27</u>	<u>0.79</u>	ΔH= <u>1.23</u>	<u>1.29</u>		Ts= <u>146.71</u>					Tm= <u>68.69</u>	

Initialization Values			Test Run Times		ORSAT System			Sample Train Components			Nozzle Calibration	
Meter Temp	Oxygen Content	Moisture Content	Start Time	End Time	Bag No.	Bag Vol	cc/min * at 15 in Hg	Filter No.	Nozzle No.	Nozzle Dn	Tech.	Date
Run 1	<u>6.3</u>	<u>19.7</u>	<u>10 51</u>	<u>12 55</u>						<u>0.213</u>	1	
Run 2		<u>9.4</u>									2	
											3	
											Avg. in.	

Moisture Recovery Data and impinger content information:

Impinger	1	2	3	4	5	6	7	Desiccant	Total
Final wt., g									
Initial wt., g									
Difference									
1 N KCl			HNO3/H2O2			H2SO4/KMNO4			

Air Flows	
ACFM	DSCFM
<u>200.148</u>	<u>147.610</u>





# ONTARIO HYRDO D-6784-16 MERCURY TESTING FIELD DATA SHEET

Project Hibbing Taconite Company Meter ID C-3 Probe ID 10-4 Bar. Pres 28.26 in Hg  
Smpl Loc F#2 S0025 Meter Y 0.9923 Pitot No. 10-4 Stat. Pres -0.78 in H<sub>2</sub>O  
Test No. 4 Run 3 Orifice H@ 0.7942 Pitot Cp 0.85 Probe Lgth 10 ft  
Date 9/7/12 Operators 03K/LC Liner Type X Glass ☐ S.S. ☐ Other ☐ Imp TC ☐

Sample Train Leak Rate (cfm)		
Pretest	<u>0.0</u>	at <u>10</u> in Hg
Posttest	<u>0.0</u>	at <u>7</u> in Hg
Pitot (3 in.)	Pos. <input checked="" type="checkbox"/>	Neg. <input checked="" type="checkbox"/>

Sample Point	Sample Time $\Delta t$	Meter Volume Vm, ft <sup>3</sup>	Velocity $\Delta P$ , in H <sub>2</sub> O	Orifice $\Delta H$ , in H <sub>2</sub> O	Ideal Meter Volume	Sample Vacuum, in Hg	Stack Temp. T <sub>s</sub> , °F	Sample Train Temperatures, °F					Oxygen Content, %
								Probe	Filter	Impinger Outlet	Meter Inlet	Meter Outlet	
A-6	5	591.47	0.66	1.02	1.06	3.5	146	236	245	66	65	63	
6	10	597.30	0.65	1.00	1.04	3.5	146	245	250	63	64	63	
5	15	600.31	0.71	1.10	1.14	3.5	147	248	252	61	73	63	
5	20	603.32	0.72	1.12	1.16	3.5	148	250	251	60	75	63	
4	25	606.46	0.79	1.23	1.27	3.5	149	250	249	61	76	64	
4	30	609.55	0.78	1.21	1.26	4.0	148	243	247	62	77	65	
3	35	613.01	0.91	1.42	1.47	4.5	149	250	251	62	78	65	
3	40	616.54	0.93	1.45	1.51	4.5	147	244	249	62	78	65	
2	45	619.94	0.94	1.47	1.52	4.5	147	237	245	63	78	66	
2	50	623.37	0.92	1.44	1.49	4.0	147	244	251	64	79	66	
1	55	626.36	0.69	1.08	1.12	3.5	146	247	247	64	78	66	
1	60	629.24	0.68	1.06	1.10	3.5	147	239	256	64	79	67	
B-6	65	632.27	0.65	1.02	1.06	3.5	146	238	250	66	77	67	
6	70	635.20	0.66	1.04	1.07	3.5	146	239	250	63	80	67	
5	75	638.50	0.80	1.25	1.30	4.0	148	241	251	58	80	67	
5	80	641.75	0.81	1.27	1.31	4.0	149	240	248	57	80	68	
4	85	645.00	0.86	1.35	1.40	4.0	148	241	247	57	81	68	
4	90	648.38	0.87	1.37	1.42	4.0	148	238	242	58	81	69	
3	95	651.52	0.86	1.35	1.40	4.0	148	237	245	59	81	69	
3	100	654.83	0.87	1.37	1.42	4.0	148	240	247	59	82	69	
2	105	658.11	0.87	1.31	1.36	4.0	146	233	255	62	83	69	
2	110	661.35	0.85	1.34	1.39	4.0	146	232	237	62	83	69	
1	115	664.58	0.71	1.12	1.16	3.5	145	240	241	62	83	70	
1	120	667.61	0.68	1.08	1.11	3.5	146	252	251	62	83	70	
0=		Vm=26.14	0.78	$\Delta H=1.23$	1.27		Ts=147.13					Tm=72.42	

Initialization Values			Test Run Times		ORSAT System			Sample Train Components			Nozzle Calibration	
Meter Temp	Oxygen Content	Moisture Content	Start Time	End Time	Bag No.	Bag Vol	cc/min * at 15 in Hg	Filter No.	Nozzle No.	Nozzle Dn	Tech.	Date
65	19.7	10.1	1326	1530					9101	0.217		
Run 1											1	
Run 2											2	
											3	
											Avg. in.	

Moisture Recovery Data and impinger content information:

Impinger	1	2	3	4	5	6	7	Desiccant	Total
Final wt., g									
Initial wt., g									
Difference									
	1 N KCl		HNO <sub>3</sub> /H <sub>2</sub> O <sub>2</sub>		H <sub>2</sub> SO <sub>4</sub> /KMnO <sub>4</sub>				

Air Flows	
ACFM	DSCFM
199.464	146.677



ONTARIO HYRDO D-6784-16 MERCURY TESTING  
IMPINGER RECOVERY

Project HTC Halldale

Date 9/7/17

Project No.

Operators BAW

Source Line 2 Stack D SVD25

Sample Location Stack

TEST RUN 1	IMPINGER VOLUMES							DRY COLUMN
	1	2	3	4	5	6	7	
	g	g	g	g	g	g	g	
START.	763.4	752.5	800.1	760.1	763.4	755.0	769.8	940.0
END	875.3	776.0	805.7	763.6	761.7	754.6	768.8	955.6
CHANGE	111.9	23.5	5.6	3.5	-1.7	-0.4	-1.0	15.6
MASS OF MOISTURE COLLECTED, g								157.0

TEST RUN 2	IMPINGER VOLUMES							DRY COLUMN
	1	2	3	4	5	6	7	
	g	g	g	g	g	g	g	
START.	750.5	762.6	775.6	757.7	762.4	805.1	759.1	955.5
END	866.6	793.7	781.7	762.5	763.8	805.4	757.9	967.1
CHANGE	116.1	31.1	6.1	4.8	1.4	0.3	-1.2	11.6
MASS OF MOISTURE COLLECTED, g								170.2

TEST RUN 3	IMPINGER VOLUMES							DRY COLUMN
	1	2	3	4	5	6	7	
	g	g	g	g	g	g	g	
START.	791.2	745.4	799.9	734.8	762.2	751.3	769.2	876.4
END	904.4	775.0	807.3	741.2	761.9	752.5	768.3	892.7
CHANGE	113.2	29.6	7.4	6.4	-0.3	1.2	-0.9	16.3
MASS OF MOISTURE COLLECTED, g								172.9

TEST RUN 4	IMPINGER VOLUMES							DRY COLUMN
	1	2	3	4	5	6	7	
	g	g	g	g	g	g	g	
START.								
END								
CHANGE								

COMMENTS



## EPA METHOD 3A -- Instrument Analysis Data Sheet

Project Hibbing Taconite Company  
Sample Location(s): Pellet Indurating Furnace Line 2 - Stack 4  
Test No: Baseline  
Date: 09/06/17  
Operators: TYL

Analyzer Make / Model / Serial No. Servomex 1440  
Analyzer O<sub>2</sub> Range (span), %: 0-21.2  
Analyzer CO<sub>2</sub> Range (span), %: 0-9.5

	Cylinder Serial No.		
		O <sub>2</sub> Cert. Conc.	CO <sub>2</sub> Cert. Conc.
Zero Gas	Nitrogen	0	0
CO <sub>2</sub> Low-Range	CC37750	-	5
O <sub>2</sub> /CO <sub>2</sub> Mid-range	CA06672	9.6	9.5
O <sub>2</sub> High-range	CA06643	21.2	-

## PRETEST ANALYZER CALIBRATION DATA

	O <sub>2</sub>		CO <sub>2</sub>	
	Cylinder Value, %	Analyzer Calibration Response, %	Cylinder Value, %	Analyzer Calibration Response, %
Zero Gas	0	0.1	0	0
Mid-range:	9.6	9.5	5	4.9
High-range:	21.2	21.1	9.5	9.6

Time of Calibration \_\_\_\_\_ to \_\_\_\_\_

## INTEGRATED BAG ANALYSIS

Location/Test No.

Run No.

Time Sampled

Time Analyzed

O<sub>2</sub>, %

CO<sub>2</sub>, %

Line 2 SV025		
1	2	3
18.9	18.8	18.9
0.8	0.8	0.8

## POSTTEST ANALYZER CALIBRATION DATA

	O <sub>2</sub>		CO <sub>2</sub>	
	Cylinder Value, %	Analyzer Calibration Response, %	Cylinder Value, %	Analyzer Calibration Response, %
Zero Gas				
Mid-range:				
High-range:				



## Ontario Hydro ASTM D6784 - Field Data Sheet - Run 1

Project	Hibbing Taconite Company		Meter ID	C-8	Probe ID	10-3	Bar.Press.	28.26	in. Hg	Sample Train Leak Rate, cfm:		
Sample Location	Pellet Indurating Furnace Line 2 - Stack 3 SV026		Meter Y	0.9994	Pitot Tube No.	10-3	Stat Press.	-0.8	in. H <sub>2</sub> O	Pretest	0.000	at 10 in. Hg
Date	09/07/17		Orifice dH@	1.9257	Pitot Cp	0.84	CPM TC	0		Posttest	0.000	at 7 in. Hg
Test	Baseline	Run #	1		Liner Type:	Glass	IMP Out TC	0		Pretest Pitot leak Check Pos	pass	@ >3" w.c
Operators	DJK /LDP2									Posttest Pitot leak Check Neg	pass	@ >3" w.c

Sample Point	Sample Time DT	Actual Meter Vol Vm, ft <sup>3</sup>	Velocity Head DP, in. H <sub>2</sub> O	Orifice DH in. H <sub>2</sub> O	Ideal Point Volume Vm, ft <sup>3</sup>	Ideal Meter Vol Vm, ft <sup>3</sup>	Sample Train Vacuum in. Hg	Stack Temp Ts, °F	Sample Train Temperatures, °F					Moisture Content, %
									Filter	Probe	Impinger Outlet	Meter Inlet	Meter Outlet	
Start Time	717													
1	5.0	880.74	0.800	1.34	3.15	880.77	*	135	*	*	*	50	50	11.0
2	10.0	883.86	0.820	1.37	3.19	883.96	*	135	*	*	*	50	50	11.0
3	15.0	887.15	0.910	1.52	3.36	887.33	*	135	*	*	*	51	50	11.0
4	20.0	890.53	0.930	1.56	3.40	890.73	*	136	*	*	*	52	50	11.0
5	25.0	894.00	0.930	1.56	3.40	894.13	*	136	*	*	*	53	50	11.0
6	30.0	897.28	0.950	1.59	3.44	897.57	*	137	*	*	*	54	50	11.0
7	35.0	900.72	0.940	1.57	3.43	901.00	*	137	*	*	*	55	51	11.0
8	40.0	904.07	0.910	1.53	3.38	904.38	*	135	*	*	*	55	51	11.0
9	45.0	907.26	0.830	1.40	3.23	907.61	*	136	*	*	*	56	51	11.0
10	50.0	910.44	0.850	1.43	3.27	910.88	*	135	*	*	*	57	51	11.0
11	55.0	913.30	0.670	1.13	2.91	913.80	*	135	*	*	*	56	51	11.0
12	60.0	916.13	0.640	1.08	2.84	916.64	*	136	*	*	*	56	51	11.0
13	65.0	919.00	0.620	1.05	2.80	919.44	*	134	*	*	*	55	52	11.0
14	70.0	921.71	0.580	0.98	2.71	922.15	*	134	*	*	*	50	49	11.0
15	75.0	924.91	0.830	1.38	3.20	925.35	*	137	*	*	*	51	50	11.0
16	80.0	928.32	0.950	1.59	3.43	928.79	*	137	*	*	*	52	49	11.0
17	85.0	931.72	1.000	1.67	3.53	932.31	*	136	*	*	*	52	49	11.0
18	90.0	935.23	1.000	1.67	3.53	935.84	*	136	*	*	*	53	50	11.0
19	95.0	938.60	0.940	1.58	3.43	939.26	*	135	*	*	*	54	50	11.0
20	100.0	942.03	0.910	1.52	3.37	942.64	*	137	*	*	*	54	50	11.0
21	105.0	945.18	0.840	1.41	3.24	945.87	*	137	*	*	*	54	50	11.0
22	110.0	948.48	0.840	1.41	3.24	949.12	*	136	*	*	*	54	50	11.0
23	115.0	951.32	0.650	1.09	2.85	951.97	*	136	*	*	*	54	50	11.0
24	120.0	954.14	0.670	1.12	2.90	954.87	*	136	*	*	*	54	50	11.0
End Time	1022													
Run Time	120		Avg DH=	1.40			Avg Ts=	135.79				Avg Tm=	51.81	

## Integrated Gas Sampling Data :

Bag No. 1  
Bag Vol. 15 liters  
Leak Rate 0 cc/min

Filter No. NA  
Nozzle No. Glass  
Nozzle Dn. 0.213

## MOISTURE RECOVERY DATA :

Impinger  
Final wt., g  
Initial wt., g  
Difference

1	2	3	4	5	6	7	Desiccant	Total
814.5	758.7	768.4	766.0	751.8	764.5	739.0	952.3	
723.7	726.9	761.0	763.1	751.7	765.1	739.2	934.0	
90.8	31.8	7.4	2.9	0.1	-0.6	-0.2	18.3	150.5

\* Data Recorded on Field Data Sheet



## Ontario Hydro ASTM D6784 - Field Data Sheet - Run 2

Project	Hibbing Taconite Company	Meter ID	C-8	Probe ID	10-3	Bar.Press.	28.26	in. Hg	Sample Train Leak Rate, cfm:
Sample Location	Pellet Indurating Furnace Line 2 - Stack 3 SV026	Meter Y	0.9994	Pitot Tube No.	10-3	Stat Press.	-0.8	in. H <sub>2</sub> O	Pretest 0.000 at 10 in. Hg
Date	09/07/17	Orifice dH@	1.9257	Pitot Cp	0.84	CPM TC	NA		Posttest 0.000 at 10 in. Hg
Test	Baseline	Run #	2	Liner Type:	Glass	IMP Out TC	0		Pretest Pitot leak Check Pos pass @ >3" w.c
Operators	DJK /LDP2								Posttest Pitot leak Check Neg pass @ >3" w.c

Sample Point	Sample Time DT	Actual Meter Vol Vm, ft <sup>3</sup>	Velocity Head DP, in. H <sub>2</sub> O	Orifice DH in. H <sub>2</sub> O	Ideal Point Volume Vm, ft <sup>3</sup>	Ideal Meter Vol Vm, ft <sup>3</sup>	Sample Train Vacuum in. Hg	Stack Temp Ts, °F	Sample Train Temperatures, °F					Moisture Content, %
									Filter	Probe	Impinger Outlet	Meter Inlet	Meter Outlet	
Start Time	1051	955.74												
1	5.0	958.80	0.780	1.30	3.11	958.85	*	135	*	*	*	52	50	11.0
2	10.0	961.81	0.780	1.31	3.12	961.97	*	135	*	*	*	52	50	11.0
3	15.0	965.14	0.940	1.57	3.42	965.39	*	136	*	*	*	54	51	11.0
4	20.0	968.65	1.000	1.68	3.54	968.93	*	137	*	*	*	55	51	11.0
5	25.0	972.32	1.100	1.85	3.71	972.64	*	136	*	*	*	56	52	11.0
6	30.0	976.08	1.150	1.93	3.80	976.44	*	137	*	*	*	56	52	11.0
7	35.0	979.64	1.000	1.68	3.55	979.99	*	137	*	*	*	55	52	11.0
8	40.0	983.18	0.970	1.63	3.49	983.48	*	136	*	*	*	55	52	11.0
9	45.0	986.61	0.920	1.55	3.40	986.88	*	136	*	*	*	55	52	11.0
10	50.0	989.92	0.890	1.50	3.35	990.23	*	136	*	*	*	55	51	11.0
11	55.0	993.08	0.760	1.28	3.09	993.32	*	136	*	*	*	55	51	11.0
12	60.0	996.06	0.720	1.21	3.01	996.33	*	136	*	*	*	54	51	11.0
13	65.0	999.46	0.930	1.57	3.42	999.75	*	134	*	*	*	54	51	11.0
14	70.0	1002.88	0.970	1.63	3.49	1003.24	*	134	*	*	*	54	51	11.0
15	75.0	1006.51	1.100	1.85	3.71	1006.96	*	135	*	*	*	55	51	11.0
16	80.0	1010.16	1.050	1.77	3.63	1010.58	*	136	*	*	*	55	51	11.0
17	85.0	1013.91	1.100	1.85	3.71	1014.30	*	136	*	*	*	55	52	11.0
18	90.0	1017.53	1.100	1.85	3.72	1018.02	*	135	*	*	*	55	52	11.0
19	95.0	1021.18	1.050	1.76	3.63	1021.65	*	137	*	*	*	56	52	11.0
20	100.0	1024.79	1.050	1.77	3.63	1025.28	*	137	*	*	*	56	52	11.0
21	105.0	1028.37	0.980	1.65	3.51	1028.79	*	138	*	*	*	56	52	11.0
22	110.0	1031.87	0.990	1.67	3.53	1032.32	*	137	*	*	*	56	52	11.0
23	115.0	1035.05	0.810	1.36	3.19	1035.51	*	137	*	*	*	55	52	11.0
24	120.0	1038.21	0.820	1.38	3.21	1038.72	*	137	*	*	*	55	52	11.0
End Time	1255													
Run Time	120		Avg DH=	1.61			Avg Ts=	136.08				Avg Tm=	53.15	

Integrated Gas Sampling Data :

Bag No.	2
Bag Vol.	15 liters
Leak Rate	0 cc/min

Filter No.	NA
Nozzle No.	Glass
Nozzle Dn.	0.213

MOISTURE RECOVERY DATA :

Impinger
Final wt., g
Initial wt., g
Difference

1	2	3	4	5	6	7	Desiccant	Total
862.7	827.6	760.7	770.2	755.5	719.0	752.6	985.6	
754.8	798.1	755.4	766.4	755.2	718.5	754.0	961.8	
107.9	29.5	5.3	3.8	0.3	0.5	-1.4	23.8	169.7

\* Data Recorded on Field Data Sheet





## Ontario Hydro ASTM D6784 - Field Data Sheet - Run 3

Project	Hibbing Taconite Company		Meter ID	C-8	Probe ID	10-3	Bar.Press.	28.26	in. Hg	Sample Train Leak Rate, cfm:		
Sample Location	Pellet Indurating Furnace Line 2 - Stack 3 SV026		Meter Y	0.9994	Pitot Tube No.	10-3	Stat Press.	-0.8	in. H <sub>2</sub> O	Pretest	0.000	at 10 in. Hg
Date	09/07/17		Orifice dH@	1.9257	Pitot Cp	0.84	CPM TC	NA		Posttest	0.000	at 8 in. Hg
Test	Baseline	Run #	3		Liner Type:	Glass	IMP Out TC	0		Pretest Pitot leak Check Pos	pass	@ >3" w.c
Operators	DJK /LDP2									Posttest Pitot leak Check Neg	pass	@ >3" w.c

Sample Point	Sample Time DT	Actual Meter Vol Vm, ft <sup>3</sup>	Velocity Head DP, in. H <sub>2</sub> O	Orifice DH in. H <sub>2</sub> O	Ideal Point Volume Vm, ft <sup>3</sup>	Ideal Meter Vol Vm, ft <sup>3</sup>	Sample Train Vacuum in. Hg	Stack Temp Ts, °F	Sample Train Temperatures, °F					Moisture Content, %
									Filter	Probe	Impinger Outlet	Meter Inlet	Meter Outlet	
Start Time	1326	38.43												
1	5.0	41.57	0.770	1.29	3.10	41.53	*	136	*	*	*	52	51	11.0
2	10.0	44.68	0.800	1.34	3.16	44.69	*	136	*	*	*	53	51	11.0
3	15.0	48.01	0.900	1.51	3.36	48.05	*	136	*	*	*	54	51	11.0
4	20.0	51.25	0.930	1.56	3.41	51.45	*	138	*	*	*	55	52	11.0
5	25.0	54.56	0.940	1.58	3.44	54.89	*	137	*	*	*	55	52	11.0
6	30.0	58.02	0.940	1.58	3.44	58.33	*	136	*	*	*	56	52	11.0
7	35.0	61.27	0.910	1.53	3.38	61.71	*	139	*	*	*	57	53	11.0
8	40.0	64.67	0.920	1.55	3.41	65.11	*	138	*	*	*	57	53	11.0
9	45.0	68.00	0.850	1.43	3.28	68.39	*	138	*	*	*	57	53	11.0
10	50.0	71.35	0.850	1.43	3.28	71.66	*	138	*	*	*	57	53	11.0
11	55.0	74.32	0.700	1.18	2.98	74.64	*	137	*	*	*	57	53	11.0
12	60.0	77.17	0.700	1.18	2.97	77.61	*	138	*	*	*	57	53	11.0
13	65.0	80.01	0.630	1.06	2.83	80.44	*	136	*	*	*	57	52	11.0
14	70.0	82.89	0.630	1.07	2.83	83.27	*	134	*	*	*	57	54	11.0
15	75.0	86.30	0.880	1.49	3.34	86.61	*	136	*	*	*	58	54	11.0
16	80.0	89.48	0.900	1.52	3.38	89.99	*	137	*	*	*	58	54	11.0
17	85.0	92.95	0.950	1.60	3.47	93.46	*	137	*	*	*	59	55	11.0
18	90.0	96.31	0.940	1.59	3.46	96.92	*	138	*	*	*	59	55	11.0
19	95.0	99.62	0.890	1.50	3.36	100.28	*	138	*	*	*	60	55	11.0
20	100.0	102.91	0.880	1.49	3.35	103.63	*	138	*	*	*	61	56	11.0
21	105.0	106.15	0.840	1.43	3.28	106.91	*	137	*	*	*	62	57	11.0
22	110.0	109.38	0.840	1.43	3.29	110.20	*	137	*	*	*	62	56	11.0
23	115.0	112.31	0.680	1.15	2.96	113.15	*	137	*	*	*	62	57	11.0
24	120.0	115.26	0.680	1.16	2.96	116.11	*	137	*	*	*	62	57	11.0
End Time	1530													
Run Time	120		Avg DH=	1.40			Avg Ts=	137.04				Avg Tm=	55.69	

## Integrated Gas Sampling Data :

Bag No.	3	Filter No.	NA
Bag Vol.	15 liters	Nozzle No.	Glass
Leak Rate	0 cc/min	Nozzle Dn.	0.213

## MOISTURE RECOVERY DATA :

Impinger	1	2	3	4	5	6	7	Desiccant	Total
Final wt., g	841.3	779.4	778.3	775.7	751.9	755.8	765.1	927.7	
Initial wt., g	754.0	754.5	768.9	770.3	750.9	755.1	765.4	909.2	
Difference	87.3	24.9	9.4	5.4	1.0	0.7	-0.3	18.5	146.9

\* Data Recorded on Field Data Sheet



ONTARIO HYRDO D-6784-16 MERCURY TESTING  
FIELD DATA SHEET #3 SU026

Project Hibbing Taconite Company Meter ID C-8 Probe ID 10-3 Bar. Pres 28.26 in Hg  
Smpl Loc F#2 SU026 Meter Y 0.999 Pitot No. 10-3 Stat. Pres -0.77 in H<sub>2</sub>O  
Test No. 3 Run 1 Orifice H@ 1.9257 Pitot Cp 0.8\* Probe Lgth 10 ft  
Date 9/8/17 Operators OST/Lewi Liner Type ☒ Glass ☐ S.S. ☐ Other \_\_\_\_\_ Imp TC \_\_\_\_\_

Sample Train Leak Rate (cfm)			
Pretest	<u>0.0</u>	at	<u>10</u> in Hg
Posttest	<u>0.0</u>	at	<u>7</u> in Hg
Pitot (3 in.)	Pos. <input type="checkbox"/>	Neg. <input checked="" type="checkbox"/>	

Sample Point	Sample Time $\Delta t$	Meter Volume Vm, ft <sup>3</sup>	Velocity $\Delta P$ , in H <sub>2</sub> O	Orifice $\Delta H$ , in H <sub>2</sub> O	Ideal Meter Volume	Sample Vacuum, in Hg	Stack Temp. $t_s$ , °F	Sample Train Temperatures, °F					Oxygen Content, %
								Probe	Filter	Impinger Outlet	Meter Inlet	Meter Outlet	
		<u>877.62</u>											
A-6	5	<u>880.74</u>	<u>0.80</u>	<u>1.34</u>		<u>2.5</u>	<u>135</u>	<u>244</u>	<u>250</u>	<u>51</u>	<u>50</u>	<u>50</u>	
6	10	<u>883.86</u>	<u>0.82</u>	<u>1.37</u>		<u>2.5</u>	<u>135</u>	<u>251</u>	<u>251</u>	<u>48</u>	<u>50</u>	<u>50</u>	
5	15	<u>887.15</u>	<u>0.91</u>	<u>1.52</u>		<u>3.0</u>	<u>135</u>	<u>247</u>	<u>250</u>	<u>46</u>	<u>51</u>	<u>50</u>	
5	20	<u>890.53</u>	<u>0.93</u>	<u>1.56</u>		<u>3.0</u>	<u>136</u>	<u>250</u>	<u>249</u>	<u>47</u>	<u>52</u>	<u>50</u>	
4	25	<u>894.00</u>	<u>0.97</u>	<u>1.56</u>		<u>3.0</u>	<u>136</u>	<u>243</u>	<u>250</u>	<u>48</u>	<u>53</u>	<u>50</u>	
4	30	<u>897.25</u>	<u>0.95</u>	<u>1.54</u>		<u>3.0</u>	<u>137</u>	<u>240</u>	<u>251</u>	<u>49</u>	<u>54</u>	<u>50</u>	
3	35	<u>900.72</u>	<u>0.94</u>	<u>1.57</u>		<u>3.0</u>	<u>137</u>	<u>238</u>	<u>250</u>	<u>50</u>	<u>55</u>	<u>51</u>	
3	40	<u>904.07</u>	<u>0.91</u>	<u>1.53</u>		<u>3.0</u>	<u>135</u>	<u>235</u>	<u>250</u>	<u>51</u>	<u>55</u>	<u>51</u>	
2	45	<u>907.26</u>	<u>0.83</u>	<u>1.40</u>		<u>3.0</u>	<u>136</u>	<u>236</u>	<u>250</u>	<u>46</u>	<u>56</u>	<u>51</u>	
2	50	<u>910.44</u>	<u>0.85</u>	<u>1.43</u>		<u>3.0</u>	<u>135</u>	<u>237</u>	<u>250</u>	<u>52</u>	<u>57</u>	<u>51</u>	
1	55	<u>913.30</u>	<u>0.67</u>	<u>1.13</u>		<u>2.5</u>	<u>135</u>	<u>240</u>	<u>250</u>	<u>53</u>	<u>56</u>	<u>51</u>	
1	60	<u>916.13</u>	<u>0.64</u>	<u>1.08</u>		<u>2.5</u>	<u>136</u>	<u>237</u>	<u>250</u>	<u>53</u>	<u>56</u>	<u>51</u>	
B-6	65	<u>919.00</u>	<u>0.62</u>	<u>1.05</u>		<u>2.5</u>	<u>134</u>	<u>238</u>	<u>248</u>	<u>51</u>	<u>55</u>	<u>52</u>	
6	70	<u>921.71</u>	<u>0.58</u>	<u>0.98</u>		<u>2.5</u>	<u>134</u>	<u>247</u>	<u>250</u>	<u>48</u>	<u>50</u>	<u>49</u>	
5	75	<u>924.91</u>	<u>0.83</u>	<u>1.34</u>		<u>3.0</u>	<u>137</u>	<u>252</u>	<u>251</u>	<u>48</u>	<u>51</u>	<u>50</u>	
5	80	<u>928.37</u>	<u>0.95</u>	<u>1.59</u>		<u>3.0</u>	<u>137</u>	<u>248</u>	<u>250</u>	<u>50</u>	<u>52</u>	<u>49</u>	
4	85	<u>931.72</u>	<u>1.00</u>	<u>1.67</u>		<u>3.0</u>	<u>136</u>	<u>242</u>	<u>257</u>	<u>52</u>	<u>52</u>	<u>49</u>	
4	90	<u>935.23</u>	<u>1.00</u>	<u>1.67</u>		<u>3.0</u>	<u>136</u>	<u>240</u>	<u>251</u>	<u>53</u>	<u>53</u>	<u>50</u>	
3	95	<u>938.60</u>	<u>0.94</u>	<u>1.58</u>		<u>3.0</u>	<u>135</u>	<u>240</u>	<u>253</u>	<u>54</u>	<u>54</u>	<u>50</u>	
3	100	<u>942.03</u>	<u>0.91</u>	<u>1.52</u>		<u>3.0</u>	<u>137</u>	<u>237</u>	<u>254</u>	<u>54</u>	<u>54</u>	<u>50</u>	
2	105	<u>945.15</u>	<u>0.84</u>	<u>1.41</u>		<u>3.0</u>	<u>137</u>	<u>240</u>	<u>252</u>	<u>56</u>	<u>54</u>	<u>50</u>	
2	110	<u>948.48</u>	<u>0.84</u>	<u>1.46</u>		<u>3.0</u>	<u>136</u>	<u>240</u>	<u>255</u>	<u>56</u>	<u>54</u>	<u>50</u>	
1	115	<u>951.32</u>	<u>0.85</u>	<u>1.09</u>		<u>3.0</u>	<u>136</u>	<u>240</u>	<u>252</u>	<u>56</u>	<u>54</u>	<u>50</u>	
1	120	<u>954.14</u>	<u>0.67</u>	<u>1.12</u>		<u>3.0</u>	<u>136</u>	<u>240</u>	<u>252</u>	<u>57</u>	<u>54</u>	<u>50</u>	
$\Sigma$		<u>Vm=76.97</u>	<u>0.83</u>	<u><math>\Delta H=1.40</math></u>			<u><math>T_s=135.79</math></u>					<u><math>T_m=51.79</math></u>	

Initialization Values									ORSAT System			Sample Train Components			Nozzle Calibration	
Initial Values			Test Run Times												Tech.	Date
Meter Temp	Oxygen Content	Moisture Content	Start Time	End Time	Bag No.	Bag Vol	cc/min * at 15 in Hg	Filter No.	Nozzle No.	Nozzle Dn					Nozzle No.	
Run 1	<u>49</u>	<u>19.7</u>	<u>11.0</u>	<u>0717</u>	<u>1022</u>			<u>NA</u>	<u>6-433</u>	<u>0.213</u>					1	
Run 2															2	
															3	
															Avg. in.	

Pause at 8:21, start 09:24 balling drum

Moisture Recovery Data and impinger content information:

Impinger	1	2	3	4	5	6	7	Desiccant	Total
Final wt., g									
Initial wt., g									
Difference									
	1 N KCl			HNO3/H2O2		H2SO4/KMNO4			

Air Flows	
ACFM	DSCFM
<u>202.820</u>	<u>154.742</u>



ONTARIO HYRDO D-6784-16 MERCURY TESTING  
FIELD DATA SHEET

Project Hibbing Taconite Company Meter ID C-8 Probe ID 10-3 Bar. Pres 23.26 in Hg  
Smpl Loc F #12 S0026 Meter Y 0.9994 Pitot No. 10-3 Stat. Pres -0.73 in H<sub>2</sub>O  
Test No. 3 Run 2 Orifice H@ 1.9257 Pitot Cp 0.84 Probe Lgth 10 ft  
Date 9/8/17 Operators DJL/LW Liner Type: ☒ Glass ☐ S.S. ☐ Other Imp TC

Sample Train Leak Rate (cfm)		
Pretest	0-5	at 10 in Hg
Posttest	0-5	at 10 in Hg
Pitot (3 in.)	Pos. <input checked="" type="checkbox"/>	Neg. <input checked="" type="checkbox"/>

Sample Point	Sample Time $\Delta t$	Meter Volume Vm, ft <sup>3</sup>	Velocity $\Delta P$ , in H <sub>2</sub> O	Orifice $\Delta H$ , in H <sub>2</sub> O	Ideal Meter Volume	Sample Vacuum, in Hg	Stack Temp. Is, °F	Sample Train Temperatures, °F					Oxygen Content, %
								Probe	Filter	Impinger Outlet	Meter Inlet	Meter Outlet	
A-6	5	955.74	0.78	1.30	1.36	4.5	135	247	250	47	52	50	
6	10	961.81	0.78	1.31	1.37	4.5	135	244	252	47	52	50	
5	15	965.14	0.94	1.33	1.64	5.5	136	244	251	48	54	51	
5	20	968.65	1.00	1.68	1.75	5.5	137	266	261	49	55	51	
4	25	972.32	1.10	1.85	1.93	5.5	136	264	250	52	56	52	
4	30	976.08	1.15	1.93	2.02	6.0	137	261	250	52	56	52	
3	35	979.64	1.00	1.68	1.75	5.5	137	248	247	53	55	52	
3	40	983.18	0.97	1.63	1.70	5.5	136	242	251	51	55	52	
2	45	986.61	0.92	1.55	1.62	5.5	136	230	250	51	55	52	
2	50	989.92	0.89	1.50	1.56	5.5	126	234	252	51	55	51	
1	55	993.08	0.76	1.28	1.33	4.5	136	240	251	50	55	51	
1	60	996.06	0.72	1.21	1.26	4.5	136	242	249	51	54	51	
B-6	65	999.46	0.93	1.57	1.64	6.0	134	254	250	52	54	51	
6	70	1002.38	0.97	1.63	1.71	6.0	134	269	251	53	54	51	
5	75	1006.51	1.10	1.85	1.93	6.5	135	264	250	54	55	51	
5	80	1010.16	1.05	1.76	1.84	6.5	136	265	250	57	55	51	
4	85	1013.91	1.10	1.85	1.93	6.5	126	259	249	60	55	52	
4	90	1017.53	1.10	1.85	1.94	6.5	135	261	250	61	55	52	
3	95	1021.18	1.05	1.76	1.84	6.0	137	262	250	63	56	52	
3	100	1024.79	1.05	1.77	1.84	6.5	137	266	251	64	56	52	
2	105	1028.37	0.98	1.64	1.72	6.0	138	268	251	64	56	52	
2	110	1031.87	0.99	1.66	1.74	6.0	137	265	250	64	56	52	
1	115	1035.05	0.81	1.30	1.42	5.5	137	268	250	65	55	52	
1	120	1038.21	0.82	1.38	1.44	5.5	137	261	252	65	55	52	
Σ=		Vm=82.47	0.96	ΔH=1.61	1.68		Ts=136.38					Tm=53.15	

												Nozzle Calibration	
Initialization Values				Test Run Times		ORSAT System			Sample Train Components			Tech.	Date
	Meter Temp	Oxygen Content	Moisture Content	Start Time	End Time	Bag No.	Bag Vol	cc/min * at 15 in Hg	Filter No.	Nozzle No.	Nozzle Dn	Nozzle No.	
Run 1	44	19.7	2.7	10:51	12:55				1.7	0.101	0.213	1	
Run 2												2	
												3	
												Avg. in.	





ONTARIO HYRDO D-6784-16 MERCURY TESTING  
FIELD DATA SHEET

Project Hibbing Taconite Company Meter ID C-8 Probe ID 10-3 Bar. Pres 28.26 in Hg  
Smpl Loc F42 SUD 26 Meter Y 0.9947 Pitot No. 10-3 Stat. Pres 0.77 in H<sub>2</sub>O  
Test No. 913 Run 3 Orifice H@ 1.9257 Pitot Cp 0.88 Probe Lgth 10 ft  
Date 9/7/17 Operators 07X1 Luv Liner Type ☒ Glass ☐ S.S. ☐ Other Imp TC

Sample Train Leak Rate (cfm)		
Pretest	<u>0.5</u>	at <u>10</u> in Hg
Posttest	<u>0.5</u>	at <u>8</u> in Hg
Pitot (3 in.)	Pos. <input checked="" type="checkbox"/> Neg. <input type="checkbox"/>	

Sample Point	Sample Time $\Delta t$	Meter Volume Vm, ft <sup>3</sup>	Velocity $\Delta P$ , in H <sub>2</sub> O	Orifice $\Delta H$ , in H <sub>2</sub> O	Ideal Meter Volume	Sample Vacuum, in Hg	Stack Temp. Is, °F	Sample Train Temperatures, °F					Oxygen Content, %
								Probe	Filter	Impinger Outlet	Meter Inlet	Meter Outlet	
		<u>38.43</u>		<u>1.29</u>	<u>1.34</u>								
A-6	5	<u>41.57</u>	<u>0.77</u>	<u>1.34</u>	<u>1.39</u>	<u>4.0</u>	<u>136</u>	<u>241</u>	<u>252</u>	<u>53</u>	<u>52</u>	<u>51</u>	
	10	<u>44.68</u>	<u>0.80</u>	<u>1.34</u>	<u>1.39</u>	<u>4.0</u>	<u>136</u>	<u>244</u>	<u>247</u>	<u>52</u>	<u>53</u>	<u>51</u>	
	15	<u>48.01</u>	<u>0.90</u>	<u>1.51</u>	<u>1.57</u>	<u>4.0</u>	<u>136</u>	<u>244</u>	<u>251</u>	<u>52</u>	<u>54</u>	<u>51</u>	
	20	<u>51.25</u>	<u>0.93</u>	<u>1.56</u>	<u>1.61</u>	<u>4.5</u>	<u>138</u>	<u>247</u>	<u>255</u>	<u>54</u>	<u>55</u>	<u>52</u>	
	25	<u>54.56</u>	<u>0.94</u>	<u>1.58</u>	<u>1.64</u>	<u>4.5</u>	<u>137</u>	<u>247</u>	<u>249</u>	<u>54</u>	<u>55</u>	<u>52</u>	
	30	<u>57.87</u>	<u>0.94</u>	<u>1.58</u>	<u>1.64</u>	<u>4.5</u>	<u>136</u>	<u>240</u>	<u>247</u>	<u>57</u>	<u>56</u>	<u>52</u>	
	35	<u>61.27</u>	<u>0.91</u>	<u>1.53</u>	<u>1.58</u>	<u>4.5</u>	<u>139</u>	<u>240</u>	<u>247</u>	<u>59</u>	<u>57</u>	<u>53</u>	
	40	<u>64.67</u>	<u>0.92</u>	<u>1.55</u>	<u>1.60</u>	<u>4.5</u>	<u>138</u>	<u>244</u>	<u>251</u>	<u>60</u>	<u>57</u>	<u>53</u>	
	45	<u>68.00</u>	<u>0.85</u>	<u>1.43</u>	<u>1.48</u>	<u>4.5</u>	<u>138</u>	<u>261</u>	<u>249</u>	<u>62</u>	<u>57</u>	<u>53</u>	
	50	<u>71.35</u>	<u>0.85</u>	<u>1.43</u>	<u>1.48</u>	<u>4.5</u>	<u>138</u>	<u>261</u>	<u>250</u>	<u>64</u>	<u>57</u>	<u>57</u>	
	55	<u>74.72</u>	<u>0.80</u>	<u>1.38</u>	<u>1.42</u>	<u>4.0</u>	<u>137</u>	<u>263</u>	<u>260</u>	<u>65</u>	<u>57</u>	<u>53</u>	
	60	<u>78.17</u>	<u>0.80</u>	<u>1.38</u>	<u>1.42</u>	<u>4.0</u>	<u>138</u>	<u>264</u>	<u>255</u>	<u>64</u>	<u>57</u>	<u>53</u>	
B-6	65	<u>80.01</u>	<u>0.63</u>	<u>1.06</u>	<u>1.10</u>	<u>3.5</u>	<u>136</u>	<u>237</u>	<u>251</u>	<u>63</u>	<u>57</u>	<u>52</u>	
	70	<u>82.89</u>	<u>0.67</u>	<u>1.47</u>	<u>1.10</u>	<u>3.5</u>	<u>134</u>	<u>239</u>	<u>249</u>	<u>61</u>	<u>57</u>	<u>54</u>	
	75	<u>86.30</u>	<u>0.88</u>	<u>1.44</u>	<u>1.54</u>	<u>4.5</u>	<u>136</u>	<u>210</u>	<u>251</u>	<u>58</u>	<u>58</u>	<u>54</u>	
	80	<u>89.48</u>	<u>0.90</u>	<u>1.52</u>	<u>1.57</u>	<u>4.5</u>	<u>137</u>	<u>240</u>	<u>252</u>	<u>58</u>	<u>58</u>	<u>54</u>	
	85	<u>92.95</u>	<u>0.95</u>	<u>1.60</u>	<u>1.66</u>	<u>4.5</u>	<u>137</u>	<u>240</u>	<u>247</u>	<u>53</u>	<u>54</u>	<u>55</u>	
	90	<u>96.31</u>	<u>0.94</u>	<u>1.59</u>	<u>1.65</u>	<u>4.5</u>	<u>138</u>	<u>240</u>	<u>247</u>	<u>52</u>	<u>54</u>	<u>55</u>	
	95	<u>99.62</u>	<u>0.89</u>	<u>1.50</u>	<u>1.56</u>	<u>4.5</u>	<u>138</u>	<u>240</u>	<u>247</u>	<u>52</u>	<u>60</u>	<u>55</u>	
	100	<u>102.91</u>	<u>0.88</u>	<u>1.49</u>	<u>1.54</u>	<u>4.5</u>	<u>138</u>	<u>242</u>	<u>246</u>	<u>52</u>	<u>61</u>	<u>56</u>	
	105	<u>106.15</u>	<u>0.84</u>	<u>1.43</u>	<u>1.48</u>	<u>4.5</u>	<u>137</u>	<u>240</u>	<u>247</u>	<u>51</u>	<u>62</u>	<u>57</u>	
	110	<u>109.38</u>	<u>0.84</u>	<u>1.43</u>	<u>1.48</u>	<u>4.5</u>	<u>137</u>	<u>242</u>	<u>251</u>	<u>52</u>	<u>62</u>	<u>56</u>	
	115	<u>112.31</u>	<u>0.68</u>	<u>1.16</u>	<u>1.20</u>	<u>4.0</u>	<u>137</u>	<u>241</u>	<u>253</u>	<u>52</u>	<u>62</u>	<u>57</u>	
	120	<u>115.26</u>	<u>0.68</u>	<u>1.16</u>	<u>1.20</u>	<u>4.0</u>	<u>137</u>	<u>247</u>	<u>249</u>	<u>53</u>	<u>62</u>	<u>57</u>	
$\Sigma$		<u>Vm 76.83</u>	<u>0.83</u>	<u><math>\Delta H = 1.44</math></u>	<u>1.45</u>		<u>Ts = 137.04</u>					<u>Tm 55.69</u>	

Initialization Values			Test Run Times		ORSAT System			Sample Train Components			Nozzle Calibration	
Meter Temp	Oxygen Content	Moisture Content	Start Time	End Time	Bag No.	Bag Vol	cc/min * at 15 in Hg	Filter No.	Nozzle No.	Nozzle Dn	Tech.	Date
Run 1	<u>51</u>	<u>14.7</u>	<u>1326</u>	<u>1530</u>				<u>N 15</u>	<u>G 1421</u>	<u>0.213</u>		
Run 2		<u>9.0</u>										
											Avg. in.	

Moisture Recovery Data and impinger content information:

Impinger	1	2	3	4	5	6	7	Desiccant	Total
Final wt., g									
Initial wt., g									
Difference									
1 N KCl			HNO3/H2O2			H2SO4/KMNO4			

Air Flows	
ACFM	DSCFM
<u>202.859</u>	<u>154.724</u>



ONTARIO HYRDO D-6784-16 MERCURY TESTING  
IMPINGER RECOVERY

Project HTC Halide

Date 9/7/17

Project No.

Operators BAN

Source Line 2 stack C SVD26

Sample Location stack

TEST RUN 1	IMPINGER VOLUMES							DRY COLUMN
	1	2	3	4	5	6	7	
	g	g	g	g	g	g	g	
START.	723.7	726.9	761.0	763.1	751.7	765.1	739.2	934.0
END	814.5	758.7	768.4	766.0	751.8	764.5	739.0	952.3
CHANGE	90.8	31.8	7.4	2.9	0.1	-0.6	-0.2	18.3
MASS OF MOISTURE COLLECTED, g								150.5

TEST RUN 2	IMPINGER VOLUMES							DRY COLUMN
	1	2	3	4	5	6	7	
	g	g	g	g	g	g	g	
START.	754.8	798.1	755.4	766.4	755.2	718.5	754.0	961.8
END	862.7	827.6	760.7	770.2	755.5	719.0	752.6	985.6
CHANGE	107.9	29.5	5.3	3.8	0.3	0.5	-1.4	23.8
MASS OF MOISTURE COLLECTED, g								169.7

TEST RUN 3	IMPINGER VOLUMES							DRY COLUMN
	1	2	3	4	5	6	7	
	g	g	g	g	g	g	g	
START.	754.0	754.5	768.9	770.3	750.9	755.1	765.4	909.2
END	841.3	779.4	778.3	775.7	751.9	755.8	765.1	927.7
CHANGE	87.3	24.9	9.4	5.4	1.0	0.7	-0.3	18.5
MASS OF MOISTURE COLLECTED, g								146.9

TEST RUN 4	IMPINGER VOLUMES							DRY COLUMN
	1	2	3	4	5	6	7	
	g	g	g	g	g	g	g	
START.								
END								
CHANGE								

COMMENTS

**EPA METHOD 3A -- Instrument Analysis Data Sheet**

Project Hibbing Taconite Company  
Sample Location(s) Pellet Indurating Furnace Line 2 - Stack 3  
Test No: Baseline  
Date: 09/06/17  
Operators: TYL

Analyzer Make / Model / Serial No. Servomex 1440  
Analyzer O<sub>2</sub> Range (span), %: 0-21.2  
Analyzer CO<sub>2</sub> Range (span), %: 0-9.5

	Cylinder Serial No.		
		O <sub>2</sub> Cert. Conc.	CO <sub>2</sub> Cert. Conc.
Zero Gas	Nitrogen	0	0
CO <sub>2</sub> Low-Range	CC37750	-	5
O <sub>2</sub> /CO <sub>2</sub> Mid-range	CA06672	9.6	9.5
O <sub>2</sub> High-range	CA06643	21.2	-

**PRETEST ANALYZER CALIBRATION DATA**

	O <sub>2</sub>		CO <sub>2</sub>	
	Cylinder Value, %	Analyzer Calibration Response, %	Cylinder Value, %	Analyzer Calibration Response, %
Zero Gas	0	0.1	0	0
Mid-range:	9.6	9.5	5	4.9
High-range:	21.2	21.1	9.5	9.6

Time of Calibration \_\_\_\_\_ to \_\_\_\_\_

**INTEGRATED BAG ANALYSIS**

Location/Test No.	Line 2 SV026		
Run No.	1	2	3
Time Sampled			
Time Analyzed			
O <sub>2</sub> , %	19.1	19.0	19.1
CO <sub>2</sub> , %	0.6	0.6	0.5



## Ontario Hydro ASTM D6784 - Field Data Sheet - Run 1

Project	Hibbing Taconite Company	Meter ID	C-6	Probe ID	10-3	Bar.Press.	28.39	in. Hg	Sample Train Leak Rate, cfm:
Sample Location	Pellet Indurating Furnace Line 2 - Stack 2 SV027	Meter Y	0.9848	Pitot Tube No.	10-3	Stat Press.	-0.8	in. H <sub>2</sub> O	Pretest 0.000 at 10 in. Hg
Date	09/06/17	Orifice dH@	1.7166	Pitot Cp	0.84	CPM TC	NA		Posttest 0.000 at 9 in. Hg
Test	Baseline	Run #	1	Liner Type:	Glass	IMP Out TC	2162		Pretest Pitot leak Check Pos pass @ >3" w.c
Operators	DJK /LDP2								Posttest Pitot leak Check Neg pass @ >3" w.c

Sample Point	Sample Time DT	Actual Meter Vol Vm, ft <sup>3</sup>	Velocity Head DP, in. H <sub>2</sub> O	Orifice DH in. H <sub>2</sub> O	Ideal Point Volume Vm, ft <sup>3</sup>	Ideal Meter Vol Vm, ft <sup>3</sup>	Sample Train Vacuum in. Hg	Stack Temp Ts, °F	Sample Train Temperatures, °F					Moisture Content, %
									Filter	Probe	Impinger Outlet	Meter Inlet	Meter Outlet	
Start Time	732	700.17												
1	5.0	703.32	0.750	1.19	3.22	703.39	*	121	*	*	*	60	59	10.0
2	10.0	706.51	0.740	1.18	3.20	706.59	*	120	*	*	*	60	59	10.0
3	15.0	709.97	0.920	1.46	3.56	710.15	*	122	*	*	*	60	59	10.0
4	20.0	713.37	0.870	1.38	3.46	713.62	*	122	*	*	*	61	60	10.0
5	25.0	717.05	0.970	1.54	3.66	717.28	*	122	*	*	*	62	60	10.0
6	30.0	720.81	0.960	1.52	3.65	720.93	*	122	*	*	*	64	60	10.0
7	35.0	724.57	1.050	1.67	3.82	724.75	*	123	*	*	*	64	61	10.0
8	40.0	728.30	1.050	1.67	3.82	728.57	*	123	*	*	*	65	61	10.0
9	45.0	731.98	0.970	1.54	3.68	732.25	*	123	*	*	*	65	62	10.0
10	50.0	735.68	0.990	1.58	3.72	735.97	*	123	*	*	*	66	62	10.0
11	55.0	739.11	0.820	1.31	3.39	739.36	*	122	*	*	*	66	62	10.0
12	60.0	742.43	0.800	1.28	3.35	742.71	*	122	*	*	*	67	63	10.0
13	65.0	745.94	0.910	1.46	3.58	746.29	*	122	*	*	*	66	63	10.0
14	70.0	749.56	0.890	1.42	3.54	749.83	*	122	*	*	*	67	64	10.0
15	75.0	753.15	1.050	1.68	3.85	753.68	*	122	*	*	*	68	64	10.0
16	80.0	757.02	1.100	1.76	3.94	757.62	*	122	*	*	*	68	65	10.0
17	85.0	760.78	1.100	1.76	3.94	761.56	*	123	*	*	*	69	65	10.0
18	90.0	764.53	1.050	1.68	3.85	765.41	*	123	*	*	*	69	65	10.0
19	95.0	768.35	1.000	1.60	3.76	769.17	*	123	*	*	*	69	65	10.0
20	100.0	772.21	1.050	1.68	3.85	773.03	*	123	*	*	*	69	66	10.0
21	105.0	775.92	0.940	1.51	3.66	776.68	*	122	*	*	*	70	66	10.0
22	110.0	779.61	0.940	1.51	3.66	780.34	*	123	*	*	*	70	66	10.0
23	115.0	782.90	0.730	1.17	3.23	783.57	*	122	*	*	*	70	67	10.0
24	120.0	786.12	0.730	1.17	3.23	786.80	*	123	*	*	*	71	67	10.0
End Time	937													
Run Time	120		Avg DH=	1.49			Avg Ts=	122.29				Avg Tm=	64.52	

## Integrated Gas Sampling Data :

Bag No. 1  
Bag Vol. 15 liters  
Leak Rate 0 cc/min

Filter No. NA  
Nozzle No. Glass  
Nozzle Dn. 0.213

## MOISTURE RECOVERY DATA :

Impinger  
Final wt., g  
Initial wt., g  
Difference

1	2	3	4	5	6	7	Desiccant	Total
846.6	767.8	802.0	760.2	758.4	749.9	766.0	951.0	
758.8	742.6	796.5	757.4	758.5	749.5	766.1	934.4	
87.8	25.2	5.5	2.8	-0.1	0.4	-0.1	16.6	138.1

\* Data Recorded on Field Data Sheet



## Ontario Hydro ASTM D6784 - Field Data Sheet - Run 2

Project	Hibbing Taconite Company		Meter ID	C-6	Probe ID	10-3	Bar.Press.	28.39	in. Hg	Sample Train Leak Rate, cfm:		
Sample Location	Pellet Indurating Furnace Line 2 - Stack 2 SV027		Meter Y	0.9848	Pitot Tube No.	10-3	Stat Press.	-0.8	in. H <sub>2</sub> O	Pretest	0.000	at 10 in. Hg
Date	09/06/17		Orifice dH@	1.7166	Pitot Cp	0.84	CPM TC	NA		Posttest	0.000	at 7 in. Hg
Test	Baseline	Run #	2		Liner Type:	Glass	IMP Out TC	2162		Pretest Pitot leak Check Pos	pass	@ >3" w.c
Operators	DJK /LDP2									Posttest Pitot leak Check Neg	pass	@ >3" w.c

Sample Point	Sample Time DT	Actual Meter Vol Vm, ft <sup>3</sup>	Velocity Head DP, in. H <sub>2</sub> O	Orifice DH in. H <sub>2</sub> O	Ideal Point Volume Vm, ft <sup>3</sup>	Ideal Meter Vol Vm, ft <sup>3</sup>	Sample Train Vacuum in. Hg	Stack Temp Ts, °F	Sample Train Temperatures, °F					Moisture Content, %
									Filter	Probe	Impinger Outlet	Meter Inlet	Meter Outlet	
Start Time	1018	786.56												
1	5.0	789.92	0.840	1.35	3.46	790.02	*	121	*	*	*	68	67	10.0
2	10.0	793.30	0.840	1.35	3.46	793.48	*	122	*	*	*	68	67	10.0
3	15.0	796.88	0.960	1.54	3.69	797.17	*	123	*	*	*	69	67	10.0
4	20.0	800.65	0.950	1.53	3.67	800.85	*	123	*	*	*	70	68	10.0
5	25.0	804.37	0.990	1.59	3.76	804.60	*	123	*	*	*	71	68	10.0
6	30.0	808.08	0.990	1.59	3.76	808.36	*	124	*	*	*	72	68	10.0
7	35.0	811.82	0.960	1.55	3.71	812.07	*	123	*	*	*	72	69	10.0
8	40.0	815.54	0.950	1.53	3.69	815.76	*	123	*	*	*	73	69	10.0
9	45.0	819.04	0.890	1.44	3.58	819.34	*	123	*	*	*	73	69	10.0
10	50.0	822.54	0.880	1.42	3.56	822.90	*	123	*	*	*	73	70	10.0
11	55.0	825.68	0.680	1.10	3.14	826.03	*	122	*	*	*	74	70	10.0
12	60.0	828.81	0.700	1.13	3.18	829.22	*	123	*	*	*	74	70	10.0
13	65.0	832.08	0.720	1.17	3.23	832.44	*	123	*	*	*	73	71	10.0
14	70.0	835.11	0.740	1.20	3.27	835.71	*	123	*	*	*	74	71	10.0
15	75.0	838.47	0.830	1.34	3.47	839.18	*	123	*	*	*	75	71	10.0
16	80.0	842.03	0.830	1.35	3.47	842.65	*	123	*	*	*	76	72	10.0
17	85.0	845.44	0.930	1.51	3.68	846.33	*	122	*	*	*	76	72	10.0
18	90.0	849.16	0.940	1.53	3.70	850.03	*	123	*	*	*	76	72	10.0
19	95.0	852.93	0.960	1.57	3.75	853.77	*	120	*	*	*	76	73	10.0
20	100.0	856.65	0.960	1.57	3.75	857.52	*	119	*	*	*	77	73	10.0
21	105.0	860.16	0.920	1.50	3.67	861.20	*	121	*	*	*	77	73	10.0
22	110.0	863.72	0.900	1.46	3.62	864.82	*	123	*	*	*	78	74	10.0
23	115.0	867.00	0.750	1.22	3.32	868.14	*	122	*	*	*	78	74	10.0
24	120.0	870.21	0.720	1.18	3.25	871.39	*	122	*	*	*	79	75	10.0
End Time	1224													
Run Time	120		Avg DH=	1.41			Avg Ts=	122.38				Avg Tm=	72.19	

## Integrated Gas Sampling Data :

Bag No. 2  
Bag Vol. 15 liters  
Leak Rate 0 cc/min

Filter No. NA  
Nozzle No. Glass  
Nozzle Dn. 0.213

## MOISTURE RECOVERY DATA :

Impinger  
Final wt., g  
Initial wt., g  
Difference

1	2	3	4	5	6	7	Desiccant	Total
832.8	785.9	769.0	761.5	760.5	800.6	755.0	967.5	
747.2	765.0	766.0	758.4	760.1	800.5	755.9	947.8	
85.6	20.9	3.0	3.1	0.4	0.1	-0.9	19.7	131.9

\* Data Recorded on Field Data Sheet





## Ontario Hydro ASTM D6784 - Field Data Sheet - Run 3

Project	Hibbing Taconite Company	Meter ID	C-6	Probe ID	10-3	Bar.Press.	28.39	in. Hg	Sample Train Leak Rate, cfm:
Sample Location	Pellet Indurating Furnace Line 2 - Stack 2 SV027	Meter Y	0.9848	Pitot Tube No.	10-3	Stat Press.	-0.8	in. H <sub>2</sub> O	Pretest 0.000 at 10 in. Hg
Date	09/06/17	Orifice dH@	1.7166	Pitot Cp	0.84	CPM TC	NA		Posttest 0.000 at 9 in. Hg
Test	Baseline	Run #	3	Liner Type:	Glass	IMP Out TC	2162		Pretest Pitot leak Check Pos pass @ >3" w.c
Operators	DJK /LDP2								Posttest Pitot leak Check Neg pass @ >3" w.c

Sample Point	Sample Time DT	Actual Meter Vol Vm, ft <sup>3</sup>	Velocity Head DP, in. H <sub>2</sub> O	Orifice DH in. H <sub>2</sub> O	Ideal Point Volume Vm, ft <sup>3</sup>	Ideal Meter Vol Vm, ft <sup>3</sup>	Sample Train Vacuum in. Hg	Stack Temp Ts, °F	Sample Train Temperatures, °F					Moisture Content, %
									Filter	Probe	Impinger Outlet	Meter Inlet	Meter Outlet	
Start Time	1300													
1	5.0	873.93	0.810	1.32	3.45	874.01	*	122	*	*	*	78	76	10.4
2	10.0	877.45	0.800	1.30	3.43	877.44	*	121	*	*	*	78	77	10.4
3	15.0	880.92	0.900	1.47	3.63	881.07	*	121	*	*	*	78	77	10.4
4	20.0	884.50	0.900	1.47	3.64	884.71	*	120	*	*	*	79	77	10.4
5	25.0	888.22	0.960	1.56	3.76	888.46	*	121	*	*	*	80	77	10.4
6	30.0	891.96	0.990	1.61	3.81	892.28	*	123	*	*	*	81	78	10.4
7	35.0	895.91	1.150	1.87	4.11	896.38	*	124	*	*	*	82	78	10.4
8	40.0	899.91	1.100	1.79	4.03	900.41	*	123	*	*	*	82	79	10.4
9	45.0	903.71	1.000	1.63	3.84	904.26	*	123	*	*	*	83	79	10.4
10	50.0	907.55	1.050	1.72	3.94	908.20	*	123	*	*	*	83	80	10.4
11	55.0	911.08	0.800	1.31	3.45	911.65	*	122	*	*	*	84	80	10.4
12	60.0	914.56	0.790	1.30	3.43	915.08	*	122	*	*	*	84	80	10.4
13	65.0	918.34	0.970	1.58	3.79	918.87	*	125	*	*	*	84	81	10.4
14	70.0	922.06	0.930	1.52	3.72	922.59	*	123	*	*	*	85	81	10.4
15	75.0	925.85	1.050	1.72	3.96	926.55	*	123	*	*	*	85	82	10.4
16	80.0	929.65	1.000	1.64	3.87	930.42	*	123	*	*	*	86	82	10.4
17	85.0	933.66	1.100	1.81	4.06	934.47	*	123	*	*	*	86	82	10.4
18	90.0	937.56	1.050	1.73	3.97	938.44	*	122	*	*	*	86	83	10.4
19	95.0	941.55	1.100	1.81	4.06	942.50	*	123	*	*	*	86	83	10.4
20	100.0	945.43	1.050	1.73	3.97	946.47	*	123	*	*	*	85	83	10.4
21	105.0	949.26	0.930	1.53	3.73	950.20	*	123	*	*	*	85	83	10.4
22	110.0	953.00	0.930	1.53	3.73	953.93	*	124	*	*	*	85	83	10.4
23	115.0	956.38	0.760	1.25	3.38	957.31	*	123	*	*	*	85	83	10.4
24	120.0	959.59	0.740	1.22	3.33	960.64	*	123	*	*	*	85	83	10.4
End Time	1505													
Run Time	120		Avg DH=	1.56			Avg Ts=	122.63				Avg Tm=	81.71	

## Integrated Gas Sampling Data :

Bag No. 3  
Bag Vol. 15 liters  
Leak Rate 0 cc/min

Filter No. NA  
Nozzle No. Glass  
Nozzle Dn. 0.213

## MOISTURE RECOVERY DATA :

Impinger  
Final wt., g  
Initial wt., g  
Difference

1	2	3	4	5	6	7	Desiccant	Total
815.6	787.4	778.4	770.5	750.3	755.0	764.1	958.9	
751.3	751.6	767.0	767.8	749.7	755.2	763.9	936.1	
64.3	35.8	11.4	2.7	0.6	-0.2	0.2	22.8	137.6

\* Data Recorded on Field Data Sheet



ONTARIO HYRDO D-6784-16 MERCURY TESTING  
FIELD DATA SHEET *Stack #2*

Project Hibbing Taconite Company Meter ID C-6 Probe ID 10-3 Bar. Pres 28.39 in Hg  
Smpl Loc Furnace 2 SV027 Meter Y 0.9848 Pitot No. 10-3 Stat. Pres 0.80 in H<sub>2</sub>O  
Test No. 2 Run 1 Orifice H@ 1.7166 Pitot Cp 0.84 Probe Lgth 10 ft  
Date 9-6-17 Operators DJK/LEV Liner Type: ☒ Glass ☐ S.S. ☐ Other Imp TC 2162

Sample Train Leak Rate (cfm)		
Pretest	<u>0.0</u>	at <u>10</u> in Hg
Posttest	<u>0.0</u>	at <u>9</u> in Hg
Pitot (3 in.)	Pos. <input checked="" type="checkbox"/> Neg. <input type="checkbox"/>	

Sample Point	Sample Time $\Delta t$	Meter Volume Vm, ft <sup>3</sup>	Velocity $\Delta P$ , in H <sub>2</sub> O	Orifice $\Delta H$ , in H <sub>2</sub> O	Ideal Meter Volume	Sample Vacuum, in Hg	Stack Temp. T <sub>s</sub> , °F	Sample Train Temperatures, °F					Oxygen Content, %
								Probe	Filter	Impinger Outlet	Meter Inlet	Meter Outlet	
	<u>0732</u>	<u>700.17</u>											
A-6	5	<u>703.32</u>	<u>0.75</u>	<u>1.79</u>	<u>703.32</u>	<u>3.5</u>	<u>121</u>	<u>250</u>	<u>250</u>	<u>47</u>	<u>60</u>	<u>59</u>	
6	10	<u>706.51</u>	<u>0.74</u>	<u>1.78</u>	<u>706.51</u>	<u>3.5</u>	<u>120</u>	<u>250</u>	<u>250</u>	<u>45</u>	<u>60</u>	<u>59</u>	
5	15	<u>709.97</u>	<u>0.92</u>	<u>1.46</u>	<u>709.97</u>	<u>4.0</u>	<u>122</u>	<u>251</u>	<u>252</u>	<u>44</u>	<u>60</u>	<u>59</u>	
5	20	<u>713.37</u>	<u>0.87</u>	<u>1.38</u>	<u>713.37</u>	<u>4.0</u>	<u>122</u>	<u>253</u>	<u>252</u>	<u>44</u>	<u>61</u>	<u>60</u>	
4	25	<u>717.05</u>	<u>0.97</u>	<u>1.50</u>	<u>717.05</u>	<u>4.5</u>	<u>122</u>	<u>249</u>	<u>250</u>	<u>44</u>	<u>62</u>	<u>60</u>	
4	30	<u>720.81</u>	<u>0.96</u>	<u>1.52</u>	<u>720.81</u>	<u>4.5</u>	<u>122</u>	<u>250</u>	<u>250</u>	<u>45</u>	<u>64</u>	<u>60</u>	
3	35	<u>724.57</u>	<u>1.05</u>	<u>1.62</u>	<u>724.57</u>	<u>4.5</u>	<u>123</u>	<u>251</u>	<u>250</u>	<u>45</u>	<u>64</u>	<u>61</u>	
3	40	<u>728.30</u>	<u>1.05</u>	<u>1.64</u>	<u>728.30</u>	<u>4.5</u>	<u>123</u>	<u>250</u>	<u>251</u>	<u>46</u>	<u>65</u>	<u>61</u>	
2	45	<u>731.98</u>	<u>0.97</u>	<u>1.57</u>	<u>731.98</u>	<u>4.5</u>	<u>123</u>	<u>251</u>	<u>251</u>	<u>46</u>	<u>65</u>	<u>62</u>	
2	50	<u>735.65</u>	<u>0.99</u>	<u>1.58</u>	<u>735.65</u>	<u>4.5</u>	<u>123</u>	<u>250</u>	<u>250</u>	<u>46</u>	<u>66</u>	<u>62</u>	
1	55	<u>739.11</u>	<u>0.82</u>	<u>1.31</u>	<u>739.11</u>	<u>4.0</u>	<u>122</u>	<u>250</u>	<u>251</u>	<u>47</u>	<u>66</u>	<u>62</u>	
1	60	<u>742.43</u>	<u>0.80</u>	<u>1.25</u>	<u>742.43</u>	<u>4.0</u>	<u>122</u>	<u>250</u>	<u>251</u>	<u>47</u>	<u>67</u>	<u>63</u>	
B-6	65	<u>745.94</u>	<u>0.91</u>	<u>1.46</u>	<u>745.94</u>	<u>4.5</u>	<u>122</u>	<u>246</u>	<u>250</u>	<u>44</u>	<u>66</u>	<u>63</u>	
6	70	<u>749.56</u>	<u>0.89</u>	<u>1.42</u>	<u>749.56</u>	<u>4.5</u>	<u>122</u>	<u>241</u>	<u>250</u>	<u>45</u>	<u>67</u>	<u>64</u>	<u>20.4</u>
5	75	<u>753.15</u>	<u>1.05</u>	<u>1.65</u>	<u>753.15</u>	<u>4.5</u>	<u>122</u>	<u>247</u>	<u>250</u>	<u>45</u>	<u>68</u>	<u>65</u>	
5	80	<u>757.07</u>	<u>1.10</u>	<u>1.76</u>	<u>757.07</u>	<u>5.0</u>	<u>122</u>	<u>244</u>	<u>250</u>	<u>49</u>	<u>65</u>	<u>65</u>	
4	85	<u>760.78</u>	<u>1.10</u>	<u>1.76</u>	<u>760.78</u>	<u>5.0</u>	<u>123</u>	<u>244</u>	<u>250</u>	<u>50</u>	<u>69</u>	<u>65</u>	
4	90	<u>764.53</u>	<u>1.05</u>	<u>1.68</u>	<u>764.53</u>	<u>5.0</u>	<u>123</u>	<u>250</u>	<u>251</u>	<u>50</u>	<u>69</u>	<u>65</u>	
3	95	<u>768.35</u>	<u>1.00</u>	<u>1.60</u>	<u>768.35</u>	<u>5.0</u>	<u>123</u>	<u>251</u>	<u>250</u>	<u>51</u>	<u>69</u>	<u>65</u>	
3	100	<u>772.21</u>	<u>1.05</u>	<u>1.68</u>	<u>772.21</u>	<u>5.0</u>	<u>123</u>	<u>249</u>	<u>249</u>	<u>52</u>	<u>69</u>	<u>66</u>	
2	105	<u>775.92</u>	<u>0.94</u>	<u>1.51</u>	<u>775.92</u>	<u>5.0</u>	<u>122</u>	<u>249</u>	<u>250</u>	<u>53</u>	<u>70</u>	<u>66</u>	
2	110	<u>779.61</u>	<u>0.94</u>	<u>1.51</u>	<u>779.61</u>	<u>4.5</u>	<u>123</u>	<u>250</u>	<u>249</u>	<u>53</u>	<u>70</u>	<u>66</u>	
1	115	<u>782.90</u>	<u>0.77</u>	<u>1.17</u>	<u>782.90</u>	<u>4.0</u>	<u>122</u>	<u>251</u>	<u>250</u>	<u>54</u>	<u>70</u>	<u>67</u>	
1	120	<u>786.12</u>	<u>0.73</u>	<u>1.17</u>	<u>786.12</u>	<u>4.0</u>	<u>123</u>	<u>250</u>	<u>250</u>	<u>54</u>	<u>71</u>	<u>67</u>	
0=		<u>Vm=85.95</u>	<u>0.93</u>	<u><math>\Delta H=1.49</math></u>			<u>Ts=122.24</u>					<u>Tm=64.52</u>	

Initialization Values			Test Run Times		ORSAT System			Sample Train Components			Nozzle Calibration	
Meter Temp	Oxygen Content	Moisture Content	Start Time	End Time	Bag No.	Bag Vol	cc/min * at 15 in Hg	Filter No.	Nozzle No.	Nozzle Dn	Tech.	Date
Run 1	<u>59</u>	<u>20.0</u>	<u>0732</u>	<u>0937</u>				<u>1/1</u>	<u>6-1433</u>	<u>0.213</u>	1	
Run 2											2	
											3	
											Avg. in.	

Moisture Recovery Data and impinger content information:

Impinger	1	2	3	4	5	6	7	Desiccant	Total
Final wt., g									
Initial wt., g									
Difference									
	1 N KCl			HNO3/H2O2		H2SO4/KMNO4			

Air Flows	
ACFM	DSCFM
<u>214.396</u>	<u>168.028</u>



ONTARIO HYDRO D-6784-16 MERCURY TESTING  
FIELD DATA SHEET

Project Hibbing Taconite Company Meter ID C-6 Probe ID 10-3 Bar. Pres 28.39 in Hg  
Smpl Loc Furnace 2 SUB 27 Meter Y 0.9844 Pitot No. 10-3 Stat. Pres 20.80 in H<sub>2</sub>O  
Test No. 2 Run 2 Orifice H<sub>2</sub>O 1.3166 Pitot Cp 0.87 Probe Lgth 18 ft  
Date 9-6-17 Operators 0721/22 Liner Type: ☒ Glass ☐ S.S. ☐ Other Imp TC

Sample Train Leak Rate (cfm)			
Pretest	<u>0.0</u>	at	<u>10</u> in Hg
Posttest	<u>0.0</u>	at	<u>7</u> in Hg
Pitot (3 in.)	Pos. <input checked="" type="checkbox"/>	Neg.	<input checked="" type="checkbox"/>

Sample Point	Sample Time Δt	Meter Volume Vm, ft <sup>3</sup>	Velocity ΔP, in H <sub>2</sub> O	Orifice ΔH, in H <sub>2</sub> O	Ideal Meter Volume	Sample Vacuum, in Hg	Stack Temp. t <sub>s</sub> , °F	Sample Train Temperatures, °F					Oxygen Content, %
								Probe	Filter	Impinger Outlet	Meter Inlet	Meter Outlet	
	<u>10:18</u>	<u>736.56</u>		<u>1.31</u>									
A-6	5	<u>739.92</u>	<u>0.84</u>	<u>1.31</u>	<u>1.42</u>	<u>2.5</u>	<u>121</u>	<u>242</u>	<u>257</u>	<u>50</u>	<u>64</u>	<u>67</u>	
6	10	<u>743.30</u>	<u>0.84</u>	<u>1.31</u>	<u>1.41</u>	<u>2.5</u>	<u>122</u>	<u>247</u>	<u>256</u>	<u>48</u>	<u>64</u>	<u>67</u>	
5	15	<u>746.88</u>	<u>0.96</u>	<u>1.54</u>	<u>1.61</u>	<u>3.0</u>	<u>123</u>	<u>238</u>	<u>250</u>	<u>47</u>	<u>69</u>	<u>67</u>	
5	20	<u>800.65</u>	<u>0.95</u>	<u>1.53</u>	<u>1.60</u>	<u>3.0</u>	<u>123</u>	<u>243</u>	<u>250</u>	<u>47</u>	<u>70</u>	<u>68</u>	
4	25	<u>804.37</u>	<u>0.99</u>	<u>1.59</u>	<u>1.67</u>	<u>3.0</u>	<u>123</u>	<u>244</u>	<u>249</u>	<u>48</u>	<u>71</u>	<u>68</u>	
4	30	<u>808.05</u>	<u>0.99</u>	<u>1.59</u>	<u>1.67</u>	<u>3.0</u>	<u>124</u>	<u>249</u>	<u>249</u>	<u>49</u>	<u>72</u>	<u>68</u>	
3	35	<u>811.82</u>	<u>0.96</u>	<u>1.57</u>	<u>1.62</u>	<u>3.0</u>	<u>123</u>	<u>251</u>	<u>250</u>	<u>49</u>	<u>72</u>	<u>69</u>	
3	40	<u>815.54</u>	<u>0.95</u>	<u>1.53</u>	<u>1.61</u>	<u>3.0</u>	<u>123</u>	<u>250</u>	<u>249</u>	<u>50</u>	<u>73</u>	<u>69</u>	
2	45	<u>819.04</u>	<u>0.89</u>	<u>1.47</u>	<u>1.51</u>	<u>3.0</u>	<u>123</u>	<u>250</u>	<u>251</u>	<u>50</u>	<u>73</u>	<u>69</u>	
2	50	<u>822.54</u>	<u>0.84</u>	<u>1.42</u>	<u>1.49</u>	<u>3.0</u>	<u>123</u>	<u>250</u>	<u>251</u>	<u>51</u>	<u>73</u>	<u>70</u>	
1	55	<u>825.68</u>	<u>0.68</u>	<u>1.10</u>	<u>1.15</u>	<u>2.5</u>	<u>122</u>	<u>252</u>	<u>259</u>	<u>51</u>	<u>74</u>	<u>70</u>	
1	60	<u>828.81</u>	<u>0.70</u>	<u>1.13</u>	<u>1.22</u>	<u>2.5</u>	<u>123</u>	<u>251</u>	<u>250</u>	<u>51</u>	<u>74</u>	<u>70</u>	
B-6	65	<u>832.08</u>	<u>0.72</u>	<u>1.16</u>	<u>1.22</u>	<u>2.5</u>	<u>123</u>	<u>251</u>	<u>249</u>	<u>52</u>	<u>73</u>	<u>71</u>	
6	70	<u>835.11</u>	<u>0.74</u>	<u>1.20</u>	<u>1.25</u>	<u>2.5</u>	<u>123</u>	<u>248</u>	<u>250</u>	<u>53</u>	<u>74</u>	<u>71</u>	
5	75	<u>838.47</u>	<u>0.83</u>	<u>1.34</u>	<u>1.41</u>	<u>2.5</u>	<u>123</u>	<u>249</u>	<u>239</u>	<u>52</u>	<u>75</u>	<u>71</u>	
5	80	<u>842.43</u>	<u>0.83</u>	<u>1.35</u>	<u>1.41</u>	<u>2.5</u>	<u>123</u>	<u>250</u>	<u>251</u>	<u>53</u>	<u>76</u>	<u>72</u>	
4	85	<u>845.44</u>	<u>0.93</u>	<u>1.51</u>	<u>1.58</u>	<u>3.0</u>	<u>122</u>	<u>249</u>	<u>247</u>	<u>55</u>	<u>76</u>	<u>72</u>	
4	90	<u>849.16</u>	<u>0.94</u>	<u>1.53</u>	<u>1.60</u>	<u>3.0</u>	<u>123</u>	<u>251</u>	<u>252</u>	<u>55</u>	<u>76</u>	<u>72</u>	
3	95	<u>852.93</u>	<u>0.96</u>	<u>1.57</u>	<u>1.64</u>	<u>3.0</u>	<u>120</u>	<u>250</u>	<u>251</u>	<u>56</u>	<u>76</u>	<u>73</u>	
3	100	<u>856.68</u>	<u>0.96</u>	<u>1.57</u>	<u>1.65</u>	<u>3.0</u>	<u>119</u>	<u>250</u>	<u>259</u>	<u>58</u>	<u>77</u>	<u>73</u>	
2	105	<u>860.66</u>	<u>0.92</u>	<u>1.50</u>	<u>1.57</u>	<u>3.0</u>	<u>121</u>	<u>250</u>	<u>249</u>	<u>54</u>	<u>77</u>	<u>73</u>	
2	110	<u>863.72</u>	<u>0.90</u>	<u>1.46</u>	<u>1.53</u>	<u>3.0</u>	<u>123</u>	<u>250</u>	<u>251</u>	<u>60</u>	<u>78</u>	<u>74</u>	
1	115	<u>867.00</u>	<u>0.75</u>	<u>1.22</u>	<u>1.28</u>	<u>2.5</u>	<u>122</u>	<u>250</u>	<u>251</u>	<u>60</u>	<u>78</u>	<u>74</u>	
1	120	<u>870.21</u>	<u>0.72</u>	<u>1.18</u>	<u>1.23</u>	<u>2.5</u>	<u>122</u>	<u>250</u>	<u>251</u>	<u>60</u>	<u>79</u>	<u>75</u>	
Σ=		<u>Vm=83.65</u>	<u>0.87</u>	<u>ΔH=1.41</u>	<u>1.47</u>		<u>Ts=122.38</u>					<u>Tm=72.19</u>	

Initialization Values			Test Run Times		ORSAT System			Sample Train Components			Nozzle Calibration	
Meter Temp	Oxygen Content	Moisture Content	Start Time	End Time	Bag No.	Bag Vol	cc/min * at 15 in Hg	Filter No.	Nozzle No.	Nozzle Dn	Tech.	Date
Run 1	<u>6.8</u>	<u>20.0</u>	<u>10:18</u>	<u>12:24</u>				<u>1/A</u>	<u>U-123</u>	<u>0.213</u>	1	
Run 2		<u>7.4</u>									2	
											3	
											Avg. in.	

Moisture Recovery Data and impinger content information:

Impinger	1	2	3	4	5	6	7	Desiccant	Total
Final wt., g									
Initial wt., g									
Difference									
	1 N KCl		HNO <sub>3</sub> /H <sub>2</sub> O <sub>2</sub>		H <sub>2</sub> SO <sub>4</sub> /KMNO <sub>4</sub>				

Air Flows	
ACFM	DSCFM
<u>304.019</u>	<u>163.186</u>





ONTARIO HYRDO D-6784-16 MERCURY TESTING  
FIELD DATA SHEET

Project Hibbing Taconite Company Meter ID C-6 Probe ID 10-3 Bar. Pres 28.39 in Hg  
Smpl Loc Furnace 2 SU 027 Meter Y 0.9848 Pitot No. 10-3 Stat. Pres -0.20 in H<sub>2</sub>O  
Test No. 2 Run 3 Orifice H<sub>2</sub>O 1.7166 Pitot Cp 0.0x Probe Lgth 12 ft  
Date 9-6-17 Operators 07K/600 Liner Type A Glass ☐ S.S. ☐ Other ☐ Imp TC ☐

Sample Train Leak Rate (cfm)		
Pretest	0.0	at 10 in Hg
Posttest	0.0	at 9 in Hg
Pitot (3 in.)	Pos. <input checked="" type="checkbox"/>	Neg. <input checked="" type="checkbox"/>

Sample Point	Sample Time $\Delta t$	Meter Volume Vm, ft <sup>3</sup>	Velocity $\Delta P$ , in H <sub>2</sub> O	Orifice $\Delta H$ , in H <sub>2</sub> O	Ideal Meter Volume	Sample Vacuum, in Hg	Stack Temp. ts, °F	Sample Train Temperatures, °F					Oxygen Content, %
								Probe	Filter	Impinger Outlet	Meter Inlet	Meter Outlet	
	13:00	870.56		1.32	1.39	3.5	122	239	251	56	78	76	
A-6	5	873.93	0.81	1.32	1.37	3.5	121	249	251	56	78	77	
6	10	877.45	0.80	1.30	1.37	3.5	121	250	251	55	78	77	
5	15	880.92	0.90	1.42	1.55	3.5	120	249	251	56	79	77	
5	20	884.50	0.90	1.42	1.55	3.5	121	249	251	58	80	77	
4	25	888.22	0.96	1.57	1.65	3.5	123	251	251	60	81	78	
4	30	891.96	0.99	1.61	1.70	3.5	124	250	249	61	82	78	
3	35	895.91	1.15	1.87	1.97	4.0	123	250	249	62	82	79	
3	40	899.91	1.10	1.79	1.89	4.0	123	250	249	62	83	79	
2	45	903.71	1.00	1.63	1.70	4.0	123	250	250	63	83	80	
2	50	907.55	1.05	1.73	1.81	4.0	122	249	250	63	84	80	
1	55	911.08	0.80	1.31	1.38	3.5	122	249	250	63	84	80	
1	60	914.56	0.79	1.30	1.39	3.5	122	249	250	63	84	80	
B-6	65	918.34	0.97	1.58	1.67	4.0	125	247	249	62	84	81	
6	70	922.06	0.93	1.52	1.61	4.0	123	250	250	63	85	81	
5	75	925.85	1.05	1.72	1.82	4.0	123	248	250	61	85	82	
5	80	929.65	1.00	1.64	1.73	4.0	123	250	251	62	86	82	
4	85	933.66	1.10	1.81	1.91	4.5	123	249	250	63	86	82	
4	90	937.56	1.05	1.73	1.82	4.5	122	249	250	62	86	83	
3	95	941.55	1.10	1.81	1.91	4.5	123	252	251	62	86	83	
3	100	945.43	1.05	1.73	1.82	4.5	123	250	251	63	85	83	
2	105	949.26	0.93	1.53	1.61	4.0	123	250	251	62	85	83	
2	110	953.00	0.93	1.53	1.61	4.0	124	250	251	62	85	83	
1	115	956.38	0.76	1.25	1.30	3.5	123	250	250	63	85	83	
1	120	959.54	0.74	1.22	1.30	3.5	123	250	249	63	85	83	
Σ = 15.05		Vm = 89.03	0.95	ΔH = 1.56	1.65		Ts = 122.67					Tm = 87.71	

Initialization Values			Test Run Times		ORSAT System			Sample Train Components			Nozzle Calibration	
Meter Temp	Oxygen Content	Moisture Content	Start Time	End Time	Bag No.	Bag Vol	cc/min * at 15 in Hg	Filter No.	Nozzle No.	Nozzle Dn	Tech.	Date
78	20.0	70.4	13:00	15:05				111	6.430	0.215		
Run 1											1	
Run 2											2	
											3	
											Avg. in.	

Moisture Recovery Data and impinger content information:

Impinger	1	2	3	4	5	6	7	Desiccant	Total
Final wt., g									
Initial wt., g									
Difference									
	1 N KCl			HNO3/H2O2			H2SO4/KMNO4		

Air Flows	
ACFM	DSCFM
213,708	169,850



ONTARIO HYRDO D-6784-16 MERCURY TESTING  
IMPINGER RECOVERY

Project HTC Halide

Date 9/6/17

Project No.

Operators Baw

Source Line 2 Stack 8 Sub 27

Sample Location Stack

TEST RUN 1	IMPINGER VOLUMES							DRY COLUMN
	1	2	3	4	5	6	7	
	g	g	g	g	g	g	g	
START.	758.8	742.6	796.5	757.4	758.5	749.5	766.1	934.4
END	846.6	767.8	802.0	760.2	758.4	749.9	766.0	951.0
CHANGE	87.8	25.2	5.5	2.8	-0.1	0.4	-0.1	16.6
MASS OF MOISTURE COLLECTED, g								138.1

TEST RUN 2	IMPINGER VOLUMES							DRY COLUMN
	1	2	3	4	5	6	7	
	g	g	g	g	g	g	g	
START.	747.2	765.0	766.0	758.4	760.1	800.5	755.9	947.8
END	832.8	785.9	769.0	761.5	760.5	800.6	755.0	967.5
CHANGE	85.6	20.9	3.0	3.1	0.4	0.1	-0.9	19.7
MASS OF MOISTURE COLLECTED, g								131.9

TEST RUN 3	IMPINGER VOLUMES							DRY COLUMN
	1	2	3	4	5	6	7	
	g	g	g	g	g	g	g	
START.	751.3	751.6	767.0	767.8	749.7	755.2	783.9	936.1
END	815.6	787.4	778.4	770.5	750.3	755.0	764.1	958.9
CHANGE	64.3	35.8	11.4	2.7	0.6	-0.2	0.2	22.8
MASS OF MOISTURE COLLECTED, g								137.6

TEST RUN 4	IMPINGER VOLUMES							DRY COLUMN
	1	2	3	4	5	6	7	
	g	g	g	g	g	g	g	
START.								
END								
CHANGE								

COMMENTS

**EPA METHOD 3A -- Instrument Analysis Data Sheet**

Project Hibbing Taconite Company  
Sample Location(s) Pellet Indurating Furnace Line 2 - Stack 2  
Test No: Baseline  
Date: 09/06/17  
Operators: TYL

Analyzer Make / Model / Serial No. Servomex 1440  
Analyzer O<sub>2</sub> Range (span), %: 0-21.2  
Analyzer CO<sub>2</sub> Range (span), %: 0-9.5

	Cylinder Serial No.	O <sub>2</sub> Cert. Conc.	
		O <sub>2</sub> Cert. Conc.	CO <sub>2</sub> Cert. Conc.
Zero Gas	Nitrogen	0	0
CO <sub>2</sub> Low-Range	CC37750	-	5
O <sub>2</sub> /CO <sub>2</sub> Mid-range	CA06672	9.6	9.5
O <sub>2</sub> High-range	CA06643	21.2	-

**PRETEST ANALYZER CALIBRATION DATA**

	O <sub>2</sub>		CO <sub>2</sub>	
	Cylinder Value, %	Analyzer Calibration Response, %	Cylinder Value, %	Analyzer Calibration Response, %
Zero Gas	0	0.1	0	0
Mid-range:	9.6	9.5	5	4.9
High-range:	21.2	21.1	9.5	9.6

Time of Calibration \_\_\_\_\_ to \_\_\_\_\_

**INTEGRATED BAG ANALYSIS**

Location/Test No.	Line 2 SV027		
Run No.	1	2	3
Time Sampled			
Time Analyzed			
O <sub>2</sub> , %	19.9	19.9	19.8
CO <sub>2</sub> , %	0.3	0.3	0.3



## Ontario Hydro ASTM D6784 - Field Data Sheet - Run 1

Project	Hibbing Taconite Company	Meter ID	C-12	Probe ID	10-4	Bar.Press.	28.39	in. Hg	Sample Train Leak Rate, cfm:
Sample Location	Pellet Indurating Furnace Line 2 - Stack 1 SV028	Meter Y	0.9955	Pitot Tube No.	10-4	Stat Press.	-0.8	in. H <sub>2</sub> O	Pretest 0.000 at 10 in. Hg
Date	09/06/17	Orifice dH@	1.9292	Pitot Cp	0.84	CPM TC	NA		Posttest 0.000 at 11 in. Hg
Test	Baseline	Run #	1	Liner Type:	Glass	IMP Out TC	1253		Pretest Pitot leak Check Pos pass @ >3" w.c
Operators	DJK /LDP2								Posttest Pitot leak Check Neg pass @ >3" w.c

Sample Point	Sample Time DT	Actual Meter Vol Vm, ft <sup>3</sup>	Velocity Head DP, in. H <sub>2</sub> O	Orifice DH in. H <sub>2</sub> O	Ideal Point Volume Vm, ft <sup>3</sup>	Ideal Meter Vol Vm, ft <sup>3</sup>	Sample Train Vacuum in. Hg	Stack Temp Ts, °F	Sample Train Temperatures, °F					Moisture Content, %
									Filter	Probe	Impinger Outlet	Meter Inlet	Meter Outlet	
Start Time	732	295.64												
1	5.0	298.81	0.750	1.38	3.22	298.86	*	111	*	*	*	57	57	9.0
2	10.0	301.87	0.760	1.40	3.25	302.11	*	111	*	*	*	57	57	9.0
3	15.0	305.25	0.880	1.62	3.50	305.61	*	111	*	*	*	58	57	9.0
4	20.0	308.73	0.900	1.65	3.54	309.15	*	112	*	*	*	59	57	9.0
5	25.0	312.38	0.960	1.76	3.65	312.80	*	112	*	*	*	61	58	9.0
6	30.0	316.02	1.000	1.85	3.74	316.54	*	111	*	*	*	62	58	9.0
7	35.0	319.84	1.100	2.03	3.93	320.47	*	111	*	*	*	64	59	9.0
8	40.0	323.75	1.100	2.04	3.94	324.40	*	112	*	*	*	64	60	9.0
9	45.0	327.64	1.050	1.94	3.85	328.25	*	112	*	*	*	65	60	9.0
10	50.0	331.51	1.050	1.95	3.86	332.11	*	111	*	*	*	66	61	9.0
11	55.0	335.10	0.840	1.56	3.46	335.57	*	111	*	*	*	67	61	9.0
12	60.0	338.51	0.820	1.53	3.42	338.99	*	111	*	*	*	67	62	9.0
13	65.0	342.40	0.900	1.68	3.59	342.58	*	111	*	*	*	67	63	9.0
14	70.0	345.66	0.920	1.71	3.63	346.20	*	112	*	*	*	68	63	9.0
15	75.0	349.60	1.100	2.05	3.97	350.17	*	112	*	*	*	69	64	9.0
16	80.0	353.38	1.100	2.05	3.97	354.14	*	112	*	*	*	70	64	9.0
17	85.0	357.50	1.150	2.15	4.06	358.21	*	112	*	*	*	70	64	9.0
18	90.0	361.44	1.150	2.15	4.06	362.27	*	112	*	*	*	70	65	9.0
19	95.0	365.48	1.100	2.06	3.98	366.25	*	112	*	*	*	71	65	9.0
20	100.0	369.47	1.100	2.06	3.98	370.23	*	112	*	*	*	71	65	9.0
21	105.0	373.22	1.000	1.87	3.80	374.03	*	112	*	*	*	71	66	9.0
22	110.0	377.16	1.000	1.88	3.80	377.84	*	112	*	*	*	72	66	9.0
23	115.0	380.71	0.840	1.58	3.49	381.33	*	112	*	*	*	72	66	9.0
24	120.0	384.23	0.840	1.58	3.49	384.82	*	112	*	*	*	73	67	9.0
End Time	937													
Run Time	120		Avg DH=	1.81			Avg Ts=	111.63				Avg Tm=	64.08	

## Integrated Gas Sampling Data :

Bag No. 1  
Bag Vol. 15 liters  
Leak Rate 0 cc/min

Filter No. NA  
Nozzle No. Glass  
Nozzle Dn. 0.213

## MOISTURE RECOVERY DATA :

Impinger  
Final wt., g  
Initial wt., g  
Difference

1	2	3	4	5	6	7	Desiccant	Total
834.0	818.1	760.1	767.5	753.6	717.6	752.5	985.7	
754.7	795.9	755.0	764.3	752.8	716.6	753.6	968.6	
79.3	22.2	5.1	3.2	0.8	1.0	-1.1	17.1	127.6

\* Data Recorded on Field Data Sheet



## Ontario Hydro ASTM D6784 - Field Data Sheet - Run 2

Project	Hibbing Taconite Company		Meter ID	C-12	Probe ID	10-4	Bar.Press.	28.39	in. Hg	Sample Train Leak Rate, cfm:		
Sample Location	Pellet Indurating Furnace Line 2 - Stack 1 SV028		Meter Y	0.9955	Pitot Tube No.	10-4	Stat Press.	-0.8	in. H <sub>2</sub> O	Pretest	0.000	at 10 in. Hg
Date	09/06/17		Orifice dH@	1.9292	Pitot Cp	0.84	CPM TC	NA		Posttest	0.000	at 8 in. Hg
Test	Baseline	Run #	2		Liner Type:	Glass	IMP Out TC	1253		Pretest Pitot leak Check Pos	pas	@ >3" w.c
Operators	DJK /LDP2									Posttest Pitot leak Check Neg	pass	@ >3" w.c

Sample Point	Sample Time DT	Actual Meter Vol Vm, ft <sup>3</sup>	Velocity Head DP, in. H <sub>2</sub> O	Orifice DH in. H <sub>2</sub> O	Ideal Point Volume Vm, ft <sup>3</sup>	Ideal Meter Vol Vm, ft <sup>3</sup>	Sample Train Vacuum in. Hg	Stack Temp Ts, °F	Sample Train Temperatures, °F					Moisture Content, %
									Filter	Probe	Impinger Outlet	Meter Inlet	Meter Outlet	
Start Time	1018													
1	5.0	388.23	0.930	1.74	3.66	388.28	*	111	*	*	*	66	66	9.0
2	10.0	391.91	0.940	1.76	3.67	391.95	*	111	*	*	*	67	66	9.0
3	15.0	395.90	1.100	2.06	3.98	395.93	*	111	*	*	*	69	66	9.0
4	20.0	399.77	1.100	2.07	3.99	399.91	*	110	*	*	*	71	67	9.0
5	25.0	403.85	1.150	2.17	4.09	404.00	*	109	*	*	*	72	67	9.0
6	30.0	407.97	1.150	2.17	4.09	408.10	*	109	*	*	*	74	67	9.0
7	35.0	412.00	1.100	2.08	4.01	412.11	*	110	*	*	*	74	68	9.0
8	40.0	415.87	1.100	2.08	4.01	416.12	*	111	*	*	*	75	68	9.0
9	45.0	419.63	1.000	1.89	3.83	419.95	*	111	*	*	*	75	69	9.0
10	50.0	423.37	0.990	1.87	3.81	423.76	*	112	*	*	*	76	69	9.0
11	55.0	426.88	0.840	1.59	3.52	427.28	*	110	*	*	*	76	70	9.0
12	60.0	430.35	0.840	1.60	3.53	430.81	*	109	*	*	*	76	70	9.0
13	65.0	433.66	0.740	1.40	3.31	434.11	*	111	*	*	*	74	70	9.0
14	70.0	437.01	0.770	1.46	3.37	437.48	*	111	*	*	*	76	71	9.0
15	75.0	440.71	0.900	1.71	3.65	441.13	*	111	*	*	*	77	71	9.0
16	80.0	444.24	0.910	1.73	3.67	444.80	*	111	*	*	*	78	71	9.0
17	85.0	448.06	0.990	1.88	3.83	448.63	*	111	*	*	*	78	71	9.0
18	90.0	452.11	1.100	2.09	4.04	452.67	*	111	*	*	*	79	72	9.0
19	95.0	456.18	1.150	2.19	4.14	456.80	*	110	*	*	*	79	72	9.0
20	100.0	460.27	1.150	2.20	4.14	460.95	*	108	*	*	*	80	73	9.0
21	105.0	464.12	1.000	1.91	3.87	464.82	*	109	*	*	*	80	73	9.0
22	110.0	467.96	1.000	1.91	3.86	468.68	*	111	*	*	*	81	73	9.0
23	115.0	471.51	0.840	1.60	3.55	472.23	*	111	*	*	*	82	75	9.0
24	120.0	474.92	0.810	1.56	3.50	475.73	*	109	*	*	*	83	76	9.0
End Time	1224													
Run Time	120		Avg DH=	1.86			Avg Ts=	110.33				Avg Tm=	72.90	

## Integrated Gas Sampling Data :

Bag No. 2  
Bag Vol. 15 liters  
Leak Rate 0 cc/min

Filter No. NA  
Nozzle No. Glass  
Nozzle Dn. 0.213

## MOISTURE RECOVERY DATA :

Impinger  
Final wt., g  
Initial wt., g  
Difference

1	2	3	4	5	6	7	Desiccant	Total
788.6	753.0	760.4	762.3	752.2	761.4	736.9	958.4	
717.9	727.8	755.4	759.4	752.1	761.1	737.1	935.4	
70.7	25.2	5.0	2.9	0.1	0.3	-0.2	23.0	127.0

\* Data Recorded on Field Data Sheet





# Ontario Hydro ASTM D6784 - Field Data Sheet - Run 3

Project	Hibbing Taconite Company		Meter ID	C-12	Probe ID	10-4	Bar.Press.	28.39	in. Hg	Sample Train Leak Rate, cfm:		
Sample Location	Pellet Indurating Furnace Line 2 - Stack 1 SV028		Meter Y	0.9955	Pitot Tube No.	10-4	Stat Press.	-0.8	in. H <sub>2</sub> O	Pretest	0.000	at 10 in. Hg
Date	09/06/17		Orifice dH@	1.9292	Pitot Cp	0.84	CPM TC	NA		Posttest	0.000	at 8 in. Hg
Test	Baseline	Run #	3		Liner Type:	Glass	IMP Out TC	1253		Pretest Pitot leak Check Pos	pass	@ >3" w.c
Operators	DJK /LDP2									Posttest Pitot leak Check Neg	pass	@ >3" w.c

Sample Point	Sample Time DT	Actual Meter Vol Vm, ft <sup>3</sup>	Velocity Head DP, in. H <sub>2</sub> O	Orifice DH in. H <sub>2</sub> O	Ideal Point Volume Vm, ft <sup>3</sup>	Ideal Meter Vol Vm, ft <sup>3</sup>	Sample Train Vacuum in. Hg	Stack Temp Ts, °F	Sample Train Temperatures, °F					Moisture Content, %
									Filter	Probe	Impinger Outlet	Meter Inlet	Meter Outlet	
Start Time	1300	475.26												
1	5.0	478.61	0.780	1.49	3.43	478.69	*	112	*	*	*	80	78	9.0
2	10.0	482.00	0.790	1.51	3.45	482.14	*	112	*	*	*	80	79	9.0
3	15.0	485.62	0.930	1.78	3.75	485.89	*	112	*	*	*	80	78	9.0
4	20.0	489.26	0.910	1.74	3.71	489.59	*	111	*	*	*	81	79	9.0
5	25.0	492.98	0.960	1.85	3.82	493.41	*	110	*	*	*	82	78	9.0
6	30.0	496.77	0.970	1.86	3.82	497.23	*	113	*	*	*	84	79	9.0
7	35.0	500.87	1.100	2.11	4.09	501.32	*	112	*	*	*	85	79	9.0
8	40.0	504.83	1.100	2.12	4.09	505.41	*	112	*	*	*	87	81	9.0
9	45.0	508.94	1.100	2.12	4.10	509.51	*	112	*	*	*	88	81	9.0
10	50.0	513.00	1.100	2.12	4.11	513.62	*	112	*	*	*	88	82	9.0
11	55.0	516.62	0.820	1.59	3.56	517.18	*	111	*	*	*	88	82	9.0
12	60.0	520.13	0.840	1.63	3.60	520.78	*	110	*	*	*	88	82	9.0
13	65.0	523.87	0.930	1.80	3.79	524.57	*	111	*	*	*	87	83	9.0
14	70.0	527.63	0.940	1.82	3.80	528.37	*	112	*	*	*	89	83	9.0
15	75.0	531.82	1.100	2.13	4.12	532.49	*	112	*	*	*	90	84	9.0
16	80.0	535.95	1.100	2.13	4.13	536.62	*	112	*	*	*	91	85	9.0
17	85.0	540.02	1.100	2.13	4.13	540.75	*	113	*	*	*	91	85	9.0
18	90.0	544.11	1.100	2.13	4.13	544.88	*	113	*	*	*	90	85	9.0
19	95.0	548.37	1.150	2.23	4.22	549.10	*	112	*	*	*	90	85	9.0
20	100.0	552.61	1.150	2.23	4.22	553.32	*	113	*	*	*	90	85	9.0
21	105.0	556.57	1.050	2.04	4.03	557.35	*	113	*	*	*	89	85	9.0
22	110.0	560.56	1.050	2.03	4.03	561.38	*	113	*	*	*	89	84	9.0
23	115.0	564.21	0.850	1.64	3.62	565.00	*	114	*	*	*	89	84	9.0
24	120.0	567.78	0.830	1.61	3.58	568.58	*	113	*	*	*	89	84	9.0
End Time	1505													
Run Time	120		Avg DH=	1.91			Avg Ts=	112.08				Avg Tm=	84.48	

Integrated Gas Sampling Data :

Bag No. 3  
 Bag Vol. 15 liters  
 Leak Rate 0 cc/min

Filter No. NA  
 Nozzle No. Glass  
 Nozzle Dn. 0.213

MOISTURE RECOVERY DATA :

Impinger  
 Final wt., g  
 Initial wt., g  
 Difference

1	2	3	4	5	6	7	Desiccant	Total
834.4	818.7	760.6	769.4	757.1	719.8	753.2	996.2	
756.7	798.6	757.2	766.3	756.8	719.2	754.7	978.7	
77.7	20.1	3.4	3.1	0.3	0.6	-1.5	17.5	121.2

\* Data Recorded on Field Data Sheet



ONTARIO HYRDO D-6784-16 MERCURY TESTING  
FIELD DATA SHEET S7-01K #1

Project Hibbing Taconite Company Meter ID C-12 Probe ID 10-4 Bar. Pres 2839 in Hg  
Smpl Loc Furnace 2 SU428 Meter Y 0.9955 Pitot No. 10-4 Stat. Pres 2830 in H<sub>2</sub>O  
Test No. 1 Run 1 Orifice H@ 1.4292 Pitot Cp 0.88 Probe Lgth 10 ft  
Date 9-6-17 Operators DJK/LC Liner Type ☒ Glass ☐ S.S. ☐ Other Imp TC 1253

Sample Train Leak Rate (cfm)		
Pretest	<u>0.0</u>	at <u>10</u> in Hg
Posttest	<u>0.0</u>	at <u>11</u> in Hg
Pitot (3 in.)	Pos. <input checked="" type="checkbox"/> Neg. <input checked="" type="checkbox"/>	

Sample Point	Sample Time $\Delta t$	Meter Volume Vm, ft <sup>3</sup>	Velocity $\Delta P$ , in H <sub>2</sub> O	Orifice $\Delta H$ , in H <sub>2</sub> O	Ideal Meter Volume	Sample Vacuum, in Hg	Stack Temp. $t_s$ , °F	Sample Train Temperatures, °F					Oxygen Content, %
								Probe	Filter	Impinger Outlet	Meter Inlet	Meter Outlet	
	<u>0732</u>	<u>295.64</u>											
A-6	5	<u>298.81</u>	<u>0.75</u>	<u>1.38</u>	<u>298.86</u>	<u>5.5</u>	<u>111</u>	<u>237</u>	<u>260</u>	<u>45</u>	<u>57</u>	<u>57</u>	
6	10	<u>303.87</u>	<u>0.76</u>	<u>1.40</u>	<u>302.14</u>	<u>5.5</u>	<u>111</u>	<u>238</u>	<u>260</u>	<u>44</u>	<u>57</u>	<u>57</u>	
5	15	<u>305.25</u>	<u>0.88</u>	<u>1.62</u>	<u>305.81</u>	<u>6.5</u>	<u>111</u>	<u>234</u>	<u>261</u>	<u>48</u>	<u>58</u>	<u>57</u>	
5	20	<u>308.73</u>	<u>0.90</u>	<u>1.65</u>	<u>309.15</u>	<u>6.5</u>	<u>112</u>	<u>237</u>	<u>262</u>	<u>44</u>	<u>59</u>	<u>57</u>	
4	25	<u>312.34</u>	<u>0.96</u>	<u>1.76</u>	<u>312.80</u>	<u>7.0</u>	<u>112</u>	<u>242</u>	<u>261</u>	<u>44</u>	<u>61</u>	<u>58</u>	
4	30	<u>316.02</u>	<u>1.00</u>	<u>1.95</u>	<u>316.54</u>	<u>7.0</u>	<u>111</u>	<u>241</u>	<u>259</u>	<u>45</u>	<u>62</u>	<u>58</u>	
3	35	<u>319.84</u>	<u>1.00</u>	<u>2.03</u>	<u>320.42</u>	<u>7.5</u>	<u>111</u>	<u>245</u>	<u>260</u>	<u>47</u>	<u>64</u>	<u>59</u>	
3	40	<u>323.75</u>	<u>1.10</u>	<u>2.04</u>	<u>324.40</u>	<u>7.5</u>	<u>112</u>	<u>244</u>	<u>261</u>	<u>46</u>	<u>64</u>	<u>60</u>	
2	45	<u>327.64</u>	<u>1.05</u>	<u>1.95</u>	<u>328.26</u>	<u>7.5</u>	<u>112</u>	<u>250</u>	<u>262</u>	<u>45</u>	<u>65</u>	<u>60</u>	
2	50	<u>331.51</u>	<u>1.05</u>	<u>1.95</u>	<u>332.44</u>	<u>7.5</u>	<u>111</u>	<u>244</u>	<u>265</u>	<u>46</u>	<u>66</u>	<u>61</u>	
1	55	<u>335.10</u>	<u>0.84</u>	<u>1.56</u>	<u>335.89</u>	<u>7.0</u>	<u>111</u>	<u>250</u>	<u>264</u>	<u>47</u>	<u>67</u>	<u>61</u>	
1	60	<u>338.51</u>	<u>0.82</u>	<u>1.53</u>	<u>338.49</u>	<u>6.5</u>	<u>111</u>	<u>250</u>	<u>264</u>	<u>47</u>	<u>67</u>	<u>62</u>	
B-6	65	<u>342.40</u>	<u>0.90</u>	<u>1.68</u>	<u>342.88</u>	<u>7.0</u>	<u>111</u>	<u>249</u>	<u>258</u>	<u>46</u>	<u>67</u>	<u>63</u>	
6	70	<u>345.66</u>	<u>0.92</u>	<u>1.71</u>	<u>346.20</u>	<u>7.5</u>	<u>112</u>	<u>246</u>	<u>258</u>	<u>47</u>	<u>68</u>	<u>63</u>	<u>20.6</u>
5	75	<u>349.60</u>	<u>1.10</u>	<u>2.05</u>	<u>350.87</u>	<u>8.0</u>	<u>112</u>	<u>246</u>	<u>249</u>	<u>46</u>	<u>69</u>	<u>64</u>	
5	80	<u>353.38</u>	<u>1.10</u>	<u>2.05</u>	<u>354.14</u>	<u>8.5</u>	<u>112</u>	<u>244</u>	<u>248</u>	<u>47</u>	<u>70</u>	<u>64</u>	
4	85	<u>357.50</u>	<u>1.15</u>	<u>2.15</u>	<u>358.28</u>	<u>8.5</u>	<u>112</u>	<u>246</u>	<u>250</u>	<u>48</u>	<u>70</u>	<u>65</u>	
4	90	<u>361.44</u>	<u>1.15</u>	<u>2.15</u>	<u>362.27</u>	<u>8.5</u>	<u>112</u>	<u>249</u>	<u>251</u>	<u>48</u>	<u>70</u>	<u>65</u>	
3	95	<u>365.44</u>	<u>1.10</u>	<u>2.06</u>	<u>366.25</u>	<u>8.5</u>	<u>112</u>	<u>251</u>	<u>251</u>	<u>49</u>	<u>71</u>	<u>65</u>	
3	100	<u>369.47</u>	<u>1.10</u>	<u>2.06</u>	<u>370.23</u>	<u>8.5</u>	<u>112</u>	<u>253</u>	<u>257</u>	<u>50</u>	<u>71</u>	<u>65</u>	
2	105	<u>373.22</u>	<u>1.00</u>	<u>1.87</u>	<u>374.03</u>	<u>8.0</u>	<u>112</u>	<u>253</u>	<u>258</u>	<u>52</u>	<u>71</u>	<u>66</u>	
2	110	<u>377.16</u>	<u>1.00</u>	<u>1.88</u>	<u>377.84</u>	<u>8.0</u>	<u>112</u>	<u>251</u>	<u>257</u>	<u>52</u>	<u>72</u>	<u>66</u>	
1	115	<u>380.71</u>	<u>0.84</u>	<u>1.58</u>	<u>381.33</u>	<u>6.5</u>	<u>112</u>	<u>251</u>	<u>257</u>	<u>52</u>	<u>72</u>	<u>66</u>	
1	120	<u>384.23</u>	<u>0.84</u>	<u>1.58</u>	<u>384.82</u>	<u>6.5</u>	<u>112</u>	<u>251</u>	<u>258</u>	<u>52</u>	<u>73</u>	<u>67</u>	
$\Sigma$		<u>Vm=38.84</u>	<u>0.93</u>	<u><math>\Delta H = 1.81</math></u>			<u>Ts=111.63</u>					<u>Tm=64.04</u>	

Initialization Values			Test Run Times		ORSAT System			Sample Train Components			Nozzle Calibration	
Meter Temp	Oxygen Content	Moisture Content	Start Time	End Time	Bag No.	Bag Vol	cc/min * at 15 in Hg	Filter No.	Nozzle No.	Nozzle Dn	Tech.	Date
Run 1	<u>56</u>	<u>20.1</u>	<u>9.0</u>	<u>732</u>	<u>0937</u>			<u>6425</u>	<u>01433</u>	<u>0.213</u>		
Run 2												
										Avg. in.		

Moisture Recovery Data and impinger content information:

Impinger	1	2	3	4	5	6	7	Desiccant	Total
Final wt., g									
Initial wt., g									
Difference									
1 N KCl			HNO3/H2O2			H2SO4/KMNO4			

Air Flows	
ACFM	DSCFM
<u>214,090</u>	<u>174,828</u>



ONTARIO HYRDO D-6784-16 MERCURY TESTING  
FIELD DATA SHEET

Project Hibbing Taconite Company Meter ID C-12 Probe ID 10-Y Bar. Pres 28.39 in Hg  
Smpl Loc Furnace 2 Meter Y 0.9955 Pitot No. 10-Y Stat. Pres 20.80 in H<sub>2</sub>O  
Test No. 1 Run 2 Orifice H@ 1.9292 Pitot Cp 0.82 Probe Lgth 10 ft  
Date 9-6-17 Operators 05K/L Liner Type ☒ Glass ☐ S.S. ☐ Other Imp TC 1257

Sample Train Leak Rate (cfm)		
Pretest	<u>0.5</u>	at <u>10</u> in Hg
Posttest	<u>0.0</u>	at <u>8</u> in Hg
Pitot (3 in.)	Pos. <input checked="" type="checkbox"/>	Neg. <input checked="" type="checkbox"/>

Sample Point	Sample Time $\Delta t$	Meter Volume Vm, ft <sup>3</sup>	Velocity $\Delta P$ , in H <sub>2</sub> O	Orifice $\Delta H$ , in H <sub>2</sub> O	Ideal Meter Volume	Sample Vacuum, in Hg	Stack Temp. Is, °F	Sample Train Temperatures, °F					Oxygen Content, %
								Probe	Filter	Impinger Outlet	Meter Inlet	Meter Outlet	
		<u>384.62</u>		<u>1.07</u>									
A-6	5	<u>388.23</u>	<u>0.93</u>	<u>1.74</u>	<u>1.81</u>	<u>3.5</u>	<u>111</u>	<u>239</u>	<u>252</u>	<u>46</u>	<u>66</u>	<u>66</u>	
6	10	<u>391.91</u>	<u>0.94</u>	<u>1.76</u>	<u>1.83</u>	<u>3.5</u>	<u>111</u>	<u>242</u>	<u>251</u>	<u>46</u>	<u>67</u>	<u>66</u>	
5	15	<u>395.90</u>	<u>1.10</u>	<u>2.06</u>	<u>2.15</u>	<u>3.5</u>	<u>111</u>	<u>242</u>	<u>243</u>	<u>45</u>	<u>69</u>	<u>66</u>	
5	20	<u>399.37</u>	<u>1.10</u>	<u>2.07</u>	<u>2.15</u>	<u>3.5</u>	<u>110</u>	<u>240</u>	<u>247</u>	<u>46</u>	<u>71</u>	<u>67</u>	
4	25	<u>403.85</u>	<u>1.15</u>	<u>2.17</u>	<u>2.26</u>	<u>3.5</u>	<u>109</u>	<u>238</u>	<u>248</u>	<u>47</u>	<u>72</u>	<u>67</u>	
4	30	<u>407.47</u>	<u>1.15</u>	<u>2.17</u>	<u>2.27</u>	<u>3.5</u>	<u>109</u>	<u>239</u>	<u>248</u>	<u>48</u>	<u>74</u>	<u>67</u>	
3	35	<u>412.00</u>	<u>1.10</u>	<u>2.08</u>	<u>2.17</u>	<u>3.5</u>	<u>110</u>	<u>245</u>	<u>250</u>	<u>48</u>	<u>74</u>	<u>68</u>	
3	40	<u>415.87</u>	<u>1.10</u>	<u>2.08</u>	<u>2.17</u>	<u>3.5</u>	<u>111</u>	<u>251</u>	<u>257</u>	<u>49</u>	<u>75</u>	<u>68</u>	
2	45	<u>419.63</u>	<u>1.00</u>	<u>1.89</u>	<u>1.97</u>	<u>3.5</u>	<u>111</u>	<u>251</u>	<u>258</u>	<u>50</u>	<u>75</u>	<u>69</u>	
2	50	<u>423.37</u>	<u>0.99</u>	<u>1.87</u>	<u>1.95</u>	<u>3.5</u>	<u>112</u>	<u>252</u>	<u>258</u>	<u>50</u>	<u>76</u>	<u>69</u>	
1	55	<u>426.88</u>	<u>0.88</u>	<u>1.59</u>	<u>1.66</u>	<u>3.0</u>	<u>110</u>	<u>251</u>	<u>261</u>	<u>51</u>	<u>76</u>	<u>70</u>	
1	60	<u>430.35</u>	<u>0.84</u>	<u>1.60</u>	<u>1.67</u>	<u>3.0</u>	<u>109</u>	<u>253</u>	<u>266</u>	<u>51</u>	<u>76</u>	<u>70</u>	
B-6	65	<u>433.66</u>	<u>0.74</u>	<u>1.40</u>	<u>1.46</u>	<u>3.0</u>	<u>111</u>	<u>244</u>	<u>262</u>	<u>51</u>	<u>74</u>	<u>70</u>	
6	70	<u>437.01</u>	<u>0.77</u>	<u>1.46</u>	<u>1.52</u>	<u>3.0</u>	<u>111</u>	<u>243</u>	<u>262</u>	<u>53</u>	<u>76</u>	<u>71</u>	
5	75	<u>440.71</u>	<u>0.90</u>	<u>1.71</u>	<u>1.78</u>	<u>3.5</u>	<u>111</u>	<u>247</u>	<u>261</u>	<u>53</u>	<u>77</u>	<u>71</u>	
5	80	<u>444.24</u>	<u>0.91</u>	<u>1.73</u>	<u>1.80</u>	<u>3.5</u>	<u>111</u>	<u>247</u>	<u>260</u>	<u>54</u>	<u>78</u>	<u>71</u>	
4	85	<u>448.06</u>	<u>0.99</u>	<u>1.83</u>	<u>1.96</u>	<u>3.5</u>	<u>111</u>	<u>248</u>	<u>261</u>	<u>56</u>	<u>78</u>	<u>71</u>	
4	90	<u>452.11</u>	<u>1.10</u>	<u>2.09</u>	<u>2.18</u>	<u>3.5</u>	<u>111</u>	<u>251</u>	<u>259</u>	<u>57</u>	<u>79</u>	<u>72</u>	
3	95	<u>456.18</u>	<u>1.15</u>	<u>2.19</u>	<u>2.29</u>	<u>4.0</u>	<u>110</u>	<u>254</u>	<u>260</u>	<u>58</u>	<u>79</u>	<u>72</u>	
3	100	<u>460.27</u>	<u>1.15</u>	<u>2.22</u>	<u>2.29</u>	<u>4.0</u>	<u>108</u>	<u>253</u>	<u>261</u>	<u>60</u>	<u>80</u>	<u>77</u>	
2	105	<u>464.12</u>	<u>1.00</u>	<u>1.91</u>	<u>2.00</u>	<u>3.5</u>	<u>109</u>	<u>251</u>	<u>260</u>	<u>61</u>	<u>80</u>	<u>77</u>	
2	110	<u>467.96</u>	<u>1.00</u>	<u>1.91</u>	<u>1.99</u>	<u>3.5</u>	<u>111</u>	<u>253</u>	<u>260</u>	<u>63</u>	<u>81</u>	<u>77</u>	
1	115	<u>471.51</u>	<u>0.84</u>	<u>1.60</u>	<u>1.67</u>	<u>3.5</u>	<u>111</u>	<u>253</u>	<u>261</u>	<u>63</u>	<u>82</u>	<u>75</u>	
1	120	<u>474.92</u>	<u>0.81</u>	<u>1.56</u>	<u>1.62</u>	<u>3.0</u>	<u>109</u>	<u>251</u>	<u>259</u>	<u>64</u>	<u>83</u>	<u>76</u>	
0=		Vm= <u>90.30</u>	<u>0.98</u>	$\Delta H$ = <u>1.86</u>	<u>1.94</u>		Ts= <u>110.33</u>					Tm= <u>72.90</u>	

Initialization Values			Test Run Times		ORSAT System			Sample Train Components			Nozzle Calibration	
Meter Temp	Oxygen Content	Moisture Content	Start Time	End Time	Bag No.	Bag Vol	cc/min * at 15 in Hg	Filter No.	Nozzle No.	Nozzle Dn	Tech.	Date
Run 1	<u>66</u>	<u>20.5</u>	<u>1013</u>	<u>1224</u>				<u>124</u>	<u>61933</u>	<u>0.213</u>		
Run 2												
											Avg. in.	

Moisture Recovery Data and impinger content information:

Impinger	1	2	3	4	5	6	7	Desiccant	Total
Final wt., g									
Initial wt., g									
Difference									
1 N KCl			HNO3/H2O2			H2SO4/KMNO4			

Air Flows	
ACFM	DSCFM
<u>214.670</u>	<u>175.785</u>





ONTARIO HYRDO D-6784-16 MERCURY TESTING  
FIELD DATA SHEET

Project Hibbing Taconite Company Meter ID C-12 Probe ID 10-4 Bar. Pres 28.39 in Hg  
Smpl Loc Furnace 2 Meter Y 0.9955 Pitot No. 10-4 Stat. Pres 20.70 in H<sub>2</sub>O  
Test No. 1 Run 3 Orifice H@ 1.9292 Pitot Cp 0.27 Probe Lgth 10 ft  
Date 9-6-77 Operators DTV/L... Liner Type ☒ Glass ☐ S.S. ☐ Other Imp TC

Sample Train Leak Rate (cfm)		
Pretest	<u>0.0</u>	at <u>10</u> in Hg
Posttest	<u>0.0</u>	at <u>8</u> in Hg
Pitot (3 in.)	Pos. <input checked="" type="checkbox"/>	Neg. <input checked="" type="checkbox"/>

Sample Point	Sample Time Δt	Meter Volume Vm, ft <sup>3</sup>	Velocity ΔP, in H <sub>2</sub> O	Orifice ΔH, in H <sub>2</sub> O	Ideal Meter Volume	Sample Vacuum, in Hg	Stack Temp. T <sub>s</sub> , °F	Sample Train Temperatures, °F					Oxygen Content, %
								Probe	Filter	Impinger Outlet	Meter Inlet	Meter Outlet	
	<u>13:00</u>	<u>478.26</u>		<u>1.080</u>									
A-6	5	<u>478.61</u>	<u>0.78</u>	<u>1.79</u>	<u>1.56</u>	<u>4.0</u>	<u>112</u>	<u>240</u>	<u>252</u>	<u>56</u>	<u>80</u>	<u>78</u>	
6	10	<u>482.00</u>	<u>0.79</u>	<u>1.51</u>	<u>1.58</u>	<u>4.0</u>	<u>112</u>	<u>242</u>	<u>254</u>	<u>57</u>	<u>80</u>	<u>79</u>	
5	15	<u>485.62</u>	<u>0.93</u>	<u>1.78</u>	<u>1.86</u>	<u>4.5</u>	<u>112</u>	<u>241</u>	<u>261</u>	<u>51</u>	<u>80</u>	<u>78</u>	
5	20	<u>489.26</u>	<u>0.91</u>	<u>1.74</u>	<u>1.82</u>	<u>4.5</u>	<u>111</u>	<u>241</u>	<u>262</u>	<u>52</u>	<u>81</u>	<u>79</u>	
4	25	<u>492.98</u>	<u>0.96</u>	<u>1.85</u>	<u>1.93</u>	<u>4.5</u>	<u>110</u>	<u>241</u>	<u>259</u>	<u>53</u>	<u>82</u>	<u>78</u>	
4	30	<u>496.77</u>	<u>0.97</u>	<u>1.86</u>	<u>1.94</u>	<u>4.5</u>	<u>113</u>	<u>239</u>	<u>263</u>	<u>54</u>	<u>82</u>	<u>79</u>	
3	35	<u>500.87</u>	<u>1.10</u>	<u>2.11</u>	<u>2.21</u>	<u>5.0</u>	<u>112</u>	<u>244</u>	<u>262</u>	<u>55</u>	<u>85</u>	<u>79</u>	
3	40	<u>504.83</u>	<u>1.10</u>	<u>2.12</u>	<u>2.21</u>	<u>5.0</u>	<u>112</u>	<u>245</u>	<u>260</u>	<u>56</u>	<u>85</u>	<u>79</u>	
2	45	<u>508.94</u>	<u>1.10</u>	<u>2.12</u>	<u>2.22</u>	<u>5.0</u>	<u>112</u>	<u>248</u>	<u>261</u>	<u>57</u>	<u>88</u>	<u>81</u>	
2	50	<u>513.00</u>	<u>1.10</u>	<u>2.13</u>	<u>2.22</u>	<u>5.0</u>	<u>112</u>	<u>250</u>	<u>261</u>	<u>57</u>	<u>88</u>	<u>82</u>	
1	55	<u>516.62</u>	<u>0.82</u>	<u>1.89</u>	<u>1.66</u>	<u>4.5</u>	<u>111</u>	<u>252</u>	<u>259</u>	<u>57</u>	<u>88</u>	<u>82</u>	
1	60	<u>520.13</u>	<u>0.84</u>	<u>1.63</u>	<u>1.70</u>	<u>4.5</u>	<u>110</u>	<u>251</u>	<u>260</u>	<u>57</u>	<u>88</u>	<u>82</u>	
B-6	65	<u>523.87</u>	<u>0.93</u>	<u>1.80</u>	<u>1.88</u>	<u>4.5</u>	<u>111</u>	<u>236</u>	<u>261</u>	<u>57</u>	<u>87</u>	<u>83</u>	
6	70	<u>527.63</u>	<u>0.94</u>	<u>1.82</u>	<u>1.90</u>	<u>4.5</u>	<u>112</u>	<u>243</u>	<u>259</u>	<u>56</u>	<u>89</u>	<u>83</u>	
5	75	<u>531.82</u>	<u>1.10</u>	<u>2.13</u>	<u>2.22</u>	<u>5.0</u>	<u>112</u>	<u>244</u>	<u>261</u>	<u>52</u>	<u>90</u>	<u>84</u>	
5	80	<u>535.95</u>	<u>1.10</u>	<u>2.14</u>	<u>2.23</u>	<u>5.0</u>	<u>112</u>	<u>245</u>	<u>260</u>	<u>52</u>	<u>91</u>	<u>85</u>	
4	85	<u>540.02</u>	<u>1.10</u>	<u>2.14</u>	<u>2.23</u>	<u>5.0</u>	<u>113</u>	<u>250</u>	<u>260</u>	<u>54</u>	<u>91</u>	<u>85</u>	
4	90	<u>544.11</u>	<u>1.10</u>	<u>2.14</u>	<u>2.23</u>	<u>5.0</u>	<u>113</u>	<u>250</u>	<u>259</u>	<u>54</u>	<u>90</u>	<u>85</u>	
3	95	<u>548.37</u>	<u>1.15</u>	<u>2.24</u>	<u>2.33</u>	<u>5.0</u>	<u>112</u>	<u>252</u>	<u>260</u>	<u>54</u>	<u>90</u>	<u>85</u>	
3	100	<u>552.61</u>	<u>1.15</u>	<u>2.23</u>	<u>2.32</u>	<u>5.5</u>	<u>113</u>	<u>254</u>	<u>254</u>	<u>53</u>	<u>90</u>	<u>85</u>	
2	105	<u>556.57</u>	<u>1.05</u>	<u>2.04</u>	<u>2.13</u>	<u>5.0</u>	<u>113</u>	<u>252</u>	<u>261</u>	<u>54</u>	<u>89</u>	<u>85</u>	
2	110	<u>560.56</u>	<u>1.05</u>	<u>2.04</u>	<u>2.12</u>	<u>5.0</u>	<u>117</u>	<u>250</u>	<u>261</u>	<u>55</u>	<u>89</u>	<u>85</u>	
1	115	<u>564.21</u>	<u>0.85</u>	<u>1.64</u>	<u>1.71</u>	<u>4.5</u>	<u>114</u>	<u>252</u>	<u>260</u>	<u>56</u>	<u>89</u>	<u>84</u>	
1	120	<u>567.78</u>	<u>0.83</u>	<u>1.61</u>	<u>1.68</u>	<u>4.5</u>	<u>113</u>	<u>251</u>	<u>261</u>	<u>56</u>	<u>89</u>	<u>84</u>	
<u>0=1505</u>		<u>Vm=42.52</u>	<u>0.99</u>	<u>ΔH=1.91</u>	<u>1.99</u>		<u>Ts=112.08</u>					<u>Tm=84.48</u>	

Initialization Values			Test Run Times		ORSAT System			Sample Train Components			Nozzle Calibration	
Meter Temp	Oxygen Content	Moisture Content	Start Time	End Time	Bag No.	Bag Vol	cc/min * at 15 in Hg	Filter No.	Nozzle No.	Nozzle Dn	Tech.	Date
Run 1	<u>79</u>	<u>20.5</u>	<u>13:30</u>	<u>1505</u>				<u>NA</u>	<u>Glass</u>	<u>0.213</u>	1	
Run 2											2	
											3	
											Avg. in.	

Moisture Recovery Data and impinger content information:

Impinger	1	2	3	4	5	6	7	Desiccant	Total
Final wt., g									
Initial wt., g									
Difference									
	1 N KCl		HNO3/H2O2		H2SO4/KMnO4				

Air Flows	
ACFM	DSCFM
<u>215.610</u>	<u>176.578</u>



ONTARIO HYRDO D-6784-16 MERCURY TESTING  
IMPINGER RECOVERY

Project HTC Halide

Date 9/6/17

Project No.

Operators BAW

Source Line 2 Stack A SWD28

Sample Location Stack

TEST RUN 1	IMPINGER VOLUMES							DRY COLUMN
	1	2	3	4	5	6	7	
	g	g	g	g	g	g	g	
START.	754.7	795.9	755.0	764.3	752.8	716.6	753.6	968.6
END	834.0	818.1	760.1	767.5	753.6	717.6	752.5	985.7
CHANGE	79.3	22.2	5.1	3.2	0.8	1.0	-1.1	17.1
MASS OF MOISTURE COLLECTED, g								127.6

TEST RUN 2	IMPINGER VOLUMES							DRY COLUMN
	1	2	3	4	5	6	7	
	g	g	g	g	g	g	g	
START.	717.9	727.8	755.4	759.4	752.1	761.1	737.1	935.4
END	788.6	753.0	760.4	762.3	752.2	761.4	736.9	958.4
CHANGE	70.7	25.2	5.0	2.9	0.1	0.3	-0.2	23.0
MASS OF MOISTURE COLLECTED, g								127.0

TEST RUN 3	IMPINGER VOLUMES							DRY COLUMN
	1	2	3	4	5	6	7	
	g	g	g	g	g	g	g	
START.	756.7	798.6	757.2	766.3	756.8	719.2	754.7	978.7
END	834.4	818.7	760.6	769.4	757.1	719.8	753.2	996.2
CHANGE	77.7	20.1	3.4	3.1	0.3	0.6	-1.5	17.5
MASS OF MOISTURE COLLECTED, g								121.2

TEST RUN 4	IMPINGER VOLUMES							DRY COLUMN
	1	2	3	4	5	6	7	
	g	g	g	g	g	g	g	
START.								
END								
CHANGE								

COMMENTS

**EPA METHOD 3A -- Instrument Analysis Data Sheet**

Project Hibbing Taconite Company  
Sample Location(s) Pellet Indurating Furnace Line 2 - Stack 1  
Test No: Baseline  
Date: 09/06/17  
Operators: TYL

Analyzer Make / Model / Serial No. Servomex 1440  
Analyzer O<sub>2</sub> Range (span), %: 0-21.2  
Analyzer CO<sub>2</sub> Range (span), %: 0-9.5

	Cylinder Serial No.		
		O <sub>2</sub> Cert. Conc.	CO <sub>2</sub> Cert. Conc.
Zero Gas	Nitrogen	0	0
CO <sub>2</sub> Low-Range	CC37750	-	5
O <sub>2</sub> /CO <sub>2</sub> Mid-range	CA06672	9.6	9.5
O <sub>2</sub> High-range	CA06643	21.2	-

**PRETEST ANALYZER CALIBRATION DATA**

	O <sub>2</sub>		CO <sub>2</sub>	
	Cylinder Value, %	Analyzer Calibration Response, %	Cylinder Value, %	Analyzer Calibration Response, %
Zero Gas	0	0.1	0	0
Mid-range:	9.6	9.5	5	4.9
High-range:	21.2	21.1	9.5	9.6

Time of Calibration \_\_\_\_\_ to \_\_\_\_\_

**INTEGRATED BAG ANALYSIS**

Location/Test No.	Line 2 Stack SV028		
Run No.	1	2	3
Time Sampled			
Time Analyzed			
O <sub>2</sub> , %	20.0	20.1	20.0
CO <sub>2</sub> , %	0.3	0.2	0.3

## **Appendix C**

### **Laboratory Reports and Sample Chain of Custody**

# **Barr Engineering**

5150 W. 76<sup>th</sup> Street  
Edina, MN 55439-2330

Project Number: 23/69-1428.72 BASE 200

Mercury

Ontario Hydro Method Analysis

Analytical Report  
30094



Element One, Inc.

6319-D Carolina Beach Rd., Wilmington, NC 28412

910-793-0128 FAX:910-792-6853 [e1lab@e1lab.com](mailto:e1lab@e1lab.com)



The following data for Analytical Report 30094  
has been reviewed for completeness, accuracy,  
adherence to method protocol,  
and compliance with quality assurance guidelines.

Review by:

A handwritten signature in black ink, appearing to be 'Katie Gattis', written over a horizontal line.

Katie Gattis, B.S. Chemist  
September 19, 2017

Report Reviewed and Finalized By:

A handwritten signature in black ink, appearing to be 'Ken Smith', written over a horizontal line.

Ken Smith, Laboratory Director  
September 19, 2017

# SUMMARY OF RESULTS

## Summary of Analysis

### Summary of OHM Mercury Analysis

Run Number		Average Total Catch, µg	Filter µg	FH Rinse µg	KCl µg	H <sub>2</sub> O <sub>2</sub> /HNO <sub>3</sub> µg	KMnO <sub>4</sub> µg
-----	----	-----	-----	-----	-----	-----	-----
Stack A-OHM-R1	# 1	3.71	0.008	0.025	0.824	0.014	2.87
	# 2		0.009	0.025	0.790	0.013	2.85
Stack A-OHM-R2	# 1	3.68	< 0.005	0.020	0.574	< 0.013	3.10
	# 2		< 0.005	0.020	0.573	< 0.013	3.07
Stack A-OHM-R3	# 1	3.73	0.007	0.026	0.596	0.017	3.09
	# 2		0.006	0.025	0.613	0.017	3.05
Stack B-OHM-R1	# 1	7.40	0.016	0.018	1.07	0.122	6.15
	# 2		0.017	0.020	1.07	0.120	6.20
Stack B-OHM-R2	# 1	6.32	0.015	0.019	0.802	0.018	5.51
	# 2		0.014	0.019	0.794	0.019	5.43
Stack B-OHM-R3	# 1	6.94	0.016	0.023	0.852	0.018	6.00
	# 2		0.015	0.022	0.843	0.017	6.07
Stack C-OHM-R1	# 1	11.9	0.027	0.038	1.45	0.042	10.4
	# 2		0.028	0.036	1.41	0.042	10.5
Stack C-OHM-R2	# 1	12.4	0.024	0.030	1.24	0.029	11.1
	# 2		0.024	0.031	1.19	0.030	11.1
Stack C-OHM-R3	# 1	12.3	0.017	< 0.01	1.33	0.028	11.0
	# 2		0.017	< 0.01	1.31	0.028	10.9
Stack D-OHM-R1	# 1	14.5	0.049	0.022	1.42	0.074	13.0
	# 2		0.052	0.023	1.39	0.073	12.8
Stack D-OHM-R2	# 1	14.2	0.034	0.016	1.33	0.040	12.7
	# 2		0.034	0.016	1.36	0.041	12.9
Stack D-OHM-R3	# 1	14.1	0.038	0.017	1.55	0.055	12.5
	# 2		0.036	0.017	1.59	0.055	12.3
Field Blank	# 1	< 0.05	---	---	< 0.025	< 0.013	< 0.025
	# 2		---	---	< 0.025	< 0.013	< 0.025

## Summary of Analysis

### Reagent Blank Summary of OHM Mercury Analysis

Run Number		Filter µg	FH Rinse µg	KCl µg	H <sub>2</sub> O <sub>2</sub> /HNO <sub>3</sub> µg	KMnO <sub>4</sub> µg	Hydroxylamine Hydrochloride µg
		-----	-----	-----	-----	-----	-----
Reagent Blank	#1	< 0.005	< 0.01	< 0.006	0.019	< 0.01	0.030
	#2	< 0.005	< 0.01	< 0.006	0.018	< 0.01	0.030

# ANALYTICAL NARRATIVE

## Element One Analytical Narrative

Client:	Barr Engineering	Element One #:	30094
Client ID:	23/69-1428.72 BASE 200	Analyst:	KLG, MMP
Method:	OHM	Dates Received:	09/12/17
Analytes:	Hg	Dates Analyzed:	09/14-19/17

### Summary of Analysis

The Ontario Hydro Method (OHM) samples were prepared and analyzed according to method protocol. Samples were analyzed for mercury on a PS Analytical Millennium Galahad CVAf and PerkinElmer FIMS-100 CVAA analyzer mercury analyzer.

### Ontario Hydro Mercury Catch Summary

The Ontario Hydro Method employs five different fractions to collect mercury in its various states in a flue gas stream. Particle-bound mercury is collected in the filter and front-half rinse. Oxidized mercury ( $\text{Hg}_2^{2+}$  and  $\text{Hg}^{2+}$ ) is collected in the potassium chloride (KCl) fraction. The acidified hydrogen peroxide ( $\text{H}_2\text{O}_2/\text{HNO}_3$ ) and potassium permanganate ( $\text{KMnO}_4$ ) fractions are utilized to collect elemental mercury ( $\text{Hg}^0$ ). Total mercury refers to all mercury, however generated or entrained, in the flue gas stream.

### Detection Limits

The Ontario Hydro Method Millennium Galahad CVAf instrument reporting limit for mercury was 0.001  $\mu\text{g}$  per aliquot analyzed, which is 0.05  $\mu\text{g}/\text{L}$  for a 20 ml aliquot. The FIMS-100 CVAA instrument reporting limit for mercury was 0.004  $\mu\text{g}$  per aliquot analyzed.

### Analysis QA/QC

Duplicate analyses relative percent difference (RPD), triplicate analysis relative standard deviation (RSD), and spike sample recovery 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. The reported results relate only to the items tested or calibrated.

# QUALITY CONTROL SUMMARY

## Summary of Quality Control Data

### Mercury Duplicate Analysis RPD

(OHM QC limits:  $\leq 10\%$  for RPD)

Run Number	Filter	FH Rinse	KCl	H <sub>2</sub> O <sub>2</sub> /HNO <sub>3</sub>	KMnO <sub>4</sub>	Hydroxylamine Hydrochloride
Stack A-R1	3.6%	3.6%	4.3%	5.8%	0.4%	---
Stack A-R2	NA	0.5%	0.1%	NA	1.1%	---
Stack A-R3	6.2%	1.6%	2.7%	3.5%	1.2%	---
Stack B-R1	6.0%	7.9%	0.4%	1.8%	0.8%	---
Stack B-R2	2.7%	0.5%	1.0%	2.2%	1.4%	---
Stack B-R3	9.0%	3.1%	1.1%	2.3%	1.2%	---
Stack C-R1	1.8%	6.2%	2.3%	0.5%	0.8%	---
Stack C-R2	1.2%	1.6%	4.2%	1.4%	0.6%	---
Stack C-R3	1.2%	NA	1.1%	0.7%	0.6%	---
Stack D-R1	5.6%	1.3%	2.3%	1.8%	1.9%	---
Stack D-R2	0.0%	1.9%	2.2%	3.4%	1.4%	---
Stack D-R3	6.3%	0.6%	2.4%	0.5%	2.0%	---
Field Blank	---	---	NA	NA	NA	---
Reagent Blank	NA	NA	NA	4.8%	NA	0.2%

### Mercury Triplicate Analysis RSD

(OHM QC limits:  $\leq 10\%$  for RSD)

Run Number	Filter	FH Rinse	KCl	H <sub>2</sub> O <sub>2</sub> /HNO <sub>3</sub>	KMnO <sub>4</sub>
Stack A-R2	NA	1.4%	0.3%	NA	1.7%
Stack B-R2	1.4%	2.9%	1.2%	1.1%	1.1%
Stack C-R2	3.7%	1.8%	2.1%	2.7%	0.6%
Stack D-R2	1.9%	1.6%	1.4%	1.8%	1.5%



## Summary of Quality Control Data

Run Number	Mercury Spike Recoveries					
		Filter	FH Rinse	KCl	H <sub>2</sub> O <sub>2</sub> /HNO <sub>3</sub>	KMnO <sub>4</sub>
Stack A-R3	# 1	88%	89%	104%	104%	93%
	# 2	90%	90%	106%	102%	96%
Stack B-R3	# 1	92%	86%	100%	112%	91%
	# 2	92%	88%	102%	111%	89%
Stack C-R3	# 1	105%	96%	109%	108%	88%
	# 2	105%	97%	113%	109%	88%
Stack D-R3	# 1	112%	95%	104%	102%	83%
	# 2	113%	93%	100%	101%	90%

# SAMPLE CUSTODY

## BARTER

<input type="checkbox"/> IA	<input type="checkbox"/> ND	<input type="checkbox"/> WI
<input type="checkbox"/> ME	<input type="checkbox"/> SD	Other; _____
<input checked="" type="checkbox"/> MN	<input type="checkbox"/> WI	

COC 1 of 2

**Barr Engineering Company**  
Attn: Accounts Payable  
4300 Marketpointe Drive  
Minneapolis, MN 55435-4803  
Ph. (952) 832-2600 Fax (952) 832-2601

Unit 18: Business Units/EMS/Support Services/Air Sampling/Datasheds/JTher/CUC V2 CDR HHS 06-18-16

Version 2 - Created 06/01/14

## Barr Engineering Co. Chain of Custody



## Request for Laboratory Analytical Services

Sample Origination State:

☐ IA ☐ ND ☐ WI  
☐ MI ☐ SD ☐ Other:  
☒ MN ☐ WI

COC Number: 10223

COC 2 of 2

Report Results To

Check One:



Barr Engineering Company  
 3128 14th Avenue East  
 Hibbing, MN 55435-4803  
 (218) 262-8600



Barr Engineering Company  
 5150 West 76th Street  
 Edina, MN 55439-2330  
 (952) 832-2600

Project Contact: Tom Leier

(Print Name)

+leier@barr.com

(email)

Send Invoice To

Project Number 23 / G 9-1428 .72 BASE 200

Barr Engineering Company

Attn: Accounts Payable

4300 Marketpointe Drive

Minneapolis, MN 55435-4803

Ph. (952) 832-2600 Fax (952) 832-2601

30094

Special instructions and/or specific regulatory requirements:  
(method, limit of detection, etc.)

Ontario Hydro

Requested Due Date:

☒ Standard Turn  
 Around Time

☐ Rush  
 (mm/dd/yyyy)

METHOD

SAMPLE FRACTION

Sample Identification	Date/Time Collected	Media I.D. #	Type			Remarks
			Grab	Comp.	QC	
1. Stack D SVO25 R1	9/7/17 1020	GFF	X		X	
2. ↓ R2	1255	↓	X		X	
3. R3	1530	↓	X		X	
4. Recovery Blank	1300	-		X	X	
5. Blank 0.1N HNO3	1400	-		X	X	
6. Blank KCl	1405	-		X	X	
7. Blank 5% HNO3/10% H2O2	1410	-		X	X	
8. Blank 4% KMnO4/10% H2SO4	1415	-		X	X	
9. Blank Hydroxylamine	1420	-		X	X	
10. Blank Filter	1425	GFF	X			

Chain of Custody

Collected by (Print Name): Ben Wiltse

Collector's Signature:

Date/Time: 9/7/17 1600

Laboratory:

Method of Shipment: ☐ Sampler ☒ FedEx ☐ UPS Other:Sample Condition upon Receipt: ☐ Acceptable ☐ Other (explain)

Relinquished by:

Received by:

Date/Time:

9/7/17 1600

9/11/17 1200

Received at Lab by:

9.12.17 1230

Distribution: White-Original Accompanies Shipment to Lab; Yellow - Field Copy

Version 2 - Created 06/01/14

# ANALYTICAL DATA

## Analytical Calculations

### Mercury-

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

### Where-

CVAA Results= Raw sample reading ( $\mu\text{g}$ )--*Hg-Data Sheet*

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

Final Volume (FV)--*Sample Submission*

$$\text{Mercury Results } (\mu\text{g}) = \text{CVAF Results } (\mu\text{g})$$

No calculation required.

## Analytical Calculations

### Spike Recovery-

$$\text{Spike (\%)} = \frac{(\text{Spiked Result } (\mu\text{g/L}) - \text{Sample Result } (\mu\text{g/L}))}{\text{Spike Amount } (\mu\text{g/L})} \times 100$$

### Where-

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

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

Spike Amount--*Hg- Data Sheet*

### Duplicate Analysis RPD-

$$\text{RPD (\%)} = \frac{(\text{Duplicate Result } (\mu\text{g/L}) - \text{Sample Result } (\mu\text{g/L}))}{\text{Average } (\mu\text{g/L})} \times 100$$

### Where-

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

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



Analysis Due Date 09.20.17  
QA/QC/Report Due Date 09.22.17

Client: Barr Engineering  
Project No 23/69-1428.72 BASE 200

Date Rec 09.12.17  
Time Rec 1230

HNO <sub>3</sub> Lot: 57052	BrK Lot: OHM-050-5	Volume Marked <u>Y</u> / N	Ref. Method: OHM
HF Lot: 3113033	KBrO <sub>3</sub> Lot: OHM-050-6	Volume Loss <u>Y</u> / (N) ?	
HCl Lot: 4116060		pH < 2.0 <u>Y</u> / N see below	

### Sample Identification

1	Stack A-OHM-R1	7	Stack C-OHM-R1	13	Field Blank
2	Stack A-OHM-R2	8	Stack C-OHM-R2	14	Reagent Blank - Page 2
	Stack A-OHM-R2 Triplicate		Stack C-OHM-R2 Triplicate		
3	Stack A-OHM-R3	9	Stack C-OHM-R3		
	Stack A-OHM-R3 Spike		Stack C-OHM-R3 Spike		
4	Stack B-OHM-R1	10	Stack D-OHM-R1		
5	Stack B-OHM-R2	11	Stack D-OHM-R2		
	Stack B-OHM-R2 Triplicate		Stack D-OHM-R2 Triplicate		
6	Stack B-OHM-R3	12	Stack D-OHM-R3		
	Stack B-OHM-R3 Spike		Stack D-OHM-R3 Spike		

Analyses Requested Samples 1-13 Hg

Run / FB	Fill (C1) / Ace (C2a)		FH HNO <sub>3</sub> Rinse (C2)			KCl (C3)		H <sub>2</sub> O <sub>2</sub> /HNO <sub>3</sub> (C4)		KMnO <sub>4</sub> (C5)	
	pH < 2.0 <u>Y</u> / N		pH < 2.0 <u>Y</u> / N			pH < 2.0 <u>Y</u> / N		pH < 2.0 <u>Y</u> / N		pH < 2.0 <u>Y</u> / N	
Lab ID.	Fill ID	BV, ml	BV, ml	FV, ml		BV, ml	FV, ml	BV, ml	FV, ml	BV, ml	FV, ml
1			96	200		750	800	178	250	720	800
2.T			96			550	600	182		630	700
3.S			94			670	700	172		660	700
4			74			660	700	172		650	700
5.T			104			590	600	158		640	700
6.S			100			560	600	210		690	850
7			90			620	700	186		690	800
8.T			86			740	800	170		670	700
9.S			90			620	700	130		590	700
10			90			760	800	182		830	900
11.T			80			710	800	176		670	800
12.S			84			680	700	112		480	500
13						440	500	220		370	500

### Lab Communications

Filters brought to FV=50mL w/ UPDI.

Rec Runs: C1, C2, C3, C4, C5; FB: C3, C4, C5; RB: C12, C7, C8, C9, C10, C11—09.12.17 LLB

Page 1 of 2  
9/12/2017 3:45:55 PM  
SS Form By ZAB  
Labeled By/Date ZAB 9/12/17

C1 Prep By/Date mmp 9/14/17 C4 Prep By/Date mmp 9/14/17  
C2 Prep By/Date mmp 9/15/17 C5 Prep By/Date mmp 9/15/17  
C3 Prep By/Date mmp 9/13/17 C2a Prep By/Date \_\_\_\_\_  
ID Verification By/Date KLG 9/13/17





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OHM  
Method 29 Microwave Worksheet

Lab ID # e 30094

Client: Barr

Date Digested: 9.18.17 Initials: SCF Worksheet Prepared by: KLG

Auto Sample Loc.	Sample Lab ID	Sample Weight (g)	# of filters digested	Spike	Prep Volume (ml)	Weight In Micro / Weight Out Micro	Units
1	LRB+			50ppb Hg std.	50		
2	LRB						
3	30094-1.1		1				
4	<del>2.2.1</del>						
5	-3.1						
6	-4.1						
7	-5.1						
8	-6.1						
9	-7.1						
10	-8.1						
11	-9.1						
12	-10.1						
13	-11.1						
14	-12.1						
15	-14.1						
16	cleaning blk						
<div style="display: flex; justify-content: space-between;"> <div> 2 mL HNO<sub>3</sub>  2 mL HCl  1 mL HF </div> <div> HCl: 4116060  HNO<sub>3</sub>: 57052  HF: 5115033 </div> <div> LRB+ spiked w/ 0.1ml 25ppm Hg Std (Hg2-098-4) </div> </div>							

Element One, Inc. Form 104 - Revision 1.0

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30094 Barr OHM Report Packet

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## MERCURY BATCH DIGESTION/RUN WORKSHEET

Date Prepared & Digested: 9/14/17 Initials: KLG Start Time: 1330 Stop Time: 1430

Using the Method Reagent Blank and the 0.4ug/ml Working, QC #2 &amp; QC #3 Standards, make the following dilutions for the calibration and QC's...

A/S	Curve & QC's	ml working std	40 ml aliquot concentration		Final Vol	Working Standard Lot Numbers
7	Reagent BLK	0	0.0		400	<b>#1 (working std):</b> Lot #: <u>Hg2-136-1</u> by: <u>KLG</u> <b>QC #2 &amp; #3 are made the same as WS #1 (0.4ug/ml)</b> QC Std #2 Lot #: <u>Hg2-136-2</u> QC Std #3 (QC #3): Lot #: <u>Hg2-136-3</u> Curve prepared by: <u>KLG</u>
8	0.001 ug, DL	0.025mL	0.000025		400	
9	0.002 ug	0.025ml	0.00005		200	
10	0.004ug	0.050ml	0.0001		200	
11	0.020ug	0.250ml	0.0005		200	
12	0.040ug	0.500ml	0.0010		200	
13	0.02ug=QC#2	0.5ml QC#2 std	0.00050		400	
14	0.02ug=QC#3	0.5ml QC#3 std	0.00050	Times to run	400	Comments: <u>091417-1m</u> <u>QC L&amp;S 09-15-17 8:00am</u>

A/S	LAB #	ml used	Sample FV, ml	Dilutions	Spike ug	Client
15	30094-1.2	20	200	2		Barr
16	-2.2					
17	-2.2 trp					
18	-3.2					
19	-3.2 +				0.02	
20	-4.2					
21	-5.2					
22	-5.2 trp					
23	-6.2					
24	-6.2 +				0.02	

**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 0.050ml per 40ml sample.**Digestion:** To the sample add... 5ml of 33% HCL, 1ml Potassium Bromate / Potassium Bromide solution and let stand for 30minHNO<sub>3</sub> Lot # 57652 HCL Lot# 4116060 Hydrox Lot# Hg2-118-4

Clear samples after digestion with 0.1ml of Hydroxylamine solution.

Element One, Inc Form 112 R2-Ontario Hydro Digestion Sheet

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30094 Barr OHM Report Packet

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A/S	LAB #	ml used	Sample FV, ml	Times to run	Dilutions	Spike ug	Client
25	30094-7.2	20	206	2			Barr
26	-8.2	↓	↓	↓			↓
27	-8.2 trp	↓	↓	↓			↓
28	-9.2	↓	↓	↓			↓
29	-9.2 +	↓	↓	↓		0.02	↓
30	-10.2	↓	↓	↓			↓
31	-11.2	↓	↓	↓			↓
32	-11.2 trp	↓	↓	↓			↓
33	-12.2	↓	↓	↓			↓
34	-12.2 +	↓	↓	↓		0.02	↓
35	-14.2	↓	↓	↓			↓
36	-1.3	10	800	2			↓
37	-2.3	↓	600	↓			↓
38	-2.3 trp	↓	↓	↓			↓
39	-3.3	↓	700	↓			↓
40	-3.3 spk	↓	↓	↓		0.02	↓
41	-4.3	↓	700	↓			↓
42	-5.3	↓	600	↓			↓
43	-5.3 trp	↓	↓	↓			↓
44	-6.3	↓	600	↓			↓
45	-6.3 +	↓	↓	↓		0.02	↓
46	-7.3	↓	700	↓			↓
47	-8.3	↓	800	↓			↓
48	-8.3 trp	↓	↓	↓			↓
49	-9.3	↓	700	↓			↓
50	-9.3 +	↓	↓	↓		0.02	↓
51	-10.3	↓	800	↓			↓
52	-11.3	↓	800	↓			↓
53	-11.3 trp	↓	↓	↓			↓
54	-12.3	↓	700	↓			↓
55	-12.3 +	↓	↓	↓		0.02	↓
56	-13.3	20	500	↓			↓
57	-14.3	↓ 120	↓ 500	↓			↓

Element One, Inc Form 112 R2-Ontario Hydro Digestion Sheet

A/S	LAB #	ml used	Sample FV, ml	Times to run	Dilutions	Spike ug	Client
58	30094-1.4	26	256	2			Barr
59	-2.4						
60	-2.4 +						
61	-3.4						
62	-3.4 +					6.02	
63	-4.4						
64	-5.4						
65	-5.4 +						
66	-6.4						
67	-6.4 +					0.02	
68	-7.4						
69	-8.4						
15	-8.4 +						
16	-9.4						
17	-9.4 +					0.02	
18	-10.4						
19	-11.4						
20	-12.4 = -11.4 +						
21	-12.4						
22	-12.4 +					0.02	
23	-13.4						
24	-14.4	✓	✓	✓			✓
25							
26							
27							
28							
29							
30							
31							
32							
33							
34							
35							
36							

Element One, Inc Form 112 R2-Ontario Hydro Digestion Sheet



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## MERCURY BATCH DIGESTION/RUN WORKSHEET

Date Prepared & Digested: 9/15/17 Initials: KLG Start Time: 900 Stop Time: 930

Using the Method Reagent Blank and the 0.4ug/ml Working, QC #2 &amp; QC #3 Standards, make the following dilutions for the calibration and QC's...

A/S	Curve & QC's	ml working std	40 ml aliquot concentration		Final Vol	Working Standard Lot Numbers	
7	Reagent BLK	0	0.0		400	#1 (working std): Lot #: <u>Hg2-136-1</u> by: <u>KLK</u>	
8	0.001 ug, DL	0.025mL	0.000025		400	QC #2 & #3 are made the same as WS #1 (0.4ug/ml)	
9	0.002 ug	0.025ml	0.00005		200	QC Std #2	
10	0.004ug	0.050ml	0.0001		200	Lot #: <u>Hg2-136-2</u>	
11	0.020ug	0.250ml	0.0005		200	QC Std #3 (QC #3):	
12	0.040ug	0.500ml	0.0010		200	Lot #: <u>Hg2-136-3</u>	
13	0.02ug=QC#2	0.5ml QC#2 std	0.00050		400	Curve prepared by: <u>KLK</u>	
14	0.02ug=QC#3	0.5ml QC#3 std	0.00050		400	Comments: <u>091517-1m</u>  <u>QC 091517-1m 1/202</u>	

A/S	LAB #	ml used	Sample FV, ml		Dilutions	Spike ug	Client
15	<u>300949.2</u>	<u>20</u>	<u>200</u>	<u>4</u>			<u>Barr</u>
16	<u>-9.2 +</u>	<u>↓</u>	<u>↓</u>	<u>2</u>		<u>0.02</u>	<u>↓</u>
17	<u>-6.3</u>	<u>5</u>	<u>600</u>	<u>1</u>			<u>↓</u>
18	<u>-6.3 +</u>	<u>↓</u>	<u>↓</u>			<u>0.02</u>	<u>↓</u>
19	<u>-6.3</u>	<u>10</u>	<u>↓</u>	<u>1</u>			<u>↓</u>
20	<u>-6.3 +</u>	<u>↓</u>	<u>↓</u>			<u>0.02</u>	<u>↓</u>
21	<u>-12.3</u>	<u>5</u>	<u>700</u>	<u>↓</u>			<u>↓</u>
22	<u>-12.3 +</u>	<u>↓</u>	<u>↓</u>	<u>↓</u>		<u>0.02</u>	<u>↓</u>
23	<u>-14.4</u>	<u>20</u>	<u>250</u>	<u>2</u>			<u>↓</u>
24							

**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 0.050ml per 40ml sample.**Digestion:** To the sample add... 5ml of 33% HCL, 1ml Potassium Bromate / Potassium Bromide solution and let stand for 30minHNO<sub>3</sub> Lot # 57052 HCL Lot# 4116060 Hydrox Lot# Hg2-118-4

Clear samples after digestion with 0.1ml of Hydroxylamine solution.

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## MERCURY BATCH DIGESTION/RUN WORKSHEET

Date Prepared & Digested: 9/15/17 Initials: KLG/mmp Start Time: 1145 Stop Time: 1220

Using the Method Reagent Blank and the 0.4ug/ml Working, QC #2 &amp; QC #3 Standards, make the following dilutions for the calibration and QC's...

					Working Standard Lot Numbers		
A/S	Curve & QC's	ml working std	40 ml aliquot concentration		Final Vol		
7	Reagent BLK	0	0.0		400	#1 (working std): Lot #: <u>Hg2-136-1</u> by: <u>KLG</u> <b>QC #2 &amp; #3 are made the same as WS #1 (0.4ug/ml)</b> QC Std #2 Lot #: <u>Hg2-136-2</u> QC Std #3 (QC #3): Lot #: <u>Hg2-136-3</u>	
8	0.001 ug, DL	0.025mL	0.000025		400		
9	0.002 ug	0.025ml	0.00005		200		
10	0.004ug	0.050ml	0.0001		200		
11	0.020ug	0.250ml	0.0005		200		
12	0.040ug	0.500ml	0.0010		200		
13	0.02ug=QC#2	0.5ml QC#2 std	0.00050		400		
14	0.02ug=QC#3	0.5ml QC#3 std	0.00050		400	Curve prepared by:  Comments: <u>091517-2m</u> <u>AC'd KLG 9/15/17</u>	
A/S	LAB #	ml used	Sample FV, ml		Dilutions	Spike ug	Client
15	30094-15	20	800	2			Barr
16	-2.5		700				
17	-2.5 trp		↓				
18	-3.5		700				
19	-3.5 +		↓			0.02	
20	-4.5		700				
21	-5.5		700				
22	-5.5 trp		↓				
23	-6.5		800				
24	-6.5 +	↓	↓	↓		0.02	↓

**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 0.050ml per 40ml sample.**Digestion:** To the sample add... 5ml of 33% HCL, 1ml Potassium Bromate / Potassium Bromide solution and let stand for 30minHNO<sub>3</sub> Lot # 57052 HCL Lot# 4116060 Hydrox Lot# Hg2-118-4

Clear samples after digestion with 0.1ml of Hydroxylamine solution.

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A/S	LAB #	ml used	Sample FV, ml	Times to run	Dilutions	Spike ug	Client
25	30094-7.5	20	800	2			Barr
26	-8.5		700				
27	-8.5 trp		↓				
28	-9.5		700				
29	-9.5 +		↓			0.02	
30	-10.5		900				
31	-11.5		800				
32	-11.5 trp		↓				
33	-12.5		500				
34	-12.5 +		↓			0.02	
35	-13.5		↓				
36	-14.5		200				
37	-14.6	↓	70	↓			↓
38							
39							
40							
41							
42							
43							
44							
45							
46							
47							
48							
49							
50							
51							
52							
53							
54							
55							
56							
57							

Element One, Inc Form 112 R2-Ontario Hydro Digestion Sheet



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## MERCURY BATCH DIGESTION - RUN WORKSHEET

Date Prepared/Digested: 9/18/17 Prep By: mmp SIF File #: 091817-1  
 Block #1 Temperature: 93.63 Start Time: 8:45 Machine ID: #1  
 Block #2 Temperature: — Stop Time: 9:45 Batch Analyst: mmp  
 Block #3 Temperature: 94.26 Typed By: mmp Verified By: DLH

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)
2	0.004 ug	0.01ml		40	40	Lot #: <u>X<sup>mmp</sup> K24g03002</u>
3	0.04 ug	0.10ml		40	40	Working Standard
4	0.08 ug	0.20ml		40	40	Lot #: <u>Hg2-139-1 by mmp</u>
5	0.16 ug	0.40ml		40	40	Standard #2 (QC #2):
6	0.20ug	0.50ml		40	40	Lot #: <u>Hg2-139-2</u>
						Standard #3 (QC #3):
						Lot #: <u>Hg2-139-3</u>
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: <u>mmp</u>

Initial Review By: mmp Date: 09/18/17 Time: 1:32  
 Final QC Review By: DLH Date: 09/18/17 Time: 2:11  
 Comments: 30089-17 @ 2ml

A/S	LAB #	Method	Wt (g)/ FV (mL)	Prep Aliquot Used, mL	Aliquot or Calc Mass	FV, mL or "1" for conc.	Comments
9	<u>29808-300c</u>	<u>7470 A</u>			<u>0.05</u>	<u>5</u>	<u>TV = 0.70</u>
10	<u>4L</u>				<u>1</u>	<u>1</u>	<u>TV = 0.008</u>
11	<u>30104-FL1-BLK</u>				<u>20</u>		
12	<u>FL1-BLK +</u>						
13	<u>30104-1</u>						
14	<u>-2</u>						
15	<u>-20</u>						
16	<u>-3</u>						
17	<u>-3+</u>						
18	<u>-4</u>						
19	<u>-5</u>						

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

"+" Denotes spike for Hg. Use calibration working 0.4ug/ml standard at the rate of 0.20ml per 40ml sample, unless otherwise noted.

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

H<sub>2</sub>SO<sub>4</sub> @ 2.0ml..... HNO<sub>3</sub> @ 1.0ml..... Persulfate @ 3.2ml..... KMnO<sub>4</sub> @ 6.0ml

H<sub>2</sub>SO<sub>4</sub> Lot # 170476 HNO<sub>3</sub> Lot # 57052 HCl Lot # 4116040 mmp  
 Persulfate Lot # Hg2-125-3 KMnO<sub>4</sub> Lot # Hg2-128-6 Hydrox Lot # Hg2-118-4 mmp

Clear samples after digestion with 2.4 ml of Hydroxylamine solution. Hg2-125-5

SIF File #: 091817-1

A/S	LAB #	Method	Wt (g)/ FV (mL)	Prep Aliquot Used, mL	Aliquot or Calc Mass	FV, mL or "1" for conc.	Comments
✓ 20	30104-6	7470A			20	1	
21	30095-9-10-BLK				1	1	
22	-BLK+				1	1	
✓ 23	30095-9						
24	-10						
25	29824-7-8-BLK						
26	BLK+				✓		
✓ 27	30095-3				10		
28	-3+				10		
29	-3				5		
✓ 30	-3+				5		
✓ 31	30110-1		$\frac{10.3715}{100}$	8	✓ 0.8297	100 mm	
32	-1D		$\frac{10.4640}{100}$	↓	0.8387	1	
✓ 33	30110-2		$\frac{10.0026}{100}$	↓	0.8002	1	
34	-2+	↓	$\frac{10.2834}{100}$	↓	0.8226	1	
✓ 35	30089-LBBH	m29			4	100	
36	-FH LBB+						
37	-4 FH						
38	-5 FH						
39	-5 FH D						
40	-6 FH						
41	-6 FH+						
42	-10 FH						
43	-11 FH						
44	-11 FH D						
45	-12 FH						
46	-12 FH+						
47	-13 FH						
48	-14 FH				↓		
49	-17				1		
50	-17				2		
✓ 51	-17	↓			4	↓	
✓ 52	30094-1.5	OHM			↓	800	
53	-2.5	↓				700	
54	-2.5 D	↓			↓	700	

SIF File #: 091817-1

A/S	LAB #	Method	Wt (g)/ FV (mL)	Prep Aliquot Used, mL	Aliquot or Calc Mass	FV, mL or "1" for conc.	Comments
✓ 55	30094-3.5	OHM			4	700	
56	-3.5+					700	
57	-4.5					700	
58	-5.5					700	
59	-5.50					700	
60	-6.5					800	
61	-6.5+					800	
62	-7.5					800	
63	-8.5					700	
64	-8.50					700	
65	-9.5					700	
66	-9.5+					700	
67	-10.5					900	
68	-11.5					800	
69	-11.50					800	
70	-12.5					500	
71	-12.5+	✓			✓	500	
72							
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## MERCURY BATCH DIGESTION/RUN WORKSHEET

Date Prepared & Digested: 9/19/17 Initials: KLG Start Time: 830 Stop Time: 900

Using the Method Reagent Blank and the 0.4ug/ml Working, QC #2 &amp; QC #3 Standards, make the following dilutions for the calibration and QC's...

					Working Standard Lot Numbers		
A/S	Curve & QC's	ml working std	40 ml aliquot concentration		Final Vol		
7	Reagent BLK	0	0.0		400	#1 (working std): Lot #: <u>Hg2-139-1</u> by: <u>mmP</u> <u>QC #2 &amp; #3 are made the same as WS #1 (0.4ug/ml)</u> QC Std #2 Lot #: <u>Hg2-139-2</u> QC Std #3 (QC #3): Lot #: <u>Hg2-139-3</u>	
8	0.001 ug, DL	0.025mL	0.000025		400		
9	0.002 ug	0.025ml	0.00005		200		
10	0.004ug	0.050ml	0.0001		200		
11	0.020ug	0.250ml	0.0005		200		
12	0.040ug	0.500ml	0.0010		200		
13	0.02ug=QC#2	0.5ml QC#2 std	0.00050		400		
14	0.02ug=QC#3	0.5ml QC#3 std	0.00050		400	Curve prepared by: <u>mmP</u>  Comments: <u>091917-1m</u> <u>all of KLG</u>	
A/S	LAB #	ml used	Sample FV, ml		Dilutions	Spike ug	Client
15	<u>30094-LPB</u>	<u>10</u>	<u>50</u>	<u>2</u>			<u>Barr</u>
16	<u>-LPB+</u>	<u>.4</u>	<u>1</u>	<u>1</u>		<u>0.02</u>	<u>1</u>
17	<u>-1.1</u>	<u>10</u>	<u>1</u>	<u>1</u>			<u>1</u>
18	<u>-2.1</u>	<u>1</u>	<u>1</u>	<u>1</u>			<u>1</u>
19	<u>-2.1 trp</u>	<u>1</u>	<u>1</u>	<u>1</u>			<u>1</u>
20	<u>-3.1</u>	<u>1</u>	<u>1</u>	<u>1</u>			<u>1</u>
21	<u>-3.1 spk</u>	<u>1</u>	<u>1</u>	<u>1</u>		<u>0.02</u>	<u>1</u>
22	<u>-4.1</u>	<u>1</u>	<u>1</u>	<u>1</u>			<u>1</u>
23	<u>-5.1</u>	<u>1</u>	<u>1</u>	<u>1</u>			<u>1</u>
24	<u>-5.1 trp</u>	<u>1</u>	<u>1</u>	<u>1</u>			<u>1</u>

**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 0.050ml per 40ml sample.**Digestion:** To the sample add... 5ml of 33% HCL, 1ml Potassium Bromate / Potassium Bromide solution and let stand for 30minHNO<sub>3</sub> Lot# 57052 HCL Lot# 4116090 Hydrox Lot# Hg2-125-5

Clear samples after digestion with 0.1ml of Hydroxylamine solution.

Element One, Inc Form 112 R2-Ontario Hydro Digestion Sheet

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30094 Barr OHM Report Packet

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A/S	LAB #	ml used	Sample FV, ml	Times to run	Dilutions	Spike ug	Client
25	30094-6.1	10	50	2			Barr
26	-6.1 spk	↓	↓	↓		0.02	↓
27	-7.1	↓	↓	↓			↓
28	-8.1	↓	↓	↓			↓
29	-8.1 trp	↓	↓	↓			↓
30	-9.1	↓	↓	↓			↓
31	-9.1 spk	↓	↓	↓		0.02	↓
32	-10.1	↓	↓	↓			↓
33	-11.1	↓	↓	↓			↓
34	-11.1 trp	↓	↓	↓			↓
35	-12.1	↓	↓	↓			↓
36	-12.1 spk	↓	↓	↓		0.02	↓
37	-14.1	↓	↓	↓			↓
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Element One, Inc Form 112 R2-Ontario Hydro Digestion Sheet

## PS Analytical Millennium Galahad CVAF Analyzer

Sample ID	Inj	Conc	Pk Ht	Pk Area	Baseline	Slope	Intercept	Alq	Vol	Date/Time
0		0	3.702812	129.73494	0.529663	0	0	----	----	9/14/2017 15:13
0.001		0.001	19.920914	859.211914	-0.127701	16218.10059	3.702812	----	----	9/14/2017 15:15
0.002		0.002	40.005863	1697.775391	0.214023	18151.52344	3.058339	----	----	9/14/2017 15:17
0.004		0.004	72.892052	3138.451904	-0.154898	17438.625	3.612814	----	----	9/14/2017 15:20
0.02		0.02	388.390442	16848.02148	-0.813421	19348.7793	0.499013	----	----	9/14/2017 15:22
0.04		0.04	728.37677	32442.83008	-1.067403	18305.08594	4.474675	----	----	9/14/2017 15:24
Blk		0	1.916473	-179.605255	-1.742141	18305.08594	4.474675	1	1	9/14/2017 15:27
DL		0.0008	20.018848	858.312134	0.258358	18305.08594	4.474675	1	1	9/14/2017 15:29
QC 2		0.0202	374.32666	16512.19922	0.023024	18305.08594	4.474675	1	1	9/14/2017 15:32
QC 3		0.0217	401.867523	17524.9082	-1.259447	18305.08594	4.474675	1	1	9/14/2017 15:34
Blk		0	1.548896	-199.742294	-1.548896	18305.08594	4.474675	1	1	9/14/2017 15:37
30094-1.2	#1	0.0254	50.935139	2234.55957	-0.075435	18305.08594	4.474675	20	200	9/14/2017 15:39
30094-1.2	#2	0.0245	49.345226	2034.324707	-0.570589	18305.08594	4.474675	20	200	9/14/2017 15:41
30094-2.2	#1	0.0196	40.430492	1660.368774	-0.37771	18305.08594	4.474675	20	200	9/14/2017 15:44
30094-2.2	#2	0.0195	40.257179	1695.596191	-0.045203	18305.08594	4.474675	20	200	9/14/2017 15:46
30094-2.2 trp	#1	0.0191	39.381889	1606.577271	-0.473555	18305.08594	4.474675	20	200	9/14/2017 15:48
30094-2.2 trp	#2	0.0187	38.745438	1600.722168	-0.112677	18305.08594	4.474675	20	200	9/14/2017 15:50
30094-3.2	#1	0.0256	51.298119	2169.624268	-0.157518	18305.08594	4.474675	20	200	9/14/2017 15:52
30094-3.2	#2	0.0252	50.627144	2090.181885	-0.649939	18305.08594	4.474675	20	200	9/14/2017 15:54
30094-3.2 spk	#1	0.2032	376.406067	16713.57617	-0.255859	18305.08594	4.474675	20	200	9/14/2017 15:57
30094-3.2 spk	#2	0.2049	379.604401	16828.47461	-1.701811	18305.08594	4.474675	20	200	9/14/2017 15:59
30094-4.2	#1	0.0182	37.765858	1332.255615	-1.662716	18305.08594	4.474675	20	200	9/14/2017 16:02
30094-4.2	#2	0.0197	40.55698	1634.825684	-0.394482	18305.08594	4.474675	20	200	9/14/2017 16:04
30094-5.2	#1	0.0192	39.608845	1619.303955	-0.429327	18305.08594	4.474675	20	200	9/14/2017 16:06
30094-5.2	#2	0.0193	39.852249	1595.973999	-0.315436	18305.08594	4.474675	20	200	9/14/2017 16:09
30094-5.2 trp	#1	0.0183	37.943813	1572.8396	-0.127828	18305.08594	4.474675	20	200	9/14/2017 16:11
30094-5.2 trp	#2	0.0186	38.59763	1592.997314	-0.380041	18305.08594	4.474675	20	200	9/14/2017 16:13
30094-6.2	#1	0.0228	46.148567	1910.13501	-0.094056	18305.08594	4.474675	20	200	9/14/2017 16:15
30094-6.2	#2	0.0221	44.98848	1879.190796	-0.323569	18305.08594	4.474675	20	200	9/14/2017 16:17
30094-6.2 spk	#1	0.1952	361.742004	15783.15527	-0.548942	18305.08594	4.474675	20	200	9/14/2017 16:19
30094-6.2 spk	#2	0.1986	368.088318	15890.52832	-1.750502	18305.08594	4.474675	20	200	9/14/2017 16:22
DL		0.0008	18.216318	542.681335	-1.877092	18305.08594	4.474675	1	1	9/14/2017 16:25
QC 2		0.021	389.341797	16601.11914	0.165876	18305.08594	4.474675	1	1	9/14/2017 16:27
QC 3		0.0218	404.250244	17396.02734	-1.031878	18305.08594	4.474675	1	1	9/14/2017 16:30
Blk		0	1.707735	-198.8694	-1.707735	18305.08594	4.474675	1	1	9/14/2017 16:32
30094-7.2	#1	0.038	74.114853	3231.996826	0.495807	18305.08594	4.474675	20	200	9/14/2017 16:35
30094-7.2	#2	0.0357	69.883804	2900.100342	-0.69777	18305.08594	4.474675	20	200	9/14/2017 16:37
30094-8.2	#1	0.0301	59.494667	2443.998535	-0.565065	18305.08594	4.474675	20	200	9/14/2017 16:39
30094-8.2	#2	0.0306	60.49688	2484.57251	-0.449311	18305.08594	4.474675	20	200	9/14/2017 16:41
30094-8.2 trp	#1	0.0295	58.400589	2412.222656	-0.654465	18305.08594	4.474675	20	200	9/14/2017 16:43
30094-8.2 trp	#2	0.0297	58.840004	2421.313477	-0.793128	18305.08594	4.474675	20	200	9/14/2017 16:46
30094-10.2	#1	0.0223	45.314449	1658.674683	-1.59142	18305.08594	4.474675	20	200	9/14/2017 16:57
30094-10.2	#2	0.0226	45.820293	1886.80957	-0.122365	18305.08594	4.474675	20	200	9/14/2017 17:00
30094-11.2	#1	0.0157	33.223904	1314.977661	-0.448558	18305.08594	4.474675	20	200	9/14/2017 17:02
30094-11.2	#2	0.016	33.723782	1349.716919	-0.16647	18305.08594	4.474675	20	200	9/14/2017 17:04
30094-11.2 trp	#1	0.0155	32.777401	1307.548218	-0.09338	18305.08594	4.474675	20	200	9/14/2017 17:06
30094-11.2 trp	#2	0.0155	32.873371	1317.383911	0.029056	18305.08594	4.474675	20	200	9/14/2017 17:08
30094-12.2	#1	0.0167	34.992088	1426.759399	0.034013	18305.08594	4.474675	20	200	9/14/2017 17:11
30094-12.2	#2	0.0166	34.778393	1443.216919	-0.341991	18305.08594	4.474675	20	200	9/14/2017 17:13
30094-12.2 spk	#1	0.2057	380.958832	16412.30273	-0.391518	18305.08594	4.474675	20	200	9/14/2017 17:15
30094-12.2 spk	#2	0.2034	376.743042	16021.24121	-1.321828	18305.08594	4.474675	20	200	9/14/2017 17:18

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DL		0.0008	19.373655	550.989807	-1.740042	18305.08594	4.474675	1	1	9/14/2017 17:20
QC 2		0.022	406.977051	16965.8457	-0.074126	18305.08594	4.474675	1	1	9/14/2017 17:22
QC 3		0.0234	433.074707	17995.93359	-1.110071	18305.08594	4.474675	1	1	9/14/2017 17:25
Blk		0	1.737575	-207.280197	-1.737575	18305.08594	4.474675	1	1	9/14/2017 17:28
30094-14.2	#1	0	2.422775	65.582283	0.441117	18305.08594	4.474675	20	200	9/14/2017 17:30
30094-14.2	#2	0	2.564782	96.517799	0.296882	18305.08594	4.474675	20	200	9/14/2017 17:32
30094-1.3	#1	0.824	193.023987	8254.765625	0.048524	18305.08594	4.474675	10	800	9/14/2017 17:34
30094-1.3	#2	0.7895	185.112091	7773.198242	-1.10408	18305.08594	4.474675	10	800	9/14/2017 17:37
30094-2.3	#1	0.5737	179.495895	7218.696777	-1.854197	18305.08594	4.474675	10	600	9/14/2017 17:39
30094-2.3	#2	0.573	179.290298	7222.354004	-0.781606	18305.08594	4.474675	10	600	9/14/2017 17:42
30094-2.3 trp	#1	0.5708	178.611145	7201.21582	-1.171882	18305.08594	4.474675	10	600	9/14/2017 17:44
30094-2.3 trp	#2	0.5777	180.724243	7312.241699	-1.996147	18305.08594	4.474675	10	600	9/14/2017 17:46
30094-3.3	#1	0.596	160.338501	6393.967285	-1.06315	18305.08594	4.474675	10	700	9/14/2017 17:48
30094-3.3	#2	0.6125	164.639023	6499.111328	-1.363689	18305.08594	4.474675	10	700	9/14/2017 17:50
30094-3.3 spk	#1	2.0592	542.969482	22774.36133	-1.784642	18305.08594	4.474675	10	700	9/14/2017 17:52
30094-3.3 spk	#2	2.0888	550.694763	23048.16992	-2.318133	18305.08594	4.474675	10	700	9/14/2017 17:55
30094-4.3	#1	1.0711	284.57605	11874.31836	-2.248495	18305.08594	4.474675	10	700	9/14/2017 17:58
30094-4.3	#2	1.0666	283.387817	11842.01953	-2.40451	18305.08594	4.474675	10	700	9/14/2017 18:00
30094-5.3	#1	0.8023	249.237625	10156.12402	-2.462655	18305.08594	4.474675	10	600	9/14/2017 18:03
30094-5.3	#2	0.7941	246.744553	10147.00586	-1.222885	18305.08594	4.474675	10	600	9/14/2017 18:05
30094-5.3 trp	#1	0.7834	243.49263	9884.992188	-1.312846	18305.08594	4.474675	10	600	9/14/2017 18:07
30094-5.3 trp	#2	0.7816	242.913742	9835.514648	-0.954398	18305.08594	4.474675	10	600	9/14/2017 18:09
QC 2		0.0211	390.168945	16766.19531	0.278376	18305.08594	4.474675	1	1	9/14/2017 18:18
QC 3		0.0237	438.66629	17959.60742	-0.900625	18305.08594	4.474675	1	1	9/14/2017 18:21
Blk		0	1.978482	-184.995193	-1.650517	18305.08594	4.474675	1	1	9/14/2017 18:24
30094-7.3	#1	1.4459	382.570831	15921.48242	-1.636423	18305.08594	4.474675	10	700	9/14/2017 18:32
30094-7.3	#2	1.4127	373.895386	15213.81055	-1.842334	18305.08594	4.474675	10	700	9/14/2017 18:34
30094-8.3	#1	1.2416	288.56192	11826.31836	-2.128457	18305.08594	4.474675	10	800	9/14/2017 18:37
30094-8.3	#2	1.1907	276.927979	11101.66016	-2.298913	18305.08594	4.474675	10	800	9/14/2017 18:39
30094-8.3 trp	#1	1.2128	281.969513	11445.14844	-2.056964	18305.08594	4.474675	10	800	9/14/2017 18:41
30094-8.3 trp	#2	1.1844	275.490417	11021.6582	-1.690425	18305.08594	4.474675	10	800	9/14/2017 18:44
30094-9.3	#1	1.3286	351.915802	14508.59668	-1.279653	18305.08594	4.474675	10	700	9/14/2017 18:46
30094-9.3	#2	1.3142	348.15274	14059.58984	-3.126066	18305.08594	4.474675	10	700	9/14/2017 18:48
30094-9.3 spk	#1	2.8418	747.599121	31214.74805	-2.969182	18305.08594	4.474675	10	700	9/14/2017 18:50
30094-9.3 spk	#2	2.9041	763.909607	31878.69727	-3.449224	18305.08594	4.474675	10	700	9/14/2017 18:53
30094-10.3	#1	1.4232	330.130463	13559.43066	-2.421106	18305.08594	4.474675	10	800	9/14/2017 18:56
30094-10.3	#2	1.3908	322.6987	12996.91992	-2.790383	18305.08594	4.474675	10	800	9/14/2017 18:58
30094-11.3	#1	1.3304	308.893372	12323.78516	-1.309034	18305.08594	4.474675	10	800	9/14/2017 19:00
30094-11.3	#2	1.3604	315.74707	12826.53027	-1.6033	18305.08594	4.474675	10	800	9/14/2017 19:03
30094-11.3 trp	#1	1.3658	316.99881	12680.92676	-0.739362	18305.08594	4.474675	10	800	9/14/2017 19:05
30094-11.3 trp	#2	1.388	322.073517	13013.02441	-1.704762	18305.08594	4.474675	10	800	9/14/2017 19:07
DL		0.0006	16.234478	272.437592	-3.159092	18305.08594	4.474675	1	1	9/14/2017 19:14
QC 2		0.0226	417.850739	17212.17578	0.216059	18305.08594	4.474675	1	1	9/14/2017 19:16
QC 3		0.0238	440.282379	18310.52734	-1.164644	18305.08594	4.474675	1	1	9/14/2017 19:19
30094-1.4	#1	0.0142	25.271427	1025.683228	-0.649258	18305.08594	4.474675	20	250	9/14/2017 19:32
30094-1.4	#2	0.0134	24.02758	997.069397	-0.017815	18305.08594	4.474675	20	250	9/14/2017 19:34
30094-2.4	#1	0.0118	21.717903	941.693726	0.004884	18305.08594	4.474675	20	250	9/14/2017 19:36
30094-2.4	#2	0.0113	21.014256	878.388123	-0.083743	18305.08594	4.474675	20	250	9/14/2017 19:38
30094-2.4 trp	#1	0.0108	20.320162	822.15979	0.441815	18305.08594	4.474675	20	250	9/14/2017 19:40
30094-2.4 trp	#2	0.0106	19.949902	823.563782	-0.035755	18305.08594	4.474675	20	250	9/14/2017 19:43
30094-3.4	#1	0.0168	29.075708	1187.291748	0.003156	18305.08594	4.474675	20	250	9/14/2017 19:45
30094-3.4	#2	0.0174	29.91601	1208.87146	0.254781	18305.08594	4.474675	20	250	9/14/2017 19:47

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30094-3.4 spk	#1	0.2773	410.571381	17568.39844	-0.116181	18305.08594	4.474675	20	250	9/14/2017 19:49
30094-3.4 spk	#2	0.2732	404.529327	17199.96484	-1.145178	18305.08594	4.474675	20	250	9/14/2017 19:52
30094-4.4	#1	0.1222	183.472336	7671.715332	-1.502088	18305.08594	4.474675	20	250	9/14/2017 19:55
30094-4.4	#2	0.12	180.152512	7438.205566	-1.078831	18305.08594	4.474675	20	250	9/14/2017 19:57
30094-5.4	#1	0.0137	24.554428	629.046021	-1.421799	18305.08594	4.474675	20	250	9/14/2017 19:59
30094-5.4	#2	0.0183	31.215683	1262.129028	0.393692	18305.08594	4.474675	20	250	9/14/2017 20:01
30094-5.4 trp	#1	0.0187	31.874294	1307.9104	-0.152606	18305.08594	4.474675	20	250	9/14/2017 20:03
30094-5.4 trp	#2	0.0185	31.628677	1281.893066	-0.070939	18305.08594	4.474675	20	250	9/14/2017 20:06
30094-6.4	#1	0.0178	30.574463	1235.562134	0.011199	18305.08594	4.474675	20	250	9/14/2017 20:08
30094-6.4	#2	0.0174	29.94191	1237.87854	-0.201462	18305.08594	4.474675	20	250	9/14/2017 20:10
DL		0.001	22.971794	885.874329	0.145859	18305.08594	4.474675	1	1	9/14/2017 20:12
QC 2		0.0221	408.152496	17193.0957	0.325616	18305.08594	4.474675	1	1	9/14/2017 20:14
QC 3		0.0218	403.622559	16892.9082	-0.816331	18305.08594	4.474675	1	1	9/14/2017 20:17
Blk		0	1.854267	-199.823776	-1.854267	18305.08594	4.474675	1	1	9/14/2017 20:20
30094-6.4 spk	#1	0.2985	441.571686	18440.89844	0.386535	18305.08594	4.474675	20	250	9/14/2017 20:22
30094-6.4 spk	#2	0.2939	434.856293	18370.87695	-0.732561	18305.08594	4.474675	20	250	9/14/2017 20:26
30094-7.4	#1	0.0421	66.065735	2609.347412	-1.873626	18305.08594	4.474675	20	250	9/14/2017 20:29
30094-7.4	#2	0.0419	65.899826	2778.384277	-0.475727	18305.08594	4.474675	20	250	9/14/2017 20:31
30094-8.4	#1	0.0291	47.065975	1778.535522	-0.165279	18305.08594	4.474675	20	250	9/14/2017 20:33
30094-8.4	#2	0.0295	47.730419	1894.702881	-0.743764	18305.08594	4.474675	20	250	9/14/2017 20:35
30094-8.4 trp	#1	0.028	45.419815	1829.631104	-0.039575	18305.08594	4.474675	20	250	9/14/2017 20:38
30094-8.4 trp	#2	0.0282	45.818108	1851.449463	-0.258064	18305.08594	4.474675	20	250	9/14/2017 20:40
30094-9.4	#1	0.028	45.406387	1834.339722	-0.261164	18305.08594	4.474675	20	250	9/14/2017 20:42
30094-9.4	#2	0.0282	45.752628	1880.272583	-0.309978	18305.08594	4.474675	20	250	9/14/2017 20:44
30094-9.4 spk	#1	0.2972	439.651398	18739.61328	0.026367	18305.08594	4.474675	20	250	9/14/2017 20:46
30094-9.4 spk	#2	0.3006	444.628418	18921.30273	-1.445408	18305.08594	4.474675	20	250	9/14/2017 20:49
30094-10.4	#1	0.0738	112.59404	4573.418457	-1.747522	18305.08594	4.474675	20	250	9/14/2017 20:52
30094-10.4	#2	0.0725	110.694557	4552.986328	-1.125255	18305.08594	4.474675	20	250	9/14/2017 20:54
30094-11.4	#1	0.0399	62.900116	2445.007324	-0.668854	18305.08594	4.474675	20	250	9/14/2017 20:56
30094-11.4	#2	0.0413	64.918106	2638.526611	-0.058742	18305.08594	4.474675	20	250	9/14/2017 20:58
30094-11.4 trp	#1	0.041	64.464813	2598.190918	-0.369573	18305.08594	4.474675	20	250	9/14/2017 21:00
30094-11.4 trp	#2	0.0427	66.938271	2711.51416	-0.241415	18305.08594	4.474675	20	250	9/14/2017 21:03
30094-12.4	#1	0.0552	85.302383	3555.87207	-0.269696	18305.08594	4.474675	20	250	9/14/2017 21:05
30094-12.4	#2	0.0549	84.868652	3527.100342	-0.544697	18305.08594	4.474675	20	250	9/14/2017 21:07
DL		0.0009	20.063972	657.249939	-0.605971	18305.08594	4.474675	1	1	9/14/2017 21:09
QC 2		0.0222	411.208374	17236.48828	0.175976	18305.08594	4.474675	1	1	9/14/2017 21:11
QC 3		0.0221	409.41217	16476.36914	-0.896601	18305.08594	4.474675	1	1	9/14/2017 21:14
Blk		0	1.794628	-248.55014	-1.744625	18305.08594	4.474675	1	1	9/14/2017 21:17
30094-12.4 spk	#1	0.311	459.946533	19417.375	0.442414	18305.08594	4.474675	20	250	9/14/2017 21:19
30094-12.4 spk	#2	0.3071	454.247589	19488.49414	-1.321557	18305.08594	4.474675	20	250	9/14/2017 21:21
30094-13.4	#1	0.0068	14.445818	369.561218	-1.470118	18305.08594	4.474675	20	250	9/14/2017 21:24
30094-13.4	#2	0.009	17.595537	685.944946	0.359663	18305.08594	4.474675	20	250	9/14/2017 21:26
30094-14.4	#1	0.0192	32.548267	1368.222168	0.267156	18305.08594	4.474675	20	250	9/14/2017 21:29
30094-14.4	#2	0.0183	31.257269	1295.459229	-0.171629	18305.08594	4.474675	20	250	9/14/2017 21:31
30094-13.3	#1	0	0.84866	-49.370579	-0.104901	18305.08594	4.474675	20	500	9/14/2017 21:33
30094-13.3	#2	0	2.219664	97.733612	0.266099	18305.08594	4.474675	20	500	9/14/2017 21:35
30094-14.3	#1	0	2.830206	113.601067	0.126573	18305.08594	4.474675	20	120	9/14/2017 21:37
30094-14.3	#2	0	2.971439	122.037491	0.154293	18305.08594	4.474675	20	120	9/14/2017 21:39
DL		0.0011	24.869097	1026.571655	0.451101	18305.08594	4.474675	1	1	9/14/2017 21:42
QC 2		0.0211	391.546082	16961.51758	0.06326	18305.08594	4.474675	1	1	9/14/2017 21:44
QC 3		0.0221	408.924805	16921.82617	-1.084108	18305.08594	4.474675	1	1	9/14/2017 21:47
Blk		0	1.705442	-223.323105	-1.69666	18305.08594	4.474675	1	1	9/14/2017 21:49



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0	0	4.445363	167.240891	0.13261	0	0	----	----	9/15/2017 9:27
0.001	0.001	21.643847	878.194397	0.057051	17198.48242	4.445364	----	----	9/15/2017 9:29
0.002	0.002	41.813675	1648.362793	-0.131385	18684.1543	3.950141	----	----	9/15/2017 9:31
0.004	0.004	72.99688	2977.089355	-0.000223	17221.04297	5.088117	----	----	9/15/2017 9:33
0.02	0.02	368.780731	15427.88574	-0.736042	18243.45508	3.421444	----	----	9/15/2017 9:36
0.04	0.04	709.739258	29713.50195	-1.530292	17712.91797	5.442364	----	----	9/15/2017 9:38
Blk	0	1.633148	-244.573196	-1.633148	17712.91797	5.442364	1	1	9/15/2017 9:41
DL	0.0009	21.158487	884.438171	0.381765	17712.91797	5.442364	1	1	9/15/2017 9:43
QC 2	0.0202	363.055695	15079.64746	0.005995	17712.91797	5.442364	1	1	9/15/2017 9:45
QC 3	0.0222	398.22464	16166.25879	-1.328822	17712.91797	5.442364	1	1	9/15/2017 9:48
Blk	0	1.80293	-210.342682	-1.80293	17712.91797	5.442364	1	1	9/15/2017 9:51
30094-9.2	0.0046	13.654761	545.554504	0.017449	17712.91797	5.442364	20	200	9/15/2017 9:57
30094-9.2	0.0045	13.38057	554.473267	0.156241	17712.91797	5.442364	20	200	9/15/2017 9:59
30094-9.2 spk #1	0.1926	346.665558	14694.81445	0.00423	17712.91797	5.442364	20	200	9/15/2017 10:02
30094-9.2 spk #2	0.1948	350.419525	14614.48438	-1.107805	17712.91797	5.442364	20	200	9/15/2017 10:04
30094-6.3 #1	0.8523	131.245819	5219.686035	-1.37485	17712.91797	5.442364	5	600	9/15/2017 10:07
30094-6.3 #2	0.8429	129.863388	5158.772949	-1.543956	17712.91797	5.442364	5	600	9/15/2017 10:09
30094-6.3 spk #1	3.2517	485.413879	19920.15234	-1.413325	17712.91797	5.442364	5	600	9/15/2017 10:11
30094-6.3 spk #2	3.2935	491.590302	20124.78711	-2.392011	17712.91797	5.442364	5	600	9/15/2017 10:14
30094-12.3 #1	1.554	202.059952	7985.539063	-2.563752	17712.91797	5.442364	5	700	9/15/2017 10:26
30094-12.3 #2	1.5924	206.911331	8001.460449	-1.814832	17712.91797	5.442364	5	700	9/15/2017 10:29
30094-12.3 spk #1	4.4926	573.847351	23448.48828	-1.544326	17712.91797	5.442364	5	700	9/15/2017 10:31
30094-12.3 spk #2	4.365	557.709473	22983.0625	-2.466907	17712.91797	5.442364	5	700	9/15/2017 10:33
30094-14.4 #1	0.0165	28.774908	888.023865	-2.497838	17712.91797	5.442364	20	250	9/15/2017 10:36
30094-14.4 #2	0.0183	31.436678	1274.517822	-0.333537	17712.91797	5.442364	20	250	9/15/2017 10:38
DL	0.0008	20.306324	731.681641	-0.216824	17712.91797	5.442364	1	1	9/15/2017 10:40
QC 2	0.0208	373.505524	15473.96387	0.073293	17712.91797	5.442364	1	1	9/15/2017 10:42
QC 3	0.0219	393.888275	16066.08887	-1.228579	17712.91797	5.442364	1	1	9/15/2017 10:45
Blk	0	1.994262	-169.199707	-1.448859	17712.91797	5.442364	1	1	9/15/2017 10:48
0	0	3.116231	78.569359	-0.049962	0	0	----	----	9/15/2017 12:53
0.001	0.001	17.602459	678.342651	0.003124	14486.22852	3.11623	----	----	9/15/2017 12:55
0.002	0.002	32.677742	1240.667236	-0.213949	14780.75488	3.018056	----	----	9/15/2017 12:57
0.004	0.004	61.242744	2367.333252	-0.5074	14549.75488	3.197722	----	----	9/15/2017 12:59
0.02	0.02	324.581787	12627.12305	-0.650933	16161.95996	0.569606	----	----	9/15/2017 13:01
0.04	0.04	597.68042	23472.8125	-1.277308	15043.64356	4.829542	----	----	9/15/2017 13:04
Blk	0	1.637255	-281.742889	-1.637255	15043.64356	4.829542	1	1	9/15/2017 13:07
DL	0.0008	17.303749	668.265442	0.06327	15043.64356	4.829542	1	1	9/15/2017 13:09
QC 2	0.0207	316.672028	12530.8252	-0.3353	15043.64356	4.829542	1	1	9/15/2017 13:11
QC 3	0.0218	332.820618	13089.52832	0.091912	15043.64356	4.829542	1	1	9/15/2017 13:17
Blk	0	0.989433	-195.090027	-0.956367	15043.64356	4.829542	1	1	9/15/2017 13:19
30094-13.5 #1	0.0116	11.783391	438.284576	0.116946	15043.64356	4.829542	20	500	9/15/2017 14:38
30094-13.5 #2	0.0104	11.069139	411.478851	0.054121	15043.64356	4.829542	20	500	9/15/2017 14:40
30094-14.5 #1	0.0035	10.044604	423.402527	-0.330126	15043.64356	4.829542	20	200	9/15/2017 14:42
30094-14.5 #2	0.0033	9.807446	369.003204	-0.23348	15043.64356	4.829542	20	200	9/15/2017 14:44
30094-14.6 #1	0.0302	134.63208	5380.290039	-0.065401	15043.64356	4.829542	20	70	9/15/2017 14:47
30094-14.6 #2	0.0303	135.043716	5104.669922	-1.444502	15043.64356	4.829542	20	70	9/15/2017 14:49
DL	0.0005	11.718708	136.852036	-1.37495	15043.64356	4.829542	1	1	9/15/2017 14:51
QC 2	0.0196	299.584656	11847.65234	-0.041497	15043.64356	4.829542	1	1	9/15/2017 14:54
QC 3	0.021	321.006439	12338.99414	-0.956422	15043.64356	4.829542	1	1	9/15/2017 14:56
Blk	0	1.763825	-339.717957	-1.763825	15043.64356	4.829542	1	1	9/15/2017 14:59
0	0	0.942705	26.613552	-0.121324	0	0	----	----	9/19/2017 10:26
0.001	0.001	14.734071	619.362183	0.042327	13791.36523	0.942705	----	----	9/19/2017 10:28

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0.002		0.002	31.497091	1280.26416	-0.29083	15277.19238	0.44743	----	----	9/19/2017 10:30
0.004		0.004	66.627159	2685.352539	-0.121835	16581.15234	-0.566762	----	----	9/19/2017 10:32
0.02		0.02	323.712494	13236.37305	-0.354693	16191.54688	0.068353	----	----	9/19/2017 10:35
0.04		0.04	591.667175	24716.76953	-1.398336	14921.55859	4.906034	----	----	9/19/2017 10:37
Blk		0	1.805262	-382.390045	-1.805262	14921.55859	4.906034	1	1	9/19/2017 10:40
DL		0.0006	14.538377	580.258423	0.228888	14921.55859	4.906034	1	1	9/19/2017 10:42
QC 2		0.0232	350.931549	14402.16211	0.209689	14921.55859	4.906034	1	1	9/19/2017 10:44
QC 3		0.023	347.843994	14370.0752	-1.009958	14921.55859	4.906034	1	1	9/19/2017 10:47
Blk		0	2.036271	-412.683319	-2.036271	14921.55859	4.906034	1	1	9/19/2017 10:49
30094-LRB	#1	0.0011	8.270563	325.358154	-0.140787	14921.55859	4.906034	10	50	9/19/2017 10:51
30094-LRB	#2	0.0009	7.628795	282.885498	-0.22636	14921.55859	4.906034	10	50	9/19/2017 10:54
30094-LRB SPK #1		2.5896	314.029755	13107.17969	0.088054	14921.55859	4.906034	0.4	50	9/19/2017 10:56
30094-LRB SPK #2		2.5669	311.325867	12854.54102	-1.06211	14921.55859	4.906034	0.4	50	9/19/2017 10:58
30094-1.1	#1	0.0082	29.477728	898.821411	-1.952925	14921.55859	4.906034	10	50	9/19/2017 11:01
30094-1.1	#2	0.0085	30.415485	1145.793091	-0.007762	14921.55859	4.906034	10	50	9/19/2017 11:03
30094-2.1	#1	0.0046	18.537184	676.465027	-0.364225	14921.55859	4.906034	10	50	9/19/2017 11:05
30094-2.1	#2	0.0047	18.820299	697.112366	-0.167544	14921.55859	4.906034	10	50	9/19/2017 11:07
30094-2.1 trp	#1	0.0046	18.727898	721.854797	-0.099578	14921.55859	4.906034	10	50	9/19/2017 11:09
30094-2.1 trp	#2	0.0046	18.547241	718.817017	-0.2182	14921.55859	4.906034	10	50	9/19/2017 11:12
30094-3.1	#1	0.0067	25.007633	935.427612	0.376728	14921.55859	4.906034	10	50	9/19/2017 11:14
30094-3.1	#2	0.0063	23.811991	894.474426	-0.4276	14921.55859	4.906034	10	50	9/19/2017 11:16
30094-3.1 spk	#1	0.0948	287.804657	11078.34082	-0.230913	14921.55859	4.906034	10	50	9/19/2017 11:18
30094-3.1 spk	#2	0.0961	291.632813	10975.72266	-1.036693	14921.55859	4.906034	10	50	9/19/2017 11:20
30094-4.1	#1	0.0161	52.863503	1788.767944	-1.889318	14921.55859	4.906034	10	50	9/19/2017 11:23
30094-4.1	#2	0.0171	55.966206	2105.129395	-0.233265	14921.55859	4.906034	10	50	9/19/2017 11:25
30094-5.1	#1	0.0148	49.10186	1835.025635	-0.191446	14921.55859	4.906034	10	50	9/19/2017 11:27
30094-5.1	#2	0.0144	47.743805	1774.793945	-0.410829	14921.55859	4.906034	10	50	9/19/2017 11:29
30094-5.1 trp	#1	0.0145	48.04879	1795.729126	-0.456308	14921.55859	4.906034	10	50	9/19/2017 11:31
30094-5.1 trp	#2	0.0146	48.479202	1805.498657	-0.135473	14921.55859	4.906034	10	50	9/19/2017 11:34
QC 2		0.0216	327.323456	13317.50977	-0.226521	14921.55859	4.906034	1	1	9/19/2017 11:38
QC 3		0.0226	342.354858	13816.02734	-1.14441	14921.55859	4.906034	1	1	9/19/2017 11:40
Blk		0	1.531959	-355.159973	-1.531959	14921.55859	4.906034	1	1	9/19/2017 11:43
30094-6.1	#1	0.0163	53.645676	2096.893311	0.20614	14921.55859	4.906034	10	50	9/19/2017 11:45
30094-6.1	#2	0.0149	49.263924	1851.885376	-0.101249	14921.55859	4.906034	10	50	9/19/2017 11:47
30094-6.1 spk	#1	0.108	327.231323	12711.75684	-0.347729	14921.55859	4.906034	10	50	9/19/2017 11:49
30094-6.1 spk	#2	0.1072	324.686005	12364.92383	-1.194298	14921.55859	4.906034	10	50	9/19/2017 11:52
30094-7.1	#1	0.0271	85.645073	3065.046387	-1.451301	14921.55859	4.906034	10	50	9/19/2017 11:54
30094-7.1	#2	0.0276	87.129997	3256.125	-0.679988	14921.55859	4.906034	10	50	9/19/2017 11:56
30094-8.1	#1	0.0241	76.804535	2857.110107	-0.648153	14921.55859	4.906034	10	50	9/19/2017 11:58
30094-8.1	#2	0.0244	77.722092	2935.81665	-0.422806	14921.55859	4.906034	10	50	9/19/2017 12:01
30094-8.1 trp	#1	0.0258	81.938232	3023.575928	-0.383738	14921.55859	4.906034	10	50	9/19/2017 12:03
30094-8.1 trp	#2	0.0258	81.990768	3046.288086	-0.504918	14921.55859	4.906034	10	50	9/19/2017 12:05
30094-9.1	#1	0.0168	54.940086	1996.372314	-0.083459	14921.55859	4.906034	10	50	9/19/2017 12:07
30094-9.1	#2	0.0166	54.430214	2057.263672	-0.400718	14921.55859	4.906034	10	50	9/19/2017 12:09
30094-9.1 spk	#1	0.1213	367.017059	14288.80664	-0.031225	14921.55859	4.906034	10	50	9/19/2017 12:11
30094-9.1 spk	#2	0.122	368.990845	13937.30566	-1.037714	14921.55859	4.906034	10	50	9/19/2017 12:14
30094-10.1	#1	0.0488	150.637817	5420.133301	-2.177389	14921.55859	4.906034	10	50	9/19/2017 12:16
30094-10.1	#2	0.0516	159.010086	5874.237305	-1.233987	14921.55859	4.906034	10	50	9/19/2017 12:18
30094-11.1	#1	0.0339	105.989136	3879.138916	-1.054086	14921.55859	4.906034	10	50	9/19/2017 12:20
30094-11.1	#2	0.0339	106.049561	3923.412109	-0.774393	14921.55859	4.906034	10	50	9/19/2017 12:23
30094-11.1 trp	#1	0.035	109.440674	4011.572998	-0.792666	14921.55859	4.906034	10	50	9/19/2017 12:25
30094-11.1 trp	#2	0.0346	108.063766	4031.30835	-0.716539	14921.55859	4.906034	10	50	9/19/2017 12:27

PS Analytical Millennium Galahad CVAF Analyzer

DL		0.0005	11.731342	355.550995	-0.759281	14921.55859	4.906034	1	1	9/19/2017 12:29
QC 2		0.0226	342.599335	13615.53027	-0.106195	14921.55859	4.906034	1	1	9/19/2017 12:31
QC 3		0.0229	346.521729	14049.00488	-1.274565	14921.55859	4.906034	1	1	9/19/2017 12:34
Blk		0	1.834444	-346.440979	-1.834444	14921.55859	4.906034	1	1	9/19/2017 12:36
30094-12.1	#1	0.0378	117.58252	4616.613281	-0.006844	14921.55859	4.906034	10	50	9/19/2017 12:38
30094-12.1	#2	0.0355	110.88443	4223.372559	-0.544515	14921.55859	4.906034	10	50	9/19/2017 12:41
30094-12.1 spk	#1	0.1486	448.368134	17108.23633	-0.77927	14921.55859	4.906034	10	50	9/19/2017 12:43
30094-12.1 spk	#2	0.1499	452.214203	17136.97266	-1.403776	14921.55859	4.906034	10	50	9/19/2017 12:45
30094-14.1	#1	0	1.856616	-225.688049	-1.856616	14921.55859	4.906034	10	50	9/19/2017 12:47
30094-14.1	#2	0.0003	5.828091	197.086304	-0.182217	14921.55859	4.906034	10	50	9/19/2017 12:50
DL		0.0006	14.323463	577.548218	0.105034	14921.55859	4.906034	1	1	9/19/2017 12:52
QC 2		0.0234	353.883179	14154.14551	-0.266296	14921.55859	4.906034	1	1	9/19/2017 12:54
Blk		0	1.788009	-455.852325	-1.788009	14921.55859	4.906034	1	1	9/19/2017 12:59

## PerkinElmer FIMS-100 CVAA Mercury Analyzer

Sample_ID	Date	Time	Mean_Sig	Mean_ST	Mean_SA	Units	Alq.	Vol.	Sig 1	Std_U 1	Smp_U 1	Sig 2	Std_U 2	Smp_U 2
Calib Blank	9/18/2017	10:15:22 AM	0.0003981			µg			0.0004561			0.00034		
STD1 = .004ug	9/18/2017	10:17:03 AM	0.0018548			µg			0.0018606			0.001849		
STD2 = .04ug	9/18/2017	10:18:45 AM	0.018603			µg			0.0187635			0.0184425		
STD3 = .08ug	9/18/2017	10:20:39 AM	0.0375904			µg			0.0378297			0.0373511		
STD4 = .16ug	9/18/2017	10:22:34 AM	0.0734209			µg			0.0736499			0.0731919		
STD5 = .2ug	9/18/2017	10:24:27 AM	0.0908068			µg			0.0921415			0.0894721		
Reagent Blank	9/18/2017	10:26:19 AM	4.14E-05	9.05E-05	9.05E-05	µg			2.54E-05	5.56E-05	5.56E-05	5.74E-05	0.0001254	0.0001254
0.004ug = DL	9/18/2017	10:28:00 AM	0.0018356	0.0040132	0.0040132	µg			0.0019341	0.0042287	0.0042287	0.001737	0.0037976	0.0037976
0.080ug = QC STD 3	9/18/2017	10:29:43 AM	0.0385807	0.0843502	0.0843502	µg			0.0392208	0.0857499	0.0857499	0.0379405	0.0829506	0.0829506
0.080ug = QC STD 2	9/18/2017	10:31:35 AM	0.0379387	0.0829466	0.0829466	µg			0.0380987	0.0832965	0.0832965	0.0377786	0.0825966	0.0825966
Reagent Blank	9/18/2017	10:33:27 AM	1.43E-05	3.12E-05	3.12E-05	µg			-2.74E-06	-6.00E-06	-6.00E-06	3.13E-05	6.84E-05	6.84E-05
0.004ug = DL	9/18/2017	12:01:33 PM	0.0017505	0.0038271	0.0038271	µg			0.0017448	0.0038147	0.0038147	0.0017562	0.0038395	0.0038395
0.080ug = QC STD 2	9/18/2017	12:03:15 PM	0.0360506	0.0788187	0.0788187	µg			0.0362492	0.0792529	0.0792529	0.035852	0.0783845	0.0783845
Reagent Blank	9/18/2017	12:05:07 PM	1.96E-05	4.28E-05	4.28E-05	µg			1.28E-05	2.81E-05	2.81E-05	2.64E-05	5.76E-05	5.76E-05
30094-1.5	9/18/2017	12:12:33 PM	0.0065803	0.0142962	2.8592495	µg	4	800	0.0065943	0.0143268	2.8653685	0.0065663	0.0142657	2.8531304
30094-2.5	9/18/2017	12:14:16 PM	0.0081002	0.0176192	3.0833581	µg	4	700	0.0081456	0.0177185	3.100734	0.0080548	0.0175199	3.0659822
30094-2.5 DUP	9/18/2017	12:15:58 PM	0.0084084	0.0182931	3.2012993	µg	4	700	0.0083335	0.0181294	3.1726427	0.0084833	0.0184569	3.229956
30094-3.5	9/18/2017	12:17:42 PM	0.0080749	0.0175639	3.0736835	µg	4	700	0.0081246	0.0176726	3.0927102	0.0080252	0.0174552	3.0546568
30094-3.5 SPK	9/18/2017	12:19:25 PM	0.0425807	0.093005	16.275883	µg	4	700	0.0420225	0.0917846	16.06231	0.0431389	0.0942255	16.489455
30094-4.5	9/18/2017	12:21:19 PM	0.0161785	0.0352812	6.1742038	µg	4	700	0.0161142	0.0351404	6.1495757	0.0162429	0.0354219	6.198832
30094-5.5	9/18/2017	12:23:14 PM	0.0143307	0.0312412	5.4672147	µg	4	700	0.0144334	0.0314657	5.5064889	0.0142281	0.0310168	5.4279404
0.004ug = DL	9/18/2017	12:25:07 PM	0.0017684	0.0038663	0.0038663	µg			0.0018072	0.0039512	0.0039512	0.0017296	0.0037814	0.0037814
0.080ug = QC STD 2	9/18/2017	12:26:49 PM	0.0363985	0.0795793	0.0795793	µg			0.0365104	0.079824	0.079824	0.0362866	0.0793346	0.0793346
Reagent Blank	9/18/2017	12:28:41 PM	-5.37E-05	-0.0001174	-0.0001174	µg			-3.38E-05	-7.38E-05	-7.38E-05	-7.37E-05	-0.000161	-0.000161
30094-5.5 DUP	9/18/2017	12:30:23 PM	0.0145233	0.0316623	5.5408952	µg	4	700	0.0145262	0.0316686	5.5420081	0.0145204	0.0316559	5.5397822
30094-6.5	9/18/2017	12:32:18 PM	0.0138363	0.0301603	6.0320663	µg	4	800	0.013753	0.0299781	5.9956153	0.0139197	0.0303426	6.0685173
30094-6.5 SPK	9/18/2017	12:34:12 PM	0.0468058	0.1022427	20.448541	µg	4	800	0.0472616	0.1032391	20.647816	0.0463501	0.1012463	20.249265
30094-7.5	9/18/2017	12:36:07 PM	0.0238488	0.052051	10.410193	µg	4	800	0.0237505	0.0518361	10.367214	0.0239471	0.0522659	10.453172
30094-8.5	9/18/2017	12:38:01 PM	0.0290696	0.0634653	11.106432	µg	4	700	0.0291494	0.0636399	11.136987	0.0289897	0.0632907	11.075877
30094-8.5 DUP	9/18/2017	12:39:55 PM	0.0288764	0.063043	11.032526	µg	4	700	0.0288162	0.0629112	11.009468	0.0289367	0.0631748	11.055585
30094-9.5	9/18/2017	12:41:49 PM	0.0285908	0.0624186	10.923248	µg	4	700	0.0286818	0.0626175	10.958065	0.0284998	0.0622196	10.888432
30094-9.5 SPK	9/18/2017	12:43:43 PM	0.0607897	0.132816	23.242797	µg	4	700	0.0607809	0.1327968	23.239446	0.0607984	0.1328351	23.246147
30094-10.5	9/18/2017	12:45:37 PM	0.0263022	0.057415	12.918372	µg	4	900	0.0265463	0.0579485	13.038424	0.0260582	0.0568814	12.798321
30094-11.5	9/18/2017	12:47:31 PM	0.0292844	0.063935	12.787007	µg	4	800	0.0290863	0.0635018	12.700357	0.0294826	0.0643683	12.873658
0.004ug = DL	9/18/2017	12:49:25 PM	0.0017098	0.0037383	0.0037383	µg			0.0017054	0.0037286	0.0037286	0.0017143	0.003748	0.003748
0.080ug = QC STD 2	9/18/2017	12:51:07 PM	0.0368466	0.0805591	0.0805591	µg			0.0369829	0.0808569	0.0808569	0.0367104	0.0802612	0.0802612
Reagent Blank	9/18/2017	12:52:59 PM	-8.79E-06	-1.92E-05	-1.92E-05	µg			-1.38E-05	-3.01E-05	-3.01E-05	-3.81E-06	-8.33E-06	-8.33E-06
30094-11.5 DUP	9/18/2017	12:54:42 PM	0.0284887	0.0621954	12.439074	µg	4	800	0.028595	0.0624276	12.485526	0.0283825	0.0619631	12.392621
30094-12.5	9/18/2017	12:56:36 PM	0.0454992	0.099386	12.423247	µg	4	500	0.0459574	0.1003876	12.548453	0.0450411	0.0983843	12.29804
30094-12.5 SPK	9/18/2017	12:58:31 PM	0.0771278	0.1685367	21.067082	µg	4	500	0.0759362	0.1659315	20.741433	0.0783194	0.1711418	21.392731
0.004ug = DL	9/18/2017	1:00:25 PM	0.001775	0.0038807	0.0038807	µg			0.0017562	0.0038397	0.0038397	0.0017937	0.0039216	0.0039216
0.080ug = QC STD 3	9/18/2017	1:02:07 PM	0.0368321	0.0805272	0.0805272	µg			0.0366824	0.0801999	0.0801999	0.0369818	0.0808545	0.0808545
Reagent Blank	9/18/2017	1:04:00 PM	5.86E-06	1.28E-05	1.28E-05	µg			-4.70E-06	-1.03E-05	-1.03E-05	1.64E-05	3.59E-05	3.59E-05

## Appendix D

### Calibration Data



# Routine Dry Gas Meter Calibration

Control Module: C-3 Leak checks Barometric Press. -- 29.30  
Date: 09/01/17 Negative 0.0 >5 W.C. Previous Y -- 0.9913  
Technician: MTP Positive - 0.0 > in.Hg Previous Delta H -- 1.8431

Orifice Diff Pressure H	Wet Test Volume, Ft³	Dry Gas Meter Temp, F		Wet Test Meter Temp, F	Dry Gas Volume Ft³	Elapsed Time of Cal. Point		Meter Coefficient Y	Orifice Coefficient dH@
Nominal 0.500	Initial 6190.50	Initial 93.0	Initial 82.0	Initial 74.0	Initial 365.335			0.9949	1.7141
Actual	Final 6198.50	Final 93.0	Final 93.0	Final 74.0	Final 373.610	Minutes 19	SEC 43.94		
0.50	Total 8.00	Average 93.0	Average 87.5	Average 74.0	Total 8.275	Minutes 19.73			
		90.3							
Nominal 1.000	Initial 6185.00	Initial 95.0	Initial 81.0	Initial 74.0	Initial 359.656			0.9911	1.7633
Actual	Final 6190.00	Final 95.0	Final 81.0	Final 74.0	Final 364.820	Minutes 8.0	SEC 47.53		
1.00	Total 5.00	Average 95.0	Average 81.0	Average 74.0	Total 5.164	8.79			
		88.0 Tm							
Nominal 2.000	Initial 6166.00	Initial 92.0	Initial 77.0	Initial 74.0	Initial 340.040			0.9911	1.7743
Actual	Final 6171.00	Final 96.0	Final 78.0	Final 74.0	Final 345.170	Minutes 6	SEC 12.97		
2.00	Total 5.00	Average 94.0	Average 77.5	Average 74.0	Total 5.130	6.22			
		85.8 Tm							
Nominal 3.000	Initial 6172.50	Initial 96.0	Initial 78.0	Initial 74.0	Initial 346.810			0.9913	1.8602
Actual	Final 6177.50	Final 97.0	Final 80.0	Final 74.0	Final 351.945	Minutes 5.0	SEC 12.25		
3.00	Total 5.00	Average 96.5	Average 79.0	Average 74.0	Total 5.135	5.20			
		87.8 Tm							
Nominal 4.000	Initial 6179.00	Initial 97.0	Initial 80.0	Initial 74.0	Initial 353.499			0.9928	1.8592
Actual	Final 6184.00	Final 97.0	Final 81.0	Final 74.0	Final 358.623	Minutes 4.0	SEC 30.72		
4.00	Total 5.00	Average 97.0	Average 80.5	Average 74.0	Total 5.124	4.51			
		88.8 Tm		Average				0.9923	1.7942

Emission Measurement Center (EMC) Approved Alternate Method (ALT-009)  
Alternative Method 5 Post-Test Calibration

Pellet Indurating Furnace Line 2 - Stack 4 (SV025)

Control Module C-3  
Test Baseline

Input Data	Symbol	Units	Run 1	Run 2	Run 3
Test date	-	-	9/7/2017	9/7/2017	9/7/2017
Test period	-	-	717 - 1022	1051 - 1255	1326 - 1530
Total run time	t	min	120	120	120
Total sample volume measured by dry gas meter	V <sub>m</sub>	acf	75.8	76.1	76.1
Absolute average dry gas meter temp	T <sub>m</sub>	°F	64.3	68.7	72.4
Absolute average dry gas meter temp	T <sub>m</sub>	°R	523.9	528.4	532.1
Barometric pressure	P <sub>b</sub>	inches Hg	28.3	28.3	28.3
Conversion factor (29.92/528)(0.75) <sup>2</sup>	---	(in Hg/°R) cfm <sup>2</sup>	0.0319	0.0319	0.0319
Average orifice meter differential	Δ h <sub>avg</sub>	in. H <sub>2</sub> O	1.22	1.23	1.23
Orifice meter calibration coefficient	Δ H <sub>@</sub>	in. H <sub>2</sub> O	1.79	1.79	1.79
Dry molecular weight of stack gas	M <sub>d</sub>	lb/lb-mole	28.88	28.88	28.88
Dry molecular weight of air	---	lb/lb-mole	29.00	29.00	29.00
Specific gravity of mercury	---	Dimensionless	13.60	13.60	13.60
Dry gas meter calibration check value	Y <sub>qa</sub>	Dimensionless	1.0036	1.0091	1.0110
Dry gas meter calibration factor	Y	Dimensionless	0.9923	0.9923	0.9923
Average of Y <sub>qa</sub> 's from test run series	<b>1.0079</b>	$Y_{qa} = \frac{t}{V_m} \sqrt{\frac{0.0319 \cdot T_m}{\Delta H_{@} (P_b + \frac{\Delta h_{avg}}{13.6})} \frac{29}{M_d}} \cdot (\sqrt{\Delta h_{avg}})$			
Dry gas meter calibration factor	<b>0.9923</b>				
% difference between average Y <sub>qa</sub> 's and Y	<b>-1.57%</b>				
(must be within ± 5%)					



## THERMOCOUPLE CALIBRATION

Meter In THERMOCOUPLE ID C3-I  
Cal Date: 1/31/2017 DGM Inlet TC  
CALIBRATION TECHNICIAN: LTR

REFERENCE STANDARDS	TRACEABILITY	DATE	LABORATORY
Hart Scientific 9103-A s/n A1B289	Report No. T15-1116-JC-2	11/16/2015	NBS Calibrations
Fluke 9144 s/n B5A077	Report No. 7060.00-205700-001	1/20/2016	JM Test Systems
Temperature Calibration Points	20	70	150
Reference Deg F (To)	20	70	150
Probe Temp (deg F)	22.0	70.0	149.0
Difference (degrees)	2.0	0.0	1.0
TC Meets Method 5 Specifications: ( $\pm 2.0$ °F)	YES	YES	YES

Reviewed by: 





## THERMOCOUPLE CALIBRATION

Meter Out THERMOCOUPLE ID C3-O  
Cal Date: 1/31/2017 DGM Outlet TC  
CALIBRATION TECHNICIAN: LTR

REFERENCE STANDARDS	TRACEABILITY	DATE	LABORATORY
Hart Scientific 9103-A s/n A1B289	Report No. T15-1116-JC-2	11/16/2015	NBS Calibrations
Fluke 9144 s/n B5A077	Report No. 7060.00-205700-001	1/20/2016	JM Test Systems
Temperature Calibration Points	20	70	150
Reference Deg F (To)	20	70	150
Probe Temp (deg F)	22.0	70.0	148.0
Difference (degrees)	2.0	0.0	2.0
TC Meets Method 5 Specifications: ( $\pm 2.0$ °F)	YES	YES	YES

Reviewed by: 

# **Meter Pyrometer Calibration**

Meter I.D.		C-3				
Temperature	CL-300-100F	X	X	X	X	X
Calibrator Used	CL-3512-A					
DATE		1/26/2017	1/26/2017	1/26/2017	1/26/2017	1/26/2017
TECHNICIAN		LTR	LTR	LTR	LTR	LTR
Thermocouple I.D.		T.C. 1	T.C. 2	T.C. 3	T.C. 4	T.C. 5
Reference °F	Acceptable Range	** If not within Acceptable Range, unit not to be used within range at which failure occurred.				
1000	990 to 1010	998				998
900	890 to 910	898				898
800	791 to 809	798				799
700	692 to 708	699				699
600	593 to 607	599				599
500	493 to 507	499	500	501		499
400	394 to 406	399	400	401		399
300	295 to 305	299	301	301		300
200	196 to 204	199	200	201		200
150	146 to 154	150	153	153	151	151
100	96 to 104	99	101	101	100	100
50	47 to 53	50	51	51	50	50
0	-3 to 3	0			0	0
-50	-53 to -47	-50			-48	-50

Pass/Fail based on +/- 0.75% of Rankine value

Fail indicated by cell highlighting

Reviewd By:





# Routine Dry Gas Meter Calibration

Control Module: C-6 Leak checks Barometric Press. -- 29.30  
Date: 09/01/17 Negative 0.0 >5 W.C. Previous Y -- 0.9938  
Technician: MTP Positive - 0.0 > in.Hg Previous Delta H -- 1.7130

Orifice Diff Pressure H	Wet Test Volume, Ft³	Dry Gas Meter Temp, F		Wet Test Meter Temp, F	Dry Gas Volume Ft³	Elapsed Time of Cal. Point		Meter Coefficient Y	Orifice Coefficient dH@
Nominal 0.500	Initial 6145.50	Initial 86.0	Initial 80.0	Initial 73.5	Initial 694.778			0.9865	1.6031
Actual	Final 6150.50	Final 86.0	Final 81.0	Final 74.0	Final 699.930	Minutes 11	SEC 51.34		
0.50	Total 5.00	Average 86.0	Average 80.5	Average 73.8	Total 5.152	Minutes 11.86			
		83.3							
Nominal 1.000	Initial 6139.00	Initial 89.0	Initial 79.0	Initial 73.5	Initial 688.057			0.9832	1.6803
Actual	Final 6145.00	Final 87.0	Final 80.0	Final 73.5	Final 694.261	Minutes 10.0	SEC 17.67		
1.00	Total 6.00	Average 88.0	Average 79.5	Average 73.5	Total 6.204	10.29			
		83.8 Tm							
Nominal 2.000	Initial 6109.00	Initial 78.0	Initial 73.0	Initial 73.5	Initial 657.440			0.9871	1.7715
Actual	Final 6120.00	Final 84.0	Final 75.0	Final 73.5	Final 668.611	Minutes 13	SEC 37.98		
2.00	Total 11.00	Average 81.0	Average 74.0	Average 73.5	Total 11.171	13.63			
		77.5 Tm							
Nominal 3.000	Initial 6122.00	Initial 85.0	Initial 76.0	Initial 73.5	Initial 670.652			0.9850	1.7549
Actual	Final 6129.00	Final 87.0	Final 77.0	Final 73.5	Final 677.808	Minutes 7.0	SEC 4		
3.00	Total 7.00	Average 86.0	Average 76.5	Average 73.5	Total 7.156	7.07			
		81.3 Tm							
Nominal 4.000	Initial 6130.00	Initial 88.0	Initial 77.0	Initial 73.5	Initial 678.830			0.9824	1.7732
Actual	Final 6138.00	Final 89.0	Final 79.0	Final 73.5	Final 687.040	Minutes 7.0	SEC 2.43		
4.00	Total 8.00	Average 88.5	Average 78.0	Average 73.5	Total 8.210	7.04			
		83.3 Tm		Average				0.9848	1.7166

Emission Measurement Center (EMC) Approved Alternate Method (ALT-009)  
Alternative Method 5 Post-Test Calibration  
Pellet Indurating Furnace Line 2 - Stack 2 (SV027)  
Control Module C-6  
Test Baseline

Input Data	Symbol	Units	Run 1	Run 2	Run 3
Test date	-	-	9/6/2017	9/6/2017	9/6/2017
Test period	-	-	732 - 937	1018 - 1224	1300 - 1505
Total run time	t	min	120	120	120
Total sample volume measured by dry gas meter	V <sub>m</sub>	acf	86.0	83.7	89.0
Absolute average dry gas meter temp	T <sub>m</sub>	°F	64.5	72.2	81.7
Absolute average dry gas meter temp	T <sub>m</sub>	°R	524.2	531.9	541.4
Barometric pressure	P <sub>b</sub>	inches Hg	28.4	28.4	28.4
Conversion factor (29.92/528)(0.75) <sup>2</sup>	---	(in Hg/°R) cfm <sup>2</sup>	0.0319	0.0319	0.0319
Average orifice meter differential	Δ h <sub>avg</sub>	in. H <sub>2</sub> O	1.49	1.41	1.56
Orifice meter calibration coefficient	Δ H <sub>@</sub>	in. H <sub>2</sub> O	1.72	1.72	1.72
Dry molecular weight of stack gas	M <sub>d</sub>	lb/lb-mole	28.84	28.84	28.84
Dry molecular weight of air	---	lb/lb-mole	29.00	29.00	29.00
Specific gravity of mercury	---	Dimensionless	13.60	13.60	13.60
Dry gas meter calibration check value	Y <sub>qa</sub>	Dimensionless	0.9986	1.0043	1.0024
Dry gas meter calibration factor	Y	Dimensionless	0.9848	0.9848	0.9848
Average of Y <sub>qa</sub> 's from test run series	<b>1.0017</b>	$Y_{qa} = \frac{t}{V_m} \sqrt{\frac{0.0319 \cdot T_m}{\Delta H_{@} (P_b + \frac{\Delta h_{avg}}{13.6})} \frac{29}{M_d}} \cdot (\sqrt{\Delta h_{avg}})$			
Dry gas meter calibration factor	<b>0.9848</b>				
% difference between average Y <sub>qa</sub> 's and Y	<b>-1.72%</b>				
(must be within ± 5%)					



## THERMOCOUPLE CALIBRATION

Meter In THERMOCOUPLE ID C6-I  
Cal Date: 1/6/2017

### CALIBRATION TECHNICIAN:

REFERENCE STANDARDS	TRACEABILITY	DATE	LABORATORY
Hart Scientific 9103-A s/n A1B289	Report No. T15-1116-JC-2	11/16/2015	NBS Calibrations
Fluke 9144 s/n B5A077	Report No. 7060.00-205700-001	1/20/2016	JM Test Systems
Temperature Calibration Points	20	70	150
Reference Deg F (To)	20	70	150
Probe Temp (deg F)	22.0	70.0	148.0
Difference (degrees)	2.0	0.0	2.0
TC Meets Method 5 Specifications: ( $\pm 2.0$ °F)	YES	YES	YES

Reviewed by:



## THERMOCOUPLE CALIBRATION

Meter Out

THERMOCOUPLE ID

C6-O

Cal Date:

1/5/2017

CALIBRATION TECHNICIAN: HLP

### REFERENCE STANDARDS

Hart Scientific 9103-A s/n A1B289

Fluke 9144 s/n B5A077

### TRACEABILITY

Report No. T15-1116-JC-2

Report No. 7060.00-205700-001

### DATE

11/16/2015

1/20/2016

### LABORATORY

NBS Calibrations

JM Test Systems

Temperature Calibration Points	20	70	150
Reference Deg F (To)	20	70	150
Probe Temp (deg F)	22.0	71.0	148.0
Difference (degrees)	2.0	1.0	2.0
TC Meets Method 5 Specifications: ( $\pm 2.0$ °F)	YES	YES	YES

Reviewed by:

# **Meter Pyrometer Calibration**

<b>Meter I.D.</b>		<b>C-6</b>				
<b>Pyrometer Used, I.D.</b>		D-15				
<b>Temperature</b>	<b>CL-300-100F</b>					
<b>Calibrator Used</b>	<b>CL-3512-A</b>	X				
<b>DATE</b>		1/4/2017				
<b>TECHNICIAN</b>		LDP2				
<b>Thermocouple I.D.</b>		T.C. 1	T.C. 2	T.C. 3	T.C. 4	T.C. 5
<b>Reference °F</b>	<b>Acceptable Range</b>	** If not within Acceptable Range, unit not to be used within range at which failure occurred.				
1950	1932 to 1968	1958				1957
1800	1784 to 1816	1806				1807
1600	1585 to 1615	1607				1607
1400	1387 to 1413	1404				1404
1200	1188 to 1212	1206				1206
1000	990 to 1010	1005				1005
900	890 to 910	904				905
800	791 to 809	805				805
700	692 to 708	705				705
600	593 to 607	602				602
500	493 to 507	500	500	500		500
400	394 to 406	400	401	400		400
300	295 to 305	302	302	302		302
200	196 to 204	200	201	201		201
150	146 to 154	149	150	149	148	149
100	96 to 104	99	99	99	98	99
50	47 to 53	49	50	49	48	49
0	-3 to 3	1			0	1
-50	-53 to -47	-50			-51	-49

Pass/Fail based on +/- 0.75% of Rankine value

Fail indicated by cell highlighting

Reviewed by:





# Routine Dry Gas Meter Calibration

Control Module: C-8 Leak checks Barometric Press. -- 29.30  
Date: 09/01/17 Negative 0.0 >5 W.C. Previous Y -- 0.9952  
Technician: MTP Positive - 0.0 > in.Hg Previous Delta H -- 1.9442

Orifice Diff Pressure H	Wet Test Volume, Ft³	Dry Gas Meter Temp, F		Wet Test Meter Temp, F	Dry Gas Volume Ft³	Elapsed Time of Cal. Point		Meter Coefficient Y	Orifice Coefficient dH@
Nominal 0.500	Initial 6079.00	Initial 82.0	Initial 76.0	Initial 73.5	Initial 795.065			1.0083	1.8510
Actual	Final 6084.00	Final 81.0	Final 77.0	Final 73.0	Final 800.071	Minutes 12	SEC 42.26		
0.50	Total 5.00	Average 81.5	Average 76.5	Average 73.3	Total 5.006	Minutes 12.70			
		79.0							
Nominal 1.000	Initial 6086.00	Initial 82.0	Initial 77.0	Initial 73.0	Initial 802.097			1.0028	1.8924
Actual	Final 6091.00	Final 84.0	Final 77.0	Final 73.0	Final 807.136	Minutes 9.0	SEC 5.5		
1.00	Total 5.00	Average 83.0	Average 77.0	Average 73.0	Total 5.039	9.09			
		80.0 Tm							
Nominal 2.000	Initial 6192.00	Initial 84.0	Initial 78.0	Initial 73.0	Initial 808.146			0.9976	1.9646
Actual	Final 6198.00	Final 86.0	Final 78.0	Final 73.0	Final 814.226	Minutes 7	SEC 52.06		
2.00	Total 6.00	Average 85.0	Average 78.0	Average 73.0	Total 6.080	7.87			
		81.5 Tm							
Nominal 3.000	Initial 6049.00	Initial 76.0	Initial 70.0	Initial 73.5	Initial 765.113			0.9931	1.9504
Actual	Final 6054.00	Final 79.0	Final 71.0	Final 73.5	Final 770.115	Minutes 5.0	SEC 17.49		
3.00	Total 5.00	Average 77.5	Average 70.5	Average 73.5	Total 5.002	5.29			
		74.0 Tm							
Nominal 4.000	Initial 6055.00	Initial 80.0	Initial 71.0	Initial 73.0	Initial 771.115			0.9954	1.9700
Actual	Final 6063.00	Final 84.0	Final 73.0	Final 73.5	Final 779.128	Minutes 7.0	SEC 22.97		
4.00	Total 8.00	Average 82.0	Average 72.0	Average 73.3	Total 8.013	7.38			
		77.0 Tm		Average				0.9994	1.9257



Emission Measurement Center (EMC) Approved Alternate Method (ALT-009)  
Alternative Method 5 Post-Test Calibration  
Pellet Indurating Furnace Line 2 - Stack 3 (SV026)  
Control Module C-8  
Test Baseline

Input Data	Symbol	Units	Run 1	Run 2	Run 3
Test date	-	-	9/7/2017	9/7/2017	9/7/2017
Test period	-	-	717 - 1022	1051 - 1255	1326 - 1530
Total run time	t	min	120	120	120
Total sample volume measured by dry gas meter	V <sub>m</sub>	acf	76.5	82.5	76.8
Absolute average dry gas meter temp	T <sub>m</sub>	°F	51.8	53.1	55.7
Absolute average dry gas meter temp	T <sub>m</sub>	°R	511.5	512.8	515.4
Barometric pressure	P <sub>b</sub>	inches Hg	28.3	28.3	28.3
Conversion factor (29.92/528)(0.75) <sup>2</sup>	---	(in Hg/°R) cfm <sup>2</sup>	0.0319	0.0319	0.0319
Average orifice meter differential	Δ h <sub>avg</sub>	in. H <sub>2</sub> O	1.40	1.61	1.40
Orifice meter calibration coefficient	Δ H <sub>@</sub>	in. H <sub>2</sub> O	1.93	1.93	1.93
Dry molecular weight of stack gas	M <sub>d</sub>	lb/lb-mole	28.98	28.98	28.98
Dry molecular weight of air	---	lb/lb-mole	29.00	29.00	29.00
Specific gravity of mercury	---	Dimensionless	13.60	13.60	13.60
Dry gas meter calibration check value	Y <sub>qa</sub>	Dimensionless	1.0139	1.0100	1.0147
Dry gas meter calibration factor	Y	Dimensionless	0.9994	0.9994	0.9994
Average of Y <sub>qa</sub> 's from test run series	<b>1.0129</b>	$Y_{qa} = \frac{t}{V_m} \sqrt{\frac{0.0319 \cdot T_m}{\Delta H_{@} (P_b + \frac{\Delta h_{avg}}{13.6})} \frac{29}{M_d}} \cdot (\sqrt{\Delta h_{avg}})$			
Dry gas meter calibration factor	<b>0.9994</b>				
% difference between average Y <sub>qa</sub> 's and Y	<b>-1.35%</b>				
(must be within ± 5%)					



## THERMOCOUPLE CALIBRATION

Meter In THERMOCOUPLE ID C8-I  
Cal Date: 2/27/2017

CALIBRATION TECHNICIAN: RMP

REFERENCE STANDARDS	TRACEABILITY	DATE	LABORATORY
Hart Scientific 9103-A s/n A1B289	Report No. T15-1116-JC-2	11/16/2015	NBS Calibrations
Fluke 9144 s/n B5A077	Report No. 7060.00-205700-001	1/20/2016	JM Test Systems
Temperature Calibration Points	20	70	150
Reference Deg F (To)	20	70	150
Probe Temp (deg F)	22.0	70.0	148.0
Difference (degrees)	2.0	0.0	2.0
TC Meets Method 5 Specifications: ( $\pm 2.0$ °F)	YES	YES	YES

Reviewed by: *Mark Petru*



## THERMOCOUPLE CALIBRATION

Meter Out

THERMOCOUPLE ID C8-O

Cal Date: 2/27/2017

CALIBRATION TECHNICIAN: RMP

### REFERENCE STANDARDS

Hart Scientific 9103-A s/n A1B289

Fluke 9144 s/n B5A077

### TRACEABILITY

Report No. T15-1116-JC-2

Report No. 7060.00-205700-001

### DATE

11/16/2015

1/20/2016

### LABORATORY

NBS Calibrations

JM Test Systems

Temperature Calibration Points	20	70	150
Reference Deg F (To)	20	70	150
Probe Temp (deg F)	22.0	70.0	148.0
Difference (degrees)	2.0	0.0	2.0
TC Meets Method 5 Specifications: ( $\pm 2.0$ °F)			
	YES	YES	YES

Reviewed by: 

# **Meter Pyrometer Calibration**

Meter I.D.		C-8				
Temperature	CL-300-100F	X	X	X	X	X
Calibrator Used	CL-3512-A					
DATE		3/3/2017	3/3/2017	3/3/2017	3/3/2017	3/3/2017
TECHNICIAN		RMP	RMP	RMP	RMP	RMP
Thermocouple I.D.		T.C. 1	T.C. 2	T.C. 3	T.C. 4	T.C. 5
Reference °F	Acceptable Range	** If not within Acceptable Range, unit not to be used within range at which failure occurred.				
1950	1932 to 1968	1958				1956
1800	1784 to 1816	1805				1804
1600	1585 to 1615	1605				1605
1400	1387 to 1413	1404				1402
1200	1188 to 1212	1205				1205
1000	990 to 1010	1005				1004
900	890 to 910	904				903
800	791 to 809	804				803
700	692 to 708	704				703
600	593 to 607	601				601
500	493 to 507	499	500	499		498
400	394 to 406	400	400	399		399
300	295 to 305	301	300	300		299
200	196 to 204	200	200	199		198
150	146 to 154	149	149	148	147	147
100	96 to 104	98	98	97	97	97
50	47 to 53	48	48	47	47	47
0	-3 to 3	0			-1	0
-50	-53 to -47	-51			-53	-52

Pass/Fail based on +/- 0.75% of Rankine value

Fail indicated by cell highlighting

Reviewd By:





# Routine Dry Gas Meter Calibration

Control Module: C-12 Leak checks Barometric Press. -- 29.28  
Date: 08/31/17 Negative 0.0 >5 W.C. Previous Y -- 1.0039  
Technician: MTP Positive - 0.0 > in.Hg Previous Delta H -- 1.9664

Orifice Diff Pressure H	Wet Test Volume, Ft³	Dry Gas Meter Temp, F		Wet Test Meter Temp, F	Dry Gas Volume Ft³	Elapsed Time of Cal. Point		Meter Coefficient Y	Orifice Coefficient dH@
Nominal 0.500	Initial 6012.00	Initial 84.0	Initial 77.0	Initial 72.5	Initial 283.875				
Actual	Final 6017.00	Final 83.0	Final 78.0	Final 72.5	Final 288.968	Minutes 13	SEC 3.85		
0.50	Total 5.00	Average 83.5	Average 77.5	Average 72.5	Total 5.093	Minutes 13.06			
		80.5							
Nominal 1.000	Initial 6006.50	Initial 87.0	Initial 76.0	Initial 71.5	Initial 278.267				
Actual	Final 6011.50	Final 85.0	Final 77.0	Final 72.0	Final 283.367	Minutes 9.0	SEC 5.89		
1.00	Total 5.00	Average 86.0	Average 76.5	Average 71.8	Total 5.100	9.10			
		81.3 Tm							
Nominal 2.000	Initial 6018.00	Initial 84.0	Initial 78.0	Initial 72.0	Initial 289.992				
Actual	Final 6023.00	Final 87.0	Final 78.0	Final 72.0	Final 295.100	Minutes 6	SEC 30.76		
2.00	Total 5.00	Average 85.5	Average 78.0	Average 72.0	Total 5.108	6.51			
		81.8 Tm							
Nominal 3.000	Initial 5091.00	Initial 84.0	Initial 74.0	Initial 72.0	Initial 262.609				
Actual	Final 5096.00	Final 85.0	Final 75.0	Final 71.5	Final 267.628	Minutes 5.0	SEC 19.15		
3.00	Total 5.00	Average 84.5	Average 74.5	Average 71.8	Total 5.019	5.32			
		79.5 Tm							
Nominal 4.000	Initial 5997.00	Initial 85.0	Initial 75.0	Initial 71.5	Initial 268.635				
Actual	Final 6003.00	Final 87.0	Final 76.0	Final 71.5	Final 274.728	Minutes 5.0	SEC 30.9		
4.00	Total 6.00	Average 86.0	Average 75.5	Average 71.5	Total 6.093	5.52			
		80.8 Tm		Average				0.9955	1.9292

Emission Measurement Center (EMC) Approved Alternate Method (ALT-009)  
Alternative Method 5 Post-Test Calibration  
Pellet Indurating Furnace Line 2 - Stack 1 (SV028)  
Control Module C-12  
Test Baseline

Input Data	Symbol	Units	Run 1	Run 2	Run 3
Test date	-	-	9/6/2017	9/6/2017	9/6/2017
Test period	-	-	732 - 937	1018 - 1224	1300 - 1505
Total run time	t	min	120	120	120
Total sample volume measured by dry gas meter	V <sub>m</sub>	acf	88.6	90.3	92.5
Absolute average dry gas meter temp	T <sub>m</sub>	°F	64.1	72.9	84.5
Absolute average dry gas meter temp	T <sub>m</sub>	°R	523.8	532.6	544.1
Barometric pressure	P <sub>b</sub>	inches Hg	28.4	28.4	28.4
Conversion factor (29.92/528)(0.75) <sup>2</sup>	---	(in Hg/°R) cfm <sup>2</sup>	0.0319	0.0319	0.0319
Average orifice meter differential	Δ h <sub>avg</sub>	in. H <sub>2</sub> O	1.81	1.86	1.91
Orifice meter calibration coefficient	Δ H <sub>@</sub>	in. H <sub>2</sub> O	1.93	1.93	1.93
Dry molecular weight of stack gas	M <sub>d</sub>	lb/lb-mole	28.85	28.84	28.85
Dry molecular weight of air	---	lb/lb-mole	29.00	29.00	29.00
Specific gravity of mercury	---	Dimensionless	13.60	13.60	13.60
Dry gas meter calibration check value	Y <sub>qa</sub>	Dimensionless	1.0078	1.0105	1.0095
Dry gas meter calibration factor	Y	Dimensionless	0.9955	0.9955	0.9955
Average of Y <sub>qa</sub> 's from test run series	<b>1.0092</b>	$Y_{qa} = \frac{t}{V_m} \sqrt{\frac{0.0319 \cdot T_m}{\Delta H_{@} (P_b + \frac{\Delta h_{avg}}{13.6})} \frac{29}{M_d}} \cdot (\sqrt{\Delta h_{avg}})$			
Dry gas meter calibration factor	<b>0.9955</b>				
% difference between average Y <sub>qa</sub> 's and Y (must be within ± 5%)	<b>-1.38%</b>				



## THERMOCOUPLE CALIBRATION

Meter In THERMOCOUPLE ID C12-I  
Cal Date: 1/31/2017 DGM Inlet TC  
CALIBRATION TECHNICIAN: LTR

REFERENCE STANDARDS	TRACEABILITY		DATE	LABORATORY
Hart Scientific 9103-A s/n A1B289	Report No. T15-1116-JC-2		11/16/2015	NBS Calibrations
Fluke 9144 s/n B5A077	Report No. 7060.00-205700-001		1/20/2016	JM Test Systems
Temperature Calibration Points	20	70	150	
Reference Deg F (To)	20	70	150	
Probe Temp (deg F)	22.0	70.0	148.0	
Difference (degrees)	2.0	0.0	2.0	
TC Meets Method 5 Specifications: ( $\pm 2.0$ °F)				
	YES	YES	YES	

Reviewed by:



## THERMOCOUPLE CALIBRATION

Meter Out

THERMOCOUPLE ID C12-O

Cal Date: 1/31/2017

DGM Outlet TC

CALIBRATION TECHNICIAN: LTR

### REFERENCE STANDARDS

Hart Scientific 9103-A s/n A1B289

Fluke 9144 s/n B5A077

### TRACEABILITY

Report No. T15-1116-JC-2

Report No. 7060.00-205700-001

### DATE

11/16/2015

1/20/2016

### LABORATORY

NBS Calibrations

JM Test Systems

Temperature Calibration Points	20	70	150
Reference Deg F (To)	20	70	150
Probe Temp (deg F)	22.0	70.0	148.0
Difference (degrees)	2.0	0.0	2.0

TC Meets Method 5 Specifications: ( $\pm 2.0$ °F)	YES	YES	YES
---	-----	-----	-----

Reviewed by:



# **Meter Pyrometer Calibration**

Meter I.D.		C-12				
Temperature	CL-300-100F	X	X	X	X	X
Calibrator Used	CL-3512-A					
DATE		1/23/2017	1/23/2017	1/23/2017	1/23/2017	1/23/2017
TECHNICIAN		LTR	LTR	LTR	LTR	LTR
Thermocouple I.D.		T.C. 1	T.C. 2	T.C. 3	T.C. 4	T.C. 5
Reference °F	Acceptable Range	** If not within Acceptable Range, unit not to be used within range at which failure occurred.				
1000	990 to 1010	999				998
900	890 to 910	899				898
800	791 to 809	799				798
700	692 to 708	700				699
600	593 to 607	599				598
500	493 to 507	497	498	499		496
400	394 to 406	399	399	401		397
300	295 to 305	300	301	301		299
200	196 to 204	200	200	200		199
150	146 to 154	150	151	150	149	149
100	96 to 104	99	99	100	97	98
50	47 to 53	49	50	49	48	48
0	-3 to 3	1			0	0
-50	-53 to -47	-49			-51	-50

Pass/Fail based on +/- 0.75% of Rankine value

Fail indicated by cell highlighting

Reviewd By:



Hibbing Taconite Company  
Hibbing, Minnesota

Barr Engineering Co.  
September 8, 2017

Nozzle Calibration  
Pellet Indurating Furnace Line 2 - Stack 4 (SV025)  
Test Baseline

Nozzle Calibration

Nozzle No.

Used for Runs:  -

Point Measurement, inches

1	0.213
2	0.213
3	0.213
Average	0.213

Test Date 9/8/2017

Date Measured: 9/7/2017

Technician: DJK

Signature: 

Nozzle Calibration  
Pellet Indurating Furnace Line 2 - Stack 3 (SV026)  
Test Baseline

Nozzle Calibration

Nozzle No.

Used for Runs:  -

Point Measurement, inches

1	0.213
2	0.213
3	0.213
Average	0.213

Test Date 9/8/2017

Date Measured: 9/7/2017

Technician: DJK

Signature: 

Nozzle Calibration  
Pellet Indurating Furnace Line 2 - Stack 2 (SV027)  
Test Baseline

Nozzle Calibration

Nozzle No.

Used for Runs:  -

Point Measurement, inches

1	0.213
2	0.213
3	0.213
Average	0.213

Test Date 9/8/2017

Date Measured: 9/7/2017

Technician: DJK

Signature:



Nozzle Calibration  
Pellet Indurating Furnace Line 2 - Stack 1 (SV028)  
Test Baseline

Nozzle Calibration

Nozzle No.

Used for Runs:  -


Point Measurement, inches

1	0.213
2	0.213
3	0.213
Average	0.213

Test Date 9/8/2017

Date Measured: 9/7/2017

Technician: DJK

Signature: 



# THERMOCOUPLE CALIBRATION

THERMOCOUPLE ID 10-3

Cal Date: 1/2/2017

Probe

CALIBRATION TECHNICIAN: HLP

## REFERENCE STANDARDS

Hart Scientific 9103-A s/n A1B289

Fluke 9144 s/n B5A077

## TRACEABILITY

Report No. T15-1116-JC-2

Report No. 7060.00-205700-001

## DATE

11/16/2015

1/20/2016

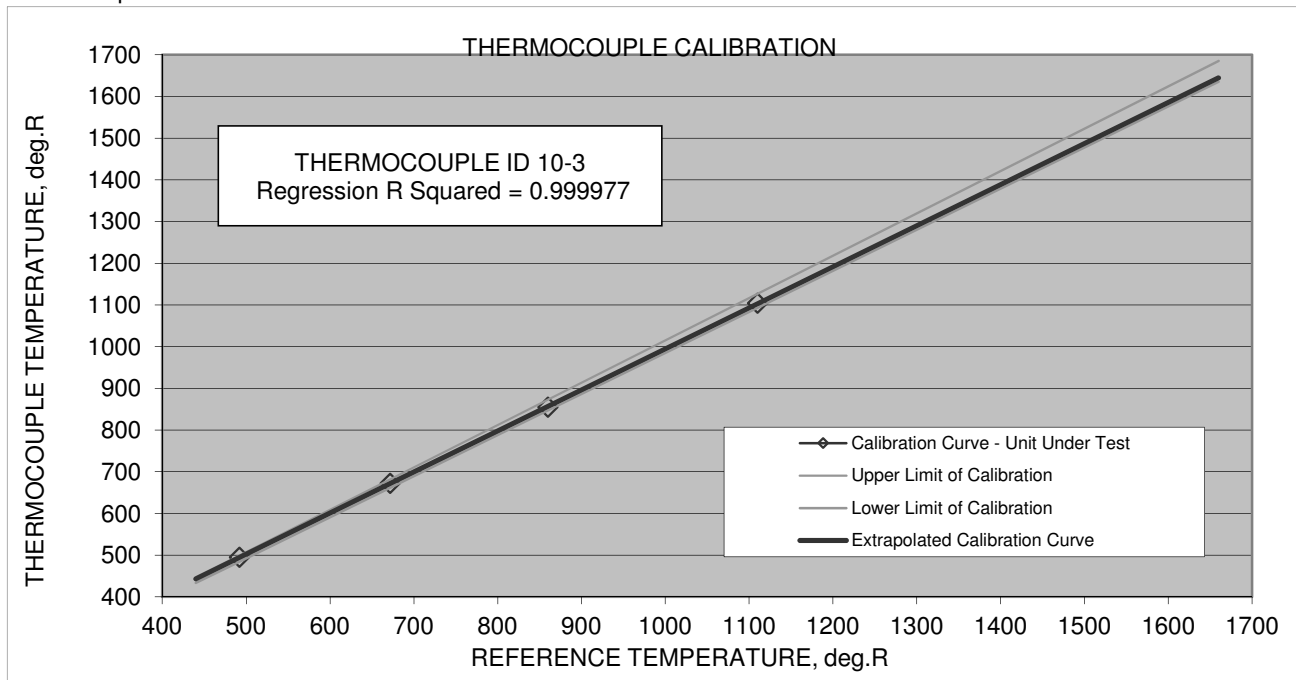
## LABORATORY

NBS Calibrations

JM Test Systems

## Temperature Calibration Points

	32	212	400	650	Ambient
Reference Deg F (To)	32	212	400	650	70
Probe Temp (deg F)	35	212	395	644	70
Reference Temp (deg R) deg F + 460	492	672	860	1110	530
Probe Temp (deg R), deg F + 460	495	672	855	1104	530
Difference (degrees)	-3	0	5	6	0
% Diff Abs. T	0.6%	0.0%	0.6%	0.5%	0.0%
Is difference less than 1.5% at all measured points?	YES				



Are extrapolated limits less than 1.5%? YES

FAHRENHEIT  
CALIBRATION RANGE  
-20 1200

If not acceptable, describe corrective action:

Reviewed by:



## S-Type Pitot Tube Geometry Check

Pitot Tube

Number: 10-3 10-3

Length: 10'

Function: M-5 Probe / Free

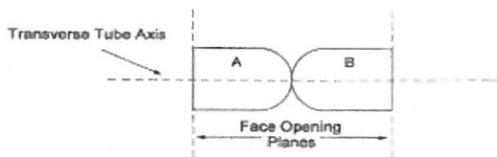
Inspection Date: 1-4-17

Technician: RMP

1. Are face openings perpendicular to tube axis?

☒ YES (go to 2)

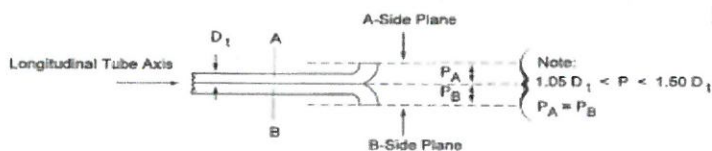
☐ NO (go to 1a)



2. Are face openings parallel to longitudinal axis?

☒ YES (go to 3)

☐ NO (go to 2a)



1a. If NO, is angle less than 10°?

☐ YES (go to 2)

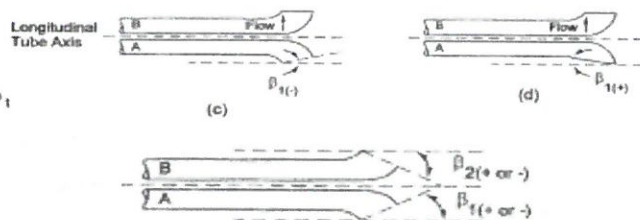
☐ NO (discontinue use)



2a. If NO, is angle less than 5°?

☐ YES (go to 3)

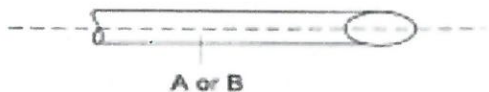
☐ NO (discontinue use)



3. Are legs of equal length?

☒ YES (go to 4)

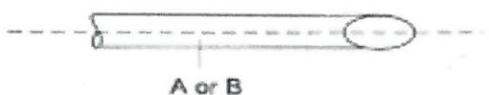
☐ NO (go to 3a)



4. Are center-lines of legs coincident?

☒ YES (go to 5)

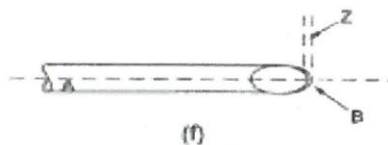
☐ NO (go to 4a)



3a. If NO, is difference less than 1/8 inch?

☐ YES (go to 4)

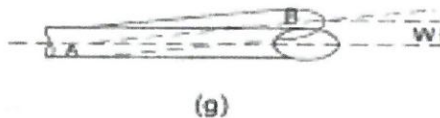
☐ NO (discontinue use)



4a. If NO, are center-lines of face openings less than 1/32 inch?

☐ YES (go to 5)

☐ NO (discontinue use)



5. Does this pitot tube pass all of the above criteria?

☒ YES

☐ NO

I certify that the pitot tube meets or exceeds all specifications and criteria listed in 40 CFR Part 60, Appendix A, EPA Method 2, and is assigned a pitot tube certification factor of 0.84.

Technician Signature: RMP

Reviewed by: DMP



# THERMOCOUPLE CALIBRATION

THERMOCOUPLE ID 10-4

Cal Date: 1/9/2016

Probe

CALIBRATION TECHNICIAN: LDP2

## REFERENCE STANDARDS

Hart Scientific 9103-A s/n A1B289

Fluke 9144 s/n B5A077

## TRACEABILITY

Report No. T15-1116-JC-2

Report No. 7060.00-205700-001

## DATE

11/16/2015

1/20/2016

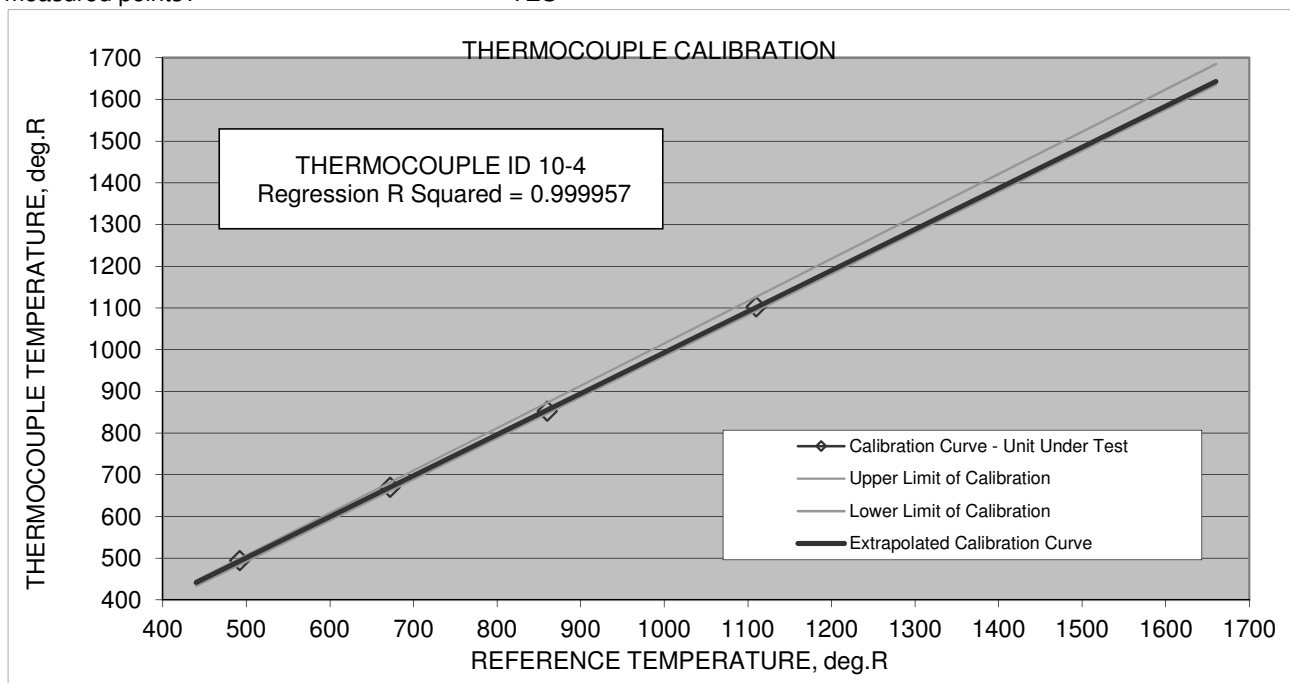
## LABORATORY

NBS Calibrations

JM Test Systems

## Temperature Calibration Points

	32	212	400	650	Ambient
Reference Deg F (To)	32	212	400	650	70
Probe Temp (deg F)	34	210	393	643	71
Reference Temp (deg R) deg F + 460	492	672	860	1110	530
Probe Temp (deg R), deg F + 460	494	670	853	1103	531
Difference (degrees)	-2	2	7	7	-1
% Diff Abs. T	0.4%	0.3%	0.8%	0.6%	0.2%
Is difference less than 1.5% at all measured points?	YES				



Are extrapolated limits less than 1.5%?

YES

FAHRENHEIT  
CALIBRATION RANGE  
-20 1200

If not acceptable, describe corrective action:

Reviewed by:





## S-Type Pitot Tube Geometry Check

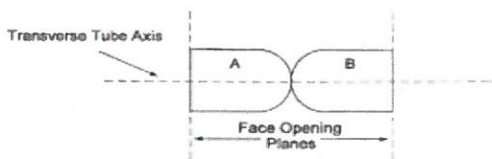
Pitot Tube  
Number: 10-4  
Length: 10'  
Function: M-5 Probe / Free

Inspection Date: 1-4-17  
Technician: RMP

1. Are face openings perpendicular to tube axis?

☒ YES (go to 2)

☐ NO (go to 1a)



1a. If NO, is angle less than 10°?

☐ YES (go to 2)

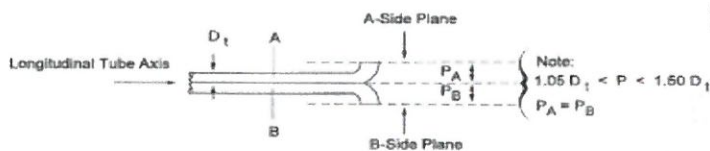
☐ NO (discontinue use)



2. Are face openings parallel to longitudinal axis?

☐ YES (go to 3)

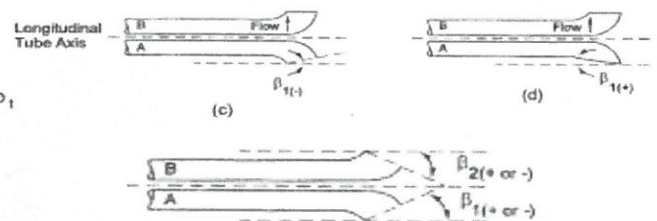
☒ NO (go to 2a)



2a. If NO, is angle less than 5°?

☒ YES (go to 3)

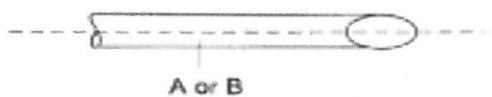
☐ NO (discontinue use)



3. Are legs of equal length?

☒ YES (go to 4)

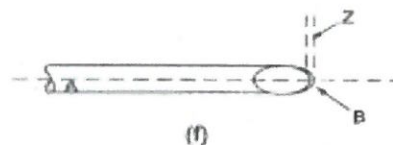
☐ NO (go to 3a)



3a. If NO, is difference less than 1/8 inch?

☐ YES (go to 4)

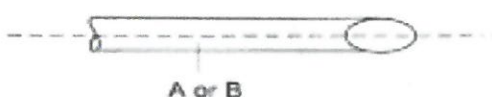
☐ NO (discontinue use)



4. Are center-lines of legs coincident?

☒ YES (go to 5)

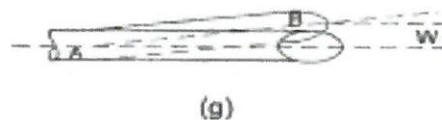
☐ NO (go to 4a)



4a. If NO, are center-lines of face openings less than 1/32 inch?

☐ YES (go to 5)

☐ NO (discontinue use)



5. Does this pitot tube pass all of the above criteria?

☒ YES

☐ NO

I certify that the pitot tube meets or exceeds all specifications and criteria listed in 40 CFR Part 60, Appendix A, EPA Method 2, and is assigned a pitot tube certification factor of 0.84.

Technician Signature: [Signature]

Reviewed by: [Signature]



# THERMOCOUPLE CALIBRATION

THERMOCOUPLE ID 10-5

Cal Date: 1/2/2017

Probe

CALIBRATION TECHNICIAN: HLP

## REFERENCE STANDARDS

Hart Scientific 9103-A s/n A1B289

Fluke 9144 s/n B5A077

## TRACEABILITY

Report No. T15-1116-JC-2

Report No. 7060.00-205700-001

## DATE

11/16/2015

1/20/2016

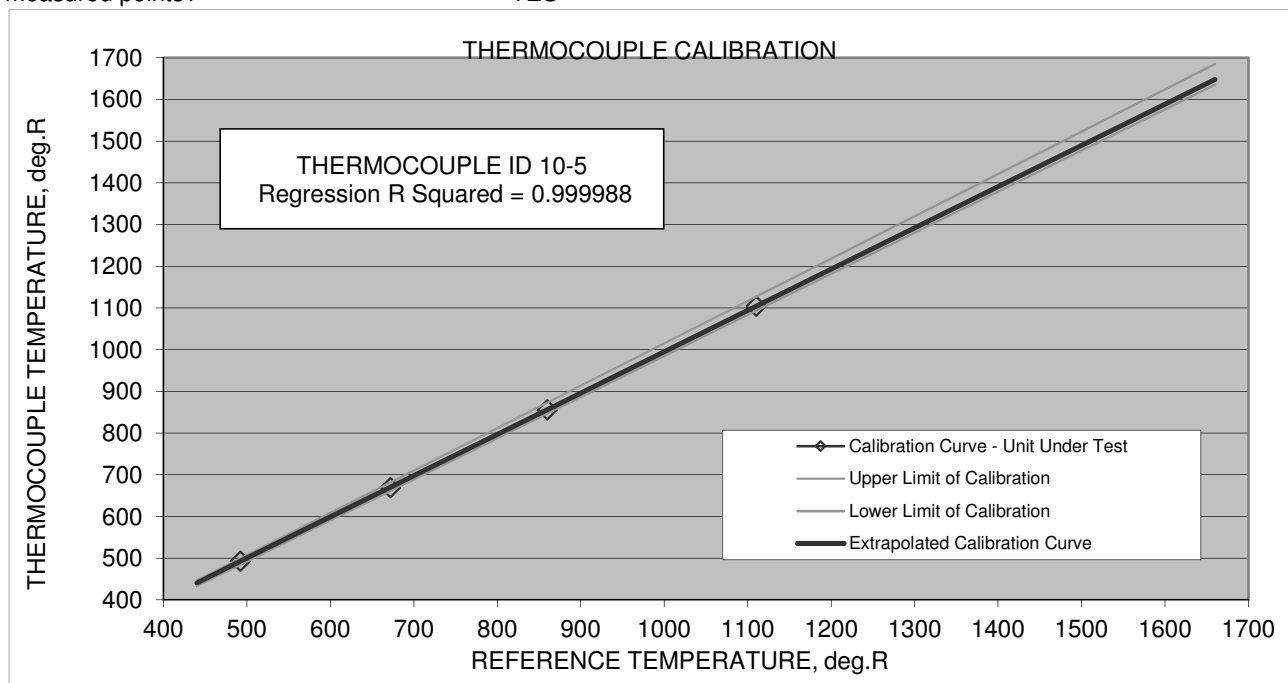
## LABORATORY

NBS Calibrations

JM Test Systems

## Temperature Calibration Points

	32	212	400	650	Ambient
Reference Deg F (To)	32	212	400	650	70
Probe Temp (deg F)	33	209	396	644	71
Reference Temp (deg R) deg F + 460	492	672	860	1110	530
Probe Temp (deg R), deg F + 460	493	669	856	1104	531
Difference (degrees)	-1	3	4	6	-1
% Diff Abs. T	0.2%	0.4%	0.5%	0.5%	0.2%
Is difference less than 1.5% at all measured points?	YES				



Are extrapolated limits less than 1.5%? YES

FAHRENHEIT  
CALIBRATION RANGE  
-20 1200

If not acceptable, describe corrective action:

Reviewed by:



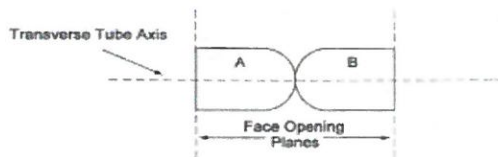
## S-Type Pitot Tube Geometry Check

Pitot Tube  
Number: 10-5  
Length: 10'  
Function: M-5 Probe / Free

Inspection Date: 1-4-17  
Technician: RMP

1. Are face openings perpendicular to tube axis?

☒ YES (go to 2) ☐ NO (go to 1a)



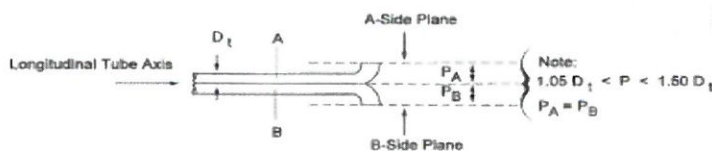
1a. If NO, is angle less than 10°?

☐ YES (go to 2) ☐ NO (discontinue use)



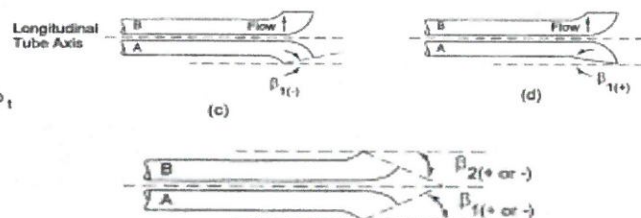
2. Are face openings parallel to longitudinal axis?

☒ YES (go to 3) ☐ NO (go to 2a)



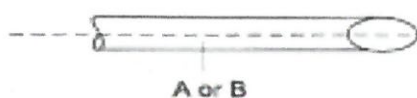
2a. If NO, is angle less than 5°?

☐ YES (go to 3) ☐ NO (discontinue use)



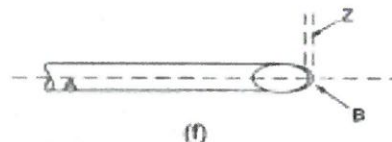
3. Are legs of equal length?

☒ YES (go to 4) ☐ NO (go to 3a)



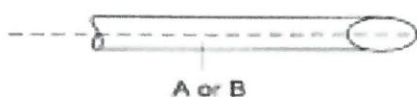
3a. If NO, is difference less than 1/8 inch?

☐ YES (go to 4) ☐ NO (discontinue use)



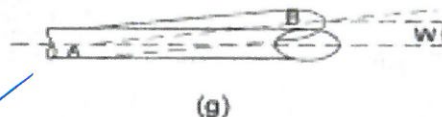
4. Are center-lines of legs coincident?

☒ YES (go to 5) ☐ NO (go to 4a)



4a. If NO, are center-lines of face openings less than 1/32 inch?

☐ YES (go to 5) ☐ NO (discontinue use)



5. Does this pitot tube pass all of the above criteria?

☒ YES ☐ NO

I certify that the pitot tube meets or exceeds all specifications and criteria listed in 40 CFR Part 60, Appendix A, EPA Method 2, and is assigned a pitot tube certification factor of 0.84.

Technician Signature: [Signature]

Reviewed by: [Signature]



# THERMOCOUPLE CALIBRATION

THERMOCOUPLE ID 10-6

Cal Date: 1/2/2017

Probe

CALIBRATION TECHNICIAN: HLP

## REFERENCE STANDARDS

Hart Scientific 9103-A s/n A1B289

Fluke 9144 s/n B5A077

## TRACEABILITY

Report No. T15-1116-JC-2

Report No. 7060.00-205700-001

## DATE

11/16/2015

1/20/2016

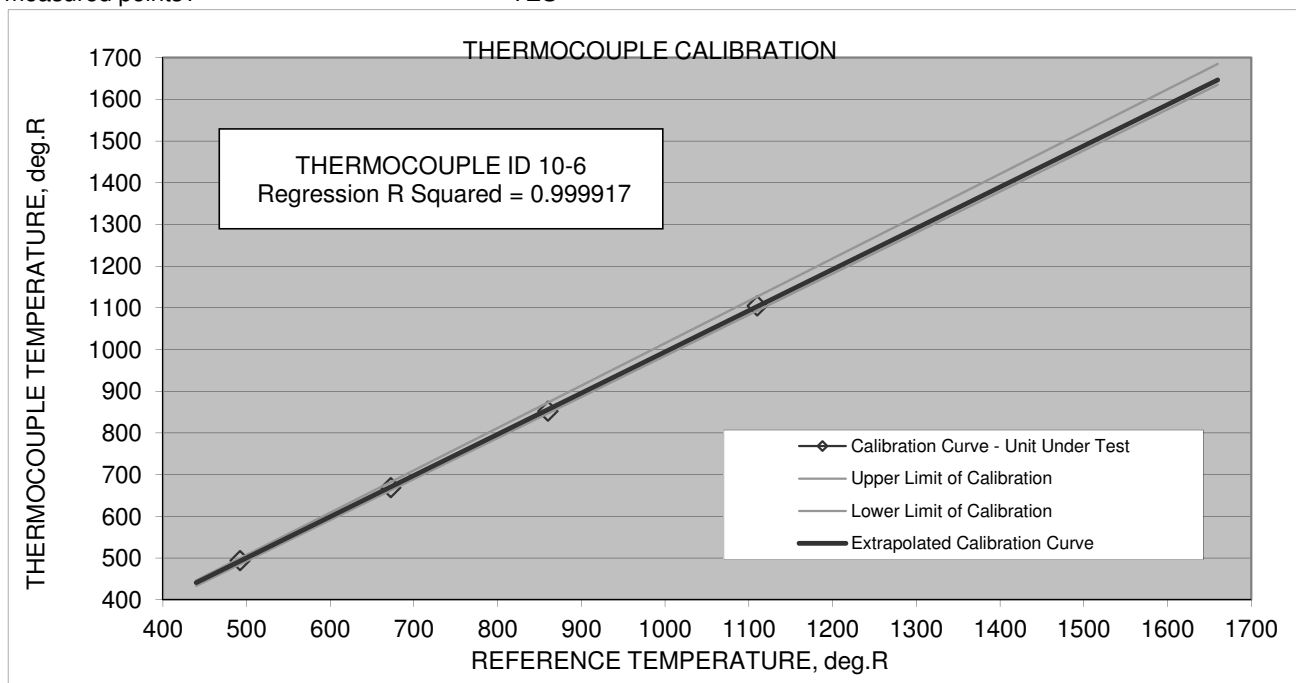
## LABORATORY

NBS Calibrations

JM Test Systems

## Temperature Calibration Points

	32	212	400	650	Ambient
Reference Deg F (To)	32	212	400	650	70
Probe Temp (deg F)	34	209	393	645	70
Reference Temp (deg R) deg F + 460	492	672	860	1110	530
Probe Temp (deg R), deg F + 460	494	669	853	1105	530
Difference (degrees)	-2	3	7	5	0
% Diff Abs. T	0.4%	0.4%	0.8%	0.5%	0.0%
Is difference less than 1.5% at all measured points?	YES				



Are extrapolated limits less than 1.5%? YES

If not acceptable, describe corrective action:

Reviewed by: *[Signature]*



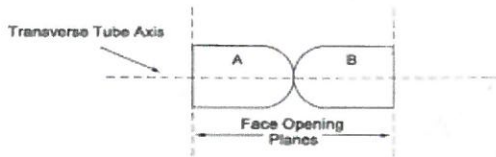
## S-Type Pitot Tube Geometry Check

Pitot Tube  
Number: 10-6  
Length: 10'  
Function: M-5 Probe / Free

Inspection Date: 1-4-16  
Technician: RMP

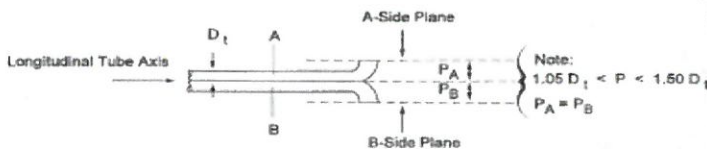
1. Are face openings perpendicular to tube axis?

☒ YES (go to 2) ☐ NO (go to 1a)



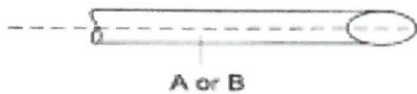
2. Are face openings parallel to longitudinal axis?

☒ YES (go to 3) ☐ NO (go to 2a)



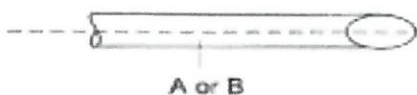
3. Are legs of equal length?

☐ YES (go to 4) ☒ NO (go to 3a)



4. Are center-lines of legs coincident?

☒ YES (go to 5) ☐ NO (go to 4a)



5. Does this pitot tube pass all of the above criteria?

☒ YES ☐ NO

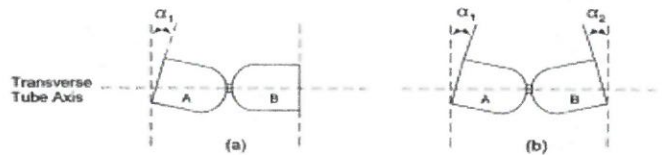
I certify that the pitot tube meets or exceeds all specifications and criteria listed in 40 CFR Part 60, Appendix A, EPA Method 2, and is assigned a pitot tube certification factor of 0.84.

Technician Signature: [Signature]

Reviewed by: [Signature]

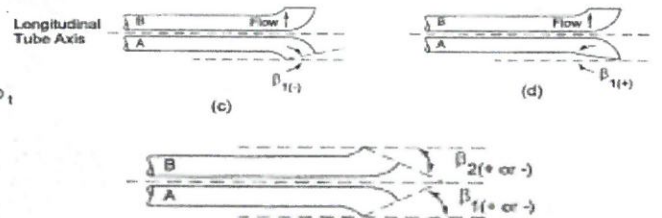
1a. If NO, is angle less than 10°?

☐ YES (go to 2) ☐ NO (discontinue use)



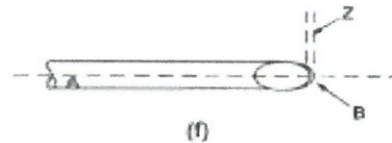
2a. If NO, is angle less than 5°?

☐ YES (go to 3) ☐ NO (discontinue use)



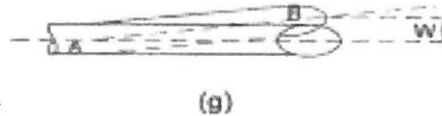
3a. If NO, is difference less than 1/8 inch?

☒ YES (go to 4) ☐ NO (discontinue use)



4a. If NO, are center-lines of face openings less than 1/32 inch?

☐ YES (go to 5) ☐ NO (discontinue use)





## THERMOCOUPLE CALIBRATION

Impinger Outlet

THERMOCOUPLE ID TIO-1253

Cal Date: 1/5/2017

Umbilical 200-5

CALIBRATION TECHNICIAN: HLP

### REFERENCE STANDARDS

### TRACEABILITY

### DATE

### LABORATORY

Hart Scientific 9103-A s/n A1B289

Report No. T15-1116-JC-2

11/16/2015

NBS Calibrations

Fluke 9144 s/n B5A077

Report No. 7060.00-205700-001

1/20/2016

JM Test Systems

Temperature Calibration Points	20	70	150
Reference Deg F (To)	20	70	150
Probe Temp (deg F)	21.0	71.0	150.0
Difference (degrees)	1.0	1.0	0.0
TC Meets Method 5 Specifications: ( $\pm 2.0$ °F)			
	YES	YES	YES

Reviewed by: 



## THERMOCOUPLE CALIBRATION

Impinger Outlet

THERMOCOUPLE ID TIO-2162

Cal Date: 1/5/2017

Umbilical 200-1

CALIBRATION TECHNICIAN: HLP

### REFERENCE STANDARDS

Hart Scientific 9103-A s/n A1B289

Fluke 9144 s/n B5A077

### TRACEABILITY

Report No. T15-1116-JC-2

Report No. 7060.00-205700-001

### DATE

11/16/2015

1/20/2016

### LABORATORY

NBS Calibrations

JM Test Systems

Temperature Calibration Points	20	70	150
Reference Deg F (To)	20	70	150
Probe Temp (deg F)	21.0	71.0	148.0
Difference (degrees)	1.0	1.0	2.0
TC Meets Method 5 Specifications: ( $\pm 2.0$ °F)			
	YES	YES	YES

Reviewed by:

## Umbilical Thermocouple Checks

<b>Umbilical I.D.</b>		200-1				
<b>Pyrometer Used, I.D.</b>		D-15				
<b>Temperature</b>	CL-300-100F					
<b>Calibrator Used</b>	CL-3512-A					
<b>DATE</b>	1/10/2017					
<b>TECHNICIAN</b>		LDP2				
<b>Thermocouple I.D. on Umbilical</b>		<b>T.C. 1</b>	<b>T.C. 2</b>	<b>T.C. 3</b>	<b>T.C. 4</b>	<b>T.C. 5</b>
<b>Reference °F</b>	<b>Acceptable Range</b>	** If not within Acceptable Range, unit not to be used within range at which failure occurred.				
1950	1932 to 1968	1951				1951
1800	1784 to 1816	1800				1801
1600	1585 to 1615	1599				1600
1400	1387 to 1413	1401				1401
1200	1188 to 1212	1200				1201
1000	990 to 1010	1000				1001
900	890 to 910	900				900
800	791 to 809	800				801
700	692 to 708	702				702
600	593 to 607	600				602
500	493 to 507	499	499	498		499
400	394 to 406	398	399	399		399
300	295 to 305	299	299	300		300
200	196 to 204	200	200	200		200
150	146 to 154	150	150	148	150	150
100	96 to 104	100	100	100	101	101
50	47 to 53	50	50	48	50	50
0	-3 to 3	0			0	0
-50	-53 to -47	-49			-49	-49

Pass/Fail based on +/- 0.75% of Rankine value

Fail indicated by cell highlighting

- 1) Are all thermocouple leads inspected and functioning properly?
- 2) Are pitot lines clear, gum rubber replaced, and appropriate length?
- 3) Ground wire resistance

(Y/N)

Y
Y
1

### Pitot Line Leak Check

Side	Press. In H2O	Vac. In H2O	Leak? (Y/N)
Positive	4.0	3.5	N
Negative	3.0	3.5	N

Reviewed by: *MRh Peter*



## Umbilical Thermocouple Checks

<b>Umbilical I.D.</b>		200-5					
<b>Pyrometer Used, I.D.</b>		D-15					
<b>Temperature</b>	CL-300-100F						
<b>Calibrator Used</b>	CL-3512-A						
<b>DATE</b>	1/5/2017						
<b>TECHNICIAN</b>		LDP2					
<b>Thermocouple I.D. on Umbilical</b>		<b>T.C. 1</b>	<b>T.C. 2</b>	<b>T.C. 3</b>	<b>T.C. 4</b>	<b>T.C. 5</b>	<b>T.C. 6</b>
<b>Reference °F</b>	<b>Acceptable Range</b>	** If not within Acceptable Range, unit not to be used within range at which failure occurred.					
1950	1932 to 1968	1950				1949	1948
1800	1784 to 1816	1799				1798	1799
1600	1585 to 1615	1599				1598	1598
1400	1387 to 1413	1400				1401	1400
1200	1188 to 1212	1200				1201	1200
1000	990 to 1010	1000				1000	1000
900	890 to 910	900				900	899
800	791 to 809	800				800	800
700	692 to 708	701				701	701
600	593 to 607	601				601	601
500	493 to 507	498	499	497		498	499
400	394 to 406	398	398	398		398	398
300	295 to 305	299	299	298		299	299
200	196 to 204	199	199	199		199	199
150	146 to 154	150	149	149	149	149	149
100	96 to 104	100	100	99	99	99	100
50	47 to 53	49	49	49	48	49	49
0	-3 to 3	0			0	-1	0
-50	-53 to -47	-49			-50	-50	-49

Pass/Fail based on +/- 0.75% of Rankine value

Fail indicated by cell highlighting

- 1) Are all thermocouple leads inspected and functioning properly?
- 2) Are pitot lines clear, gum rubber replaced, and appropriate length?
- 3) Ground wire resistance

(Y/N)

Y
Y
1

### Pitot Line Leak Check

Side	Press. In H2O	Vac. In H2O	Leak? (Y/N)
Positive	4.0	4.0	N
Negative	3.0	3.0	N

Reviewed by:



### Field Barometer Calibration

Calibration to National Weather Service at Chisholm-Hibbing Airport

Station elevation at Barr Hibbing Office 3128 14th Avenue East, Hibbing, MN 1460 ft.

Date	Technician	NWS Observation		Field Barometer			Barr Office	Condition	Remarks	Offset
		Time	Altimeter	ID	Time	Barometric Pressure	Station Pressure			
9/5/17	DJK	9:54	29.94	BA-23	10:18	28.50	28.48	In Calibration	As Found	0.02
10/19/17	DJK	11:53	29.98	BA-23	12:28	28.50	28.52	In Calibration	As Found	-0.02

**SCOTT-MARRIN, INC.**

PGVP Vendor ID: H12016

6531 Box Springs Blvd • Riverside, CA 92507-0725

Phone: +1(951)653-6780 • Fax: +1(951)653-2430 • [www.scottmarrin.com](http://www.scottmarrin.com)

## Report Of Analysis EPA Protocol Gas Mixtures

BARR01

TO: Barr Engineering Co  
Attn: Benjamin Wiltse  
5150 West 76th Street  
Edina, MN 55439-2900  
(952) 832-2885

REPORT NO: 67882-01

REPORT DATE: May 10, 2016

CUSTOMER PO NO: BAW0316

CYLINDER SIZE: 150A (141 std cu ft)

CYLINDER PRESSURE: 2000 psig

CYLINDER NUMBER: **CC37750**

COMPONENT	MOLAR CONCENTRATION ± EXPANDED UNCERTAINTY	REFERENCE STANDARD	ANALYZER		REPLICATE ANALYSIS DATA	
			MAKE, MODEL, S/N, DETECTION			
Carbon dioxide	5.02 ± 0.05 %	GMIS	SRM 1674b	Varian Model 3400	5/10/2016	
			Samp#: 7-H-39	Serial # 10680	5.02 %	
			Cyl#: CC116770	Cyl#: FF10598	Thermal Conductivity	5.02 %
			7.99 ± 0.08 %	6.944 ± 0.013 %	Gas Chromotography	5.02 %
			Exp: 3/18/2022	Exp: 6/17/2019	LAST CAL DATE: 4/26/2016	5.02 %
Oxygen	9.48 ± 0.02 %	GMIS	SRM 2658a	Varian Model 3800	5/10/2016	
			Samp#: 72-D-37	Serial # None	9.48 %	
			Cyl#: CA03042	Cyl#: CAL016820	Thermal Conductivity	9.50 %
			10.17 ± 0.02 %	9.918 ± 0.022 %	Gas Chromotography	9.47 %
			Exp: 1/11/2024	Exp: 6/1/2017	LAST CAL DATE: 5/10/2016	9.48 %
Nitrogen	Balance					

CERTIFICATION DATE: May 10, 2016

EPA EXPIRATION DATE: May 11, 2024

ppm =  $\mu$ mole/mole

% = mole-%

x̄ = EPA weighted mean

The above analyses were performed in accordance with Procedure G1 of the EPA Traceability Protocol, Report Number EPA600/R-12/531, dated May 2012.

The above analyses should not be used if the cylinder pressure is less than 100 psig.

ANALYST:

M.S. Calhoun

APPROVED:

J. T. Marrin

The only liability of this company for gas which fails to comply with this analysis shall be replacement or reanalysis thereof by the company without extra cost.

Report Of Analysis  
EPA Protocol Gas Mixtures

BARR01

TO: Barr Engineering Co  
Attn: Benjamin Wiltse  
5150 West 76th Street  
Edina, MN 55439-2900  
(952) 832-2885

REPORT NO: 68894-01

REPORT DATE: January 13, 2017

CUSTOMER PO NO: BAW01032017

CYLINDER SIZE: 150A (141 std cu ft)

CYLINDER PRESSURE: 2000 psig

CYLINDER NUMBER: CA06672

COMPONENT	CONCENTRATION (v/v) ± EPA UNCERTAINTY	REFERENCE STANDARD	ANALYZER MAKE, MODEL, S/N, DETECTION	REPLICATE ANALYSIS DATA
Carbon dioxide	9.53 ± 0.07 %	GMIS	SRM 1674b	1/11/2017
			Samp#: 7-H-39	9.54 %
		Cyl#: CC116770	Cyl#: FF10598	9.52 %
		7.99 ± 0.08 %	6.944 ± 0.013 %	9.52 %
		Exp: 3/18/2022	Exp: 6/17/2019	9.53 %
Oxygen	9.57 ± 0.02 %	GMIS	SRM 2658a	1/10/2017
			Samp#: 72-D-37	9.58 %
		Cyl#: CA03042	Cyl#: CAL016820	9.55 %
		10.17 ± 0.02 %	9.918 ± 0.022 %	9.57 %
		Exp: 1/11/2024	Exp: 6/1/2017	9.57 %
Nitrogen	Balance			

CERTIFICATION DATE: January 10, 2017

EPA EXPIRATION DATE: January 11, 2025

ppm =  $\mu$ mole/mole

% = mole-%

 $\bar{x}$  = EPA weighted mean

The above analyses were performed in accordance with Procedure G1 of the EPA Traceability Protocol, Report Number EPA600/R-12/531, dated May 2012.

The above analyses should not be used if the cylinder pressure is less than 100 psig.

ANALYST:

M.S. Calhoun

APPROVED:

J. T. Marrin

The only liability of this company for gas which fails to comply with this analysis shall be replacement or reanalysis thereof by the company without extra cost.

Report Of Analysis  
EPA Protocol Gas Mixtures

BARR01

TO: Barr Engineering Co  
Attn: Benjamin Wiltse  
5150 West 76th Street  
Edina, MN 55439-2900  
(952) 832-2885

REPORT NO: 67349-02

REPORT DATE: December 15, 2015

CUSTOMER PO NO: BAW11102015

CYLINDER SIZE: 150A (141 std cu ft)

CYLINDER PRESSURE: 2000 psig

CYLINDER NUMBER: CA06643

COMPONENT	MOLAR CONCENTRATION ± EXPANDED UNCERTAINTY	REFERENCE STANDARD	ANALYZER		REPLICATE ANALYSIS DATA
			MAKE, MODEL, S/N, DETECTION		
Oxygen	21.16 ± 0.05 %	GMIS	SRM 2659a	Varian Model 3800	<u>12/4/2015</u>
			Samp#: 71-D-23	Serial # None	21.20 %
		Cyl#: CC106787	Cyl#: CAL015788	Thermal Conductivity	21.15 %
		24.04 ± 0.05 %	20.72 ± 0.043 %	Gas Chromotography	<u>21.14 %</u>
		Exp: 9/3/2023	Exp: 1/1/2016	LAST CAL DATE: 12/4/2015	$\bar{x}$ : 21.16 %

Nitrogen Balance

CERTIFICATION DATE: December 4, 2015

EPA EXPIRATION DATE: December 5, 2023

ppm =  $\mu$ mole/mole

% = mole-%

 $\bar{x}$  = EPA weighted mean

The above analyses were performed in accordance with Procedure G1 of the EPA Traceability Protocol, Report Number EPA600/R-12/531, dated May 2012.

The above analyses should not be used if the cylinder pressure is less than 100 psig.

ANALYST:

M.S. Calhoun

APPROVED:

J. T. Marrin

The only liability of this company for gas which fails to comply with this analysis shall be replacement or reanalysis thereof by the company without extra cost.

## Appendix E

### Process Operating Data

Throughput  
wltp>dltp>dstph  
Stacks 3 and 4  
Ontario Hydro Hg Baseline Testing

Furnace Stacks Line #2

Ontario Hydro SV25 & SV26

Minimum Run 1		Minimum Run 2		Minimum Run 3	
Tag	ADBI3160	Tag	ADBI3160	Tag	ADBI3160
Start	9/7/2017 7:17	Start	9/7/2017 10:51	Start	9/7/2017 13:26
End	9/7/2017 8:20	End	9/7/2017 12:55	End	9/7/2017 15:30
07-Sep-17 07:17:00	491.1932678	07-Sep-17 10:51:00	483.4721069	07-Sep-17 13:26:00	487.6226196
07-Sep-17 07:32:00	387.2711182	07-Sep-17 11:06:00	465.4112244	07-Sep-17 13:41:00	499.8361206
07-Sep-17 07:47:00	344.594574	07-Sep-17 11:21:00	465.850708	07-Sep-17 13:56:00	497.7486572
07-Sep-17 08:02:00	388.9497375	07-Sep-17 11:36:00	489.911499	07-Sep-17 14:11:00	496.0457153
07-Sep-17 09:22:00	489.8199463	07-Sep-17 11:51:00	491.1566467	07-Sep-17 14:26:00	491.2848206
07-Sep-17 09:37:00	492.5483093	07-Sep-17 12:06:00	469.2748718	07-Sep-17 14:41:00	498.5909729
07-Sep-17 09:52:00	500.1290894	07-Sep-17 12:21:00	493.9216309	07-Sep-17 14:56:00	491.7975464
07-Sep-17 10:07:00	493.8300781	07-Sep-17 12:36:00	500.4570007	07-Sep-17 15:11:00	488.9776306
Average	448.5420151	Average	482.4319611	Average	493.9880104
Maximum Run 1		Maximum Run 2		Maximum Run 3	
Tag	ADBI3160	Tag	ADBI3160	Tag	ADBI3160
Start	9/7/2017 7:17	Start	9/7/2017 10:51	Start	9/7/2017 13:26
End	9/7/2017 8:20	End	9/7/2017 12:55	End	9/7/2017 15:30
07-Sep-17 07:17:00	518.5683594	07-Sep-17 10:51:00	523.3288574	07-Sep-17 13:26:00	523.0546265
07-Sep-17 07:32:00	515.6935425	07-Sep-17 11:06:00	515.6935425	07-Sep-17 13:41:00	513.4595947
07-Sep-17 07:47:00	388.9497375	07-Sep-17 11:21:00	512.2327271	07-Sep-17 13:56:00	529.0606689
07-Sep-17 08:02:00	501.0995789	07-Sep-17 11:36:00	512.3059692	07-Sep-17 14:11:00	517.5979004
07-Sep-17 09:22:00	515.4555054	07-Sep-17 11:51:00	522.9447021	07-Sep-17 14:26:00	511.2622375
07-Sep-17 09:37:00	519.4473267	07-Sep-17 12:06:00	515.2357788	07-Sep-17 14:41:00	518.1105957
07-Sep-17 09:52:00	518.2387695	07-Sep-17 12:21:00	520.8206177	07-Sep-17 14:56:00	520.0515747
07-Sep-17 10:07:00	532.0270386	07-Sep-17 12:36:00	525.4899902	07-Sep-17 15:11:00	523.2377319
Average	501.1849823	Average	518.5065231	Average	519.4793663
Average Run 1		Average Run 2		Average Run 3	
Tag	ADBI3160	Tag	ADBI3160	Tag	ADBI3160
Start	9/7/2017 7:17	Start	9/7/2017 10:51	Start	9/7/2017 13:26
End	9/7/2017 8:20	End	9/7/2017 12:55	End	9/7/2017 15:30
07-Sep-17 07:17:00	507.5309677	07-Sep-17 10:51:00	507.5800932	07-Sep-17 13:26:00	509.5700242
07-Sep-17 07:32:00	469.2679729	07-Sep-17 11:06:00	498.2345197	07-Sep-17 13:41:00	505.1920419
07-Sep-17 07:47:00	369.3482196	07-Sep-17 11:21:00	497.6773218	07-Sep-17 13:56:00	508.0879644
07-Sep-17 08:02:00	456.8219829	07-Sep-17 11:36:00	504.1429667	07-Sep-17 14:11:00	508.3224858
07-Sep-17 09:22:00	505.2666619	07-Sep-17 11:51:00	506.8770023	07-Sep-17 14:26:00	503.8958806
07-Sep-17 09:37:00	502.1842059	07-Sep-17 12:06:00	503.3305626	07-Sep-17 14:41:00	506.7842568
07-Sep-17 09:52:00	510.237051	07-Sep-17 12:21:00	506.002851	07-Sep-17 14:56:00	503.6326206
07-Sep-17 10:07:00	509.3394182	07-Sep-17 12:36:00	511.7752579	07-Sep-17 15:11:00	506.3214909
Average	373 dltp 418 dshtp	Average	393 dltp 441 dshtp	Average	395 dltp 442 dshtp
				Average	387 dltp 434 dshtp

Fuel Usage  
Natural Gas  
Stacks 3 and 4  
Ontario Hydro Hg Baseline Testing

Furnace Stacks Line #2

Natural Gas Usage

**North Chamber**

**Run 1**

**Tag** ADBI3109  
**Start** 9/7/2017 7:17  
**End** 9/7/2017 8:20

07-Sep-17 07:17:00	49.90995619
07-Sep-17 07:32:00	51.16078703
07-Sep-17 07:47:00	49.13163569
07-Sep-17 08:02:00	45.11421489
07-Sep-17 09:22:00	48.29013786
07-Sep-17 09:37:00	50.19765652
07-Sep-17 09:52:00	51.39577886
07-Sep-17 10:07:00	50.88252512

**Average** 50

**South Chamber**

**Run 1**

**Tag** ADBI3108  
**Start** 9/7/2017 7:17  
**End** 9/7/2017 8:20

07-Sep-17 07:17:00	31.92217105
07-Sep-17 07:32:00	32.28558959
07-Sep-17 07:47:00	33.1283666
07-Sep-17 08:02:00	33.52808716
07-Sep-17 09:22:00	31.02311532
07-Sep-17 09:37:00	31.64637688
07-Sep-17 09:52:00	32.25247476
07-Sep-17 10:07:00	32.02072166

**Average** 32

**Total (MCF/hr)** 82

Heat Content  
(MMBtu/MCF) 1.023

Heat Input  
(MMBtu/hr) 84

**North Chamber**

**Run 2**

**Tag** ADBI3109  
**Start** 9/7/2017 10:51  
**End** 9/7/2017 12:55

07-Sep-17 10:51:00	50.69018899
07-Sep-17 11:06:00	50.0620521
07-Sep-17 11:21:00	49.9497294
07-Sep-17 11:36:00	51.01347943
07-Sep-17 11:51:00	50.80101454
07-Sep-17 12:06:00	50.33797983
07-Sep-17 12:21:00	49.91730805
07-Sep-17 12:36:00	49.64745885

**Average** 50

**South Chamber**

**Run 2**

**Tag** ADBI3108  
**Start** 9/7/2017 10:51  
**End** 9/7/2017 12:55

07-Sep-17 10:51:00	31.0269065
07-Sep-17 11:06:00	30.99194488
07-Sep-17 11:21:00	31.01305683
07-Sep-17 11:36:00	31.03304609
07-Sep-17 11:51:00	31.03939914
07-Sep-17 12:06:00	31.04173424
07-Sep-17 12:21:00	31.04406935
07-Sep-17 12:36:00	31.04640445

**Average** 31

**Total (MCF/hr)** 81

Heat Content  
(MMBtu/MCF) 1.023

Heat Input  
(MMBtu/hr) 83

**North Chamber**

**Run 3**

**Tag** ADBI3109  
**Start** 9/7/2017 13:26  
**End** 9/7/2017 15:30

07-Sep-17 13:26:00	50.50380486
07-Sep-17 13:41:00	50.49682382
07-Sep-17 13:56:00	50.39796919
07-Sep-17 14:11:00	50.34899072
07-Sep-17 14:26:00	50.09818751
07-Sep-17 14:41:00	49.86121193
07-Sep-17 14:56:00	50.23745079
07-Sep-17 15:11:00	50.01038909

**Average** 50 **Total Average** 50

**South Chamber**

**Run 3**

**Tag** ADBI3108  
**Start** 9/7/2017 13:26  
**End** 9/7/2017 15:30

07-Sep-17 13:26:00	31.21993916
07-Sep-17 13:41:00	31.3282846
07-Sep-17 13:56:00	31.43663003
07-Sep-17 14:11:00	31.54497546
07-Sep-17 14:26:00	31.65332089
07-Sep-17 14:41:00	31.76166632
07-Sep-17 14:56:00	31.86407609
07-Sep-17 15:11:00	31.92895136

**Average** 32 **Total Average** 32

**Total (MCF/hr)** 82 **Total (MCF/hr)** 82

Heat Content  
(MMBtu/MCF) 1.023 (MMBtu/MCF) 1.02

Heat Input  
(MMBtu/hr) 84 (MMBtu/hr) 84



Pressure Drop - Inches of Water Column  
Stack 4 - SV025  
Ontario Hydro Hg Baseline Testing

Furnace Stacks Line #2

Minimum		Minimum		Minimum	
Run 1		Run 2		Run 3	
Tag	ADBI3718	Tag	ADBI3718	Tag	ADBI3718
Start	9/7/2017 7:17	Start	9/7/2017 10:51	Start	9/7/2017 13:26
End	9/7/2017 8:20	End	9/7/2017 12:55	End	9/7/2017 15:30
07-Sep-17 07:17:00	3.976923704	07-Sep-17 10:51:00	3.949596643	07-Sep-17 13:26:00	3.806285858
07-Sep-17 07:32:00	3.960765839	07-Sep-17 11:06:00	3.947992086	07-Sep-17 13:41:00	3.803920984
07-Sep-17 07:47:00	3.852741003	07-Sep-17 11:21:00	3.858258724	07-Sep-17 13:56:00	3.773587942
07-Sep-17 08:02:00	3.869405985	07-Sep-17 11:36:00	3.874806404	07-Sep-17 14:11:00	3.980240107
		07-Sep-17 11:51:00	3.988792181	07-Sep-17 14:26:00	4.016647339
07-Sep-17 09:22:00	3.665920973	07-Sep-17 12:06:00	3.961874962	07-Sep-17 14:41:00	3.974396944
07-Sep-17 09:37:00	3.939914465	07-Sep-17 12:21:00	3.889452219	07-Sep-17 14:56:00	3.884896994
07-Sep-17 09:52:00	3.925876379	07-Sep-17 12:36:00	3.892540455	07-Sep-17 15:11:00	3.908971071
07-Sep-17 10:07:00	4.037227631				
Average	3.9	Average	3.9	Average	3.9 Total Average 3.9
Maximum		Maximum		Maximum	
Run 1		Run 2		Run 3	
Tag	ADBI3718	Tag	ADBI3718	Tag	ADBI3718
Start	9/7/2017 7:17	Start	9/7/2017 10:51	Start	9/7/2017 13:26
End	9/7/2017 8:20	End	9/7/2017 12:55	End	9/7/2017 15:30
07-Sep-17 07:17:00	4.025414944	07-Sep-17 10:51:00	4.06934166	07-Sep-17 13:26:00	4.006390572
07-Sep-17 07:32:00	3.995975733	07-Sep-17 11:06:00	4.04233408	07-Sep-17 13:41:00	3.904361725
07-Sep-17 07:47:00	3.960765839	07-Sep-17 11:21:00	3.957022905	07-Sep-17 13:56:00	4.104272366
07-Sep-17 08:02:00	3.90282321	07-Sep-17 11:36:00	3.988792181	07-Sep-17 14:11:00	4.097445965
		07-Sep-17 11:51:00	4.099890232	07-Sep-17 14:26:00	4.097775459
07-Sep-17 09:22:00	4.025724411	07-Sep-17 12:06:00	4.105203152	07-Sep-17 14:41:00	4.038894176
07-Sep-17 09:37:00	4.037847996	07-Sep-17 12:21:00	4.02884388	07-Sep-17 14:56:00	3.978000641
07-Sep-17 09:52:00	4.129508018	07-Sep-17 12:36:00	3.913552761	07-Sep-17 15:11:00	3.994567394
07-Sep-17 10:07:00	4.134411812				
Average	4.0	Average	4.0	Average	4.0 Total Average 4.0
Average		Average		Average	
Run 1		Run 2		Run 3	
Tag	ADBI3718	Tag	ADBI3718	Tag	ADBI3718
Start	9/7/2017 7:17	Start	9/7/2017 10:51	Start	9/7/2017 13:26
End	9/7/2017 8:20	End	9/7/2017 12:55	End	9/7/2017 15:30
07-Sep-17 07:17:00	4.004591133	07-Sep-17 10:51:00	3.995465252	07-Sep-17 13:26:00	3.890785026
07-Sep-17 07:32:00	3.983237975	07-Sep-17 11:06:00	3.995240803	07-Sep-17 13:41:00	3.854465242
07-Sep-17 07:47:00	3.89893469	07-Sep-17 11:21:00	3.895133762	07-Sep-17 13:56:00	3.979611947
07-Sep-17 08:02:00	3.891546792	07-Sep-17 11:36:00	3.918887874	07-Sep-17 14:11:00	4.036420899
		07-Sep-17 11:51:00	4.053472031	07-Sep-17 14:26:00	4.063453077
07-Sep-17 09:22:00	3.895179975	07-Sep-17 12:06:00	4.024463518	07-Sep-17 14:41:00	3.997900855
07-Sep-17 09:37:00	3.999560051	07-Sep-17 12:21:00	3.950434789	07-Sep-17 14:56:00	3.930229695
07-Sep-17 09:52:00	4.000463828	07-Sep-17 12:36:00	3.900442139	07-Sep-17 15:11:00	3.943454241
07-Sep-17 10:07:00	4.064407367				
Average	4.0	Average	4.0	Average	4.0 Total Average 4.0

Water Flow - Gpm  
Stack 4 - SV025  
Ontario Hydro Hg Baseline Testing

Furnace Stacks Line #2

Minimum Run 1		Minimum Run 2		Minimum Run 3	
Tag	ADBI3720	Tag	ADBI3720	Tag	ADBI3720
Start	9/7/2017 7:17	Start	9/7/2017 10:51	Start	9/7/2017 13:26
End	9/7/2017 8:20	End	9/7/2017 12:55	End	9/7/2017 15:30
07-Sep-17 07:17:00	434.6204224	07-Sep-17 10:51:00	434.0595703	07-Sep-17 13:26:00	431.2463684
07-Sep-17 07:32:00	433.284729	07-Sep-17 11:06:00	433.7115173	07-Sep-17 13:41:00	430.5130615
07-Sep-17 07:47:00	433.9552002	07-Sep-17 11:21:00	431.4667358	07-Sep-17 13:56:00	434.117157
07-Sep-17 08:02:00	432.3869629	07-Sep-17 11:36:00	432.3303528	07-Sep-17 14:11:00	433.910553
		07-Sep-17 11:51:00	433.8170776	07-Sep-17 14:26:00	433.8509521
07-Sep-17 09:22:00	431.5263367	07-Sep-17 12:06:00	432.7780457	07-Sep-17 14:41:00	433.0467834
07-Sep-17 09:37:00	432.7184448	07-Sep-17 12:21:00	432.0925903	07-Sep-17 14:56:00	432.3012085
07-Sep-17 09:52:00	433.7840881	07-Sep-17 12:36:00	432.7091675	07-Sep-17 15:11:00	431.2283325
07-Sep-17 10:07:00	430.960083				
Average	433	Average	433	Average	433 Total Average 433
Maximum Run 1		Maximum Run 2		Maximum Run 3	
Tag	ADBI3720	Tag	ADBI3720	Tag	ADBI3720
Start	9/7/2017 7:17	Start	9/7/2017 10:51	Start	9/7/2017 13:26
End	9/7/2017 8:20	End	9/7/2017 12:55	End	9/7/2017 15:30
07-Sep-17 07:17:00	436.8516846	07-Sep-17 10:51:00	435.2516785	07-Sep-17 13:26:00	434.2384033
07-Sep-17 07:32:00	434.6204224	07-Sep-17 11:06:00	435.9967651	07-Sep-17 13:41:00	434.9029541
07-Sep-17 07:47:00	436.8260498	07-Sep-17 11:21:00	433.7115173	07-Sep-17 13:56:00	434.9238281
07-Sep-17 08:02:00	436.8312378	07-Sep-17 11:36:00	434.3518372	07-Sep-17 14:11:00	434.5066223
		07-Sep-17 11:51:00	434.4172058	07-Sep-17 14:26:00	434.8629761
07-Sep-17 09:22:00	434.1489868	07-Sep-17 12:06:00	433.8170776	07-Sep-17 14:41:00	435.1324463
07-Sep-17 09:37:00	433.907196	07-Sep-17 12:21:00	433.552948	07-Sep-17 14:56:00	433.2817993
07-Sep-17 09:52:00	436.2947998	07-Sep-17 12:36:00	433.9999695	07-Sep-17 15:11:00	433.552948
07-Sep-17 10:07:00	433.7840881				
Average	435	Average	434	Average	434 Total Average 435
Average Run 1		Average Run 2		Average Run 3	
Tag	ADBI3720	Tag	ADBI3720	Tag	ADBI3720
Start	9/7/2017 7:17	Start	9/7/2017 10:51	Start	9/7/2017 13:26
End	9/7/2017 8:20	End	9/7/2017 12:55	End	9/7/2017 15:30
07-Sep-17 07:17:00	435.7366109	07-Sep-17 10:51:00	434.6376262	07-Sep-17 13:26:00	433.1965468
07-Sep-17 07:32:00	433.8413052	07-Sep-17 11:06:00	435.0771564	07-Sep-17 13:41:00	432.9026399
07-Sep-17 07:47:00	435.245614	07-Sep-17 11:21:00	432.3863354	07-Sep-17 13:56:00	434.7047948
07-Sep-17 08:02:00	434.3118166	07-Sep-17 11:36:00	433.7423526	07-Sep-17 14:11:00	434.2216944
		07-Sep-17 11:51:00	434.3077854	07-Sep-17 14:26:00	434.2272093
07-Sep-17 09:22:00	433.1295537	07-Sep-17 12:06:00	433.1872206	07-Sep-17 14:41:00	434.1461506
07-Sep-17 09:37:00	433.2357265	07-Sep-17 12:21:00	432.8092359	07-Sep-17 14:56:00	432.7353915
07-Sep-17 09:52:00	435.0713282	07-Sep-17 12:36:00	433.6346247	07-Sep-17 15:11:00	432.3371449
07-Sep-17 10:07:00	432.0545896				
Average	434	Average	434	Average	434 Total Average 434

Pressure Drop - Inches of Water Column  
Stack 3 - SV026  
Ontario Hydro Hg Baseline Testing

Furnace Stacks Line #2

Minimum Run 1			Minimum Run 2			Minimum Run 3		
Tag	ADBI3715		Tag	ADBI3715		Tag	ADBI3715	
Start	9/7/2017 7:17	9/7/2017 9:22	Start	9/7/2017 10:51		Start	9/7/2017 13:26	
End	9/7/2017 8:20	9/7/2017 10:22	End	9/7/2017 12:55		End	9/7/2017 15:30	
07-Sep-17 07:17:00	5.051150799		07-Sep-17 10:51:00	5.002886772		07-Sep-17 13:26:00	5.011879921	
07-Sep-17 07:32:00	4.998684883		07-Sep-17 11:06:00	4.865985394		07-Sep-17 13:41:00	4.99150753	
07-Sep-17 07:47:00	4.841564655		07-Sep-17 11:21:00	4.893560886		07-Sep-17 13:56:00	4.9869771	
07-Sep-17 08:02:00	4.906794071		07-Sep-17 11:36:00	5.012316704		07-Sep-17 14:11:00	4.857962132	
			07-Sep-17 11:51:00	5.055800915		07-Sep-17 14:26:00	4.952368259	
07-Sep-17 09:22:00	4.334978104		07-Sep-17 12:06:00	4.828097343		07-Sep-17 14:41:00	4.969289303	
07-Sep-17 09:37:00	4.904900074		07-Sep-17 12:21:00	4.906006336		07-Sep-17 14:56:00	4.944850445	
07-Sep-17 09:52:00	4.935509205		07-Sep-17 12:36:00	5.007276058		07-Sep-17 15:11:00	5.020976067	
07-Sep-17 10:07:00	4.980091095							
Average	4.9		Average	4.9		Average	5.0 Total Average	4.9
Maximum Run 1			Maximum Run 2			Maximum Run 3		
Tag	ADBI3715		Tag	ADBI3715		Tag	ADBI3715	
Start	9/7/2017 7:17		Start	9/7/2017 10:51		Start	9/7/2017 13:26	
End	9/7/2017 8:20		End	9/7/2017 12:55		End	9/7/2017 15:30	
07-Sep-17 07:17:00	5.167108536		07-Sep-17 10:51:00	5.114447117		07-Sep-17 13:26:00	5.120698452	
07-Sep-17 07:32:00	5.112451553		07-Sep-17 11:06:00	5.002886772		07-Sep-17 13:41:00	5.033787251	
07-Sep-17 07:47:00	5.031797409		07-Sep-17 11:21:00	5.012316704		07-Sep-17 13:56:00	5.054918766	
07-Sep-17 08:02:00	5.025645256		07-Sep-17 11:36:00	5.147197247		07-Sep-17 14:11:00	5.051617146	
			07-Sep-17 11:51:00	5.109669685		07-Sep-17 14:26:00	5.055092335	
07-Sep-17 09:22:00	4.946675301		07-Sep-17 12:06:00	5.111048698		07-Sep-17 14:41:00	5.074055195	
07-Sep-17 09:37:00	5.069739342		07-Sep-17 12:21:00	5.088593006		07-Sep-17 14:56:00	5.179457188	
07-Sep-17 09:52:00	5.008700848		07-Sep-17 12:36:00	5.080453396		07-Sep-17 15:11:00	5.173084259	
07-Sep-17 10:07:00	5.05539608							
Average	5.1		Average	5.1		Average	5.1 Total Average	5.1
Average			Average			Average		
Run 1			Run 2			Run 3		
Tag	ADBI3715		Tag	ADBI3715		Tag	ADBI3715	
Start	9/7/2017 7:17		Start	9/7/2017 10:51		Start	9/7/2017 13:26	
End	9/7/2017 8:20		End	9/7/2017 12:55		End	9/7/2017 15:30	
07-Sep-17 07:17:00	5.094129077		07-Sep-17 10:51:00	5.059769697		07-Sep-17 13:26:00	5.040853953	
07-Sep-17 07:32:00	5.050228014		07-Sep-17 11:06:00	4.925363359		07-Sep-17 13:41:00	5.016656995	
07-Sep-17 07:47:00	4.930368445		07-Sep-17 11:21:00	4.97432435		07-Sep-17 13:56:00	5.031102302	
07-Sep-17 08:02:00	4.930261031		07-Sep-17 11:36:00	5.06522189		07-Sep-17 14:11:00	4.960979705	
			07-Sep-17 11:51:00	5.069927427		07-Sep-17 14:26:00	5.02861932	
07-Sep-17 09:22:00	4.667092187		07-Sep-17 12:06:00	4.999021402		07-Sep-17 14:41:00	5.017390912	
07-Sep-17 09:37:00	4.980704175		07-Sep-17 12:21:00	5.005142583		07-Sep-17 14:56:00	5.037706133	
07-Sep-17 09:52:00	4.983281742		07-Sep-17 12:36:00	5.042425245		07-Sep-17 15:11:00	5.111573587	
07-Sep-17 10:07:00	4.99833556							
Average	5.0		Average	5.0		Average	5.0 Total Average	5.0

Water Flow - Gpm  
Stack 3 - SV026  
Ontario Hydro Hg Baseline Testing

Furnace Stacks Line #2

Minimum Run 1			Minimum Run 2			Minimum Run 3		
Tag	ADBI3717		Tag	ADBI3717		Tag	ADBI3717	
Start	9/7/2017 7:17	9/7/2017 9:22	Start	9/7/2017 10:51		Start	9/7/2017 13:26	
End	9/7/2017 8:20	9/7/2017 10:22	End	9/7/2017 12:55		End	9/7/2017 15:30	
07-Sep-17 07:17:00	394.3324585		07-Sep-17 10:51:00	395.9716187		07-Sep-17 13:26:00	392.0849304	
07-Sep-17 07:32:00	394.5411072		07-Sep-17 11:06:00	393.5202026		07-Sep-17 13:41:00	393.527771	
07-Sep-17 07:47:00	394.698822		07-Sep-17 11:21:00	391.6204224		07-Sep-17 13:56:00	394.0465393	
07-Sep-17 08:02:00	393.6578064		07-Sep-17 11:36:00	392.3599854		07-Sep-17 14:11:00	395.0775452	
			07-Sep-17 11:51:00	393.5575867		07-Sep-17 14:26:00	393.9319763	
07-Sep-17 09:22:00	391.650238		07-Sep-17 12:06:00	393.9702454		07-Sep-17 14:41:00	393.0211487	
07-Sep-17 09:37:00	394.7028198		07-Sep-17 12:21:00	393.8258057		07-Sep-17 14:56:00	392.8947449	
07-Sep-17 09:52:00	392.7142029		07-Sep-17 12:36:00	393.9450073		07-Sep-17 15:11:00	392.723114	
07-Sep-17 10:07:00	391.7992554							
Average	394		Average	394		Average	393	Total Average 394
Maximum Run 1			Maximum Run 2			Maximum Run 3		
Tag	ADBI3717		Tag	ADBI3717		Tag	ADBI3717	
Start	9/7/2017 7:17		Start	9/7/2017 10:51		Start	9/7/2017 13:26	
End	9/7/2017 8:20		End	9/7/2017 12:55		End	9/7/2017 15:30	
07-Sep-17 07:17:00	394.8365479		07-Sep-17 10:51:00	396.2696838		07-Sep-17 13:26:00	394.4563599	
07-Sep-17 07:32:00	394.698822		07-Sep-17 11:06:00	395.9947205		07-Sep-17 13:41:00	395.0775452	
07-Sep-17 07:47:00	395.1897888		07-Sep-17 11:21:00	393.5202026		07-Sep-17 13:56:00	395.3457642	
07-Sep-17 08:02:00	395.1967468		07-Sep-17 11:36:00	393.9450073		07-Sep-17 14:11:00	395.673584	
			07-Sep-17 11:51:00	395.8822021		07-Sep-17 14:26:00	395.6070557	
07-Sep-17 09:22:00	395.941803		07-Sep-17 12:06:00	395.474823		07-Sep-17 14:41:00	393.9319763	
07-Sep-17 09:37:00	395.7779541		07-Sep-17 12:21:00	394.4815063		07-Sep-17 14:56:00	393.4681702	
07-Sep-17 09:52:00	394.7028198		07-Sep-17 12:36:00	395.5422668		07-Sep-17 15:11:00	393.4085693	
07-Sep-17 10:07:00	394.9009705							
Average	395		Average	395		Average	395	Total Average 395
Average Run 1			Average Run 2			Average Run 3		
Tag	ADBI3717		Tag	ADBI3717		Tag	ADBI3717	
Start	9/7/2017 7:17		Start	9/7/2017 10:51		Start	9/7/2017 13:26	
End	9/7/2017 8:20		End	9/7/2017 12:55		End	9/7/2017 15:30	
07-Sep-17 07:17:00	394.4960717		07-Sep-17 10:51:00	396.1132615		07-Sep-17 13:26:00	392.7324255	
07-Sep-17 07:32:00	394.5767233		07-Sep-17 11:06:00	395.03283		07-Sep-17 13:41:00	394.2696304	
07-Sep-17 07:47:00	394.9441136		07-Sep-17 11:21:00	392.3976083		07-Sep-17 13:56:00	394.9803452	
07-Sep-17 08:02:00	394.5702593		07-Sep-17 11:36:00	393.4978106		07-Sep-17 14:11:00	395.3859774	
			07-Sep-17 11:51:00	394.7775391		07-Sep-17 14:26:00	395.0876834	
07-Sep-17 09:22:00	394.3728192		07-Sep-17 12:06:00	394.6170555		07-Sep-17 14:41:00	393.2953707	
07-Sep-17 09:37:00	395.3384387		07-Sep-17 12:21:00	394.1705627		07-Sep-17 14:56:00	393.2417585	
07-Sep-17 09:52:00	393.7890415		07-Sep-17 12:36:00	394.4591944		07-Sep-17 15:11:00	393.0534881	
07-Sep-17 10:07:00	392.9489739							
Average	394		Average	394		Average	394	Total Average 394

Throughput  
wltph>dltpH>dstph  
Stacks 1 and 2  
Ontario Hydro Hg Baseline Testing

Furnace Stacks Line #2

<b>Minimum</b>		<b>Minimum</b>		<b>Minimum</b>	
<b>Run 1</b>		<b>Run 2</b>		<b>Run 3</b>	
<b>Tag</b>	ADBI3160	<b>Tag</b>	ADBI3160	<b>Tag</b>	ADBI3160
<b>Start</b>	9/6/2017 7:32	<b>Start</b>	9/6/2017 10:18	<b>Start</b>	9/6/2017 13:00
<b>End</b>	9/6/2017 9:37	<b>End</b>	9/6/2017 12:24	<b>End</b>	9/6/2017 15:05
06-Sep-17 07:32:00	498.7923889	06-Sep-17 10:18:00	485.0041199	06-Sep-17 13:00:00	387.9552612
06-Sep-17 07:47:00	492.8595886	06-Sep-17 10:33:00	502.0883789	06-Sep-17 13:15:00	462.5390015
06-Sep-17 08:02:00	469.4396667	06-Sep-17 10:48:00	493.8666992	06-Sep-17 13:30:00	487.897522
06-Sep-17 08:17:00	470.5383606	06-Sep-17 11:03:00	491.5228882	06-Sep-17 13:45:00	497.6937256
06-Sep-17 08:32:00	491.0284729	06-Sep-17 11:18:00	490.7355042	06-Sep-17 14:00:00	490.112915
06-Sep-17 08:47:00	496.8330994	06-Sep-17 11:33:00	361.5369873	06-Sep-17 14:15:00	496.888031
06-Sep-17 09:02:00	492.8595886	06-Sep-17 11:48:00	348.09198	06-Sep-17 14:30:00	491.4313049
06-Sep-17 09:17:00	492.3651733	06-Sep-17 12:03:00	474.8597717	06-Sep-17 14:45:00	497.1809998
<b>Average</b>	488.0895424	<b>Average</b>	455.9632912	<b>Average</b>	476.4623451
<b>Maximum</b>		<b>Maximum</b>		<b>Maximum</b>	
<b>Run 1</b>		<b>Run 2</b>		<b>Run 3</b>	
<b>Tag</b>	ADBI3160	<b>Tag</b>	ADBI3160	<b>Tag</b>	ADBI3160
<b>Start</b>	9/6/2017 7:32	<b>Start</b>	9/6/2017 10:18	<b>Start</b>	9/6/2017 13:00
<b>End</b>	9/6/2017 9:37	<b>End</b>	9/6/2017 12:24	<b>End</b>	9/6/2017 15:05
06-Sep-17 07:32:00	523.3842163	06-Sep-17 10:18:00	528.7859497	06-Sep-17 13:00:00	499.5760498
06-Sep-17 07:47:00	512.0496216	06-Sep-17 10:33:00	521.3699951	06-Sep-17 13:15:00	522.9080811
06-Sep-17 08:02:00	521.6263428	06-Sep-17 10:48:00	516.4767456	06-Sep-17 13:30:00	517.4147949
06-Sep-17 08:17:00	517.1754761	06-Sep-17 11:03:00	526.6435547	06-Sep-17 13:45:00	513.3863525
06-Sep-17 08:32:00	520.9121704	06-Sep-17 11:18:00	520.6924438	06-Sep-17 14:00:00	516.5358276
06-Sep-17 08:47:00	514.137085	06-Sep-17 11:33:00	517.7798462	06-Sep-17 14:15:00	517.4147949
06-Sep-17 09:02:00	509.5410156	06-Sep-17 11:48:00	489.7650146	06-Sep-17 14:30:00	516.9935913
06-Sep-17 09:17:00	515.8400269	06-Sep-17 12:03:00	517.7810059	06-Sep-17 14:45:00	520.8206177
<b>Average</b>	516.8332443	<b>Average</b>	517.4118195	<b>Average</b>	515.6312637
<b>Average</b>		<b>Average</b>		<b>Average</b>	
<b>Run 1</b>		<b>Run 2</b>		<b>Run 3</b>	
<b>Tag</b>	ADBI3160	<b>Tag</b>	ADBI3160	<b>Tag</b>	ADBI3160
<b>Start</b>	9/6/2017 7:32	<b>Start</b>	9/6/2017 10:18	<b>Start</b>	9/6/2017 13:00
<b>End</b>	9/6/2017 9:37	<b>End</b>	9/6/2017 12:24	<b>End</b>	9/6/2017 15:05
06-Sep-17 07:32:00	508.5486681	06-Sep-17 10:18:00	508.1370985	06-Sep-17 13:00:00	419.5667976
06-Sep-17 07:47:00	502.8885574	06-Sep-17 10:33:00	513.0316864	06-Sep-17 13:15:00	502.0608531
06-Sep-17 08:02:00	502.7820801	06-Sep-17 10:48:00	503.08498	06-Sep-17 13:30:00	505.1039851
06-Sep-17 08:17:00	500.4525946	06-Sep-17 11:03:00	503.6344001	06-Sep-17 13:45:00	504.1515866
06-Sep-17 08:32:00	502.1424	06-Sep-17 11:18:00	501.5099627	06-Sep-17 14:00:00	502.2923857
06-Sep-17 08:47:00	504.3741146	06-Sep-17 11:33:00	466.5783014	06-Sep-17 14:15:00	507.2651343
06-Sep-17 09:02:00	501.7194651	06-Sep-17 11:48:00	404.1853556	06-Sep-17 14:30:00	507.3856087
06-Sep-17 09:17:00	504.402824	06-Sep-17 12:03:00	499.2135628	06-Sep-17 14:45:00	506.3111898
<b>Average</b>	393 dltpH 440 dshtp	<b>Average</b>	380 dltpH 426 dshtp	<b>Average</b>	386 dltpH 432 dshtp
				<b>Average</b>	386 dltpH 432 dshtp

Fuel Usage  
Natural Gas  
Stacks 1 and 2  
Ontario Hydro Hg Baseline Testing

Furnace Stacks Line #2

Natural Gas Usage

**North Chamber**

**Run 1**

**Tag** ADBI3109  
**Start** 9/6/2017 7:32  
**End** 9/6/2017 9:37

06-Sep-17 07:32:00	50.12683797
06-Sep-17 07:47:00	50.27465311
06-Sep-17 08:02:00	50.15548554
06-Sep-17 08:17:00	50.15804891
06-Sep-17 08:32:00	50.20096312
06-Sep-17 08:47:00	50.45757611
06-Sep-17 09:02:00	50.62529826
06-Sep-17 09:17:00	50.52548444

**Average** 50.31554343

**South Chamber**

**Run 1**

**Tag** ADBI3108  
**Start** 9/6/2017 7:32  
**End** 9/6/2017 9:37

06-Sep-17 07:32:00	31.75090045
06-Sep-17 07:47:00	32.00450934
06-Sep-17 08:02:00	32.12458192
06-Sep-17 08:17:00	32.1700267
06-Sep-17 08:32:00	32.21547149
06-Sep-17 08:47:00	32.21516744
06-Sep-17 09:02:00	32.15585208
06-Sep-17 09:17:00	32.09630476

**Average** 32.09160177

**Total (MCF/hr)** 82  
Heat Content  
(MMBtu/MCF) 1.023  
Heat Input  
(MMBtu/hr) 84

**North Chamber**

**Run 2**

**Tag** ADBI3109  
**Start** 9/6/2017 10:18  
**End** 9/6/2017 12:24

06-Sep-17 10:18:00	50.55302935
06-Sep-17 10:33:00	50.53072983
06-Sep-17 10:48:00	50.54360407
06-Sep-17 11:03:00	50.72640453
06-Sep-17 11:18:00	50.80421129
06-Sep-17 11:33:00	50.86308318
06-Sep-17 11:48:00	48.85630377
06-Sep-17 12:03:00	48.48108132

**Average** 50

**South Chamber**

**Run 2**

**Tag** ADBI3108  
**Start** 9/6/2017 10:18  
**End** 9/6/2017 12:24

06-Sep-17 10:18:00	31.97360323
06-Sep-17 10:33:00	31.96115356
06-Sep-17 10:48:00	31.94870388
06-Sep-17 11:03:00	31.93625421
06-Sep-17 11:18:00	32.00607215
06-Sep-17 11:33:00	32.55865511
06-Sep-17 11:48:00	33.04990672
06-Sep-17 12:03:00	32.90371965

**Average** 32

**Total (MCF/hr)** 82  
Heat Content  
(MMBtu/MCF) 1.023  
Heat Input  
(MMBtu/hr) 84

**North Chamber**

**Run 3**

**Tag** ADBI3109  
**Start** 9/6/2017 13:00  
**End** 9/6/2017 15:05

06-Sep-17 13:00:00	50.23525587
06-Sep-17 13:15:00	50.03599313
06-Sep-17 13:30:00	52.37260321
06-Sep-17 13:45:00	52.02867528
06-Sep-17 14:00:00	51.50435309
06-Sep-17 14:15:00	51.29370184
06-Sep-17 14:30:00	51.37166046
06-Sep-17 14:45:00	50.85676017

**Average** 51 **Total Average** 51

**South Chamber**

**Run 3**

**Tag** ADBI3108  
**Start** 9/6/2017 13:00  
**End** 9/6/2017 15:05

06-Sep-17 13:00:00	32.1460396
06-Sep-17 13:15:00	32.3885768
06-Sep-17 13:30:00	33.3655012
06-Sep-17 13:45:00	33.71702917
06-Sep-17 14:00:00	32.7533867
06-Sep-17 14:15:00	32.40498564
06-Sep-17 14:30:00	32.06573673
06-Sep-17 14:45:00	31.88504686

**Average** 33 **Total Average** 32

**Total (MCF/hr)** 84 **Total (MCF/hr)** 83  
Heat Content  
(MMBtu/MCF) 1.023 **Heat Content**  
Heat Input  
(MMBtu/hr) 86 **Heat Input** 1.02  
**Heat Input** 85

Pressure Drop - Inches of Water Column  
Stack 2 - SV027  
Ontario Hydro Hg Baseline Testing

Furnace Stacks Line #2

**Minimum**

**Run 1**

**Tag** ADBI3712  
**Start** 9/6/2017 7:32  
**End** 9/6/2017 9:37

06-Sep-17 07:32:00 5.32874918  
06-Sep-17 07:47:00 5.250602245  
06-Sep-17 08:02:00 5.18655014  
06-Sep-17 08:17:00 5.323801994  
06-Sep-17 08:32:00 5.18069458  
06-Sep-17 08:47:00 5.202681065  
06-Sep-17 09:02:00 5.254388332  
06-Sep-17 09:17:00 5.167730331

**Average** 5.2

**Maximum**

**Run 1**

**Tag** ADBI3712  
**Start** 9/6/2017 7:32  
**End** 9/6/2017 9:37

06-Sep-17 07:32:00 5.347930908  
06-Sep-17 07:47:00 5.32874918  
06-Sep-17 08:02:00 5.35969305  
06-Sep-17 08:17:00 5.433083057  
06-Sep-17 08:32:00 5.323801994  
06-Sep-17 08:47:00 5.36522913  
06-Sep-17 09:02:00 5.322947502  
06-Sep-17 09:17:00 5.307565689

**Average** 5.3

**Average**

**Run 1**

**Tag** ADBI3712  
**Start** 9/6/2017 7:32  
**End** 9/6/2017 9:37

06-Sep-17 07:32:00 5.340113942  
06-Sep-17 07:47:00 5.291363265  
06-Sep-17 08:02:00 5.235139698  
06-Sep-17 08:17:00 5.402833253  
06-Sep-17 08:32:00 5.244483613  
06-Sep-17 08:47:00 5.285298629  
06-Sep-17 09:02:00 5.305737276  
06-Sep-17 09:17:00 5.22226157

**Average** 5.3

**Minimum**

**Run 2**

**Tag** ADBI3712  
**Start** 9/6/2017 10:18  
**End** 9/6/2017 12:24

06-Sep-17 10:18:00 5.264848709  
06-Sep-17 10:33:00 5.312080383  
06-Sep-17 10:48:00 5.274677277  
06-Sep-17 11:03:00 5.25779295  
06-Sep-17 11:18:00 5.205566883  
06-Sep-17 11:33:00 5.132441044  
06-Sep-17 11:48:00 5.20219183  
06-Sep-17 12:03:00 5.192564011

**Average** 5.2

**Maximum**

**Run 2**

**Tag** ADBI3712  
**Start** 9/6/2017 10:18  
**End** 9/6/2017 12:24

06-Sep-17 10:18:00 5.317298412  
06-Sep-17 10:33:00 5.342434406  
06-Sep-17 10:48:00 5.312080383  
06-Sep-17 11:03:00 5.314408302  
06-Sep-17 11:18:00 5.25779295  
06-Sep-17 11:33:00 5.207274437  
06-Sep-17 11:48:00 5.294865131  
06-Sep-17 12:03:00 5.274003506

**Average** 5.3

**Average**

**Run 2**

**Tag** ADBI3712  
**Start** 9/6/2017 10:18  
**End** 9/6/2017 12:24

06-Sep-17 10:18:00 5.294062957  
06-Sep-17 10:33:00 5.329274569  
06-Sep-17 10:48:00 5.285129018  
06-Sep-17 11:03:00 5.293398131  
06-Sep-17 11:18:00 5.229634522  
06-Sep-17 11:33:00 5.169288451  
06-Sep-17 11:48:00 5.244608755  
06-Sep-17 12:03:00 5.220615384

**Average** 5.3

**Minimum**

**Run 3**

**Tag** ADBI3712  
**Start** 9/6/2017 13:00  
**End** 9/6/2017 15:05

06-Sep-17 13:00:00 5.173395634  
06-Sep-17 13:15:00 5.173705101  
06-Sep-17 13:30:00 5.309262753  
06-Sep-17 13:45:00 5.206731796  
06-Sep-17 14:00:00 5.16876936  
06-Sep-17 14:15:00 5.309499264  
06-Sep-17 14:30:00 5.309437275  
06-Sep-17 14:45:00 5.231220722

**Average** 5.2 **Total Average** 5.2

**Maximum**

**Run 3**

**Tag** ADBI3712  
**Start** 9/6/2017 13:00  
**End** 9/6/2017 15:05

06-Sep-17 13:00:00 5.332683086  
06-Sep-17 13:15:00 5.349594116  
06-Sep-17 13:30:00 5.472017288  
06-Sep-17 13:45:00 5.435816288  
06-Sep-17 14:00:00 5.395807266  
06-Sep-17 14:15:00 5.39789629  
06-Sep-17 14:30:00 5.328070641  
06-Sep-17 14:45:00 5.309437275

**Average** 5.4 **Total Average** 5.3

**Average**

**Run 3**

**Tag** ADBI3712  
**Start** 9/6/2017 13:00  
**End** 9/6/2017 15:05

06-Sep-17 13:00:00 5.262003004  
06-Sep-17 13:15:00 5.229995909  
06-Sep-17 13:30:00 5.390879607  
06-Sep-17 13:45:00 5.342986589  
06-Sep-17 14:00:00 5.271232732  
06-Sep-17 14:15:00 5.348445033  
06-Sep-17 14:30:00 5.319828108  
06-Sep-17 14:45:00 5.265429163

**Average** 5.3 **Total Average** 5.3

Water Flow - Gpm  
Stack 2 - SV027  
Ontario Hydro Hg Baseline Testing

Furnace Stacks Line #2

<b>Minimum</b>		<b>Minimum</b>		<b>Minimum</b>	
<b>Run 1</b>		<b>Run 2</b>		<b>Run 3</b>	
<b>Tag</b>	ADBI3714	<b>Tag</b>	ADBI3714	<b>Tag</b>	ADBI3714
<b>Start</b>	9/6/2017 7:32	<b>Start</b>	9/6/2017 10:18	<b>Start</b>	9/6/2017 13:00
<b>End</b>	9/6/2017 9:37	<b>End</b>	9/6/2017 12:24	<b>End</b>	9/6/2017 15:05
06-Sep-17 07:32:00	381.4278564	06-Sep-17 10:18:00	379.2298889	06-Sep-17 13:00:00	377.6977539
06-Sep-17 07:47:00	379.1629028	06-Sep-17 10:33:00	377.6429138	06-Sep-17 13:15:00	377.5237122
06-Sep-17 08:02:00	378.924469	06-Sep-17 10:48:00	378.9882507	06-Sep-17 13:30:00	378.6515198
06-Sep-17 08:17:00	379.6695251	06-Sep-17 11:03:00	377.9946289	06-Sep-17 13:45:00	378.0558472
06-Sep-17 08:32:00	379.1032715	06-Sep-17 11:18:00	375.1990967	06-Sep-17 14:00:00	374.6924438
06-Sep-17 08:47:00	379.8671875	06-Sep-17 11:33:00	378.9637146	06-Sep-17 14:15:00	377.1931763
06-Sep-17 09:02:00	379.729126	06-Sep-17 11:48:00	378.6264038	06-Sep-17 14:30:00	379.3714905
06-Sep-17 09:17:00	378.2389832	06-Sep-17 12:03:00	378.924469	06-Sep-17 14:45:00	380.0549316
<b>Average</b>	380	<b>Average</b>	378	<b>Average</b>	378 <b>Total Average</b> 378
<b>Maximum</b>		<b>Maximum</b>		<b>Maximum</b>	
<b>Run 1</b>		<b>Run 2</b>		<b>Run 3</b>	
<b>Tag</b>	ADBI3714	<b>Tag</b>	ADBI3714	<b>Tag</b>	ADBI3714
<b>Start</b>	9/6/2017 7:32	<b>Start</b>	9/6/2017 10:18	<b>Start</b>	9/6/2017 13:00
<b>End</b>	9/6/2017 9:37	<b>End</b>	9/6/2017 12:24	<b>End</b>	9/6/2017 15:05
06-Sep-17 07:32:00	382.0506287	06-Sep-17 10:18:00	380.802002	06-Sep-17 13:00:00	381.3384399
06-Sep-17 07:47:00	382.8286133	06-Sep-17 10:33:00	380.7844849	06-Sep-17 13:15:00	378.6515198
06-Sep-17 08:02:00	380.265564	06-Sep-17 10:48:00	380.3251648	06-Sep-17 13:30:00	379.3791199
06-Sep-17 08:17:00	380.531189	06-Sep-17 11:03:00	387.8056641	06-Sep-17 13:45:00	379.4013062
06-Sep-17 08:32:00	380.5933838	06-Sep-17 11:18:00	379.2354736	06-Sep-17 14:00:00	378.0558472
06-Sep-17 08:47:00	381.6066589	06-Sep-17 11:33:00	380.9212036	06-Sep-17 14:15:00	381.0404358
06-Sep-17 09:02:00	381.7854919	06-Sep-17 11:48:00	380.0867615	06-Sep-17 14:30:00	380.0549316
06-Sep-17 09:17:00	380.2877808	06-Sep-17 12:03:00	380.7381592	06-Sep-17 14:45:00	381.1740723
<b>Average</b>	381	<b>Average</b>	381	<b>Average</b>	380 <b>Total Average</b> 381
<b>Average</b>		<b>Average</b>		<b>Average</b>	
<b>Run 1</b>		<b>Run 2</b>		<b>Run 3</b>	
<b>Tag</b>	ADBI3714	<b>Tag</b>	ADBI3714	<b>Tag</b>	ADBI3714
<b>Start</b>	9/6/2017 7:32	<b>Start</b>	9/6/2017 10:18	<b>Start</b>	9/6/2017 13:00
<b>End</b>	9/6/2017 9:37	<b>End</b>	9/6/2017 12:24	<b>End</b>	9/6/2017 15:05
06-Sep-17 07:32:00	381.5895837	06-Sep-17 10:18:00	379.9937327	06-Sep-17 13:00:00	379.6487266
06-Sep-17 07:47:00	381.532378	06-Sep-17 10:33:00	378.9122762	06-Sep-17 13:15:00	378.0574184
06-Sep-17 08:02:00	379.7293341	06-Sep-17 10:48:00	379.873952	06-Sep-17 13:30:00	379.1156324
06-Sep-17 08:17:00	380.0014537	06-Sep-17 11:03:00	383.4491585	06-Sep-17 13:45:00	378.6523029
06-Sep-17 08:32:00	379.8208207	06-Sep-17 11:18:00	377.2169522	06-Sep-17 14:00:00	376.6137506
06-Sep-17 08:47:00	380.7957953	06-Sep-17 11:33:00	380.0008986	06-Sep-17 14:15:00	379.7408874
06-Sep-17 09:02:00	380.7888562	06-Sep-17 11:48:00	379.4250396	06-Sep-17 14:30:00	379.7274767
06-Sep-17 09:17:00	379.029786	06-Sep-17 12:03:00	379.6012484	06-Sep-17 14:45:00	380.3705317
<b>Average</b>	380	<b>Average</b>	380	<b>Average</b>	379 <b>Total Average</b> 380



Pressure Drop - Inches of Water Column  
Stack 1 - SV028  
Ontario Hydro Hg Baseline Testing

Furnace Stacks Line #2

**Minimum**

**Run 1**

**Tag** ADBI3709  
**Start** 9/6/2017 7:32  
**End** 9/6/2017 9:37

06-Sep-17 07:32:00 4.203345776  
06-Sep-17 07:47:00 4.138856411  
06-Sep-17 08:02:00 4.239304066  
06-Sep-17 08:17:00 4.260868073  
06-Sep-17 08:32:00 4.224643707  
06-Sep-17 08:47:00 4.22029829  
06-Sep-17 09:02:00 4.269022942  
06-Sep-17 09:17:00 4.263720512

**Average** 4.2

**Maximum**

**Run 1**

**Tag** ADBI3709  
**Start** 9/6/2017 7:32  
**End** 9/6/2017 9:37

06-Sep-17 07:32:00 4.414514065  
06-Sep-17 07:47:00 4.341182232  
06-Sep-17 08:02:00 4.314758301  
06-Sep-17 08:17:00 4.498456955  
06-Sep-17 08:32:00 4.408229828  
06-Sep-17 08:47:00 4.458771706  
06-Sep-17 09:02:00 4.373977661  
06-Sep-17 09:17:00 4.37945509

**Average** 4.4

**Average**

**Run 1**

**Tag** ADBI3709  
**Start** 9/6/2017 7:32  
**End** 9/6/2017 9:37

06-Sep-17 07:32:00 4.293234853  
06-Sep-17 07:47:00 4.247299879  
06-Sep-17 08:02:00 4.259078343  
06-Sep-17 08:17:00 4.37068221  
06-Sep-17 08:32:00 4.314468084  
06-Sep-17 08:47:00 4.35273856  
06-Sep-17 09:02:00 4.339449862  
06-Sep-17 09:17:00 4.304821186

**Average** 4.3

**Minimum**

**Run 2**

**Tag** ADBI3709  
**Start** 9/6/2017 10:18  
**End** 9/6/2017 12:24

06-Sep-17 10:18:00 4.18291378  
06-Sep-17 10:33:00 4.217283249  
06-Sep-17 10:48:00 4.143078327  
06-Sep-17 11:03:00 4.175540447  
06-Sep-17 11:18:00 4.287267208  
06-Sep-17 11:33:00 4.278928757  
06-Sep-17 11:48:00 4.16233778  
06-Sep-17 12:03:00 4.143033504

**Average** 4.2

**Maximum**

**Run 2**

**Tag** ADBI3709  
**Start** 9/6/2017 10:18  
**End** 9/6/2017 12:24

06-Sep-17 10:18:00 4.290874481  
06-Sep-17 10:33:00 4.384477615  
06-Sep-17 10:48:00 4.388847351  
06-Sep-17 11:03:00 4.378377914  
06-Sep-17 11:18:00 4.357193947  
06-Sep-17 11:33:00 4.379479885  
06-Sep-17 11:48:00 4.368235111  
06-Sep-17 12:03:00 4.271160603

**Average** 4.4

**Average**

**Run 2**

**Tag** ADBI3709  
**Start** 9/6/2017 10:18  
**End** 9/6/2017 12:24

06-Sep-17 10:18:00 4.234436057  
06-Sep-17 10:33:00 4.352268744  
06-Sep-17 10:48:00 4.312017952  
06-Sep-17 11:03:00 4.327488703  
06-Sep-17 11:18:00 4.307683337  
06-Sep-17 11:33:00 4.316299513  
06-Sep-17 11:48:00 4.264213957  
06-Sep-17 12:03:00 4.199829253

**Average** 4.3

**Minimum**

**Run 3**

**Tag** ADBI3709  
**Start** 9/6/2017 13:00  
**End** 9/6/2017 15:05

06-Sep-17 13:00:00 4.168056011  
06-Sep-17 13:15:00 4.159821987  
06-Sep-17 13:30:00 4.289972305  
06-Sep-17 13:45:00 4.289851189  
06-Sep-17 14:00:00 4.308557987  
06-Sep-17 14:15:00 4.296314716  
06-Sep-17 14:30:00 4.175910473  
06-Sep-17 14:45:00 4.148077965

**Average** 4.2 **Total Average** 4.2

**Maximum**

**Run 3**

**Tag** ADBI3709  
**Start** 9/6/2017 13:00  
**End** 9/6/2017 15:05

06-Sep-17 13:00:00 4.356728077  
06-Sep-17 13:15:00 4.475507736  
06-Sep-17 13:30:00 4.514687538  
06-Sep-17 13:45:00 4.364331245  
06-Sep-17 14:00:00 4.402515411  
06-Sep-17 14:15:00 4.366557598  
06-Sep-17 14:30:00 4.400050163  
06-Sep-17 14:45:00 4.246013165

**Average** 4.4 **Total Average** 4.4

**Average**

**Run 3**

**Tag** ADBI3709  
**Start** 9/6/2017 13:00  
**End** 9/6/2017 15:05

06-Sep-17 13:00:00 4.282054278  
06-Sep-17 13:15:00 4.248079546  
06-Sep-17 13:30:00 4.392709677  
06-Sep-17 13:45:00 4.323114594  
06-Sep-17 14:00:00 4.358508298  
06-Sep-17 14:15:00 4.319429577  
06-Sep-17 14:30:00 4.346786913  
06-Sep-17 14:45:00 4.197906295

**Average** 4.3 **Total Average** 4.3

Water Flow - Gpm  
Stack 1 - SV028  
Ontario Hydro Hg Baseline Testing

Furnace Stacks Line #2

<b>Minimum</b>		<b>Minimum</b>		<b>Minimum</b>	
<b>Run 1</b>		<b>Run 2</b>		<b>Run 3</b>	
<b>Tag</b>	ADBI3711	<b>Tag</b>	ADBI3711	<b>Tag</b>	ADBI3711
<b>Start</b>	9/6/2017 7:32	<b>Start</b>	9/6/2017 10:18	<b>Start</b>	9/6/2017 13:00
<b>End</b>	9/6/2017 9:37	<b>End</b>	9/6/2017 12:24	<b>End</b>	9/6/2017 15:05
06-Sep-17 07:32:00	531.1698608	06-Sep-17 10:18:00	525.7602539	06-Sep-17 13:00:00	525.8956299
06-Sep-17 07:47:00	526.5077515	06-Sep-17 10:33:00	526.4798584	06-Sep-17 13:15:00	525.345459
06-Sep-17 08:02:00	526.5421753	06-Sep-17 10:48:00	526.4481812	06-Sep-17 13:30:00	524.7572021
06-Sep-17 08:17:00	527.9763794	06-Sep-17 11:03:00	529.8264771	06-Sep-17 13:45:00	524.5408325
06-Sep-17 08:32:00	524.7494507	06-Sep-17 11:18:00	528.206543	06-Sep-17 14:00:00	493.5161133
06-Sep-17 08:47:00	525.5883789	06-Sep-17 11:33:00	526.9250488	06-Sep-17 14:15:00	529.1900024
06-Sep-17 09:02:00	526.4465332	06-Sep-17 11:48:00	527.2543945	06-Sep-17 14:30:00	526.8952026
06-Sep-17 09:17:00	524.8984375	06-Sep-17 12:03:00	527.1932373	06-Sep-17 14:45:00	527.77771
<b>Average</b>	527	<b>Average</b>	527	<b>Average</b>	522 <b>Total Average</b> 525
<b>Maximum</b>		<b>Maximum</b>		<b>Maximum</b>	
<b>Run 1</b>		<b>Run 2</b>		<b>Run 3</b>	
<b>Tag</b>	ADBI3711	<b>Tag</b>	ADBI3711	<b>Tag</b>	ADBI3711
<b>Start</b>	9/6/2017 7:32	<b>Start</b>	9/6/2017 10:18	<b>Start</b>	9/6/2017 13:00
<b>End</b>	9/6/2017 9:37	<b>End</b>	9/6/2017 12:24	<b>End</b>	9/6/2017 15:05
06-Sep-17 07:32:00	531.9578857	06-Sep-17 10:18:00	526.4798584	06-Sep-17 13:00:00	532.9153442
06-Sep-17 07:47:00	532.4087524	06-Sep-17 10:33:00	529.5476074	06-Sep-17 13:15:00	527.9085083
06-Sep-17 08:02:00	528.0133667	06-Sep-17 10:48:00	529.8264771	06-Sep-17 13:30:00	527.569519
06-Sep-17 08:17:00	528.8025513	06-Sep-17 11:03:00	537.7731934	06-Sep-17 13:45:00	533.9897461
06-Sep-17 08:32:00	527.9763794	06-Sep-17 11:18:00	533.5529785	06-Sep-17 14:00:00	543.2867432
06-Sep-17 08:47:00	526.4465332	06-Sep-17 11:33:00	528.8621826	06-Sep-17 14:15:00	537.6303711
06-Sep-17 09:02:00	532.2894897	06-Sep-17 11:48:00	528.6237793	06-Sep-17 14:30:00	529.6370239
06-Sep-17 09:17:00	528.0013428	06-Sep-17 12:03:00	530.6503906	06-Sep-17 14:45:00	530.7993774
<b>Average</b>	529	<b>Average</b>	531	<b>Average</b>	533 <b>Total Average</b> 531
<b>Average</b>		<b>Average</b>		<b>Average</b>	
<b>Run 1</b>		<b>Run 2</b>		<b>Run 3</b>	
<b>Tag</b>	ADBI3711	<b>Tag</b>	ADBI3711	<b>Tag</b>	ADBI3711
<b>Start</b>	9/6/2017 7:32	<b>Start</b>	9/6/2017 10:18	<b>Start</b>	9/6/2017 13:00
<b>End</b>	9/6/2017 9:37	<b>End</b>	9/6/2017 12:24	<b>End</b>	9/6/2017 15:05
06-Sep-17 07:32:00	531.38176	06-Sep-17 10:18:00	526.08673	06-Sep-17 13:00:00	530.7098872
06-Sep-17 07:47:00	529.9954444	06-Sep-17 10:33:00	528.2398018	06-Sep-17 13:15:00	526.8912643
06-Sep-17 08:02:00	526.9944589	06-Sep-17 10:48:00	527.4934266	06-Sep-17 13:30:00	526.4750831
06-Sep-17 08:17:00	528.4859568	06-Sep-17 11:03:00	534.5859045	06-Sep-17 13:45:00	526.5880113
06-Sep-17 08:32:00	525.8959647	06-Sep-17 11:18:00	529.7418227	06-Sep-17 14:00:00	531.9944402
06-Sep-17 08:47:00	526.0087063	06-Sep-17 11:33:00	527.9645754	06-Sep-17 14:15:00	531.4371921
06-Sep-17 09:02:00	529.6687908	06-Sep-17 11:48:00	528.0266715	06-Sep-17 14:30:00	528.3621728
06-Sep-17 09:17:00	525.7597068	06-Sep-17 12:03:00	528.8161765	06-Sep-17 14:45:00	529.4456705
<b>Average</b>	528	<b>Average</b>	529	<b>Average</b>	529 <b>Total Average</b> 529

## **Appendix F**

### **Project Participants**

# Project Participants and Contact Information

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## Hibbing Taconite Company

Jack Croswell – General Manager  
Julie Lucas – Area Manager – Environmental  
Tasha Niemi – Environmental Representative – Plants  
Corie Ekholm – CEMS Engineer

## Barr Engineering Company

Tim Russell – Vice President/Chemical Engineer  
Tom Kuchinski – Stack Testing Supervisor  
Tom Leier – Project Manager/ Senior Air Quality Technician  
Mark Petersen – Senior Air Quality Technician  
Dan Koschak – Senior Air Quality Technician  
Benjamin Wiltse – Senior Air Quality Technician  
Ryan Pantzke – Air Quality Technician  
David Herbst – Air Quality Technician  
Levi Paul – Air Quality Technician

## CONTACT INFORMATION

<b>Hibbing Taconite Company</b>	<b>Barr Engineering Company</b>
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