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**RESULTS OF THE LINE 1 PELLET INDURATION  
FURNACE AIR EMISSION INVENTORY TESTING  
AT THE UNITED TACONITE FACILITY  
IN FORBES, MINNESOTA  
EQUI45/STRU53**

**Permit No. 13700113-007  
Agency Interest ID: 140099**

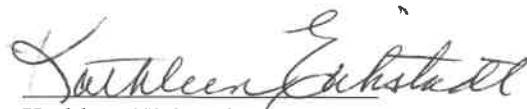
Submitted to:

**UNITED TACONITE**  
1200 West Highway 16  
Forbes, Minnesota 55738

Attention:

Mike Bonham

Reviewed by:

  
Kathleen Eickstadt  
Coordinator  
Source Testing Department

Report Number 19-37384  
April 26, 2019  
DVH



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## ABBREVIATIONS

ACFM	actual cubic feet per minute
cc (ml)	cubic centimeter (milliliter)
DSCFM	dry standard cubic foot of dry gas per minute
DSML	dry standard milliliter
DEG-F (°F)	degrees Fahrenheit
DIA.	Diameter
FT/SEC	feet per second
g	gram
GPM	gallons per minute
GR/ACF	grains per actual cubic foot
GR/DSCF	grains per dry standard cubic foot
g/dscm	grams per dry standard meter
HP	horsepower
HRS	hours
IN.	inches
IN.HG.	inches of mercury
IN.WC.	inches of water
LB	pound
LB/DSCF	pounds per dry standard cubic foot
LB/HR	pounds per hour
LB/106BTU	pounds per million British Thermal Units heat input
LB/MMBTU	pounds per million British Thermal Units heat input
MW	megawatt
mg/dscm	milligrams per dry standard cubic meter
ug/dscm	micrograms per dry standard cubic meter
microns (um)	micrometer
MIN.	minutes
ng	nanograms
PM	particulate matter
PPH	pounds per hour
PPM	parts per million
ppmC	parts per million carbon
ppm,d	parts per million, dry
ppm,w	parts per million, wet
ppt	parts per trillion
PSI	pounds per square inch
SQ.FT.	square feet
TPD	tons per day
ug	micrograms
v/v	percent by volume
w/w	percent by weight

Standard conditions are defined as 68 °F (20 °C) and 29.92 IN. of mercury pressure





Minnesota Pollution  
Control Agency

520 Lafayette Road  
St. Paul, MN 55155-4194

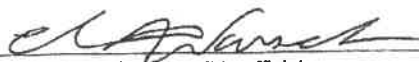
# Air Performance Test Form

## Certifications Required for Performance Test Reports

**NOTE:** All performance test reports must contain a certification by the responsible parties that the test results have been reported accurately, that the field data is a true representation of the sampling procedures, and that the process data is a true indicator of the operating parameters of the emissions unit at the time of the performance test. (Ref. Minn. R. 7017.2040). Performance test results will not be accepted without certification of the report. Please note that original signatures are required.

**1. Certification of sampling procedures by the team leader of the personnel conducting the 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."

  
Signature of responsible official

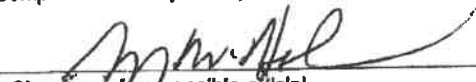
Chris Warneke  
Printed name of person signing

Title Field Engineer

Date 2-14-19

**2. Certification of analytical procedures by the person responsible for the laboratory analysis of field samples:**

"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."

  
Signature of responsible official

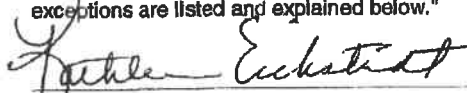
Gregg Holman  
Printed name of person signing

Title Lab Manager

Date 4/26/19

**3. Certification of test report by the senior staff person at the testing company who is responsible for compiling and checking the test report:**

"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."

  
Signature of responsible official

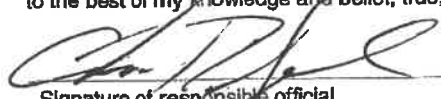
Kathleen Eckstadt  
Printed name of person signing

Title Source Testing Coordinator

Date 4/26/19

**4. Certification of test report by owner or operator of the 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 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."

  
Signature of responsible official

CHAS R. ASGARAO  
Printed name of person signing

Title General Manager

Date 4-26-19

**Note:** This form is to be submitted as part of the performance test report and must have original signatures.



## 1 INTRODUCTION

On February 13-14, 2019, Interpoll Laboratories conducted air emission inventory testing on the Line 1 Pellet Induration Furnace at the United Taconite facility in Forbes, Minnesota. On-site testing was performed by Chris Warneke, Colin Kelly and Tony Smith. Coordination between testing activities and plant operation was provided by Mike Bonham and Logan Koskela of United Taconite. The tests were not witnessed by a representative of the MPCA.

Particulate evaluations were performed in accordance with EPA Methods 1-5. A preliminary determination of the gas linear velocity profile was made before the first particulate determination to allow selection of the appropriate nozzle diameter required for isokinetic sample withdrawal. An Interpoll Labs sampling train, which meets or exceeds specifications in the above-cited reference, was used to extract the samples by means of a glass-lined probe. Additionally, Wet catch samples were collected in the back half of the sampling train and analyzed in accordance with EPA Method 202.

Trace metal sampling was performed in accordance with EPA Method 29. The Multi-Metal Modified Method 5 (4M5) sampling train, described in this method, was used to isokinetically collect solid and vapor phase trace metals from the exhaust gas stream. The aerosol or solid phase trace metal samples were collected on Whatman QMA ultra-pure Quartz Fiber filters. The vapor phase trace metals were collected in an all glass impinger train. The first impinger was left empty as a knockout, second and third impingers each contained 100 cc of a mixture of 5%  $\text{HNO}_3$  and 10%  $\text{H}_2\text{O}_2$ . The Fourth Impinger was empty and the fourth and fifth impingers each contained 100 cc of a mixture of 4.0%  $\text{KMnO}_4$  and 10%  $\text{H}_2\text{SO}_4$ . These impingers collect any elemental mercury, which might penetrate the Nitric Acid impingers.

The recovered samples were returned to the laboratory where the probe rinse, filter, nitric acid impinger catch were analyzed for Lead by Inductively Coupled Argon Plasma Emission Spectrometry (ICP). In addition the samples were also analyzed for Mercury by Cold Vapor Atomic Absorption Spectrometry (CV/AA). One reagent blank and one field-biased train blank per test were also collected and recovered at the test site and analyzed for lead and mercury with the field samples.

Oxygen and carbon monoxide sampling were conducted using EPA Methods 3A and 10. A



slipstream of sample gas was withdrawn from the exhaust gas stream using a heat-traced probe and filter assembly. After passing through the filter, the gas passed through a heated manifold and then two condenser-type moisture removal systems operating in series. The particulate-free dry gas was then transported to the analyzers, with the excess exhausted to the atmosphere through a calibrated orifice, which was used to ensure that the flow from the stack exceeds the requirements of the analyzers. The instruments were calibrated before and after the runs using EPA Protocol 1 calibration gases. The reference method concentrations were recorded using a computer data logger.

Total Volatile Organic Compounds (TGNM - VOC's) was determined instrumentally using a VIG Industries heated flame ionization detector (HFID) calibrated against propane in air standards in accordance with EPA Method 25A. The VOC concentration was continuously monitored by extracting a slipstream of exhaust gas from the heated manifold and then to the back of the instrument, by means of a heated a heat-traced Teflon line. The analog response of the analyzer was then recorded using a computer data logger. All the analyzers were calibrated with EPA Protocol I Gases.

A summary of all of the important results is given in the following section. Supplemental information such as field data sheets and laboratory results are presented in the appendices.



## 2 SUMMARY AND DISCUSSION

The air emission results are summarized in the following tables. An overview of all results is presented below:

**Table 1: Summary of Compliance Test Results**

<b>Emission Unit No.</b>	<b>Limitation Basis</b>	<b>Pollutant Emission Limit</b>	<b>Test Result</b>
EQUI 45(EU040)/ STRU 53 <b>Line 1 Pellet Induration Furnace (Natural Gas/Coal)</b>	<b>Not Applicable</b>	<b>Emission Inventory</b>	<b>Mercury</b> $\leq 5.73$ ug/dscm $\leq 0.0063$ lb/hr <b>Lead</b> $\leq 23.24$ ug/dscm $< 0.025$ lb/hr <b>Carbon Monoxide</b> 9.77 ppm dry 12.47 lbs/hr <b>VOC</b> 0.68 ppm, propane (TGNM) 1.36 lbs. propane/hr (TGNM)
EQUI 45(EU040)/ STRU 53 <b>Line 1 Pellet Induration Furnace (Natural Gas)</b>	<b>Not Applicable</b>	<b>Emission Inventory</b>	<b>PM10/PM2.5</b> 0.0059 gr/dscf 15.26 lb/hr
			<b>Filterable PM with Organic</b> 0.0035 gr/dscf 8.93 lb/hr
EQUI 45(EU040)/ STRU 53 <b>Line 1 Pellet Induration Furnace (Natural Gas)</b>	<b>Not Applicable</b>	<b>Emission Inventory</b>	<b>Mercury</b> $\leq 5.61$ ug/dscm $\leq 0.0063$ lb/hr <b>Lead</b> $< 17.63$ ug/dscm $< 0.02$ lb/hr <b>Carbon Monoxide</b> 8.69 ppm dry 11.38 lb/hr <b>VOC</b> 0.68 ppm propane (TGNM) 1.39 lb propane /hr (TGNM)



No difficulties were encountered in the field or in the laboratory evaluation of the samples. On the basis of these facts and a complete review of the data and results, it is our opinion that the concentrations and emission rates reported herein are accurate and closely reflect the actual values which existed at the time the tests were performed.



**Table 1. Test 1 Summary of the February 13, 2019 Mercury Emission Test on the Line 1 (EQUI45/STRU53) Pellet Induration Stack at the United Taconite Facility in Forbes, Minnesota.(Natural Gas/ Coal)**

Item	Run 1	Run 2	Run 3	Average
Date of test	02-13-19	02-13-19	02-13-19	
Time runs were done	(Hrs) 0800 / 0904	0942 / 1232	1305 / 1409	
Volumetric Flow				
Actual	419,767	410,641	387,798	406,069
Standard	301,322	298,876	278,549	292,916
Standard	21,024,197	20,575,726	19,441,981	20,347,301
Standard	595,350	582,651	550,546	576,182
Gas Temperature	140	140	139	140
Moisture Content	14.01	12.85	14.04	13.63
Gas Composition				
Carbon Dioxide	2.10	2.07	1.91	2.02
Oxygen	17.54	17.51	17.45	17.50
Nitrogen	80.37	80.42	80.64	80.48
Isokinetic Variation	101.3	99.1	101.4	100.6
Sample Volume	42.70	41.46	39.50	
Sample Volume	1.41	1.35	1.30	
	10113	10153	10115	
<b>Method 29 Results</b>				
<i>Mercury Front Half</i>				
Concentration - Actual	<	<	<	<
Emission Rate	(ug)	(ug/DSCM)	(ug/DSCM)	(ug/DSCM)
Concentration	(ug/DSCM @ 7% O <sub>2</sub> )	(LB/HR)	(LB/HR)	(LB/HR)
	0.05	0.041	0.000047	0.000047
	0.171	0.174	0.180	0.175
<i>Mercury Back Half</i>				
Concentration - Actual	<	<	<	<
Emission Rate	(ug)	(ug/DSCM)	(ug/DSCM)	(ug/DSCM)
Concentration	(ug/DSCM @ 7% O <sub>2</sub> )	(LB/HR)	(LB/HR)	(LB/HR)
	7.27	6.010	0.006773	0.006773
	24.826	24.510	20.435	23.257
<i>Mercury Total</i>				
Concentration - Actual	<	<	<	<
Concentration	(ug)	(ug/DSCM)	(ug/DSCM)	(ug/DSCM)
Emission Rate	(ug/DSCM @ 7% O <sub>2</sub> )	(LB/HR)	(LB/HR)	(LB/HR)
Concentration	7.32	6.051	5.2062	5.731
	24.997	24.684	20.615	23.432

"<" = BDL (Below Detection Level)-All analytical levels used to calculate emission values are less than the laboratory's detection levels.  
 "<=" = DLL (Detection Level Limited)- At least one but not all values used to calculate emission values are less than the laboratory's detection levels.  
 "" = ADL (Above Detection Limit) - All analytical values used to calculate emissions are greater than the laboratory's reported detection levels.



**Table 2.** Test 1 Summary of the February 13, 2019 **Lead** Emission Test on the Line 1(EQUI45/STRU53) Pellet Induration Stack at the United Taconite facility in Forbes, Minnesota.(Natural Gas/ Coal)

Item	Run 1	Run 2	Run 3	Average
Date of test	02-13-19	02-13-19	02-13-19	
Time runs were done	(Hrs)	0942 / 1232	1305 / 1409	
Volumetric Flow				
Actual	(ACFM)	410641	387798	406069
Standard	(DSCFM)	298876	278549	292916
Gas Temperature	(°F)	140	139	140
Moisture Content	(%v/v)	14.01	14.04	13.63
Gas Composition	(%v/v, dry)			
Carbon Dioxide		2.10	1.91	2.02
Oxygen		17.54	17.45	17.50
Nitrogen		80.37	80.64	80.48
Isokinetic Variation	(%)	101.3	101.4	100.6
Sample Volume	(DSCF)	42.70	39.50	
<b>Results</b>				
<b>Lead</b>	(ug)	≤	≤	≤
Concentration - Actual	(ug/DSCM)	≤	26.90	≤
Emission Rate	(LB/HR)	≤	22.911	≤
Concentration	(ug/DSCM @ 7% O2)	≤	0.025610	≤
		≤	93.879	≤
		≤	27.00	≤
		≤	24.135	≤
		≤	0.025143	≤
		≤	97.206	≤
		≤	94.897	≤

"<" = BDL (Below Detection Level)-All analytical levels used to calculate emission values are less than the laboratory's detection levels.  
 "≤" = DLL (Detection Level Limited)- At least one but not all values used to calculate emission values are less than the laboratory's detection levels.  
 " " = ADL (Above Detection Limit) - All analytical values used to calculate emissions are greater than the laboratory's reported detection levels.



Table 3 Test 2 Summary of the February 13, 2019, Carbon Monoxide and VOC (Method 25a) Test on the Line 1 Pellet Induration (EQUI45/STRU53) at the United Taconite located in Forbes, MN.(Coal/Natural Gas)

Item	Run 1 02-12-19 0800 / 0900	Run 2 02-12-19 0955 / 1232	Run 3 02-12-19 1305 / 1405	Average
Date of test				
Time runs were done	(Hrs)			
Volumetric Flow				
Actual	419,767	410,641	387,798	406,069
Standard	301,323	298,876	278,549	292,916
Gas Temperature	140	140	139	140
Moisture Content	14.01	12.85	14.04	13.63
Gas Composition				
Carbon Dioxide	2.10	2.07	1.91	2.02
Oxygen	17.54	17.51	17.45	17.50
Nitrogen	80.37	80.42	80.64	80.48
<b>Results:</b>				
Carbon Monoxide (EPA Method 10)				
Concentration	9.34	10.06	9.91	9.77
Emission Rate	12.27	13.11	12.04	12.47
VOC (EPA Method 25a)				
Concentration	1.40	1.33	1.41	1.38
Concentration	0.73	0.63	0.67	0.68
Concentration	4.20	3.98	4.22	4.13
Concentration	2.20	1.88	2.02	2.03
Emission Rate (Lb/Hr)	2.37	2.23	2.20	2.26
	1.24	1.05	1.05	1.11
Emission Rate (Lb/Hr)	2.90	2.72	2.69	2.77
	1.52	1.29	1.29	1.36

TGNM = Total Gaseous Non-methane



Table 4 Test 3 Summary of the February 14, 2019, Particulate Emission Test on the Line No. 1 Pellet Induration Furnace Stack (EQUI45/STRU53 at the United Taconite Facility in Forbes, Minnesota. (Natural Gas)

Date of test	Item	Run 1 02-14-19	Run 2 02-14-19	Run 3 02-14-19	Average
Time (Start/Finish)	(Hrs)	0835 / 0951	1047 / 1154	1237 / 1342	
Volumetric Flow					
Actual	(ACFM)	420,536	425,318	413,956	419,937
Standard	(SCFM)	346,267	350,302	341,275	345,948
Dry Standard	(DSCFM)	300,662	303,683	295,531	299,959
Gas Temperature	(°F)	140	140	140	140
Moisture Content	(%v/v)	13.17	13.31	13.40	13.29
Gas Composition					
Carbon Dioxide	(%v/v, dry)	1.19	1.05	1.07	1.10
Oxygen		18.33	18.38	18.40	18.37
Nitrogen		80.48	80.57	80.53	80.53
Sample Volume	(dscf)	42.34	42.63	41.58	42.18
Isokinetic Variation	(%)	99.9	99.6	99.8	99.8
Particulate Results-EPA Methods 5 with EPA 202					
Dry Catch Only					
Sample Mass (Nozzle, PW, Filter)	(g)	0.0095	0.0094	0.0086	
Concentration - Actual	(GR/ACF)	0.00248	0.00243	0.00228	0.00239
Concentration - Actual	(MG/ACM)	5.664	5.558	5.213	5.47831
Concentration - Standard	(GR/DSCF)	0.00346	0.00340	0.00319	0.00335
Emission Rate	(LB/HR)	8.920	8.854	8.082	8.619
Organic CPM					
Sample Mass	(g)	0.0006	0.0001	0.0003	
Concentration - Actual	(GR/ACF)	0.00016	0.00003	0.00008	0.000087
Concentration - Standard	(GR/DSCF)	0.00022	0.00004	0.00011	0.000122
Emission Rate	(LB/HR)	0.564	0.094	0.281	0.313
Dry Catch + Organic CPM					
Sample Mass	(g)	0.0101	0.0095	0.0089	
Concentration - Actual	(GR/ACF)	0.00263	0.00246	0.00236	0.002481
Concentration - Standard	(GR/DSCF)	0.00368	0.00344	0.00330	0.003474
Emission Rate	(LB/HR)	9.485	8.948	8.366	8.933
Inorganic CPM					
Sample Mass	(g)	0.0074	0.0057	0.0071	
Concentration - Actual	(GR/ACF)	0.00193	0.00147	0.00188	0.001761
Concentration - Standard	(GR/DSCF)	0.00270	0.00206	0.00264	0.002465
Emission Rate	(LB/HR)	6.949	5.369	6.674	6.331
Total Particulate (Dry + Organic + Inorganic)					
Sample Mass	(g)	0.0175	0.0152	0.016	
Concentration - Actual	(GR/ACF)	0.00456	0.00393	0.00424	0.004242
Concentration - Standard	(GR/DSCF)	0.00638	0.00550	0.00594	0.005939
Emission Rate	(LB/HR)	16.434	14.317	15.037	15.263



**Table 5.** Test 4 Summary of the February 14, 2019 Mercury Emission Test on the Line 1 (EQU145/STRU53) Pellet Induration Stack at the United Taconite facility in Forbes, Minnesota.(Natural Gas)

Item	Run 1	Run 2	Run 3	Average
Date of test	02-14-19	02-14-19	02-14-19	
Time runs were done	(Hrs)	0835 / 0951	1047 / 1154	1237 / 1342
Volumetric Flow				
Actual	422,916	417,381	421,917	420,738
Standard	303,350	296,681	302,229	300,753
Standard	20,893,583	20,605,882	20,864,535	20,788,000
Standard	591,652	583,505	590,829	588,662
Gas Temperature	(°F)	140	141	140
Moisture Content	(%v/v)	12.89	13.61	13.20
Gas Composition	(%v/v, dry)			
Carbon Dioxide	1.19	1.05	1.07	1.10
Oxygen	18.33	18.38	18.40	18.37
Nitrogen	80.48	80.57	80.53	80.53
Isokinetic Variation	(%)	99.8	100.6	99.5
Sample Volume	(DSCF)	42.36	41.77	42.08
Sample Volume	(SCM)	1.38	1.37	1.37
		10113	10153	10115
<b>Method 29 Results</b>				
<i>Mercury Front Half</i>				
Concentration - Actual	(ug)	<	<	<
Emission Rate	(ug/DSCM)	<	<	<
Concentration	(LB/HR)	<	<	<
	(ug/DSCM @ 7% O <sub>2</sub> )	<	<	<
<i>Mercury Back Half</i>				
Concentration - Actual	(ug)	6.36	6.69	6.86
Emission Rate	(ug/DSCM)	5.298	5.654	5.752
Concentration	(LB/HR)	0.006010	0.006274	0.006502
	(ug/DSCM @ 7% O <sub>2</sub> )	28.652	31.141	31.978
<i>Mercury Total</i>				
Concentration - Actual	(ug)	6.41	6.74	6.91
Concentration	(ug/DSCM)	5.339	5.697	5.794
Emission Rate	(ug/SCM)	4.6536	4.9237	5.0383
Concentration	(LB/HR)	0.006058	0.006321	0.006549
	(ug/DSCM @ 7% O <sub>2</sub> )	28.878	31.374	32.211

"<" = BDL (Below Detection Level)-All analytical levels used to calculate emission values are less than the laboratory's detection levels.  
"<" = DLL (Detection Level Limited)- At least one but not all values used to calculate emission values are less than the laboratory's detection levels.  
"-" = ADL (Above Detection Limit) - All analytical values used to calculate emissions are greater than the laboratory's reported detection levels.



**Table 6.** Test 4 Summary of the February 14, 2019, Lead Emission Test on the Line 1 (EQUI45/STRU53) Pellet Induration Stack at the United Taconite facility in Forbes, Minnesota.(Natural Gas)

Item	Run 1	Run 2	Run 3	Average
Date of test	02-14-19	02-14-19	02-14-19	
Time runs were done	(Hrs) 0835 / 0951	1047 / 1154	1237 / 1342	
Volumetric Flow				
Actual	(ACFM) 422916	417381	421917	420738
Standard	(DSCFM) 303350	296681	302229	300753
Gas Temperature	(°F) 140	141	140	140
Moisture Content	(%v/v) 12.89	13.61	13.09	13.20
Gas Composition	(%v/v, dry)			
Carbon Dioxide	1.19	1.05	1.07	1.10
Oxygen	18.33	18.38	18.40	18.37
Nitrogen	80.48	80.57	80.53	80.53
Isokinetic Variation	(%) 99.8	100.6	99.5	100.0
Sample Volume	(DSCF) 42.36	41.77	42.08	
<b>Results</b>				
Lead	(ug)	<	<	<
Concentration - Actual	(ug/DSCM)	<	21.00	21.00
Emission Rate	(LB/HR)	<	17.506	17.621
Concentration	(ug/DSCM @ 7% O2)	<	0.019861	0.019918
		<	94.681	97.962
		<	97.768	96.804

"<" = BDL (Below Detection Level)-All analytical levels used to calculate emission values are less than the laboratory's detection levels.

"≤" = DLL (Detection Level Limited)- At least one but not all values used to calculate emission values are less than the laboratory's detection levels.

" " = ADL (Above Detection Limit) - All analytical values used to calculate emissions are greater than the laboratory's reported detection levels.



Table 7 Test 5 Summary of the February 14, 2019, Carbon Monoxide and VOC (Method 25a) Test on the Line 1 Pellet Induration (EQUI45/STRU53) at the United Taconite facility located in Forbes, Minnesota. (Natural Gas)

Item	Run 1 02-14-19 0835 / 0935	Run 2 02-14-19 1050 / 1150	Run 3 02-14-19 1235 / 1335	Average
Date of test				
Time runs were done	(Hrs)			
Volumetric Flow				
Actual	420,538	425,318	413,696	419,851
Standard	300,663	303,683	296,422	300,256
Gas Temperature	(°F)	140	140	140
Moisture Content	(%v/v)	13.17	13.31	13.19
Gas Composition	(%v/v, dry)			
Carbon Dioxide	1.19	1.05	1.07	1.10
Oxygen	18.33	18.38	18.40	18.37
Nitrogen	80.48	80.57	80.53	80.53
<b>Results:</b>				
Carbon Monoxide (EPA Method 10)				
Concentration	(ppm, d)	8.89	8.53	8.69
Emission Rate	(LB /HR)	11.66	11.29	11.38
VOC (EPA Method 25a)				
Concentration	(ppm Propane, d)	1.15	1.15	1.15
Concentration	(TGNM ppm Propane, d)	0.45	0.39	0.68
Concentration	(ppm Carbon, d)	3.46	3.46	3.46
Concentration	(TGNM ppm Carbon, d)	1.36	1.16	1.26
Emission Rate (Lb/Hr)	(LB Carbon/HR)	1.94	1.97	1.95
	(TGNM LB Carbon/HR)	0.76	0.66	0.71
Emission Rate (Lb/Hr)	(LB Propane/HR)	2.38	2.41	2.39
	(TGNM LB Propane/HR)	0.93	0.81	0.87

\* Used analyzer detection limit of 1 ppm propane wet



### **3      AIR EMISSION RESULTS**

The results of all air emission tests are presented in this section. Gas composition and moisture are presented first followed by the computer printout of the particulate determinations and fugitive emissions. Preliminary measurements including test port locations are given in the appendices.

The results have been calculated on a personal computer using Microsoft Excel spreadsheets specifically for source testing calculations. EPA-published equations have been used as the basis of the calculation techniques in these programs. The particulate emission rate has been calculated using the product of the concentration times flow method.



### **3.1 Results of Orsat & Moisture Determinations**



Test Number 1  
 Line 1 Pellet Induration (STRU53)

**Results of Gas Composition and Moisture Analyses --- Methods 3A and 4 (% v/v)**

	<b>Run 1</b>	<b>Run 2</b>	<b>Run 3</b>
<b>Date of Run</b>	02-13-19	02-13-19	02-13-19
<b>Dry basis (Orsat)</b>			
Carbon Dioxide.....	2.10	2.07	1.91
Oxygen.....	17.54	17.51	17.45
Nitrogen.....	80.37	80.42	80.64
<b>Wet basis (Orsat)</b>			
Carbon Dioxide.....	1.80	1.80	1.64
Oxygen.....	15.08	15.26	15.00
Nitrogen.....	69.11	70.09	69.32
Water Vapor.....	14.01	12.85	14.04
Dry Molecular Weight.....	29.04	29.03	29.00
Wet Molecular Weight.....	27.4907	27.61	27.46
Specific Gravity.....	0.950	0.954	0.948
Water Mass Flow.....	137715	123548	127562
Fo.....	1.606	1.640	1.809



Test Number 3  
Line 1 Pellet Induration (STRU53)

**Results of Gas Composition and Moisture Analyses --- Methods 3A and 4 (% v/v)**

Date of Run		Run 1 02-14-19	Run 2 02-14-19	Run 3 02-14-19
<b>Dry basis</b>				
Carbon Dioxide.....	( % )	1.19	1.05	1.07
Oxygen.....	( % )	18.33	18.38	18.40
Nitrogen.....	( % )	80.48	80.57	80.53
<b>Wet basis</b>				
Carbon Dioxide.....	( % )	1.03	0.91	0.93
Oxygen.....	( % )	15.92	15.93	15.93
Nitrogen.....	( % )	69.88	69.85	69.73
Water Vapor.....		13.17	13.31	13.40
Dry Molecular Weight.....	(g/gmole)	28.92	28.90	28.91
Wet Molecular Weight.....	(g/gmole)	27.48	27.45	27.45
Specific Gravity.....		0.949	0.948	0.948
Water Mass Flow.....	(lb/hr)	127961	130745	128291
Fo.....		2.160	2.402	2.331



Test Number 4  
Line 1 Pellet Induration (STRU53)

**Results of Gas Composition and Moisture Analyses --- Methods 3A and 4 (% v/v)**

	Run 1	Run 2	Run 3
Date of Run	02-14-19	02-14-19	02-14-19
<b>Dry basis (Orsat)</b>			
Carbon Dioxide.....	1.19	1.05	1.07
Oxygen.....	18.33	18.38	18.40
Nitrogen.....	80.48	80.57	80.53
<b>Wet basis (Orsat)</b>			
Carbon Dioxide.....	1.04	0.91	0.93
Oxygen.....	15.97	15.87	15.99
Nitrogen.....	70.11	69.60	69.99
Water Vapor.....	12.89	13.61	13.09
Dry Molecular Weight.....	28.92	28.90	28.91
Wet Molecular Weight.....	27.5159	27.42	27.48
Specific Gravity.....	0.950	0.947	0.949
Water Mass Flow.....	125917	131114	127644
Fo.....	2.160	2.402	2.331



### **3.2 Results of the Particulate Determinations**



**Test Number 3**  
**Line 1 Pellet Induration (STRU53)**

**Results of EPA Method 5/202 Sampling Data**

---

		<b>Run 1</b>	<b>Run 2</b>	<b>Run 3</b>
Date of Test		02-14-19	02-14-19	02-14-19
Time of Runs	(Hrs)	0835 / 0951	1047 / 1154	1237 / 1342
Static Pressure	(In. of WC)	-1.40	-1.40	-1.40
Cross Sectional Area	(Sq. ft)	80.38	80.38	80.38
Pitot Tube Coefficient		0.84	0.84	0.84
Water in Sample Gas				
Impingers	(g)	120.2	111.8	126.5
Desiccant	(g)	16.0	27.0	10.0
Total	(g)	136.2	138.8	136.5
Gas Meter Coefficient		1.0041	1.0041	1.0041
Barometric Pressure	(In. of Hg)	28.11	28.11	28.11
Avg. Orifice Pressure Drop	(In. of WC)	1.60	1.64	1.55
Avg. Gas Meter Temperature	(°F)	66.5	69.3	70.2
Volume Through Gas Meter				
Meter Conditions	(CF)	44.58	45.13	44.10
Standard Conditions	(DSCF)	42.34	42.63	41.58
Total Sampling Time	(Min.)	60.00	60.00	60.00
Nozzle Diameter	(In.)	0.186	0.186	0.186
Avg. Stack Gas Temperature	(°F)	140	140	140
Volumetric Flow Rate				
Actual	(ACFM)	420,536	425,318	413,956
Dry Standard	(DSCFM)	300,662	303,683	295,531
Isokinetic Variation	(%)	99.9	99.6	99.8



### **3.3 Results of the Trace Metals Determinations**



**Test Number 1****Line 1 Pellet Induration (STRU53)****Results of EPA Method 29 Sampling**

		<b>Run 1</b>	<b>Run 2</b>	<b>Run 3</b>
Date of Test		02-13-19	02-13-19	02-13-19
Time of Runs	(Hrs)	0800 / 0904	0942 / 1232	1305 / 1409
Static Pressure	(In. of WC)	-1.20	-1.20	-1.20
Cross Sectional Area	(Sq. ft)	80.383	80.383	80.383
Pitot Tube Coefficient		0.84	0.84	0.84
Water in Sample Gas				
Impingers	(g)	136.5	117.6	129.8
Desiccant	(g)	11.0	12.0	7.0
Total	(g)	147.5	129.6	136.8
Gas Meter Coefficient		1.0039	1.0039	1.0039
Barometric Pressure	(In. of Hg)	28.47	28.47	28.47
Avg. Orifice Pressure Drop	(In. of WC)	1.82	1.72	1.58
Avg. Gas Meter Temperature	(°F)	61.5	65.3	68.3
Volume Through Gas Meter				
Meter Conditions	(CF)	43.94	42.99	41.21
Standard Conditions	(DSCF)	42.70	41.46	39.50
Standard Conditions	(SCM)	1.41	1.35	1.30
Total Sampling Time	(Min.)	60.00	60.00	60.00
Nozzle Diameter	(In.)	0.185	0.185	0.185
Avg. Stack Gas Temperature	(°F)	140.00	139.75	139.42
Stack Gas Velocity	(Ft/Sec)	87.03	85.1	80.41
Volumetric Flow Rate				
Actual	(ACFM)	419,767	410,641	387,798
Dry Standard	(DSCFM)	301,322	298,876	278,549
Isokinetic Variation	(%)	101.3	99.1	101.4



**Test Number 4**

**Line 1 Pellet Induration (STRU53)**

**Results of EPA Method 29 Sampling**

		Run 1	Run 2	Run 3
Date of Test		02-14-19	02-14-19	02-14-19
Time of Runs	(Hrs)	0835 / 0951	1047 / 1154	1237 / 1342
Static Pressure	(In. of WC)	-1.40	-1.40	-1.40
Cross Sectional Area	(Sq. ft)	80.383	80.383	80.383
Pitot Tube Coefficient		0.84	0.84	0.84
Water in Sample Gas				
Impingers	(g)	124.9	129.6	127.4
Desiccant	(g)	8.0	10.0	7.0
Total	(g)	132.9	139.6	134.4
Gas Meter Coefficient		1.0039	1.0039	1.0039
Barometric Pressure	(In. of Hg)	28.11	28.11	28.11
Avg. Orifice Pressure Drop	In. of WC)	1.81	1.77	1.80
Avg. Gas Meter Temperature	(°F)	64.0	67.0	67.9
Volume Through Gas Meter				
Meter Conditions	(CF)	44.36	44.00	44.40
Standard Conditions	(DSCF)	42.36	41.77	42.08
Standard Conditions	(SCM)	1.38	1.37	1.37
Total Sampling Time	(Min.)	60.00	60.00	60.00
Nozzle Diameter	(In.)	0.185	0.185	0.185
Avg. Stack Gas Temperature	(°F)	140.25	140.67	139.67
Stack Gas Velocity	(Ft/Sec)	87.69	86.5	87.48
Volumetric Flow Rate				
Actual	(ACFM)	422,916	417,381	421,917
Dry Standard	(DSCFM)	303,350	296,681	302,229
Isokinetic Variation	(%)	99.8	100.6	99.5



## **4 RESULTS OF FUEL ANALYSIS**





Twin Ports Testing, Inc.  
 1301 North 3rd Street  
 Superior, WI 54880  
 p: 715-392-7114  
 p: 800-373-2562  
 f: 715-392-7163  
 www.twinportstesting.com

## Analytical Test Report

**Report No:** USR:W219-0197-01  
**Issue No:** 1

**Client:** CLIFFS NATURAL RESOURCES INC.  
 PO Box 180  
 Eveleth, MN  
**Attention:** Jennifer Krause  
**PO No:** U84619

**Signed:** *Katy Jahr*  
 Katy Jahr  
 Chemistry Lab Supervisor  
**Date of Issue:** 3/1/2019

THIS DOCUMENT SHALL NOT BE REPRODUCED EXCEPT IN FULL

### Sample Details

**Sample Log No:** W219-0197-01  
**Sample Designation:** L1 Coal  
**Sample Recognized As:** Coal  
**Sample Date:** 2/13/2019  
**Sample Time:** 9:00 AM  
**Arrival Date:** 2/26/2019

### Test Results

	METHOD	UNITS	MOISTURE FREE	AS RECEIVED
Moisture - Total	ASTM D3173	wt. %		2.50
Ash	ASTM D3174	wt. %	7.98	7.78
Volatile Matter	ASTM D3175	wt. %		
Fixed Carbon by Difference	ASTM D3172	wt. %		
Sulfur	ASTM D4239	wt. %	0.800	0.780
SO <sub>2</sub>	Calculated	lb/mmbtu		1.18
Net Cal. Value at Const. Pressure	ISO 1928	GJ/tonne		
Net Cal. Value at Const. Pressure	ISO 1928	J/g		
Gross Cal. Value at Const. Vol.	ASTM D5865	J/g	31453	30666
Gross Cal. Value at Const. Vol.	ASTM D5865	Btu/lb	13523	13185

Carbon	ASTM D5373	wt. %
Hydrogen*	ASTM D5373	wt. %
Nitrogen	ASTM D5373	wt. %
Oxygen*	ASTM D3176	wt. %

\*Note: As received values do not include hydrogen and oxygen in the total moisture.

Chlorine	ASTM D6721	mg/kg
Fluorine	ASTM D3761	mg/kg
Mercury	ASTM D6722	mg/kg
Sodium Oxide in Ash	ASTM D3682	wt. %
Hardgrove Grindability Index	ASTM D409	wt./index

### Comments



## **APPENDIX A**

### **SAMPLING TRAIN CALIBRATION DATA**



INTERPOLL LABORATORIES, INC.  
(763) 786-6020

Stack Sampling Department - QA  
Field Barometer Calibration Sheet

Date: 10/23/2018  
Technician: Duane Van Hoever  
Mercury Column Barometer Number: Weighing Room Barometer  
Aneroid Barometer Number: Serial # 21144067

Reference Mercury Barometer Reading	Ambient Temperature	Temperature Correction Factor	Adjusted Mercury Barometer Reading	Initial Field Barometer Reading	Difference ( $P_{ba} - P_{bm}$ )
29.59	78	0.129	29.46	29.41	-0.051

**Weighing room barometer setup:**

- 1) Using the set screw on the bottom of the barometer, adjust the level of the mercury reservoir to the point that the level indicator makes slight contact with the mercury. A flashlight can aid in seeing the dimple formed when the level indicator makes contact with the mercury.
- 2) Slide the measurement ruler on the barometer to the point where the bottom of the ruler is in line with the top of the mercury column's reverse meniscus. Record the reading (in. Hg)
- 3) Take a temperature reading and record the temperature correction factor from the lookup table near the barometer.
- 4) Apply the temperature correction factor to the mercury barometer.
- 5) Adjust the field barometer reading to within +/- 0.1 in. Hg of the reference barometer reading.

Has this barometer shown any consistent problems with calibration? Has the problem been alleviated? \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Note: Aneroid barometers will be calibrated periodically against a mercury column barometer. The aneroid barometer to be calibrated should be placed in close proximity to the mercury barometer and left to equilibrate for 20 - 30 minutes before calibrating. Aneroid barometer will be calibrated to the adjusted mercury barometer readings.

**Alternative Calibration Procedure:**

- 1) Obtain the station value or absolute barometric pressure  $P_r$  from a nearby National Weather Service station and its elevation (A) in feet above sea level.
- 2) Determine the elevation (B) in feet above sea level of the site of the field barometer. (local airport)
- 3) Calculate the site barometric pressure ( $P_b$ ) as follows:  
$$P_b = P_r + 0.001 (A-B)$$
- 4) Compare the field barometer reading against  $P_b$  obtained in step 3.
- 5) Adjust the field barometer reading to within +/- 0.1 in. Hg.



INTERPOL LABORATORIES, INC.  
(763) 786-6020

### Temperature Measurement Device Calibration Sheet

**Unit under Test:**

Vendor Digital Meter  
Model 6802II  
Range 0-2100 °F  
Date of Calibration 1/3/2019

Serial Number t538247  
Thermocouple Type Type K  
Technician CK  
PDT Number 173

**Method of Calibration:**

Omega Model CL-300 Type K Thermocouple Simulator which provides 22 precise temperature equivalent millivolt signals. The CL-300 is cold junction compensated. Calibration accuracy is +/- 0.1 % of span(2100 °F) +/- 1 degree (for negative temperatures add +/- 2 degrees). The CL-300 simulated exactly the millivoltage of a Type K thermocouple at the indicated temperature.

Desired Temp. (°F) Nominal	Response of Unit Under Test (°F)	Deviation	
		$\Delta t$ (°F)	%
0	-2	2	0.435
100	98	2	0.357
200	197	3	0.455
300	297	3	0.395
400	397	3	0.349
500	497	3	0.313
600	597	3	0.283
700	697	3	0.259
800	797	3	0.238
900	897	3	0.221
1000	997	3	0.205
1100	1097	3	0.192
1200	1197	3	0.181
1300	1297	3	0.170
1400	1397	3	0.161
1500	1497	3	0.153
1600	1597	3	0.146
1700	1697	3	0.139
1800	1797	3	0.133
1900	1897	3	0.127
2000	1997	3	0.122
2100	2097	3	0.117
Average:		3	0.234

OF = off scale response by unit under test (°F)

$$\% \text{ dev} = 100\Delta t / (460 + t)$$

☐ Unit was in tolerance

☐ Unit was not in tolerance : Recalibrated see new calibration sheet or unit put out of service.

( Must be within +/- 1.5% absolute reference temperature)



Interpoll Laboratories, Inc.  
(763)786-6020

# Metering System Calibration Sheet-EPA Method 5

Date 12/28/2018 Control Module No. 17  
 Barometric Pressure 29.00 in.Hg Serial No. DTM 1334119  
 Initial Calibration \_\_\_\_\_ Recalibration x WTM No. AL-20  
 Technician \_\_\_\_\_ DVH \_\_\_\_\_ Capacity: WTM \_\_\_\_\_ 1cf/rev \_\_\_\_\_ (≥ 1 cf/rev?)

ΔH (in. H <sub>2</sub> O)	WTM			Dry Gas Metering System					Time θ (min)	Meter coefficient calibration factor Y <sub>1</sub>	Orifice calibration factor ΔH <sub>ref</sub>
	V <sub>w</sub> (cf)	T <sub>w</sub> (deg. F)	Cal Index* (%)	V <sub>d</sub> (cf)	V <sub>dr</sub> (cf)	V <sub>d</sub> (cf)	t <sub>i</sub> (deg. F)	t <sub>o</sub> (deg. F)	Avg t <sub>d</sub> (deg. F)	Delta P (in. H <sub>2</sub> O)	
0.5	5	64.8	99.8%	630.615	635.63	5.015	68.7	68.5	68.6	0.01	1.91
1.2	5	64.7	99.9%	625.115	630.115	5	68.7	68.5	68.6	0.025	1.94
2.0	5	64.7	99.9%	614.17	619.15	4.98	69.6	68.7	69.15	0.055	1.97
3.3	5	64.7	100.0%	619.645	624.615	4.97	69.1	68.7	68.9	0.09	1.97
									Average		1.95

✓ Meter was in tolerance (Y<sub>1</sub> ≤ +/- 0.02 from average, ΔH@ < +/- 0.20 from average)

\_\_\_\_\_ Meter was not in tolerance, readjusted linkage.

\_\_\_\_\_ Meter was not in tolerance, changed dry test meter.

QA/QC Check

Completeness ✓

Legibility ✓

Accuracy ✓

Specifications ✓ Reasonableness ✓

Approved By: \_\_\_\_\_

Personnel (Signature/Date)  
1/2/19

Note - Calibrate dry gas metering system every 1000 ft<sup>3</sup> of volume, or if meter system post test calibration (EPA/EMC, "Alt-009- Alternative Method 5 Post Test calibration") indicates a change in the DGM meter coefficient calibration factor of greater than 5% from .

\* Based on AL-20 wet test meter calibration in Oct. 2012 against Bell Prover (NBS Traceable)-Carl Poe Co.

Dry Gas Meter Thermocouple Calibration	Meter Inlet / Ice Bath	Meter Outlet / Ambient	Meter Inlet / Ambient	Meter Outlet / Ambient
Ref °C	0.3	19.8	0.3	19.8
Temp °C	0.2	19.6	0.2	19.6
Δ	0.1	0.2	0.1	0.2

Temperature calibration using a Traceable Reference thermometer. VWR CE sn160618733 Due 12/20/2019



Interpoll Laboratories, Inc.  
(763)786-6020

# Metering System Calibration Sheet-EPA Method 5

Date 1/2/2019 Control Module No. 18  
 Barometric Pressure 28.95 in. Hg Serial No. DTM 960548  
 Initial Calibration                      Recalibration x WTM No. AL-20  
 Technician DVH Capacity: WTM                      1cf/rev (≥ 1 cf/rev?)

ΔH (in. H <sub>2</sub> O)	WTM			Dry Gas Metering System					Time θ (min)	Meter coefficient calibration factor Y <sub>1</sub>	Orifice calibration factor ΔH <sub>ref</sub>
	V <sub>w</sub> (cf)	T <sub>w</sub> (deg. F)	Cal Index* (%)	V <sub>di</sub> (cf)	V <sub>dr</sub> (cf)	V <sub>d</sub> (cf)	t <sub>i</sub> (deg. F)	t <sub>o</sub> (deg. F)			
0.5	5	65	99.8%	93.33	98.35	5.02	69	69.3	12.14	1.0006	1.69
1.2	5	65	99.8%	71.92	76.91	4.99	69.2	68.1	7.78	1.0039	1.67
2.0	10	65	99.9%	77.41	87.38	9.97	69	68	12.19	1.0036	1.72
3.3	5	65	100.0%	87.88	92.83	4.95	69	68	4.81	1.0084	1.77
									Average	1.0041	1.71

Meter was in tolerance (Y<sub>1</sub> ≤ ±0.02 from average, ΔH@ ±0.20 from average)

Meter was not in tolerance, readjusted linkage.

Meter was not in tolerance, changed dry test meter.

QA/QC Check

Completeness

Legibility

Accuracy

Specifications

Reasonableness

Approved By:

Personal (Signature/Date)

Note - Calibrate dry gas metering system every 1000 ft<sup>3</sup> of volume, or if meter system post test calibration (EPA/EMC, "Alt-009- Alternative Method 5 Post Test calibration") indicates a change in the DGM meter coefficient calibration factor of greater than 5% from .

\* Based on AL-20 wet test meter calibration in October 2012 against Bell Prover (NBS Traceable)-Carl Poe Co.

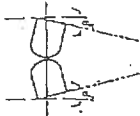
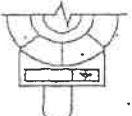

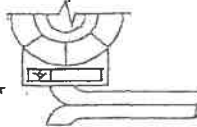

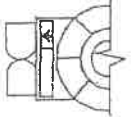
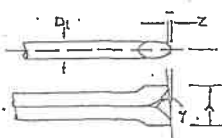
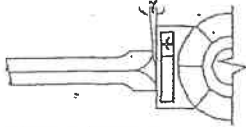
Dry Gas Meter Thermocouple Calibration	Meter inlet / Ice Bath	Meter inlet / Ambient	Meter Outlet / Ice Bath	Meter outlet / Ambient
Ref °C	0.8	20.5	0.8	20.5
Temp °C	1	20	1	20
Δ	0.2	0.5	0.2	0.5

Temperature calibration using a Traceable Reference thermometer. VWR CE sn160618733 Due 12-20-2019



EPA Method 2 - Type S Pitot Tube Inspection

CALIBRATION DATA SHEET

		Obstruction? Y/N	N
		Damaged? Y/N	N
		Pitot leak check? Y/N	Y
		$\alpha_1 (-10^\circ \leq \alpha_1 \leq +10^\circ)$	16
		$\alpha_2 (-10^\circ \leq \alpha_2 \leq +10^\circ)$	10
		$\beta_1 (-5^\circ < \beta_1 < +5^\circ)$	10
		$\beta_2 (-5^\circ < \beta_2 < +5^\circ)$	10
		$z = (\leq 0.125")$	.004
		$w = (\leq 0.03125")$	.002
		$D_1 (3/16" (0.1875") \leq D_1 \leq 3/8" (0.375"))$	.315
		A	.871
		$A/2D_1 (1.05 \leq P_A/D_1 \leq 1.5)$	1.38
		Distance from Pitot to probe components (Method S Probe)	
		Pitot to 0.500 in. nozzle ( $> 0.750$ in.)	.802
		Pitot to probe sheath ( $> 3$ in.)	3.538
		Pitot to thermocouple (parallel to probe)	3.272
		Thermocouple operates properly (Y/N)	Y see below

Ref.	Ref. °F	In Temp °F
Ice Bath	32	32
Boiling Water	210	212

QA/QC Check: RL Completeness ☒ Legibility ☒ Accuracy ☒ Specifications ☒ Reasonableness ☒

Certification

I certify that the Type S pitot tube/probe ID # 05-041-A1 meets or exceeds all specifications, criteria and/or applicable design features and is hereby assigned a pitot tube calibration factor  $C_p$  of 0.84. RL

Certified by:

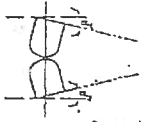
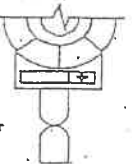
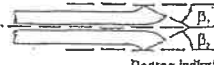
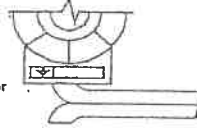

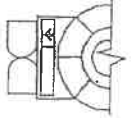
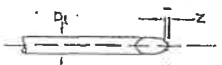
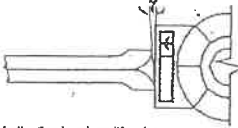
[Signature]  
Personnel (Signature)

12-29-17  
(Date)



EPA Method-2 - Type S Pitot Tube Inspection

CALIBRATION DATA SHEET

		Obstruction? Y/N	No
		Damaged? Y/N	No
		Pitot leak check? Y/N	Yes
		$\alpha_1 (-10^\circ \leq \alpha_1 \leq +10^\circ)$	2°
		$\alpha_2 (-10^\circ \leq \alpha_2 \leq +10^\circ)$	2°
		$\beta_1 (-5^\circ < \beta_1 < +5^\circ)$	1°
		$\beta_2 (-5^\circ < \beta_2 < +5^\circ)$	1°
		$z = (\leq 0.125")$	.001
		$w = (\leq 0.03125")$	.004
		$D_1 (3/16" (0.1875") \leq D_1 \leq 3/8" (0.375"))$	.309
		A	.900
		$A/2D_1 (1.05 \leq P_A/D_1 \leq 1.5)$	1.456
		Distance from Pitot to probe components (Method S Probe)	
		Pitot to 0.500 in. nozzle ( $\geq 0.750$ in.)	2.9 <del>1.05</del> 1.05
		Pitot to probe sheath ( $\geq 3$ in.)	3.64
		Pitot to thermocouple (parallel to probe)	2.53
		Thermocouple operates properly (Y/N)	Y see below

Thermocouple Calibration		
Ref.	Ref. °F	In Temp °F
Ice Bath	32	31
Boiling Water	210	211

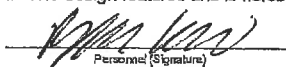
QA/QC Check:

Completeness ☒ Legibility ☒ Accuracy ☒ Specifications ☒ Reasonableness ☒

Certification

I certify that the Type S pitot tube/probe ID # 09-04-A2 meets or exceeds all specifications, criteria and/or applicable design features and is hereby assigned a pitot tube calibration factor Cp of 0.84.

Certified by:

  
Personnel (Signature)

12-28-17

(Date)



**Interpoll Laboratories**  
(763) 786-6020

**Field Calibration Data Sheet**

Job United Taconite Date 2/13/2019  
Operator Chris Warneke Meter Box Number 17

**Instructions:**

Operate the control module at a flow rate equal to the Delta H@ for 10 minutes before attaching the umbilical.

**Record the following data:**

Barometric Pressure: 28.47 Meter Coefficient: 1.0039 Gas Meter Delta H: 1.95

Time (min)	Volume (cf)	Meter Temperature (°F)	
		Inlet	Outlet
	356.90		
2.5	358.82	56	60
5.0	360.73	56	60
7.5	362.65	56	60
10.0	364.56	56	60
	V <sub>m</sub> = 7.66	Average =	58.0

**Calculate Y<sub>cn</sub> as follows:**

$$Y_{cn} = \frac{10}{V_m} \sqrt{\frac{0.0319 T_m}{P_{bar}}} = 0.9907$$

Note: If Y<sub>cn</sub> is not within the range of 0.97 to 1.03, "the volume metering system should be investigated before beginning."

CFR Title 40, Part 60, Appendix A, Method 5, Section 4.4.1



**Interpoll Laboratories**  
(763) 786-6020

**Method 5 Post Test Meter Calibration**

**United Taconite**  
**Forbes, MN**

**Line 1 Pellet Induration (STRU53)**

**Test     1**

	<u>Run 1</u>	<u>Run 2</u>	<u>Run 3</u>
$\Delta$ (min) =	60.00	60.00	60
Vm (dcf) =	43.94	42.99	41.21
Tm ( $^{\circ}$ R) =	521.5	525.333	528.333
P <sub>b</sub> (in. Hg) =	28.47	28.47	28.47
	0.0319	0.0319	0.0319
$\Delta$ H <sub>avg</sub> (in. W.C.) =	1.82	1.72	1.58
$\Delta$ H @ (in. W.C.) =	1.95	1.95	1.95
M <sub>d</sub> (lb/lb-mole) =	29.04	29.03	29.00
Dry Mol wt. <sub>(air)</sub> (lb/lb-mole) =	29	29	29
Spec. Grav. Merc. =	13.6	13.6	13.6
Y <sub>qa</sub> =	1.00563	1.0027	1.00519
Y <sub>qa (avg.)</sub> =	1.00451		
Y =	1.0039		
% Diff. =	-0.0606		

Note: If the average Y<sub>qa</sub> does not meet the  $\pm 5$  percent criterion, recalibrate the meter over the full range of orifice settings, as detailed in Section 5.3.1 of Method 5. Then follow the procedure in Section 5.3.3 of Method 5.

\*\* EPA Emission Measurement Center, Approved alternative method (ALT-009)



**Interpoll Laboratories**  
(763) 786-6020

**Field Calibration Data Sheet**

Job United Taconite Date 2/14/2019  
Operator Chris Warneke Meter Box Number 17

**Instructions:**

Operate the control module at a flow rate equal to the Delta H@ for 10 minutes before attaching the umbilical.

**Record the following data:**

Barometric Pressure: 28.11 Meter Coefficient: 1.0039 Gas Meter Delta H: 1.95

Time (min)	Volume (cf)	Meter Temperature (°F)	
		Inlet	Outlet
	499.20		
2.5	501.12	58	65
5.0	503.04	58	65
7.5	504.96	58	65
10.0	506.88	58	65
	V <sub>m</sub> = 7.68	Average =	61.5

**Calculate Y<sub>cn</sub> as follows:**

$$Y_{cn} = \frac{10}{V_m} \sqrt{\frac{0.0319 T_m}{P_{bar}}} = 0.9978$$

Note: If Y<sub>cn</sub> is not within the range of 0.97 to 1.03, "the volume metering system should be investigated before beginning."

CFR Title 40, Part 60, Appendix A, Method 5, Section 4.4.1



**Interpoll Laboratories**  
(763) 786-6020

**Method 5 Post Test Meter Calibration**

**United Taconite**  
**Forbes, MN**

**Line 1 Pellet Induration (STRU53)**

**Test 4**

	<u>Run 1</u>	<u>Run 2</u>	<u>Run 3</u>
$\Delta$ (min) =	60.00	60.00	60
Vm (dcf) =	44.36	44.00	44.40
Tm ( $^{\circ}$ R) =	524	527	527.917
P <sub>b</sub> (in. Hg) =	28.11	28.11	28.11
	0.0319	0.0319	0.0319
$\Delta$ H <sub>avg</sub> (in. W.C.) =	1.81	1.77	1.80
$\Delta$ H @ (in. W.C.) =	1.95	1.95	1.95
M <sub>d</sub> (lb/lb-mole) =	29.00	28.90	28.91
Dry Mol wt. <sub>(air)</sub> (lb/lb-mole) =	29	29	29
Spec. Grav. Merc. =	13.6	13.6	13.6

$$Y_{qa} = 1.00265 \quad 1.00289 \quad 1.00284$$

$$Y_{qa \text{ (avg.)}} = 1.0028$$

$$Y = 1.0039$$

$$\% \text{ Diff.} = 0.1099$$

Note: If the average Y<sub>qa</sub> does not meet the  $\pm 5$  percent criterion, recalibrate the meter over the full range of orifice settings, as detailed in Section 5.3.1 of Method 5. Then follow the procedure in Section 5.3.3 of Method 5.

\*\* EPA Emission Measurement Center, Approved alternative method (ALT-009)



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(763) 786-6020

**Field Calibration Data Sheet**

Test Number **3**

Job \_\_\_\_\_ Date 2/14/2019  
Operator United Taconite Chris Warneke Meter Box Number 18

**Instructions:**

Operate the control module at a flow rate equal to the Delta H@ for 10 minutes before attaching the umbilical.

**Record the following data:**

Barometric Pressure: 28.11 Meter Coefficient: 1.0041 Gas Meter Delta H: 1.71

Time (min)	Volume (cf)	Meter Temperature (°F)	
		Inlet	Outlet
	608.20		
2.5	610.12	59	63
5.0	612.05	59	63
7.5	613.97	59	63
10.0	615.89	59	63
	$V_m = 7.69$	Average =	61.0

**Calculate  $Y_{cn}$  as follows:**

$$Y_{cn} = \frac{10}{V_m} \sqrt{\frac{0.0319 T_m}{P_{bar}}} = 0.9958$$

Note: If  $Y_{cn}$  is not within the range of 0.97 to 1.03, "the volume metering system should be investigated before beginning."

CFR Title 40, Part 60, Appendix A, Method 5, Section 4.4.1



**Interpoll Laboratories**  
(763) 786-6020

**Method 5 Post Test Meter Calibration**

**United Taconite**  
**Line 1 Pellet Induration (STRU53)**

**Test 3**

**2/14/2019**

	<u>Run 1</u>	<u>Run 2</u>	<u>Run 3</u>
$\Delta$ (min) =	60	60	60
Vm (dcf) =	44.58	45.13	44.10
Tm ( $^{\circ}$ R) =	526.45833	529.33333	530.208333
P <sub>b</sub> (in. Hg) =	28.11	28.11	28.11
	0.0319	0.0319	0.0319
$\Delta$ H <sub>avg</sub> (in. W.C.) =	1.60	1.64	1.55
$\Delta$ H @ (in. W.C.) =	1.71	1.71	1.71
M <sub>d</sub> (lb/lb-mole) =	29.00	28.90	28.91
Dry Mol wt. <sub>(air)</sub> (lb/lb-mole) =	29	29	29
Spec. Grav. Merc. =	13.6	13.6	13.6

Y<sub>qa</sub> = 1.0033      1.0072      1.0048

Y<sub>qa (avg.)</sub> = 1.0051201

Y = 1.0041

% Diff. = -0.101592

Note: If the average Y<sub>qa</sub> does not meet the  $\pm 5$  percent criterion, recalibrate the meter over the full range of orifice settings, as detailed in Section 5.3.1 of Method 5. Then follow the procedure in Section 5.3.3 of Method 5.

\*\* EPA Emission Measurement Center, Approved alternative method (ALT-009)



## **APPENDIX B**

### **TEST PORT LOCATION**



**Interpoll Laboratories**  
**(763) 786-6020**

**Test Protocol**

Job United Taconite  
Source Line 1 Pellet Induration (STRU53)

Equivalent Diameter ( $D_{eq}$ ) for a Rectangular Stack =

$$D_{eq} = \frac{L \times W \times 2}{(L + W)} =$$

$$A = \frac{\text{Distance from test port to downstream flow disturbance}}{D_s \text{ or } D_{eq}}$$

$$B = \frac{\text{Distance from test port to upstream flow disturbance}}{D_s \text{ or } D_{eq}}$$

Round Stack Diameter	<u>121.40</u>	Inches inside diameter
Rectangular Stack Length	<u>0.00</u>	Width <u>0.00</u>
Port Length	<u>6.00</u>	inches

<u>246</u>	inches	A =	<u>2.03</u>
<u>1000</u>	inches	B =	<u>8.24</u>

**Run parameters using A and B dimensions:**

		Run 2	Run 3	Run 4
Using A dimension	12	12	12	12
Using B dimension	12	12	12	12
Total number of traverse points	12	12	12	12
Number of test ports	4	4	4	4
Number of points per port	3	3	3	3
Time per point (minutes)	5	5	5	5



**APPENDIX C**

**FIELD DATA SHEETS**



Job	United Taconite			
Source	Line 1 Pellet Induration (STRU53)			
Test	1	Run	1	Date 2/13/2019
Duct Diameter (in.)	121.40			
Dry Bulb (°F)	133	Wet Bulb (°F)		
Moisture Content	14.01%			
Manometer	Inclined			
Barometric Pressure	28.47			
Static Pressure +/-	-1.20			
Operators	Chris Warneke / Colin Kelly			
Pitot No.	09-04-A2	Pitot Coeff.	0.84	

1



Interpoll Laboratories  
(763) 786-6020  
Interpoll Laboratories Condensate Sample Log Sheet

Job	United Taconite	Test	1	Run	1
Source	Line 1 Pellet Induration (STRU53)	Number of Traverse Points			12
Date	2/13/2019	Filter Holder Type		Glass	
Method Used	Method 29	Filter Type		Pallflex	

**Sample Train Leak Check:**

Pre-test: 0.02 cfm @ 15 in. Hg (vac)  
Post test: 0.02 cfm @ 16 in. Hg (vac)

**Post test Pitot Leak Check:**

Positive 0 in W.C. @ 3.7 in. W.C.  
Negative 0 in W.C. @ 3.8 in. W.C.

**Particulate Catch Data**

No. of Filter Used:

NA

**Recovery Solvents:**

0.1 N HNO<sub>3</sub>

6N HCl

Number of Probe wash bottles:

1

Sample recovered by:

Chris Warneke

**Condensate Data:**

Item	Weight (grams)		
	Final	Tare	Difference
Jar #1	609.5	478.7	130.8
Jar #2	496.1	494	2.1
Jar #3	178.8	175.2	3.6
Jar #4			
Desiccant	1722	1711	11
Total Grams of Water			147.5

147.7821



Interpoll Laboratories, Inc.  
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## EPA Method 29 Field Data Sheet

Job	United Taconite	Operators	CW / CK	Nozzle No.	Glass	Pitot No.
Source	Line 1 Pellet Induration (STRU53)	Meter Box No.	17	Nozzle Dia.	0.185	Cp
Date	2/13/2019	Gas Meter Coeff.	1.0039	Bar. Press.	28.47	H <sub>2</sub> O
Test	1 Run	Gas Meter Delta H@	1.95			

[illegible]



Interpoll Laboratories  
(763) 786-6020  
Interpoll Laboratories Condensate Sample Log Sheet

Job	United Taconite	Test	1	Run	2
Source	Line 1 Pellet Induration (STRU53)	Number of Traverse Points	12		
Date	2/13/2019	Filter Holder Type	Glass		
Method Used	Method 29	Filter Type	Pallflex		

**Sample Train Leak Check:**

Pre-test: 0.02 cfm @ 15 in. Hg (vac)  
Post test: 0.02 cfm @ 15 in. Hg (vac)

**Post test Pitot Leak Check:**

Positive 0 in W.C. @ 3.6 in. W.C.  
Negative 0 in W.C. @ 3.8 in. W.C.

**Particulate Catch Data**

No. of Filter Used:

NA

**Recovery Solvents:**

0.1 N HNO3

6N HCl

Number of Probe wash bottles:

1

Sample recovered by:

Chris Warneke

**Condensate Data:**

Item	Weight (grams)		
	Final	Tare	Difference
Jar #1	593.1	474.3	118.8
Jar #2	179.7	177.6	2.1
Jar #3	460.6	463.9	-3.3
Jar #4			
Desiccant	1653	1641	12
Total Grams of Water			129.6
			129.8479



## EPA Method 29 Field Data Sheet

Job	United Taconite	Operators	CW / CK	Nozzle No.	Glass	Pilot No.
Source	Line 1 Pellet Induration (STRU53)	Meter Box No.	17	Nozzle Dia.	0.185	Cp
Date	2/13/2019	Gas Meter Coeff.	1.0039	Bar. Press.	28.47	H <sub>2</sub> O
Test	1 Run 2	Gas Meter Delta H@	1.95			
						09-04-A2.

[illegible]



Interpoll Laboratories  
(763) 786-6020  
Interpoll Laboratories Condensate Sample Log Sheet

Job	United Taconite	Test	1	Run	3
Source	Line 1 Pellet Induration (STRU53)	Number of Traverse Points			12
Date	2/13/2019	Filter Holder Type		Glass	
Method Used	Method 29	Filter Type		Pallflex	

**Sample Train Leak Check:**

Pre-test: 0.02 cfm @ 15 in. Hg (vac)  
Post test: 0.02 cfm @ 14 in. Hg (vac)

**Post test Pitot Leak Check:**

Positive 0 in W.C. @ 3.9 in. W.C.  
Negative 0 in W.C. @ 4 in. W.C.

**Particulate Catch Data**

No. of Filter Used:

NA

**Recovery Solvents:**

0.1 N HNO3

6N HCl

Number of Probe wash bottles:

1

Sample recovered by:

Chris Warneke

**Condensate Data:**

Item	Weight (grams)		
	Final	Tare	Difference
Jar #1	609.3	485.4	123.9
Jar #2	180.9	176.8	4.1
Jar #3	476.4	474.6	1.8
Jar #4			
Desiccant	1729	1722	7
Total Grams of Water			136.8

137.0616







# EPA Method 2 Field Data Sheet

Job	United Taconite			
Source	Line 1 Pellet Induration (STRU53)			
Test	3	Run	0	Date 2/14/2019
Duct Diameter (in.)	121.40			
Dry Bulb (°F)	140	Wet Bulb (°F)		
Moisture Content	13.17%			
Manometer	fluid			
Barometric Pressure	28.11			
Static Pressure +/-	-1.40			
Operators	Chris Warneke / Colin Kelly			
Pitot No.	05-04-A1	Pitot Coeff.	0.84	

Traverse Point Number	Fraction of Diameter	Distance From Stack Wall (in.)	Distance From End of Port (in.)	Velocity	Temperature of Gas (°F)
		Port Length (in.):	6.00	Start Time:	
A-1	0.044	5.34	11.34	1.800	140
A-2	0.146	17.72	23.72	1.800	140
A-3	0.296	35.93	41.93	1.700	140
B-1				2.100	140
B-2				2.000	140
B-3				1.800	140
C-1				2.100	140
C-2				2.100	140
C-3				2.000	140
D-1				2.000	140
D-2				2.100	140
D-3				2.100	140
Digital Numbers Used:				End Time:	



Interpoll Laboratories  
(763) 786-6020

**Interpoll Laboratories Condensate Sample Log Sheet**

Job	United Taconite	Test	3	Run	1
Source	Line 1 Pellet Induration (STRU53)	Number of Traverse Points	12		
Date	2/14/2019	Filter Holder Type	Glass		
Method Used	Method 5, 202(Dry Imp)	Filter Type	82mm Glass Fiber		

**Sample Train Leak Check:**

Pre-test: 0.000 cfm @ 15 in. Hg (vac)  
 Post test: 0.000 cfm @ 16 in. Hg (vac)

**Post test Pitot Leak Check:**

Positive 0 in W.C. @ 3.9 in. W.C. (press)  
 Negative 0 in W.C. @ 3.8 in. W.C. (vac)

**Particulate Catch Data**

No. of Filter Used:  
3499

**Recovery Solvents with Lot Numbers:**

Solvent used	Lot Number
Acetone	DU840-US
Hexane	DU192-US

Number of Probe wash bottles: 1  
 Sample recovered by: Chris Warneke

**Condensate Data:**

Item	Weight (grams)		
	Final	Tare	Difference
Container No. 1	622.9	513	109.9
Container No. 2	616.5	607.8	8.7
Container No. 3	748.3	746.7	1.6
Container No. 4			
Desiccant	1801	1785	16
Total Grams of Water			136.2

**EPA Method 202 Data:**

pH of Impinger Catch: 6  
 Purge Performed: Yes Time \_\_\_\_\_ Date 2/14/2019  
 CPM Filter Type 82 mm Zeffluor  
 Method 202 Kit No. 6-Jan  
 Was the glassware baked? yes



EPA Method 5 Field Data Sheet

[illegible]



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**Interpoll Laboratories Condensate Sample Log Sheet**

Job	United Taconite	Test	3	Run	2
Source	Line 1 Pellet Induration (STRU53)	Number of Traverse Points	12		
Date	2/14/2019	Filter Holder Type	Glass		
Method Used	Method 5, 202(Dry Imp)	Filter Type	82mm Glass Fiber		

**Sample Train Leak Check:**

Pre-test: 0.000 cfm @ 16 in. Hg (vac)  
 Post test: 0.000 cfm @ 15 in. Hg (vac)

**Post test Pitot Leak Check:**

Positive 0 in W.C. @ 3.8 in. W.C. (press)  
 Negative 0 in W.C. @ 3.9 in. W.C.(vac)

**Particulate Catch Data**

No. of Filter Used:  
3500

**Recovery Solvents with Lot Numbers:**

Solvent used	Lot Number
Acetone	DU840-US
Hexane	DU192-US

Number of Probe wash bottles: 1  
 Sample recovered by: Chris Warneke

**Condensate Data:**

Item	Weight (grams)		
	Final	Tare	Difference
Container No. 1	654.2	525	129.2
Container No. 2	594.8	593.9	0.9
Container No. 3	662.6	680.9	-18.3
Container No. 4			
Desiccant	1612	1585	27
Total Grams of Water			138.8

**EPA Method 202 Data:**

pH of Impinger Catch: 6  
 Purge Performed: Yes Time \_\_\_\_\_ Date 2/14/2019  
 CPM Filter Type 82 mm Zefluor  
 202 Kit No. 6-Jan  
 Was the glassware baked? yes







Interpoll Laboratories  
(763) 786-6020

**Interpoll Laboratories Condensate Sample Log Sheet**

Job	United Taconite	Test	3	Run	3
Source	Line 1 Pellet Induration (STRU53)	Number of Traverse Points	12		
Date	2/14/2019	Filter Holder Type	Glass		
Method Used	Method 5, 202(Dry Imp)	Filter Type	82mm Glass Fiber		

**Sample Train Leak Check:**

Pre-test: 0.000 cfm @ 15 in. Hg (vac)  
 Post test: 0.000 cfm @ 15 in. Hg (vac)

**Post test Pitot Leak Check:**

Positive 0 in W.C. @ 3.9 in. W.C. (press)  
 Negative 0 in W.C. @ 3.8 in. W.C. (vac)

**Particulate Catch Data**

No. of Filter Used:  
 3501

**Recovery Solvents with Lot Numbers:**

Solvent used	Lot Number
Acetone	DU840-US
Hexane	DU192-US

Number of Probe wash bottles: 1  
 Sample recovered by: Chris Warneke

**Condensate Data:**

Item	Weight (grams)		
	Final	Tare	Difference
Impinger No. 1	641.1	513	128.1
Impinger No. 2	608.2	607.8	0.4
Condenser No. 1	746.3	748.3	-2
Condenser No. 2			
Desiccant	1811	1801	10
Total Grams of Water			136.5

**EPA Method 202 Data:**

pH of Impinger Catch: 6  
 Purge Performed: Yes Time Date 2/14/2019  
 CPM Filter Type 82 mm Zefluor  
 202 Kit No. 6-Jan  
 Was the glassware baked? yes







**Interpoll Laboratories**  
**(763) 786-6020**  
**EPA Method 2 Field Data Sheet**

Job	United Taconite				Cross-section View	Elevation View	
Source	Line 1 Pellet Induration (STRU53)						
Test	4	Run	1	Date			2/14/2019
Duct Diameter (in.)	121.40						
Dry Bulb (°F)	140	Wet Bulb (°F)					
Moisture Content	12.89%						
Manometer	Inclined						
Barometric Pressure	28.11						
Static Pressure +/-	-1.40						
Operators	Chris Warneke / Colin Kelly						
Pitot No.	09-04-A2	Pitot Coeff.		0.84			

Traverse Point Number	Fraction of Diameter	Distance From Stack Wall (in.)	Distance From End of Port (in.)	Velocity	Temperature of Gas (°F)
		Port Length (in.):	6.00	Start Time:	12:00 AM
A-1	0.044	5.34	11.34	1.800	140
A-2	0.146	17.72	23.72	1.800	140
A-3	0.296	35.93	41.93	1.700	140
B-1				2.100	140
B-2				2.000	140
B-3				1.800	140
C-1				2.100	140
C-2				2.100	140
C-3				2.000	140
D-1				2.000	140
D-2				2.100	140
D-3				2.100	140
Digital Numbers Used:			173	End Time:	8:18 AM



Interpoll Laboratories  
(763) 786-6020  
Interpoll Laboratories Condensate Sample Log Sheet

Job	United Taconite	Test	4	Run	1
Source	Line 1 Pellet Induration (STRU53)	Number of Traverse Points			12
Date	2/14/2019	Filter Holder Type		Glass	
Method Used	Method 29	Filter Type		Pallflex	

**Sample Train Leak Check:**

Pre-test: 0.02 cfm @ 15 in. Hg (vac)  
Post test: 0.02 cfm @ 14 in. Hg (vac)

**Post test Pitot Leak Check:**

Positive 0 in W.C. @ 3.7 in. W.C.  
Negative 0 in W.C. @ 3.8 in. W.C.

**Particulate Catch Data**

No. of Filter Used:

NA

**Recovery Solvents:**

0.1 N HNO3

6N HCl

Number of Probe wash bottles:

1

Sample recovered by:

Chris Warneke

**Condensate Data:**

Item	Weight (grams)		
	Final	Tare	Difference
Jar #1	599.9	478.5	121.4
Jar #2	178.6	176.7	1.9
Jar #3	478	476.4	1.6
Jar #4			
Desiccant	1660	1652	8
Total Grams of Water			132.9

133.1542



## EPA Method 29 Field Data Sheet

Job	United Taconite	Operators	CW / CK	Nozzle No.	Glass	Pitot No.
Source	Line 1 Pellet Induration (STRU53)	Meter Box No.	17	Nozzle Dia.	0.185	Cp
Date	2/14/2019	Gas Meter Coeff.	1.0039	Bar. Press.	28.11	H <sub>2</sub> O
Test	4 Run 1	Gas Meter Delta H@	1.95			

[illegible]



Interpoll Laboratories  
(763) 786-6020  
Interpoll Laboratories Condensate Sample Log Sheet

Job	United Taconite	Test	4	Run	2
Source	Line 1 Pellet Induration (STRU53)	Number of Traverse Points			12
Date	2/14/2019	Filter Holder Type		Glass	
Method Used	Method 29	Filter Type		Pallflex	

**Sample Train Leak Check:**

Pre-test: 0.02 cfm @ 15 in. Hg (vac)  
Post test: 0.02 cfm @ 15 in. Hg (vac)

**Post test Pitot Leak Check:**

Positive 0 in W.C. @ 3.6 in. W.C.  
Negative 0 in W.C. @ 3.8 in. W.C.

**Particulate Catch Data**

No. of Filter Used:

NA

**Recovery Solvents:**

0.1 N HNO<sub>3</sub>

6N HCl

Number of Probe wash bottles:

1

Sample recovered by:

Chris Warneke

**Condensate Data:**

Item	Weight (grams)		
	Final	Tare	Difference
Jar #1	604.9	482.3	122.6
Jar #2	179	175.5	3.5
Jar #3	486.2	482.7	3.5
Jar #4			
Desiccant	1718	1708	10
Total Grams of Water			139.6
			139.867



## EPA Method 29 Field Data Sheet

Traverse Point Number	Sampling Time Minutes	Sample Volume (cf)	Velocity Head (in. WC)	Orifice Meter (in. WC)	Desired Volume (cf)	Vacuum (in. Hg)	Temperatures (°F)						Oxygen (% v/v)	Estimated Moisture at Respective Point
							Stack	Probe	Oven	Imp.	Gas/In	Gas/Out		
	10:47	552.12												
A-1	5.0	555.87	2.000	1.89	555.89	10	141	251	249	37	66	68	18.0	12.89
A-2	10.0	559.55	1.800	1.72	559.49	10	139	251	249	37	66	68	18	12.89
A-3	15.0	563.01	1.700	1.62	562.99	10	140	251	249	37	65	69	18	12.89
B-1	20.0	566.88	1.900	1.81	566.68	10	140	251	249	37	65	69	18	12.89
B-2	25.0	570.47	1.900	1.81	570.38	10	139	251	249	37	65	69	18	12.89
B-3	30.0	574.00	1.700	1.62	573.88	10	141	251	249	37	65	69	18	12.89
C-1	35.0	577.75	2.000	1.90	577.67	10	141	251	249	37	65	69	18	12.89
C-2	40.0	581.50	1.900	1.80	581.36	10	142	251	249	37	65	69	18	12.89
C-3	45.0	585.14	1.700	1.61	584.85	10	142	251	249	37	65	69	18	12.89
D-1	50.0	588.82	2.000	1.90	588.64	10	142	251	249	37	65	69	18	12.89
D-2	55.0	592.53	1.900	1.81	592.33	10	141	251	249	37	65	69	18	12.89
D-3	60.0	596.12	1.800	1.71	595.93	10	140	251	249	37	65	69	18	12.89



Interpoll Laboratories  
(763) 786-6020  
Interpoll Laboratories Condensate Sample Log Sheet

Job	United Taconite	Test	4	Run	3
Source	Line 1 Pellet Induration (STRU53)	Number of Traverse Points	12		
Date	2/14/2019	Filter Holder Type	Glass		
Method Used	Method 29	Filter Type	Pallflex		

**Sample Train Leak Check:**

Pre-test: 0.02 cfm @ 15 in. Hg (vac)  
Post test: 0.02 cfm @ 16 in. Hg (vac)

**Post test Pitot Leak Check:**

Positive 0 in W.C. @ 3.9 in. W.C.  
Negative 0 in W.C. @ 3.8 in. W.C.

**Particulate Catch Data**

No. of Filter Used:

NA

**Recovery Solvents:**

0.1 N HNO3

6N HCl

Number of Probe wash bottles:

1

Sample recovered by:

Chris Warneke

**Condensate Data:**

Item	Weight (grams)		
	Final	Tare	Difference
Jar #1	620.1	493.8	126.3
Jar #2	177.9	175.5	2.4
Jar #3	472.9	474.2	-1.3
Jar #4			
Desiccant	1667	1660	7
Total Grams of Water			134.4

134.657







## **APPENDIX D**

### **INTERPOLL LABORATORIES ANALYTICAL DATA**



INTERPOLL LABORATORIES, INC.  
(612)786-6020

Lead by ICP Reporting Form

Client: United Taconite

Due Date: 2/28/19

Sample Type: M29, Test 1, Fraction 1A, Pellet Induration (STUR) Stack

Analyst's Initials: GWH

Digestion Method: M-29

Analytical Method: EPA 6010A

37384	Run	Prep Date	Analysis Date	Instru. Reading (ug/mL)	Instru. RL (ug/mL)	Dilution	Final Volume of Digestate (mL)	Reported Result	
								Reporting Limit (Total ug)	Analytical Results (Total ug)
-06	00	2/20/19A	2/20/19	0.050 <	0.050	2	100	10	10 <
-02/-07	0	2/20/19A	2/20/19	0.050 <	0.050	2	100	10	10 <
-03/-08	1	2/20/19A	2/20/19	0.0819	0.050	2	100	10	16.4
-04/-09	2	2/20/19A	2/20/19	0.0793	0.050	2	100	10	15.9
-05/-10	3	2/20/19A	2/20/19	0.0802	0.050	2	100	10	16.0
Method Blank		2/20/19A	2/20/19	0.050 <	0.050	2	100	10	10 <

Comments:

*Gregory M. Almon*



**INTERPOLL LABORATORIES, INC.**  
(612)786-6020

**Lead by ICP Reporting Form**

Client: United Taconite

Due Date: 2/28/19

Sample Type: M29, Test 1, Fraction 2A, Pellet Induration (STUR) Stack

Analyst's Initials: GWH

Digestion Method: M-29

Analytical Method: EPA 6010A

37384	Run	Prep Date	Analysis Date	Instru. Reading (ug/mL)	Instru. RL (ug/mL)	Dilution	Final Volume of Digestate (mL)	Reported Result	
								Reporting Limit (Total ug)	Analytical Results (Total ug)
-12/-16	0	2/20/19A	2/20/19	0.050 <	0.050	2.400	100	12	12 <
-13/-17	1	2/20/19A	2/20/19	0.050 <	0.050	2.286	100	11	11 <
-14/-18	2	2/20/19A	2/20/19	0.050 <	0.050	2.286	100	11	11 <
-15/-19	3	2/20/19A	2/20/19	0.050 <	0.050	2.286	100	11	11 <

Comments:

Dilution takes into account Total volume of original sample divided by the aliquot taken for digestion. (ie. Dilution=500mL/4  
If a 2x dilution total dilution = 2.222)



**INTERPOLL LABORATORIES, INC.**  
(763)786-6020

**Total Mercury by Cold Vapor Atomic Absorption Reporting Form**

Client: United Taconite

Sample Type: M29, Test 1, Fraction 1B, Pellet Induration (STRU) Stack

Digestion Method: EPA M-29/7470

Due Date: 2/28/19

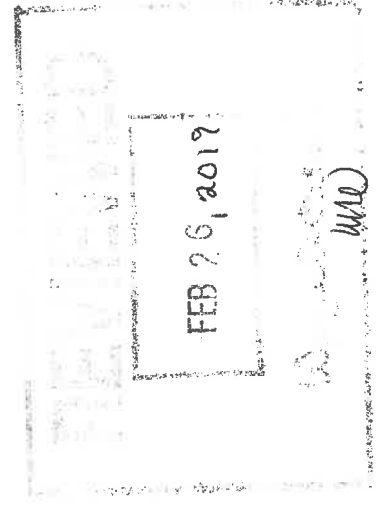
Analyst's Initials: GWH

Analytical Method: EPA 7470

ILI Log #: 37384	Run	Digestion Date	Analysis Date	Instru. Reading (ppb)	Instru. Reporting Limit (ppb)	Dilution	Volume of Sample Digested (mL)	Final Volume of Sample Digestate (mL)	Total Volume of sample (L)	Reported Results	
										Reporting Limit (ug)	Analytical Results (ug)
-06	00	2/21/19A	2/21/19	0.10 <	0.10	1	10	50	0.100	0.050	0.050 <
-07	0	2/21/19A	2/21/19	0.10 <	0.10	1	10	50	0.100	0.050	0.050 <
-08	1	2/21/19A	2/21/19	0.10 <	0.10	1	10	50	0.100	0.050	0.050 <
-09	2	2/21/19A	2/21/19	0.10 <	0.10	1	10	50	0.100	0.050	0.050 <
-10	3	2/21/19A	2/21/19	0.10 <	0.10	1	10	50	0.100	0.050	0.050 <
Method Blank		2/21/19A	2/21/19	0.10 <	0.10	1	10	50	0.100	0.050	0.050 <

Footnotes:

In-House Comments:



LSA-15

Z:\chem group\Chemistry\Excel\Metals\CVAA\Reports\37384 United Taconite - LSA-15 2018 Mercury M29 Report Form



**INTERPOLL LABORATORIES, INC.**  
(763)786-6020

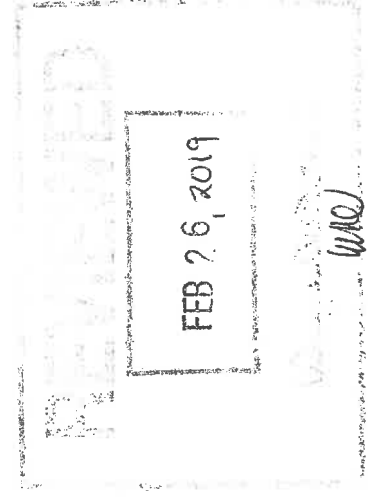
**Total Mercury by Cold Vapor Atomic Absorption Reporting Form**

Client: United Taconite  
 Sample Type: M29, Test 1, Fraction 2B, Pellet Induration (STRU) Stack  
 Digestion Method: EPA M-29/7470  
 Due Date: 2/28/19  
 Analyst's Initials: GWH  
 Analytical Method: EPA 7470

ILI Log #:	Run	Digestion Date	Analysis Date	Instru. Reading (ppb)	Instru. Reporting Limit (ppb)	Dilution	Volume of Sample Digested (mL)	Final Volume of Sample Digestate (mL)	Total Volume of sample (L)	Reported Results	
										Reporting Limit (ug)	Analytical Results (ug)
-12	0	2/21/19A	2/21/19	0.10 <	0.10	1	10	50	0.300	0.15	0.15 <
-13	1	2/21/19A	2/21/19	0.176	0.10	1	10	50	0.400	0.20	0.352
-14	2	2/21/19A	2/21/19	0.212	0.10	1	10	50	0.400	0.20	0.424
-15	3	2/21/19A	2/21/19	0.205	0.10	1	10	50	0.400	0.20	0.410

Footnotes:

In-House Comments:





**INTERPOLL LABORATORIES, INC.**  
(763)786-6020

**Total Mercury by Cold Vapor Atomic Absorption Reporting Form**

Client: United Taconite

Due Date: 2/28/19

Sample Type: M29, Test 1, Fraction 3A, Pellet Induration (STRU) Stack

Analyst's Initials: GWH

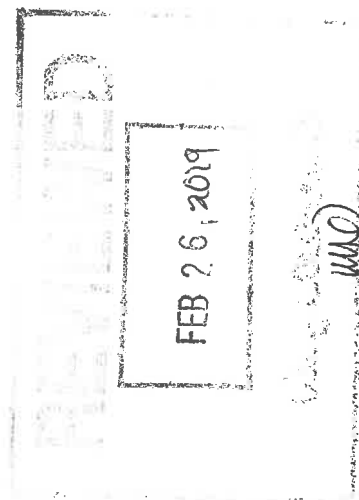
Digestion Method: EPA M-29/7470

Analytical Method: EPA 7470

ILI Log #:	Run	Digestion Date	Analysis Date	Instru. Reading (ppb)	Instru. Reporting Limit (ppb)	Dilution	Volume of Sample Digested (mL)	Final Volume of Sample Digestate (mL)	Reported Results	
									Total Volume of sample (L)	Analytical Results (ug)
-20	0	2/21/19A	2/21/19	0.10 <	0.10	1	10	50	0.050	0.025 <
-21	1	2/21/19A	2/21/19	0.10 <	0.10	1	10	50	0.050	0.025 <
-22	2	2/21/19A	2/21/19	0.10 <	0.10	1	10	50	0.050	0.025 <
-23	3	2/21/19A	2/21/19	0.10 <	0.10	1	10	50	0.050	0.025 <

Footnotes:

In-House Comments:





**INTERPOLL LABORATORIES, INC.**  
(763)786-6020

**Total Mercury by Cold Vapor Atomic Absorption Reporting Form**

Client: United Taconite

Due Date: 2/28/19

Sample Type: M29, Test 1, Fraction 3B, Pellet Induration (STRU) Stack

Analyst's Initials: GWH

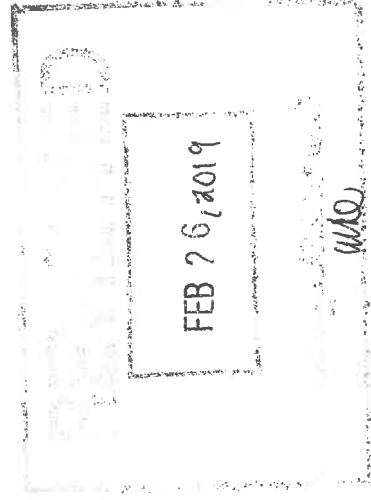
Digestion Method: EPA M-29/7470

Analytical Method: EPA 7470

ILI Log #:	Run	Digestion Date	Analysis Date	Instru. Reading (ppb)	Instru. Reporting Limit (ppb)	Dilution	Volume of Sample Digested (mL)	Final Volume of Sample Digestate (mL)	Total Volume of sample (L)	Reported Results	
										Reporting Limit (ug)	Analytical Results (ug)
-25	0	2/21/19A	2/21/19	0.10 <	0.10	1	20	50	0.500	0.13	0.13 <
-26	1	2/21/19A	2/21/19	1.10	0.10	1	20	50	0.500	0.13	1.38
-27	2	2/21/19A	2/21/19	0.179	0.10	1	20	50	0.500	0.13	0.224
-28	3	2/21/19A	2/21/19	0.305	0.10	1	20	50	0.500	0.13	0.381

Footnotes:

In-House Comments:



LSA-15

Z:\chem group\Chemistry\Excel\Metals\CVAA\Reports\37384 United Taconite - LSA-15 2018 Mercury M29 Report Form



**INTERPOLL LABORATORIES, INC.**  
(763)786-6020

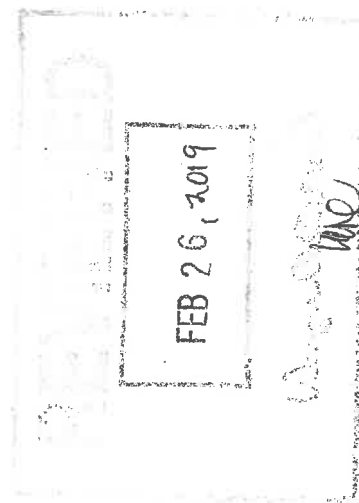
**Total Mercury by Cold Vapor Atomic Absorption Reporting Form**

Client: United Taconite  
 Sample Type: M29, Test 1, Fraction 3C, Pellet Induration (STRU) Stack  
 Digestion Method: EPA M-29/7470  
 Due Date: 2/28/19  
 Analyst's Initials: GWH  
 Analytical Method: EPA 7470

ILL Log #: 37384	Run	Digestion Date	Analysis Date	Instru. Reading (ppb)	Instru. Reporting Limit (ppb)	Dilution	Volume of Sample Digested (mL)	Final Volume of Sample Digestate (mL)	Total Volume of sample (L)	Reported Results	
										Reporting Limit (ug)	Analytical Results (ug)
-35	0	2/21/19A	2/21/19	0.10 <	0.10	1	10	50	0.200	0.10	0.10 <
-36	1	2/21/19A	2/21/19	5.51	0.10	1	10	50	0.200	0.10	5.51
-37	2	2/21/19A	2/21/19	6.35	0.10	1	10	50	0.200	0.10	6.35
-38	3	2/21/19A	2/21/19	4.86	0.10	1	10	50	0.200	0.10	4.86

Footnotes:

In-House Comments:





**INTERPOLL LABORATORIES, INC.**

(763)786-6020

**Total Mercury by Cold Vapor Atomic Absorption Reporting Form**

Client: United Taconite

Sample Type: Filter

Digestion Method: EPA M-29/7470

Due Date: 2/28/19

Analyst's Initials: GWH

Analytical Method: EPA 7470

									Reported Result	
ILI Log #:	Digestion Date	Analysis Date	Instru. Reading (ppb)	Instru. Reporting Limit (ppb)	Dilution	Volume of Sample Digested (mL)	Final Volume of Sample Digestate (mL)	Total Volume of sample (L)	Reporting Limit (ug)	Analytical Results (ug)
37384	2/21/19A	2/21/19	3.50	0.10	10	10	50	0.100	0.50	17.5

Footnotes: *Mercury Audit Sample Analysis - Filter*

In-House Comments:

**Total Mercury by Cold Vapor Atomic Absorption Reporting Form**

Client: United Taconite

Sample Type: Impinger

Digestion Method: EPA M-29/7470

Due Date: 2/28/19

Analyst's Initials: GWH

Analytical Method: EPA 7470

									Reported Result	
ILI Log #:	Digestion Date	Analysis Date	Instru. Reading (ug/L)	Instru. Reporting Limit (ug/L)	Dilution	Volume of Sample Digested (mL)	Final Volume of Sample Digestate (mL)		Reporting Limit (ug/L)	Analytical Results (ug/L)
37384	2/21/19A	2/21/19	5.11	0.10	1	10	50		0.50	25.6

Footnotes: *Mercury Audit sample Analysis - Impinger solution*

In-House Comments:





# INTERPOLL LABORATORIES, INC.

(612)786-6020

## Total Mercury by Cold Vapor Atomic Absorption Reporting Form

Client: United Taconite

Due Date: 2/28/19

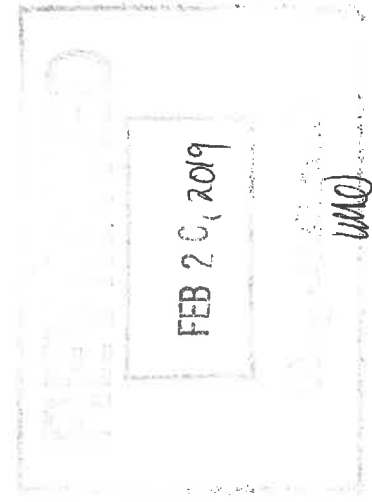
Sample Type: M29, Test 1, Reagents

Analyst's Initials: GWH

Analytical Method: EPA 7470

ILI Log #:	Reagent	Digestion Date	Analysis Date	Instru. Reading (ppb)	Instru. Reporting Limit (ppb)	Dilution	Volume of Sample Digested (L)	Final Volume of Sample Digestate (L)	Reported Result	
									Reporting Limit (ug/L)	Analytical Results (ug/L)
37384										
-01	0.1N HNO3	2/21/19A	2/21/19	0.10 <	0.10	1	0.040	0.050	0.13	0.13 <
-11	5% HNO3/10% H2O2	2/21/19A	2/21/19	0.10 <	0.10	1	0.010	0.050	0.50	0.50 <
-29	Milli-Q Water	2/21/19A	2/21/19	0.10 <	0.10	1	0.040	0.050	0.13	0.13 <
-24	4% KMnO4/10% H2SO4	2/21/19A	2/21/19	0.10 <	0.10	1	0.020	0.050	0.25	0.25 <
-34	8N HCl	2/21/19A	2/21/19	0.10 <	0.10	1	0.010	0.050	0.50	0.50 <

In-House Comments:





**INTERPOLL LABORATORIES, INC.**  
(763)786-6020

**Methane and Ethane by GSV/GC/FID Reporting Form**

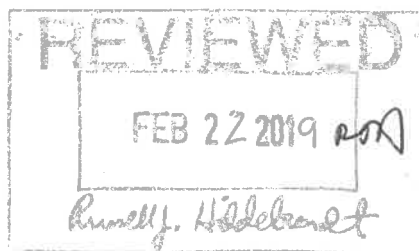
Client: United Taconite  
Sample Type: IGS  
Analytical Method: GC/FID

Date Due: 02/28/2019  
Analyst initials : BVT

ILI Log #	Source	Test/Ru	Date Collected	Analysis Date	Methane Instrument Reading (ppmv)	Ethane Instrument Reading (ppmv)	Instrument D.L. (ppmv)	Dilution	Detection Limit (ppmv)	Methane Analytical Result (ppmv)	Ethane Analytical Result (ppmv)
37384-39	Line1Pellet Induration(STRU53)	2/1	2/13/2019	2/20/2019	2.041	1.000 <	1	1	1	2.0	1.0 <
37384-40	Line1Pellet Induration(STRU53)	2/2	2/13/2019	2/20/2019	2.055	1.000 <	1	1	1	2.1	1.0 <
37384-41	Line1Pellet Induration(STRU53)	2/3	2/13/2019	2/20/2019	2.194	1.000 <	1	1	1	2.2	1.0 <
37384-67	Line1Pellet Induration(STRU53)	5/1	2/14/2019	2/20/2019	2.141	1.000 <	1	1	1	2.1	1.0 <
37384-68	Line1Pellet Induration(STRU53)	5/2	2/14/2019	2/20/2019	2.289	1.000 <	1	1	1	2.3	1.0 <
37384-69	Line1Pellet Induration(STRU53)	5/3	2/14/2019	2/20/2019	2.289	1.000 <	1	1	1	2.3	1.0 <

Footnotes:

In-House:





INTERPOL LABORATORIES, INC  
(763) 786-5020

Gravimetrics Data Sheet

Job:  
Date Collected:  
Date of Analysis:

United Taconite

2/14/2019  
2/22/2019

Source:  
Test Number:  
Analyst:

Line 1 Pellet Induration

3  
PLK

STR453

Probe Wash Data

Filter Data

Solvent Used:

Acetone

Filter Type:

Run 00			
Log Number	37384	Dish Number	42
Volume	50 mL	Leakage	
Tare + Sample (g)	58.0222	Tare + Sample (g)	4664
Tare (g)	55.0222	Tare (g)	4663
Sample (g)	0	Sample (g)	0001

Run 0			
Log Number	43	Dish Number	102
Volume	70 mL	Leakage	
Tare + Sample (g)	50.4394	Tare + Sample (g)	4599
Tare (g)	50.4394	Tare (g)	4597
Sample (g)	0	Sample (g)	0002

Run 1			
Log Number	44	Dish Number	17
Volume	70 mL	Leakage	
Tare + Sample (g)	52.2875	Tare + Sample (g)	4703
Tare (g)	52.2859	Tare (g)	4629
Sample (g)	0016	Sample (g)	0079

Run 2			
Log Number	45	Dish Number	13
Volume	70 mL	Leakage	
Tare + Sample (g)	50.3178	Tare + Sample (g)	4694
Tare (g)	50.3568	Tare (g)	4610
Sample (g)	0010	Sample (g)	0084

Run 3			
Log Number	46	Dish Number	69
Volume	70 mL	Leakage	
Tare + Sample (g)	46.0761	Tare + Sample (g)	4645
Tare (g)	46.0751	Tare (g)	4569
Sample (g)	0010	Sample (g)	0076

Run 4			
Log Number		Dish Number	
Volume	mL	Leakage	
Tare + Sample (g)		Tare + Sample (g)	
Tare (g)		Tare (g)	
Sample (g)		Sample (g)	

Note: Solvent residue must be less than 0.0000078 g/mL

Balance Room Conditions

Time	10:30	Barometric Pressure	29.41
Humidity	9.6	Temperature	74.3



# Impinger Catch Data Reporting Sheet

Protocol: Minnesota Wisconsin Iowa x EPA 202-DRY Other  
Job: United Taconite Source/Site: Line 1 Pellet Induration (STRU53) Stack  
Date Submitted: 2/15/2019 Test No: 3  
Date of Analysis: 2/18/2019 to 2/27/2019 Technician: BVT

Reagent Blank			
Test:	3	Run:	0
Log No:	37384-52	Dish No:	B8
Comments: Container #7, Water		Dish + Sample Wt:	51.0353 gram
		Dish Tare Wt:	51.0353 gram
		Fraction Wt:	0.0000 gram
		Smpl Vol:	150 ml, Alqt: 150 ml, Factor 1.000
		Sample Wt:	0.0000 gram
Test:	3	Run:	0
Log No:	37384-57	Dish No:	57
Comments: Container #6, Acetone		Dish + Sample Wt:	4.0107 gram
		Dish Tare Wt:	4.0107 gram
		Fraction Wt:	0.0000 gram
		Smpl Vol:	150 ml, Alqt: 150 ml, Factor 1.000
		Sample Wt:	0.0000 gram
Test:	3	Run:	0
Log No:	37384-58	Dish No:	58
Comments: Container #8, Hexane		Dish + Sample Wt:	4.0014 gram
		Dish Tare Wt:	4.0014 gram
		Fraction Wt:	0.0000 gram
		Smpl Vol:	150 ml, Alqt: 150 ml, Factor 1.000
		Sample Wt:	0.0000 gram

REVIEWED  
FEB 27 2019 PA  
Rumely, H. H. H. H. H.

Field Blank			
Solvent Phase		Aqueous Phase	
Test:	3	Run:	0
Log No:	37384-63/53/59	Dish No:	59
Comments:		Dish + Sample Wt:	4.0013 gram
		Dish Tare Wt:	4.0003 gram
		Fraction Wt:	0.0010 gram
		Smpl Vol:	87 ml, Alqt: 87 ml, Factor 1.000
		Sample Wt:	0.0010 gram
		Dish No:	A5
		Dish + Sample Wt:	54.1739 gram
		Dish Tare Wt:	54.1732 gram
		Fraction Wt:	0.0007 gram
		Smpl Vol:	87 ml, Alqt: 87 ml, Factor 1.000
		Sample Wt:	0.0007 gram

Sample Runs			
Solvent Phase		Aqueous Phase	
Test:	3	Run:	1
Log No:	37384-64/54/60	Dish No:	60
Comments:		Dish + Sample Wt:	4.0178 gram
		Dish Tare Wt:	4.0162 gram
		Fraction Wt:	0.0016 gram
		Smpl Vol:	148 ml, Alqt: 148 ml, Factor 1.000
		Sample Wt:	0.0016 gram
		Dish No:	42
		Dish + Sample Wt:	52.1902 gram
		Dish Tare Wt:	52.1821 gram
		Fraction Wt:	0.0081 gram
		Smpl Vol:	148 ml, Alqt: 148 ml, Factor 1.000
		Sample Wt:	0.0081 gram
Test:	3	Run:	2
Log No:	37384-65/55/61	Dish No:	61
Comments:		Dish + Sample Wt:	4.0020 gram
		Dish Tare Wt:	4.0009 gram
		Fraction Wt:	0.0011 gram
		Smpl Vol:	175 ml, Alqt: 175 ml, Factor 1.000
		Sample Wt:	0.0011 gram
		Dish No:	56
		Dish + Sample Wt:	54.5031 gram
		Dish Tare Wt:	54.4967 gram
		Fraction Wt:	0.0064 gram
		Smpl Vol:	175 ml, Alqt: 175 ml, Factor 1.000
		Sample Wt:	0.0064 gram
Test:	3	Run:	3
Log No:	37384-66/56/62	Dish No:	62
Comments:		Dish + Sample Wt:	4.0031 gram
		Dish Tare Wt:	4.0018 gram
		Fraction Wt:	0.0013 gram
		Smpl Vol:	173 ml, Alqt: 173 ml, Factor 1.000
		Sample Wt:	0.0013 gram
		Dish No:	33
		Dish + Sample Wt:	53.4611 gram
		Dish Tare Wt:	53.4533 gram
		Fraction Wt:	0.0078 gram
		Smpl Vol:	173 ml, Alqt: 173 ml, Factor 1.000
		Sample Wt:	0.0078 gram

Note: Factor = Sample Volume/Aliquot Volume \*

Blank Solvent Wt. \_\_\_\_\_ g

	RUN 0	RUN 1	RUN 2	RUN 3
Results of Solvent Phase	g 0.0010	0.0016	0.0011	0.0013
Results of Aqueous Phase	g 0.0007	0.0081	0.0064	0.0078
Volume of 0.081N NH4OH (ml)	NA	NA	NA	NA
Mass of NH4 added (equation 1), mg	#VALUE!	#VALUE!	#VALUE!	#VALUE!

## Balance Room Conditions:

	Date & Time	Humidity	Barometric Pressure (inHg)	Temperature (°F)
First Reading	2/22/08 4:52 AM	9.2	29.527	74.4
Final Reading	2/26/18 6:41 AM	4.1	29.687	67.3
Last Reading	2/27/18 6:13 AM	5.6	29.467	71.8



## Total Mercury by Cold Vapor Atomic Absorption Reporting Form

Client: United Taconite

Due Date: 2/28/19

Sample Type: M29, Test 4, Fraction 1B, Pellet Induration (STRU) Stack

Analyst's Initials: GWH

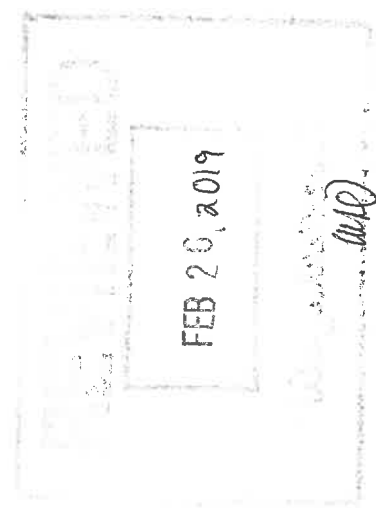
Digestion Method: EPA M-29/7470

Analytical Method: EPA 7470

ILL Log #:	Run	Digestion Date	Analysis Date	Instru. Reading (ppb)	Instru. Reporting Limit (ppb)	Dilution	Volume of Sample Digested (mL)	Final Volume of Sample Digestate (mL)	Total Volume of sample (L)	Reported Results	
										Reporting Limit (ug)	Analytical Results (ug)
-75	00	2/21/19A	2/21/19	0.10 <	0.10	1	10	50	0.100	0.050	0.050 <
-76	0	2/21/19A	2/21/19	0.10 <	0.10	1	10	50	0.100	0.050	0.050 <
-77	1	2/21/19A	2/21/19	0.10 <	0.10	1	10	50	0.100	0.050	0.050 <
-78	2	2/21/19A	2/21/19	0.10 <	0.10	1	10	50	0.100	0.050	0.050 <
-79	3	2/21/19A	2/21/19	0.10 <	0.10	1	10	50	0.100	0.050	0.050 <
Method Blank		2/21/19A	2/21/19	0.10 <	0.10	1	10	50	0.100	0.050	0.050 <

Footnotes:

In-House Comments:





# INTERPOL LABORATORIES, INC.

(763)786-6020

## Total Mercury by Cold Vapor Atomic Absorption Reporting Form

Client: United Taconite

Sample Type: M29, Test 4, Fraction 2B, Pellet Induration (STRU) Stack

Digestion Method: EPA M-29/7470

Due Date: 2/28/19

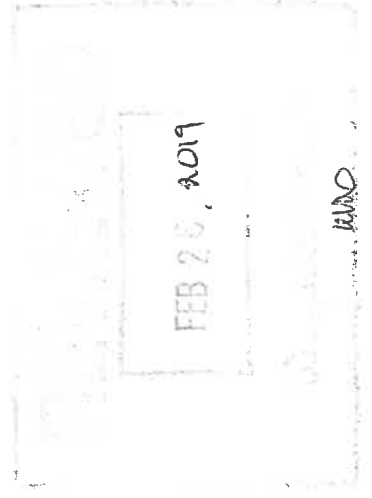
Analyst's Initials: GWH

Analytical Method: EPA 7470

ILJ Log #:	Run	Digestion Date	Analysis Date	Instru. Reading (ppb)	Instru. Reporting Limit (ppb)	Dilution	Volume of Sample Digested (mL)	Final Volume of Sample Digestate (mL)	Total Volume of sample (L)	Reported Results	
										Reporting Limit (ug)	Analytical Results (ug)
-81	0	2/21/19A	2/21/19	0.104	0.10	1	10	50	0.300	0.15	0.156
-82	1	2/21/19A	2/21/19	0.145	0.10	1	10	50	0.400	0.20	0.290
-83	2	2/21/19A	2/21/19	0.123	0.10	1	10	50	0.400	0.20	0.246
-84	3	2/21/19A	2/21/19	0.146	0.10	1	10	50	0.400	0.20	0.292

Footnotes:

In-House Comments:





# INTERPOLL LABORATORIES, INC.

(763)786-6020

## Total Mercury by Cold Vapor Atomic Absorption Reporting Form

Client: United Taconite

Due Date: 2/28/19

Sample Type: M29; Test 4, Fraction 3A, Pellet Induration (STRU) Stack

Analyst's Initials: GWH

Digestion Method: EPA M-29/7470

Analytical Method: EPA 7470

IL1 Log #:	Run	Digestion Date	Analysis Date	Instru. Reading (ppb)	Instru. Reporting Limit (ppb)	Dilution	Volume of Sample Digested (mL)	Final Volume of Sample Digestate (mL)	Total Volume of sample (L)	Reported Results	
										Reporting Limit (ug)	Analytical Results (ug)
-89	0	2/21/19A	2/21/19	0.10 <	0.10	1	10	50	0.050	0.025	<
-90	1	2/21/19A	2/21/19	0.10 <	0.10	1	10	50	0.050	0.025	<
-91	2	2/21/19A	2/21/19	0.10 <	0.10	1	10	50	0.050	0.025	<
-92	3	2/21/19A	2/21/19	0.10 <	0.10	1	10	50	0.050	0.025	<

Footnotes:

In-House Comments:





# INTERPOL LABORATORIES, INC.

(763)786-6020

## Total Mercury by Cold Vapor Atomic Absorption Reporting Form

Client: United Taconite

Due Date: 2/28/19

Sample Type: M29, Test 4, Fraction 3B, Pellet Induration (STRU) Stack

Analyst's Initials: GWH

Digestion Method: EPA M-29/7470

Analytical Method: EPA 7470

ILL Log #:	Run	Digestion Date	Analysis Date	Instru. Reading (ppb)	Instru. Reporting Limit (ppb)	Dilution	Volume of Sample Digested (mL)	Final Volume of Sample Digestate (mL)	Total Volume of sample (L)	Reported Results	
										Reporting Limit (ug)	Analytical Results (ug)
-94	0	2/21/19A	2/21/19	0.10 <	0.10	1	20	50	0.500	0.13	0.13 <
-95	1	2/21/19A	2/21/19	1.40	0.10	1	20	50	0.500	0.13	1.75
-96	2	2/21/19A	2/21/19	4.38	0.10	1	20	50	0.500	0.13	5.48
-97	3	2/21/19A	2/21/19	4.55	0.10	1	20	50	0.500	0.13	5.69

Footnotes:

In-House Comments:





# INTERPOL LABORATORIES, INC.

(763)786-6020

## Total Mercury by Cold Vapor Atomic Absorption Reporting Form

Client: United Taconite

Due Date: 2/28/19

Sample Type: M29, Test 4, Fraction 3C, Pellet Induration (STRU) Stack

Analyst's Initials: GWH

Digestion Method: EPA M-29/7470

Analytical Method: EPA 7470

ILI Log #:	Run	Digestion Date	Analysis Date	Instru. Reading (ppb)	Instru. Reporting Limit (ppb)	Dilution	Volume of Sample Digested (mL)	Final Volume of Sample Digestate (mL)	Total Volume of sample (L)	Reported Results	
										Reporting Limit (ug)	Analytical Results (ug)
-104	0	2/21/19A	2/21/19	0.10 <	0.10	1	10	50	0.200	0.10	0.10 <
-105	1	2/21/19A	2/21/19	4.29	0.10	1	10	50	0.200	0.10	4.29
-106	2	2/21/19A	2/21/19	0.938	0.10	1	10	50	0.200	0.10	0.938
-107	3	2/21/19A	2/21/19	0.848	0.10	1	10	50	0.200	0.10	0.848

Footnotes:

In-House Comments:





# INTERPOLL LABORATORIES, INC.

(612)786-6020

## Lead by ICP Reporting Form

Client: United Taconite

Due Date: 2/28/19

Sample Type: M29, Test 4, Fraction 1A, Pellet Induration (STUR) Stack

Analyst's Initials: GWH

Digestion Method: M-29

Analytical Method: EPA 6010A

37384	Run	Prep Date	Analysis Date	Instru. Reading (ug/mL)	Instru. RL (ug/mL)	Dilution	Final Volume of Digestate (mL)	Reported Result	
								Reporting Limit (Total ug)	Analytical Results (Total ug)
-75	00	2/20/19A	2/20/19	0.050 <	0.050	2	100	10	10 <
-71/-76	0	2/20/19A	2/20/19	0.050 <	0.050	2	100	10	10 <
-72/-77	1	2/20/19A	2/20/19	0.050 <	0.050	2	100	10	10 <
-73/-78	2	2/20/19A	2/20/19	0.050 <	0.050	2	100	10	10 <
-74/-79	3	2/20/19A	2/20/19	0.050 <	0.050	2	100	10	10 <
Method Blank		2/20/19A	2/20/19	0.050 <	0.050	2	100	10	10 <

Comments:

*Betty M. Allen*



# INTERPOLL LABORATORIES, INC.

(612)786-6020

## Lead by ICP Reporting Form

Client: United Taconite

Due Date: 2/28/19

Sample Type: M29, Test 4, Fraction 2A, Pellet Induration (STUR) Stack

Analyst's Initials: GWH

Digestion Method: M-29

Analytical Method: EPA 6010A

37384	Run	Prep Date	Analysis Date	Instru. Reading (ug/mL)	Instru. RL (ug/mL)	Dilution	Final Volume of Digestate (mL)	Reported Result	
								Reporting Limit (Total ug)	Analytical Results (Total ug)
-81/-85	0	2/20/19A	2/20/19	0.050 <	0.050	2.400	100	12	12 <
-82/-86	1	2/20/19A	2/20/19	0.050 <	0.050	2.286	100	11	11 <
-83/-87	2	2/20/19A	2/20/19	0.050 <	0.050	2.286	100	11	11 <
-84/-88	3	2/20/19A	2/20/19	0.050 <	0.050	2.286	100	11	11 <

Comments:

Dilution takes into account Total volume of original sample divided by the aliquot taken for digestion. (ie. Dilution=500mL/4  
If a 2x dilution total dilution = 2.222)



# INTERPOLL LABORATORIES, INC.

(612)786-6020

## Total Mercury by Cold Vapor Atomic Absorption Reporting Form

Client: United Taconite

Sample Type: M29, Test 4, Reagents

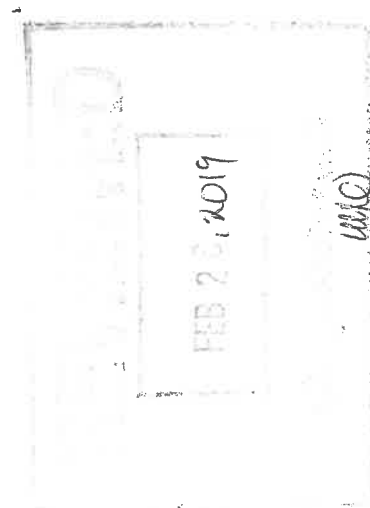
Analytical Method: EPA 7470

Due Date: 2/28/19

Analyst's Initials: GWH

ILL Log #:	Reagent	Digestion Date	Analysis Date	Instr. Reading (ppb)	Instr. Reporting Limit (ppb)	Dilution	Volume of Sample Digested (L)	Final Volume of Sample Digestate (L)	Reported Result	
									Reporting Limit (ug/L)	Analytical Results (ug/L)
-70	0.1N HNO3	2/21/19A	2/21/19	0.10 <	0.10	1	0.040	0.050	0.13	0.13 <
-80	5% HNO3/10% H2O2	2/21/19A	2/21/19	0.10 <	0.10	1	0.010	0.050	0.50	0.50 <
-98	Milli-Q Water	2/21/19A	2/21/19	0.10 <	0.10	1	0.040	0.050	0.13	0.13 <
-93	4% KMnO4/10% H2SO4	2/21/19A	2/21/19	0.10 <	0.10	1	0.020	0.050	0.25	0.25 <
-103	8N HCl	2/21/19A	2/21/19	0.10 <	0.10	1	0.010	0.050	0.50	0.50 <

In-House Comments:





**Interpoll Laboratories**  
(763) 786-6020

**Sample Chain of Custody**

Job \_\_\_\_\_ United Taconite \_\_\_\_\_ Source \_\_\_\_\_ ie 1 Pellet Induration (STRU): Site \_\_\_\_\_ Stack \_\_\_\_\_ Log Number \_\_\_\_\_ 37384  
Field Engineer Chris Warneke \_\_\_\_\_ Date of Test 2/13/2019 \_\_\_\_\_ Test Number \_\_\_\_\_ 1 \_\_\_\_\_ Number of Runs \_\_\_\_\_ 3

Number of Items	Sample Type	Analysis	Sequence Number	Comments
45	Probe Wash: <input type="checkbox"/> Acetone <input type="checkbox"/> MeCl <sub>2</sub> <input checked="" type="checkbox"/> 0.1 N HNO <sub>3</sub>	<input type="checkbox"/> EPA Method 5 <input checked="" type="checkbox"/> EPA Method 29	01-05	
5	Filter: <input type="checkbox"/> 4" Glass Fiber <input checked="" type="checkbox"/> SS Thimble <input type="checkbox"/> Pallflex <input type="checkbox"/> 2.5" Glass Fiber	<input type="checkbox"/> EPA Method 5 <input checked="" type="checkbox"/> EPA Method 29 <input type="checkbox"/> EPA Method 201A <input type="checkbox"/> EPA Method 17	06-10	
10	Impingers: <input type="checkbox"/> DI Water <input checked="" type="checkbox"/> H <sub>2</sub> SO <sub>4</sub> <input type="checkbox"/> 3 % H <sub>2</sub> O <sub>2</sub> <input checked="" type="checkbox"/> HNO <sub>3</sub> /H <sub>2</sub> O <sub>2</sub> <input type="checkbox"/> 1N NaOH <input checked="" type="checkbox"/> KMnO <sub>4</sub> /H <sub>2</sub> SO <sub>4</sub> <input type="checkbox"/> 2,4-DNPH <input type="checkbox"/> Sodium bisulfate Integrated Gas: <input type="checkbox"/> Tedlar Bag Oxides of Nitrogen: <input type="checkbox"/>	<input type="checkbox"/> MN Protocol <input type="checkbox"/> WI Protocol <input type="checkbox"/> EPA Method 202 <input checked="" type="checkbox"/> EPA Method 6,8 <input type="checkbox"/> IA Protocol <input type="checkbox"/> Formaldehyde <input type="checkbox"/> EPA Method 28 <input checked="" type="checkbox"/> Metals <input type="checkbox"/> EPA Method 3 <input type="checkbox"/> Methane <input type="checkbox"/> EPA Method 10 <input type="checkbox"/> EPA Method 7A <input type="checkbox"/> Per S-0163	11-15 24-28 1 See Labels	
	Fuel Lab: <input type="checkbox"/> Fuel Sample <input type="checkbox"/> Aggregate Particle Sizing <input type="checkbox"/>	<input type="checkbox"/> X-Ray Scdgraph <input type="checkbox"/> Cascade Impactor		
16	Miscellaneous: <input checked="" type="checkbox"/> Impinger Rinses 0.1 N HNO <sub>3</sub> KMnO <sub>4</sub> /H <sub>2</sub> O 0.1 N HNO <sub>3</sub> 6N HCL Imp 4	<input checked="" type="checkbox"/> Impinger Rinses <input type="checkbox"/> Waste Oil <input type="checkbox"/> No. 2 <input type="checkbox"/> No. 6 <input type="checkbox"/> Natural Gas <input type="checkbox"/> RDF <input type="checkbox"/> Diesel	16-19 29-33 34-38 20-23	See labels

Fuel Type: Coal: ☐ Bituminous ☐ Wood: ☐ Anthracite ☐ Lignite ☐ Wood Waste ☐ Dust ☐ Bark ☐ Oil: ☐ Waste Oil ☐ No. 2 ☐ No. 6 ☐ Natural Gas ☐ RDF ☐ Diesel

Relinquished by/Affiliation Chris Warneke	Accepted by/Affiliation Interpoll Laboratories	Date 2/13/19
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**Interpoll Laboratories**  
(763) 786-6020

**Sample Chain of Custody**

Job \_\_\_\_\_ United Taconite \_\_\_\_\_ Source \_\_\_\_\_ Line 1 Pellet Induration (STRU53) \_\_\_\_\_ Log Number \_\_\_\_\_ 37384  
 Field Engineer \_\_\_\_\_ Chris Warneke \_\_\_\_\_ Date of Test \_\_\_\_\_ 2/13/2019 \_\_\_\_\_ Test Number \_\_\_\_\_ 2 \_\_\_\_\_ Number of Runs \_\_\_\_\_ 3

Number of Items	Sample Type	Analysis	Sequence Number	Comments
	Probe Wash: Acetone	DI Water	EPA Method 201A EPA Method 29	
	Front Half Filter: 82mm Glass Fiber SS Thimble	Pallflex Quartz 2.5" Glass Fiber	EPA Method 201A EPA Method 17	
	Impinger: Condensate/DI Water 3 % H2O2 1N NaOH 2,4-DNPH	H2SO4 HNO3/H2O2 KMnO4/H2SO4 Sodium bisulfate	MN Protocol WI Protocol EPA Method 202 (Dry Imp.) EPA Method 26 or 26A Modified Method 5	
	Impinger Rinses: Acetone/Hexane		EPA Method 202 (Dry Imp.)	
	CPM Filter: 83 mm Zefluor		EPA Method 202 (Dry Imp.)	
3	Integrated Gas: Tedlar Bag		EPA Method 3 EPA Method 10 <u>Methane (M-25A)</u> 39-41	
	Fuel Lab: Fuel Sample	Aggregate	ASTM-D1945	
	Particle Sizing		X-Ray Sdgraph Cascade Impactor	
	Miscellaneous:			

Fuel Type: Coal: Bituminous Anthracite Lignite Wood: Wood Waste Dust Bark Oil: Waste Oil No. 2 No. 6 Miscellaneous: Natural Gas RDF Diesel Other:

Relinquished by/Affiliation Chris Warneke	Accepted by/Affiliation 	Date 2/15/19
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**Interpoll Laboratories**  
(763) 786-6020

**Sample Chain of Custody**

Job Field Engineer Chris Warneke Source United Taconite Date of Test 2/14/2019 Line 1 Pellet Incubation (STRU53) Test Number 3 Log Number 37384 Number of Runs 3

Number of Items	Sample Type	Analysis	Sequence Number	Comments
5	Probe Wash: <u>Acetone</u> DI Water	<u>EPA Method 5</u> EPA Method 29	<u>42-46</u>	
5	Front Half Filter: <u>82mm Glass Fiber</u> <u>SS Thimble</u> Pallflex Quartz 2.5" Glass Fiber	<u>EPA Method 5</u> EPA Method 29	<u>47-51</u>	
5	Impinger: <u>Condensate/DI Water</u> 3% H2O2 1N NaOH 2,4-DNPH H2SO4 HNO3/H2O2 KMnO4/H2SO4 Sodium bisulfate	MN Protocol WI Protocol <u>EPA Method 202 (Dry Imp.)</u>	<u>52-56</u>	
6	Impinger Rinses: Acetone/Hexane	EPA Method 202 (Dry Imp.)	<u>57-62</u>	
4	CPM Filter: 83 mm Zeflur	EPA Method 202 (Dry Imp.)	<u>63-64</u>	
	Integrated Gas: Tedlar Bag	EPA Method 3 EPA Method 10		
	Fuel Lab: Fuel Sample Aggregate			
	Particle Sizing	X-Ray Sdgraph Cascade Impactor		
	Miscellaneous:			

Fuel Type: Coal: Bituminous Anthracite Lignite Wood: Wood Waste Dust Bark Oil: Waste Oil No. 2 No. 6 Miscellaneous: Natural Gas RDF Diesel Other:

Relinquished by/Affiliation <u>Chris Warneke</u>	Accepted by/Affiliation <u>[Signature]</u>	Date <u>2/15/19</u>
<u>[Signature]</u>	<u>[Signature]</u>	<u>2/15/19</u>



**Interpoll Laboratories**  
(763) 786-6020

**Sample Chain of Custody**

Job Field Engineer Chris Warneke Source ie 1 Pellet Induration (STRU) Site Log Number 37384  
2/14/2019 Date of Test 2/14/2019 Test Number 4 Number of Runs 3

*Stack*

Number of Items	Sample Type	Analysis	Sequence Number	Comments
45	Probe Wash: <input type="checkbox"/> Acetone <input type="checkbox"/> MeCl <sub>2</sub>	<input type="checkbox"/> EPA Method 5 <input checked="" type="checkbox"/> EPA Method 29	70-784	<i>See Labels</i>
	Filter: <input type="checkbox"/> 4" Glass Fiber <input checked="" type="checkbox"/> Pallflex <input type="checkbox"/> SS Thimble <input type="checkbox"/> 2.5" Glass Fiber	<input type="checkbox"/> EPA Method 5 <input checked="" type="checkbox"/> EPA Method 29		
5	Impingers: <input type="checkbox"/> DI Water <input type="checkbox"/> H <sub>2</sub> SO <sub>4</sub> <input checked="" type="checkbox"/> 3% H <sub>2</sub> O <sub>2</sub> <input checked="" type="checkbox"/> HNO <sub>3</sub> /H <sub>2</sub> O <sub>2</sub> <input checked="" type="checkbox"/> 1N NaOH <input checked="" type="checkbox"/> KMnO <sub>4</sub> /H <sub>2</sub> SO <sub>4</sub> <input type="checkbox"/> 2,4-DNPH <input type="checkbox"/> Sodium bisulfate	<input type="checkbox"/> MN Protocol <input type="checkbox"/> WI Protocol <input type="checkbox"/> EPA Method 202 <input checked="" type="checkbox"/> EPA Method 6,8 <input type="checkbox"/> Metals	75-79	
10	Integrated Gas: <input type="checkbox"/> Tedlar Bag	<input type="checkbox"/> EPA Method 3 <input type="checkbox"/> EPA Method 10 <input type="checkbox"/> EPA Method 7A	80-84	See Labels
	Oxides of Nitrogen:		93-97	
	Fuel Lab: <input type="checkbox"/> Fuel Sample <input type="checkbox"/> Aggregate	<input type="checkbox"/> Per S-0163		
	Particle Sizing	<input type="checkbox"/> X-Ray Sdgraph <input type="checkbox"/> Cascade Impactor		
1519	Miscellaneous: <input checked="" type="checkbox"/> Impinger Rinses 0.1 N HNO <sub>3</sub> KMnO <sub>4</sub> /H <sub>2</sub> O 0.1 N HNO <sub>3</sub> 6N HCL <i>Addits</i> <input checked="" type="checkbox"/> Mercury in imp <input checked="" type="checkbox"/> Mercury on filter	<input checked="" type="checkbox"/> Imp 4 Impinger Rinses	89-92 98-102 85-88 103-107 108-109	See labels

Fuel Type: Coal: ☐ Bituminous ☐ Wood: ☐ Anthracite ☐ Lignite  
 Oil: ☐ No. 2 ☐ No. 6  
 Miscellaneous: ☐ Waste Oil ☐ Natural Gas  
 RDF Diesel

Relinquished by/Affiliation <i>Chris Warneke</i>	Accepted by/Affiliation <i>[Signature]</i>	Date <i>2/15/19</i>
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**Interpoll Laboratories**  
(763) 786-6020

**Sample Chain of Custody**

Job Field Engineer Chris Wameke United Taconite Source Chris Wameke Date of Test 2/14/2019 Line 1 Pellet Induration (STRU53) Test Number 5 Log Number 37384 Number of Runs 3

Number of Items	Sample Type	Analysis	Sequence Number	Comments
	Probe Wash: Acetone	DI Water	EPA Method 201A	
	Front Half Filter: 82mm Glass Fiber SS Thimble	EPA Method 5 EPA Method 29	EPA Method 201A EPA Method 17	
	Impinger: Condensate/DI Water 3 % H2O2 1N NaOH 2,4-DNPH	IA Protocol WI Protocol EPA Method 202 (Dry Imp.) EPA Method 26 or 26A Modified Method 5		
	Impinger Rinses: Acetone/Hexane	EPA Method 202 (Dry Imp.)		
	CPM Filter: 83 mm Zeffluor	EPA Method 202 (Dry Imp.)		
3	Integrated Gas: Tedlar Bag	EPA Method 3 EPA Method 10 ASTM-D1945	<u>67-69</u>	
	Fuel Lab: Fuel Sample	Aggregate		
	Particle Sizing	X-Ray Sdgraph	Cascade Impactor	
	Miscellaneous:			

Fuel Type: Coal: Bituminous Anthracite Lignite Wood: Wood Waste Dust Bark Oil: Waste Oil No. 2 No. 6 Miscellaneous: Natural Gas RDF Diesel Other:

Relinquished by/Affiliation Chris Wameke	Accepted by/Affiliation 	Date <u>2/15/19</u>
Interpoll Laboratories		



# **APPENDIX E**

## **TEST PLAN**



**From:** Place, Andrew (MPCA) <andrew.place@state.mn.us>  
**Sent:** Monday, February 11, 2019 2:02 PM  
**To:** 'Bonham, Michael J'  
**Cc:** Palzkill, Steven (MPCA); Kathy Eickstadt  
**Subject:** Test Plan Approval - Line 1 Waste Gas Stack

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

## **Test Plan Approval Letter**

Facility: United Taconite LLC  
Address: 1200 West Highway 16, Forbes, MN 55738  
Contact Person/Phone: Mike Bonham, Environmental Coordinator  
Test Date: February 11, 2019  
Test Plan Submittal Date: January 11, 2019  
Pretest Meeting Date: via email week of February 4, 2019  
Units to be Tested: Line 1 Pellet Induration (EQUI 45/STRU 53/CE056)  
Agency Interest ID: 140099

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

Test plan approved with the following provisions:

1. One test plan submitted. MPCA will send out second test plan approval closer to Line 2 test date. Testing of both Lines may be considered a single test event and submitted with one report.
2. Testing for Hg emissions while burning coal and natural gas to meet requirements of Mercury TMDL. Testing of PM, CO, VOC, and Pb on various fuel as needed for emissions inventory data.
3. Test will be completed at operating rates similar to those experienced in 2016 (>250 tons/hour production)
4. Method 29 used rather than Method 30B in order to capture lead results as well as Mercury.
5. 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.
6. 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.

**In the event of a failure:**

**Please be aware that enforcement action will be taken for performance test failures, indicating emissions above applicable limits, which can include a monetary penalty. Upon discovery of the test failure, the Regulated Party must take immediate action to reduce emissions to remain in compliance with its permitted limits. The actions taken should be documented, as they will become part of the record of corrective actions. If a monetary penalty is required, the amount of time from the date of the failed test to the date of the passed test, or other compliance demonstration, will be taken into consideration. It is in the Regulated Party's best interest to demonstrate compliance with its permitted emissions limits through a passed retest or other compliance demonstration as soon as possible after a failed test.**

**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.**

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)

**(Preferred)** Electronic copies of the test report submitted to [SubmitStackTest.PCA@state.mn.us](mailto: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

**Andy Place** | State Program Administrator Principal

Minnesota Pollution Control Agency (MPCA)

Industrial Division

520 Lafayette Road No. | St. Paul, Minnesota | 55155-4194

651-757-2652

Email | [andrew.place@state.mn.us](mailto:andrew.place@state.mn.us)

*Our mission is to protect and improve the environment and human health.*

NOTICE: This email (including attachments) is covered by the Electronic Communications Privacy Act, 18 U.S.C. 2510-2521. This email may be confidential and may be legally privileged. If you are not the intended recipient, you are hereby notified that any retention, dissemination, distribution, or copying of this communication is strictly prohibited. Please reply back to the sender that you have received this message in error, then delete it. Thank you.



## Proposed Test Plan United Taconite, LLC Forbes, Minnesota

Date Test Plan Created/Revised: January 11, 2019

Scheduled Test Dates:

Line 1: Week of February 11, 2019

Line 2: Week of March 11, 2019

### PART I: General Information

Emissions facility location	Facility contact	Testing company contact
United Taconite, LLC 1200 West Hwy 16 Forbes, Minnesota 55738	Mike Bonham Environmental Coordinator United Taconite LLC P.O. Box 180 Eveleth, Minnesota 55738 (218) 744-7840 (7803 GO) (218) 744-7635 (fax)	Ed "EJ" Juers Source Testing Dept. Interpoll Laboratories, Inc. 4500 Ball Rd NE, Circle Pines, MN 55014 Tel: 763.786.6020 x25   Fax: 763.786.7854   mobile 651.247.7873

### Reason emissions units are to be tested:

Air Emissions Inventory testing will be conducted on Line 1 and Line 2 Waste Gas Stacks. The purpose of the tests is to update Air Emission Inventory factors and to satisfy on going mercury compliance testing requirements.

Mercury emissions testing will be conducted on Line 1 and Line 2 Waste Gas Stacks while burning a mixture of natural gas/coal. The purpose of the tests is to satisfy mercury testing requirements under the Mercury TMDL

Testing will be conducted on each Line (Line 1 and Line 2) at 2 operating scenarios:

- 100% Natural Gas
- Natural Gas/ Coal mixture

The table below provides the emissions units' plant nomenclature and permit identification. Stack drawings showing stack dimensions and test port orientation and locations relative to airflow disturbances will be provided in the final report or upon request.

Process unit nomenclature	Emissions Source	Stack	Control Equipment number
Line 1 Pellet Induration	EQUI 45	STRU 53	CE 056
Line 2 Pellet Induration	EQUI 47	STRU 15, STRU 16	CE 49, CE 50



## PART II: Testing Requirements

The following table identifies pollutants to be determined; applicable emissions limit and units, and associated regulation for each emissions unit and stack vent.

Process equipment description for units to be tested		
Emission Unit #(s)	Stack Vent #	Description
EU040/ EQUI 45	STRU 53	Line 1 Induration
EU042/ EQUI 47	STRU 16	Line 2 Induration

### Hg Compliance testing

Process unit nomenclature	Limitation Basis of Pollutant Tested	Pollutant Tested/Permit Limit	Specific Methods/Procedures Required Citation
Line 1 Waste Gas Stack (STRU 53)  (EQUI 45)	Minn. R. 7007.0800	Mercury	EPA Method 29.3 60-minute test runs at each stack  Line 2 Stacks 2A and 2B to be tested simultaneously
Line 2 Waste Gas Stacks  (STRU15, STRU16)  EQUI 47)	Minn. R. 7007.0800		

### Control Equipment Parameters to be Monitored

Control equipment ID	Control equipment description	Monitoring Parameters	Frequency
CE 056	Wet Scrubber – High Efficiency w/o Lime	Scrubber dP, in w.c Scrubber liquid flow rate, gpm	15 Minutes
CE 049 CE 050	Wet Scrubber – High Efficiency w/o Lime	Scrubber dP, in w.c Scrubber liquid flow rate, gpm	15 Minutes



#### Part IV: Test Methods

Test methods	
Method 1	Sample and Velocity Traverses for Stationary Sources. Once per location
Method 2	EPA Method 2 for stack gas velocity and volumetric flow rate.
Method 3 /3A	EPA Method 3 or modified 3A to determine stack gas molecular weight at the Line 2 Waste Gas stacks.
Method 4	EPA Method 4 for determination of moisture content in stack gas will be performed in conjunction with test.
EPA Method 5	3 2 hour runs for the MACT testing
EPA Method 5,202	3 one-hour runs per stack using EPA Method 5, 202 (Line 1 and Line 2 while burning natural gas)
EPA Method 10	Instrumental CO
EPA Method 25A	Total VOC's (measured as propane)
EPA Method 29	Pb, Hg (Hg results (natural gas/coal) used for compliance purposes

*Please refer to proposed testing scenario for further details*

#### Part V: Continuous Emissions Monitors

SO<sub>2</sub> and NO<sub>x</sub> CEMS systems are located on the Line 1 and Line 2 Waste Gas Stacks.

#### Test Dates: Tests scheduled for:

Line 1- February 11-15, 2019

Line 2- March 11- 15, 2019

United Taconite and Interpoll Laboratories contacts will make themselves available for a pretest meeting prior 7 days in advance of the testing. At the preference of the MPCA, United Taconite suggests the pretest meeting be conducted by telephone.

**Maintenance:** A description of any work done within 30 days prior to the test will be included in the test report.

**Test Reports:** One electronic copy in .pdf format of the test report will be submitted to the MPCA on or before 45 days from last test date of the mobilization.

#### Closing Remarks

If there are questions or comments about the information provided, please contact me by telephone or e-mail.

Mike Bonham

*Michael Bonham*

Environmental Coordinator  
United Taconite LLC



Proposed testing Scenario

							Comments
EQUI 45	Line 1 Pellet Incineration SV 046						Feb 12th
							Air Emission Inventory Pb, Hg (Hg used for compliance)
	Natural Gas/coal	Method 29	Pb	EPA M29	Test 1		VOC, CO
		Method 29	Hg				No PM Necessary
		Method 25A	VOC	as propane	Test 2		
			CO	EPA M10	Test 3		
EQUI 45	Line 1 Pellet Incineration SV 046	Dry catch only	PM	EPA M5 with 202	Test 4		Air Emission inventory EPA M5 with 202 VOC, CO, Pb, Hg
		Dry + org cond	PM				
		Dry + org cond + aq cond	PM				
	Natural Gas		CO	EPA M10	Test 5		
		Method 29	Pb	EPA M29	Test 6		
		Method 29	Hg				
		Method 25A	VOC	as propane	Test 7		
EQUI 47	Line 2 Pellet Incineration SV 048/STRU 16	Dry catch only	PM	EPA M5 with 202	Test 1		March 12th Air Emission Inventory EPA M5 with 202 VOC, CO, Pb, Hg
		Dry + org cond	PM				
		Dry + org cond + aq cond	PM				
	Natural Gas		CO	EPA M10	Test 2		
		Method 29	Pb	EPA M29	Test 3		
		Method 29	Hg				
		Method 25A	VOC	as propane	Test 4		
EQUI 47	Line 2 Pellet Incineration SV 049/STRU 15	Dry catch only	PM	EPA M5 with 202	Test 5		March 12th Air Emission Inventory EPA M5 with 202 VOC, CO, Pb, Hg
		Dry + org cond	PM				
		Dry + org cond + aq cond	PM				
	Natural Gas		CO	EPA M10	Test 6		
		Method 29	Pb	EPA M29	Test 7		
		Method 29	Hg				
		Method 25A	VOC	as propane	Test 8		
EQUI 47	Line 2 Pellet Incineration SV 048	only dry catch necessary	PM	EPA M5	Test 9 Used for MACT testing		March 13th No back half necessary for MACT (filterable) Air Emission Inventory Pb, Hg (Hg used for compliance) VOC, CO
	Natural Gas/coal		CO	EPA M10	Test 10		
		Method 29	Pb	EPA M29	Test 11		
		Method 29	Hg				
		Method 25A	VOC	as propane	Test 12		
EQUI 47	Line 2 Pellet Incineration SV 049	Dry catch only	PM	EPA M5	Test 13 used for MACT testing		March 13th No back half necessary for MACT (filterable) Air Emission Inventory Pb, Hg (Hg used for compliance) VOC, CO
	Natural Gas/coal		CO	EPA M10	Test 14		
		Method 29	Pb	EPA M29	Test 15		
		Method 29	Hg				
		Method 25A	VOC	as propane	Test 16		



**APPENDIX F**

**OPERATING DATA**



**Hg Compliance/ Pb Air Emission Inventory Testing 2/14/19 (coal/natural gas)**

Run 1 0800-0904		Greenball	Fired pellet	Line 1	L1 WG	Fuel	Fuel	coal tph
Line 1 (SV046)		LT/hr	LT/hr	dP	Flow 1	ng BTU/hr	coal BTU/hr	
2/13/19 8:00	2/13/19 8:15	300.59	242.73	19.4	4029.29	51.4	108.64	4.03
2/13/19 8:15	2/13/19 8:30	299.58	237.37	19.4	4024.59	51.5	108.64	4.03
2/13/19 8:30	2/13/19 8:45	299.59	235.68	19.3	4029.96	46.9	108.64	4.03
2/13/19 8:45	2/13/19 9:00	299.21	236.50	19.3	4032.86	46.7	108.66	4.03
2/13/19 9:00	2/13/19 9:15	301.44	242.06	19.3	4029.81	46.1	108.63	4.03
		300.08	238.87	19.35	4029.30	48.53	108.64	4.03
Run 2 0942-1202-1232		Greenball	Fired pellet	Line 1	L1 WG	Fuel	Fuel	coal tph
		LT/hr	LT/hr	dP	Flow 1	ng BTU/hr	coal BTU/hr	
2/13/19 9:42	2/13/19 9:57	299.9	238.00	19.4	4027.27	48.4	108.64	4.03
2/13/19 9:55	2/13/19 10:10	300.90	242.03	19.6	4028.43	47.2	108.63	4.03
2/13/19 10:10	2/13/19 10:25	291.96	234.68	19.2	4024.49	48.5	108.63	4.03
2/13/19 12:02	2/13/19 12:17	299.60	242.98	20.3	4025.80	55.7	108.62	4.03
2/13/19 12:17	2/13/19 12:32	300.60	240.37	20.4	4026.47	52.0	108.63	4.03
		298.58	239.61	19.76	4026.49	50.38	108.63	4.03
Run 3 1305-1409		Greenball	Fired pellet	Line 1	L1 WG	Fuel	Fuel	coal tph
		LT/hr	LT/hr	dP	Flow 1	ng BTU/hr	coal BTU/hr	
2/13/19 13:05	2/13/19 13:20	299.34	240.08	20.6	4019.70	51.6	108.67	4.03
2/13/19 13:20	2/13/19 13:35	300.06	244.15	20.7	4014.74	48.4	108.65	4.03
2/13/19 13:35	2/13/19 13:50	299.50	242.72	20.8	4009.61	47.4	108.66	4.03
2/13/19 13:50	2/13/19 14:05	301.51	243.56	20.8	4006.59	49.8	108.67	4.03
2/13/19 14:05	2/13/19 14:20	299.76	240.81	20.9	3994.64	48.9	108.70	4.03
Average		300.03	242.27	20.76	4009.05	49.21	108.67	4.03
3 run Average		299.57	240.25	19.96	4021.62	49.37	108.65	4.03



### Air Emission Inventory Testing 2/14/19 (natural gas)

Run 1 0835-0951		Greenball	Fired pellet	Line 1	L1 WG	Fuel
Line 1 (SV046)		LT/hr	LT/hr	dP	Flow 1	ng BTU/hr
2/14/19 8:35	2/14/19 8:50	299.64	238.47	19.9	4029.07	93.8
2/14/19 8:50	2/14/19 9:05	301.01	240.39	20.0	4021.15	92.1
2/14/19 9:05	2/14/19 9:20	298.77	237.22	20.0	4018.49	91.7
2/14/19 9:20	2/14/19 9:35	301.12	243.63	20.1	4024.79	94.1
2/14/19 9:35	2/14/19 9:50	299.04	238.84	20.1	4009.24	95.7
		<b>299.91</b>	<b>239.71</b>	<b>20.01</b>	<b>4020.55</b>	<b>93.49</b>

Run 2 1047-1154		Greenball	Fired pellet	Line 1	L1 WG	Fuel
		LT/hr	LT/hr	dP	Flow 1	ng BTU/hr
2/14/19 10:47	2/14/19 11:02	299.5	242.16	20.3	3980.29	95.3
2/14/19 11:02	2/14/19 11:17	300.84	239.06	20.3	4138.19	91.9
2/14/19 11:17	2/14/19 11:32	301.03	244.16	20.4	4033.47	92.0
2/14/19 11:32	2/14/19 11:47	300.68	245.07	20.4	4019.00	94.4
2/14/19 11:47	2/14/19 12:02	301.09	244.58	20.5	4017.76	94.9
		<b>300.62</b>	<b>243.00</b>	<b>20.38</b>	<b>4037.74</b>	<b>93.70</b>

Run 3 1237-1342		Greenball	Fired pellet	Line 1	L1 WG	Fuel
		LT/hr	LT/hr	dP	Flow 1	ng BTU/hr
2/14/19 12:37	2/14/19 12:52	299.34	240.08	20.6	3988.06	93.4
2/14/19 12:52	2/14/19 13:07	300.06	244.15	20.6	3973.54	96.4
2/14/19 13:07	2/14/19 13:22	299.50	242.72	20.7	3961.63	98.2
2/14/19 13:22	2/14/19 13:37	301.51	243.56	20.7	3945.87	96.5
2/14/19 13:37	2/14/19 13:52	299.76	240.81	20.8	3945.93	94.6
<b>Average</b>		<b>300.03</b>	<b>242.27</b>	<b>20.68</b>	<b>3963.01</b>	<b>95.80</b>

<b>3 run Average</b>	<b>300.19</b>	<b>241.66</b>	<b>20.36</b>	<b>4007.10</b>	<b>94.33</b>
<b>3 Hr Average</b>					



## **APPENDIX G**

### **PROCEDURES**

Please Note: In an effort to conserve paper, the procedure section of the appendix has been reserved for explanations of EPA methodology deviations. Please refer to the specific EPA Methods on the following EPA websites:

<http://www.epa.gov/ttn/emc/>



# **APPENDIX H**

## **CALCULATION EQUATIONS**



INTERPOLL LABORATORIES, INC.  
(763) 786-6020

**EPA Method 5/202 Calculations**

Job	United Taconite	Test	3	Run	1
Source	Line 1 Pellet Induration (STRU53)	Test Site	Stack	Date of Analysis	2/27/2019
Date of Test	2/14/2019	Technician	DVH		

**Mass of Particulate (Mp):**

Mp = Wt. Of Part. On Filter (g) + Wt. Of Part. In Probe Wash (g) + Wt. Of Condensable Particulate (g)

$$Mp = \frac{0.0079}{0.0175} (g) + \frac{0.0016}{0.0175} (g) + \frac{0.008}{0.0175} (g)$$

**Particulate Concentration GR/DSCF (Cs):**

$$Cs = \frac{15.43 * Mp}{V_{std}}$$

$$\frac{M_p}{V_{std}} = \frac{0.0175}{42.34} \frac{g}{DSCF}$$

$$Cs = \frac{15.43 * (0.0175)}{(42.3376)}$$

$$Cs = 0.0063779$$

**Emission Rate LB/HR (M):**

$$M = 0.00857 (Cs) (Qs)$$

$$Cs = 0.0063779 \text{ GR/DSCF}$$

$$M = 0.00857 ( ) ( )$$

$$Qs = 300300 \text{ DSCF/Minute}$$

$$M = 16.41396462 \text{ LB/HR}$$

j:\excel\equats\onsite analysis



Report No. 19-37384

# United Taconite

## Line 1 Waste Gas (STRU53)

TGNMO Calculations

Test 5

RUN	Convert Wet to Dry		MC	as carbon		methane	TGNMO	TGNMO	GASFLOW	MASSRATE	(GR/DSCF)
	as carbon	ppm,w		ppm,d	ppm,d		ppm,d	ppm,w	(DSCFM)	(LB/HR)	
1	***	3.00	13.17	3.5	2.10	1.36	1.18	1.18	300300	0.762	0.000295942
2	***	3.00	13.31	3.5	2.30	1.16	1.01	1.01	303683	0.660	0.000253462
3		5.11	13.09	5.9	2.30	3.58	3.11	3.11	296422	1.987	0.000781872
Averages										1.136	

\*\*\* Result less than 1 ppm propane. Result changed to 1ppm propane for analyzer detection limit.



Report No. 19-37384

**United Taconite**  
**Line 1 Waste Gas (STRU53)**

TGNMO Calculations

Test 2

Convert Wet to Dry											
RUN	as carbon		MC	as carbon		methane	TGNMO ppm,d	TGNMO ppm,w	GASFLOW (DSCFM)	MASSRATE (LB/HR)	(GR/DSCF)
	ppm,w	ppm,d		ppm,d	ppm,w						
1	3.61	14.01		4.2	2.00	2.20	1.89	301323	1.240	0.000480062	
2	3.47	12.85		4.0	2.10	1.88	1.64	298876	1.050	0.000410003	
3	3.63	14.04		4.2	2.20	2.02	1.73	278549	1.052	0.000440732	
Averages											
							1.75		1.114		



# **APPENDIX I**

## **ANALYZER COMPUTER PRINTOUTS**



United Taconite  
Forbes, MN  
Line 1 Waste Gas (STRU53)  
2/12/2019  
Run 1

<u>Time</u>	<u>CO ppm, d</u>	<u>O<sub>2</sub> %, d</u>	<u>CO<sub>2</sub> %, d</u>	<u>VOC's as as Propane</u>
8:00 AM	8.957	17.741	2.096	1.046
8:01 AM	8.708	17.686	1.958	0.986
8:02 AM	9.057	17.694	2.023	0.993
8:03 AM	9.218	17.709	2.093	0.998
8:04 AM	9.489	17.718	2.183	0.992
8:05 AM	9.095	17.678	2.031	0.987
8:06 AM	9.465	17.690	2.131	1.020
8:07 AM	9.432	17.665	2.093	1.061
8:08 AM	9.648	17.669	2.121	1.068
8:09 AM	9.554	17.666	2.094	1.055
8:10 AM	9.448	17.649	2.104	1.079
8:11 AM	9.545	17.639	2.146	1.060
8:12 AM	9.775	17.671	2.224	1.067
8:13 AM	9.758	17.614	2.212	1.055
8:14 AM	9.696	17.621	2.103	0.997
8:15 AM	9.827	17.626	2.189	1.006
8:16 AM	9.927	17.642	2.235	1.037
8:17 AM	9.488	17.612	2.063	1.033
8:18 AM	9.497	17.636	2.127	1.075
8:19 AM	9.543	17.630	2.149	1.090
8:20 AM	9.417	17.623	2.089	1.089
8:21 AM	9.568	17.653	2.146	1.116
8:22 AM	9.529	17.659	2.126	1.118
8:23 AM	9.532	17.667	2.133	1.111
8:24 AM	9.510	17.653	2.088	1.109
8:25 AM	9.626	17.670	2.126	1.108
8:26 AM	9.744	17.694	2.177	1.121
8:27 AM	9.478	17.661	2.094	1.149
8:28 AM	9.529	17.673	2.130	1.209
8:29 AM	9.775	17.683	2.194	1.215
8:30 AM	9.900	17.683	2.194	1.210
8:31 AM	9.767	17.658	2.091	1.202
8:32 AM	9.610	17.680	2.129	1.261
8:33 AM	9.481	17.655	2.086	1.372
8:34 AM	9.658	17.666	2.068	1.428
8:35 AM	9.815	17.664	2.134	1.361
8:36 AM	9.612	17.685	2.137	1.326
8:37 AM	9.403	17.651	2.025	1.277
8:38 AM	9.490	17.657	2.034	1.258
8:39 AM	9.307	17.642	1.980	1.276
8:40 AM	9.544	17.667	2.017	1.404
8:41 AM	9.541	17.676	2.046	1.468
8:42 AM	9.819	17.697	2.084	1.486
8:43 AM	9.862	17.681	2.124	1.506
8:44 AM	9.520	17.653	2.017	1.437
8:45 AM	9.780	17.664	2.068	1.391
8:46 AM	9.741	17.679	2.088	1.350
8:47 AM	9.596	17.683	2.085	1.320
8:48 AM	9.448	17.665	2.016	1.289
8:49 AM	9.447	17.673	2.067	1.271
8:50 AM	9.350	17.703	2.109	1.287
8:51 AM	9.512	17.699	2.138	1.313
8:52 AM	9.517	17.685	2.062	1.337
8:53 AM	9.439	17.679	2.008	1.354
8:54 AM	9.518	17.680	2.042	1.367
8:55 AM	9.705	17.695	2.092	1.361
8:56 AM	9.905	17.702	2.130	1.351
8:57 AM	9.495	17.693	2.022	1.312
8:58 AM	9.664	17.665	2.018	1.289
8:59 AM	9.734	17.672	2.063	1.285
<b>Average</b>	<b>9.550</b>	<b>17.669</b>	<b>2.097</b>	<b>1.203</b>



United Taconite  
Forbes, MN  
Line 1 Waste Gas (STRU53)

2/12/2019  
Test 2 Run 1  
Natural Gas / Coal Mixture

Volumetric Flow Rate  
Number of Sample Points 12

Traverse Number	Point Location	Delta p	Sq. Root of Delta p	Stack Temperature	Time
1	A-1	2.000	1.414	142	8:00 AM
2	A-2	1.800	1.342	139	
3	A-3	1.000	1.000	137	
4	B-1	2.200	1.483	137	
5	B-2	2.100	1.449	140	
6	B-3	2.000	1.414	140	
7	C-1	2.100	1.449	140	
8	C-2	2.000	1.414	139	
9	C-3	2.000	1.414	142	
10	D-1	2.100	1.449	142	
11	D-2	2.000	1.414	142	
12	D-3	1.800	1.342	140	9:00 AM
Average		1.925	1.382	140	

#### FIELD CALCULATIONS

Moisture Content	Data	Flow Rate	
Meter Volume	0.00	Static Pressure	-1.20
Grams of Water	0.00	Pitot Coefficient	0.84
Average Gas Meter Temperature			
Gas Meter Coefficient	0.000	Duct Width (in.)	0
Standard Meter Volume		Duct Length (in.)	0
Barometric Pressure	28.47	Duct Area (sq. ft.)	.
		Stack Diameter (in.)	121.4
		Stack Area (sq. ft.)	80.38
Moisture Content	14.007		
		Molecular Weight (dry)	29.04
Oxygen, dry	17.535	Molecular Weight (wet)	27.49
CO <sub>2</sub> %, dry	2.095	Stack Pressure	28.38
		Feet Per Second	87.03
Standard CFH	21,024,203	Actual CFM	419766.53
K Standard CFM	350.403	Dry Standard CFM	301322.55

#### RAW DATA TABLE

Instrument	ppm or %	Zero	Span	Gas	Gas Corrected For Calibration
VOC (wet)	1.203	0.20	50.32	51.5	1.20
O <sub>2</sub> (dry)	17.669	0.11	11.13	11.0	17.54
CO (dry)	9.550	0.40	26.86	27.0	9.34
CO <sub>2</sub> (dry)	2.097	0.03	8.31	8.4	2.10
Moisture	14.01		Standard CFH		21,024,203
Fuel Factor d	N/A		K Standard CFM		350.403
DSCFM	301,323				

#### RESULTS

O <sub>2</sub> % (dry)	17.54		
CO <sub>2</sub> % (dry)	2.1		
VOC ppm as C (wet)	3.61	VOC Lbs C/Hr	2.37
CO ppm, (dry)	9.34	CO Lbs/Hr	12.27



United Taconite  
Forbes, MN  
Line 1 Waste Gas (STRU53)  
2/12/2019  
Run 2

<u>Time</u>	<u>CO ppm, d</u>	<u>O<sub>2</sub> %, d</u>	<u>CO<sub>2</sub> %, d</u>	<u>VOC's as as Propane</u>
9:55 AM	11.039	17.670	2.516	1.073
9:56 AM	11.335	17.700	2.549	1.086
9:57 AM	11.779	17.692	2.620	1.106
9:58 AM	11.819	17.712	2.647	1.109
9:59 AM	11.721	17.707	2.673	1.102
10:00 AM	11.725	17.725	2.692	1.089
10:01 AM	11.541	17.745	2.679	1.103
10:02 AM	11.499	17.745	2.657	1.113
10:03 AM	11.534	17.764	2.641	1.135
10:04 AM	11.626	17.751	2.626	1.132
10:05 AM	11.678	17.739	2.608	1.150
10:06 AM	11.364	17.725	2.576	1.142
10:07 AM	11.212	17.714	2.528	1.118
10:08 AM	11.092	17.704	2.476	1.093
10:09 AM	11.042	17.682	2.434	1.039
10:10 AM	10.663	17.684	2.355	1.028
10:11 AM	10.681	17.660	2.316	1.009
10:12 AM	10.070	17.568	1.985	0.980
10:13 AM	10.011	17.551	1.919	0.947
10:14 AM	9.909	17.538	1.860	0.963
10:15 AM	9.799	17.509	1.811	0.973
10:16 AM	9.627	17.503	1.735	0.940
10:17 AM	9.342	17.479	1.685	0.918
10:18 AM	9.246	17.485	1.645	0.882
10:19 AM	9.183	17.470	1.625	0.840
10:20 AM	9.031	17.463	1.602	0.815
10:21 AM	8.930	17.459	1.598	0.817
10:22 AM	8.771	17.480	1.586	0.833
10:23 AM	8.879	17.488	1.602	0.856
10:24 AM	9.922	17.572	2.006	0.938
12:03 PM	10.523	17.564	2.085	1.129
12:04 PM	10.389	17.596	2.120	1.142
12:05 PM	10.468	17.606	2.173	1.153
12:06 PM	10.617	17.636	2.225	1.175
12:07 PM	10.168	17.600	2.024	1.166
12:08 PM	10.261	17.615	2.076	1.200
12:09 PM	10.379	17.615	2.102	1.206
12:10 PM	10.329	17.627	2.053	1.234
12:11 PM	10.196	17.613	1.991	1.301
12:12 PM	9.957	17.629	1.996	1.299
12:13 PM	9.969	17.618	2.006	1.304
12:14 PM	10.178	17.627	2.002	1.307
12:15 PM	10.207	17.626	1.969	1.311
12:16 PM	10.176	17.615	1.948	1.303
12:17 PM	10.103	17.615	1.887	1.309
12:18 PM	10.186	17.588	1.844	1.321
12:19 PM	9.948	17.586	1.816	1.378
12:20 PM	10.161	17.578	1.788	1.386
12:21 PM	10.055	17.576	1.743	1.364
12:22 PM	9.894	17.573	1.669	1.375
12:23 PM	9.622	17.564	1.622	1.371
12:24 PM	10.217	17.644	1.924	1.399
12:25 PM	10.127	17.634	1.886	1.360
12:26 PM	10.052	17.637	1.829	1.368
12:27 PM	9.989	17.619	1.775	1.375
12:28 PM	9.956	17.594	1.723	1.342
12:29 PM	9.757	17.590	1.692	1.349
12:30 PM	9.720	17.587	1.647	1.362
12:31 PM	9.724	17.587	1.618	1.347
12:32 PM	9.785	17.589	1.599	1.362
<b>Average</b>	<b>10.320</b>	<b>17.614</b>	<b>2.051</b>	<b>1.155</b>



United Taconite  
Forbes, MN  
Line 1 Waste Gas (STRU53)

2/12/2019  
Test 2 Run 2  
Natural Gas / Coal Mixture

Volumetric Flow Rate  
Number of Sample Points 12

Traverse Number	Point Location	Delta p	Sq. Root of Delta p	Stack Temperature	Time
1	A-1	2.100	1.449	139	9:55 AM
2	A-2	2.000	1.414	139	
3	A-3	1.800	1.342	140	
4	B-1	1.900	1.378	140	
5	B-2	2.000	1.414	142	
6	B-3	1.900	1.378	142	
7	C-1	1.900	1.378	135	
8	C-2	1.800	1.342	141	
9	C-3	1.600	1.265	140	
10	D-1	1.900	1.378	140	
11	D-2	1.800	1.342	139	
12	D-3	1.400	1.183	140	

12:32 PM

Average 1.842 1.355 140

#### FIELD CALCULATIONS

Moisture Content	Data	Flow Rate	
Meter Volume	0.00	Static Pressure	-1.20
Grams of Water	0.00	Pitot Coefficient	0.84
Average Gas Meter Temperature			
Gas Meter Coefficient	0	Duct Width (in.)	0.00
Standard Meter Volume		Duct Length (in.)	0.00
Barometric Pressure	28.47	Duct Area (sq. ft.)	0.00
		Stack Diameter (in.)	121.40
		Stack Area (sq. ft.)	80.38
Moisture Content	12.846		
		Molecular Weight (dry)	29.03
Oxygen	17.508	Molecular Weight (wet)	27.61
CO <sub>2</sub> %	2.068	Stack Pressure	28.38
		Feet Per Second	85.14
Standard CFH	20,575,721	Actual CFM	410641.03
K Standard CFM	342.929	Dry Standard CFM	298876.14

#### RAW DATA TABLE

Instrument	ppm or %	Zero	Span	Gas	Gas Corrected For Calibration
VOC (wet)	1.155	0.30	50.50	51.50	1.16
O <sub>2</sub> (dry)	17.614	0.13	11.12	11.00	17.51
CO (dry)	10.320	0.49	26.89	27.00	10.06
CO <sub>2</sub> (dry)	2.051	0.03	8.21	8.37	2.07
Moisture	12.85		Standard CFH		20,575,721
Fuel Factor d	N/A		K Standard CFM		342.929
DSCFM	298,876				

#### RESULTS

O <sub>2</sub> % (dry)	17.51		
CO <sub>2</sub> % (dry)	2.07		
VOC ppm as C (wet)	3.47	VOC Lbs C/Hr	2.23
CO ppm, (dry)	10.06	CO Lbs/Hr	13.11

Note: Run paused from 10:25 to 12:02



United Taconite  
Forbes, MN  
Line 1 Waste Gas (STRU53)  
2/12/2019  
Run 3

<u>Time</u>	<u>CO ppm, d</u>	<u>O<sub>2</sub> %, d</u>	<u>CO<sub>2</sub> %, d</u>	<u>VOC's as as Propane</u>
1:05 PM	10.903	17.638	2.028	1.255
1:06 PM	11.044	17.656	2.084	1.303
1:07 PM	11.252	17.682	2.109	1.413
1:08 PM	11.516	17.672	2.182	1.464
1:09 PM	11.356	17.703	2.217	1.397
1:10 PM	11.078	17.665	2.100	1.259
1:11 PM	11.050	17.668	2.100	1.252
1:12 PM	10.798	17.635	1.969	1.246
1:13 PM	10.807	17.636	1.959	1.258
1:14 PM	10.786	17.634	1.982	1.251
1:15 PM	10.816	17.647	1.988	1.286
1:16 PM	10.869	17.648	1.977	1.290
1:17 PM	10.812	17.650	1.949	1.258
1:18 PM	10.523	17.643	1.921	1.260
1:19 PM	10.759	17.665	1.880	1.248
1:20 PM	10.677	17.653	1.874	1.201
1:21 PM	10.868	17.684	1.933	1.211
1:22 PM	10.874	17.688	1.895	1.216
1:23 PM	10.859	17.672	1.840	1.190
1:24 PM	10.621	17.650	1.807	1.161
1:25 PM	10.630	17.647	1.763	1.174
1:26 PM	10.472	17.639	1.697	1.146
1:27 PM	10.525	17.641	1.647	1.132
1:28 PM	10.258	17.615	1.600	1.100
1:29 PM	10.719	17.661	1.870	1.120
1:30 PM	10.599	17.665	1.806	1.123
1:31 PM	10.493	17.646	1.774	1.082
1:32 PM	10.184	17.645	1.720	1.051
1:33 PM	10.097	17.622	1.680	1.043
1:34 PM	10.155	17.611	1.645	1.078
1:35 PM	10.309	17.602	1.611	1.078
1:36 PM	10.395	17.588	1.603	1.089
1:37 PM	10.309	17.563	1.561	1.089
1:38 PM	10.356	17.561	1.569	1.087
1:39 PM	10.234	17.563	1.579	1.102
1:40 PM	10.151	17.584	1.599	1.127
1:41 PM	10.381	17.589	1.624	1.126
1:42 PM	10.314	17.605	1.673	1.126
1:43 PM	10.423	17.617	1.735	1.138
1:44 PM	10.546	17.607	1.815	1.158
1:45 PM	10.698	17.626	1.887	1.198
1:46 PM	10.905	17.645	1.971	1.234
1:47 PM	11.129	17.664	1.969	1.278
1:48 PM	11.194	17.672	1.962	1.277
1:49 PM	11.293	17.679	2.025	1.265
1:50 PM	11.253	17.676	1.997	1.277
1:51 PM	11.192	17.682	2.023	1.284
1:52 PM	11.120	17.670	1.984	1.269
1:53 PM	11.126	17.686	2.050	1.279
1:54 PM	11.016	17.665	1.983	1.256
1:55 PM	11.028	17.681	1.984	1.269
1:56 PM	10.933	17.658	1.922	1.242
1:57 PM	11.007	17.672	1.957	1.244
1:58 PM	10.987	17.653	2.010	1.221
1:59 PM	11.017	17.664	1.992	1.201
2:00 PM	10.941	17.653	1.991	1.155
2:01 PM	10.779	17.648	2.008	1.216
2:02 PM	11.033	17.636	2.014	1.277
2:03 PM	11.045	17.657	2.015	1.249
2:04 PM	11.034	17.662	2.017	1.237
<b>Average</b>	<b>10.776</b>	<b>17.645</b>	<b>1.885</b>	<b>1.209</b>



United Taconite  
Forbes, MN  
Line 1 Waste Gas (STRU53)

2/12/2019  
Test 2 Run 3  
Natural Gas / Coal Mixture

Volumetric Flow Rate  
Number of Sample Points 12

Traverse Number	Point Location	Delta p	Sq. Root of Delta p	Stack Temperature	Time
1	A-1	2.000	1.414	136	1:05 PM
2	A-2	1.700	1.304	140	
3	A-3	1.400	1.183	139	
4	B-1	1.900	1.378	139	
5	B-2	1.600	1.265	141	
6	B-3	1.000	1.000	139	
7	C-1	1.800	1.342	139	
8	C-2	1.700	1.304	138	
9	C-3	1.600	1.265	142	
10	D-1	1.900	1.378	142	
11	D-2	1.700	1.304	140	
12	D-3	1.400	1.183	138	2:05 PM
Average		1.642	1.277	139	

#### FIELD CALCULATIONS

Moisture Content	Data	Flow Rate	
Meter Volume	0.00	Static Pressure	-1.20
Grams of Water	0.00	Pitot Coefficient	0.84
Average Gas Meter Temperature			
Gas Meter Coefficient	0	Duct Width (in.)	0
Standard Meter Volume		Duct Length (in.)	0
Barometric Pressure	28.47	Duct Area (sq. ft.)	0
		Stack Diameter (in.)	121.40
		Stack Area (sq. ft.)	80.38
Moisture Content	14.037		
Oxygen	17.449	Molecular Weight (dry)	29.003
CO <sub>2</sub> %	1.907	Molecular Weight (wet)	27.459
		Stack Pressure	28.382
		Feet Per Second	80.406
Standard CFH	19,441,958	Actual CFM	387798.24
K Standard CFM	324.033	Dry Standard CFM	278548.59

#### RAW DATA TABLE

Instrument	ppm or %	Zero	Span	Gas	Gas Corrected For Calibration
VOC (wet)	1.209	0.25	51.80	51.5	1.21
O <sub>2</sub> (dry)	17.645	0.13	11.17	11.0	17.45
CO (dry)	10.776	1.20	27.29	27.00	9.91
CO <sub>2</sub> (dry)	1.885	0.04	8.16	8.4	1.91
Moisture	14.04				
Fuel Factor d	N/A				
DSCFM	278,549				
		Standard CFH			19,441,958
		K Standard CFM			324.033

#### RESULTS

O <sub>2</sub> % (dry)	17.45		
CO <sub>2</sub> % (dry)	1.91		
VOC ppm as C (wet)	3.63	VOC Lbs C/Hr	2.20
CO ppm, (dry)	9.91	CO Lbs/Hr	12.04



United Taconite  
Forbes, MN  
Line 1 Waste Gas (STRU53)  
2/14/2019  
Run 1

<u>Time</u>	<u>CO ppm, d</u>	<u>O<sub>2</sub> %, d</u>	<u>CO<sub>2</sub> %, d</u>	<u>VOC's as as Propane</u>
8:35 AM	9.173	18.420	1.230	0.577
8:36 AM	9.257	18.447	1.301	0.482
8:37 AM	9.409	18.460	1.364	0.496
8:38 AM	9.607	18.483	1.483	0.487
8:39 AM	9.733	18.503	1.554	0.435
8:40 AM	9.194	18.432	1.269	0.379
8:41 AM	9.203	18.430	1.263	0.346
8:42 AM	9.194	18.419	1.239	0.313
8:43 AM	9.290	18.439	1.297	0.295
8:44 AM	9.309	18.446	1.310	0.310
8:45 AM	9.047	18.421	1.203	0.327
8:46 AM	9.191	18.439	1.259	0.314
8:47 AM	9.018	18.423	1.190	0.286
8:48 AM	9.144	18.435	1.223	0.282
8:49 AM	9.197	18.448	1.256	0.294
8:50 AM	9.042	18.459	1.266	0.300
8:51 AM	8.997	18.460	1.256	0.305
8:52 AM	9.207	18.463	1.274	0.274
8:53 AM	9.075	18.460	1.256	0.280
8:54 AM	8.963	18.457	1.226	0.306
8:55 AM	8.892	18.464	1.189	0.261
8:56 AM	8.831	18.457	1.139	0.294
8:57 AM	8.858	18.443	1.089	0.313
8:58 AM	8.670	18.441	1.043	0.256
8:59 AM	8.656	18.443	1.003	0.234
9:00 AM	8.408	18.430	0.952	0.256
9:01 AM	8.449	18.424	0.895	0.206
9:02 AM	8.915	18.470	1.065	0.226
9:03 AM	8.976	18.446	1.005	0.181
9:04 AM	8.799	18.411	0.906	0.135
9:05 AM	8.414	18.388	0.803	0.123
9:06 AM	8.366	18.376	0.775	0.106
9:07 AM	8.899	18.444	1.061	0.147
9:08 AM	8.851	18.431	1.035	0.104
9:09 AM	8.796	18.432	1.029	0.112
9:10 AM	9.026	18.430	1.043	0.119
9:11 AM	9.003	18.437	1.082	0.145
9:12 AM	9.088	18.455	1.137	0.169
9:13 AM	9.188	18.469	1.191	0.165
9:14 AM	9.148	18.466	1.186	0.167
9:15 AM	9.178	18.479	1.213	0.163
9:16 AM	9.059	18.481	1.213	0.177
9:17 AM	8.939	18.479	1.208	0.180
9:18 AM	9.009	18.466	1.183	0.197
9:19 AM	8.977	18.472	1.240	0.170
9:20 AM	8.930	18.459	1.208	0.178
9:21 AM	9.119	18.480	1.296	0.256
9:22 AM	9.210	18.462	1.230	0.247
9:23 AM	9.094	18.450	1.169	0.247
9:24 AM	9.180	18.451	1.244	0.262
9:25 AM	9.015	18.436	1.197	0.259
9:26 AM	9.143	18.435	1.212	0.264
9:27 AM	9.179	18.436	1.221	0.281
9:28 AM	9.198	18.434	1.228	0.253
9:29 AM	9.341	18.428	1.209	0.246
9:30 AM	9.100	18.417	1.180	0.227
9:31 AM	9.012	18.410	1.137	0.202
9:32 AM	9.013	18.402	1.081	0.203
9:33 AM	8.853	18.386	1.037	0.202
9:34 AM	8.841	18.365	0.968	0.187
<b>Average</b>	<b>9.031</b>	<b>18.442</b>	<b>1.167</b>	<b>0.254</b>



United Taconite  
Forbes, MN  
Line 1 Waste Gas (STRU53)

2/14/2019  
Test 5 Run 1  
Natural Gas

Number of Sample Points      Volumetric Flow Rate  
12

Traverse Number	Point Location	Delta p	Sq. Root of Delta p	Stack Temperature	Time
1	A-1	1.900	1.378	140	8:35 AM
2	A-2	1.900	1.378	141	
3	A-3	1.800	1.342	141	
4	B-1	1.900	1.378	141	
5	B-2	1.900	1.378	139	
6	B-3	1.700	1.304	140	9:35 AM
7	C-1	1.900	1.378	140	
8	C-2	2.000	1.414	142	
9	C-3	2.000	1.414	140	
10	D-1	2.000	1.414	140	
11	D-2	1.900	1.378	138	
12	D-3	1.800	1.342	141	
Average		1.892	1.375	140	

#### FIELD CALCULATIONS

Moisture Content	Data	Flow Rate	
Meter Volume	0.00	Static Pressure	-1.40
Grams of Water	0.00	Pitot Coefficient	0.84
Average Gas Meter Temperature			
Gas Meter Coefficient	0.000	Duct Width (in.)	0
Standard Meter Volume		Duct Length (in.)	0
Barometric Pressure	28.11	Duct Area (sq. ft.)	.
		Stack Diameter (in.)	121.4
		Stack Area (sq. ft.)	80.38
Moisture Content	13.171		
Oxygen, dry	18.332	Molecular Weight (dry)	28.92
CO <sub>2</sub> %, dry	1.188	Molecular Weight (wet)	27.48
		Stack Pressure	28.01
		Feet Per Second	87.19
Standard CFH	20,776,085	Actual CFM	420537.57
K Standard CFM	346.268	Dry Standard CFM	300662.79

#### RAW DATA TABLE

Instrument	ppm or %	Zero	Span	Gas	Gas Corrected For Calibration
VOC (wet)	0.254	-0.25	50.50	51.5	*** 1.00
O <sub>2</sub> (dry)	18.442	0.09	11.10	11.0	18.33
CO (dry)	9.031	0.39	26.64	27.0	8.89
CO <sub>2</sub> (dry)	1.167	-0.01	8.28	8.4	1.19
Moisture	13.17		Standard CFH		20,776,085
Fuel Factor d	N/A		K Standard CFM		346.268
DSCFM	300,663				

#### RESULTS

O <sub>2</sub> % (dry)	18.33		
CO <sub>2</sub> % (dry)	1.19		
VOC ppm as C (wet)	3.00	VOC Lbs C/Hr	1.94
CO ppm, (dry)	8.89	CO Lbs/Hr	11.66

\*\*\* Analyzer detection limit



United Taconite  
Forbes, MN  
Line 1 Waste Gas (STRU53)  
2/14/2019  
Run 2

<u>Time</u>	<u>CO ppm, d</u>	<u>O<sub>2</sub> %, d</u>	<u>CO<sub>2</sub> %, d</u>	<u>VOC's as as Propane</u>
10:50 AM	8.667	18.385	1.251	0.760
10:51 AM	8.632	18.387	1.240	0.750
10:52 AM	8.632	18.397	1.232	0.779
10:53 AM	8.752	18.415	1.295	0.763
10:54 AM	8.659	18.406	1.265	0.752
10:55 AM	8.532	18.393	1.212	0.734
10:56 AM	8.636	18.405	1.232	0.720
10:57 AM	8.619	18.400	1.206	0.726
10:58 AM	8.528	18.395	1.168	0.732
10:59 AM	8.522	18.405	1.158	0.787
11:00 AM	8.508	18.412	1.141	0.765
11:01 AM	8.446	18.408	1.117	0.742
11:02 AM	8.429	18.412	1.099	0.770
11:03 AM	8.342	18.408	1.070	0.724
11:04 AM	8.265	18.405	1.036	0.729
11:05 AM	8.171	18.402	0.987	0.728
11:06 AM	7.928	18.401	0.949	0.687
11:07 AM	7.778	18.394	0.918	0.771
11:08 AM	7.682	18.376	0.890	0.649
11:09 AM	7.802	18.378	0.842	0.641
11:10 AM	8.431	18.459	1.157	0.689
11:11 AM	8.603	18.455	1.093	0.669
11:12 AM	8.477	18.442	1.056	0.666
11:13 AM	8.354	18.439	1.034	0.656
11:14 AM	8.396	18.441	0.988	0.748
11:15 AM	8.496	18.430	0.967	0.875
11:16 AM	8.599	18.410	0.934	0.914
11:17 AM	8.278	18.396	0.894	0.820
11:18 AM	8.316	18.390	0.862	0.745
11:19 AM	8.488	18.377	0.839	0.700
11:20 AM	8.435	18.370	0.798	0.684
11:21 AM	9.157	18.454	1.142	0.704
11:22 AM	9.245	18.441	1.118	0.692
11:23 AM	9.028	18.427	1.075	0.682
11:24 AM	8.912	18.427	1.057	0.695
11:25 AM	8.882	18.430	1.028	0.707
11:26 AM	8.843	18.428	1.016	0.724
11:27 AM	8.781	18.426	0.991	0.678
11:28 AM	8.752	18.415	0.961	0.645
11:29 AM	8.560	18.402	0.924	0.685
11:30 AM	8.479	18.397	0.899	0.832
11:31 AM	8.450	18.389	0.851	0.956
11:32 AM	8.451	18.383	0.813	1.166
11:33 AM	9.065	18.449	1.084	1.382
11:34 AM	8.992	18.435	1.030	1.409
11:35 AM	8.819	18.416	0.965	1.359
11:36 AM	8.716	18.397	0.903	1.291
11:37 AM	8.667	18.372	0.867	1.240
11:38 AM	8.499	18.358	0.829	1.238
11:39 AM	8.501	18.346	0.800	1.188
11:40 AM	8.353	18.344	0.801	1.147
11:41 AM	8.233	18.342	0.814	1.137
11:42 AM	8.422	18.354	0.852	1.147
11:43 AM	8.767	18.364	0.896	1.135
11:44 AM	8.808	18.374	0.956	1.131
11:45 AM	8.688	18.389	1.032	1.169
11:46 AM	8.783	18.408	1.108	1.209
11:47 AM	9.152	18.427	1.181	1.367
11:48 AM	9.216	18.426	1.210	1.480
11:49 AM	9.347	18.442	1.263	1.553
<b>Average</b>	<b>8.583</b>	<b>18.404</b>	<b>1.023</b>	<b>0.894</b>



United Taconite  
Forbes, MN  
Line 1 Waste Gas (STRU53)

2/14/2019  
Test 5 Run 2  
Natural Gas

Volumetric Flow Rate  
Number of Sample Points 12

Traverse Number	Point Location	Delta p	Sq. Root of Delta p	Stack Temperature	Time
1	A-1	2.000	1.414	141	10:50 AM
2	A-2	2.000	1.414	139	
3	A-3	1.900	1.378	140	
4	B-1	2.000	1.414	140	
5	B-2	2.000	1.414	140	
6	B-3	1.900	1.378	141	
7	C-1	2.000	1.414	141	
8	C-2	2.000	1.414	142	
9	C-3	1.700	1.304	138	
10	D-1	2.000	1.414	138	
11	D-2	1.900	1.378	141	
12	D-3	1.800	1.342	140	
					11:50 AM
Average		1.933	1.390	140	

#### FIELD CALCULATIONS

Moisture Content	Data	Flow Rate	
Meter Volume	0.00	Static Pressure	-1.40
Grams of Water	0.00	Pitot Coefficient	0.84
Average Gas Meter Temperature			
Gas Meter Coefficient	0	Duct Width (in.)	0.00
Standard Meter Volume		Duct Length (in.)	0.00
Barometric Pressure	28.11	Duct Area (sq. ft.)	0.00
		Stack Diameter (in.)	121.40
		Stack Area (sq. ft.)	80.38
Moisture Content	13.308		
Oxygen	18.376	Molecular Weight (dry)	28.90
CO <sub>2</sub> %	1.051	Molecular Weight (wet)	27.45
		Stack Pressure	28.01
		Feet Per Second	88.19
Standard CFH	21,018,114	Actual CFM	425318.45
K Standard CFM	350.302	Dry Standard CFM	303682.69

#### RAW DATA TABLE

Instrument	ppm or %	Zero	Span	Gas	Gas Corrected For Calibration
VOC (wet)	0.894	-0.05	49.80	51.50	*** 1.00
O <sub>2</sub> (dry)	18.404	0.15	11.08	11.00	18.38
CO (dry)	8.583	0.26	26.62	27.00	8.53
CO <sub>2</sub> (dry)	1.023	-0.02	8.26	8.37	1.05
Moisture	13.31		Standard CFH		21,018,114
Fuel Factor d	N/A		K Standard CFM		350.302
DSCFM	303,683				

#### RESULTS

O <sub>2</sub> % (dry)	18.38		
CO <sub>2</sub> % (dry)	1.05		
VOC ppm as C (wet)	3.00	VOC Lbs C/Hr	1.97
CO ppm, (dry)	8.53	CO Lbs/Hr	11.29

\*\*\* Analyzer detection limit



United Taconite  
Forbes, MN  
Line 1 Waste Gas (STRU53)  
2/14/2019  
Run 3

<u>Time</u>	<u>CO ppm, d</u>	<u>O<sub>2</sub> %, d</u>	<u>CO<sub>2</sub> %, d</u>	<u>VOC's as as Propane</u>
12:35 PM	8.537	18.464	1.249	0.923
12:36 PM	8.521	18.482	1.314	0.946
12:37 PM	8.451	18.469	1.256	0.925
12:38 PM	8.463	18.450	1.178	0.911
12:39 PM	8.328	18.457	1.199	0.887
12:40 PM	8.347	18.467	1.213	0.881
12:41 PM	8.357	18.475	1.207	0.885
12:42 PM	8.325	18.484	1.213	0.873
12:43 PM	8.299	18.480	1.196	0.879
12:44 PM	8.364	18.473	1.199	0.899
12:45 PM	8.514	18.460	1.179	0.912
12:46 PM	8.561	18.457	1.170	0.858
12:47 PM	8.459	18.460	1.151	0.800
12:48 PM	8.354	18.459	1.122	0.761
12:49 PM	8.486	18.444	1.087	0.741
12:50 PM	8.340	18.425	1.042	0.728
12:51 PM	8.484	18.410	1.032	0.732
12:52 PM	8.513	18.395	1.000	0.763
12:53 PM	8.541	18.381	0.971	0.774
12:54 PM	8.424	18.373	0.939	0.773
12:55 PM	8.146	18.363	0.888	0.750
12:56 PM	7.836	18.361	0.855	0.732
12:57 PM	7.810	18.356	0.824	0.719
12:58 PM	7.823	18.343	0.806	0.728
12:59 PM	7.703	18.338	0.763	0.726
1:00 PM	8.349	18.428	1.112	0.772
1:01 PM	8.633	18.413	1.074	0.791
1:02 PM	8.534	18.396	1.047	0.801
1:03 PM	8.298	18.376	1.008	0.795
1:04 PM	8.385	18.374	0.997	0.790
1:05 PM	8.477	18.364	0.974	0.831
1:06 PM	8.474	18.356	0.955	0.890
1:07 PM	8.481	18.346	0.935	0.899
1:08 PM	8.186	18.338	0.891	0.814
1:09 PM	8.187	18.335	0.881	0.798
1:10 PM	8.230	18.327	0.842	0.806
1:11 PM	8.359	18.323	0.807	1.547
1:12 PM	8.494	18.304	0.741	2.524
1:13 PM	9.328	18.406	1.128	2.899
1:14 PM	9.146	18.396	1.071	3.063
1:15 PM	9.315	18.387	1.016	3.142
1:16 PM	9.116	18.370	0.953	3.196
1:17 PM	9.009	18.356	0.899	3.206
1:18 PM	8.732	18.341	0.821	3.202
1:19 PM	9.537	18.426	1.151	3.216
1:20 PM	9.605	18.415	1.086	3.217
1:21 PM	9.485	18.404	1.047	3.180
1:22 PM	9.319	18.392	1.008	3.168
1:23 PM	9.247	18.374	0.962	3.110
1:24 PM	9.135	18.364	0.910	3.108
1:25 PM	8.785	18.348	0.838	3.095
1:26 PM	9.047	18.338	0.809	3.067
1:27 PM	9.692	18.413	1.134	3.106
1:28 PM	9.718	18.407	1.125	3.050
1:29 PM	9.443	18.410	1.114	3.091
1:30 PM	9.525	18.409	1.138	3.121
1:31 PM	9.598	18.413	1.172	3.112
1:32 PM	9.463	18.421	1.204	3.114
1:33 PM	9.670	18.425	1.257	3.091
1:34 PM	9.668	18.425	1.273	3.093
<b>Average</b>	<b>8.711</b>	<b>18.401</b>	<b>1.040</b>	<b>1.703</b>



United Taconite  
Forbes, MN  
Line 1 Waste Gas (STRU53)

2/14/2019  
Test 5 Run 3  
Natural Gas

Volumetric Flow Rate  
Number of Sample Points 12

Traverse Number	Point Location	Delta p	Sq. Root of Delta p	Stack Temperature	Time
1	A-1	1.900	1.378	141	12:35 PM
2	A-2	1.900	1.378	141	
3	A-3	1.900	1.378	139	
4	B-1	2.000	1.414	139	
5	B-2	1.900	1.378	139	
6	B-3	1.700	1.304	139	
7	C-1	1.900	1.378	139	
8	C-2	1.800	1.342	139	
9	C-3	1.800	1.342	139	
10	D-1	1.900	1.378	139	
11	D-2	1.700	1.304	140	
12	D-3	1.600	1.265	140	

1:35 PM

Average 1.833 1.353 140

#### FIELD CALCULATIONS

Moisture Content	Data	Flow Rate	
Meter Volume	0.00	Static Pressure	-1.40
Grams of Water	0.00	Pitot Coefficient	0.84
Average Gas Meter Temperature			
Gas Meter Coefficient	0	Duct Width (in.)	0
Standard Meter Volume		Duct Length (in.)	0
Barometric Pressure	28.11	Duct Area (sq. ft.)	0
		Stack Diameter (in.)	121.40
		Stack Area (sq. ft.)	80.38
Moisture Content	13.088		
Oxygen	18.4	Molecular Weight (dry)	28.908
CO <sub>2</sub> %	1.073	Molecular Weight (wet)	27.48
		Stack Pressure	28.007
		Feet Per Second	85.776
Standard CFH	20,463,677	Actual CFM	413696.42
K Standard CFM	341.061	Dry Standard CFM	296422.14

#### RAW DATA TABLE

Instrument	ppm or %	Zero	Span	Gas	Gas Corrected For Calibration
VOC (wet)	1.703	1.40	50.30	51.5	1.70
O <sub>2</sub> (dry)	18.401	0.16	11.07	11.0	18.40
CO (dry)	8.711	0.22	26.72	27.00	8.65
CO <sub>2</sub> (dry)	1.040	-0.02	8.26	8.4	1.07
Moisture	13.09				
Fuel Factor d	N/A				
DSCFM	296,422				
		Standard CFH			20,463,677
		K Standard CFM			341.061

#### RESULTS

O <sub>2</sub> % (dry)	18.4		
CO <sub>2</sub> % (dry)	1.07		
VOC ppm as C (wet)	5.11	VOC Lbs C/Hr	3.26
CO ppm, (dry)	8.65	CO Lbs/Hr	11.19



## **APPENDIX J**

### **CALIBRATION GAS CERTIFICATION SHEETS**





Tier 5 Labs  
5353 W. Southern Ave.  
Indianapolis, IN 46241  
(317) 961-5227

Cylinder Number:	CC220050	Certification Date:	05 April 2017
Mixture Grade:	EPA Protocol Standard Gas Mixture	Expiration Date:	06 April 2025
Certificate Number:	0867A-01T5-C01	Lot Number:	0867A-01T5
Cylinder Pressure:	2015 PSIG	Customer Part Number:	SPC NAE03001

Do not use below 100 psi (0.7 megapascals)

EPA Traceability Protocol for Gaseous Calibration Standards Procedure G2, EPA/600/R-12/531 May 2012

### Certified Concentrations

Component	Concentration	Uncertainty	Assay Dates
Oxygen	20.9%	+/- 0.19% (absolute)	4/3/2017
Carbon Dioxide	16.9%	+/- 0.05% (absolute)	4/5/2017
Nitrogen	Balance		

### Analytical Instrumentation


Component	Analytical Principle	Make	Model	Serial	MPC Date
Oxygen	Zirconia Transduction	Servomex	5400	05410A1/11223	3/3/2017
Carbon Dioxide	NDIR	Horiba	VA-3111	PC062W1E	3/7/2017

### Reference Standards

Serial Number	Lot	Expiration	Type	Component	Balance	Concentration	Uncertainty (%)	NIST Reference
FF22304	71-E-25	8/23/2021	SRM	O2	N2	20.86%	0.101	2659a
CC478894	1976A-05T5	7/15/2019	GMIS	CO2	N2	16.12%	0.328	2745

The calibration results published in this certificate were obtained using equipment and standards capable of producing results that are traceable to National Institute of Standards and Technology (NIST) and through NIST to the International System of Units (SI). The expanded uncertainties, if included on this certificate, use a coverage factor of  $k=2$  to approximate the 95% confidence level of the measurement, unless otherwise noted. If uncertainties are not included on this certificate, they are available upon request. This calibration certificate applies only to the item described and shall not be reproduced other than in full, without written approval from the calibration facility. Calibration certificates without signatures are not valid.

This calibration meets the requirements of ISO/IEC 17025-2005

  
Analyst: Eric Frymier

  
Reviewer: Jeff Lynn

Production Laboratory:  
Tier 5 Labs, LLC  
5353 W. Southern Ave.  
Indianapolis, IN 46241  
PGVP Vendor ID R12017





TIER 5 LABS  
5353 W. SOUTHERN AVE.  
INDIANAPOLIS, IN 46241  
317-538-5590

Cylinder Number:	CC462061	Certification Date:	16 January 2019
Mixture Grade:	EPA Protocol Standard Gas Mixture	Expiration Date:	17 January 2027
Certificate Number:	0119C-02T5-C03	Lot Number:	0119C-02T5
Cylinder Pressure:	2015 PSIG	Customer Part Number:	EPA 307-020085C

Do not use below 100 psi (0.7 megapascals)

EPA Traceability Protocol for Gaseous Calibration Standards Procedure G1, EPA/600/R-12/531 May 2012

### Certified Concentrations

Component	Concentration	Uncertainty	Assay Dates
Carbon Dioxide	8.37%	+/- 0.04% (absolute)	1/16/2019
Oxygen	11.0%	+/- 0.10% (absolute)	1/16/2019
Nitrogen	Balance		

### Analytical Instrumentation

Component	Analytical Principle	Make	Model	Serial	MPC Date
Carbon Dioxide	GC-TCD	Shimadzu	GC-8A	C10495021497SA	12/31/2018
Oxygen	GC-TCD	Shimadzu	GC-8A	C10495021497SA	12/18/2018

### Reference Standards

Serial Number	Lot	Expiration	Type	Component	Balance	Concentration	Uncertainty (%)	NIST Reference
CC478894	1976A-05T5	10/26/2024	GMIS	CO2	N2	16.12%	0.328	2745
FF22304	71-E-25	8/23/2021	SRM	O2	N2	20.86%	0.101	2659a

The calibration results published in this certificate were obtained using equipment and standards capable of producing results that are traceable to National Institute of Standards and Technology (NIST) and through NIST to the International System of Units (SI). The expanded uncertainties, if included on this certificate, use a coverage factor of k=2 to approximate the 95% confidence level of the measurement, unless otherwise noted. If uncertainties are not included on this certificate, they are available upon request. The nitrogen used as a component or balance gas as well as the oxygen used in air mixtures meets the requirements set forth in EPA 1065.750. This calibration certificate applies only to the item described and shall not be reproduced other than in full, without written approval from the calibration facility. Calibration certificates without signatures are not valid. This calibration meets the requirements of ISO/IEC 17025-2005

Analyst: Allison Hanover

Reviewer: Abigail Helman

Production Laboratory:

Tier 5 Labs, LLC

5353 W. Southern Ave.

Indianapolis, IN 46241

PGVP Vendor ID R12019





TIER 5 LABS  
6363 W. SOUTHERN AVE.  
INDIANAPOLIS, IN 46241  
317-536-6690

Cylinder Number: CC480189  
Mixture Grade: EPA Protocol Standard Gas Mixture  
Certificate Number: 1388A-01T5-C02  
Cylinder Pressure: 2015 PSIG

Certification Date: 14 June 2018  
Expiration Date: 15 June 2021  
Lot Number: 1388A-01T5  
Customer Part Number: EPA 407-010025C

Do not use below 100 psi (0.7 megapascals)

EPA Traceability Protocol for Gaseous Calibration Standards Procedure G1, EPA/600/R-12/531 May 2012

### Certified Concentrations

Component	Concentration	Uncertainty	Assay Dates
Carbon Monoxide	27.0 PPM	+/- 0.2 PPM (absolute)	5/31/2018
Sulfur Dioxide	25.8 PPM	+/- 0.3 PPM (absolute)	5/31/2018, 6/7/2018
Nitric Oxide	25.0 PPM	+/- 0.3 PPM (absolute)	5/23/2018, 6/1/2018, 6/14/2018
Oxides of Nitrogen	25.1 PPM	+/- 0.3 PPM (absolute)	5/23/2018, 6/1/2018, 6/14/2018
Nitrogen	Balance		

### Analytical Instrumentation

Component	Analytical Principle	Make	Model	Serial	MPC Date
Carbon Monoxide	NDIR	Horiba	VA-3111	PC062W1E	5/29/2018
Sulfur Dioxide	NDIR	Horiba	VA-3111	PC062W1E	6/4/2018
Nitric Oxide	Chemiluminescence	Beckman	951a	100827	6/7/2018
Oxides of Nitrogen	Chemiluminescence	Beckman	951a	100827	6/7/2018

### Reference Standards

Serial Number	Lot	Expiration	Type	Component	Balance	Concentration	Uncertainty (%)	NIST Reference
FF24546	3-K-41	9/25/2022	SRM	CO	N2	99.28 PPM	0.212	1679c
CAL016677	95-J-21	1/5/2019	SRM	SO2	N2	98.07 PPM	0.795	1694a
CC454408	2547A-01T5	3/21/2021	GMIS	NO	N2	98.4 PPM	0.406	VSL
D562923	VSL	2/6/2019	PRM	NO2	Air	100.0 PPM	1.000	VSL

The calibration results published in this certificate were obtained using equipment and standards capable of producing results that are traceable to National Institute of Standards and Technology (NIST) and through NIST to the International System of Units (SI). The expanded uncertainties, if included on this certificate, use a coverage factor of  $k=2$  to approximate the 95% confidence level of the measurement, unless otherwise noted. If uncertainties are not included on this certificate, they are available upon request. The nitrogen used as a component or balance gas as well as the oxygen used in air mixtures meets the requirements set forth in EPA 1065.750. This calibration certificate applies only to the item described and shall not be reproduced other than in full, without written approval from the calibration facility. Calibration certificates without signatures are not valid. This calibration meets the requirements of ISO/IEC 17025-2005

Prepared by: Eric Frymier

Reviewer: Jeff Lynn

Production Laboratory:

Tier 5 Labs, LLC  
5353 W. Southern Ave.  
Indianapolis, IN 46241  
PGVP Vendor ID R12018





TIER 5 LABS  
5363 W. SOUTHERN AVE.  
INDIANAPOLIS, IN 46241  
317-636-5590

Cylinder Number:	CC480191	Certification Date:	25 July 2018
Mixture Grade:	EPA Protocol Standard Gas Mixture	Expiration Date:	26 July 2026
Certificate Number:	1708A-05T5-C03	Lot Number:	1708A-05T5
Cylinder Pressure:	2015 PSIG	Customer Part Number:	EPA 407-010050C

Do not use below 100 psi (0.7 megapascals)

EPA Traceability Protocol for Gaseous Calibration Standards Procedure G1, EPA/600/R-12/531 May 2012

### Certified Concentrations

Component	Concentration	Uncertainty	Assay Dates
Carbon Monoxide	49.5 PPM	+/- 0.3 PPM (absolute)	6/25/2018
Sulfur Dioxide	50.5 PPM	+/- 0.4 PPM (absolute)	6/25/2018, 7/2/2018
Nitric Oxide	50.7 PPM	+/- 0.5 PPM (absolute)	7/11/2018, 7/18/2018, 7/25/2018
Oxides of Nitrogen	51.2 PPM	+/- 0.5 PPM (absolute)	7/11/2018, 7/18/2018, 7/25/2018
Nitrogen	Balance		

### Analytical Instrumentation

Component	Analytical Principle	Make	Model	Serial	MPC Date
Carbon Monoxide	NDIR	Horiba	VA-3111	PC062W1E	5/30/2018
Sulfur Dioxide	NDIR	Horiba	VA-3111	PC062W1E	6/4/2018
Nitric Oxide	Chemiluminescence	Beckman	951a	100827	7/18/2018
Oxides of Nitrogen	Chemiluminescence	Beckman	951a	100827	7/18/2018

### Reference Standards

Serial Number	Lot	Expiration	Type	Component	Balance	Concentration	Uncertainty (%)	NIST Reference
CC481442	1976A-06T5	10/4/2024	GMIS	CO	N2	249.03 PPM	0.205	2636a
CAL016642	95-J-71	1/5/2019	SRM	SO2	N2	98.07 PPM	0.795	1694a
APEX1223933	VSL	2/15/2020	PRM	NO	N2	99.93 PPM	0.400	VSL
D562923	VSL	2/6/2019	PRM	NO2	Air	100.0 PPM	1.000	VSL

The calibration results published in this certificate were obtained using equipment and standards capable of producing results that are traceable to National Institute of Standards and Technology (NIST) and through NIST to the International System of Units (SI). The expanded uncertainties, if included on this certificate, use a coverage factor of  $k=2$  to approximate the 95% confidence level of the measurement, unless otherwise noted. If uncertainties are not included on this certificate, they are available upon request. The nitrogen used as a component or balance gas as well as the oxygen used in air mixtures meets the requirements set forth in EPA 1065.750. This calibration certificate applies only to the item described and shall not be reproduced other than in full, without written approval from the calibration facility. Calibration certificates without signatures are not valid. This calibration meets the requirements of ISO/IEC 17025-2005

Analyst: Allison Hanover

  
Reviewer: Jeff Lynn

Production Laboratory:

Tier 5 Labs, LLC

5353 W. Southern Ave.

Indianapolis, IN 46241

PGVP Vendor ID R12018





Global Calibration Gases  
Sarasota, FL

EPA Protocol  
Gas Mixture

Customer: Minneapolis Oxygen  
CGA: 590  
Customer PO#: 32285  
Cylinder #: CC187715

Reference#: 041117DH-2  
Certification Date: 04/15/2017  
Expiration Date: 04/15/2025  
Pressure, psig: 2000

**Method:** This standard was analyzed according to EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards, Procedure G1 (May 2012).

**Analyzed Cylinder-**

Components	Certified Concentration	Expanded Uncertainty	Assay Dates
Propane	30.7ppm	0.7%	4/15/17
Air	Balance	-	-

**Reference Standard-**

Type/SRM Sample	Cylinder #	Concentration
Propane/ GMIS	GCG-4745988Y	48.8ppm
Propane/ SRM	CAL018130	48.83ppm

**Instrument-**

Instrument/ Model	Serial Number	Last Date Calibrated	Analytical Method
Gow-Mac/ 23-500	K35606	4/15/2017	Flame Ionization Detector

These mixtures were prepared gravimetrically using a high load high sensitivity electronic scale. Prior to filling the scale is verified for accuracy throughout the target mass range against applicable NIST traceable weights. We certify that the weights are calibrated to ASTM E617-97 Echelon 1 tolerances.

This report states accurately the results of the investigation made upon the material submitted to the analytical laboratory. Every effort has been made to determine objectively the information requested. However, in connection with this report, Global Calibration Gases LLC shall have no liability in excess of the established charge for this service. Assayed at Global Calibration Gases LLC, Sarasota, Florida. No correction required for interfering gases.

The calibration results published in this certificate were obtained using equipment and standards capable of producing results that are traceable to National Institute of Standards and Technology (NIST) and through NIST to the International System of Units (SI). The expanded uncertainties, if included on this certificate, use a coverage factor of  $k=2$  to approximate the 95% confidence level of the measurement, unless otherwise noted. If uncertainties are not included on this certificate, they are available upon request. This calibration certificate applies only to the item described and shall not be reproduced other than in full, without written approval from the calibration facility. Calibration certificates without signatures are not valid. This calibration meets the requirements of ISO/IEC 17025:2005. Do not use this standard when cylinder pressure is below 150 psig.



**Produced by:**  
Global Calibration Gases LLC.  
1090 Commerce Blvd N.  
Sarasota, Florida 34243 USA  
PGVP Vendor ID.: N22017

**Principal Analyst:** Beth Walker

**Date:** 04/15/2017

**Principal Reviewer:** James H. Hone

**Date:** 04/15/2017





Tier 5 Labs  
5353 W. Southern Ave.  
Indianapolis, IN 46241  
(317) 961-6227

Cylinder Number:	CC480286	Certification Date:	19 September 2017
Mixture Grade:	EPA Protocol Standard Gas Mixture	Expiration Date:	20 September 2025
Certificate Number:	2567A-01T5-C03	Lot Number:	2567A-01T5
Cylinder Pressure:	2015 PSIG	Customer Part Number:	EPA 201-060050C

Do not use below 100 psi (0.7 megapascals)

EPA Traceability Protocol for Gaseous Calibration Standards Procedure G1, EPA/600/R-12/531 May 2012

### Certified Concentrations

Component	Concentration	Uncertainty	Assay Dates
Propane	51.5 ppm	+/- 0.1 ppm	09/19/2017
Air	Balance		

### Analytical Instrumentation

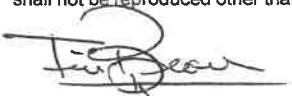
Component	Analytical Principle	Make	Model	Serial	MPC Date
Propane	FTIR	Thermo	Antaris IGS	AWZ1200117	9/18/2017

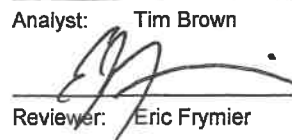
### Reference Standards

Serial Number	Lot	Expiration	Type	Component	Balance	Concentration	Uncertainty (%)	NIST Reference
CAL017809	83-J-12	8/17/2017	SRM	C3H8	Air	48.83 PPM	0.23	1667b

The calibration results published in this certificate were obtained using equipment and standards capable of producing results that are traceable to National Institute of Standards and Technology (NIST) and through NIST to the International System of Units (SI). The expanded uncertainties, if included on this certificate, use a coverage factor of  $k=2$  to approximate the 95% confidence level of the measurement, unless otherwise noted. If uncertainties are not included on this certificate, they are available upon request. This calibration certificate applies only to the item described and shall not be reproduced other than in full, without written approval from the calibration facility. Calibration certificates without signatures are not valid.

This calibration meets the requirements of ISO/IEC 17025-2005

  
Analyst: Tim Brown

  
Reviewer: Eric Frymier

Production Laboratory:  
Tier 5 Labs, LLC  
5353 W. Southern Ave.  
Indianapolis, IN 46241  
PGVP Vendor ID R12017





Tier 5 Labs  
6353 W. Southern Ave.  
Indianapolis, IN 46241  
(810) 981-8227

Cylinder Number:	CC480177	Certification Date:	19 September 2017
Mixture Grade:	EPA Protocol Standard Gas Mixture	Expiration Date:	20 September 2025
Certificate Number:	2567A-02T5-C02	Lot Number:	2567A-02T5
Cylinder Pressure:	2015 psig	Customer Part Number:	EPA 201-060085C

Do not use below 100 psi (0.7 megapascals)

EPA Traceability Protocol for Gaseous Calibration Standards Procedure G2, EPA/600/R-12/531 May 2012

### Certified Concentrations

Component	Concentration	Uncertainty	Assay Dates
Propane	87.1 ppm	+/- 0.2 ppm	09/19/2017
Air	Balance		

### Analytical Instrumentation

Component	Analytical Principle	Make	Model	Serial	MPC Date
Propane	FTIR	Thermo	Antaris IGS	AWZ1200117	9/18/2017

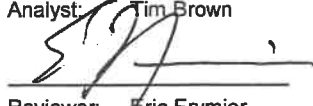
### Reference Standards

Serial Number	Lot	Expiration	Type	Component	Balance	Concentration	Uncertainty (%)	NIST Reference
CAL017809	83-J-12	8/17/2017	SRM	C3H8	Air	48.83 PPM	0.23	1667b

The calibration results published in this certificate were obtained using equipment and standards capable of producing results that are traceable to National Institute of Standards and Technology (NIST) and through NIST to the International System of Units (SI). The expanded uncertainties, if included on this certificate, use a coverage factor of  $k=2$  to approximate the 95% confidence level of the measurement, unless otherwise noted. If uncertainties are not included on this certificate, they are available upon request. This calibration certificate applies only to the item described and shall not be reproduced other than in full, without written approval from the calibration facility. Calibration certificates without signatures are not valid.

This calibration meets the requirements of ISO/IEC 17025-2005

Analyst:  Tim Brown

Reviewer:  Eric Frymier

Production Laboratory:  
Tier 5 Labs, LLC  
5353 W. Southern Ave.  
Indianapolis, IN 46241  
PGVP Vendor ID R12017



# **APPENDIX K**

## **MEASUREMENT SYSTEMS PERFORMANCE SPECIFICATIONS**



## Analyzer Calibration Error Check

**United Taconite**  
**Forbes, MN**  
**Line 1 Waste Gas (STRU53)**  
**2/12/2019**  
**Test 2**

Time of Linearity : 7:35

### CO (TECO 48C)

	Cylinder Value (%)	Analyzer Response (%)	Difference (%)	Span Value (%)	% of Span
<b>Zero</b>	0.00	0.00	0.00	49.50	0.00
<b>Mid Level</b>	27.00	26.86	0.14	49.50	0.28
<b>High Level</b>	49.50	49.52	0.02	49.50	0.04

### VIG #2(Model 20/2)

	Cylinder Value (ppm)	Analyzer Response (ppm)	Difference (ppm)	Span Value (ppm)	% of Span
<b>Zero</b>	0.00	0.10	0.10	100.11	0.10
<b>Low Level</b>	30.70	31.12	0.42	100.11	0.42
<b>Mid Level</b>	51.50	51.13	0.37	100.11	0.37
<b>High Level</b>	87.10	87.55	0.45	100.11	0.45

### CO<sub>2</sub> (Servomex Series 1440)

	Cylinder Value (%)	Analyzer Response (%)	Difference (%)	Span Value (%)	% of Span
<b>Zero</b>	0.00	-0.01	0.01	16.90	0.06
<b>Mid Level</b>	8.37	8.50	0.13	16.90	0.77
<b>High Level</b>	16.90	16.93	0.03	16.90	0.18

### O<sub>2</sub> (Servomex Series 1440)

	Cylinder Value (%)	Analyzer Response (%)	Difference (%)	Span Value (%)	% of Span
<b>Zero</b>	0.00	0.00	0.00	20.90	0.00
<b>Mid Level</b>	11.00	11.19	0.19	20.90	0.91
<b>High Level</b>	20.90	20.93	0.03	20.90	0.14

\*\*\*\* All Calibrations must be within 2% of the span value...



United Taconite  
Forbes, MN  
Line 1 Waste Gas (STRU53)  
2/12/2019  
Test 2

O<sub>2</sub>

			Initial	Pre-Cal Bias	Final	Post-Cal Bias	Avg.	Drift of Span	
	1	Zero	0.10	0.5%	0.12	0.6%	0.11	0.10%	
		Upscale	11.15	-0.2%	11.10	-0.4%	11.13	0.24%	
	2	Zero	0.12	0.6%	0.14	0.7%	0.13	0.10%	
		Upscale	11.10	-0.4%	11.13	-0.3%	11.12	0.14%	
	3	Zero	0.14	0.7%	0.11	0.5%	0.13	0.14%	
		Upscale	11.13	-0.3%	11.21	0.1%	11.17	0.38%	

	Cylinder Value		Analyzer Value	
Zero	0.00	%	0.00	%
Upscale	11.00	%	11.19	%
Span	20.90	%	20.9	%

All Bias values must be within 5% of the span value.

All Drift values must be within 3% of the span value.



United Taconite  
Forbes, MN  
Line 1 Waste Gas (STRU53)  
2/12/2019  
Test 2

CO<sub>2</sub>

			<u>Initial</u>	<u>Pre-Cal Bias</u>	<u>Final</u>	<u>Post-Cal Bias</u>	<u>Avg.</u>	<u>Drift of Span</u>	
	<b>1</b>	<b>Zero</b>	0.02	0.2%	0.03	0.2%	<b>0.03</b>	<b>0.06%</b>	
		<b>Upscale</b>	8.35	-0.9%	8.26	-1.4%	<b>8.31</b>	<b>0.53%</b>	
	<b>2</b>	<b>Zero</b>	0.03	0.2%	0.03	0.2%	<b>0.03</b>	<b>0.00%</b>	
		<b>Upscale</b>	8.26	-1.4%	8.16	-2.0%	<b>8.21</b>	<b>0.59%</b>	
	<b>3</b>	<b>Zero</b>	0.03	0.2%	0.04	0.3%	<b>0.04</b>	<b>0.06%</b>	
		<b>Upscale</b>	8.16	-2.0%	8.15	-2.1%	<b>8.16</b>	<b>0.06%</b>	

	<u>Cylinder Value</u>		<u>Analyzer Value</u>	
<b>Zero</b>	0.00	%	-0.01	%
<b>Upscale</b>	8.37	%	8.50	%
<b>Span</b>	16.9	%	16.9	%

All Bias values must be within 5% of the span value.

All Drift values must be within 3% of the span value.



United Taconite  
Forbes, MN  
Line 1 Waste Gas (STRU53)  
2/12/2019  
Test 2

CO

			<u>Initial</u>	<u>Pre-Cal Bias</u>	<u>Final</u>	<u>Post-Cal Bias</u>	<u>Avg.</u>	<u>Drift of Span</u>	
	1	Zero	0.34	0.7%	0.46	0.9%	0.40	0.24%	
		Upscale	26.87	0.0%	26.85	0.0%	26.86	0.04%	
	2	Zero	0.46	0.9%	0.51	1.0%	0.49	0.10%	
		Upscale	26.85	0.0%	26.93	0.1%	26.89	0.16%	
	3	Zero	0.51	1.0%	1.88	3.8%	1.20	2.77%	
		Upscale	26.93	0.1%	27.65	1.6%	27.29	1.45%	

	<u>Cylinder Value</u>	<u>Analyzer Value</u>
Zero	0.00 ppm	0.00 ppm
Upscale	27.00 ppm	26.86 ppm
Span	49.5 ppm	49.50 ppm

All Bias values must be within 5% of the span value.  
All Drift values must be within 3% of the span value.



United Taconite  
Forbes, MN  
Line 1 Waste Gas (STRU53)  
2/12/2019  
Test 2

VOC

			<u>Initial</u>	<u>Pre-Cal</u> <u>Bias</u>	<u>Final</u>	<u>Post-Cal</u> <u>Bias</u>	<u>Avg.</u>	<u>Drift</u> <u>of</u> <u>Span</u>	
	1	Zero	0.10	0.0%	0.30	0.2%	0.20	0.20%	
		Upscale	51.13	0.0%	49.50	-1.6%	50.32	1.63%	
	2	Zero	0.30	0.2%	0.30	0.2%	0.30	0.00%	
		Upscale	49.50	-1.6%	51.50	0.4%	50.50	2.00%	
	3	Zero	0.30	0.2%	0.20	0.1%	0.25	0.10%	
		Upscale	51.50	0.4%	52.10	1.0%	51.80	0.60%	

	<u>Cylinder</u> <u>Value</u>	<u>Analyzer</u> <u>Value</u>
Zero	0.00 ppm	0.10 ppm
Upscale	51.50 ppm	51.13 ppm
Span	100.1 ppm	100.11 ppm

All Bias values must be within 5% of the span value.

All Drift values must be within 3% of the span value.



INTERPOLL LABORATORIES, INC.  
(763) 786-6020  
**EPA Method 7E Stratification Test**

Job:	United Taconite	Date:	2/12/2019
Source:	Line 1 Waste Gas (STRU53)	Personnel:	Chris Warneke / Colin Kelly
Test	2	Bar. Press. (in. Hg)	28.47

Measurement Response Time: 180 seconds

Stack Diameter 121.40 in. Port Length in. 6.00

Traverse Point	Fraction of Diameter	Distance From Stack Wall (in.)	Distance From End of Port (in.)	O <sub>2</sub> % (dry)	CO <sub>2</sub> % (dry)	SO <sub>2</sub> % (dry)	Time (min)
1	0.2	20.2	26.23	17.74	2.10	8.96	8:00
2	0.5	60.7	66.70	17.63	2.19	9.83	8:15
3	0.8	101.2	107.17	17.68	2.19	9.90	8:30
Average				17.68	2.16	9.56	

Largest Value	17.74	2.19	9.90
Smallest Value	17.63	2.10	8.96
%Deviation	0.65%	4.87%	10.52%

Modified: 8/27/99  
G:\Stack\Excel\Forms\S-382.3



## Analyzer Calibration Error Check

United Taconite  
Forbes, MN  
Line 1 Waste Gas (STRU53)  
2/14/2019  
Test 5

Time of Linearity : 0:00

### CO (TECO 48C)

	Cylinder Value (%)	Analyzer Response (%)	Difference (%)	Span Value (%)	% of Span
Zero	0.00	0.20	0.20	49.50	0.40
Mid Level	27.00	26.62	0.38	49.50	0.77
High Level	49.50	49.85	0.35	49.50	0.71

### VIG #2(Model 20/2)

	Cylinder Value (ppm)	Analyzer Response (ppm)	Difference (ppm)	Span Value (ppm)	% of Span
Zero	0.00	-0.10	0.10	100.11	0.10
Low Level	30.70	31.40	0.70	100.11	0.70
Mid Level	51.50	51.40	0.10	100.11	0.10
High Level	87.10	87.30	0.20	100.11	0.20

### CO<sub>2</sub> (Servomex Series 1440)

	Cylinder Value (%)	Analyzer Response (%)	Difference (%)	Span Value (%)	% of Span
Zero	0.00	-0.01	0.01	16.90	0.06
Mid Level	8.37	8.43	0.06	16.90	0.36
High Level	16.90	16.90	0.00	16.90	0.00

### O<sub>2</sub> (Servomex Series 1440)

	Cylinder Value (%)	Analyzer Response (%)	Difference (%)	Span Value (%)	% of Span
Zero	0.00	0.00	0.00	20.90	0.00
Mid Level	11.00	11.15	0.15	20.90	0.72
High Level	20.90	20.87	0.03	20.90	0.14

\*\*\*\* All Calibrations must be within 2% of the span value...



United Taconite  
Forbes, MN  
Line 1 Waste Gas (STRU53)  
2/14/2019  
Test 5

O<sub>2</sub>

			<u>Initial</u>	<u>Pre-Cal Bias</u>	<u>Final</u>	<u>Post-Cal Bias</u>	<u>Avg.</u>	<u>Drift of Span</u>	
	<b>1</b>	<b>Zero</b>	0.06	0.3%	0.11	0.5%	<b>0.09</b>	<b>0.24%</b>	
		<b>Upscale</b>	11.13	-0.1%	11.07	-0.4%	<b>11.10</b>	<b>0.29%</b>	
	<b>2</b>	<b>Zero</b>	0.11	0.5%	0.18	0.9%	<b>0.15</b>	<b>0.33%</b>	
		<b>Upscale</b>	11.07	-0.4%	11.08	-0.3%	<b>11.08</b>	<b>0.05%</b>	
	<b>3</b>	<b>Zero</b>	0.18	0.9%	0.14	0.7%	<b>0.16</b>	<b>0.19%</b>	
		<b>Upscale</b>	11.08	-0.3%	11.05	-0.5%	<b>11.07</b>	<b>0.14%</b>	

	<u>Cylinder Value</u>		<u>Analyzer Value</u>	
<b>Zero</b>	0.00	%	0.00	%
<b>Upscale</b>	11.00	%	11.15	%
<b>Span</b>	20.90	%	20.9	%

All Bias values must be within 5% of the span value.

All Drift values must be within 3% of the span value.



United Taconite  
Forbes, MN  
Line 1 Waste Gas (STRU53)  
2/14/2019  
Test 5

CO<sub>2</sub>

		<u>Initial</u>	<u>Pre-Cal Bias</u>	<u>Final</u>	<u>Post-Cal Bias</u>	<u>Avg.</u>	<u>Drift of Span</u>	
1	Zero	-0.01	0.0%	-0.01	0.0%	-0.01	0.00%	
	Upscale	8.31	-0.7%	8.25	-1.1%	8.28	0.36%	
2	Zero	-0.01	0.0%	-0.02	-0.1%	-0.02	0.06%	
	Upscale	8.25	-1.1%	8.26	-1.0%	8.26	0.06%	
3	Zero	-0.02	-0.1%	-0.02	-0.1%	-0.02	0.00%	
	Upscale	8.26	-1.0%	8.25	-1.1%	8.26	0.06%	

	<u>Cylinder Value</u>		<u>Analyzer Value</u>	
Zero	0.00	%	-0.01	%
Upscale	8.37	%	8.43	%
Span	16.9	%	16.9	%

All Bias values must be within 5% of the span value.

All Drift values must be within 3% of the span value.



United Taconite  
Forbes, MN  
Line 1 Waste Gas (STRU53)  
2/14/2019  
Test 5

CO

		<u>Initial</u>	<u>Pre-Cal Bias</u>	<u>Final</u>	<u>Post-Cal Bias</u>	<u>Avg.</u>	<u>Drift of Span</u>	
1	Zero	0.31	0.2%	0.47	0.5%	0.39	0.32%	
	Upscale	26.72	0.2%	26.55	-0.1%	26.64	0.34%	
2	Zero	0.47	0.5%	0.05	-0.3%	0.26	0.85%	
	Upscale	26.55	-0.1%	26.68	0.1%	26.62	0.26%	
3	Zero	0.05	-0.3%	0.38	0.4%	0.22	0.67%	
	Upscale	26.68	0.1%	26.76	0.3%	26.72	0.16%	

	<u>Cylinder Value</u>	<u>Analyzer Value</u>
Zero	0.00 ppm	0.20 ppm
Upscale	27.00 ppm	26.62 ppm
Span	49.5 ppm	49.50 ppm

All Bias values must be within 5% of the span value.

All Drift values must be within 3% of the span value.



United Taconite  
Forbes, MN  
Line 1 Waste Gas (STRU53)  
2/14/2019  
Test 5

VOC

			Initial	Pre-Cal Bias	Final	Post-Cal Bias	Avg.	Drift of Span	
	1	Zero	-0.10	0.0%	-0.40	-0.3%	-0.25	0.30%	
		Upscale	51.40	0.0%	49.60	-1.8%	50.50	1.80%	
	2	Zero	-0.40	-0.3%	0.30	0.4%	-0.05	0.70%	
		Upscale	49.60	-1.8%	50.00	-1.4%	49.80	0.40%	
	3	Zero	0.30	0.4%	2.50	2.6%	1.40	2.20%	
		Upscale	50.00	-1.4%	50.60	-0.8%	50.30	0.60%	

	Cylinder Value	Analyzer Value
Zero	0.00 ppm	-0.10 ppm
Upscale	51.50 ppm	51.40 ppm
Span	100.1 ppm	100.11 ppm

All Bias values must be within 5% of the span value.  
All Drift values must be within 3% of the span value.



INTERPOLL LABORATORIES, INC.  
(763) 786-6020  
**EPA Method 7E Stratification Test**

Job:	United Taconite	Date:	2/14/2019
Source:	Line 1 Waste Gas (STRU53)	Personnel:	Chris Warneke / Colin Kelly
Test	5	Bar. Press. (in. Hg)	28.11

Measurement Response Time: 180 seconds

Stack Diameter		121.40	in.	Port Length		in.	6.00
Traverse Point	Fraction of Diameter	Distance From Stack Wall (in.)	Distance From End of Port (in.)	O <sub>2</sub> % (dry)	CO <sub>2</sub> % (dry)	CO % (dry)	Time (min)
1	0.2	20.2	26.23	18.42	1.23	9.17	8:35
2	0.5	60.7	66.70	18.46	1.27	9.04	8:50
3	0.8	101.2	107.17	18.43	1.04	9.03	9:10
Average				18.44	1.18	9.08	

Largest Value	18.46	1.27	9.17
Smallest Value	18.42	1.04	9.03
%Deviation	0.22%	21.39%	1.63%

Modified: 3/27/99  
G:\Stack\ExchForm\5-392.3



# **APPENDIX L**

## **STATIONARY SOURCE AUDIT SAMPLE PROGRAM**





A Waters Company

## Order Confirmation

Page 1 of 1

Contact	Bill To	Ship To	Order #	1-6WG9FD
Name: Ed Juers	Interpoll Laboratories Inc.	Interpoll Laboratories Inc.	Account	1008063
Email: ed.juers@interpoll-labs.com	4500 Ball Road NE	4500 Ball Road NE	Date	01-28-2019
Phone: (763) 786-6020	Circle Pines, MN 55014	Circle Pines, MN 55014	PO # / CC Type	United Taconite
Fax:	Attn: Accounts Payable	Attn: Ed Juers	Processed	Claire Toon
			CS Representative	Claire Toon
			Shipping	FedEx Econ
			Payment Terms	CREDIT CARD

							Surcharge			Ext. Price
QTY	Ship Date	Cat #	Description	Study/Prod Type	Unit Price	Disc	S/H	QR	WV	
1	2/5/2019	1427	Mercury on Filter	QC	\$173.00					\$173.00
							Comments: Date: 12-Feb-2019			
							PID: TBD			
							Tester: Interpoll Laboratories Inc.			
							Facility: United Taconite, LLC			
							Lab: Interpoll Laboratories Inc.			
							Reg: MN PCA			
1	2/5/2019	1428	Mercury in Impinger Solution	QC	\$173.00					\$173.00

Subtotal	\$346.00
Trade Discount	\$0.00
Handling	\$10.00
Freight	\$44.81
COD Surcharge	\$0.00
Tax	\$0.00
Order Total	\$400.81





February 27, 2019

Ed Juers  
Interpoll Laboratories Inc.  
4500 Ball Road NE  
Circle Pines, MN 55014

Enclosed is your final report for ERA's Stationary Source Audit Sample (SSAS) Program. Your final report includes an evaluation of all results submitted by your laboratory to ERA.

Data Evaluation Protocols: All analytes in ERA's SSAS Program have been evaluated comparing the reported result to the acceptance limits generated using the criteria contained in the TNI SSAS Table.

For any "Not Acceptable" results, please contact your state regulator for any corrective action requirements.

Thank you for your participation in ERA's SSAS Program. If you have any questions, please contact our Proficiency Testing Department at 1-800-372-0122.

Sincerely,

Matthew Seebeck  
Quality Officer

cc: Project File Number 020519K





A Waters Company

Recipient Type	Report Recipient	Contact	Project ID
Agency	MN-MPCA (SSAS) 520 Lafayette Road St Paul, MN 55155 USA	Andrew Place andrew.place@state.mn.us Phone: 651-757-2652	
Facility	United Taconite, LLC 1200 West Highway 16 Forbes, MN 55738 USA	Mike Bonham michael.bonham@clevelandcliffs.com Phone: (218) 744-7840	
Lab	Interpoll Laboratories Inc. 4500 Ball Road NE Circle Pines, MN 55014 USA	Wayne Olson Quality Assurance Officer wayne.olson@interpoll-labs.com Phone: 763-786-6020 Fax: 763-786-7854	
Tester	Interpoll Laboratories Inc. 4500 Ball Road NE Circle Pines, MN 55014 USA	Ed Juers ed.juers@interpoll-labs.com Phone: 763-786-6020	



Project # : 020519K







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# 020519K Laboratory Exception Report

Wayne Olson  
Quality Assurance Officer  
Interpoll Laboratories Inc.  
4500 Ball Road NE  
Circle Pines, MN 55014  
763-786-6020

EPA ID:  
ERA Customer Number:

Not Reported  
1008063

## Evaluation Checks

There are no values reported with < where the assigned value was greater than 0.

## Not Acceptable Evaluations

There were no Not Acceptable evaluations for this study.





## Final Report Results For Laboratory Interpoll Laboratories Inc.





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## **SSAP Evaluation Report**

**Project Number: 020519K**

**ERA Customer Number: I008063**

**Laboratory Name: Interpoll Laboratories  
Inc.**

### **Inorganic Results**







A Waters Company

Wayne Olson  
Quality Assurance Officer  
Interpoll Laboratories Inc.  
4500 Ball Road NE  
Circle Pines, MN 55014  
763-786-6020

EPA ID:  
ERA Customer Number:

Not Reported  
I008063

# 020519K Evaluation Final Complete Report

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TNI Analyte Code	Analyte	Units	Reported Value	Assigned Value	Acceptance Limits	Performance Evaluation	Method Description	Analysis Date	Analyst Name
SSAP Mercury on Filter Paper (cat# 1427, lot# 020519K) Study Dates: 02/05/19 - 02/27/19									
1095	Mercury	µg/Filter	17.5	18.3	13.7 - 22.9	Acceptable	EPA Method 29 2000	2/21/2019	G Horman
SSAP Mercury in Impinger Solution (cat# 1428, lot# 020519K) Study Dates: 02/05/19 - 02/27/19									
1095	Mercury	ng/mL	25.6	25.5	19.1 - 31.9	Acceptable	EPA Method 29 2000	2/21/2019	G Horman

