

**Results of the April 5, 2017 Mercury and Lead
Emissions Tests at the U. S. Steel Corporation - Keetac
Agglomerator Facility Located in Keewatin
Minnesota**

Phase II Waste Gas Stack

SV051

Agency Interest ID: 142828

Air Emissions Permit No. 13700063

Barr Project No. 23311210.00

Prepared for
U. S. Steel Corporation – Keetac
Keewatin, Minnesota

June 2017



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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



Tom Kuchinski
Stack Testing Services Coordinator
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. analyzed metals samples. A signed laboratory report is provided in this report.



Richard Berg
Air Quality Technician
Barr Engineering Co.

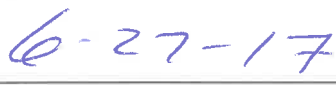

Date

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:

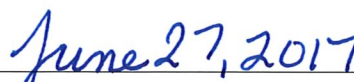
I certify under penalty of law that the information submitted in this test report accurately reflects the operating conditions at the emission facility during this performance test and describes the date and nature of all operational and maintenance activities that were performed on the process and control 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.



Stephani Campbell

Environmental Control Engineer

U. S. Steel Corporation –Keetac



Date

Executive Summary

Barr Engineering Co. performed mercury emissions testing at the U. S. Steel Corporation Keetac Agglomerator facility located in Keewatin, Minnesota. Testing was performed to satisfy the Minnesota Rule 7019.3050 mercury emission inventory testing requirement. The mercury (Hg) testing was April 4, 2017 performed on the Phase II Waste Gas Stack (SV051). Lead (Pb) was added to the analysis and is reported for emission inventory purposes. There are no emission limits in the facility permit for Hg or Pb. Test results are provided in the Executive Summary Table (Table ES-1).

Table ES-1 Executive Summary Table

Average Test Results	
Test Parameter Methods 1-4, 29	Phase II Waste Gas Stack
Stack Vent Number	SV051
Test Date	4/05/2017
Total Mercury Emission Rate, lb/hr	0.012
Total Lead Emission Rate, lb/hr	0.032

1.0 Introduction

Barr Engineering Co. performed mercury emissions testing at the U. S. Steel Corporation Keetac Agglomerator facility located in Keewatin, Minnesota. Testing was performed to satisfy the Minnesota Rule 7019.3050 mercury emission inventory testing requirement. The mercury (Hg) testing was April 4, 2017 performed on the Phase II Waste Gas Stack (SV051). Lead (Pb) was added to the analysis and is reported for emission inventory purposes.

A test plan dated March 3, 2017 was submitted to the Minnesota Pollution Control Agency (MPCA). A pretest meeting between Stephani Campbell of U.S. Steel Corporation-Keetac (Keetac) , Andy Place of the MPCA, and Tom Kuchinski of Barr Engineering Co. (Barr) was held on March 23, 2016. The test plan and relevant correspondence are provided in Appendix F.

Tom Kuchinski led the Barr test team. Stephani Campbell of Keetac provided coordination of the test team with facility operations. The performance tests were not witnessed by a representative of the MPCA. A list of project participants is provided in Appendix G.

Each test consisted of three independent 2-hour test runs using EPA Method 29 to determine mercury emissions. Lead was included in the sample analysis of the EPA Method 29 samples.

A list of the emissions units tested with target process operating rate ranges and applicable rules are presented in Table 1 below. Production rates during the testing were at or above 90 percent of maximum throughput. The Phase II furnace was fired on natural gas.

Table 1-1 Emission Source Information

Source	Emissions Unit	Control Equipment	Stack Vent	Permit Group	Greenball Feed Rate (LTPH)	Applicable Rule
Phase II Waste Gas Stack	EU030	CE110/CE111	SV051	none	0-950	Minn. R. 7019.3050

2.0 Results

2.1 Phase II Waste Gas Stack (SV051)

Results of the Phase II Waste Gas Stack (SV051) test performed on April 4, 2017 are provided in Table 1. The average emission rate of total mercury is 0.012 pounds per hour (lb/hr). The average lead emission rate is 0.032 lb/hr.

The bag sample collected during run two was compromised in transport and the sample was lost. Run two oxygen and carbon dioxide values used for determination of molecular weight are the average of runs one and three. No other testing difficulties were noted.

The process was operating at greater than 90 percent of maximum production. The kiln system was firing on natural gas for the test. A summary of the process rates during the testing periods is provided in Table 2. Detailed process data are located in Appendix E.

3.0 Process Description

The Keetac Phase II indurating furnace (EU030) is an Allis Chalmers model 48-30-3 Grate Kiln Pelletizing system. The greenball feed is dried and preheated on a traveling grate by down draft drying to develop mechanical strength prior to entering a rotary kiln for high temperature induration. The kiln product drops into an annular cooler for cooling and heat recovery by ambient air driven by two stages of cooling fans. Hot gases from the first stage of cooling pass through the kiln as secondary air to the preheat section of the grate. A heat recoup system draws air from the cooler for second down draft drying section.

The furnace particulate emissions are controlled by two Zurn MTSA-288-11.5 CXT-TA multiclones one serving each side of the kiln (CE030-031 and CE035-036) (A and B side). Two wet scrubbers (CE110 and CE111) provide additional emission control after each of the multiclones. The scrubbers are venturi type designed by STS. The exhausts of the two scrubbers are vented to the atmosphere through a common waste gas stack (SV051).

Process rate parameters recorded and summarized for each run include green ball feed rate and fired pellet production rate. Scrubber water flow rate and pressure drop were recorded. The process operating data are summarized in Table 2. Detailed process data along with completed MPCA Operating Data Summary for Process Sources forms are located in Appendix E.

4.0 Stack Testing Procedures and Methods

Testing was performed at locations meeting EPA method 1 criteria. Method criteria are listed below in Table 4-1. Sample port locations and traverse points are provided in Figures 1-2.

Table 4-1 EPA Method 1 Criteria

Stack Vent Number	Distance to Upstream Disturbances (Diameters)	Distance to Downstream Disturbances (Diameters)	Number of Ports	Number of Points
SV051	3.6	2.2	4	24

Volumetric airflow determinations were performed in accordance with EPA Method 2 using an S-type pitot tube. Airflows were determined in conjunction with the EPA Method 29 tests.

Oxygen and carbon dioxide concentrations at the waste gas stacks were determined from integrated stack gas samples collected with each test run and analyzed by modified EPA Method 3A. Results of those analyses are located in Appendix B. Gas calibration certifications are provided in Appendix D.

Stack gas moistures were determined by performing EPA Method 4 in conjunction with the EPA Method 29 test.

Mercury and lead were determined following EPA Method 29. All glassware used for the testing was prepared as directed by the method. All reagents were prepared at Barr's laboratory except for the acidified potassium permanganate solution which was prepared on-site daily prior to sampling. Sample recovery was performed in Barr Engineering's recovery trailer to minimize potential for sample contamination. Samples were analyzed by Element One, Inc. of Wilmington, North Carolina. A complete laboratory report along with chain of custody is located in Appendix C.

Mercury levels in all reagent blanks were below analytical detection limits. No blank corrections were performed. Mercury sample fractions reported at the analytical detection limit are included in the total mass of the sample using the full detection limit value.

Lead was detected in the front half blank. Blank corrections to the front half results were made as allowed by Method 29.

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

Tables

U.S. Steel Corporation
Keetac
Keewatin, Minnesota

Barr Engineering Co.
June 16, 2017

TABLE 1
EPA METHOD 29 METALS RESULTS
Phase II Waste Gas Stack (SV051)

Parameter	Run 1	Run 2	Run 3	Average
Test Date	4/5/2017	4/5/2017	4/5/2017	-
Test Period	917 - 1136	1237 - 1451	1709 - 1922	-
Test Duration, min	120	120	120	120
Average Stack Temperature, °F	126.21	127.63	125.46	126.43
Average Moisture Content, %V/V	14.27	14.83	13.98	14.36
Front Half Metals Concentration, ug/dscm				
Lead (Pb)	15.60	14.76	11.30	13.89
Mercury (Hg)	< 0.042	< 0.041	< 0.041	< 0.041
Back Half Metals Concentration, ug/dscm				
Lead (Pb)	0.45	0.67	0.32	0.48
Mercury (Hg)	5.25	5.55	5.06	5.29
Total Metals Concentration, ug/dscm				
Lead (Pb)	16.1	15.4	11.6	14.4
Mercury (Hg)	5.29	5.60	5.10	5.33
Front Half Metals Emission Rate, lb/hr				
Lead (Pb)	0.035	0.033	0.026	0.031
Mercury (Hg)	< 0.000094	< 0.000092	< 0.000093	< 0.000093
Back Half Metals Emission Rate, lb/hr				
Lead (Pb)	0.0010	0.0015	0.0007	0.0011
Mercury (Hg)	0.012	0.013	0.011	0.012
Total Metals Emission Rate, lb/hr				
Lead (Pb)	0.036	0.035	0.026	0.032
Mercury (Hg)	0.012	0.013	0.012	0.012

U.S. Steel Corporation
Keetac
Keewatin, Minnesota

Barr Engineering Co.
June 16, 2017

TABLE 2
PROCESS and CONTROL EQUIPMENT DATA SUMMARY

Phase II Waste Gas (SV051)

April 5, 2017

Time	Feed Rates, LTPH		Prod Rate, LTPH Fired Pellets	Kiln Gas MBTUH	Total MBTUH	4A-04-62			4A-04-63		
	Green ball	To Grate				Lower dP	Upper dP	GPM	Lower dP	Upper dP	GPM
0917-1136	887	726	616	216.4	216.4	9.9	10.2	2200	12.2	12.4	2201
1237-1451	876	734	609	229.7	229.7	9.7	10.1	2200	12.1	12.2	2201
1709-1922	854	705	594	211.1	211.1	10.0	10.4	2199	12.3	12.5	2200

Figures

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
Waste Gas Stack (SV051)

Input Data	Symbol	Units	Run 1	Run 2	Run 3
Test Date	-	-	4/5/2017	4/5/2017	4/5/2017
Test Period	-	-	917 - 1136	1237 - 1451	1709 - 1922
Number of Sample Ports	-	-	4	4	4
Number of Traverse Points	-	-	24	24	24
Duct Dimensions (diameter or Length x Width)	D, L X W	inches	227.50	227.50	227.50
Barometric Pressure	Pbar	in. Hg	28.55	28.55	28.55
Stack Static Pressure	Pg	in. H ₂ O	-0.35	-0.35	-0.35
Average Stack Temperature	Tsf	degrees F	126	128	125
Actual Dry Gas Meter Volume	Vm	cubic feet	83.04	86.67	88.90
Dry Gas Meter Calibration Factor	Y	-	1.0069	1.0069	1.0069
Average Orifice Meter Pressure Drop	DH	in H ₂ O	1.70	1.84	1.86
Average Meter Temperature	Tmf	degrees F	44	50	64
Pitot Tube Coefficient	Cp	-	0.84	0.84	0.84
Average Square Root of Velocity Head	(DP) ^{0.5}	-	0.767	0.782	0.779
Mass of Water Vapor Condensed in Impingers	Vwc	g	299	331	298
Mass of Water Vapor Collected in Desiccant	Vwsg	g	18	17	19
Orsat Results, Dry Basis					
Oxygen	%O ₂	%v/v	18.0	18.1 *	18.2
Carbon Dioxide	%CO ₂	%v/v	1.2	1.1 *	1.1
Nitrogen + Carbon Monoxide	%N ₂ + %CO	%v/v	80.9	80.8	80.8
Nozzle Diameter	Dn	inches	0.250	0.250	0.250
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	586	588	585
Stack Pressure Ps = Pbar + Pg / 13.6	Ps	in. Hg	28.52	28.52	28.52
Duct Area A = 3.14 x D ² / (4 x 144) or A = L x W / 144	A	Sq. ft	282.287	282.287	282.287
Meter Volume at Standard Conditions Vmstd = 17.64 x Vm x Y x ((Pbar + (DH / 13.6)) / (Tmf + 460))	Vmstd-Ft3	cubic feet	83.90	86.65	86.44
Meter Volume at Standard Conditions Vmstd-m3 = Vmstd-ft3 x 0.02832	Vmstd-m3	cubic meter	2.38	2.45	2.45
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	14.27 see note	14.83 see note	13.98 see note
Molecular Weight of Stack Gas, dry Md = (0.44 x %CO ₂) + (0.32 x %O ₂) + (0.28 x (%N ₂ + %CO))	Md	lb/lbmol	28.90	28.90	28.90
Molecular Weight of Stack Gas, wet Ms = Md x (1 - (MC/100)) + 18 x (MC/100)	Ms	lb/lbmol	27.35	27.28	27.37
Average Stack Gas Velocity Vs = 85.49 x Cp x (dP) ^{0.5} x ((Tsr/(Ps x Ms)) ^{0.5})	Vs	ft/sec	47.75	48.81	48.44
Actual Volumetric Air Flow Rate Qa = 60 x Vs x A	Qa	acfm	808,738	826,688	820,513
Volumetric Air Flow Rate at Standard Conditions Qs = Qa x (528 / (Ts + 460)) x (Ps / 29.92)	Qs	scfm	694,452	708,155	705,466
Dry Volumetric Air Flow Rate at Standard Conditions Qd = Qa x (1 - (MC / 100)) x (528 / Tsr) x (Ps / 29.92)	Qd	dscfm	595,357	603,158	606,828
Nozzle Cross-Sectional Area An = (3.14 x Dn ²) / (4 x 144)	An	sq. ft	0.000341	0.000341	0.000341
Isokinetic Variation I = (0.0945 x Tsr x Vmstd) / (Ps x Vs x An x theta x (1 - (MC / 100)))	I	%	97.3	99.2	98.4

Note: Moisture Content limited to moisture at saturation

* Bag sample for Run 2 was compromised. Result is average of Run 1 and 3

EPA Method 29 Metals Calculation Summary
Determination of Metal Emissions
EPA Method 29

Waste Gas Stack (SV051)
Test 1

Input Data	Symbol	Units	Run 1	Run 2	Run 3
Test Date	-	-	04/05/2017	04/05/2017	04/05/2017
Test Period	-	-	917 - 1136	1237 - 1451	1709 - 1922
Run Time	theta	min	120	120	120
Meter Volume at Standard Conditions Vmstd	Vmstd-ft3	cubic feet	83.90	86.65	86.44
Meter Volume at Standard Conditions Vmstd	Vmstd-m3	cubic meter	2.38	2.45	2.45
Dry Volumetric Air Flow Rate at Standard Conditions	Qd	DSCFM	595,357	603,158	606,828
Laboratory Results					
Metals Loading, Total = Front Half Analysis, ug			Front Half	Front Half	Front Half
Lead (Pb)	Pb-ug	Tot-ug	37.073	36.223	27.673
Mercury (Hg)	Hg-ug	Tot-ug	< 0.10	< 0.10	< 0.10
Metals Loading, Total = Back Half Analysis, ug			Back-Half	Back-Half	Back-Half
Lead (Pb)	Pb-ug	Tot-ug	1.08	1.64	0.773
Mercury (Hg)	Hg-ug	Tot-ug	12.47	13.63	12.38
Calculated Data					
Front Half Metals Concentration, ug/dscm					
ug/dscm = FH Tot-ug / Vstd-m3			Front Half	Front Half	Front Half
Lead (Pb)	Pb(Conc)	ug/dscm	15.60	14.76	11.30
Mercury (Hg)	Hg(Conc)	ug/dscm	< 0.042	< 0.041	< 0.041
Back Half Metals Concentration, ug/dscm					
ug/dscm = BH Tot-ug / Vstd-m3			Back-Half	Back-Half	Back-Half
Lead (Pb)	Pb(Conc)	ug/dscm	0.45	0.67	0.32
Mercury (Hg)	Hg(Conc)	ug/dscm	5.25	5.55	5.06
Total Metals Concentration, ug/dscm					
Total ug/dscm = (FH Tot-ug + BH Tot-ug) / VMstd m3			Total	Total	Total
Lead (Pb)	Pb(Conc)	ug/dscm	16.06	15.43	11.62
Mercury (Hg)	Hg(Conc)	ug/dscm	5.29	5.60	5.10
Front Half Metals Emission Rate, lb/hr					
Metal-E = tot ug x 2.2046e-9/vstd ft3 x Qd x 60			Front Half	Front Half	Front Half
Lead (Pb)	Pb-E	lb/hr	3.48E-02	3.34E-02	2.57E-02
Mercury (Hg)	Hg-E	lb/hr	< 9.39E-05	< 9.21E-05	< 9.29E-05
Back Half Metals Emission Rate, lb/hr					
Metal-E = tot ug x 2.2046e-9/vstd ft3 x Qd x 60			Back Half	Back Half	Back Half
Lead (Pb)	Pb-E	lb/hr	1.01E-03	1.51E-03	7.18E-04
Mercury (Hg)	Hg-E	lb/hr	1.17E-02	1.26E-02	1.15E-02
Total Metals Emission Rate, lb/hr					
Metal-E = Front half lb/hr + Back Half lb/hr			Total	Total	Total
Lead (Pb)	Pb-E	lb/hr	3.58E-02	3.49E-02	2.64E-02
Mercury (Hg)	Hg-E	lb/hr	1.18E-02	1.26E-02	1.16E-02

Appendix B

Field Data Sheets



EPA METHOD 29 MULTI-METALS TESTING IMPINGER RECOVERY

Project U.S. Steel Date 4/5/17
Project No. 2331 12 10 Operators TAK
Source Phase II Waste Gas Sample Location STACK SV051

TEST RUN 1	IMPINGER VOLUMES							DRY COLUMN
	1	2	3	4	5	6	7	
	g	g	g	g	g	g	g	g
END	828.4	869.3	757.5	655.8	741.8	770.6	X	1008.0
START.	659.4	769.1	733.1	652.5	739.4	771.0	X	989.6
CHANGE								
MASS OF MOISTURE COLLECTED, g								

TEST RUN 2	IMPINGER VOLUMES							DRY COLUMN
	1	2	3	4	5	6	7	
	g	g	g	g	g	g	g	g
END	874.2	848.6	793.7	667.0	766.2	775.1	X	1046.1
START.	649.9	760.7	778.5	664.8	764.1	775.6	X	1024.5
CHANGE								
MASS OF MOISTURE COLLECTED, g								

TEST RUN 3	IMPINGER VOLUMES							DRY COLUMN
	1	2	3	4	5	6	7	
	g	g	g	g	g	g	g	g
END	886.8	831.5	744.7	653.8	740.5	773.8	X	1005.6
START.	660.4	770.5	735.7	652.8	739.8	773.5	X	986.5
CHANGE								
MASS OF MOISTURE COLLECTED, g								

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

COMMENTS

BARR

**EPA METHOD 29
FIELD DATA SHEET**

Project K-100 Meter ID C-5 Probe ID 7-3 Bar. Pres 28.55 in Hg
 Smpl Loc W-5 S-5051 Meter Y 1.0069 Pitot No. 7-3 Stat. Pres 28.35 in H₂O
 Test No. 1 Run 1 Orifice H@ 1.9074 Pitot Cp 0.88 Probe Lgth 7 ft
 Date 4-5-77 Operators OK/MSV/INK Liner Type: ☒ Glass ☐ S.S. ☐ Other _____ Imp TC T40-5

Sample Train Leak Rate (cfm)		
Pretest	0.0	at 10 in Hg
Posttest	0.0	at 6 in Hg
Pitot (3 in.)	Pos. <input checked="" type="checkbox"/> Neg. <input type="checkbox"/>	

Sample Point	Sample Time Δt	Meter Volume Vm, ft ³	Velocity ΔP, in H ₂ O	Orifice ΔH, in H ₂ O	Sample Vacuum, in Hg	Stack Temp. Ts, °F	Sample Train Temperatures, °F					Oxygen Content, %
							Probe	Filter	Impinger Outlet	Meter Inlet	Meter Outlet	
A-6	0917	616.12										
5	5	619.42	0.55	1.57	1.0	126	237	261	41	39	41	18.1
Y	10	622.78	0.59	1.68	1.0	126	238	258	39	39	41	
2	15	626.36	0.67	1.91	2.0	126	236	257	38	40	40	
2	20	630.14	0.71	2.02	2.0	127	236	258	39	41	40	
1	25	633.91	0.78	2.11	2.0	127	239	258	40	42	40	
1	30	637.52	0.65	1.85	2.0	127	239	257	40	43	41	
B-6	35	646.83	0.55	1.57	1.0	127	248	259	43	43	41	
5	40	644.25	0.58	1.66	1.5	127	247	257	43	44	41	
Y	45	647.80	0.64	1.83	1.5	126	259	260	46	45	43	
3	50	651.45	0.64	1.84	1.0	126	261	263	45	46	42	
2	55	655.40	0.73	2.10	2.0	126	261	252	45	46	42	
1	60	659.45	0.72	2.07	2.0	127	261	264	46	47	44	
C-6	65	662.74	0.49	1.41	1.5	126	239	258	43	46	44	
5	70	655.94	0.49	1.41	1.5	127	236	259	44	48	44	
Y	75	669.25	0.52	1.50	1.5	127	250	250	42	47	43	
3	80	672.06	0.52	1.50	1.5	127	259	262	42	47	44	
2	85	675.42	0.53	1.57	1.5	127	261	260	42	48	44	
1	90	679.28	0.53	1.44	1.5	127	265	261	44	48	44	
D-6	95	682.51	0.50	1.43	1.5	125	267	262	39	45	45	
5	100	685.70	0.55	1.59	1.5	125	265	259	50	47	45	
Y	105	689.00	0.58	1.68	1.5	125	265	260	58	48	45	
7	110	692.48	0.58	1.69	1.5	125	265	258	55	49	45	
2	115	695.95	0.59	1.71	2.0	125	262	260	55	49	45	
1	120	699.16	0.49	1.42	1.5	125	265	261	55	48	45	
Σ		Vm=63.02	0.59	ΔH=1.70		Ts=126.21					Tm=44.6	

	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	Nozzle No.
Run 1	41	18.1	16.0	0917	1136	1	15	—	400655	51055	0.250		1 0.250
Run 2										5			2 0.250
													3 0.250
													Avg. in. 0.250

Moisture Recovery Data:

Impinger	1	2	3	4	5	6	Desiccant	Total
Final wt., g	828.4	869.3	757.5	655.8	741.8	770.6	1008.0	
Initial wt., g	659.4	764.1	733.1	652.5	739.4	771.0	989.6	
Difference	169.0	105.2	24.4	3.3	2.4	-0.4	18.4	317.3

Air Flows	
ACFM	DSCFM
805,955	593,308

BARR

EPA METHOD 29
FIELD DATA SHEET

Project K. Inc Meter ID C-5 Probe ID 7-3 Bar. Pres 28.55 in Hg
 Smpl Loc WBS 50051 Meter Y 1.0069 Pitot No. 7-3 Stat. Pres -0.35 in H₂O
 Test No. 1 Run 2 Orifice H@ 1.9074 Pitot Cp 0.8X Probe Lgth 7 ft
 Date 4-5-17 Operators DJK/MSN/TAK Liner Type: ☐ Glass ☐ S.S. ☐ Other _____ Imp TC T605

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

Sample Point	Sample Time Δt	Meter Volume Vm, ft ³	Velocity ΔP , in H ₂ O	Orifice ΔH , in H ₂ O	Sample Vacuum, in Hg	Stack Temp. Ts, °F	Sample Train Temperatures, °F					Oxygen Content, %
							Probe	Filter	Impinger Outlet	Meter Inlet	Meter Outlet	
A-6	1237	699.62										
5	5	702.95	0.54	1.60	1.5	128	237	257	38	44	44	
Y	12	706.48	0.62	1.84	2.0	128	241	260	39	44	44	
3	15	710.32	0.68	2.02	2.0	127	241	258	39	45	45	
2	20	714.18	0.74	2.19	2.5	128	233	260	39	46	44	
1	25	718.12	0.73	2.17	2.5	128	239	258	40	47	44	
B-6	30	721.95	0.70	2.08	2.0	127	232	267	40	47	44	
5	25	725.44	0.59	1.75	1.5	128	233	258	41	47	45	
Y	40	728.91	0.63	1.87	2.0	128	239	251	43	48	45	
3	45	732.63	0.65	1.94	2.0	128	241	259	42	49	45	
2	50	736.33	0.63	1.88	2.0	128	240	255	42	50	46	
1	55	740.15	0.70	2.09	2.5	128	238	259	42	50	46	
C-6	60	744.31	0.78	2.33	3.0	129	239	254	43	51	46	
5	65	747.56	0.53	1.58	1.5	128	240	254	42	49	46	
Y	70	750.95	0.54	1.61	1.5	128	239	254	42	50	47	
3	75	754.41	0.58	1.74	2.0	127	242	259	44	52	47	
2	80	758.00	0.62	1.86	2.5	127	240	258	45	53	48	
1	85	761.76	0.63	1.89	3.0	127	241	260	45	54	48	
D-6	90	765.26	0.58	1.63	2.0	126	238	261	47	55	49	
5	95	768.71	0.53	1.60	2.0	127	247	258	45	56	52	
Y	100	772.32	0.53	1.60	2.0	127	241	260	46	57	52	
3	105	775.56	0.59	1.79	3.0	127	241	257	48	59	53	
2	110	780.39	0.63	1.91	3.5	127	236	250	48	60	54	
1	115	783.01	0.55	1.67	3.5	129	239	248	46	61	56	
0=	120	786.29	0.48	1.46	2.5	127	241	251	48	62	57	
		Vm=67	0.61	$\Delta H=1.85$		Ts=127.63					Tm=49.63	

	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	44	18.1	14.7	1237	1451	2	15	-	700656	3145	0.252	1	See
Run 2												2	Run 1
												3	
												Avg. in.	

Moisture Recovery Data:

Impinger	1	2	3	4	5	6	Desiccant	Total
Final wt., g	871.2	878.6	743.7	667.0	766.2	775.1	1046.1	
Initial wt., g	649.9	760.7	778.5	664.8	764.1	773.6	1029.5	
Difference	224.3	87.9	15.2	2.2	2.1	-0.5	16.6	347.80

Air Flows	
ACFM	DSCFM
823.803	601.05X

BARR

EPA METHOD 29
FIELD DATA SHEET

Project Kinetic Meter ID C-5 Probe ID 7-3 Bar. Pres 28.55 in Hg
 Smpl Loc WHS 50851 Meter Y 1.5069 Pitot No. 7-3 Stat. Pres 20.35 in H₂O
 Test No. 1 Run 3 Orifice H@ 1.9074 Pitot Cp 0.88 Probe Lgth 7 ft
 Date 4-5-17 Operators 03K/MSV/JAC Liner Type: ☒ Glass ☐ B.S. ☐ Other _____ Imp TC TC-5

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"/>	

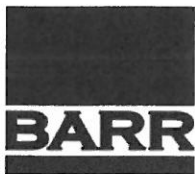
Sample Point	Sample Time Δt	Meter Volume Vm, ft ³	Velocity ΔP , in H ₂ O	Orifice ΔH , in H ₂ O	Sample Vacuum, in Hg	Stack Temp. Ts, °F	Sample Train Temperatures, °F					Oxygen Content, %
							Probe	Filter	Impinger Outlet	Meter Inlet	Meter Outlet	
A-6	5	786.69	0.53	1.60	1.5	127	240	252	42	64	63	
5	10	793.73	0.60	1.84	2.0	125	242	251	43	64	63	
4	15	797.44	0.60	1.84	2.0	125	241	250	42	64	64	
3	20	801.33	0.67	2.05	2.0	125	242	251	43	64	64	
2	25	805.41	0.73	2.24	2.5	125	241	252	43	65	65	
1	30	809.56	0.76	2.33	3.0	125	240	252	43	65	65	
B-6	35	813.18	0.53	1.63	2.0	125	241	252	41	65	65	
5	40	816.79	0.57	1.75	2.0	126	246	258	41	64	64	
4	45	820.41	0.60	1.84	2.0	125	241	262	40	64	64	
3	50	824.17	0.66	2.02	2.0	126	241	268	41	64	64	
2	55	828.28	0.72	2.20	2.5	126	248	259	42	63	64	
1	60	832.33	0.72	2.20	2.5	126	249	262	44	63	63	
C-6	65	835.91	0.62	1.90	2.0	125	239	258	44	62	62	
5	70	839.45	0.56	1.71	1.5	126	239	250	44	63	62	
4	75	843.11	0.60	1.83	2.0	125	240	258	43	63	62	
3	80	846.80	0.61	1.86	2.0	126	241	258	44	64	62	
2	85	850.42	0.57	1.74	2.0	126	239	247	45	64	62	
1	90	853.97	0.56	1.71	2.0	126	240	249	46	65	63	
D-6	95	857.42	0.55	1.68	2.0	126	250	261	47	65	63	
5	100	860.96	0.55	1.68	2.0	125	250	257	50	66	64	
4	105	864.64	0.60	1.84	2.0	125	250	259	52	66	64	
3	110	868.42	0.59	1.81	2.5	125	250	262	52	66	64	
2	115	872.18	0.62	1.90	2.5	125	264	259	54	67	65	
1	120	875.79	0.49	1.51	2.0	125	265	262	57	67	65	
0=		878.93	0.61	$\Delta H = 1.86$		Ts = 25.46					Tm = 64.02	

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 3 67.54	18.1	18.8	1709	1922	3	15	—	400657	3155	0.250	1	0.250
Run 2											2	
											3	
											Avg. in.	0.250

Moisture Recovery Data:

Impinger	1	2	3	4	5	6	Desiccant	Total
Final wt., g	886.8	831.5	749.7	653.8	740.5	773.8	1025.6	
Initial wt., g	660.4	770.5	735.7	652.8	739.8	773.5	986.5	
Difference	226.4	61.0	9	1	0.7	0.3	19.1	312.5

Air Flows	
ACFM	DSCFM
817.579	604.658



EPA METHOD 3A -- Instrument Analysis Data Sheet

Project U.S. Steel Keetac
Sample Location(s): Waste Gas Stack SW51
Test No: 1
Date: 4/5/17
Operators: TAK/DJK

Analyzer Make / Model / Serial No. Servomex
Analyzer O₂ Range (span), %: 0 - 21.75
Analyzer CO₂ Range (span), %: 0 - 19.94

	Cylinder Serial No.	O ₂ Cert. Conc.		CO ₂ Cert. Conc.	
Zero Gas	<u>Nitrogen</u>	<u>0</u>		<u>0</u>	
O ₂ /CO ₂ Mid-range	<u>CA06652</u>	<u>9.50</u>		<u>9.50</u>	
O ₂ /CO ₂ High-range	<u>CC51254</u>	<u>21.75</u>			
CO ₂ High	<u>CA01060</u>			<u>19.94</u>	

PRETEST ANALYZER CALIBRATION DATA

	O ₂		CO ₂	
	Cylinder Value, %	Analyzer Calibration Response, %	Cylinder Value, %	Analyzer Calibration Response, %
Zero Gas	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>
Mid-range:	<u>9.5</u>	<u>9.4</u>	<u>9.5</u>	<u>9.5</u>
High-range:	<u>21.75</u>	<u>21.80</u>	<u>19.94</u>	<u>19.9</u>

Time of Calibration 1934 to 1941

INTEGRATED BAG ANALYSIS

Location/Test No. 4/6/17

Run No.

Time Sampled

Time Analyzed

O₂, %

CO₂, %

<u>Waste Gas Stack SW51</u>		
1	2	3
<u>1944</u>	<u>X</u>	<u>1947</u>
<u>18.0</u>		<u>18.2</u>
<u>1.2</u>		<u>1.1</u>

POSTTEST ANALYZER CALIBRATION DATA

1953-1956

	O ₂		CO ₂	
	Cylinder Value, %	Analyzer Calibration Response, %	Cylinder Value, %	Analyzer Calibration Response, %
Zero Gas	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>
Mid-range:	<u>9.5</u>	<u>9.5</u>	<u>9.5</u>	<u>9.5</u>
High-range:	<u>21.75</u>	<u>21.80</u>	<u>19.94</u>	<u>19.9</u>



EPA Method 29 - Field Data Sheet - Run 1

Project	U.S. Steel Corporation	Meter ID	C-5	Probe ID	7-3	Bar.Press.	28.55	in. Hg	Sample Train Leak	Rate, cfm:
Sample Location	Waste Gas Stack SV051	Meter Y	1.0069	Pitot Tube No.	7-3	Stat Press.	-0.4	in. H2O	Pretest	0.000 at 10 in. Hg
Date	04/05/17	Orifice dH@	1.9074	Pitot Cp	0.84	CPM TC	NA		Posttest	0.000 at 6 in. Hg
Test	1	Run #	1	Liner Type:	Glass	IMP Out TC	TIO-5		Pretest Pitot leak Check Pos	pass @ >3" w.c
Operators	DJK /MJN								Posttest Pitot leak Check Neg	pass @ >3" w.c

Sample Point	Sample Time DT	Actual Meter Vol Vm, ft3	Velocity Head DP, in. H2O	Orifice DH in. H2O	Ideal Point Volume Vm, ft³	Ideal Meter Vol Vm, ft3	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	917	616.12												
1	5.0	619.42	0.550	1.57	3.35	619.47	*	126	*	*	*	39	41	16.0
2	10.0	622.74	0.590	1.68	3.46	622.93	*	126	*	*	*	39	41	16.0
3	15.0	626.36	0.670	1.91	3.69	626.62	*	126	*	*	*	40	40	16.0
4	20.0	630.14	0.710	2.02	3.79	630.41	*	127	*	*	*	41	40	16.0
5	25.0	633.91	0.740	2.11	3.87	634.29	*	127	*	*	*	42	40	16.0
6	30.0	637.52	0.650	1.85	3.64	637.92	*	127	*	*	*	43	41	16.0
7	35.0	640.83	0.550	1.57	3.35	641.28	*	127	*	*	*	43	41	16.0
8	40.0	644.25	0.580	1.66	3.44	644.72	*	127	*	*	*	44	41	16.0
9	45.0	647.80	0.640	1.83	3.62	648.35	*	126	*	*	*	45	43	16.0
10	50.0	651.45	0.640	1.84	3.63	651.98	*	126	*	*	*	46	42	16.0
11	55.0	655.40	0.730	2.10	3.88	655.86	*	126	*	*	*	46	42	16.0
12	60.0	659.45	0.720	2.07	3.85	659.71	*	127	*	*	*	47	44	16.0
13	65.0	662.74	0.490	1.41	3.19	662.90	*	126	*	*	*	46	44	16.0
14	70.0	655.94	0.490	1.41	3.19	666.09	*	127	*	*	*	48	44	16.0
15	75.0	669.25	0.520	1.50	3.29	669.37	*	127	*	*	*	47	43	16.0
16	80.0	672.60	0.520	1.50	3.28	672.66	*	127	*	*	*	47	44	16.0
17	85.0	675.92	0.530	1.53	3.32	675.97	*	127	*	*	*	48	44	16.0
18	90.0	679.25	0.570	1.64	3.44	679.42	*	127	*	*	*	48	44	16.0
19	95.0	682.51	0.500	1.45	3.23	682.65	*	125	*	*	*	45	45	16.0
20	100.0	685.70	0.550	1.59	3.38	686.03	*	125	*	*	*	47	45	16.0
21	105.0	689.00	0.580	1.68	3.48	689.50	*	125	*	*	*	48	45	16.0
22	110.0	692.48	0.580	1.68	3.48	692.98	*	125	*	*	*	49	45	16.0
23	115.0	695.95	0.590	1.71	3.51	696.50	*	125	*	*	*	49	45	16.0
24	120.0	699.16	0.490	1.42	3.20	699.70	*	125	*	*	*	49	45	16.0
End Time	1136													
Run Time	120		Avg DH=	1.70			Avg Ts=	126.21				Avg Tm=	44.06	

Integrated Gas Sampling Data :

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

Filter No. 4Q0655
Nozzle No. glass
Nozzle Dn. 0.250

MOISTURE RECOVERY DATA :

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

1	2	3	4	5	6	Desiccant	Total	
828.4	869.3	757.5	655.8	741.8	770.6	1008.0		
659.4	769.1	733.1	652.5	739.4	771.0	989.6		
169.0	100.2	24.4	3.3	2.4	-0.4	18.4	317.3	

* Data Recorded on Field Data Sheet



EPA Method 29 - Field Data Sheet - Run 2

Project	U.S. Steel Corporation		Meter ID	C-5	Probe ID	7-3	Bar.Press.	28.55	in. Hg	Sample Train Leak Rate, cfm:			
Sample Location	Waste Gas Stack SV051		Meter Y	1.0069	Pitot Tube No.	7-3	Stat Press.	-0.4	in. H ₂ O	Pretest	0.000	at 10	in. Hg
Date	04/05/17		Orifice dH@	1.9074	Pitot Cp	0.84	CPM TC	NA		Posttest	0.000	at 7	in. Hg
Test	1	Run #	2		Liner Type:	Glass	IMP Out TC	TIO-5		Pretest Pitot leak Check Pos	pass	@ >3" w.c	
Operators	DJK /MJN									Posttest Pitot leak Check Neg	pass	@ >3" w.c	

Sample Point	Sample Time DT	Actual Meter Vol Vm, ft ³	Velocity Head DP, in. H ₂ O	Orifice DH in. H ₂ O	Ideal Point Volume Vm, ft ³	Ideal Meter Vol Vm, ft ³	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	1237	699.62												
1	5.0	702.95	0.540	1.60	3.39	703.01	*	128	*	*	*	44	44	14.3
2	10.0	706.48	0.620	1.84	3.63	706.64	*	128	*	*	*	44	44	14.3
3	15.0	710.32	0.680	2.02	3.80	710.45	*	127	*	*	*	45	44	14.3
4	20.0	714.18	0.740	2.19	3.97	714.41	*	128	*	*	*	46	44	14.3
5	25.0	718.12	0.730	2.17	3.94	718.36	*	128	*	*	*	47	44	14.3
6	30.0	721.95	0.700	2.08	3.87	722.23	*	127	*	*	*	47	44	14.3
7	35.0	725.44	0.590	1.75	3.55	725.78	*	128	*	*	*	47	45	14.3
8	40.0	728.91	0.630	1.87	3.67	729.46	*	128	*	*	*	48	45	14.3
9	45.0	732.63	0.650	1.94	3.74	733.19	*	128	*	*	*	49	45	14.3
10	50.0	736.33	0.630	1.88	3.68	736.88	*	128	*	*	*	50	46	14.3
11	55.0	740.15	0.700	2.09	3.89	740.76	*	128	*	*	*	50	46	14.3
12	60.0	744.31	0.780	2.33	4.10	744.86	*	129	*	*	*	51	46	14.3
13	65.0	747.56	0.530	1.58	3.39	748.25	*	128	*	*	*	49	46	14.3
14	70.0	750.95	0.540	1.61	3.41	751.66	*	128	*	*	*	50	47	14.3
15	75.0	754.41	0.580	1.74	3.55	755.21	*	127	*	*	*	52	47	14.3
16	80.0	758.00	0.620	1.86	3.67	758.88	*	127	*	*	*	53	48	14.3
17	85.0	761.76	0.630	1.89	3.71	762.59	*	127	*	*	*	54	48	14.3
18	90.0	765.26	0.540	1.63	3.44	766.04	*	126	*	*	*	55	49	14.3
19	95.0	768.71	0.530	1.60	3.42	769.45	*	127	*	*	*	56	52	14.3
20	100.0	772.32	0.530	1.60	3.43	772.88	*	127	*	*	*	57	52	14.3
21	105.0	775.56	0.590	1.79	3.62	776.50	*	127	*	*	*	59	53	14.3
22	110.0	780.39	0.630	1.91	3.75	780.25	*	127	*	*	*	60	54	14.3
23	115.0	783.01	0.550	1.67	3.51	783.76	*	129	*	*	*	61	56	14.3
24	120.0	786.29	0.480	1.46	3.29	787.05	*	128	*	*	*	62	57	14.3
End Time	1451													
Run Time	120		Avg DH=	1.84			Avg Ts=	127.63				Avg Tm=	49.63	

Integrated Gas Sampling Data :

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

Filter No.	4Q0656
Nozzle No.	glass
Nozzle Dn.	0.250

MOISTURE RECOVERY DATA :

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

1	2	3	4	5	6	Desiccant	Total	
874.2	848.6	793.7	667.0	766.2	775.1	1046.1		
649.9	760.7	778.5	664.8	764.1	775.6	1029.5		
224.3	87.9	15.2	2.2	2.1	-0.5	16.6	347.8	

* Data Recorded on Field Data Sheet



EPA Method 29 - Field Data Sheet - Run 3

Project	U.S. Steel Corporation		Meter ID	C-5	Probe ID	7-3	Bar.Press.	28.55	in. Hg	Sample Train Leak Rate, cfm:			
Sample Location	Waste Gas Stack SV051		Meter Y	1.0069	Pitot Tube No.	7-3	Stat Press.	-0.4	in. H ₂ O	Pretest	0.000	at 10	in. Hg
Date	04/05/17		Orifice dH@	1.9074	Pitot Cp	0.84	CPM TC	NA		Posttest	0.000	at 7	in. Hg
Test	1	Run #	3		Liner Type:	Glass	IMP Out TC	TIO-5		Pretest Pitot leak Check Pos	pass	@ >3" w.c	
Operators	DJK /MJN									Posttest Pitot leak Check Neg	pass	@ >3" w.c	

Sample Point	Sample Time DT	Actual Meter Vol Vm, ft ³	Velocity Head DP, in. H ₂ O	Orifice DH in. H ₂ O	Ideal Point Volume Vm, ft ³	Ideal Meter Vol Vm, ft ³	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	1709	786.69												
1	5.0	790.04	0.530	1.62	3.48	790.17	*	127	*	*	*	64	63	14.8
2	10.0	793.73	0.600	1.84	3.70	793.87	*	125	*	*	*	64	63	14.8
3	15.0	797.44	0.600	1.84	3.70	797.57	*	125	*	*	*	64	64	14.8
4	20.0	801.33	0.670	2.05	3.91	801.48	*	125	*	*	*	64	64	14.8
5	25.0	805.41	0.730	2.24	4.08	805.56	*	125	*	*	*	65	65	14.8
6	30.0	809.56	0.760	2.33	4.17	809.73	*	125	*	*	*	65	65	14.8
7	35.0	813.18	0.530	1.63	3.49	813.22	*	125	*	*	*	65	65	14.8
8	40.0	816.79	0.570	1.75	3.61	816.83	*	126	*	*	*	64	64	14.8
9	45.0	820.41	0.600	1.84	3.70	820.54	*	125	*	*	*	64	64	14.8
10	50.0	824.17	0.660	2.02	3.88	824.42	*	126	*	*	*	64	64	14.8
11	55.0	828.28	0.720	2.20	4.05	828.47	*	126	*	*	*	63	64	14.8
12	60.0	832.33	0.720	2.20	4.05	832.51	*	126	*	*	*	63	63	14.8
13	65.0	835.91	0.620	1.90	3.76	836.27	*	125	*	*	*	62	62	14.8
14	70.0	839.45	0.560	1.71	3.56	839.83	*	126	*	*	*	63	62	14.8
15	75.0	843.11	0.600	1.83	3.69	843.52	*	125	*	*	*	63	62	14.8
16	80.0	846.80	0.610	1.86	3.72	847.24	*	126	*	*	*	64	62	14.8
17	85.0	850.42	0.570	1.74	3.60	850.84	*	126	*	*	*	64	62	14.8
18	90.0	853.97	0.560	1.71	3.57	854.41	*	126	*	*	*	65	63	14.8
19	95.0	857.42	0.550	1.68	3.54	857.96	*	126	*	*	*	65	63	14.8
20	100.0	860.96	0.550	1.68	3.55	861.50	*	125	*	*	*	66	64	14.8
21	105.0	864.64	0.600	1.84	3.71	865.22	*	125	*	*	*	66	64	14.8
22	110.0	868.42	0.590	1.81	3.68	868.89	*	125	*	*	*	66	64	14.8
23	115.0	872.18	0.620	1.90	3.77	872.67	*	125	*	*	*	67	65	14.8
24	120.0	875.59	0.490	1.51	3.36	876.03	*	125	*	*	*	67	65	14.8
End Time	1922													
Run Time	120		Avg DH=	1.86			Avg Ts=	125.46				Avg Tm=	64.02	

Integrated Gas Sampling Data :

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

Filter No.	4Q0657
Nozzle No.	glass
Nozzle Dn.	0.250

MOISTURE RECOVERY DATA :

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

1	2	3	4	5	6	Desiccant	Total	
886.8	831.5	744.7	653.8	740.5	773.8	1005.6		
660.4	770.5	735.7	652.8	739.8	773.5	986.5		
226.4	61.0	9.0	1.0	0.7	0.3	19.1	317.5	

* Data Recorded on Field Data Sheet



EPA METHOD 3A -- Instrument Analysis Data Sheet

Project U.S. Steel Corporation
Sample Location(s): Waste Gas Stack
Test No: 1
Date: 04/05/2017
Operators: TAK/DJK

Analyzer Make / Model / Serial No. Servomex
Analyzer O₂ Range (span), %: 0-21.75
Analyzer CO₂ Range (span), %: 0-19.94

	Cylinder Serial No.		
		O ₂ Cert. Conc.	CO ₂ Cert. Conc.
Zero Gas	Nitrogen	0	0
CO ₂ High-Range	CA01066	-	19.94
O ₂ /CO ₂ Mid-range	CA06652	9.5	9.5
O ₂ High-range	CA51254	21.75	-

PRETEST ANALYZER CALIBRATION DATA

	O ₂		CO ₂	
	Cylinder Value, %	Analyzer Calibration Response, %	Cylinder Value, %	Analyzer Calibration Response, %
Zero Gas	0	0	0	0
Mid-range:	9.5	9.4	9.5	9.5
High-range:	21.75	21.8	19.94	19.9

Time of Calibration 1936 to 1941

INTEGRATED BAG ANALYSIS

Location/Test No.	Waste Gas Stack (SV051)		
Run No.	1	2	3
Time Sampled			
Time Analyzed	1944		1947
O ₂ , %	18	-	18.2
CO ₂ , %	1.2	-	1.1

POSTTEST ANALYZER CALIBRATION DATA

	O ₂		CO ₂	
	Cylinder Value, %	Analyzer Calibration Response, %	Cylinder Value, %	Analyzer Calibration Response, %
Zero Gas	0	0	0	0.1
Mid-range:	9.5	9.5	9.5	9.5
High-range:	21.75	21.8	19.94	19.9

EPA Method 29 Laboratory Data Entry

Waste Gas Stack (SV051)

Run 1												
Metal	Front-Half Results						Back-Half Results					
	Total ¹ ug	Duplicate ug	Average ug	Blank Correction ² , ug	Corrected Amount, ug	Adjusted Amount, ug	Total ¹ ug	Duplicate ug	Average ug	Blank Correction ² , ug	Corrected Amount, ug	Adjusted Amount, ug
Lead (Pb)	37.3	---	37.30	0.23	37.07	37.07	1.08	---	1.08	0.00	1.08	1.08
Mercury (Hg) ³	< 0.100			0	< 0.100	< 0.100	12.47			0.00	12.47	12.47
Run 2												
Metal	Front-Half Results						Back-Half Results					
	Total ¹ ug	Duplicate ug	Average ug	Blank Correction ² , ug	Corrected Amount, ug	Adjusted Amount, ug	Total ¹ ug	Duplicate ug	Average ug	Blank Correction ² , ug	Corrected Amount, ug	Adjusted Amount, ug
Lead (Pb)	36.9	36	36.45	0.23	36.22	36.22	1.650	1.62	1.64	0.00	1.64	1.64
Mercury (Hg) ³	< 0.100			0	< 0.100	< 0.100	13.63			0.00	13.63	13.63
Run 3												
Metal	Front-Half Results						Back-Half Results					
	Total ¹ ug	Duplicate ug	Average ug	Blank Correction ² , ug	Corrected Amount, ug	Adjusted Amount, ug	Total ¹ ug	Duplicate ug	Average ug	Blank Correction ² , ug	Corrected Amount, ug	Adjusted Amount, ug
Lead (Pb)	27.90	---	27.90	0.23	27.67	27.67	0.77	---	0.77	0.00	0.77	0.77
Mercury (Hg) ³	< 0.1			0	< 0.1	< 0.1	12.38			0.00	12.38	12.38

Mercury Analysis Results (Run 1)		
Sample	Initial Run Total, ug	Duplicate Run, ug
Front-Half	< 0.10	< 0.10
Back-Half (2)	< 0.60	< 0.60
HNO3 Back-Half, (3A)	< 0.20	< 0.20
KMnO4 Back-Half (3B)	6.72	6.82
HCl Back-Half (3C)	4.88	4.91

Mercury Blank Results		
Sample	Initial Run Total, ug	Duplicate Run, ug
Front-Half	< 0.1	< 0.1
Back-Half (2)	< 0.2	< 0.2
HNO3 Back-Half, (3A)	< 0.2	< 0.2
KMnO4 Back-Half (3B)	< 0.5	< 0.5
HCl Back-Half (3C)	< 0.4	< 0.4

¹ Amount is initial analysis only, duplicates not used

² Blank corrected as per EPA Method 29 Sec. 8.4.2

³ Mercury results are average of initial duplicate runs

Mercury Analysis Results (Run 2)		
Sample	Initial Run Total, ug	Duplicate Run, ug
Front-Half	< 0.10	< 0.10
Back-Half (2)	< 0.30	< 0.30
HNO3 Back-Half, (3A)	< 0.20	< 0.20
KMnO4 Back-Half (3B)	6.24	6.24
HCl Back-Half (3C)	6.87	6.91

Blank Results, Total ug		
Metal	Front-Half	Back-Half
Lead (Pb)	0.23	< 0.0

Mercury Analysis Results (Run 3)		
Sample	Initial Run Total, ug	Duplicate Run, ug
Front-Half	< 0.10	< 0.10
Back-Half (2)	< 0.60	< 0.60
HNO3 Back-Half, (3A)	< 0.20	< 0.20
KMnO4 Back-Half (3B)	8.47	8.45
HCl Back-Half (3C)	3.10	3.14

Appendix C

Laboratory Reports and Sample Chain of Custody

Barr Engineering

5150 West 76th Street
Edina, MN 55439

Project Number: 23/31-1210.00100.002

Lead and Mercury

EPA Method 29 Analysis

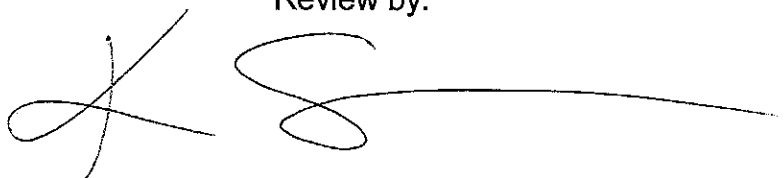
Analytical Report
29278



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

The following data for Analytical Report 29278
has been reviewed for completeness, accuracy,
adherence to method protocol,
and compliance with quality assurance guidelines.

Review by:

A handwritten signature in black ink, consisting of a stylized 'K' followed by a long horizontal line that curves upwards at the end.

Katie Strickland, B.S. Chemist
April 20, 2017

Report Reviewed and Finalized By:

A handwritten signature in black ink, appearing to be 'Ken Smith' in a cursive style.

Ken Smith, Laboratory Director
April 20, 2017

SUMMARY OF RESULTS

Summary of Analysis

Summary of Method 29 Mercury Analysis

Run Number		Average Total Catch, µg	Front Half µg	5% HNO ₃ / 10% H ₂ O ₂ µg	Empty Impinger µg	KMnO ₄ µg	HCl µg
-----		---	-----	-----	-----	-----	-----
SV051-M29-R1	#1	11.7	< 0.1	< 0.6	< 0.2	6.72	4.88
	#2		< 0.1	< 0.6	< 0.2	6.82	4.91
SV051-M29-R2	#1	13.1	< 0.1	< 0.3	< 0.2	6.24	6.87
	#2		< 0.1	< 0.3	< 0.2	6.24	6.91
SV051-M29-R3	#1	11.6	< 0.1	< 0.6	< 0.2	8.47	3.10
	#2		< 0.1	< 0.6	< 0.2	8.45	3.14
Reagent Blank	#1	< 0.5	< 0.1	< 0.2	< 0.2	< 0.5	< 0.4
	#2		< 0.1	< 0.2	< 0.2	< 0.5	< 0.4

Front Half - Summary of Method 29 Metals Analysis

Element	SV051-R1 29278-1 FH Total µg	SV051-R2 29278-2 FH Total µg	SV051-R2 29278-2 FH dup Total µg	SV051-R3 29278-3 FH Total µg	Reagent Blank 29278-4 FH Total µg
-----	-----	-----	-----	-----	-----
Lead	37.3	36.9	36.0	27.9	0.227

Back Half - Summary of Method 29 Metals Analysis

Element	SV051-R1 29278-1 BH Total µg	SV051-R2 29278-2 BH Total µg	SV051-R2 29278-2 BH dup Total µg	SV051-R3 29278-3 BH Total µg	Reagent Blank 29278-4 BH Total µg
-----	-----	-----	-----	-----	-----
Lead	1.08	1.65	1.62	0.773	< 0.1

ANALYTICAL NARRATIVE

Element One Analytical Narrative

Client:	Barr Engineering	Element One #:	29278
Client ID:	23/31-1210.00100.002	Analyst:	JBP & DMR
Method:	Method 29	Dates Received:	04/11/17
Analytes:	Pb & Hg	Dates Analyzed:	04/17-19/17

Summary of Analysis

The Method 29 samples were digested, prepared, and analyzed according to Method 29 protocol. Samples were analyzed for mercury on a PerkinElmer FIMS-100 CVAA mercury analyzer. The samples were analyzed for lead on a PerkinElmer Nexlon 350X ICP-MS.

Detection Limits

The FIMS-100 CVAA instrument reporting limit for mercury was 0.004 µg per aliquot analyzed. The ICP-MS instrument reporting limit was 1.0µg/L for lead.

Analysis QA/QC

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

Additional Comments

The reported results have not been corrected for any blank values or spike recovery values. The ICP analysis of the Front Half Reagent Blank samples revealed detectable concentrations of lead. The reported results relate only to the items tested or calibrated.

QUALITY CONTROL SUMMARY

Summary of Quality Control Data

Mercury Duplicate Analysis RPD

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

Run Number	Front half	5% HNO ₃ / 10% H ₂ O ₂	Empty Impinger	KMnO ₄	HCl
SV051-M29-R1	NA	NA	NA	1.4%	0.5%
SV051-M29-R2	NA	NA	NA	0.1%	0.6%
SV051-M29-R3	NA	NA	NA	0.2%	1.2%
Reagent Blank	NA	NA	NA	NA	NA

Mercury Spike Recoveries

(Method 29 QC limits: 75-125% for Spike Recoveries)

Run Number		Front half	5% HNO ₃ / 10% H ₂ O ₂	Empty Impinger	KMnO ₄	HCl
SV051-M29-R3	#1	110%	111%	106%	105%	88%
	#2	110%	111%	106%	107%	89%

Summary of Quality Control Data

Metals Duplicate Analysis RPD

(Method 29 QC limits: < 20% for RPD)

Element	SV051-R2 Front Half	SV051-R2 Back Half
	RPD	RPD
Lead	2.5%	2.0%

Metals Analysis Spike Recoveries

(Method 29 QC limits: 75-125% for Spike Recoveries)

Element	SV051-R3 Front Half	SV051-R3 Back Half
	Recovery	Recovery
Lead	115%	89%

Second Source Calibration Check Recoveries

(Method 29 QC limits: $\pm 10\%$ for Second Source Continuing Check Standard)*

Element	1 ppb	50 ppb	100 ppb*	250 ppb
Lead	95%	102%	104%	100%

SAMPLE CUSTODY



Request for Laboratory Analytical Services

No 20092
29278

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
Attention: Tom Kuchawski
(Print Name)
(952) 832-2727
(Direct Phone No.)

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

Send Invoice To

Project Number 23131-1210.00 / 00.00
Barr Engineering Company
Attn: Accounts Payable
4700 West 74th Street
Minneapolis, MN 55435-4803
Ph. (952) 832-2600 Fax (952) 832-2601
Barr Project Contact: (Print Name)

W:\Business Units\EM\Subunit Admin\Technical & Support Services\Air Sampling\Datasheets\Other\CCG, CDR RLG 07-01-14

Sample Identification	Date/Time Collected	Media I.D. #	Type		QC	METHOD		SAMPLE FRACTION		Remarks
			Grab	Comp.						
1. Waste Gas SV051 TIR1	4/5/17	400655	X							
2. TIR2		400656	X							
3. TIR3		400657	X							
4. Reagent Blank TIR0		3 Quat	X	X						
5.										
6.										
7.										
8.										
9.										
10. Per Tom via phone FH/Att separate - 4.11.17										

Chain of Custody	Received by:	Date/Time
Collected by (Print Name): Tom Kuchawski (BARR)		
Collector's Signature: Tom Kuchawski		4/10/17
Laboratory: Element One		
Method of Shipment: <input type="checkbox"/> Sampler <input checked="" type="checkbox"/> FedEx <input type="checkbox"/> UPS Other:		
Sample Condition upon Receipt: <input checked="" type="checkbox"/> Acceptable <input type="checkbox"/> Other (explain) Samples were used in good condition. No empty containers		
Received at Lab by: Anna Brack		4.11.17 1000

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

Version 1 - Created 10/30/14

ANALYTICAL DATA

Analytical Calculations

Metals-

$$\text{Element Results } (\mu\text{g}) = \text{ICP Results } (\mu\text{g/L}) * \text{Dilution} * \text{Final Volume (L)}$$

Where-

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

Dilution= $\frac{\text{Diluted Volume}}{\text{Aliquot}}$ --*ICP-MS Run Sheet*

Final Volume= FH= Final Volume (FV)--*Sample Submission*

BH= $\frac{\text{Received Volume (BV)} * \text{Final Volume (FV)}}{\text{Aliquot (Used)}}$ --*Sample Submission*

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 (μg)--*Hg-Data Sheet*

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

Final Volume= Final Volume (FV)*--*Sample Submission*

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

Analytical Calculations

Spike Recovery-

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

Where-

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

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

Spike Amount--*ICP-MS Spike Table*

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)--*ICP-Data Sheet*

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

FH/BH Separate

Analysis Due Date 04.20.17

QA/QC/Report Due Date 04.24.17

Client: Barr Engineering

Date Received 04.11.17

Project No 23/31-1210.00100.002

Time Received 1000

HNO ₃ Lot: 1116078	HF Lot: 5115122	HCl Lot: 4116060	Ref. Method:
Volume Marked Y / N	Volume Loss Y / N (2)		29

Sample Identification

1	SV051-M29-R1	4	Reagent Blank
2	SV051-M29-R2		
	SV051-M29-R2 Duplicate		
3	SV051-M29-R3		
	SV051-M29-R3 Spike		
Analyses Requested		Samples 1-4	Pb
		Samples 1-4	Hg

Runs / FB	Fill / Ace (FH)		HNO ₃ (FH)		5% HNO ₃ /10% H ₂ O ₂ (BH)			HNO ₃ (A)		KMnO ₄ (B)		HCl (C)	
	pH <2.0	Y / N	pH <2.0	Y / N	pH <2.0	Y / N		pH <2.0	Y / N	pH <2.0	Y / N	pH <2.0	Y / N
Lab ID	Fill ID	BV ml	BV ml	FV ml	BV ml	Used	FV ml	BV ml	FV ml	BV ml	FV ml	BV ml	FV ml
1			140	100	580	29	50	88	200	390	500	230	460
2.D			145	↓	620	310	↓	114	↓	390	↓	220	↓
3.S			145	↓	600	300	↓	100	↓	390	↓	230	↓

M-29 Reagent Blank

Lab ID	Fraction	BV, ml	FV, ml	Comments
4	C 7 FH Acetone Blank			
	C 8A FH 0.1N HNO ₃	310	100	used 100 ml
	C 8A A 0.1N HNO ₃	310	—	
	C 8B B DI H ₂ O	98	100+33	
	C 9 BH 5% HNO ₃ /10% H ₂ O ₂	200	50	combined 200 ml C 9 + 100 ml C 8A. used 100 ml
	C 10 B 4% KMnO ₄ /10% H ₂ SO ₄	110	100+33	
	C 11 C 8N HCl DI H ₂ O	285	100	
	C 12 FH Filter			

Lab Communications

LRB + FH/BH spiked with .1 ml @ 25 ppm Std A, B (02/11/17 - A, B) } BP 4/13/17
 LRB Hgt spiked with .2 ml @ 25 ppm Hg Std (05/02/16 - C) } BP 4/13/17

Fractions Received: Runs C1, C3, C4, C5A, C5B, C5C—RB; C12, C8A, C8B, C9, C10, C11 —04.11.17 LLB

SS Page 1 of 2

4/11/2017 5:01:01 PM

SS by

Labeled By/Date

FH Prep By/Date BP 4/13/17

BH Prep By/Date BP 4/13/17

BH/FH Prep By/Date

PM Prep By/Date

A Prep By/Date BP 4/13/17

B Prep By/Date BH 3.13.17

C Prep By/Date BH 3.14.17

ID Verification By / Date BP 4/13/17

Sample/Batch Report

Handwritten signature and date: 2/19/17

User Name: r2d2

Computer Name: PESERVICE-PC

Sample File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\Sample\b4.sam

Report Date/Time: Wednesday, April 19, 2017 08:40:27

A/S Loc.	Batch ID	Sample ID	Description	Sample Type	Init. Quant.	Prep. Vol.	Aliquot Vol.	Diluted Vol.	Solids Ratio
	5	QC Std 2		Sample					
101		LRB		Sample					
102	s	LRB		Spike - 3 of 2					
103		29255-1		Sample					
104	d	29255-1		Duplicate of 4					
105		29225-2		Sample					
106	s	29225-2		Spike - 3 of 6					
107		29225-3		Sample					
108		29272-1		Sample					
109	d	29272-1		Duplicate of 9					
110		29272-2		Sample					
111	s	29272-2		Spike - 3 of 11					
112		29272-3		Sample					
113		29294-1		Sample					
114	d	29294-1		Duplicate of 14					
115		29294-2		Sample					
116	s	29294-2		Spike - 3 of 16					
117		29294-3		Sample					
1		QC Std 1		Sample					
5		QC Std 2		Sample					
5		QC Std 2		Sample					
118		29247 LRB FH		Sample					
119	s	29247 LRB FH		Spike - 1 of 22					
120		29247-1 FH		Sample					
121		29247-2 FH		Sample					
122	d	29247-2 FH		Duplicate of 25					
123		29247-3 FH		Sample					
124	s	29247-3 FH		Spike - 1 of 27					
125		29247-4 FH		Sample					
126		29247-5 FH		Sample					
127	d	29247-5 FH		Duplicate of 30					
128		29247-6 FH		Sample					
129	s	29247-6 FH		Spike - 1 of 32					
130		29247-7 FH		Sample					
131		29247-8 FH		Sample					
132		29247-9 FH		Sample					
133		29247 LRB BH		Sample					
134	s	29247 LRB BH		Spike - 1 of 37					
135		29247-1 BH		Sample					
136		29247-2 BH		Sample					
137	d	29247-2 BH		Duplicate of 40					
138		29247-3 BH		Sample					
139	s	29247-3 BH		Spike - 1 of 42					
140		29247-4 BH		Sample					
141		29247-5 BH		Sample					
142	d	29247-5 BH		Duplicate of 45					
143		29247-6 BH		Sample					
144	s	29247-6 BH		Spike - 1 of 47					
145		29247-7 BH		Sample					
146		29247-8 BH		Sample					
147		29247-9 BH		Sample					
148	x10	29247-10		Sample					

149	x10s	29247-10	Spike - 1 of 52
150	x250	29247-11	Sample
151	x250s	29247-11	Spike - 1 of 54
1		QC Std 1	Sample
5		QC Std 2	Sample
3		QC Std 4	Spike - 3 of 56
5		QC Std 2	Sample
321		29278 LRB FH	Sample
322	s	29278 LRB FH	Spike - 1 of 60
323		29278-1 FH	Sample
324		29278-2 FH	Sample
325	d	29278-2 FH	Duplicate of 63
326		29278-3 FH	Sample
327	s	29278-3 FH	Spike - 1 of 65
328		29278-4 FH	Sample
329		29278 LRB BH	Sample
330	s	29278 LRB BH	Spike - 1 of 68
152		QC Std 1	Sample
153		QC Std 4	Spike - 3 of 70
331		29278-1 BH	Sample
332		29278-2 BH	Sample
333	d	29278-2 BH	Duplicate of 73
334		29278-3 BH	Sample
335	s	29278-3 BH	Spike - 1 of 75
336		29278-4 BH	Sample
152		QC Std 1	Sample
5		QC Std 2	Sample
153		QC Std 4	Spike - 3 of 78
337		29220 LRB	Sample
338	s	29220 LRB	Spike - 1 of 81
339		29220-4	Sample
340		29220-5	Sample
341	d	29220-5	Duplicate of 84
342		29220-6	Sample
343	s	29220-6	Spike - 1 of 86
344		29220-10	Sample
345		29220-11	Sample
346	d	29220-11	Duplicate of 89
152		QC Std 1	Sample
153		QC Std 4	Spike - 3 of 91
347		29220-12	Sample
348	s	29220-12	Spike - 1 of 93
349		29220-16	Sample
350		29220-17	Sample
351	d	29220-17	Duplicate of 96
352		29220-18	Sample
353	s	29220-18	Spike - 1 of 98
354		29220-19	Sample
355		29220-20	Sample
154		QC Std 1	Sample
155		QC Std 4	Spike - 3 of 102
356	x10	29220-21	Sample
357	x10s	29220-21	Spike - 1 of 104
358	x250	29220-22	Sample
359	x250s	29220-22	Spike - 1 of 106
154		QC Std 1	Sample
5		QC Std 2	Sample
155		QC Std 4	Sample
201		29221 LRB FH	Sample
202	s	29221 LRB FH	Spike - 1 of 111

Dataset Report

User Name: r2d2

Computer Name: PESERVICE-PC

Dataset File Path: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\DataSet\041817-7a\

Report Date/Time: Wednesday, April 19, 2017 08:40:05

James Head
4/19/17

The Dataset

Time	Sample ID	Batch ID	Read Type	Description	Init. Quant Prep.	Vol. Aliquot Vol.	Diluted Vol.
17:18:52 Tue 18-Apr-17	Blank		Blank				
17:20:27 Tue 18-Apr-17	Standard 1		Standard #1				
17:22:02 Tue 18-Apr-17	Standard 2		Standard #2				
17:23:38 Tue 18-Apr-17	Standard 3		Standard #3				
17:25:14 Tue 18-Apr-17	QC Std 1		QC Std #1				
17:26:50 Tue 18-Apr-17	QC Std 2		QC Std #2				
17:28:25 Tue 18-Apr-17	QC Std 3		QC Std #3				
17:30:00 Tue 18-Apr-17	QC Std 4		QC Std #4				
17:31:36 Tue 18-Apr-17	QC Std 5		QC Std #5				
17:33:12 Tue 18-Apr-17	QC Std 2		Sample				
17:34:47 Tue 18-Apr-17	LRB		Sample				
17:36:22 Tue 18-Apr-17	LRB	s	Spike - 3 of 11				
17:37:58 Tue 18-Apr-17	29255-1		Sample				
17:39:33 Tue 18-Apr-17	29255-1	d	Duplicate of 13				
17:41:09 Tue 18-Apr-17	29225-2		Sample				
17:42:44 Tue 18-Apr-17	29225-2	s	Spike - 3 of 15				
17:44:20 Tue 18-Apr-17	29225-3		Sample				
17:45:55 Tue 18-Apr-17	29272-1		Sample				
17:47:30 Tue 18-Apr-17	29272-1	d	Duplicate of 18				
17:49:07 Tue 18-Apr-17	QC Std 1		QC Std #1				
17:50:43 Tue 18-Apr-17	QC Std 4		QC Std #4				
17:52:19 Tue 18-Apr-17	29272-2		Sample				
17:53:55 Tue 18-Apr-17	29272-2	s	Spike - 3 of 22				
17:55:30 Tue 18-Apr-17	29272-3		Sample				
17:57:05 Tue 18-Apr-17	29294-1		Sample				
17:58:41 Tue 18-Apr-17	29294-1	d	Duplicate of 25				
18:00:16 Tue 18-Apr-17	29294-2		Sample				
18:01:52 Tue 18-Apr-17	29294-2	s	Spike - 3 of 27				
18:03:27 Tue 18-Apr-17	29294-3		Sample				
18:05:04 Tue 18-Apr-17	QC Std 1		Sample				
18:06:39 Tue 18-Apr-17	QC Std 2		Sample				
18:08:15 Tue 18-Apr-17	QC Std 1		QC Std #1				
18:09:51 Tue 18-Apr-17	QC Std 4		QC Std #4				
18:11:26 Tue 18-Apr-17	Blank		Blank				
18:12:57 Tue 18-Apr-17	Standard 1		Standard #1				
18:14:28 Tue 18-Apr-17	Standard 2		Standard #2				
18:16:00 Tue 18-Apr-17	Standard 3		Standard #3				
18:17:31 Tue 18-Apr-17	QC Std 1		QC Std #1				
18:19:03 Tue 18-Apr-17	QC Std 2		QC Std #2				
18:20:34 Tue 18-Apr-17	QC Std 3		QC Std #3				
18:22:06 Tue 18-Apr-17	QC Std 4		QC Std #4				
18:23:38 Tue 18-Apr-17	QC Std 5		QC Std #5				
18:25:09 Tue 18-Apr-17	QC Std 6		QC Std #6				
18:26:40 Tue 18-Apr-17	QC Std 7		QC Std #7				
18:28:12 Tue 18-Apr-17	QC Std 2		Sample				
18:29:44 Tue 18-Apr-17	29247 LRB FH		Sample				
18:31:16 Tue 18-Apr-17	29247 LRB FH	s	Spike - 1 of 46				
18:32:47 Tue 18-Apr-17	29247-1 FH		Sample				
18:34:18 Tue 18-Apr-17	29247-2 FH		Sample				

Seas Is for Cr. DWR
4/19/17

18:35:50 Tue 18-Apr-17	29247-2 FH	d	Duplicate of 49
18:37:21 Tue 18-Apr-17	29247-3 FH		Sample
18:38:53 Tue 18-Apr-17	29247-3 FH	s	Spike - 1 of 51
18:40:24 Tue 18-Apr-17	29247-4 FH		Sample
18:41:56 Tue 18-Apr-17	29247-5 FH		Sample
18:43:27 Tue 18-Apr-17	29247-5 FH	d	Duplicate of 54
18:44:59 Tue 18-Apr-17	QC Std 1		QC Std #1
18:46:30 Tue 18-Apr-17	QC Std 4		QC Std #4
18:48:03 Tue 18-Apr-17	29247-6 FH		Sample
18:49:34 Tue 18-Apr-17	29247-6 FH	s	Spike - 1 of 58
18:51:05 Tue 18-Apr-17	29247-7 FH		Sample
18:52:37 Tue 18-Apr-17	29247-8 FH		Sample
18:54:08 Tue 18-Apr-17	29247-9 FH		Sample
18:55:39 Tue 18-Apr-17	29247 LRB BH		Sample
18:57:11 Tue 18-Apr-17	29247 LRB BH	s	Spike - 1 of 63
18:58:42 Tue 18-Apr-17	29247-1 BH		Sample
19:00:13 Tue 18-Apr-17	29247-2 BH		Sample
19:01:45 Tue 18-Apr-17	29247-2 BH	d	Duplicate of 66
19:03:17 Tue 18-Apr-17	QC Std 1		QC Std #1
19:04:49 Tue 18-Apr-17	QC Std 4		QC Std #4
19:06:21 Tue 18-Apr-17	29247-3 BH		Sample
19:07:52 Tue 18-Apr-17	29247-3 BH	s	Spike - 1 of 70
19:09:23 Tue 18-Apr-17	29247-4 BH		Sample
19:10:55 Tue 18-Apr-17	29247-5 BH		Sample
19:12:26 Tue 18-Apr-17	29247-5 BH	d	Duplicate of 73
19:13:58 Tue 18-Apr-17	29247-6 BH		Sample
19:15:29 Tue 18-Apr-17	29247-6 BH	s	Spike - 1 of 75
19:17:00 Tue 18-Apr-17	29247-7 BH		Sample
19:18:32 Tue 18-Apr-17	29247-8 BH		Sample
19:20:03 Tue 18-Apr-17	29247-9 BH		Sample
19:21:36 Tue 18-Apr-17	QC Std 1		QC Std #1
19:23:08 Tue 18-Apr-17	QC Std 4		QC Std #4
19:24:41 Tue 18-Apr-17	29247-10	x10	Sample
19:26:12 Tue 18-Apr-17	29247-10	x10s	Spike - 1 of 82
19:27:43 Tue 18-Apr-17	29247-11	x250	Sample
19:29:15 Tue 18-Apr-17	29247-11	x250s	Spike - 1 of 84
19:30:47 Tue 18-Apr-17	QC Std 1		Sample
19:32:19 Tue 18-Apr-17	QC Std 2		Sample
19:33:50 Tue 18-Apr-17	QC Std 4		Spike - 3 of 86
19:35:27 Tue 18-Apr-17	Blank		Blank
19:37:55 Tue 18-Apr-17	Standard 1		Standard #1
19:40:22 Tue 18-Apr-17	Standard 2		Standard #2
19:42:50 Tue 18-Apr-17	Standard 3		Standard #3
19:45:18 Tue 18-Apr-17	QC Std 1		QC Std #1
19:47:45 Tue 18-Apr-17	QC Std 2		QC Std #2
19:50:13 Tue 18-Apr-17	QC Std 3		QC Std #3
19:52:41 Tue 18-Apr-17	QC Std 4		QC Std #4
19:55:09 Tue 18-Apr-17	QC Std 5		QC Std #5
19:57:37 Tue 18-Apr-17	QC Std 6		QC Std #6
20:00:05 Tue 18-Apr-17	QC Std 7		QC Std #7
20:02:33 Tue 18-Apr-17	QC Std 8		QC Std #8
20:05:01 Tue 18-Apr-17	QC Std 2		Sample
20:07:30 Tue 18-Apr-17	29278 LRB FH		Sample
20:09:57 Tue 18-Apr-17	29278 LRB FH	s	Spike - 1 of 102
20:12:25 Tue 18-Apr-17	29278-1 FH		Sample
20:14:52 Tue 18-Apr-17	29278-2 FH		Sample
20:17:20 Tue 18-Apr-17	29278-2 FH	d	Duplicate of 105
20:19:48 Tue 18-Apr-17	29278-3 FH		Sample
20:22:16 Tue 18-Apr-17	29278-3 FH	s	Spike - 1 of 107
20:24:43 Tue 18-Apr-17	29278-4 FH		Sample

20:27:10 Tue 18-Apr-17	29278 LRB BH		Sample
20:29:38 Tue 18-Apr-17	29278 LRB BH	s	Spike - 1 of 110
20:32:06 Tue 18-Apr-17	QC Std 1		Sample
20:34:33 Tue 18-Apr-17	QC Std 4		Spike - 3 of 112
20:37:01 Tue 18-Apr-17	29278-1 BH		Sample
20:39:29 Tue 18-Apr-17	29278-2 BH		Sample
20:41:56 Tue 18-Apr-17	29278-2 BH	d	Duplicate of 115
20:44:24 Tue 18-Apr-17	29278-3 BH		Sample
20:46:51 Tue 18-Apr-17	29278-3 BH	s	Spike - 1 of 117
20:49:18 Tue 18-Apr-17	29278-4 BH		Sample
20:51:46 Tue 18-Apr-17	QC Std 1		Sample
20:54:15 Tue 18-Apr-17	QC Std 2		Sample
20:56:43 Tue 18-Apr-17	QC Std 4		Spike - 3 of 120
20:59:12 Tue 18-Apr-17	29220 LRB		Sample
21:01:39 Tue 18-Apr-17	29220 LRB	s	Spike - 1 of 123
21:04:06 Tue 18-Apr-17	29220-4		Sample
21:06:34 Tue 18-Apr-17	29220-5		Sample
21:09:02 Tue 18-Apr-17	29220-5	d	Duplicate of 126
21:11:29 Tue 18-Apr-17	29220-6		Sample
21:13:56 Tue 18-Apr-17	29220-6	s	Spike - 1 of 128
21:16:24 Tue 18-Apr-17	29220-10		Sample
21:18:51 Tue 18-Apr-17	29220-11		Sample
21:21:19 Tue 18-Apr-17	29220-11	d	Duplicate of 131
21:23:47 Tue 18-Apr-17	QC Std 1		Sample
21:26:15 Tue 18-Apr-17	QC Std 4		Spike - 3 of 133
21:28:43 Tue 18-Apr-17	29220-12		Sample
21:31:11 Tue 18-Apr-17	29220-12	s	Spike - 1 of 135
21:33:38 Tue 18-Apr-17	29220-16		Sample
21:36:05 Tue 18-Apr-17	29220-17		Sample
21:38:33 Tue 18-Apr-17	29220-17	d	Duplicate of 138
21:41:01 Tue 18-Apr-17	29220-18		Sample
21:43:28 Tue 18-Apr-17	29220-18	s	Spike - 1 of 140
21:45:56 Tue 18-Apr-17	29220-19		Sample
21:48:23 Tue 18-Apr-17	29220-20		Sample
21:50:51 Tue 18-Apr-17	QC Std 1		Sample
21:53:19 Tue 18-Apr-17	QC Std 4		Spike - 3 of 144
21:55:47 Tue 18-Apr-17	29220-21	x10	Sample
21:58:15 Tue 18-Apr-17	29220-21	x10s	Spike - 1 of 146
22:00:42 Tue 18-Apr-17	29220-22	x250	Sample
22:03:10 Tue 18-Apr-17	29220-22	x250s	Spike - 1 of 148
22:05:38 Tue 18-Apr-17	QC Std 1		Sample
22:08:07 Tue 18-Apr-17	QC Std 2		Sample
22:10:36 Tue 18-Apr-17	QC Std 4		Sample
22:13:05 Tue 18-Apr-17	29221 LRB FH		Sample
22:15:32 Tue 18-Apr-17	29221 LRB FH	s	Spike - 1 of 153
22:17:59 Tue 18-Apr-17	29221-1 FH		Sample
22:20:26 Tue 18-Apr-17	29221-2 FH		Sample
22:22:54 Tue 18-Apr-17	29221-2 FH	d	Duplicate of 156
22:25:21 Tue 18-Apr-17	29221-3 FH		Sample
22:27:49 Tue 18-Apr-17	29221-3 FH	s	Spike - 1 of 158
22:30:16 Tue 18-Apr-17	29221-4 FH		Sample
22:32:43 Tue 18-Apr-17	29221-5 FH		Sample
22:35:11 Tue 18-Apr-17	29221-5 FH	d	Duplicate of 161
22:37:40 Tue 18-Apr-17	QC Std 1		Sample
22:40:08 Tue 18-Apr-17	QC Std 4		Spike - 3 of 163
22:42:36 Tue 18-Apr-17	29221-6 FH		Sample
22:45:04 Tue 18-Apr-17	29221-6 FH	s	Spike - 1 of 165
22:47:31 Tue 18-Apr-17	29221-7 FH		Sample
22:49:59 Tue 18-Apr-17	29221-8 FH		Sample
22:52:26 Tue 18-Apr-17	29221-8 FH	d	Duplicate of 168

Job Number:
14

29278 Barr Engineering M29 Report Packet
Page 22 of 35

Method 6020 & 200.8 Metals Summary Report

Sample ID: Standard 3

Sample Date/Time: Tuesday, April 18, 2017 19:42:50

Sample Description:

Number of Replicates: 3

Batch ID:

Dataset File: C:\Users\Public\Documents\PerkinElmer Syngistix\ICPMS\DataSet\041817-7a\Standard 3.092

Sample Prep Volume (mL):

Initial Sample Quantity (mg):

Aliquot Volume (mL):

Diluted To Volume (mL):

Autosampler Position: 4

Calibration

Analyte	Curve Type	Slope	Correlation Coefficient	Intercept
Li	Linear Thru Zero			
Sc	Linear Thru Zero			
Cr	Linear Thru Zero	0.039	0.999975	0.00
Cr	Linear Thru Zero	0.004	0.999972	0.00
Mn	Linear Thru Zero	0.046	1.000000	0.00
Ni	Linear Thru Zero	0.008	0.999998	0.00
As	Linear Thru Zero	0.005	0.999994	0.00
Rh	Linear Thru Zero			
Ho	Linear Thru Zero			
Pb	Linear Thru Zero	0.038	0.999982	0.00
Kr	Linear Thru Zero			

Wednesday, Apr 19, 2017 09:24 AM

ICP-MS QC Values Table

Element or Test	ICP Element Mass	Element symbol	Lowest Reported Value (ug)	Upper Reported Value (ug)	Report ing Unit	QC #1	QC #2	QC #3	QC #4	QC #5	QC #6 A	QC #7 AB	QC #8 .25	QC #9 LRB	QC #10 LRB+	QC #11 LRB+
Lithium	6	Li														
Lithium	7	Li	1	500	mg/L	0	1	250	100	50				0	50	100
Beryllium	9	Be	1	500	mg/L	0	1	250	100	50			0.25	0	50	100
Boron	10	B	5	500	mg/L	0	1	250	100	50				0	50	100
Boron	11	B	5	500	mg/L	0	1	250	100	50				0	50	100
Sodium	23	Na	20	5500	mg/L	0	21	2500	1100	250	5000	5000		0	718	
Magnesium	24	Mg	20	5500	mg/L	0	21	2500	1100	250	5000	5000		0	550	
Magnesium	25	Mg	20	5500	mg/L	0	21	2500	1100	250				0	550	
Aluminum	27	Al	1	500	mg/L	0	1	250	100	50	5000	5000		0	50	100
Phosphorus	31	P	20	5000	mg/L	0	20	2500	1000	250	5000	5000		0	200	
Potassium	39	K	20	5500	mg/L	0	20	2000	1000	200	5000	5000		0	500	
Calcium	44	Ca	50	5500	mg/L	0	21	2500	1100	250	5000	5000		0	550	
Scandium	45															
Titanium	47	Ti	1	500	mg/L	0	1	250	100	50	100	100	0.25	0	50	100
Titanium	49	Ti	1	500	mg/L	0	1	250	100	50	100	100	0.25	0	50	100
Vanadium	51	V	1	500	mg/L	0	1	250	100	50	0	2	0.25	0	50	100
Vanadium	51	V	1	500	mg/L	0	1	250	100	50	0	2	0.25	0	50	100
Chromium	52	Cr	1	500	mg/L	0	1	250	100	50	0	1	0.25	0	50	100
Chromium	53	Cr	1	500	mg/L	0	1	250	100	50			0.25	0	50	100
Iron	54	Fe	20	5500	mg/L	0	21	2500	1100	250	5000	0		0		
Manganese	55	Mn	1	500	mg/L	0	1	250	100	50	0	1	0.25	0	50	100
Iron	57	Fe	20	5500	mg/L	0	21	2500	1100	250	5000	0		0		
Cobalt	59	Co	1	500	mg/L	0	1	250	100	50	0	2	0.25	0	50	100
Nickel	60	Ni	1	500	mg/L	0	1	250	100	50	0	2	0.25	0	50	100
Copper	63	Cu	1	500	mg/L	0	1	250	100	50	0	1	0.25	0	50	100
Copper	65	Cu	1	500	mg/L	0	1	250	100	50	0	1	0.25	0	50	100
Zinc	66	Zn	1	500	mg/L	0	1	250	100	50	0	1	0.25	0	50	100
Zinc	67	Zn	1	500	mg/L	0	1	250	100	50			0.25	0	50	100
Zinc	68	Zn	1	500	mg/L	0	1	250	100	50			0.25	0	50	100
Germanium	72	Ge	1	500	mg/L	0	1	250	100	50				0	50	100
Arsenic	75	As	1	500	mg/L	0	1	250	100	50	0	1	0.25	0	50	100
Selenium	77	Se	1	500	mg/L	0	1	250	100	50			0.25	0	50	100
Selenium	82	Se	1	500	mg/L	0	1	250	100	50	0	1	0.25	0	50	100
Strontium	88	Sr	1	500	mg/L	0	1	250	100	50				0	50	100
Molybdenum	95	Mo	1	500	mg/L	0	1	250	100	50	100	100	0.25	0	50	100
Molybdenum	97	Mo	1	500	mg/L	0	1	250	100	50	100	100	0.25	0	50	100
Molybdenum	98	Mo	1	500	mg/L	0	1	250	100	50	100	100	0.25	0	50	100
Rhodium	103															
Silver	107	Ag	1	500	mg/L	0	1	250	100	50	0	1		0	50	100
Silver	109	Ag	1	500	mg/L	0	1	250	100	50				0	50	100
Cadmium	111	Cd	1	500	mg/L	0	1	250	100	50	0	0.5	0.25	0	50	100
Cadmium	114	Cd	1	500	mg/L	0	1	250	100	50			0.25	0	50	100
Tin	118	Sn	1	500	mg/L	0	1	250	100	50				0	50	100
Antimony	121	Sb	1	500	mg/L	0	1	250	100	50			0.25	0	50	100
Antimony	123	Sb	1	500	mg/L	0	1	250	100	50			0.25	0	50	100
Tellurium	128	Te	1	500	mg/L	0	1	250	100	50				0	50	100
Cesium	133															
Barium	135	Ba	1	500	mg/L	0	1	250	100	50				0	50	100
Barium	137	Ba	1	500	mg/L	0	1	250	100	50				0	50	100
Lanthanum	139	La	1	500	mg/L	0	1	250	100	50				0	50	100
Tantalum	159	Ta	1	500	mg/L	0	1	250	100	50				0	50	100
Platinum	195	Pt	1	500	mg/L	0	1	250	100	50				0	50	100
Gold	181	Au	1	500	mg/L	0	1	250	100	50				0	50	100
Thallium	205	Tl	1	500	mg/L	0	1	250	100	50				0	50	100
Lead	208	Pb	1	500	mg/L	0	1	250	100	50			0.25	0	50	100
Bismuth	209	Bi	1	500	mg/L	0	1	250	100	50				0	50	100
Thorium	232	Th	1	500	mg/L	0	1	250	100	50				0	50	100
Uranium	238	U	1	500	mg/L	0	1	250	100	50				0	50	100
Krypton	83															

elementOne

MERCURY BATCH DIGESTION - RUN WORKSHEET

Date Prepared/Digested: 041317 Prep By: JPB/DKH SIF File #: 041417-2
 Block #1 Temperature: 92.83 Start Time: 5:45 Machine ID: 2
 Block #2 Temperature: 92.31 Stop Time: 8:00 Batch Analyst: JPB
 Block #3 Temperature: ~95 Typed By: DKH Verified By: JPB

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>42-4602122</u>
3	0.04 ug	0.10ml		40	40	Working Standard
4	0.08 ug	0.20ml		40	40	Lot #: <u>42-093-1</u> by: <u>JPB</u>
5	0.16 ug	0.40ml		40	40	Standard #2 (QC #2):
6	0.20ug	0.50ml		40	40	Lot #: <u>42-093-2</u>
						Standard #3 (QC #3):
						Lot #: <u>42-093-3</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>JPB</u>

Initial Review By: JPBDate: 4/14/17Time: 12:33Final QC Review By: DKHDate: 4/14/17Time: 1511Comments: 29278-2BH

A/S	LAB #	Method	Wt (g)/ FV (mL)	Prep Aliquot Used, mL	Aliquot or Calc Mass	FV, mL or "1" for conc.	Comments
✓ 9	28813-80C	7470A			.05	5	TV = 7.45
10	L/L QC	↓			1	1	TV = .008
✓ 11	29220-23	M29			.5	100	
12	-23D	↓			↓	↓	
13	-23+	↓			↓	↓	
✓ 14	-13C	↓			4	400	
✓ 15	29221-7C	↓			4	↓	
16	-8C	↓			↓	↓	
17	-8CD	↓			↓	↓	
18	-9C	↓			↓	↓	
19	-9C+	↓			↓	↓	

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.H₂SO₄ @ 2.0ml..... HNO₃ @ 1.0ml..... Persulfate @ 3.2ml..... KMnO₄ @ 6.0mlH₂SO₄ Lot # 162185 HNO₃ Lot # 1116070 HCl Lot #: 4116060Persulfate Lot # 42-089-10 KMnO₄ Lot # 42-087-5 Hydrox Lot # 42-089-24 ^(see)

Clear samples after digestion with 2.4 ml of Hydroxylamine solution.

SIF File #: 041417-2

A/S	LAB #	Method	Wt (g)/ FV (mL)	Prep Aliquot Used, mL	Aliquot or Calc Mass	FV, mL or "1" for conc.	Comments
✓ 20	29274-LRB	M29			4	100	
21	-LRB+	↓			1.6	↓	
22	-1FH	↓			4	↓	
23	-2FH	↓				↓	
24	-2FHD	↓				↓	
25	-3FH	↓				↓	
26	-3FH+	↓				↓	
27	-4FH	↓				↓	
28	-1BH	↓				580	
29	-2BH	↓				620	
30	-2RHD	↓				↓	
31	-3BH	↓				600	
32	-3BH+	↓				↓	
33	-4BH	↓				200	
34	-5BH1A	↓				200	
35	-2A	↓				↓	
36	-2AD	↓				↓	
37	-3A	↓				↓	
38	-3A+	↓				↓	
39	-4A	↓				↓	
40	-1B	↓				500	
41	-2B	↓				↓	
42	-2BD	↓				↓	
43	-3B	↓				↓	
44	-3B+	↓				↓	
45	-4B	↓			↓	↓	
✓ 46	29263-10	7470A			10	↓	
47	-10+	↓			↓	↓	
48	-10	↓			5	↓	
49	-10+	↓			↓	↓	
50	29270/260/263/269/289-Tot LRB				4	↓	
51	-Tot LRB+				.2	↓	
✓ 52	29260-1		.5320/50	4	.0426	↓	
53	29263-1		.5074/50	1.52	.0408	↓	
54	-1D		↓	↓	↓	↓	

elementOne

MERCURY BATCH DIGESTION - RUN WORKSHEET

SIF File #: 041417

A/S	LAB #	Method	Wt (g)/ FV (mL)	Prep Aliquot Used, mL	Aliquot or Calc Mass	FV, mL or "1" for conc.	Comments
55	29269	7470A	.5920 / 50	4	.0474	1	
56	- +	↓	↓	↓	↓	↓	
57	29289	↓	.5140 / 50	↓	.0412	↓	
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elementOne

MERCURY BATCH DIGESTION - RUN WORKSHEET

Date Prepared/Digested: 04/18/17

Prep By: JBP

SIF File #: 041817-1

Block #1 Temperature: 93.51

Start Time: 8:50

Machine ID: 1

Block #2 Temperature: 94.09

Stop Time: 9:50

Batch Analyst: JBP

Block #3 Temperature: —

Typed By: DGH

Verified By: JBP

A/S	Curve & QC's	0.4ug/ml working std		BV, ml	FV, ml	Standard Lot Numbers
1	Lab BLK (3/ batch)	0		40	40	Standard #1 (for working std) Lot #: HZ-1602122
2	0.004 ug	0.01ml		40	40	Working Standard
3	0.04 ug	0.10ml		40	40	Lot #: Hg2-094-1 by: JBP
4	0.08 ug	0.20ml		40	40	Standard #2 (QC #2):
5	0.16 ug	0.40ml		40	40	Lot #: Hg2-094-2
6	0.20ug	0.50ml		40	40	Standard #3 (QC #3): Lot #: Hg2-094-3
7	QC #2= 0.08ug	0.2ml #2 std		40	40	
8	QC #3= 0.08ug	0.2ml #3 std		40	40	Curve prepared by: JBP

Initial Review By: JBP

Date: 4/18/17

Time: 1:05

Final QC Review By: LHW

Date: 04.18.17

Time: 2:52

Comments: 29221-13, 29289-35, 65-95, 29278-4C

A/S	LAB #	Method	Wt (g)/ FV (mL)	Prep Aliquot Used, mL	Aliquot or Calc Mass	FV, mL or "1" for conc.	Comments
9	28813-80	7470BA			.05	5	TV=7.45
10	L/L QC	↓			1	1	TV=.008
11	29221-13	M29			1	100	
12	-13	↓			2	↓	
13	-13	↓			4	↓	
14	-LRB	↓			↓	↓	
15	-LRB+	↓			1.6	↓	
16	-1FH	↓			4	↓	
17	-2FH	↓			↓	↓	
18	-2FHD	↓			↓	↓	
19	-3FH	↓			↓	↓	

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

"4" 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.H₂SO₄ @ 2.0ml..... HNO₃ @ 1.0ml..... Persulfate @ 3.2ml..... KMnO₄ @ 6.0mlH₂SO₄ Lot # 168345 HNO₃ Lot # 111670 HCl Lot # 4116060Persulfate Lot # Hg2-089-10 KMnO₄ Lot # Hg2-087-8 Hydrox Lot #: Hg2-089-4

Clear samples after digestion with 2.4 ml of Hydroxylamine solution.

SIF File #: 041817-1

A/S	LAB #	Method	Wt (g)/ FV (mL)	Prep Aliquot Used, mL	Aliquot or Calc Mass	FV, mL or "1" for conc.	Comments
20	29221-3FH	M29			4	100	
21	-4FH						
22	-5FH						
23	-5FHD						
24	-6FH						
25	-6FHD						
26	-7FH						
27	-8FH						
28	-8FHD						
29	-9FH						
30	-9FHD						
31	-10FH						
32	29278-1C					400	
33	-2C						
34	-2CD						
35	-3C						
36	-3C+						
37	-4C						
38	29290/291-BIK	7470A			20	1	
39	-BIK+						
40	29289-BIK						
41	-BIK+						
42	29289-1						
43	-2						
44	-328						
45	-3						
46	-3+						
47	-4						
48	-5						
49	-6						
50	-6+						
51	-7						
52	-8						
53	-9						
54	-9+						

SIF File #: 041817-1

A/S	LAB #	Method	Wt (g)/ FV (mL)	Prep Aliquot Used, mL	Aliquot or Calc Mass	FV, mL or "1" for conc.	Comments
55	29289-6	✓ 74-10A			20	1	
56	29290-1	✓			↓	↓	
57	-2	↓			↓	↓	
58	-20	↓			↓	↓	
59	29291-8	✓			↓	↓	
60	- +31	↓			↓	↓	
61	29267-5BH	✓ M29			↓	630	
62	-5BH	↓			↓	↓	
63	29278-2BH	✓			↓	310	
64	-2BH	↓			↓	↓	
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elementOne

MERCURY BATCH DIGESTION - RUN WORKSHEET

Date Prepared/Digested: 04/16/17 Prep By: JBP/DKH SIF File #: 041917-2
 Block #1 Temperature: 92.74 Start Time: 5:45 Machine ID: 2
 Block #2 Temperature: 93.94 Stop Time: 6:00 Batch Analyst: JBP
 Block #3 Temperature: 92.73 Typed By: DKH Verified By: JBP

A/S	Curve & QC's	0.4ug/ml working std		BV, ml	FV, ml	Standard Lot Numbers
1	Lab BLK (3/ batch)	0		40	40	Standard #1 (for working std) Lot #: <u>H2-H602122</u>
2	0.004 ug	0.01ml		40	40	Working Standard
3	0.04 ug	0.10ml		40	40	Lot #: <u>H2-094-1</u> by: <u>JBP</u>
4	0.08 ug	0.20ml		40	40	Standard #2 (QC #2):
5	0.16 ug	0.40ml		40	40	Lot #: <u>H2-094-2</u>
6	0.20ug	0.50ml		40	40	Standard #3 (QC #3):
						Lot #: <u>H2-094-3</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>JBP</u>

Initial Review By: JBP Date: 12/04/19/17 Time: 12:58
 Final QC Review By: KS Date: 4/20/17 Time: 1600
 Comments: 29268-11, -10

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>28813-8QC</u>	<u>7470A</u>			<u>.05</u>	<u>5</u>	<u>TV=7.45</u>
10	<u>L/h QC</u>	<u>↓</u>			<u>1</u>	<u>1</u>	<u>TV= .008</u>
11	<u>29268-11</u>	<u>M29</u>			<u>.05</u>	<u>5</u>	
12	<u>-11</u>	<u>↓</u>			<u>1</u>	<u>↓</u>	
13	<u>-11</u>	<u>↓</u>			<u>.2</u>	<u>↓</u>	
14	<u>-10</u>	<u>↓</u>			<u>1</u>	<u>100</u>	
15	<u>-10</u>	<u>↓</u>			<u>2</u>	<u>↓</u>	
16	<u>-16</u>	<u>↓</u>			<u>4</u>	<u>↓</u>	
17	<u>-LRB</u>	<u>↓</u>			<u>↓</u>	<u>↓</u>	
18	<u>-LRB+</u>	<u>↓</u>			<u>1.6</u>	<u>↓</u>	
19	<u>-LFH</u>	<u>↓</u>			<u>4</u>	<u>↓</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_2SO_4 @ 2.0ml..... HNO_3 @ 1.0ml..... Persulfate @ 3.2ml..... $KMnO_4$ @ 6.0ml

H_2SO_4 Lot # 168346 HNO_3 Lot # 1116070 HCl Lot # 4116260

Persulfate Lot # H2-089-10 $KMnO_4$ Lot # H2-087-8 Hydrox Lot # H2-089-11

Clear samples after digestion with 2.4 ml of Hydroxylamine solution.

SIF File #: 041917-2

A/S	LAB #	Method	Wt (g)/ FV (mL)	Prep Aliquot Used, mL	Aliquot or Calc Mass	FV, mL or "1" for conc.	Comments
20	29268-2FH	M29			4	100	
21	-2FH0				↓	↓	
22	-3FH				↓	↓	
23	-3FH+				↓	↓	
24	-4FH				↓	↓	
25	-5FH				↓	↓	
26	-5FH0				↓	↓	
27	-6FH				↓	↓	
28	-6FH+				↓	↓	
29	-7FH	↓			↓	↓	
30	29249-9	7470A	7		10	1	
31	-9+				↓	↓	
32	-9				5	↓	
33	-9+				↓	↓	
34	-6				10	↓	
35	-6+				↓	↓	
36	-6				5	↓	
37	-6+				↓	↓	
38	-3				10	↓	
39	-3+				↓	↓	
40	-3				5	↓	
41	-3+	↓			↓	↓	
42	29478-4C	M29			4	400	
43	29258-1RB	7470A			1	1	
44	-1RB+				1	↓	
45	29258				.0545	↓	
46	-Dup				.5071	↓	
47	-SpK	↓			.5952	↓	
48							
49							
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51							
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53							
54							

PerkinElmer ELAN 6100 ICP-MS

Method 6020 & 200.8 Metals Summary Report

Sample ID: Blank

Sample Date: Tuesday, April 18, 2017 19:35:27

Sample Description:

Concentration Results

	Analyte	Mass	Meas. Intens	Conc.	Mear Report Unit
	Li	6	285470.5		ppb
>	Sc	45	608542.1		ppb
>	Rh	103	783306.5		ppb
>	Ho	165	1056823.2		ppb
-	Pb	208	5568.8		ppb
	Kr	83	3404.4		mg/L

Method 6020 & 200.8 Metals Summary Report

Sample ID: Standard 1

Sample Date: Tuesday, April 18, 2017 19:37:55

Sample Description:

Concentration Results

	Analyte	Mass	Meas. Intens	Conc.	Mear Report Unit
	Li	6	285722.6		ppb
>	Sc	45	599021.3		ppb
>	Rh	103	779222.3		ppb
>	Ho	165	1026565.3		ppb
-	Pb	208	43733.1	0.97093	ppb
	Kr	83	3344.1		mg/L

Method 6020 & 200.8 Metals Summary Report

Sample ID: Standard 2

Sample Date: Tuesday, April 18, 2017 19:40:22

Sample Description:

Concentration Results

	Analyte	Mass	Meas. Intens	Conc.	Mear Report Unit
	Li	6	291510.3		ppb
>	Sc	45	610790.7		ppb
>	Rh	103	773315.4		ppb
>	Ho	165	1040427.5		ppb
-	Pb	208	4124461.4	102.97444	ppb
	Kr	83	3360.7		mg/L

Method 6020 & 200.8 Metals Summary Report

Sample ID: Standard 3

Sample Date: Tuesday, April 18, 2017 19:42:50

Sample Description:

Concentration Results

	Analyte	Mass	Meas. Intens	Conc.	Mear Report Unit
	Li	6	291292.7		ppb
>	Sc	45	610506.8		ppb
>	Rh	103	753660		ppb
>	Ho	165	1035941.4		ppb
-	Pb	208	19896893	499.40517	ppb
	Kr	83	3553.8		mg/L

Method 6020 & 200.8 Metals Summary Report

Sample ID: QC Std 1

Sample Date: Tuesday, April 18, 2017 19:45:18

Sample Description:

Concentration Results

	Analyte	Mass	Meas. Intens	Conc.	Mear Report Unit
	Li	6	312844.8		ppb
>	Sc	45	624204.2		ppb
>	Rh	103	777274.5		ppb
>	Ho	165	1037120.2		ppb
-	Pb	208	9357.6	0.09781	ppb
	Kr	83	3469.4		mg/L

PerkinElmer ELAN 6100 ICP-MS

Method 6020 & 200.8 Metals Summary Report

Sample ID: QC Std 2

Sample Date: Tuesday, April 18, 2017 19:47:45

Sample Description:

Concentration Results

	Analyte	Mass	Meas. Intens	Conc.	Mear Report Unit
	Li	6	309298		ppb
>	Sc	45	614547.6		ppb
>	Rh	103	782075.2		ppb
>	Ho	165	1032106.4		ppb
-	Pb	208	43261.3	0.95311	ppb
	Kr	83	3436.1		mg/L

Method 6020 & 200.8 Metals Summary Report

Sample ID: QC Std 3

Sample Date: Tuesday, April 18, 2017 19:50:13

Sample Description:

Concentration Results

	Analyte	Mass	Meas. Intens	Conc.	Mear Report Unit
	Li	6	312306.8		ppb
>	Sc	45	622100.6		ppb
>	Rh	103	770390		ppb
>	Ho	165	1051349.3		ppb
-	Pb	208	10118829	250.18237	ppb
	Kr	83	3511.4		mg/L

Method 6020 & 200.8 Metals Summary Report

Sample ID: QC Std 4

Sample Date: Tuesday, April 18, 2017 19:52:41

Sample Description:

Concentration Results

	Analyte	Mass	Meas. Intens	Conc.	Mear Report Unit
	Li	6	327246.2		ppb
>	Sc	45	633086.4		ppb
>	Rh	103	779191.2		ppb
>	Ho	165	1056295.6		ppb
-	Pb	208	4229062	103.99038	ppb
	Kr	83	3496.4		mg/L

Method 6020 & 200.8 Metals Summary Report

Sample ID: QC Std 5

Sample Date: Tuesday, April 18, 2017 19:55:09

Sample Description:

Concentration Results

	Analyte	Mass	Meas. Intens	Conc.	Mear Report Unit
	Li	6	330621.8		ppb
>	Sc	45	633589.6		ppb
>	Rh	103	793681.4		ppb
>	Ho	165	1064947.5		ppb
-	Pb	208	2091560.3	50.95085	ppb
	Kr	83	3495.4		mg/L

Method 6020 & 200.8 Metals Summary Report

Sample ID: QC Std 6

Sample Date: Tuesday, April 18, 2017 19:57:37

Sample Description:

Concentration Results

	Analyte	Mass	Meas. Intens	Conc.	Mear Report Unit
	Li	6	406343.4		ppb
>	Sc	45	782014.5		ppb
>	Rh	103	937458.8		ppb
>	Ho	165	1326234.1		ppb
-	Pb	208	3296.5	-0.07241	ppb
	Kr	83	3497.4		mg/L

Method 6020 & 200.8 Metals Summary Report

Sample ID: QC Std 7

Sample Date: Tuesday, April 18, 2017 20:00:05

Sample Description:

Concentration Results

	Analyte	Mass	Meas. Intens	Conc.	Mear Report Unit
	Li	6	399655.2		ppb
>	Sc	45	741582.7		ppb
>	Rh	103	890695.6		ppb
>	Ho	165	1266214.9		ppb
-	Pb	208	2023.1	-0.09548	ppb
	Kr	83	3522.8		mg/L

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Method 6020 & 200.8 Metals Summary Report

Sample ID: QC Std 8

Sample Date: Tuesday, April 18, 2017 20:02:33

Sample Description:

Concentration Results

	Analyte	Mass	Meas. Intens	Conc.	Mear Report Unit
	Li	6	926353.3		ppb
>	Sc	45	1511918.9		ppb
>	Rh	103	1824293.4		ppb
>	Ho	165	2579741.7		ppb
-	Pb	208	29780.2	0.16319	ppb
	Kr	83	3858.5		mg/L

Method 6020 & 200.8 Metals Summary Report

Sample ID: QC Std 2

Sample Date: Tuesday, April 18, 2017 20:05:01

Sample Description:

Concentration Results

	Analyte	Mass	Meas. Intens	Conc.	Mear Report Unit
	Li	6	361051.3		ppb
>	Sc	45	642044.2		ppb
>	Rh	103	793285.4		ppb
>	Ho	165	1072513.8		ppb
-	Pb	208	43903.4	0.9276	ppb
	Kr	83	3555.4		mg/L

Method 6020 & 200.8 Metals Summary Report

Sample ID: 29278 LRB FH

Sample Date: Tuesday, April 18, 2017 20:07:30

Sample Description:

Concentration Results

	Analyte	Mass	Meas. Intens	Conc.	Mear Report Unit
	Li	6	527606.5		ppb
>	Sc	45	867874.4		ppb
>	Rh	103	946727		ppb
>	Ho	165	1341738.7		ppb
-	Pb	208	6601.6	-0.00907	ppb
	Kr	83	4379.3		mg/L

Method 6020 & 200.8 Metals Summary Report

Sample ID: 29278 LRB FH

Sample Date: Tuesday, April 18, 2017 20:09:57

Sample Description:

Concentration Results

	Analyte	Mass	Meas. Intens	Conc.	Mear Report Unit
	Li	6	508583.2		ppb
>	Sc	45	846261		ppb
>	Rh	103	942061.3		ppb
>	Ho	165	1341563.1		ppb
-	Pb	208	2390051.4	46.19946	ppb
	Kr	83	4213.6		mg/L

Method 6020 & 200.8 Metals Summary Report

Sample ID: 29278-1 FH

Sample Date: Tuesday, April 18, 2017 20:12:25

Sample Description:

Concentration Results

	Analyte	Mass	Meas. Intens	Conc.	Mear Report Unit
	Li	6	476390.5		ppb
>	Sc	45	1017590.6		ppb
>	Rh	103	813503.1		ppb
>	Ho	165	1268305.1		ppb
-	Pb	208	18206857	373.21922	ppb
	Kr	83	4055.9		mg/L

Method 6020 & 200.8 Metals Summary Report

Sample ID: 29278-2 FH

Sample Date: Tuesday, April 18, 2017 20:14:52

Sample Description:

Concentration Results

	Analyte	Mass	Meas. Intens	Conc.	Mear Report Unit
	Li	6	316610.3		ppb
>	Sc	45	632010.7		ppb
>	Rh	103	678127.6		ppb
>	Ho	165	1057851.5		ppb
-	Pb	208	14996527	368.60758	ppb
	Kr	83	3332.7		mg/L

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Method 6020 & 200.8 Metals Summary Report

Sample ID: 29278-2 FH

Sample Date: Tuesday, April 18, 2017 20:17:20

Sample Description:

Concentration Results

	Analyte	Mass	Meas. Intens	Conc.	Mear Report Unit
	Li	6	313481.8		ppb
>	Sc	45	612478.4		ppb
>	Rh	103	665873.8		ppb
>	Ho	165	1066049.4		ppb
-	Pb	208	14744647	359.59431	ppb
	Kr	83	3362.4		mg/L

Method 6020 & 200.8 Metals Summary Report

Sample ID: 29278-3 FH

Sample Date: Tuesday, April 18, 2017 20:19:48

Sample Description:

Concentration Results

	Analyte	Mass	Meas. Intens	Conc.	Mear Report Unit
	Li	6	494130.6		ppb
>	Sc	45	920673		ppb
>	Rh	103	804075.5		ppb
>	Ho	165	1292069.3		ppb
-	Pb	208	13876320	279.1778	ppb
	Kr	83	4014.9		mg/L

Method 6020 & 200.8 Metals Summary Report

Sample ID: 29278-3 FH

Sample Date: Tuesday, April 18, 2017 20:22:15

Sample Description:

Concentration Results

	Analyte	Mass	Meas. Intens	Conc.	Mear Report Unit
	Li	6	481251.9		ppb
>	Sc	45	889508.8		ppb
>	Rh	103	769638.5		ppb
>	Ho	165	1238975.8		ppb
-	Pb	208	16047127	336.72916	ppb
	Kr	83	3991.6		mg/L

Method 6020 & 200.8 Metals Summary Report

Sample ID: 29278-4 FH

Sample Date: Tuesday, April 18, 2017 20:24:43

Sample Description:

Concentration Results

	Analyte	Mass	Meas. Intens	Conc.	Mear Report Unit
	Li	6	603512.8		ppb
>	Sc	45	1086129.4		ppb
>	Rh	103	933951.3		ppb
>	Ho	165	1417996.7		ppb
-	Pb	208	131012.9	2.26596	ppb
	Kr	83	4316		mg/L

Method 6020 & 200.8 Metals Summary Report

Sample ID: 29278 LRB BH

Sample Date: Tuesday, April 18, 2017 20:27:10

Sample Description:

Concentration Results

	Analyte	Mass	Meas. Intens	Conc.	Mear Report Unit
	Li	6	703354.6		ppb
>	Sc	45	1044964.9		ppb
>	Rh	103	1014696.4		ppb
>	Ho	165	1569239.1		ppb
-	Pb	208	4060.9	-0.06973	ppb
	Kr	83	4573.4		mg/L

Method 6020 & 200.8 Metals Summary Report

Sample ID: 29278 LRB BH

Sample Date: Tuesday, April 18, 2017 20:29:38

Sample Description:

Concentration Results

	Analyte	Mass	Meas. Intens	Conc.	Mear Report Unit
	Li	6	529130.3		ppb
>	Sc	45	813120.1		ppb
>	Rh	103	878033.9		ppb
>	Ho	165	1304982.8		ppb
-	Pb	208	2280997.6	45.32573	ppb
	Kr	83	4234.6		mg/L

PerkinElmer ELAN 6100 ICP-MS

Method 6020 & 200.8 Metals Summary Report

Sample ID: QC Std 1

Sample Date: Tuesday, April 18, 2017 20:32:06

Sample Description:

Concentration Results

	Analyte	Mass	Meas. Intens	Conc.	Mear Report Unit
	Li	6	444945.1		ppb
>	Sc	45	717309.8		ppb
>	Rh	103	835248.6		ppb
>	Ho	165	1164392.1		ppb
-	Pb	208	6962	0.01845	ppb
	Kr	83	3767.8		mg/L

Method 6020 & 200.8 Metals Summary Report

Sample ID: QC Std 4

Sample Date: Tuesday, April 18, 2017 20:34:33

Sample Description:

Concentration Results

	Analyte	Mass	Meas. Intens	Conc.	Mear Report Unit
	Li	6	452348.4		ppb
>	Sc	45	722090.5		ppb
>	Rh	103	831981		ppb
>	Ho	165	1163965.2		ppb
-	Pb	208	4610487.4	102.89726	ppb
	Kr	83	3805.5		mg/L

Method 6020 & 200.8 Metals Summary Report

Sample ID: 29278-1 BH

Sample Date: Tuesday, April 18, 2017 20:37:01

Sample Description:

Concentration Results

	Analyte	Mass	Meas. Intens	Conc.	Mear Report Unit
	Li	6	679716.7		ppb
>	Sc	45	1056569.1		ppb
>	Rh	103	1040640.7		ppb
>	Ho	165	1552239.6		ppb
-	Pb	208	654791.4	10.83437	ppb
	Kr	83	4828.1		mg/L

Method 6020 & 200.8 Metals Summary Report

Sample ID: 29278-2 BH

Sample Date: Tuesday, April 18, 2017 20:39:29

Sample Description:

Concentration Results

	Analyte	Mass	Meas. Intens	Conc.	Mear Report Unit
	Li	6	665158.9		ppb
>	Sc	45	1016857.5		ppb
>	Rh	103	982278.8		ppb
>	Ho	165	1514765.6		ppb
-	Pb	208	967979.6	16.48658	ppb
	Kr	83	4760.1		mg/L

Method 6020 & 200.8 Metals Summary Report

Sample ID: 29278-3 BH

Sample Date: Tuesday, April 18, 2017 20:41:56

Sample Description:

Concentration Results

	Analyte	Mass	Meas. Intens	Conc.	Mear Report Unit
	Li	6	684851.9		ppb
>	Sc	45	1020447.3		ppb
>	Rh	103	994367.6		ppb
>	Ho	165	1542144.6		ppb
-	Pb	208	966398.3	16.16159	ppb
	Kr	83	4663.8		mg/L

Method 6020 & 200.8 Metals Summary Report

Sample ID: 29278-3 BH

Sample Date: Tuesday, April 18, 2017 20:44:24

Sample Description:

Concentration Results

	Analyte	Mass	Meas. Intens	Conc.	Mear Report Unit
	Li	6	687443.1		ppb
>	Sc	45	1032433.2		ppb
>	Rh	103	998541.6		ppb
>	Ho	165	1554403		ppb
-	Pb	208	469959.3	7.72698	ppb
	Kr	83	4622.4		mg/L

PerkinElmer ELAN 6100 ICP-MS

Method 6020 & 200.8 Metals Summary Report

Sample ID: 29278-3 BH

Sample Date: Tuesday, April 18, 2017 20:46:51

Sample Description:

Concentration Results

	Analyte	Mass	Meas. Intens	Conc.	Mear Report Unit
	Li	6	681561.5		ppb
>	Sc	45	1032963.3		ppb
>	Rh	103	984145.6		ppb
>	Ho	165	1573845.4		ppb
-	Pb	208	3155637.2	52.01017	ppb
	Kr	83	4580.1		mg/L

Method 6020 & 200.8 Metals Summary Report

Sample ID: 29278-4 BH

Sample Date: Tuesday, April 18, 2017 20:49:18

Sample Description:

Concentration Results

	Analyte	Mass	Meas. Intens	Conc.	Mear Report Unit
	Li	6	700821.5		ppb
>	Sc	45	1044041.2		ppb
>	Rh	103	1015426.3		ppb
>	Ho	165	1577334.2		ppb
-	Pb	208	25121.3	0.27725	ppb
	Kr	83	4664.4		mg/L

Method 6020 & 200.8 Metals Summary Report

Sample ID: QC Std 1

Sample Date: Tuesday, April 18, 2017 20:51:46

Sample Description:

Concentration Results

	Analyte	Mass	Meas. Intens	Conc.	Mear Report Unit
	Li	6	440896.7		ppb
>	Sc	45	713578.6		ppb
>	Rh	103	827161.7		ppb
>	Ho	165	1170094.5		ppb
-	Pb	208	5774.5	-0.00869	ppb
	Kr	83	3797.8		mg/L

Method 6020 & 200.8 Metals Summary Report

Sample ID: QC Std 2

Sample Date: Tuesday, April 18, 2017 20:54:15

Sample Description:

Concentration Results

	Analyte	Mass	Meas. Intens	Conc.	Mear Report Unit
	Li	6	451821.7		ppb
>	Sc	45	715028.8		ppb
>	Rh	103	826994.6		ppb
>	Ho	165	1150901.1		ppb
-	Pb	208	47285	0.93155	ppb
	Kr	83	3815.2		mg/L

Method 6020 & 200.8 Metals Summary Report

Sample ID: QC Std 4

Sample Date: Tuesday, April 18, 2017 20:56:43

Sample Description:

Concentration Results

	Analyte	Mass	Meas. Intens	Conc.	Mear Report Unit
	Li	6	442512.1		ppb
>	Sc	45	721764.5		ppb
>	Rh	103	822326.1		ppb
>	Ho	165	1173600		ppb
-	Pb	208	4604006.1	101.89303	ppb
	Kr	83	3725.5		mg/L

PerkinElmer FIMS-100 CVAA Mercury Analyzer

Sample_ID	Date	Time	Mean_Sig	Mean_Rd	Mean_Rt	Units	Alq.	Vol.	Sig 1	Reading-1	Result-1	Sig 2	Reading-2	Result-2	Cor. Coeff.
Calib Blank	4/14/2017	10:22:23 AM	0.00095813			µg			0.00102017			0.0008961			
STD1 = .004ug	4/14/2017	10:24:05 AM	0.00113907			µg			0.00107777			0.00120037			
STD2 = .04ug	4/14/2017	10:25:48 AM	0.001185075			µg			0.01190844			0.01179305			
STD3 = .08ug	4/14/2017	10:27:42 AM	0.02366404			µg			0.02375458			0.02357349			
STD4 = .16ug	4/14/2017	10:29:37 AM	0.04788899			µg			0.04794591			0.04783207			
STD5 = .2ug	4/14/2017	10:31:31 AM	0.05970287			µg			0.05983021			0.05957554			
Reagent Blank	4/14/2017	10:33:24 AM	-1.13E-05	-3.77E-05	-3.77E-05	µg			6.81E-06	2.28E-05	2.28E-05	-2.93E-05	-9.83E-05	-9.83E-05	
0.004ug = DL	4/14/2017	10:35:06 AM	0.00115489	0.00386891	0.00386891	µg			0.00113914	0.00381613	0.00381613	0.00117065	0.00392169	0.00392169	0.999984429
0.080ug = QC STD 2	4/14/2017	10:36:48 AM	0.02377232	0.07963785	0.07963785	µg			0.02370405	0.07940914	0.07940914	0.0238406	0.07986656	0.07986656	0.999984429
0.080ug = QC STD 3	4/14/2017	10:38:40 AM	0.02392326	0.0801435	0.0801435	µg			0.0240249	0.08048398	0.08048398	0.02382163	0.07980302	0.07980302	0.999984429
Reagent Blank	4/14/2017	10:40:33 AM	3.29E-05	0.00011016	0.00011016	µg			4.31E-05	0.00014435	0.00014435	2.27E-05	7.60E-05	7.60E-05	0.999984429
0.004ug = DL	4/14/2017	11:00:08 AM	0.00124311	0.00416444	0.00416444	µg			0.00120163	0.00402547	0.00402547	0.00128459	0.00430341	0.00430341	0.999984429
0.080ug = QC STD 2	4/14/2017	11:01:50 AM	0.02396414	0.08028043	0.08028043	µg			0.02390754	0.08009084	0.08009084	0.02402073	0.08047002	0.08047002	0.999984429
Reagent Blank	4/14/2017	11:03:43 AM	6.16E-05	0.00020627	0.00020627	µg			7.35E-05	0.00024624	0.00024624	4.96E-05	0.00016631	0.00016631	0.999984429
29278-LRB	4/14/2017	11:07:18 AM	-0.0001983	-0.0006265	-0.015663	µg	4	100	-0.0001635	-0.0005101	-0.012752	-0.000233	-0.000743	-0.0185741	0.999984429
29278-LRB SPK	4/14/2017	11:09:01 AM	0.02500612	0.08380885	5.23805298	µg	1.6	100	0.02517099	0.08436114	5.27257095	0.02484126	0.08325656	5.203535	0.999984429
29278-1 FH	4/14/2017	11:10:56 AM	0.00020723	0.00073197	0.01829933	µg	4	100	0.00018302	0.00065087	0.01627176	0.00023144	0.00081308	0.0203269	0.999984429
29278-2 FH	4/14/2017	11:12:40 AM	2.69E-05	0.00012784	0.00319589	µg	4	100	3.13E-05	0.00014257	0.00356434	2.25E-05	0.0001131	0.00282744	0.999984429
29278-2 FH DUP	4/14/2017	11:14:25 AM	0.00033483	0.00115943	0.02898563	µg	4	100	0.00029234	0.00101709	0.02542734	0.00037732	0.00130176	0.03254392	0.999984429
29278-3 FH	4/14/2017	11:16:09 AM	0.00034465	0.00119231	0.02980786	µg	4	100	0.00033589	0.00116299	0.02907471	0.0003534	0.00122164	0.03054101	0.999984429
29278-3 FH SPK	4/14/2017	11:17:53 AM	0.02626649	0.0880311	2.20077756	µg	4	100	0.02635197	0.08831747	2.20793677	0.02618101	0.08774473	2.19361835	0.999984429
29278-4 FH	4/14/2017	11:19:46 AM	5.16E-05	0.00021057	0.00526428	µg	4	100	0.00010495	0.00038932	0.00973303	-1.77E-06	3.18E-05	0.00079552	0.999984429
29278-1 BH	4/14/2017	11:21:29 AM	0.00064579	0.00220115	0.3191667	µg	4	580	0.00069006	0.00234947	0.34067344	0.00060151	0.00205283	0.29765996	0.999984429
0.004ug = DL	4/14/2017	11:23:12 AM	0.00120425	0.00403428	0.00403428	µg			0.00121425	0.00406777	0.00406777	0.00119426	0.00400078	0.00400078	0.999984429
0.080ug = QC STD 2	4/14/2017	11:24:55 AM	0.0237687	0.07962572	0.07962572	µg			0.02369663	0.07938427	0.07938427	0.02384078	0.07986717	0.07986717	0.999984429
Reagent Blank	4/14/2017	11:26:48 AM	3.81E-05	0.00012766	0.00012766	µg			8.20E-05	0.00027484	0.00027484	-5.83E-06	-1.95E-05	-1.95E-05	0.999984429
29278-3 BH	4/14/2017	11:31:55 AM	0.00086908	0.00294918	0.44237666	µg	4	600	0.00085256	0.00289384	0.43407651	0.0008856	0.00300451	0.45067681	0.999984429
29278-3 BH SPK	4/14/2017	11:33:39 AM	0.02647197	0.08871945	13.3079178	µg	4	600	0.0264841	0.08876009	13.314013	0.02645984	0.08867882	13.3018227	0.999984429
29278-4 BH	4/14/2017	11:35:33 AM	-9.62E-05	-0.0002846	-0.0142319	µg	4	200	-0.0001014	-0.0003021	-0.015103	-9.10E-05	-0.0002672	-0.0133608	0.999984429
29278-1 A	4/14/2017	11:37:17 AM	0.00015317	0.00055085	0.02754264	µg	4	200	0.00018953	0.00067268	0.0336338	0.0001168	0.00042903	0.02145148	0.999984429
29278-2 A	4/14/2017	11:39:01 AM	-9.18E-05	-0.0002697	-0.0134849	µg	4	200	-0.0001021	-0.0003044	-0.0152216	-8.14E-05	-0.000235	-0.0117482	0.999984429
29278-2 A DUP	4/14/2017	11:40:46 AM	-5.28E-05	-0.000139	-0.006951	µg	4	200	-2.87E-05	-5.83E-05	-0.0029146	-7.69E-05	-0.0002197	-0.0109874	0.999984429
29278-3 A	4/14/2017	11:42:30 AM	0.00018694	0.000664	0.0332	µg	4	200	0.00023516	0.00082554	0.04127723	0.00013872	0.00050246	0.02512276	0.999984429
29278-3 A SPK	4/14/2017	11:44:15 AM	0.02532846	0.08488867	4.24443348	µg	4	200	0.02527153	0.08469795	4.23489747	0.02538539	0.08507939	4.2539695	0.999984429
0.004ug = DL	4/14/2017	11:47:51 AM	0.000127954	0.00428648	0.00428648	µg			0.00132852	0.00445059	0.00445059	0.00123055	0.00412237	0.00412237	0.999984429
0.080ug = QC STD 2	4/14/2017	11:49:33 AM	0.02398718	0.08035763	0.08035763	µg			0.02394437	0.0802142	0.0802142	0.02403	0.08050106	0.08050106	0.999984429
Reagent Blank	4/14/2017	11:51:26 AM	1.41E-05	4.74E-05	4.74E-05	µg			2.86E-05	9.58E-05	9.58E-05	-3.00E-07	-1.01E-06	-1.01E-06	0.999984429
29278-4 A	4/14/2017	11:53:09 AM	-0.0001963	-0.0006198	-0.0309891	µg	4	200	-0.0002234	-0.0007107	-0.0355369	-0.0001691	-0.0005288	-0.0264413	0.999984429
29278-1 B	4/14/2017	11:54:52 AM	0.01615764	0.05416623	6.77077835	µg	4	500	0.01604406	0.05378573	6.72321652	0.01627122	0.05454672	6.81834017	0.999984429
29278-2 B	4/14/2017	11:56:46 AM	0.01488932	0.04991732	6.23966505	µg	4	500	0.01489979	0.04995239	6.24404852	0.01487885	0.04988225	6.23528157	0.999984429
29278-2 B DUP	4/14/2017	11:58:40 AM	0.01446828	0.04850682	6.06335193	µg	4	500	0.01444595	0.04843202	6.05400194	0.01449061	0.04858162	6.07270193	0.999984429
29278-3 B	4/14/2017	12:00:35 PM	0.02018932	0.06767244	8.45905473	µg	4	500	0.02021159	0.06774704	8.4683804	0.02016705	0.06759783	8.44972906	0.999984429
29278-3 B SPK	4/14/2017	12:02:29 PM	0.04545854	0.15232494	19.0406174	µg	4	500	0.04519062	0.15142739	18.9284241	0.04572647	0.15322249	19.1528107	0.999984429
29278-4 B	4/14/2017	12:04:23 PM	-2.55E-05	-4.76E-05	-0.0059505	µg	4	500	-4.12E-05	-0.0001004	-0.0125504	-9.72E-06	5.20E-06	0.00064944	0.999984429
0.004ug = DL	4/14/2017	12:11:30 PM	0.00110593	0.00370489	0.00370489	µg			0.00108791	0.00364454	0.00364454	0.00112394	0.00376523	0.00376523	0.999984429
0.080ug = QC STD 2	4/14/2017	12:13:12 PM	0.02424312	0.08121503	0.08121503	µg			0.02423626	0.08119203	0.08119203	0.02424998	0.08123802	0.08123802	0.999984429
Reagent Blank	4/14/2017	12:15:04 PM	9.80E-06	3.28E-05	3.28E-05	µg			-4.90E-06	-1.64E-05	-1.64E-05	2.45E-05	8.21E-05	8.21E-05	0.999984429
Calib Blank	4/18/2017	10:32:59 AM	0.00066036			µg			0.00066071			0.00066001			
STD1 = .004ug	4/18/2017	10:34:41 AM	0.00135475			µg			0.0013881			0.00132141			
STD2 = .04ug	4/18/2017	10:36:23 AM	0.01510371			µg			0.01511378			0.01509365			
STD3 = .08ug	4/18/2017	10:38:16 AM	0.03057674			µg			0.03057729			0.03057619			
STD4 = .16ug	4/18/2017	10:40:11 AM	0.06122092			µg			0.06126103			0.0611808			
STD5 = .2ug	4/18/2017	10:42:03 AM	0.07983111			µg			0.07977286			0.07988936			
Reagent Blank	4/18/2017	10:43:56 AM	-0.0001679	-0.0004286	-0.0004286	µg			-0.0001875	-0.0004787	-0.0004787	-0.0001483	-0.0003786	-0.0003786	
0.004ug = DL	4/18/2017	10:47:18 AM	0.00152108	0.00388391	0.00388391	µg			0.001553313	0.00391468	0.00391468	0.00150903	0.00385314	0.00385314	0.999358295
0.080ug = QC STD 2	4/18/2017	10:49:00 AM	0.03148755	0.08039989	0.08039989	µg			0.03165337	0.08082332	0.08082332	0.03132172	0.07997647	0.07997647	0.999358295
0.080ug = QC STD 3	4/18/2017	10:50:52 AM	0.03406413	0.0869789	0.0869789	µg			0.03417598	0.08726451	0.08726451	0.03395227	0.08669329	0.08669329	0.999358295
Reagent Blank	4/18/2017	10:52:45 AM	-0.0001607	-0.0004104	-0.0004104	µg			-0.0001563	-0.0003991	-0.0003991	-0.0001652	-0.0004217	-0.0004217	0.999358295
0.004ug = DL	4/18/2017	11:34:55 AM	0.00161004	0.00411106	0.00411106	µg			0.00156627	0.0039993	0.0039993	0.00165381	0.00422282	0.00422282	0.999358295
0.080ug = QC STD 2	4/18/2017	11:36:37 AM	0.03166984	0.08086535	0.08086535	µg			0.03156259	0.08059151	0.08059151	0.03177708	0.0811392	0.0811392	0.999358295
Reagent Blank	4/18/2017	11:38:28 AM	-0.0001528	-0.0003901	-0.0003901	µg			-0.0001259	-0.0003213	-0.0003213	-0.0001797	-0.0004588	-0.0004588	0.999358295
29278-1 C	4/18/2017	11:45:26 AM	0.019005	0.04895578	4.89557808	µg	4	400	0.01895658	0.04883213	4.88321279	0.01905343	0.04907943	4.90794338	0.999358295
29278-2 C	4/18/2017	11:47:20 AM	0.0												

PerkinElmer FIMS-100 CVAA Mercury Analyzer

Sample_ID	Date	Time	Mean_Sig	Mean_Rd	Mean_Rt	Units	Alq.	Vol.	Sig 1	Reading-1	Result-1	Sig 2	Reading-2	Result-2	Cor. Coeff.
Reagent Blank	4/19/2017	12:03:38 PM	-3.19E-05	-0.0001108	-0.0001108	µg			-1.43E-05	-4.97E-05	-4.97E-05	-4.94E-05	-0.0001719	-0.0001719	
0.004ug = DL	4/19/2017	12:07:02 PM	0.00116378	0.00404901	0.00404901	µg			0.00114182	0.00397259	0.00397259	0.00118575	0.00412543	0.00412543	0.999980251
0.080ug = QC STD 2	4/19/2017	12:08:45 PM	0.02265425	0.07881823	0.07881823	µg			0.02260693	0.0786536	0.0786536	0.02270156	0.07898285	0.07898285	0.999980251
Reagent Blank	4/19/2017	12:10:38 PM	-2.10E-06	-7.30E-06	-7.30E-06	µg			-2.94E-05	-0.0001023	-0.0001023	2.52E-05	8.77E-05	8.77E-05	0.999980251
0.004ug = DL	4/19/2017	12:30:20 PM	0.00109354	0.00380463	0.00380463	µg			0.00110166	0.00383288	0.00383288	0.00108542	0.00377638	0.00377638	0.999980251
0.080ug = QC STD 2	4/19/2017	12:32:02 PM	0.02207644	0.07680794	0.07680794	µg			0.02219375	0.07721608	0.07721608	0.02195913	0.07639979	0.07639979	0.999980251
Reagent Blank	4/19/2017	12:33:55 PM	-3.99E-06	-1.39E-05	-1.39E-05	µg			1.04E-06	3.61E-06	3.61E-06	-9.01E-06	-3.13E-05	-3.13E-05	0.999980251
29478-4 C	4/19/2017	12:41:09 PM	8.92E-05	0.00042129	0.04212884	µg	4	400	0.00010804	0.00048671	0.04867104	7.04E-05	0.00035587	0.03558664	0.999980251
0.004ug = DL	4/19/2017	12:51:52 PM	0.00110111	0.00383095	0.00383095	µg			0.00111541	0.00388072	0.00388072	0.0010868	0.00378119	0.00378119	0.999980251
0.080ug = QC STD 3	4/19/2017	12:53:34 PM	0.02383558	0.08292831	0.08292831	µg			0.02406433	0.08372416	0.08372416	0.02360684	0.08213245	0.08213245	0.999980251
Reagent Blank	4/19/2017	12:55:27 PM	2.37E-05	8.24E-05	8.24E-05	µg			1.07E-05	3.72E-05	3.72E-05	3.67E-05	0.00012757	0.00012757	0.999980251

Appendix D

Calibration Data



Routine Dry Gas Meter Calibration

Control Module: C-5 Leak checks Barometric Press. -- 28.23
Date: 04/03/17 Negative pass >5 W.C. Previous Y -- 0.9804
Technician: DJK Positive - pass > in.Hg Previous Delta H -- 1.9850

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@
Inlet	Outlet								
Nominal 0.500	Initial 4744.00	Initial 68.0	Initial 65.0	Initial 72.0	Initial 571.870				
Actual	Final 4755.00	Final 70.0	Final 68.0	Final 72.0	Final 582.600	Minutes 26	SEC 49		
0.50	Total 11.00	Average 69.0	Average 66.5	Average 72.0	Total 10.730	Minutes 26.82		1.0157	1.7938
		67.8							
Nominal 1.000	Initial 4756.00	Initial 70.0	Initial 68.0	Initial 72.0	Initial 583.590				
Actual	Final 4762.00	Final 72.0	Final 69.0	Final 72.0	Final 589.490	Minutes 10.0	SEC 32		
1.00	Total 6.00	Average 71.0	Average 68.5	Average 72.0	Total 5.900	10.53		1.0100	1.8533
		69.8	Tm						
Nominal 2.000	Initial 4731.00	Initial 65.0	Initial 60.0	Initial 72.0	Initial 559.190				
Actual	Final 4743.00	Final 68.0	Final 64.0	Final 72.0	Final 570.900	Minutes 15	SEC 20		
2.00	Total 12.00	Average 66.5	Average 62.0	Average 72.0	Total 11.710	15.33		1.0046	1.9881
		64.3	Tm						
Nominal 3.000	Initial 4763.00	Initial 72.0	Initial 69.0	Initial 72.0	Initial 590.480				
Actual	Final 4775.00	Final 75.0	Final 69.0	Final 72.0	Final 602.390	Minutes 12.0	SEC 28		
3.00	Total 12.00	Average 73.5	Average 69.0	Average 72.0	Total 11.910	12.47		0.9983	1.9453
		71.3	Tm						
Nominal 4.000	Initial 4776.00	Initial 75.0	Initial 69.0	Initial 72.0	Initial 603.380				
Actual	Final 4788.00	Final 76.0	Final 70.0	Final 72.0	Final 615.200	Minutes 10.0	SEC 50		
4.00	Total 12.00	Average 75.5	Average 69.5	Average 72.0	Total 11.820	10.83		1.0057	1.9567
		72.5	Tm						
					Average			1.0069	1.9074

U.S. Steel Corporation
Keetac
Keewatin, Minnesota

Barr Engineering Co.
May 15, 2017

Emission Measurement Center (EMC) Approved Alternate Method (ALT-009)
Alternative Method 5 Post-Test Calibration
Waste Gas Stack (SV051)
Control Module C-5
Test 1

Input Data	Symbol	Units	Run 1	Run 2	Run 3
Test date	-	-	04/05/2017	04/05/2017	04/05/2017
Test period	-	-	917 - 1136	1237 - 1451	1709 - 1922
Total run time	t	min	120	120	120
Total sample volume measured by dry gas meter	V _m	acf	83.0	86.7	88.9
Absolute average dry gas meter temp	T _m	°F	44.1	49.6	64.0
Absolute average dry gas meter temp	T _m	°R	503.7	509.3	523.7
Barometric pressure	P _b	inches Hg	28.6	28.6	28.6
Conversion factor (29.92/528)(0.75) ²	---	(in Hg/°R) cfm ²	0.0319	0.0319	0.0319
Average orifice meter differential	Δ h _{avg}	in. H ₂ O	1.70	1.84	1.86
Orifice meter calibration coefficient	Δ H _@	in. H ₂ O	1.91	1.91	1.91
Dry molecular weight of stack gas	M _d	lb/lb-mole	28.90	28.90	28.90
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 _{qa}	Dimensionless	1.0219	1.0247	1.0199
Dry gas meter calibration factor	Y	Dimensionless	1.0069	1.0069	1.0069
Average of Y _{qa} 's from test run series	1.0222	$Y_{qa} = \frac{t}{V_m} \sqrt{\frac{0.0319 \cdot T_m}{\Delta H_{@} (P_b + \frac{\Delta h_{avg}}{13.6})} \frac{29}{M_d}} \cdot (\sqrt{\Delta h_{avg}})$			
Dry gas meter calibration factor	1.0069				
% difference between average Y _{qa} 's and Y (must be within ± 5%)	-1.52%				

Meter Pyrometer Calibration

Meter I.D.		C-5				
Temperature	CL-300-100F	X	X	X	X	X
Calibrator Used	CL-3512-A					
DATE		01/06/2017	01/06/2017	01/06/2017	01/06/2017	01/06/2017
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	996				996
900	890 to 910	897				896
800	791 to 809	806				796
700	692 to 708	697				697
600	593 to 607	596				596
500	493 to 507	494	495	495		495
400	394 to 406	395	396	396		396
300	295 to 305	297	298	298		298
200	196 to 204	197	197	197		197
150	146 to 154	147	148	147	147	147
100	96 to 104	96	96	96	96	96
50	47 to 53	47	47	47	47	47
0	-3 to 3	-2			-1	-1
-50	-53 to -47	-53			-53	-53

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

Fail indicated by cell highlighting

Reviewed By:





THERMOCOUPLE CALIBRATION

Meter In THERMOCOUPLE ID C5-I
Cal Date: 01/31/2017 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		01/20/2016	JM Test Systems
Temperature Calibration Points	20	70	150	
Reference Deg F (To)	20	70	150	
Probe Temp (deg F)	21.0	70.0	149.0	
Difference (degrees)	1.0	0.0	1.0	
TC Meets Method 5 Specifications: (± 2.0 °F)				
	YES	YES	YES	

Reviewed by: 



THERMOCOUPLE CALIBRATION

Meter Out THERMOCOUPLE ID C5-O
Cal Date: 01/31/2017 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		01/20/2016	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: (± 2.0 °F)				
	YES	YES	YES	

Reviewed by:



THERMOCOUPLE CALIBRATION

Impinger Outlet TC

THERMOCOUPLE ID TIO-5

Cal Date: 01/25/2017

Umbilical 300-3

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

01/20/2016

JM Test Systems

Temperature Calibration Points	20	70	150
Reference Deg F (To)	20	70	150
Probe Temp (deg F)	21.0	70.0	151.0
Difference (degrees)	1.0	0.0	1.0
TC Meets Method 5 Specifications: (± 2.0 °F)	YES	YES	YES

Reviewed by: 



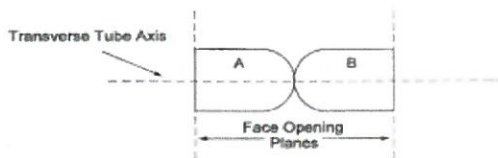
S-Type Pitot Tube Geometry Check

Pitot Tube
Number: 7-3
Length: 7'
Function: M-5 Probe / Free

Inspection Date: 1-3-17
Technician: RMP

1. Are face openings perpendicular to tube axis?

☒ YES (go to 2) ☐ NO (go to 1a)



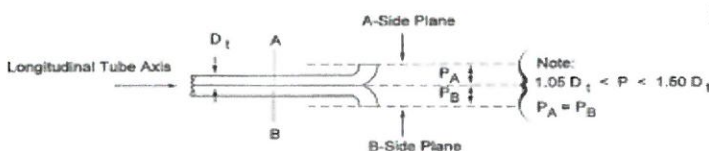
1a. If NO, is angle less than 10°?

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



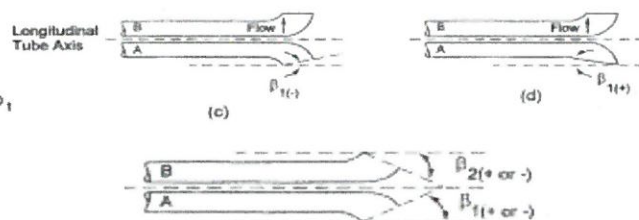
2. Are face openings parallel to longitudinal axis?

☒ YES (go to 3) ☐ NO (go to 2a)



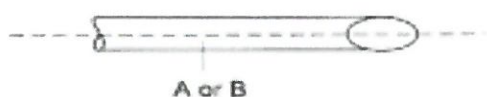
2a. If NO, is angle less than 5°?

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



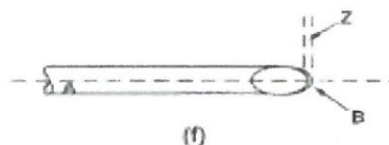
3. Are legs of equal length?

☒ YES (go to 4) ☐ NO (go to 3a)



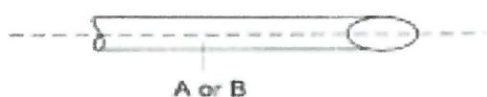
3a. If NO, is difference less than 1/8 inch?

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



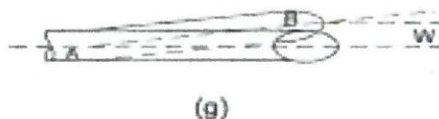
4. Are center-lines of legs coincident?

☒ 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 7-3

Cal Date: 01/02/2017

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

01/20/2016

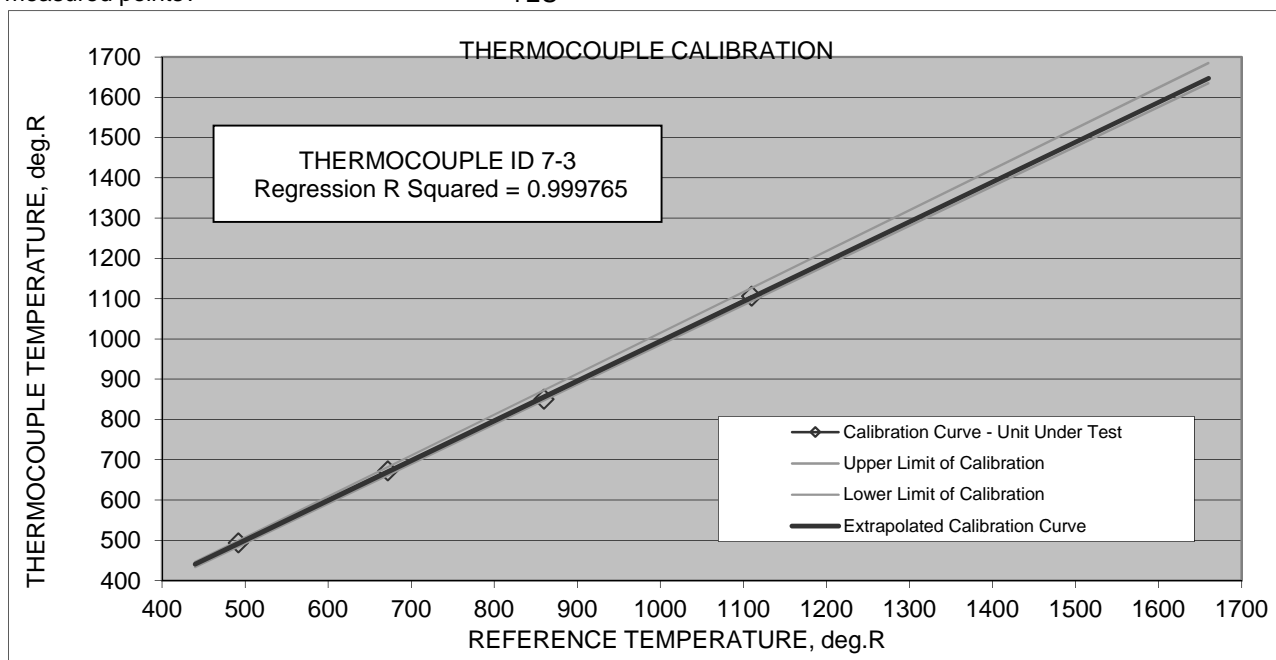
LABORATORY

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	212	390	646	70
Reference Temp (deg R) deg F + 460	492	672	860	1110	530
Probe Temp (deg R), deg F + 460	493	672	850	1106	530
Difference (degrees)	-1	0	10	4	0
% Diff Abs. T	0.2%	0.0%	1.2%	0.4%	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:

U.S. Steel Corporation
Keetac
Keewatin, Minnesota

Barr Engineering Co.
April 5, 2017

Nozzle Calibration
Waste Gas Stack (SV051)
Test 1

Nozzle Calibration

Nozzle No.

glass

Used for Runs:

1

 -

3

Point Measurement, inches

1	0.250
2	0.250
3	0.250
Average	0.250

Test Date 04/05/2017
Date Measured: 04/05/2017

Technician: DJK

Signature: 



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.

		NWS Observation		Field Barometer			Barr Office				
Date	Technician	Time	Altimeter	ID	Time	Barometric Pressure	Station Pressure	Condition	Remarks		Offset
3/9/17	DJK	9:53	30.24	BA-23	10:00	28.75	28.78	In Calibration	As Found		-0.03
5/1/17	DJK	14:53	29.49	BA-23	15:01	28.06	28.03	In Calibration	As Found		0.03

Appendix E

Process Operating Data

Air Performance Test Form

Operating Data Summary for Process Sources

Facility Information (please print)

Company Name: U.S. Steel Corporation

Equipment ID No: SV051

Test date(s): 04/05/17

Equipment and Operating Data

- Process Equipment Description: Waste Gas Stack
- Were the process and control equipment operated consistent with normal procedures? ☒ Yes ☐ No If no, explain: _____
- Include copy of production records or instrumentation which indicates rate of production or operation of the equipment, i.e. units per hour, pounds per hour, pressure, air flow, etc.
- Date(s) and procedure(s) of last maintenance/cleaning within 6 months:
☒ Remains unchanged from info. provided in test plan
- Process rate (amount of raw material or finished product per hour, wet or dry basis) while combusting (list fuel type(s) and ratios as appropriate _____)

Process Parameter: list type and units	Run 1	Run 2	Run 3	Run 4	Average
Greenball Feed Rate, LTPH	887	876	854		872.3333333
Fired Pellet Production Rate, LTPH	616	609	594		606.3
Fuel Input (list units)					
Heat Input (10⁶ British thermal units/hour) Gas only	216	230	211		218.9

- Summarize control equipment operating data documented during testing. Values reported should reflect maximum, minimum, averages, or as approved in the test plan. (See test plan and approval letter)

Examples of APC equipment and parameters generally monitored. Monitor as in test plan and/or approval letter.

- Scrubber (list type of scrubber): DP (in. w.c.) and feed rate (gpm and psig)
- Baghouse, Cyclone, and Multi-clone: DP (in. w.c.)
- Catalytic Incinerator : (°F_{in} , °F_{out}) and Thermal Incinerator: (°F_{temperature})
- ESP: Number and identity of operating field(s)

APC and parameter monitored	Run 1	Run 2	Run 3	Run 4	Average
CE110 Lower dP (in. W.C)	9.9	9.7	10		9.9
CE110 Upper dP (in. W.C)	10.2	10.1	10.4		10.2
CE110 Scrubber Water Flow, GPM	2200	2200	2199		2199.7
CE111 Lower dP (in. W.C)	12.2	12.1	12.3		12.2
CE111 Upper dP (in. W.C)	12.4	12.2	12.5		12.4
CE111 Scrubber Water Flow, GPM	2200	2201	2200		2200.3
List pollutant & averaging basis.--should reflect permit	Run 1	Run 2	Run 3	Run 4	Average
Continuous Opacity Monitor(list hourly average)					
Monitor (list averaging basis):					
Monitor (list averaging basis):					

Abbreviations: APC=air pollution control
lbs.-pounds

gpm.=gallons per minute
psig=pressure per square inch gauge

in. w.c.=inches of water column
ΔP=pressure drop

Note: This form provides only a summary of the operating conditions during the performance test. Additional and more detailed records are required to meet the requirements of Minn. R. 7017.2035, subp. 3. This form is to be submitted as part of the performance test report

Process Data Summary

Waste Gas (SV051)

5-Apr-17

Run Time	Feed Rates LTPH		Prod. Rate LTPH	Kiln Gas MBTUH	Total MBTUH	4A-04-62			4A-04-63		
	Green ball	To Grate				Lower dP	Upper dP	GPM	Lower dP	Upper dP	GPM
0917-1136	887	726	616	216.4	216.4	9.9	10.2	2200	12.2	12.4	2201
1237-1451	876	734	609	229.7	229.7	9.7	10.1	2200	12.1	12.2	2201
1709-1922	854	705	594	211.1	211.1	10.0	10.4	2199	12.3	12.5	2200

Waste Gas Stack
Process Data

run 1-0917-1136	886.85	160.56	216.42	2200.24	10.21	9.90	2200.53	12.35	12.21
run 2-1237-1451	876.39	142.08	229.74	2200.02	10.10	9.73	2200.67	12.21	12.08
run 3-1709-1922	854.12	148.93	211.08	2199.20	10.38	9.97	2199.51	12.50	12.35

4/5/2017 9:04 GREEN BALL FEED RATE	FINES	GAS FLOW	4A (North)Total Venturi Flow	4A (North) Venturi Diff Press Upper	4A (North) Venturi Diff Press Lower	4B (South)Total Venturi Flow	4B (South) Venturi Diff Press Upper	4B (South) Venturi Diff Press Lower
4/5/2017 19:25 Q5-BL05-400317	Q4-IND02-401	Q4-IND02-401617	Q4-SC10-N_VENTURI_FLOW	Q4-SC10-PDT_5022	Q4-SC10-PDT_5023	Q4-SC10-S_VENTURI_FLOW	Q4-SC10-PDT_5026	Q4-SC10-PDT_5027
05-Apr-17 09:04:00	907.03	163.40	217.34	2199.35	10.29	9.96	2195.63	12.30
05-Apr-17 09:05:00	910.53	167.34	223.63	2202.29	10.33	9.98	2197.35	12.36
05-Apr-17 09:06:00	926.94	171.97	223.72	2203.78	10.29	9.95	2197.28	12.30
05-Apr-17 09:07:00	916.04	172.17	219.69	2217.21	10.21	9.89	2206.31	12.30
05-Apr-17 09:08:00	907.51	169.57	219.31	2191.34	10.32	9.95	2191.77	12.35
05-Apr-17 09:09:00	900.20	170.75	221.59	2205.13	10.30	9.88	2199.15	12.34
05-Apr-17 09:10:00	910.78	171.60	224.96	2197.44	10.27	9.88	2194.73	12.34
05-Apr-17 09:11:00	925.45	172.52	223.80	2193.57	10.31	9.96	2193.06	12.38
05-Apr-17 09:12:00	889.04	163.62	217.78	2195.75	10.36	9.95	2198.25	12.38
05-Apr-17 09:13:00	890.41	168.12	217.42	2217.17	10.37	10.01	2205.98	12.42
05-Apr-17 09:14:00	898.34	174.96	219.44	2207.74	10.30	9.90	2198.93	12.35
05-Apr-17 09:15:00	901.65	169.62	217.03	2204.37	10.30	9.98	2203.00	12.40
05-Apr-17 09:16:00	893.07	162.11	212.57	2198.19	10.25	9.98	2205.04	12.45
05-Apr-17 09:17:00	905.47	169.22	214.28	2200.97	10.35	9.99	2198.10	12.48
05-Apr-17 09:18:00	904.89	169.48	219.16	2203.75	10.37	9.99	2202.05	12.43
05-Apr-17 09:19:00	905.34	171.86	217.73	2207.06	10.29	9.96	2206.00	12.42
05-Apr-17 09:20:00	909.75	169.24	218.30	2208.73	10.38	9.98	2202.28	12.41
05-Apr-17 09:21:00	910.89	166.90	215.65	2202.19	10.27	9.89	2210.25	12.36
05-Apr-17 09:22:00	921.84	173.37	219.21	2195.41	10.23	9.91	2202.75	12.32
05-Apr-17 09:23:00	927.21	176.04	218.80	2203.09	10.26	9.92	2206.10	12.30
05-Apr-17 09:24:00	912.21	168.35	218.79	2199.34	10.18	9.85	2209.06	12.26
05-Apr-17 09:25:00	915.00	172.41	216.59	2208.28	10.21	9.90	2212.21	12.32
05-Apr-17 09:26:00	917.54	175.02	219.00	2203.65	10.29	9.90	2199.88	12.28
05-Apr-17 09:27:00	905.27	170.71	221.15	2215.17	10.26	9.91	2197.59	12.36
05-Apr-17 09:28:00	909.39	172.25	222.72	2201.96	10.26	9.92	2195.67	12.39
05-Apr-17 09:29:00	917.27	170.22	218.54	2197.25	10.29	9.92	2202.83	12.36
05-Apr-17 09:30:00	935.10	174.11	214.64	2204.16	10.32	9.93	2211.17	12.40
05-Apr-17 09:31:00	909.24	167.34	218.39	2198.53	10.29	9.92	2205.54	12.33
05-Apr-17 09:32:00	906.07	168.56	217.98	2199.45	10.39	9.95	2202.38	12.32
05-Apr-17 09:33:00	911.83	171.38	215.55	2192.07	10.29	9.89	2190.21	12.32
05-Apr-17 09:34:00	897.81	173.90	214.52	2208.23	10.14	9.83	2200.12	12.25
05-Apr-17 09:35:00	910.29	166.07	211.40	2203.14	10.26	9.89	2200.89	12.28
05-Apr-17 09:36:00	924.97	164.93	217.02	2198.10	10.37	9.95	2194.70	12.37
05-Apr-17 09:37:00	905.86	166.12	221.13	2199.65	10.30	9.91	2191.07	12.36
05-Apr-17 09:38:00	911.06	172.25	218.03	2199.35	10.30	9.90	2197.23	12.35
05-Apr-17 09:39:00	926.10	168.18	219.88	2205.13	10.22	9.88	2207.25	12.30
05-Apr-17 09:40:00	916.19	166.35	220.80	2207.69	10.30	9.94	2201.57	12.32
05-Apr-17 09:41:00	897.20	169.58	220.49	2205.52	10.26	9.91	2183.61	12.33
05-Apr-17 09:42:00	904.94	174.02	222.62	2197.26	10.25	9.94	2193.78	12.34
05-Apr-17 09:43:00	904.10	169.60	221.35	2204.62	10.27	9.91	2203.95	12.25
05-Apr-17 09:44:00	915.59	167.00	218.37	2201.71	10.35	9.95	2204.36	12.34
05-Apr-17 09:45:00	893.63	164.46	218.15	2198.24	10.25	9.93	2196.44	12.37
05-Apr-17 09:46:00	905.89	169.04	218.28	2196.28	10.37	9.98	2192.84	12.41
05-Apr-17 09:47:00	893.96	162.18	219.94	2200.52	10.36	9.99	2196.48	12.34
05-Apr-17 09:48:00	922.46	161.46	217.54	2219.62	10.36	10.01	2193.38	12.36
05-Apr-17 09:49:00	912.53	165.40	215.55	2205.88	10.35	10.00	2200.79	12.38
05-Apr-17 09:50:00	918.81	171.84	217.95	2209.35	10.15	9.84	2203.60	12.34
05-Apr-17 09:51:00	910.40	160.99	217.65	2200.63	9.83	9.68	2201.79	12.28
05-Apr-17 09:52:00	902.55	167.97	216.18	2194.32	9.34	9.41	2199.98	12.26
05-Apr-17 09:53:00	907.19	168.19	217.32	2185.91	9.28	9.55	2198.17	12.33
05-Apr-17 09:54:00	904.38	168.37	213.61	2202.68	9.50	9.58	2208.97	12.30
05-Apr-17 09:55:00	922.53	158.00	217.49	2197.69	9.52	9.59	2200.52	12.30
05-Apr-17 09:56:00	917.05	163.35	217.50	2192.69	9.81	9.73	2204.04	12.31
05-Apr-17 09:57:00	900.63	165.93	219.23	2191.79	9.90	9.81	2209.12	12.31
05-Apr-17 09:58:00	906.05	170.32	219.10	2208.27	10.00	9.82	2191.87	12.27
05-Apr-17 09:59:00	914.90	167.18	218.61	2209.46	9.78	9.65	2205.43	12.24
05-Apr-17 10:00:00	938.24	168.93	224.26	2200.14	9.79	9.67	2213.60	12.21
05-Apr-17 10:01:00	915.48	163.95	225.39	2198.09	9.92	9.80	2187.84	12.23
05-Apr-17 10:02:00	910.63	166.11	224.89	2196.15	10.12	9.85	2205.05	12.22
05-Apr-17 10:03:00	894.50	164.34	220.04	2207.56	10.02	9.73	2200.20	12.20
05-Apr-17 10:04:00	907.31	168.62	215.96	2202.07	9.89	9.70	2200.17	12.19
05-Apr-17 10:05:00	911.19	165.79	217.56	2197.82	9.95	9.74	2197.91	12.27
05-Apr-17 10:06:00	905.82	168.11	219.16	2196.96	10.20	9.98	2192.90	12.34
05-Apr-17 10:07:00	911.64	162.58	217.37	2189.29	10.19	9.86	2199.31	12.31
05-Apr-17 10:08:00	912.31	167.26	215.23	2209.29	10.35	10.01	2200.82	12.33
05-Apr-17 10:09:00	915.61	166.13	213.28	2196.76	10.33	9.96	2199.39	12.38
05-Apr-17 10:10:00	916.44	168.18	214.28	2203.93	10.37	9.98	2206.28	12.40
05-Apr-17 10:11:00	909.16	165.22	214.88	2197.27	10.19	9.84	2209.42	12.31
05-Apr-17 10:12:00	914.07	167.83	216.35	2197.96	10.05	9.79	2192.55	12.33
05-Apr-17 10:13:00	905.22	172.83	217.71	2189.00	9.97	9.81	2206.17	12.31
05-Apr-17 10:14:00	921.81	170.27	218.25	2204.29	10.27	9.91	2210.05	12.22

Waste Gas Stack
Process Data

05-Apr-17 10:15:00	927.38	166.11	219.22	2198.38	10.22	9.83	2197.66	12.21	12.07
05-Apr-17 10:16:00	908.06	167.55	221.85	2202.50	10.07	9.80	2207.29	12.25	12.08
05-Apr-17 10:17:00	917.74	170.49	217.98	2196.74	10.19	9.92	2204.38	12.23	12.09
05-Apr-17 10:18:00	893.69	171.59	218.15	2196.70	10.24	9.82	2190.35	12.26	12.10
05-Apr-17 10:19:00	903.48	166.02	218.88	2206.10	10.29	9.85	2207.58	12.29	12.11
05-Apr-17 10:20:00	909.78	170.99	219.52	2215.80	10.07	9.77	2202.97	12.26	12.12
05-Apr-17 10:21:00	903.77	167.55	221.27	2205.62	10.02	9.77	2201.82	12.27	12.13
05-Apr-17 10:22:00	913.13	170.73	220.22	2199.28	10.16	9.82	2198.72	12.34	12.19
05-Apr-17 10:23:00	911.38	165.80	218.89	2193.63	9.99	9.73	2204.35	12.29	12.19
05-Apr-17 10:24:00	907.36	166.40	220.32	2198.00	10.02	9.86	2187.18	12.29	12.19
05-Apr-17 10:25:00	900.59	166.66	220.77	2205.94	10.05	9.82	2200.00	12.28	12.18
05-Apr-17 10:26:00	899.23	162.65	219.78	2192.71	9.98	9.76	2206.16	12.31	12.17
05-Apr-17 10:27:00	918.59	161.12	216.74	2186.81	9.98	9.77	2200.01	12.32	12.20
05-Apr-17 10:28:00	904.53	166.03	214.29	2200.82	10.14	9.88	2200.36	12.35	12.19
05-Apr-17 10:29:00	909.78	168.68	213.60	2226.00	10.21	9.88	2214.92	12.30	12.17
05-Apr-17 10:30:00	912.95	167.80	218.58	2197.33	10.08	9.74	2195.31	12.26	12.15
05-Apr-17 10:31:00	933.55	162.69	219.67	2207.99	10.32	9.93	2209.64	12.24	12.13
05-Apr-17 10:32:00	908.01	164.82	216.76	2210.25	10.23	9.80	2199.52	12.27	12.12
05-Apr-17 10:33:00	897.48	164.45	216.53	2197.40	10.25	9.89	2197.12	12.21	12.10
05-Apr-17 10:34:00	899.63	167.67	218.30	2205.84	10.28	9.85	2213.20	12.22	12.09
05-Apr-17 10:35:00	913.71	163.24	215.46	2199.23	10.25	9.86	2201.50	12.24	12.07
05-Apr-17 10:36:00	911.90	168.59	216.60	2198.89	10.28	9.87	2191.01	12.26	12.12
05-Apr-17 10:37:00	913.42	167.83	214.10	2191.68	10.11	9.74	2194.91	12.28	12.17
05-Apr-17 10:38:00	913.74	162.69	215.83	2183.68	9.88	9.71	2202.84	12.30	12.13
05-Apr-17 10:39:00	914.54	162.32	217.62	2197.92	9.79	9.69	2199.05	12.26	12.14
05-Apr-17 10:40:00	896.51	167.40	215.66	2201.18	9.94	9.79	2201.64	12.29	12.13
05-Apr-17 10:41:00	903.85	166.68	215.64	2205.15	10.05	9.82	2206.45	12.27	12.12
05-Apr-17 10:42:00	908.48	160.85	218.22	2211.21	10.25	9.90	2190.61	12.25	12.12
05-Apr-17 10:43:00	927.74	159.96	215.71	2195.10	10.19	9.76	2196.39	12.25	12.10
05-Apr-17 10:44:00	901.20	160.73	211.00	2201.13	10.07	9.75	2190.21	12.25	12.13
05-Apr-17 10:45:00	897.22	161.50	211.82	2207.17	10.08	9.83	2200.47	12.24	12.08
05-Apr-17 10:46:00	906.31	160.49	217.18	2202.75	10.14	9.81	2190.54	12.24	12.09
05-Apr-17 10:47:00	913.40	161.07	220.76	2200.05	10.09	9.76	2198.77	12.24	12.10
05-Apr-17 10:48:00	898.33	160.43	221.69	2204.89	10.20	9.88	2209.26	12.23	12.12
05-Apr-17 10:49:00	917.16	163.24	218.52	2194.13	10.14	9.84	2207.97	12.27	12.13
05-Apr-17 10:50:00	900.48	158.00	219.79	2202.45	10.26	9.88	2190.45	12.29	12.14
05-Apr-17 10:51:00	903.17	159.85	219.68	2193.86	10.18	9.87	2199.20	12.24	12.13
05-Apr-17 10:52:00	914.17	165.57	221.95	2196.93	10.29	9.94	2201.95	12.30	12.14
05-Apr-17 10:53:00	919.10	162.48	222.96	2195.62	10.37	9.94	2202.02	12.28	12.16
05-Apr-17 10:54:00	923.64	156.36	219.69	2202.28	10.34	9.95	2188.12	12.30	12.15
05-Apr-17 10:55:00	888.83	162.76	219.20	2201.72	10.37	9.96	2196.24	12.27	12.14
05-Apr-17 10:56:00	822.00	166.93	216.51	2206.96	10.27	9.87	2193.35	12.35	12.15
05-Apr-17 10:57:00	835.76	164.23	213.71	2195.13	10.21	9.87	2184.47	12.35	12.18
05-Apr-17 10:58:00	818.09	158.65	214.90	2196.12	10.19	9.94	2198.16	12.37	12.20
05-Apr-17 10:59:00	818.97	154.66	214.15	2197.12	10.26	9.88	2198.72	12.36	12.22
05-Apr-17 11:00:00	818.92	142.74	214.05	2203.61	10.22	9.94	2200.22	12.42	12.32
05-Apr-17 11:01:00	811.43	147.90	212.44	2199.11	10.43	10.10	2210.31	12.51	12.33
05-Apr-17 11:02:00	819.09	142.35	216.37	2196.05	10.48	10.12	2200.90	12.50	12.33
05-Apr-17 11:03:00	807.67	144.76	218.60	2200.23	10.45	10.06	2202.65	12.45	12.32
05-Apr-17 11:04:00	808.23	145.05	218.96	2202.96	10.59	10.13	2198.95	12.49	12.32
05-Apr-17 11:05:00	835.41	143.72	219.22	2201.45	10.46	10.09	2204.16	12.47	12.32
05-Apr-17 11:06:00	825.57	138.97	217.93	2200.80	10.05	9.84	2201.26	12.49	12.37
05-Apr-17 11:07:00	824.64	143.99	223.22	2199.85	10.17	10.02	2188.94	12.51	12.36
05-Apr-17 11:08:00	821.49	148.85	219.39	2191.63	10.33	10.06	2189.67	12.50	12.36
05-Apr-17 11:09:00	832.28	147.08	215.87	2206.64	10.42	10.05	2206.39	12.46	12.36
05-Apr-17 11:10:00	839.98	142.73	215.84	2203.24	10.42	10.07	2204.39	12.53	12.38
05-Apr-17 11:11:00	827.83	145.15	214.46	2208.71	10.39	10.09	2201.82	12.50	12.39
05-Apr-17 11:12:00	829.16	149.76	214.76	2195.49	10.51	10.17	2196.07	12.47	12.38
05-Apr-17 11:13:00	830.48	150.32	211.32	2196.87	10.40	10.05	2199.47	12.52	12.36
05-Apr-17 11:14:00	830.32	146.32	213.89	2201.67	10.37	10.03	2208.15	12.52	12.37
05-Apr-17 11:15:00	831.01	149.67	208.85	2200.72	10.28	10.03	2205.35	12.54	12.39
05-Apr-17 11:16:00	823.38	145.99	207.27	2189.48	10.23	9.99	2199.79	12.56	12.40
05-Apr-17 11:17:00	820.82	147.20	209.04	2192.80	10.33	9.99	2201.07	12.52	12.38
05-Apr-17 11:18:00	822.53	145.60	211.33	2202.08	10.27	9.99	2206.14	12.44	12.31
05-Apr-17 11:19:00	816.48	147.04	210.98	2193.70	10.28	9.96	2215.64	12.48	12.34
05-Apr-17 11:20:00	821.02	144.13	208.41	2186.21	10.42	10.10	2203.51	12.52	12.39
05-Apr-17 11:21:00	821.59	141.33	210.46	2198.51	10.75	10.28	2195.60	12.51	12.33
05-Apr-17 11:22:00	832.86	140.41	211.20	2198.26	10.83	10.26	2200.97	12.50	12.33
05-Apr-17 11:23:00	836.03	144.22	211.51	2186.96	10.73	10.20	2193.02	12.50	12.34
05-Apr-17 11:24:00	830.49	141.49	210.05	2205.88	10.52	10.05	2200.15	12.48	12.34
05-Apr-17 11:25:00	826.66	140.19	210.33	2201.22	10.29	9.96	2202.48	12.45	12.35
05-Apr-17 11:26:00	827.13	141.59	212.01	2206.57	10.18	9.91	2193.13	12.46	12.33
05-Apr-17 11:27:00	828.48	146.74	210.39	2192.27	10.21	9.96	2193.32	12.48	12.33
05-Apr-17 11:28:00	819.73	141.70	210.25	2197.29	10.17	9.95	2203.84	12.49	12.35
05-Apr-17 11:29:00	811.42	141.20	211.15	2190.11	10.26	10.02	2196.17	12.50	12.38
05-Apr-17 11:30:00	820.24	140.78	209.40	2191.62	10.35	10.05	2201.27	12.53	12.38
05-Apr-17 11:31:00	820.96	145.37	204.26	2191.86	10.45	10.08	2197.47	12.51	12.35

Waste Gas Stack
Process Data

05-Apr-17 11:32:00	820.69	141.08	202.46	2203.64	10.42	10.13	2197.69	12.53	12.36
05-Apr-17 11:33:00	844.22	138.77	204.85	2196.27	10.25	9.96	2201.93	12.44	12.36
05-Apr-17 11:34:00	870.71	141.02	206.03	2198.18	10.16	9.94	2204.61	12.46	12.33
05-Apr-17 11:35:00	918.96	145.71	209.95	2202.86	10.27	10.03	2204.32	12.47	12.33
05-Apr-17 11:36:00	908.34	140.41	211.99	2201.22	10.40	10.04	2203.52	12.46	12.36
05-Apr-17 11:37:00	910.27	137.56	208.87	2198.17	10.50	10.12	2203.50	12.49	12.33
05-Apr-17 11:38:00	913.78	144.83	208.41	2203.96	10.88	10.29	2206.31	12.48	12.32
05-Apr-17 11:39:00	906.72	144.40	207.76	2199.71	10.63	10.12	2194.11	12.44	12.31
05-Apr-17 11:40:00	919.71	145.58	206.75	2195.47	10.31	9.96	2197.10	12.48	12.30
05-Apr-17 11:41:00	920.28	140.07	210.43	2197.52	10.25	9.99	2204.58	12.46	12.33
05-Apr-17 11:42:00	912.06	139.87	211.08	2205.17	10.30	10.02	2200.19	12.53	12.39
05-Apr-17 11:43:00	914.12	144.65	210.68	2198.00	10.37	10.06	2203.30	12.52	12.36
05-Apr-17 11:44:00	906.78	143.64	208.50	2200.32	10.38	9.97	2194.22	12.46	12.32
05-Apr-17 11:45:00	916.01	140.38	210.32	2196.45	10.60	10.08	2201.68	12.47	12.31
05-Apr-17 11:46:00	915.83	141.02	209.95	2200.49	10.66	10.17	2203.24	12.48	12.35
05-Apr-17 11:47:00	919.17	141.26	210.75	2201.88	10.68	10.20	2213.41	12.47	12.33
05-Apr-17 11:48:00	913.50	143.69	208.56	2197.52	10.63	10.18	2200.47	12.45	12.31
05-Apr-17 11:49:00	901.34	153.30	210.75	2197.58	10.56	10.05	2202.41	12.39	12.25
05-Apr-17 11:50:00	912.21	158.93	212.03	2195.95	10.38	9.88	2194.20	12.23	12.11
05-Apr-17 11:51:00	914.34	162.56	211.78	2196.93	9.98	9.69	2201.68	12.21	12.08
05-Apr-17 11:52:00	906.22	158.80	214.55	2204.74	9.92	9.74	2202.01	12.27	12.14
05-Apr-17 11:53:00	898.44	156.73	213.53	2201.88	10.09	9.83	2201.26	12.23	12.12
05-Apr-17 11:54:00	908.92	159.84	211.02	2206.80	10.31	9.89	2193.01	12.23	12.10
05-Apr-17 11:55:00	904.22	160.74	208.59	2208.30	10.29	9.88	2211.51	12.29	12.14
05-Apr-17 11:56:00	901.62	160.09	208.12	2202.84	10.26	9.91	2190.40	12.27	12.13
05-Apr-17 11:57:00	897.73	156.86	211.39	2206.16	10.51	10.03	2200.57	12.24	12.12
05-Apr-17 11:58:00	892.06	160.64	210.57	2195.25	10.42	9.87	2194.68	12.22	12.12
05-Apr-17 11:59:00	905.76	158.73	211.29	2197.74	10.26	9.80	2201.45	12.20	12.12
05-Apr-17 12:00:00	919.49	158.17	208.61	2200.23	10.19	9.83	2195.37	12.28	12.13
05-Apr-17 12:01:00	919.04	157.65	211.07	2192.58	10.05	9.73	2203.67	12.30	12.13
05-Apr-17 12:02:00	904.84	161.22	216.78	2199.99	10.28	9.93	2200.97	12.31	12.13
05-Apr-17 12:03:00	910.21	160.08	222.47	2202.34	10.36	9.95	2194.16	12.30	12.14
05-Apr-17 12:04:00	928.85	158.65	222.95	2203.96	10.09	9.74	2194.47	12.25	12.09
05-Apr-17 12:05:00	913.54	156.27	225.07	2206.18	10.08	9.75	2196.63	12.25	12.10
05-Apr-17 12:06:00	918.43	157.38	223.41	2193.77	9.94	9.70	2198.79	12.25	12.11
05-Apr-17 12:07:00	918.62	156.09	218.96	2191.62	10.06	9.83	2206.63	12.17	12.05
05-Apr-17 12:08:00	913.19	155.22	220.59	2198.58	10.13	9.79	2201.09	12.18	12.03
05-Apr-17 12:09:00	906.88	153.85	220.55	2193.32	10.10	9.76	2199.13	12.17	12.02
05-Apr-17 12:10:00	894.22	157.93	223.16	2202.93	10.02	9.72	2197.17	12.15	12.02
05-Apr-17 12:11:00	899.46	153.59	222.85	2201.67	10.33	9.95	2204.44	12.22	12.06
05-Apr-17 12:12:00	911.20	155.53	224.54	2201.32	10.38	9.94	2205.98	12.34	12.23
05-Apr-17 12:13:00	907.40	150.41	238.65	2201.19	10.47	10.10	2201.54	12.56	12.43
05-Apr-17 12:14:00	902.48	156.65	242.03	2186.12	10.63	10.26	2203.99	12.67	12.52
05-Apr-17 12:15:00	913.47	155.41	244.12	2188.95	10.61	10.19	2201.56	12.71	12.58
05-Apr-17 12:16:00	906.70	155.23	245.39	2202.78	10.56	10.18	2194.94	12.70	12.58
05-Apr-17 12:17:00	914.37	153.62	244.88	2200.23	10.63	10.22	2201.00	12.69	12.56
05-Apr-17 12:18:00	904.52	158.48	245.12	2197.05	10.44	10.07	2191.02	12.68	12.55
05-Apr-17 12:19:00	903.58	152.76	242.44	2204.98	10.46	10.16	2204.67	12.67	12.53
05-Apr-17 12:20:00	916.18	152.85	241.63	2202.60	10.44	10.13	2202.83	12.66	12.51
05-Apr-17 12:21:00	904.93	154.58	243.10	2195.54	10.43	10.08	2198.00	12.67	12.50
05-Apr-17 12:22:00	903.85	158.33	247.80	2206.57	10.38	10.05	2199.90	12.66	12.53
05-Apr-17 12:23:00	911.57	155.91	246.13	2204.33	10.42	10.10	2197.65	12.66	12.56
05-Apr-17 12:24:00	916.23	154.00	245.14	2190.32	10.44	10.14	2204.80	12.69	12.54
05-Apr-17 12:25:00	915.30	154.59	244.06	2192.86	10.42	10.15	2205.46	12.69	12.57
05-Apr-17 12:26:00	918.23	159.86	242.98	2200.21	10.53	10.17	2211.10	12.65	12.51
05-Apr-17 12:27:00	909.91	158.37	242.30	2200.72	10.78	10.32	2205.09	12.64	12.49
05-Apr-17 12:28:00	905.49	154.67	239.16	2207.66	10.68	10.14	2188.80	12.60	12.48
05-Apr-17 12:29:00	894.98	156.25	232.55	2192.31	10.31	9.97	2198.86	12.65	12.47
05-Apr-17 12:30:00	894.52	157.40	232.67	2194.32	10.25	10.01	2203.38	12.65	12.47
05-Apr-17 12:31:00	913.24	152.94	296.13	2194.90	10.21	9.92	2191.52	12.59	12.46
05-Apr-17 12:32:00	908.41	148.07	315.16	2200.71	10.38	10.04	2201.63	12.54	12.41
05-Apr-17 12:33:00	904.34	152.91	314.56	2200.09	10.28	9.98	2207.80	12.52	12.38
05-Apr-17 12:34:00	908.95	154.90	315.78	2200.16	10.31	9.97	2199.37	12.50	12.37
05-Apr-17 12:35:00	915.56	151.91	316.01	2202.22	10.46	10.07	2201.99	12.48	12.36
05-Apr-17 12:36:00	907.77	150.28	308.26	2201.64	10.61	10.09	2194.25	12.51	12.41
05-Apr-17 12:37:00	906.25	152.15	299.63	2210.40	10.63	10.10	2200.02	12.53	12.41
05-Apr-17 12:38:00	914.06	154.32	299.24	2209.61	10.52	10.08	2202.23	12.53	12.39
05-Apr-17 12:39:00	902.15	152.45	293.91	2211.54	10.44	10.00	2207.01	12.52	12.38
05-Apr-17 12:40:00	911.65	149.82	283.08	2200.48	10.45	10.09	2193.00	12.59	12.44
05-Apr-17 12:41:00	919.57	155.78	279.44	2196.38	10.68	10.23	2206.91	12.57	12.43
05-Apr-17 12:42:00	903.49	154.41	269.05	2192.28	10.51	10.04	2200.08	12.58	12.43
05-Apr-17 12:43:00	899.31	155.51	253.48	2198.94	10.26	9.97	2198.80	12.57	12.43
05-Apr-17 12:44:00	918.25	151.22	249.81	2201.11	10.20	9.99	2199.55	12.57	12.44
05-Apr-17 12:45:00	906.90	149.66	256.80	2209.29	10.25	10.00	2204.42	12.58	12.46
05-Apr-17 12:46:00	900.42	151.46	257.53	2203.37	10.51	10.13	2205.19	12.63	12.48
05-Apr-17 12:47:00	906.91	150.60	254.12	2200.10	10.49	10.07	2207.06	12.57	12.45
05-Apr-17 12:48:00	905.21	146.93	244.98	2202.65	10.49	10.09	2204.44	12.67	12.48

Waste Gas Stack
Process Data

05-Apr-17 12:49:00	899.47	151.58	225.23	2190.93	10.72	10.26	2202.81	12.66	12.50
05-Apr-17 12:50:00	892.73	147.79	220.92	2199.81	10.68	10.17	2197.02	12.63	12.52
05-Apr-17 12:51:00	893.94	147.46	224.93	2201.81	10.65	10.15	2212.13	12.62	12.49
05-Apr-17 12:52:00	891.80	149.81	228.82	2192.86	10.57	10.12	2206.95	12.65	12.47
05-Apr-17 12:53:00	910.68	144.67	228.96	2196.83	10.54	10.14	2198.19	12.63	12.48
05-Apr-17 12:54:00	907.30	147.24	225.85	2196.56	10.43	10.06	2206.80	12.64	12.49
05-Apr-17 12:55:00	911.46	146.21	224.10	2201.73	10.07	9.82	2207.02	12.64	12.50
05-Apr-17 12:56:00	881.45	150.65	223.48	2195.91	10.10	9.98	2195.97	12.65	12.51
05-Apr-17 12:57:00	915.15	150.73	228.18	2196.12	10.25	10.00	2200.21	12.62	12.47
05-Apr-17 12:58:00	875.47	148.35	227.11	2193.47	10.43	10.10	2189.55	12.62	12.49
05-Apr-17 12:59:00	878.45	145.32	228.43	2201.71	10.50	10.10	2196.90	12.69	12.51
05-Apr-17 13:00:00	890.04	151.79	228.20	2197.80	10.36	10.04	2194.51	12.68	12.53
05-Apr-17 13:01:00	882.06	144.72	229.76	2202.32	10.35	10.03	2205.18	12.66	12.53
05-Apr-17 13:02:00	889.92	141.86	229.03	2205.56	10.38	10.07	2195.42	12.69	12.58
05-Apr-17 13:03:00	891.24	143.48	230.33	2202.07	10.46	10.11	2196.82	12.69	12.53
05-Apr-17 13:04:00	889.67	141.77	223.50	2201.76	10.52	10.14	2195.38	12.69	12.53
05-Apr-17 13:05:00	909.45	147.82	214.27	2205.24	10.67	10.20	2204.98	12.69	12.53
05-Apr-17 13:06:00	921.92	141.36	213.82	2204.22	10.88	10.25	2200.40	12.64	12.52
05-Apr-17 13:07:00	916.68	142.11	218.78	2207.88	10.54	9.99	2207.83	12.61	12.47
05-Apr-17 13:08:00	918.56	145.88	219.33	2198.89	10.45	10.09	2208.55	12.60	12.43
05-Apr-17 13:09:00	909.59	153.58	219.88	2197.41	10.60	10.11	2201.85	12.50	12.38
05-Apr-17 13:10:00	904.25	149.30	220.39	2198.50	10.58	10.11	2194.15	12.53	12.37
05-Apr-17 13:11:00	891.02	152.00	221.17	2210.06	10.21	9.90	2201.47	12.54	12.38
05-Apr-17 13:12:00	906.49	151.96	224.03	2200.94	10.14	9.89	2198.50	12.49	12.32
05-Apr-17 13:13:00	896.38	148.32	223.49	2196.52	10.32	10.03	2200.60	12.57	12.40
05-Apr-17 13:14:00	901.24	146.26	222.46	2189.70	10.56	10.15	2202.69	12.53	12.39
05-Apr-17 13:15:00	906.03	149.66	223.11	2204.43	10.52	10.08	2200.57	12.53	12.38
05-Apr-17 13:16:00	910.69	147.04	221.96	2195.41	10.29	9.91	2197.67	12.49	12.36
05-Apr-17 13:17:00	915.14	150.68	220.25	2192.38	10.48	10.12	2196.50	12.51	12.36
05-Apr-17 13:18:00	909.01	146.73	222.03	2195.52	10.56	10.09	2208.16	12.47	12.36
05-Apr-17 13:19:00	911.76	148.10	222.68	2206.02	10.31	9.94	2211.49	12.49	12.36
05-Apr-17 13:20:00	904.34	153.19	224.07	2204.27	10.30	9.96	2201.91	12.48	12.36
05-Apr-17 13:21:00	910.70	151.75	226.63	2214.03	10.23	9.89	2202.48	12.52	12.36
05-Apr-17 13:22:00	918.86	149.16	226.80	2202.29	10.28	9.99	2208.36	12.53	12.39
05-Apr-17 13:23:00	924.47	149.12	226.30	2193.78	10.35	10.01	2194.93	12.53	12.41
05-Apr-17 13:24:00	909.61	154.53	224.74	2198.85	10.25	9.99	2200.09	12.58	12.43
05-Apr-17 13:25:00	912.61	155.84	229.70	2194.18	10.28	9.96	2205.26	12.52	12.41
05-Apr-17 13:26:00	912.84	155.41	231.44	2197.17	10.23	9.94	2205.34	12.52	12.39
05-Apr-17 13:27:00	905.22	153.12	231.21	2208.74	10.32	9.98	2199.07	12.52	12.38
05-Apr-17 13:28:00	922.66	156.74	228.22	2204.17	10.50	10.06	2203.63	12.57	12.41
05-Apr-17 13:29:00	914.28	152.62	228.08	2203.71	10.56	10.05	2205.30	12.55	12.40
05-Apr-17 13:30:00	910.91	151.29	224.59	2201.05	10.55	10.05	2194.42	12.51	12.37
05-Apr-17 13:31:00	915.56	152.21	225.80	2204.70	10.26	9.91	2193.04	12.52	12.34
05-Apr-17 13:32:00	896.54	151.65	229.14	2203.12	10.03	9.80	2195.07	12.42	12.31
05-Apr-17 13:33:00	895.19	152.04	229.28	2198.20	10.14	9.91	2204.45	12.46	12.31
05-Apr-17 13:34:00	907.35	153.79	228.91	2201.16	10.40	10.06	2195.72	12.44	12.33
05-Apr-17 13:35:00	896.27	152.70	229.61	2189.45	10.73	10.19	2209.95	12.46	12.34
05-Apr-17 13:36:00	904.71	152.20	231.94	2204.23	10.61	10.02	2197.00	12.48	12.35
05-Apr-17 13:37:00	918.67	153.28	236.20	2193.66	10.58	10.01	2201.32	12.46	12.37
05-Apr-17 13:38:00	899.56	149.10	233.34	2203.99	10.47	10.02	2196.81	12.51	12.38
05-Apr-17 13:39:00	918.54	151.43	234.50	2199.81	10.48	9.99	2207.45	12.53	12.40
05-Apr-17 13:40:00	911.46	156.39	237.73	2209.72	10.21	9.87	2205.36	12.51	12.38
05-Apr-17 13:41:00	903.05	150.20	242.04	2200.42	10.35	10.06	2197.10	12.51	12.40
05-Apr-17 13:42:00	907.82	154.58	242.37	2192.73	10.36	10.00	2188.14	12.55	12.42
05-Apr-17 13:43:00	913.65	154.12	236.96	2195.38	10.20	9.91	2197.54	12.58	12.43
05-Apr-17 13:44:00	921.69	154.39	235.35	2198.02	10.31	10.03	2198.16	12.61	12.48
05-Apr-17 13:45:00	917.28	151.70	234.73	2198.49	10.35	10.01	2206.29	12.61	12.46
05-Apr-17 13:46:00	910.71	153.98	237.73	2207.11	10.39	10.08	2205.46	12.57	12.44
05-Apr-17 13:47:00	917.40	155.66	239.65	2207.75	10.19	9.88	2206.92	12.54	12.41
05-Apr-17 13:48:00	911.51	156.28	235.65	2209.33	10.05	9.83	2196.85	12.54	12.38
05-Apr-17 13:49:00	913.32	147.84	235.87	2200.83	10.05	9.85	2200.19	12.48	12.34
05-Apr-17 13:50:00	901.78	153.81	235.37	2206.55	10.15	9.85	2194.80	12.43	12.33
05-Apr-17 13:51:00	912.18	153.54	237.46	2203.48	10.16	9.88	2198.79	12.40	12.32
05-Apr-17 13:52:00	920.69	156.71	242.97	2212.88	10.19	9.90	2193.77	12.47	12.30
05-Apr-17 13:53:00	922.68	150.03	239.52	2198.23	10.17	9.91	2207.58	12.46	12.34
05-Apr-17 13:54:00	916.48	156.66	238.43	2196.58	10.41	10.00	2200.38	12.44	12.32
05-Apr-17 13:55:00	902.34	155.58	238.00	2200.33	10.61	10.13	2204.52	12.43	12.31
05-Apr-17 13:56:00	904.10	157.69	242.64	2193.65	10.61	10.02	2196.75	12.45	12.35
05-Apr-17 13:57:00	899.16	152.94	241.64	2204.35	10.40	9.92	2205.12	12.49	12.36
05-Apr-17 13:58:00	909.86	153.86	239.67	2203.18	10.52	10.02	2194.36	12.51	12.37
05-Apr-17 13:59:00	915.82	153.22	235.07	2203.50	10.42	9.97	2190.24	12.57	12.39
05-Apr-17 14:00:00	902.49	154.34	235.78	2203.50	10.44	9.99	2192.63	12.55	12.42
05-Apr-17 14:01:00	912.44	148.60	229.01	2203.41	10.40	10.02	2196.13	12.54	12.42
05-Apr-17 14:02:00	906.65	150.64	226.39	2203.26	10.48	9.99	2193.45	12.57	12.40
05-Apr-17 14:03:00	897.11	153.81	227.03	2203.92	10.20	9.91	2211.49	12.57	12.41
05-Apr-17 14:04:00	903.65	158.08	230.01	2192.66	10.01	9.75	2199.32	12.49	12.37
05-Apr-17 14:05:00	906.31	150.35	234.17	2195.58	10.10	9.94	2195.71	12.52	12.39

Waste Gas Stack
Process Data

05-Apr-17 14:06:00	910.02	151.42	235.77	2208.01	10.15	9.91	2200.79	12.49	12.37
05-Apr-17 14:07:00	915.36	154.51	237.56	2195.73	10.33	9.98	2187.36	12.51	12.41
05-Apr-17 14:08:00	909.73	155.48	235.78	2202.47	10.16	9.85	2201.98	12.52	12.40
05-Apr-17 14:09:00	923.10	149.77	233.86	2193.36	10.17	9.86	2197.48	12.47	12.38
05-Apr-17 14:10:00	905.13	150.61	234.50	2189.34	10.28	9.91	2197.86	12.54	12.37
05-Apr-17 14:11:00	911.41	153.62	237.20	2199.39	10.36	9.95	2191.72	12.50	12.37
05-Apr-17 14:12:00	924.41	158.20	234.25	2196.73	10.46	9.97	2209.87	12.49	12.36
05-Apr-17 14:13:00	910.95	151.44	237.82	2208.23	10.30	9.97	2204.57	12.51	12.35
05-Apr-17 14:14:00	905.84	153.64	238.79	2205.41	10.26	9.87	2207.49	12.49	12.34
05-Apr-17 14:15:00	904.15	156.10	235.94	2190.21	10.44	9.98	2205.84	12.44	12.34
05-Apr-17 14:16:00	899.20	156.33	236.95	2199.05	10.42	9.93	2204.19	12.45	12.34
05-Apr-17 14:17:00	918.99	146.69	238.98	2196.56	10.30	9.98	2192.54	12.50	12.35
05-Apr-17 14:18:00	914.86	151.83	233.01	2194.92	10.28	9.92	2193.04	12.50	12.37
05-Apr-17 14:19:00	921.29	153.68	231.91	2195.43	10.43	10.02	2207.84	12.50	12.42
05-Apr-17 14:20:00	915.13	154.97	233.57	2205.95	10.46	10.05	2204.40	12.53	12.43
05-Apr-17 14:21:00	906.38	149.38	229.85	2203.25	10.41	9.92	2193.83	12.55	12.39
05-Apr-17 14:22:00	900.74	156.21	227.95	2189.24	10.31	9.92	2200.28	12.51	12.38
05-Apr-17 14:23:00	913.25	156.06	226.84	2188.49	10.38	9.98	2207.11	12.49	12.37
05-Apr-17 14:24:00	909.17	152.00	230.56	2214.71	10.22	9.87	2205.17	12.51	12.35
05-Apr-17 14:25:00	909.58	148.89	228.87	2206.39	10.23	9.95	2202.48	12.51	12.34
05-Apr-17 14:26:00	907.42	151.66	230.33	2200.16	10.40	10.01	2207.92	12.53	12.35
05-Apr-17 14:27:00	923.67	153.65	231.79	2198.74	10.43	10.00	2208.33	12.49	12.35
05-Apr-17 14:28:00	924.75	152.32	233.25	2197.32	10.35	9.95	2204.73	12.49	12.33
05-Apr-17 14:29:00	904.74	153.37	234.52	2198.37	10.30	9.88	2202.46	12.45	12.31
05-Apr-17 14:30:00	910.73	156.91	233.61	2202.54	10.41	9.98	2207.02	12.44	12.29
05-Apr-17 14:31:00	912.76	157.07	234.82	2194.91	10.34	9.90	2211.50	12.44	12.30
05-Apr-17 14:32:00	908.60	154.47	233.83	2199.04	10.32	9.76	2197.62	12.47	12.33
05-Apr-17 14:33:00	906.14	151.86	236.68	2209.69	10.08	9.76	2211.07	12.45	12.36
05-Apr-17 14:34:00	905.98	155.46	235.51	2188.38	10.17	9.92	2207.43	12.47	12.37
05-Apr-17 14:35:00	914.06	156.48	235.01	2186.71	10.37	10.00	2203.76	12.54	12.39
05-Apr-17 14:36:00	906.71	152.99	231.97	2205.55	10.32	9.93	2199.51	12.50	12.38
05-Apr-17 14:37:00	918.60	147.94	231.01	2204.97	10.35	10.03	2195.56	12.53	12.40
05-Apr-17 14:38:00	898.81	158.35	233.64	2193.45	10.37	10.00	2196.65	12.53	12.41
05-Apr-17 14:39:00	911.73	153.72	229.77	2202.80	10.28	9.96	2197.75	12.55	12.40
05-Apr-17 14:40:00	916.15	151.69	228.43	2204.15	10.27	9.94	2198.84	12.51	12.39
05-Apr-17 14:41:00	917.01	150.20	230.76	2202.81	10.30	9.95	2200.15	12.51	12.38
05-Apr-17 14:42:00	895.45	157.26	228.78	2207.37	10.41	9.98	2204.96	12.47	12.37
05-Apr-17 14:43:00	909.44	154.39	230.08	2199.96	10.38	10.00	2206.46	12.41	12.29
05-Apr-17 14:44:00	919.68	147.52	233.75	2210.77	10.31	9.91	2206.41	12.46	12.32
05-Apr-17 14:45:00	914.04	151.30	233.76	2199.11	10.13	9.82	2196.39	12.48	12.36
05-Apr-17 14:46:00	906.42	157.35	235.13	2195.37	10.23	9.87	2199.81	12.46	12.33
05-Apr-17 14:47:00	916.85	158.29	234.00	2197.15	10.17	9.83	2188.06	12.45	12.31
05-Apr-17 14:48:00	903.77	145.57	233.08	2194.30	10.40	9.95	2190.94	12.53	12.36
05-Apr-17 14:49:00	911.26	153.92	234.00	2195.21	10.29	9.86	2203.50	12.51	12.40
05-Apr-17 14:50:00	911.20	155.75	230.13	2196.96	10.37	9.87	2195.92	12.47	12.32
05-Apr-17 14:51:00	903.09	156.56	231.99	2208.02	10.13	9.84	2208.72	12.49	12.34
05-Apr-17 14:52:00	912.96	147.05	232.08	2191.67	10.12	9.86	2201.24	12.43	12.34
05-Apr-17 14:53:00	921.16	150.86	230.42	2200.07	10.03	9.83	2202.62	12.46	12.33
05-Apr-17 14:54:00	905.61	152.49	233.22	2199.91	10.05	9.79	2209.67	12.47	12.33
05-Apr-17 14:55:00	910.74	153.56	225.49	2217.40	10.16	9.95	2192.69	12.51	12.33
05-Apr-17 14:56:00	891.93	143.96	229.34	2192.24	10.21	9.89	2201.63	12.46	12.32
05-Apr-17 14:57:00	900.18	149.40	230.53	2196.54	10.11	9.87	2204.72	12.45	12.31
05-Apr-17 14:58:00	916.78	149.28	231.08	2193.18	10.34	9.89	2196.00	12.42	12.29
05-Apr-17 14:59:00	903.90	146.23	229.56	2200.15	10.23	9.84	2201.64	12.45	12.28
05-Apr-17 15:00:00	907.52	137.02	232.51	2190.99	10.12	9.82	2207.27	12.41	12.26
05-Apr-17 15:01:00	905.44	145.28	233.87	2189.63	10.15	9.80	2191.83	12.43	12.25
05-Apr-17 15:02:00	924.62	145.95	238.86	2175.92	10.11	9.72	2203.24	12.37	12.24
05-Apr-17 15:03:00	910.19	145.36	241.21	2207.49	10.02	9.73	2195.98	12.34	12.19
05-Apr-17 15:04:00	906.51	138.45	235.31	2200.83	10.30	9.90	2186.19	12.27	12.15
05-Apr-17 15:05:00	896.55	148.23	235.78	2184.08	10.07	9.67	2201.22	12.24	12.11
05-Apr-17 15:06:00	902.81	144.71	240.41	2216.38	10.13	9.73	2199.53	12.20	12.07
05-Apr-17 15:07:00	887.29	142.82	240.11	2209.46	10.05	9.62	2178.94	12.21	12.07
05-Apr-17 15:08:00	877.50	133.14	241.26	2194.56	10.10	9.67	2190.81	12.14	12.06
05-Apr-17 15:09:00	870.90	138.66	236.59	2199.39	10.08	9.65	2194.72	12.14	12.05
05-Apr-17 15:10:00	864.91	136.43	236.86	2197.21	10.04	9.69	2201.29	12.19	12.05
05-Apr-17 15:11:00	864.08	129.90	236.61	2203.46	10.27	9.87	2201.55	12.18	12.04
05-Apr-17 15:12:00	858.80	124.06	231.56	2191.90	10.37	9.81	2206.95	12.17	12.04
05-Apr-17 15:13:00	852.03	126.52	227.60	2210.90	10.13	9.69	2221.82	12.19	12.04
05-Apr-17 15:14:00	856.93	126.13	232.14	2204.33	9.99	9.70	2197.07	12.23	12.05
05-Apr-17 15:15:00	852.45	119.52	234.38	2209.80	10.12	9.74	2199.18	12.19	12.04
05-Apr-17 15:16:00	861.73	120.08	228.51	2185.57	10.18	9.74	2201.30	12.10	12.02
05-Apr-17 15:17:00	849.47	120.43	225.04	2205.60	10.12	9.73	2203.21	12.12	12.00
05-Apr-17 15:18:00	829.30	120.70	223.12	2204.52	9.97	9.58	2195.84	12.13	11.97
05-Apr-17 15:19:00	842.54	115.31	223.48	2177.59	10.10	9.72	2188.81	12.06	11.90
05-Apr-17 15:20:00	840.42	116.82	221.98	2195.24	10.12	9.67	2197.38	11.95	11.84
05-Apr-17 15:21:00	849.60	117.26	222.91	2208.31	9.77	9.30	2205.93	11.71	11.60
05-Apr-17 15:22:00	848.75	118.31	224.81	2199.99	9.45	9.17	2213.73	11.54	11.43

Waste Gas Stack
Process Data

05-Apr-17 15:23:00	831.39	114.48	222.48	2213.07	9.40	9.18	2213.08	11.51	11.37
05-Apr-17 15:24:00	835.49	116.54	221.35	2197.72	9.49	9.10	2198.63	11.48	11.34
05-Apr-17 15:25:00	830.66	120.78	219.97	2198.01	9.35	9.03	2199.24	11.38	11.25
05-Apr-17 15:26:00	826.64	119.53	219.71	2197.50	9.38	9.14	2198.16	11.35	11.24
05-Apr-17 15:27:00	830.05	112.96	215.18	2197.25	9.47	9.13	2205.79	11.33	11.23
05-Apr-17 15:28:00	826.52	114.65	213.19	2213.61	9.30	9.06	2198.16	11.34	11.22
05-Apr-17 15:29:00	808.08	119.53	217.40	2204.70	9.36	9.07	2202.67	11.35	11.21
05-Apr-17 15:30:00	816.38	114.26	214.27	2210.04	9.33	9.02	2201.03	11.26	11.17
05-Apr-17 15:31:00	807.55	109.41	213.07	2204.06	9.40	9.04	2200.35	11.24	11.14
05-Apr-17 15:32:00	803.34	113.55	213.75	2187.56	9.38	9.05	2195.68	11.22	11.11
05-Apr-17 15:33:00	795.92	114.58	214.43	2177.89	9.36	9.07	2209.74	11.18	11.07
05-Apr-17 15:34:00	796.79	115.02	214.66	2197.58	9.61	9.22	2198.19	11.24	11.12
05-Apr-17 15:35:00	786.09	112.83	215.16	2203.51	9.76	9.30	2210.59	11.30	11.16
05-Apr-17 15:36:00	796.33	116.99	215.55	2213.44	9.79	9.30	2204.17	11.34	11.20
05-Apr-17 15:37:00	782.32	120.94	214.37	2204.94	9.89	9.31	2197.20	11.35	11.24
05-Apr-17 15:38:00	799.95	121.79	216.92	2202.35	9.79	9.25	2208.53	11.40	11.26
05-Apr-17 15:39:00	791.28	118.57	214.75	2202.90	9.64	9.13	2199.71	11.37	11.27
05-Apr-17 15:40:00	799.82	123.41	218.56	2205.28	9.64	9.22	2201.36	11.42	11.27
05-Apr-17 15:41:00	811.12	129.28	216.10	2221.47	9.56	9.17	2202.73	11.42	11.30
05-Apr-17 15:42:00	811.43	129.49	217.06	2209.34	9.31	9.05	2204.10	11.38	11.29
05-Apr-17 15:43:00	808.20	128.65	212.93	2193.85	9.43	9.21	2198.66	11.43	11.31
05-Apr-17 15:44:00	755.01	133.06	212.25	2191.28	9.35	9.12	2203.20	11.46	11.33
05-Apr-17 15:45:00	730.91	134.34	212.93	2201.62	9.43	9.19	2195.64	11.45	11.35
05-Apr-17 15:46:00	736.95	137.76	216.35	2206.85	9.47	9.18	2199.97	11.52	11.42
05-Apr-17 15:47:00	729.33	112.45	213.42	2192.65	9.59	9.35	2197.63	11.67	11.53
05-Apr-17 15:48:00	713.40	115.96	211.18	2194.55	9.71	9.43	2202.42	11.85	11.66
05-Apr-17 15:49:00	680.91	117.17	211.67	2196.12	9.69	9.48	2202.73	11.95	11.78
05-Apr-17 15:50:00	680.13	116.87	214.16	2198.94	9.89	9.57	2199.50	11.81	11.71
05-Apr-17 15:51:00	660.59	115.84	210.95	2190.92	10.09	9.68	2197.65	11.76	11.64
05-Apr-17 15:52:00	664.14	111.02	210.16	2197.79	10.08	9.59	2196.28	11.81	11.72
05-Apr-17 15:53:00	656.17	106.73	212.01	2193.16	10.13	9.74	2204.32	11.99	11.80
05-Apr-17 15:54:00	655.11	100.44	211.10	2188.54	10.19	9.73	2189.64	12.00	11.88
05-Apr-17 15:55:00	629.63	99.43	212.85	2199.84	10.00	9.43	2194.98	11.70	11.58
05-Apr-17 15:56:00	629.27	96.47	207.26	2190.98	9.75	9.39	2201.72	11.60	11.46
05-Apr-17 15:57:00	623.13	101.75	206.93	2229.31	9.60	9.35	2195.24	11.62	11.43
05-Apr-17 15:58:00	607.45	90.69	212.90	2196.17	9.52	9.37	2197.59	11.55	11.40
05-Apr-17 15:59:00	603.18	89.31	215.85	2194.57	9.57	9.38	2201.87	11.47	11.35
05-Apr-17 16:00:00	600.43	91.16	218.08	2202.64	9.79	9.48	2195.08	11.39	11.28
05-Apr-17 16:01:00	602.81	87.09	217.89	2192.87	9.61	9.28	2194.45	11.30	11.20
05-Apr-17 16:02:00	605.99	81.54	225.06	2199.18	9.83	9.41	2208.57	11.25	11.13
05-Apr-17 16:03:00	604.23	81.40	221.07	2188.42	9.61	9.21	2200.95	11.13	11.03
05-Apr-17 16:04:00	599.92	84.63	226.95	2207.56	9.58	9.22	2201.90	11.01	10.92
05-Apr-17 16:05:00	605.77	82.71	228.08	2215.48	9.67	9.23	2202.85	10.94	10.81
05-Apr-17 16:06:00	607.90	79.42	228.23	2177.72	9.53	9.11	2193.04	10.96	10.86
05-Apr-17 16:07:00	631.09	81.80	226.98	2198.91	9.62	9.25	2201.67	10.98	10.91
05-Apr-17 16:08:00	623.72	84.45	225.27	2197.65	9.45	9.10	2195.67	11.04	10.96
05-Apr-17 16:09:00	636.74	83.64	223.02	2222.37	9.34	9.10	2180.83	11.02	10.95
05-Apr-17 16:10:00	679.09	84.13	211.28	2189.32	9.38	9.14	2189.41	11.06	10.94
05-Apr-17 16:11:00	684.02	85.92	212.69	2199.56	9.33	9.14	2206.04	11.34	11.22
05-Apr-17 16:12:00	696.90	90.50	212.96	2180.29	9.94	9.96	2203.66	12.25	12.11
05-Apr-17 16:13:00	695.62	96.23	206.96	2205.30	10.27	10.19	2207.35	12.47	12.29
05-Apr-17 16:14:00	711.75	93.55	196.69	2199.97	10.18	9.81	2210.82	12.04	11.91
05-Apr-17 16:15:00	706.88	96.11	188.54	2212.20	10.31	9.85	2197.53	11.91	11.80
05-Apr-17 16:16:00	722.25	99.48	186.45	2205.41	10.45	9.86	2209.60	11.95	11.78
05-Apr-17 16:17:00	712.74	102.01	193.09	2197.93	10.22	9.71	2202.35	11.84	11.73
05-Apr-17 16:18:00	718.55	98.23	194.00	2202.90	9.97	9.55	2203.66	11.85	11.67
05-Apr-17 16:19:00	702.04	104.30	197.83	2190.32	10.09	9.58	2193.53	11.82	11.65
05-Apr-17 16:20:00	741.60	103.85	198.55	2176.95	9.99	9.55	2183.21	11.78	11.64
05-Apr-17 16:21:00	735.63	105.54	200.13	2197.89	9.83	9.50	2205.63	11.75	11.62
05-Apr-17 16:22:00	745.37	102.11	196.58	2189.96	9.83	9.54	2201.26	11.75	11.61
05-Apr-17 16:23:00	737.71	107.58	198.16	2209.23	9.95	9.58	2205.57	11.82	11.68
05-Apr-17 16:24:00	750.02	108.57	197.98	2210.80	9.77	9.45	2207.63	11.83	11.69
05-Apr-17 16:25:00	734.34	114.98	196.86	2213.13	9.86	9.59	2202.11	11.88	11.71
05-Apr-17 16:26:00	737.62	110.29	194.08	2201.85	9.79	9.54	2204.56	11.87	11.73
05-Apr-17 16:27:00	768.45	113.61	193.40	2189.66	9.83	9.54	2192.96	11.85	11.73
05-Apr-17 16:28:00	786.65	111.57	197.31	2190.16	10.08	9.68	2186.03	11.89	11.73
05-Apr-17 16:29:00	776.79	114.29	195.51	2191.24	10.20	9.76	2183.54	11.88	11.75
05-Apr-17 16:30:00	784.88	113.63	231.93	2192.32	9.99	9.67	2191.15	12.09	11.96
05-Apr-17 16:31:00	795.52	123.02	225.74	2210.78	9.99	9.67	2199.20	12.07	11.93
05-Apr-17 16:32:00	782.26	122.33	202.36	2222.53	10.09	9.80	2213.36	12.04	11.90
05-Apr-17 16:33:00	800.81	123.70	203.33	2210.77	9.85	9.61	2190.18	12.04	11.88
05-Apr-17 16:34:00	806.60	123.88	203.67	2198.81	9.79	9.59	2211.63	12.00	11.89
05-Apr-17 16:35:00	809.58	127.08	200.34	2200.75	9.88	9.60	2195.20	12.08	11.89
05-Apr-17 16:36:00	822.92	123.19	199.07	2211.39	10.01	9.69	2193.09	12.08	11.97
05-Apr-17 16:37:00	824.08	126.06	201.01	2192.73	10.25	9.84	2198.54	12.14	12.02
05-Apr-17 16:38:00	817.10	128.47	204.26	2194.47	10.22	9.79	2191.70	12.17	12.00
05-Apr-17 16:39:00	792.27	136.47	209.00	2195.93	10.23	9.80	2198.95	12.13	11.98

Waste Gas Stack
Process Data

05-Apr-17 16:40:00	797.40	133.36	209.40	2203.50	9.99	9.63	2196.73	12.10	11.95
05-Apr-17 16:41:00	791.86	132.52	213.53	2194.23	9.95	9.69	2186.35	12.09	11.93
05-Apr-17 16:42:00	792.46	130.84	214.54	2199.18	10.26	9.85	2212.82	12.11	11.98
05-Apr-17 16:43:00	798.39	130.18	213.75	2195.44	10.46	9.95	2201.22	12.14	12.00
05-Apr-17 16:44:00	800.62	129.32	213.65	2195.87	10.49	9.96	2208.04	12.16	12.02
05-Apr-17 16:45:00	813.18	126.35	210.88	2204.12	10.20	9.77	2202.47	12.21	12.05
05-Apr-17 16:46:00	821.87	129.67	209.01	2188.46	10.20	9.89	2206.13	12.18	12.04
05-Apr-17 16:47:00	826.47	130.70	211.02	2201.61	10.26	9.93	2187.58	12.25	12.09
05-Apr-17 16:48:00	835.42	131.55	212.01	2196.43	10.37	9.93	2177.10	12.31	12.15
05-Apr-17 16:49:00	832.13	130.72	212.61	2195.30	10.25	9.89	2196.86	12.30	12.15
05-Apr-17 16:50:00	850.39	137.27	221.37	2209.62	10.20	9.83	2188.73	12.23	12.08
05-Apr-17 16:51:00	846.06	138.90	222.92	2198.25	10.16	9.73	2202.01	12.16	12.01
05-Apr-17 16:52:00	855.63	138.10	220.81	2206.88	10.14	9.81	2189.88	12.14	12.01
05-Apr-17 16:53:00	845.33	140.15	220.82	2205.54	9.92	9.67	2197.56	12.10	11.97
05-Apr-17 16:54:00	852.53	145.48	220.17	2210.77	9.95	9.74	2210.64	12.11	11.97
05-Apr-17 16:55:00	847.04	148.98	219.94	2203.32	10.06	9.73	2212.50	12.10	11.97
05-Apr-17 16:56:00	851.38	141.84	224.28	2191.48	10.32	9.87	2196.71	12.14	12.02
05-Apr-17 16:57:00	844.16	143.58	226.24	2194.89	10.34	9.90	2205.33	12.16	12.02
05-Apr-17 16:58:00	839.84	144.13	220.14	2200.27	10.27	9.87	2203.33	12.16	12.02
05-Apr-17 16:59:00	852.19	148.73	216.17	2205.65	10.25	9.81	2203.70	12.14	12.03
05-Apr-17 17:00:00	852.86	143.31	215.19	2198.93	9.96	9.65	2201.59	12.15	12.03
05-Apr-17 17:01:00	845.96	141.78	216.82	2199.00	10.01	9.81	2195.21	12.24	12.13
05-Apr-17 17:02:00	840.46	144.09	216.92	2197.23	10.30	9.94	2204.07	12.36	12.25
05-Apr-17 17:03:00	849.77	144.70	217.65	2189.32	10.31	9.94	2213.90	12.40	12.28
05-Apr-17 17:04:00	850.27	144.36	220.37	2208.45	9.99	9.99	2213.51	12.43	12.30
05-Apr-17 17:05:00	859.89	138.44	221.67	2201.51	10.39	9.97	2208.06	12.44	12.30
05-Apr-17 17:06:00	842.33	145.38	219.01	2194.57	10.35	10.00	2202.60	12.52	12.36
05-Apr-17 17:07:00	843.32	144.06	222.38	2197.76	10.35	9.99	2195.15	12.47	12.32
05-Apr-17 17:08:00	847.41	143.80	222.13	2187.90	10.35	10.01	2184.17	12.45	12.35
05-Apr-17 17:09:00	845.05	143.48	224.27	2192.98	10.31	9.92	2186.27	12.51	12.39
05-Apr-17 17:10:00	839.84	144.96	223.25	2211.38	10.29	9.94	2202.10	12.51	12.37
05-Apr-17 17:11:00	835.84	145.03	222.48	2220.87	10.41	10.12	2211.81	12.57	12.41
05-Apr-17 17:12:00	847.67	141.44	223.95	2188.95	10.40	10.08	2208.51	12.58	12.44
05-Apr-17 17:13:00	862.74	141.05	225.92	2209.00	10.32	10.00	2205.20	12.58	12.46
05-Apr-17 17:14:00	842.66	144.00	226.01	2194.00	10.33	10.03	2201.92	12.61	12.44
05-Apr-17 17:15:00	834.35	141.07	222.44	2204.75	10.40	10.04	2202.12	12.59	12.44
05-Apr-17 17:16:00	848.45	146.29	220.44	2191.89	10.48	10.07	2196.54	12.54	12.45
05-Apr-17 17:17:00	853.94	141.93	217.61	2187.61	10.44	9.97	2191.99	12.55	12.45
05-Apr-17 17:18:00	855.11	144.54	215.82	2178.80	10.49	10.10	2194.46	12.56	12.45
05-Apr-17 17:19:00	853.81	143.44	217.26	2206.00	10.43	10.08	2209.54	12.62	12.47
05-Apr-17 17:20:00	880.19	145.47	218.64	2213.41	10.39	10.03	2203.22	12.55	12.40
05-Apr-17 17:21:00	848.12	145.15	218.35	2216.64	10.33	9.95	2207.74	12.57	12.43
05-Apr-17 17:22:00	844.14	148.30	217.19	2202.90	10.28	9.98	2203.53	12.53	12.38
05-Apr-17 17:23:00	841.22	147.30	221.22	2199.91	10.28	9.87	2199.32	12.48	12.34
05-Apr-17 17:24:00	824.33	144.55	222.16	2196.91	10.38	10.00	2195.11	12.50	12.32
05-Apr-17 17:25:00	858.57	143.55	217.82	2193.92	10.40	10.05	2181.97	12.53	12.34
05-Apr-17 17:26:00	848.75	146.56	215.05	2173.38	10.38	9.99	2193.67	12.53	12.37
05-Apr-17 17:27:00	840.09	143.33	212.85	2198.16	10.33	10.01	2206.90	12.57	12.40
05-Apr-17 17:28:00	826.09	147.30	212.95	2211.10	10.45	10.05	2198.19	12.60	12.42
05-Apr-17 17:29:00	831.48	149.20	217.63	2212.87	10.37	9.97	2212.90	12.54	12.38
05-Apr-17 17:30:00	835.44	148.88	218.56	2211.18	10.30	10.00	2207.71	12.58	12.41
05-Apr-17 17:31:00	849.90	141.07	218.99	2194.60	10.15	9.91	2195.93	12.61	12.45
05-Apr-17 17:32:00	863.72	142.42	219.78	2189.61	10.04	9.90	2192.66	12.63	12.48
05-Apr-17 17:33:00	856.07	144.02	219.01	2191.21	10.10	9.95	2191.45	12.64	12.47
05-Apr-17 17:34:00	863.72	149.54	216.03	2206.34	10.19	9.97	2190.24	12.60	12.45
05-Apr-17 17:35:00	868.82	148.26	216.31	2227.67	10.42	10.07	2217.87	12.58	12.45
05-Apr-17 17:36:00	871.13	145.02	216.10	2207.45	10.56	10.11	2212.36	12.57	12.39
05-Apr-17 17:37:00	867.54	150.56	208.00	2207.93	10.57	10.10	2199.32	12.56	12.41
05-Apr-17 17:38:00	857.61	155.08	206.05	2206.62	10.43	10.00	2202.59	12.56	12.42
05-Apr-17 17:39:00	860.09	149.03	205.68	2188.77	10.42	10.01	2194.01	12.56	12.41
05-Apr-17 17:40:00	872.32	147.99	205.85	2189.50	10.49	10.02	2200.16	12.56	12.40
05-Apr-17 17:41:00	864.59	148.63	205.83	2196.12	10.47	10.03	2189.58	12.59	12.41
05-Apr-17 17:42:00	859.20	149.57	203.84	2193.91	10.44	10.02	2196.68	12.58	12.40
05-Apr-17 17:43:00	870.65	149.74	202.43	2195.45	10.36	9.97	2211.67	12.56	12.41
05-Apr-17 17:44:00	871.68	144.99	203.89	2200.60	10.26	9.92	2203.75	12.54	12.37
05-Apr-17 17:45:00	886.23	150.15	206.02	2205.44	10.30	10.00	2200.63	12.55	12.40
05-Apr-17 17:46:00	858.89	151.69	204.07	2197.07	10.26	9.88	2204.31	12.51	12.35
05-Apr-17 17:47:00	864.20	154.52	201.92	2196.07	10.28	9.84	2201.08	12.40	12.30
05-Apr-17 17:48:00	850.61	153.72	202.43	2181.94	10.30	9.91	2205.49	12.44	12.27
05-Apr-17 17:49:00	847.53	147.65	203.17	2182.73	10.12	9.79	2182.97	12.41	12.31
05-Apr-17 17:50:00	855.46	149.62	200.49	2191.31	10.07	9.83	2197.13	12.48	12.34
05-Apr-17 17:51:00	855.81	146.79	203.34	2206.85	10.16	9.91	2201.43	12.47	12.34
05-Apr-17 17:52:00	860.06	142.02	205.40	2201.77	10.28	9.95	2215.40	12.44	12.34
05-Apr-17 17:53:00	844.26	148.49	208.18	2215.92	10.28	9.91	2215.98	12.48	12.32
05-Apr-17 17:54:00	845.30	147.18	207.81	2209.08	10.34	10.01	2208.84	12.47	12.33
05-Apr-17 17:55:00	852.96	150.39	206.89	2203.20	10.85	10.26	2205.26	12.47	12.33
05-Apr-17 17:56:00	872.46	146.52	205.63	2193.09	10.99	10.25	2192.97	12.47	12.33

Waste Gas Stack
Process Data

05-Apr-17 17:57:00	858.44	153.34	206.01	2180.57	11.05	10.20	2189.72	12.52	12.36
05-Apr-17 17:58:00	850.72	147.58	207.09	2182.98	11.04	10.18	2182.39	12.49	12.31
05-Apr-17 17:59:00	864.04	152.13	204.65	2180.56	10.91	10.17	2187.55	12.49	12.32
05-Apr-17 18:00:00	870.94	147.13	202.93	2175.33	10.80	10.18	2186.10	12.55	12.40
05-Apr-17 18:01:00	865.51	143.47	202.85	2210.06	10.75	10.15	2201.68	12.54	12.41
05-Apr-17 18:02:00	869.34	147.90	203.60	2199.03	10.68	10.12	2201.70	12.55	12.43
05-Apr-17 18:03:00	867.21	150.88	205.93	2211.24	10.60	10.05	2207.52	12.55	12.40
05-Apr-17 18:04:00	870.51	150.34	205.86	2198.08	10.56	10.01	2206.56	12.46	12.32
05-Apr-17 18:05:00	857.40	150.20	206.57	2200.04	10.55	10.06	2194.92	12.49	12.34
05-Apr-17 18:06:00	851.41	149.89	205.13	2194.19	10.52	10.01	2202.22	12.47	12.31
05-Apr-17 18:07:00	851.02	152.54	204.66	2195.15	10.43	9.98	2200.88	12.45	12.28
05-Apr-17 18:08:00	854.13	150.70	207.79	2196.11	10.29	9.89	2203.76	12.39	12.25
05-Apr-17 18:09:00	854.57	152.49	206.64	2189.74	10.35	9.95	2193.04	12.40	12.24
05-Apr-17 18:10:00	854.45	144.37	207.96	2198.98	10.47	10.01	2202.11	12.38	12.24
05-Apr-17 18:11:00	852.41	147.53	209.61	2204.17	10.35	9.93	2201.83	12.39	12.24
05-Apr-17 18:12:00	863.27	151.54	209.86	2203.13	10.43	9.95	2207.18	12.40	12.25
05-Apr-17 18:13:00	853.57	149.86	210.12	2202.54	10.39	9.89	2196.02	12.43	12.27
05-Apr-17 18:14:00	850.39	145.87	212.43	2195.17	10.32	9.89	2203.83	12.45	12.30
05-Apr-17 18:15:00	831.45	152.47	214.64	2189.93	10.33	9.95	2199.96	12.44	12.32
05-Apr-17 18:16:00	847.34	148.04	212.44	2180.71	10.36	9.93	2197.33	12.45	12.33
05-Apr-17 18:17:00	852.59	145.90	209.50	2205.45	10.33	9.97	2202.83	12.46	12.34
05-Apr-17 18:18:00	854.28	138.51	207.46	2193.31	10.37	10.02	2192.30	12.53	12.36
05-Apr-17 18:19:00	854.11	142.97	207.40	2205.01	10.46	10.01	2200.15	12.52	12.37
05-Apr-17 18:20:00	857.49	147.23	207.35	2204.21	10.31	9.93	2201.83	12.46	12.34
05-Apr-17 18:21:00	858.49	155.28	207.77	2199.84	10.28	9.89	2198.05	12.45	12.32
05-Apr-17 18:22:00	851.25	146.63	207.19	2197.46	10.35	9.94	2202.08	12.43	12.31
05-Apr-17 18:23:00	846.78	149.17	205.67	2178.18	10.42	9.98	2186.45	12.41	12.29
05-Apr-17 18:24:00	849.24	152.84	204.62	2196.63	10.37	9.95	2188.45	12.45	12.30
05-Apr-17 18:25:00	860.53	150.98	210.20	2193.50	10.32	9.93	2188.87	12.43	12.31
05-Apr-17 18:26:00	854.57	143.76	210.07	2217.05	10.27	9.93	2200.54	12.49	12.32
05-Apr-17 18:27:00	853.29	146.93	206.87	2208.25	10.38	10.01	2208.93	12.55	12.34
05-Apr-17 18:28:00	846.77	148.64	208.12	2204.15	10.46	10.03	2202.19	12.48	12.34
05-Apr-17 18:29:00	858.98	152.01	209.63	2197.98	10.39	9.95	2199.41	12.47	12.33
05-Apr-17 18:30:00	847.94	149.44	208.20	2199.33	10.32	9.91	2187.31	12.50	12.32
05-Apr-17 18:31:00	851.33	146.66	211.42	2210.06	10.35	9.97	2206.20	12.45	12.31
05-Apr-17 18:32:00	854.43	151.70	210.26	2195.00	10.36	9.97	2186.34	12.42	12.29
05-Apr-17 18:33:00	860.70	152.24	207.68	2201.67	10.31	9.93	2199.64	12.42	12.26
05-Apr-17 18:34:00	844.89	149.73	212.82	2191.65	10.31	9.89	2195.98	12.41	12.27
05-Apr-17 18:35:00	849.73	151.92	210.91	2200.25	10.29	9.86	2202.59	12.40	12.30
05-Apr-17 18:36:00	849.52	152.97	212.52	2204.64	10.29	9.90	2206.92	12.48	12.33
05-Apr-17 18:37:00	849.66	149.29	210.02	2210.53	10.35	9.98	2202.23	12.52	12.36
05-Apr-17 18:38:00	850.57	148.48	210.39	2196.94	10.43	10.04	2200.40	12.55	12.40
05-Apr-17 18:39:00	865.23	149.81	211.43	2195.80	10.42	9.97	2192.76	12.52	12.36
05-Apr-17 18:40:00	864.16	152.26	210.18	2195.84	10.44	9.99	2203.35	12.52	12.40
05-Apr-17 18:41:00	860.13	148.16	206.82	2198.99	10.36	10.01	2191.96	12.53	12.40
05-Apr-17 18:42:00	859.40	152.60	208.24	2199.59	10.35	9.96	2202.45	12.51	12.38
05-Apr-17 18:43:00	859.43	154.51	208.48	2193.11	10.29	9.86	2203.34	12.47	12.29
05-Apr-17 18:44:00	868.50	156.37	207.54	2199.28	10.35	9.94	2198.26	12.48	12.32
05-Apr-17 18:45:00	854.94	150.13	207.59	2210.99	10.31	9.94	2204.13	12.46	12.29
05-Apr-17 18:46:00	850.51	151.95	208.56	2195.38	10.30	9.88	2204.54	12.43	12.26
05-Apr-17 18:47:00	845.71	148.98	210.12	2192.30	10.30	9.91	2200.94	12.39	12.26
05-Apr-17 18:48:00	844.60	153.67	208.11	2204.41	10.27	9.91	2211.01	12.40	12.26
05-Apr-17 18:49:00	847.16	149.52	209.25	2214.23	10.26	9.89	2200.85	12.40	12.26
05-Apr-17 18:50:00	860.16	149.76	210.02	2199.01	10.32	9.91	2186.59	12.45	12.28
05-Apr-17 18:51:00	855.35	151.06	210.79	2203.00	10.29	9.92	2191.52	12.44	12.29
05-Apr-17 18:52:00	859.18	152.73	209.45	2194.60	10.33	9.93	2202.16	12.45	12.31
05-Apr-17 18:53:00	856.40	147.61	211.04	2194.44	10.26	9.89	2199.29	12.46	12.30
05-Apr-17 18:54:00	848.44	150.54	214.78	2186.53	10.30	9.92	2196.10	12.42	12.30
05-Apr-17 18:55:00	851.37	154.45	212.19	2205.70	10.29	9.90	2198.26	12.42	12.30
05-Apr-17 18:56:00	853.30	151.54	213.59	2197.01	10.30	9.93	2196.90	12.46	12.30
05-Apr-17 18:57:00	852.30	147.83	213.86	2210.25	10.30	9.95	2207.06	12.49	12.33
05-Apr-17 18:58:00	850.14	145.73	213.80	2210.67	10.34	9.93	2206.87	12.50	12.36
05-Apr-17 18:59:00	859.85	150.99	213.80	2197.63	10.28	9.94	2208.68	12.53	12.39
05-Apr-17 19:00:00	858.92	149.68	214.21	2203.17	10.36	10.03	2195.55	12.53	12.41
05-Apr-17 19:01:00	847.95	145.65	213.12	2194.37	10.44	10.07	2188.07	12.57	12.40
05-Apr-17 19:02:00	842.68	152.74	213.84	2192.02	10.45	10.00	2191.58	12.53	12.38
05-Apr-17 19:03:00	852.63	153.88	212.32	2201.71	10.32	9.94	2190.63	12.49	12.36
05-Apr-17 19:04:00	850.40	158.07	212.63	2209.21	10.34	9.93	2202.87	12.50	12.34
05-Apr-17 19:05:00	848.17	145.82	210.64	2194.17	10.40	9.96	2200.50	12.51	12.32
05-Apr-17 19:06:00	862.17	148.04	210.58	2194.16	10.32	9.92	2192.99	12.48	12.30
05-Apr-17 19:07:00	851.42	151.84	208.32	2204.77	10.29	9.86	2206.05	12.44	12.29
05-Apr-17 19:08:00	861.26	151.12	209.47	2195.79	10.27	9.90	2197.11	12.42	12.27
05-Apr-17 19:09:00	844.48	148.52	211.17	2203.64	10.23	9.90	2208.17	12.44	12.26
05-Apr-17 19:10:00	847.44	148.12	215.23	2208.66	10.31	9.91	2203.43	12.43	12.30
05-Apr-17 19:11:00	848.94	155.70	213.31	2205.32	10.28	9.94	2203.63	12.46	12.33
05-Apr-17 19:12:00	843.35	154.51	213.62	2197.53	10.33	9.96	2201.82	12.50	12.34
05-Apr-17 19:13:00	844.82	147.05	213.23	2199.50	10.31	9.95	2199.66	12.57	12.38

Waste Gas Stack
Process Data

05-Apr-17 19:14:00	857.45	150.54	212.62	2197.13	10.33	9.99	2201.57	12.55	12.39
05-Apr-17 19:15:00	857.44	154.52	213.16	2199.29	10.33	9.96	2197.54	12.53	12.37
05-Apr-17 19:16:00	854.88	151.77	212.43	2224.19	10.30	9.95	2194.25	12.50	12.39
05-Apr-17 19:17:00	863.89	148.44	213.71	2197.17	10.34	9.95	2209.51	12.53	12.38
05-Apr-17 19:18:00	852.64	154.18	214.29	2185.29	10.37	9.96	2193.35	12.48	12.36
05-Apr-17 19:19:00	854.91	154.10	211.81	2185.97	10.35	9.92	2195.75	12.48	12.33
05-Apr-17 19:20:00	846.55	160.50	213.17	2208.25	10.30	9.91	2194.40	12.41	12.31
05-Apr-17 19:21:00	858.73	150.25	211.30	2191.77	10.26	9.94	2190.63	12.43	12.32
05-Apr-17 19:22:00	851.15	147.76	213.01	2205.26	10.29	9.89	2192.30	12.44	12.32
05-Apr-17 19:23:00	852.31	152.01	214.26	2197.15	10.33	9.94	2195.79	12.48	12.33
05-Apr-17 19:24:00	854.54	150.45	212.23	2196.83	10.30	9.93	2201.71	12.46	12.34
05-Apr-17 19:25:00	856.08	147.57	210.13	2199.75	10.34	9.95	2205.90	12.44	12.35

Appendix F

Stack Test Plan

John A. Rooney

From: Place, Andrew (MPCA) <andrew.place@state.mn.us>
Sent: 23 March, 2017 4:42 PM
To: Stephani Campbell
Cc: Tom Kuchinski; Palzkill, Steven (MPCA)
Subject: March 27 and April 3 Test Plan Approval

Include a copy of the Test Plan and this Test Plan Approval Email in the Final Report

Test Plan Approval Letter

Facility: US Steel – Keetac

Address: PO Box 217, 1 Mine Road, Keewatin, MN 55753

Contact Person/Phone: Stephani Campbell, Environmental Control, 218-778-8684

Test Date: March 27 and April 3, 2017

Test Plan Submittal Date: February 28 and March 3, 2017

Pretest Meeting Date: March 23, 2017

Units to be Tested: Group 1 (COMG 5) Crude Ore Feed Lines Primary #4 (STRU 59/SV008), Group 2 Crude Ore Feed Lines Primary #9 (STRU 64/SV013) Waste Gas Stack (EQUI 97/EU030 & STRU 8/SV051), Group 6 (COMG 14) Additive Blending (EQUI 95/EU016 & STRU 67/SV016), and Group 5 (COMG 3) Pellet Screening (EQUI 46/EU037 & STRU 6/SV037)

Agency Interest ID: 142828

Your test plan has been approved by the Minnesota Pollution Control Agency (MPCA) as follows:

Test plan approved with the following provisions:

1. Results of all tests completed March through May, 2017 will be supplied in one report submitted withing 45 days after the last test completed in May. Additional test plans and approvals will be used to communicate upcoming tests. In the event a noncompliant test result is discovered, contact the MPCA as soon as possible to determine the appropriate course of action.
2. Emission rate and air flows will be applied to the test units to calculate as part of the NESHAP flow weighted averages. US Steel does not intend to change operating limits with this test.
3. Include in the executive summary of the test report an updated calculation of the affected source groups' flow weighted averages based on the results of this test. Additionally, as discussed, supply a summary of the flow weighted averages and operating limits for all affected sources subject to the MACT in order for comparison with current MPCA summary.
4. Operating limits will not be adjusted for units operated within 20% of the current operating limit. If operations fall outside this range, contact the MPCA to discuss the situation. If after testing, US Steel decides to adjust a limit based on test conditions, communicate this intention as part of the executive summary and make necessary adjustment to the summary requested above.
5. SO₂ and NO_x results will be collected from the CEMS RATA. These results will be supplied as part of the test executive summary. The RATA summary must also be submitted as part of the next Excess Emission Report submission required by Minn. R. 7017.1110, subp. 2(D).
6. The testing schedule for units listed in the test plan may be adjusted based on operations, weather, etc.

7. Include in the final test report all process and pollution control equipment operating data collected at 15 minute intervals (minimum) and averaged for each test run and test. This information must be clear easily understood by individuals not familiar with the process. All information needed to show process operating rate and pollution control equipment compliant operation must be included. A link to reporting forms can be found below.
8. An acceptable report must comply with Minn. Rule 7017.2035 PERFORMANCE TEST REPORTING REQUIREMENTS. Use of the PTRCC form will help assure that a complete test report is submitted to the MPCA.

Andy Place
State Program Administrator Principal
Minnesota Pollution Control Agency
520 Lafayette Road No.
St. Paul, Minnesota 55155-4194
651-757-2652
andrew.place@state.mn.us

The following forms are available at <http://www.pca.state.mn.us/jsrid16>

Operating Data Summary – Combustion Sources
Operating Data Summary – Process Sources
Operating Data Summary – Asphalt Plants
Report Certifications Form
Performance Test Report Completeness Criteria (PTRCC)

All periods of noncompliance with emission limits must be reported to the MPCA, this includes any periods of engineering tests. The requirements outlined under the Notification of Deviations Endangering Human Health or the Environment, Minn. R. 7019.1000, subp. 1., shall be followed. This information should also be clearly stated and readily available in the executive summary of the test report.

Please be aware that enforcement action will be taken for performance test failures indicating emissions above applicable limits (excess actual emissions to the environment). Failures commonly result in assessment of a monetary penalty. Upon the first test failure, the Company should take immediate measures to minimize emissions. The measures taken should be documented, as they will become part of the record of corrective actions.

(Preferred) Electronic copies of the test report submitted to SubmitStackTest.PCA@state.mn.us

If an electronic copy of the complete test report is submitted the paper and CD copies are not required. Please follow requirements outlined in Method 1 of the document found at this link:

<https://www.pca.state.mn.us/sites/default/files/aq1-39.pdf>

Hard Copy Performance Test Reports and Microfiche or CD Copy submittals will be addressed to:

Air Quality Compliance Tracking Coordinator
Industrial Division
Minnesota Pollution Control Agency
520 Lafayette Road North
St. Paul, Minnesota 55155-4194



U. S. Steel Corporation
Minnesota Ore Operations
P.O. Box 417
Mt. Iron, MN 55768

CERTIFIED MAIL # 7015 1730 0001 0864 8014

March 3, 2017

Andy Place
North District, Major Facilities
Minnesota Pollution Control Agency
520 Lafayette Road
St. Paul, Minnesota 55155-4194

Re: **U. S. Steel – Keetac**
Notification of Testing and Test Plan

Dear Mr. Place,

This document is the Notification of Testing and Test Plan for a performance tests to be conducted on three Agglomerator sources, the Waste Gas (SV051), additive blending (SV016) and pellet screening (SV037).

The initial compliance determination for MACT has been conducted for applicable collectors. These performance tests are related to Air Emission Permit No. 13700063 (Title V permit).

TEST PLAN

Part I. General Information

(1) Name and address of the emission facility.

U. S. Steel – Keetac
P.O. Box 217
1 Mine Road
Keewatin, Minnesota 55753

(2) Name, title, telephone and fax number of contact person at the emission facility.

Stephani Campbell
Environmental Control
Voice (218) 778-8684 Fax (218) 749-7360
Electronic mail: scampbell@uss.com

(3) Permit number of name or other applicable document.

Title V Air Emissions Permit 13700063

40 CFR Part 63 Subpart RRRRR – National Emission Standards for Hazardous Air
Pollutants: Taconite Iron Ore Processing

(4) Reasons for testing.

For SV051 determination of PM, PM10, NOx, SO2, CO, VOC and Opacity for the Title V
Permit and Hg for MN Rule MN 7019.3050

Determination of total particulate matter (TPM) and opacity for industrial process rules
(IPER) and Title V permit limits for SV037 and SV016.

(5) Schematic drawing of the stacks and sample ports.

Enclosed herein.

(6) Location of Plant

Within the corporate limits of the city of Keewatin, MN.

(7) Name, contact person, telephone and fax number for testing company

Barr Engineering, Minneapolis, MN.
Tom Kuchinski
Voice (952) 832-2727 Fax (952) 832-2996

Part II. Testing Requirements

- (1) List of emission unit, pollutants to be tested, the emission limit for each pollutant and the
applicable rule or regulation for the emission limit.

Waste Gas Stack (SV051)

Particulate Matter

Emission limit Minn. R 7011.0715 subp. 1(A)
0.3 grains/dscf or the less stringent of 7011.0730 or 7011.0735

Opacity

Less than or equal to 20%. Minn. R 7011.0715 subp. 1(B)

Filterable portion PM limit of 0.01 gr/dscf from 40 CFR Part 63 Subpart
RRRRR Table I

Carbon monoxide:

Less than or equal to 123 tons/yr using a 12-month rolling sum.

Volatile organic compounds:

Less than or equal to 75 tons/yr using a 12-month rolling sum.

Nitrogen oxides:

Less than or equal to 6076 tons/year using a 12-month rolling

Sulfur dioxides:

Less than or equal to 951 tons/yr using a 12-month rolling sum.

Group 006 Additive Blending

4D-04-14 (SV 016)

Particulate Matter

Minn. R 7011.0710 subp. 1(A)

0.3 grains/dscf or the less stringent of 7011.0730 or 7011.0735

Opacity

Emission limit

Minn. R 7011.0710 subp. 1(B)

Group 005 Pellet Screening

4D-04-58 (SV 037)

Particulate Matter

40 CFR 60.385(a)(1)

0.5 grains/dscf

Minn. R 7011.2700

Opacity

Emission limit

40 CFR 60.385(b)

Minn. R 7011.2700

- (2) Description of procedure for fuel sampling and analysis, where applicable.

Fuel will likely be natural gas for SV051.

Part III. Operating Conditions

- (1) List the process or operating rate and conditions of the process equipment and the air pollution control equipment for the test.

All tests will be performed while the associated process equipment is operating normally. All control equipment will be operated normally and greater than 90 percent of maximum throughput.

- (2) Explanation of why the proposed conditions are considered to be in accordance with Part 7017.2025, Subpart 2, for required testing conditions.

The statement about the assumption of worst-case conditions in the cited subpart applies.

- (3) List the range of process or operating rates for the emission units.

Dust Collector	CE#	SV#	Process Description	Estimated Process Rate (LTPH)
4A-04-62/4A-04-63	110/111	051	Waste Gas	0-950 (Greenballs)
4D-04-14	016	016	Additive Blending 2	15-20 lbs/LT GB
4D-04-58	037	037	Pellet Screening	0-950 (Greenballs)

- (4) Descriptions of how air pollution control and process equipment will be monitored.

The dust collectors will be monitored for pressure drop and water flow during all three runs. Process rates will be monitored during all three test runs at each location.

Part IV. Test Methods

- (1) List of the methods to be used to determine the emission rate of each pollutant.

Test Port Location	EPA Method 1
Determination of velocity and volumetric flow	EPA Method 2
Determination of gas molecular weight	EPA Method 3
Determination of moisture content	EPA Method 4
Determination of PM	EPA Method 5
Determination of Condensable PM	EPA Method 202*
Opacity	EPA Method 9
Determination of SO ₂	CEMS / RATA Results
Determination of NO _x	CEMS / RATA Results
Determination of CO	EPA Method 10
Determination of VOC	EPA Method 25A
Determination of Hg	Method 29
*Original Method	

- (2) Number of test runs, length of the test runs, and sampling rate for each method.

SV016 and SV037 - Tests will be performed in accordance with the EPA Methods given above.

- (3) Reference to any compliance document, federal regulation, or Minnesota rule or statute requiring use of specific methods or procedures.

Applicable test methods are listed above.

- (4) Summary of reasons for proposing to use alternative or equivalent method.

For EPA Method 202, propose using original method, with the exception of using hexane instead of the methylene chloride.

The post test dry gas meter calibration check will be done using the alternative approach listed in EPA Method 5.

- (5) For test methods other than reference methods, statement of the detection limit and the degree of accuracy of that method at the expected emission rate and under the conditions of the performance test.

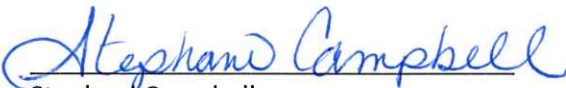
Not applicable

Test Schedule and Pretest Meeting

SV016 and SV037 are proposed to be tested the latter half of the week of April 3, 2017. At the preference of the MPCA, we would suggest the pretest meeting could occur the week prior to when the testing begins and be conducted via telephone.

Closing Remarks

If there are any questions or comments on the information given in this document, please contact me at the telephone number listed above.

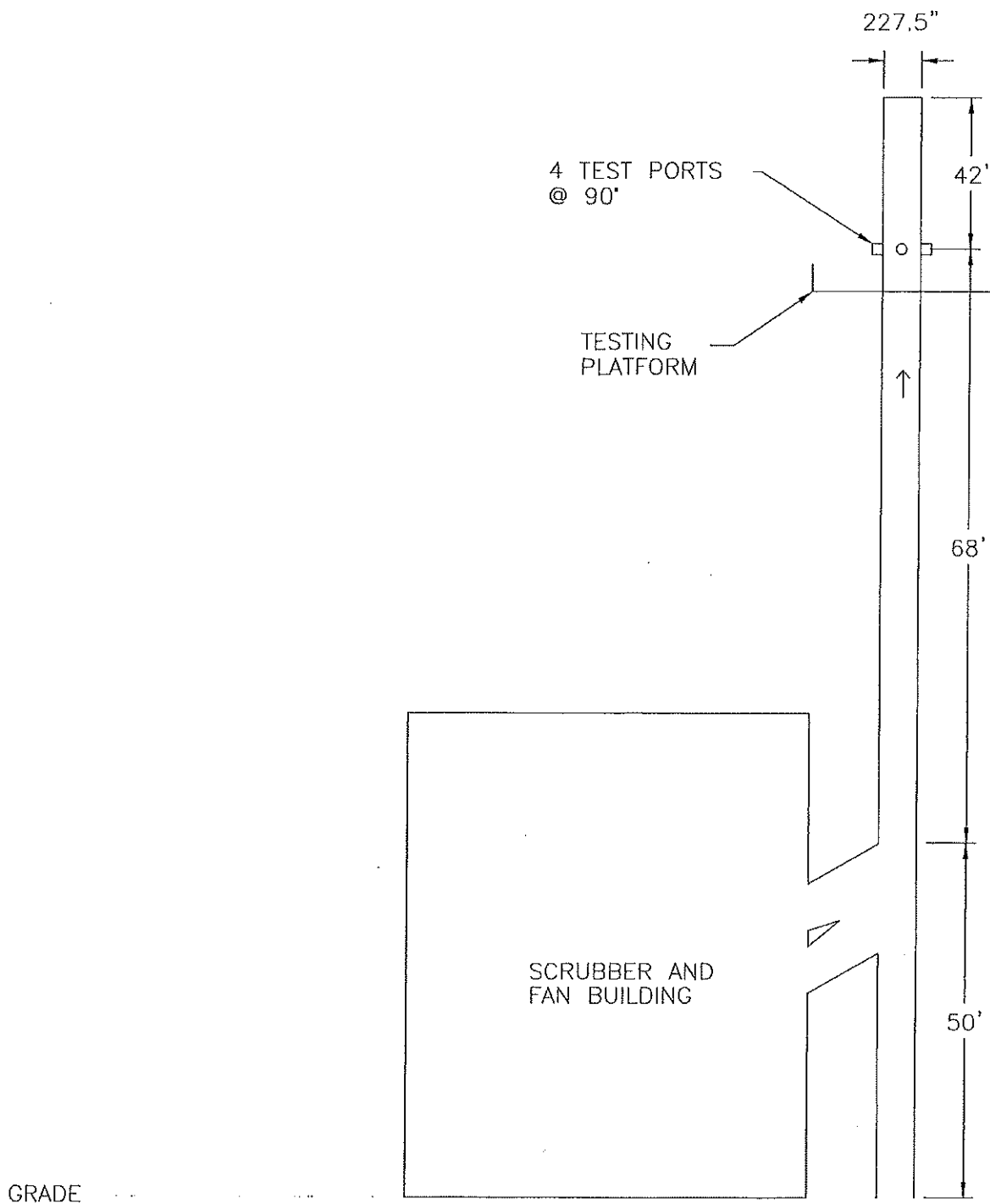


Stephanie Campbell
Environmental Control
U. S. Steel – Minnesota Ore Operations

Enclosures:

Waste Gas (SV051)
Phase II Additive Blending (SV016)
Pellet Screening (SV037)

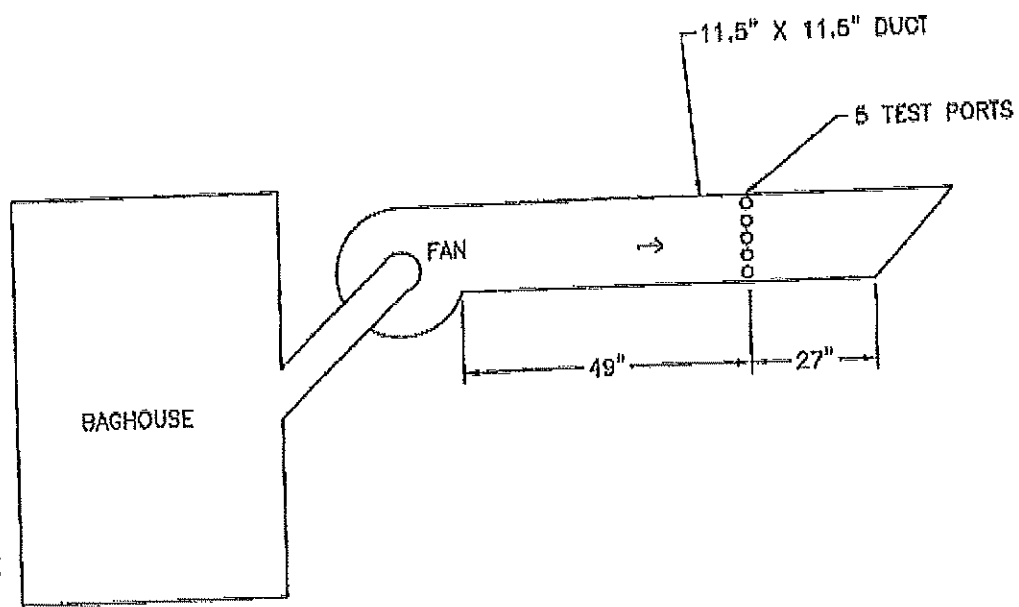
cc: Steve Palzkill – MPCA
Tom Kuchinski – Barr Engineering



TEST PORT LOCATIONS
KEEWATIN TACONITE
KEEWATIN, MINNESOTA
PHASE II WASTE GAS STACK (SV051)

NOT TO SCALE

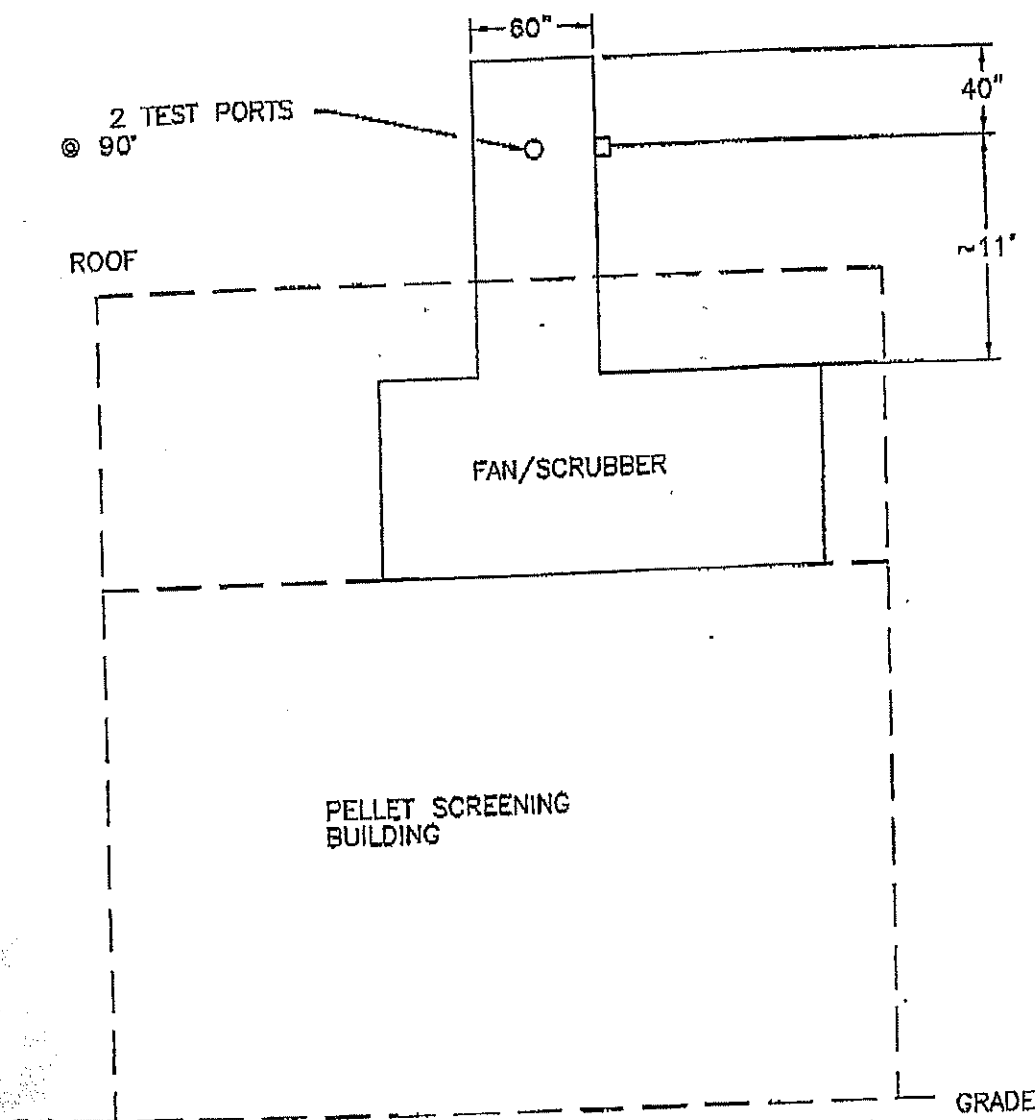
FIGURE 3



TEST PORT LOCATION
SV016
PHASE II ADDITIVE BLENDING

MAY-17-2006 10:34 BARR ENGINEERING
MAY-17-2006 10:27 BARR ENGINEERING
MAY 17 2006 10:24 FR BARR ENGINEERING C0952 832 2996 TO 2601

9528322601 P.05
9528322601 P.06/08
P.06



TEST PORT LOCATIONS
KEEWATIN TACONITE
KEEWATIN, MINNESOTA
PELLET SCREENING (SV037)

Appendix G

Project Participants and Contact Information

Project Participants and Contact Information

Minnesota Pollution Control Agency

Andrew Place – State Program Administrator Principal

U.S. Steel Corporation – Keewatin Taconite

Stephani Campbell – Environmental Affairs

Barr Engineering Company

Tim Russell – Vice President / Chemical Engineer

Tom Kuchinski – Sr. Air Quality Technician

Dan Koschak – Sr. Air Quality Technician

CONTACT INFORMATION

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