1.0 INTRODUCTION

1.1 SUMMARY OF TEST PROGRAM

DTE Energy-Belle River Power Plant (BRPP) (State Registration Number: B2796) contracted Montrose Air Quality Services, LLC (Montrose) to perform a compliance test program on the Coal-Fired Boiler No. 2 (EU-BOILER2-BR) (part of FG-DSI/ACI-BR) at the DTE Energy-BRPP facility located in East China Township, Michigan. Testing was performed on September 20, 2021, for the purpose of satisfying the emission testing requirements pursuant to Michigan Department of Environment, Great Lakes, and Energy (EGLE) Renewable Operating Permit No. MI-ROP-B2796-2015c and 40 CFR Part 63, Subpart UUUUU.

The specific objectives were to:

- Verify the emissions of hydrogen chloride (HCl) at the electrostatic precipitator (ESP) serving EU-BOILER2-BR
- Conduct the test program with a focus on safety

Montrose performed the tests to measure the emission parameters listed in Table 1-1.

TABLE 1-1
SUMMARY OF TEST PROGRAM

Test Date(s)	Unit ID/ Source Name	Activity/ Parameters	Test Methods	No. of Runs	Duration (Minutes)
9/20/2021	EU-BOILER2-BR	O_2, CO_2	EPA 3A	3	60
9/20/2021	EU-BOILER2-BR	Moisture	EPA 4	3	60
9/20/2021	EU-BOILER2-BR	HCl	EPA 26	3	60

To simplify this report, a list of Units and Abbreviations is included in Appendix D.1. Throughout this report, chemical nomenclature, acronyms, and reporting units are not defined. Please refer to the list for specific details.

This report presents the test results and supporting data, descriptions of the testing procedures, descriptions of the facility and sampling locations, and a summary of the quality assurance procedures used by Montrose. The average emission test results are summarized and compared to their respective permit limits in Table 1-2. Detailed results for individual test runs can be found in Section 4.0. All supporting data can be found in the appendices.

TABLE 1-2
SUMMARY OF AVERAGE COMPLIANCE RESULTS - EU-BOILER2-BR
SEPTEMBER 20, 2021

Parameter/Units	Average Results	Emission Limits
Hydrogen Chloride (HCl)		
lb/MMBtu	0.00051	0.002

1.2 KEY PERSONNEL

A list of project participants is included below:

Facility Information

Source Location: DTE Energy - Belle River Power Plant
4901 Pointe Drive
East China Township, MI 48054

Project Contact:	Mark Grigereit	Fred Meinecke
Role:	Principal Engineer	Sr. Environmental Technician
Company:	DTE Energy	DTE Energy
Telephone:	313-412-0305	313-897-0214
Email:	mark.grigereit@dteenergy.com	fred.meinecke@dteenergy.com

Agency Information

Regulatory Agency: EGLE
Agency Contact: Karen Kajiya-Mills
Telephone: 517-335-3122
Email: kajiya-millk@michigan.gov

Testing Company Information

Testing Firm: Montrose Air Quality Services, LLC

Contact:	Todd Wessel	Shawn Jaworski
Title:	Client Project Manager	Senior Field Technician
Telephone:	248-548-8070	248-548-8070
Email:	twessel@montrose-env.com	sjaworski@montrose-env.com

Laboratory Information

Laboratory: Enthalpy Analytical, LLC
City, State: Durham, NC 27713
Method: EPA Method 26A

Test personnel and observers are summarized in Table 1-3.

TABLE 1-3
TEST PERSONNEL AND OBSERVERS

Name	Affiliation	Role/Responsibility
Shawn Jaworski	Montrose	Senior Field Technician, QI
Michael Nummer	Montrose	Senior Field Technician
Scott Dater	Montrose	Field Technician
Fred Meinecke	DTE Energy	Observer/Client Liaison

2.0 PLANT AND SAMPLING LOCATION DESCRIPTIONS

2.1 PROCESS DESCRIPTION, OPERATING, AND CONTROL EQUIPMENT

The DTE Energy-BRPP employs the use of two coal-fired boilers (EU-BOILER1-BR and EU-BOILER2-BR) to produce power. Boilers No. 1 (EU-BOILER1-BR) and No. 2 (EU-BOILER2-BR) are Electric Generating Units (EGU) (FG-DSI/ACI-BR). EU-BOILER2-BR has a nominally rated capability of 697 MW, and its emissions are controlled by an ESP. EU-BOILER2-BR was in operation for this test event.

2.2 FLUE GAS SAMPLING LOCATION

Information regarding the sampling location is presented in Table 2-1.

TABLE 2-1
SAMPLING LOCATION

Sampling Location	Stack Inside Diameter (in.)	Distance from Nearest Disturbance Downstream EPA "B" (in./dia.)	 Upstream EPA "A" (in./dia.)	Number of Traverse Points
EU-BOILER2-BR ESP Exhaust Stack	306.0	4,920 / 16.1	1,920 / 6.3	Gaseous: 1

See Appendix A.1 for more information.

2.3 OPERATING CONDITIONS AND PROCESS DATA

Emission tests were performed while EU-BOILER2-BR and the ESP were operating at the conditions required by the permit.

Plant personnel were responsible for establishing the test conditions and collecting all applicable unit-operating data. The process data that was provided is presented in Appendix B.

3.0 SAMPLING AND ANALYTICAL PROCEDURES

3.1 TEST METHODS

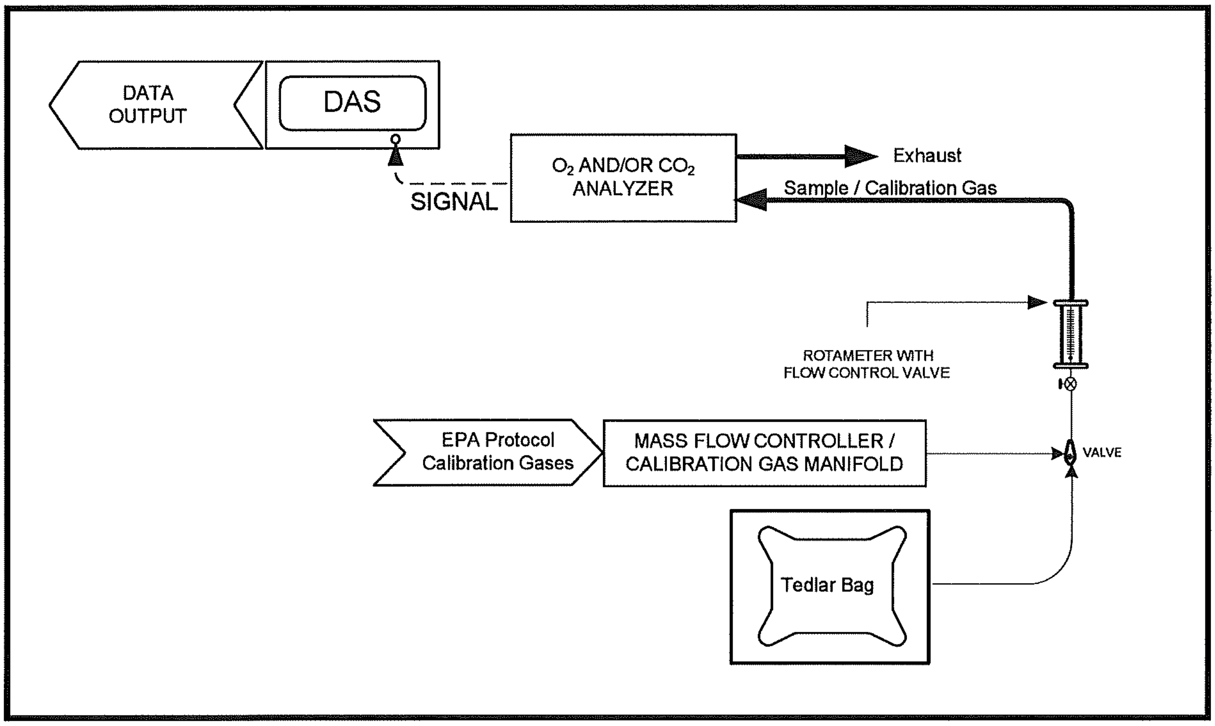
The test methods for this test program were presented previously in Table 1-1. Additional information regarding specific applications or modifications to standard procedures is presented below.

3.1.1 EPA Method 3A, Determination of Oxygen and Carbon Dioxide Concentrations in Emissions from Stationary Sources (Instrumental Analyzer Procedure)

EPA Method 3A is an instrumental test method used to measure the concentration of O_2 and CO_2 in stack gas. The effluent gas is continuously or intermittently sampled and conveyed to analyzers that measure the concentration of O_2 and CO_2. The performance requirements of the method must be met to validate data.

For the purpose of this test event, Tedlar bags were utilized to collect exhaust gas from the ESP exhaust stack. Then, the Tedlar bags were analyzed using EPA Method 3A. The typical sampling system is detailed in Figure 3-1.

FIGURE 3-1
EPA METHOD 3A (O_2/CO_2) TEDLAR BAG SAMPLING TRAIN



3.1.2 EPA Method 4, Determination of Moisture Content in Stack Gas

EPA Method 4 is a manual, non-isokinetic method used to measure the moisture content of gas streams. Gas is sampled at a constant sampling rate through a probe and impinger train. Moisture is removed using a series of pre-weighed impingers containing methodology-specific liquids and silica gel immersed in an ice water bath. The impingers are weighed after each run to determine the percent moisture.

The typical sampling system is detailed in Figure 3-2.

3.1.3 EPA Method 19, Determination of Sulfur Dioxide Removal Efficiency and Particulate Matter, Sulfur Dioxide, and Nitrogen Oxide Emission Rates

EPA Method 19 is a manual method used to determine (a) PM, SO_2, and NO_x emission rates; (b) sulfur removal efficiencies of fuel pretreatment and SO_2 control devices; and (c) overall reduction of potential SO_2 emissions. This method provides data reduction procedures, but does not include any sample collection or analysis procedures.

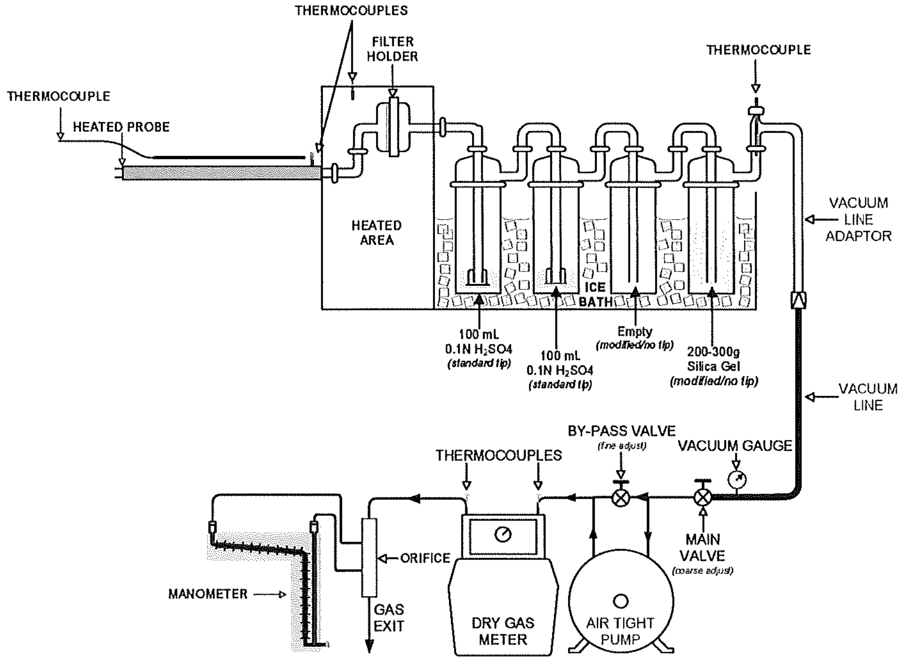
EPA Method 19 is used to calculate mass emission rates in units of lb/MMBtu. EPA Method 19, Table 19-2 contains a list of assigned fuel factors for different types of fuels, which can be used for these calculations.

3.1.4 EPA Method 26, Determination of Hydrogen Halide and Halogen Emissions from Stationary Sources Non-Isokinetic Method

An integrated sample is extracted from the source and passed through a pre-purged heated probe and filter into dilute sulfuric acid and dilute sodium hydroxide solutions which collect the gaseous hydrogen halides and halogens, respectively. The filter collects particulate matter including halide salts but is not routinely recovered and analyzed. The hydrogen halides are solubilized in the acidic solution and form chloride (Cl^-), bromide (Br^-), and fluoride (F^-) ions. The halogens have a very low solubility in the acidic solution and pass through to the alkaline solution where they are hydrolyzed to form a proton (H^+), the halide ion, and the hypohalous acid (HClO or HBrO). Sodium thiosulfate is added in excess to the alkaline solution to assure reaction with hypohalous acid to form a second halide ion such that 2 halide ions are formed for each molecule of halogen gas. The halide ions in the separate solutions are measured by ion chromatography (IC).

For the purpose of this test, non-isokinetic sampling was performed. The typical sampling system is detailed in Figure 3-2.

FIGURE 3-2
EPA METHOD 26 (HALIDES) SAMPLING TRAIN



3.2 PROCESS TEST METHODS

Process samples of coal were taken by DTE Energy personnel and analyzed for Proximate and Ultimate fuel analysis.

4.0 TEST DISCUSSION AND RESULTS

4.1 FIELD TEST DEVIATIONS AND EXCEPTIONS

No field deviations or exceptions from the test plan or test methods occurred during this test program.

4.2 PRESENTATION OF RESULTS

The average results are compared to the permit limits in Table 1-2. The results of individual compliance test runs performed are presented in Table 4-1. Emissions are reported in units consistent with those in the applicable regulations or requirements. Additional information is included in the appendices as presented in the Table of Contents.

TABLE 4-1
HCl EMISSIONS RESULTS -
EU-BOILER2-BR

Run Number	**1**	**2**	**3**	**Average**
Date	9/20/2021	9/20/2021	9/20/2021	--
Time	9:55-10:55	11:00-12:00	12:05-13:05	--
Process Data				
F-Factor, dscf/MMBtu	9694.8	9694.8	9694.8	9694.8
Flue Gas Parameters				
O_2, % volume dry	9.74	8.69	9.06	9.16
CO_2, % volume dry	10.31	11.12	10.35	10.59
flue gas temperature, °F	314.0	316.0	318.3	316.1
moisture content, % volume	11.04	10.96	11.35	11.12
Hydrogen Chloride (HCl)				
ppmvd	0.29	0.24	0.41	0.31
lb/MMBtu	0.00050	0.00038	0.00066	0.00051

5.0 INTERNAL QA/QC ACTIVITIES

5.1 QA/QC AUDITS

The meter box and sampling train used during sampling performed within the requirements of their respective methods. All post-test leak checks, minimum metered volumes met the applicable QA/QC criteria.

EPA Method 3A calibration audits were all within the measurement system performance specifications for the calibration drift checks, system calibration bias checks, and calibration error checks.

EPA Method 26A analytical QA/QC results are included in the laboratory report. The method QA/QC criteria were met.

5.2 QA/QC DISCUSSION

All QA/QC criteria were met during this test program.

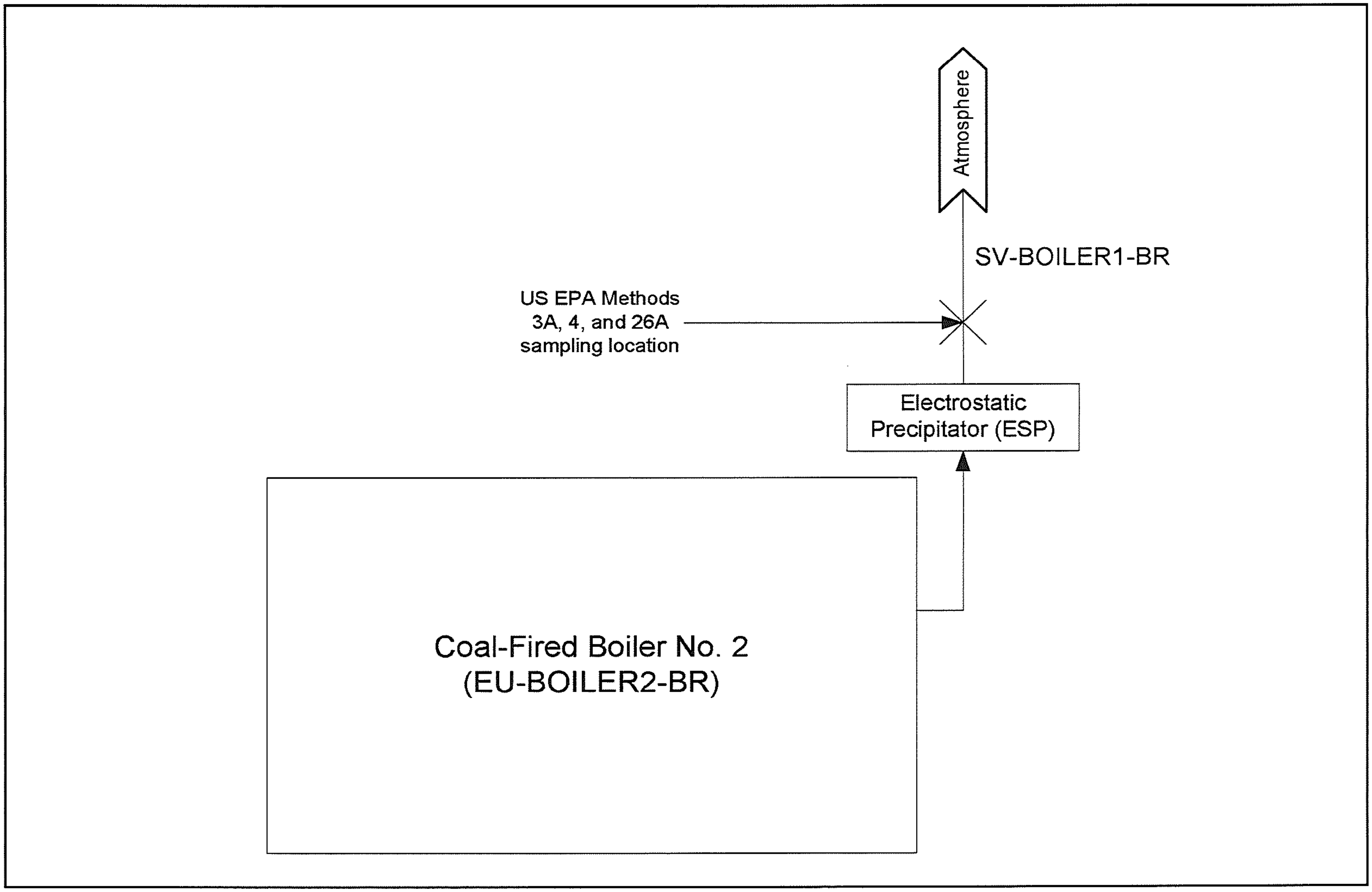
5.3 QUALITY STATEMENT

Montrose is qualified to conduct this test program and has established a quality management system that led to accreditation with ASTM Standard D7036-04 (Standard Practice for Competence of Air Emission Testing Bodies). Montrose participates in annual functional assessments for conformance with D7036-04 which are conducted by the American Association for Laboratory Accreditation (A2LA). All testing performed by Montrose is supervised on site by at least one Qualified Individual (QI) as defined in D7036-04 Section 8.3.2. Data quality objectives for estimating measurement uncertainty within the documented limits in the test methods are met by using approved test protocols for each project as defined in D7036-04 Sections 7.2.1 and 12.10. Additional quality assurance information is included in the report appendices. The content of this report is modeled after the EPA Emission Measurement Center Guideline Document (GD-043).

APPENDIX A
FIELD DATA AND CALCULATIONS

Appendix A.1
Sampling Locations

EU-BOILER2-BR SAMPLING LOCATION SCHEMATIC



THIS PAGE LEFT INTENTIONALLY BLANK.

Appendix A.2
EU-BOILER2-BR ESP Exhaust Stack Data Sheets

TEST DATA

Number of Test Runs	3
Traverse Points	12

	Run 1	Run 2	Run 3	Average
Stack Cross-Sectional Diameter 1 (**circular**) (in)	306.0	306.0	306.0	306.0
Stack Cross-Sectional Diameter 2 (**circular**) (in)	306.0	306.0	306.0	306.0
Barometric Pressure at Ground Level (Pbar) (in Hg)	30.10	30.10	30.10	30.10
Elevation Difference Between Ground Level and Meter Box Locations (ft)	500	500	500	500
Elevation Difference Between Ground Level and Sampling Locations (ft)	1000	1000	1000	1000
Initial Dry Gas Meter Reading (ft3)	584.460	629.858	675.138	
Final Dry Gas Meter Reading (ft3)	629.708	674.998	720.677	
Dry Gas Meter Calibration Factor (Gamma)	1.018	1.018	1.018	1.018
Dry Gas Meter Calibration Coefficient (Delta H@)	1.84	1.84	1.84	1.84
Total Sampling Run Time (Theta) (min)	60	60	60	60
Volume of Water Vapor Condensed in the Impingers (g)	100.1	94.3	110.2	101.5
Weight of Water Vapor Collected in Silica Gel (g)	16.4	19.7	9.0	15.0
Air Percent by Volume Oxygen in Stack Gas (%-dry)	9.74	8.69	9.06	9.16
Air Percent by Volume Carbon Dioxide in Stack Gas (%-dry)	10.31	11.12	10.35	10.59
Air Percent by Volume Nitrogen in Stack Gas (%-dry)	**79.96**	**80.18**	**80.59**	80.24
Test Run Start Time (hrmin)	9/20/2021 9:55	9/20/2021 11:00	9/20/2021 12:05	
Test Run Stop Time (hrmin)	9/20/2021 10:55	9/20/2021 12:00	9/20/2021 13:05	

DETAILED RESULTS

Stack Gas Conditions

	Run 1	Run 2	Run 3	Average
Stack Cross-Sectional Area (A) (ft2)	510.71	510.71	510.71	510.71
Barometric Pressure at Sampling Location (in Hg)	29.10	29.10	29.10	29.10
Dry Molecular Weight of Stack Gas (Md) (lb/lb-mole)	30.04	30.13	30.02	30.06
Wet Molecular Weight of Stack Gas (Ms) (lb/lb-mole)	28.71	28.80	28.66	28.72
Average Stack Gas Temperature (ts) (°F)	314.0	316.0	318.3	316.1
Average Stack Gas Temperature (Ts) (°R)	774.0	776.0	778.3	776.1
Percent by Volume Moisture as measured in Stack Gas (%H2O)	11.04	10.96	11.35	11.12

Test Results

	Run 1	Run 2	Run 3	Average
Volume of Dry Gas Sampled at Standard Conditions (Vmstd) (dscf)	44.276	43.667	43.887	43.943
Rate of Dry Gas Sampled at Standard Conditions (dscfm)	0.738	0.728	0.731	0.732
Dry Mole Fraction of Flue Gas (Mfd)	0.890	0.890	0.886	0.889
Average Pressure Differential of Orifice Meter (Delta H) (in H2O)	2.00	2.00	2.00	2.00
Average DGM Temperature (tm) (°F)	85.8	92.1	94.2	90.7
Average Dry Gas Meter Temperature (Tm) (°R)	545.8	552.1	554.2	550.7
Volume of Metered Gas Sample (Vm) (dry) (acf)	45.248	45.140	45.539	45.309

SAMPLING QA

	Run 1	Run 2	Run 3	Average
Post-Test Meter Calibration Check Value (Yqa)	1.031	1.037	1.032	1.033
Post-Test/Pre-Test Calibration Factor Difference (%)	-1.24	-1.91	-1.39	-1.51
Allowable Post-Test Leak Rate (dscfm)	0.020	0.020	0.020	0.020
Current Sampling Rate Status	**OK**	**OK**	**OK**	
1-Hour Sample Volume Based on Current Sampling Rate (dscf)	44.276	43.667	43.887	43.943

FUEL ANALYSIS

	Run 1	Run 2	Run 3	Average
Enter Fuel Type	Coal	Coal	Coal	
Examples: (Coal, NG, Wood, NA)	Valid Fuel Type	Valid Fuel Type	Valid Fuel Type	

Fuel Factor

	Run 1	Run 2	Run 3	Average
Measured Fuel Factor Value (F0)	1.083	1.097	1.144	1.108
Corrected Values				
Corrected %CO2	10.31	11.12	10.35	10.59
Corrected %O2	9.74	8.69	9.06	9.16
Measured Fuel Factor Value (Corrected for CO) (Fo)	1.08	1.10	1.14	1.11

Fuel Factor QA

	Run 1	Run 2	Run 3	Average
Fo Low Range Value for Fuel Type of Coal	1.083	1.083	1.083	1.083
Fo High Range Value for Fuel Type of Coal	1.230	1.230	1.230	1.230
Fo Range Check	In Range	In Range	In Range	

Ultimate F Factor

Ultimate Analysis (Fuel) (Dry)	Run 1	Run 2	Run 3	Average
Percent Hydrogen (%H)	5.05	5.05	5.05	5.05
Percent Carbon (%C)	72.48	72.48	72.48	72.48
Percent Sulfur (%S)	0.43	0.43	0.43	0.43
Percent Nitrogen (%N)	1.10	1.10	1.10	1.10
Percent Oxygen (%O)	15.78	15.78	15.78	15.78
Percent Ash	5.17	5.17	5.17	5.17
Gross Caloric Value (GCV) (dry)	12627	12627	12627	12627
Determined F-Factor at 0% Oxygen and 68°F (Fd) (dscf/million BTU)	9694.8	9694.8	9694.8	9694.8

MEASURED DATA FROM TEST RUNS

Point Count	Run #	Run Time (min)	Orifice Delta H (in H2O)	DGM Temp IN (°F)	DGM Temp OUT (°F)	Average DGM Temp (°F)	Stack Temp (°F)
1	1	0	2.00	81	79	80.00	314
2	1	5	2.00	81	79	80.00	314
3	1	10	2.00	84	80	82.00	314
4	1	15	2.00	87	81	84.00	314
5	1	20	2.00	88	82	85.00	314
6	1	25	2.00	90	83	86.50	314
7	1	30	2.00	90	83	86.50	314
8	1	35	2.00	91	84	87.50	314
9	1	40	2.00	92	85	88.50	314
10	1	45	2.00	93	86	89.50	314
11	1	50	2.00	93	86	89.50	314
12	1	55	2.00	94	87	90.50	314
13	2	0	2.00	93	88	90.50	315
14	2	5	2.00	93	88	90.50	315
15	2	10	2.00	94	88	91.00	316
16	2	15	2.00	94	89	91.50	316
17	2	20	2.00	95	89	92.00	316
18	2	25	2.00	95	89	92.00	316
19	2	30	2.00	95	89	92.00	316
20	2	35	2.00	96	89	92.50	316
21	2	40	2.00	96	90	93.00	316
22	2	45	2.00	96	90	93.00	316
23	2	50	2.00	96	90	93.00	317
24	2	55	2.00	97	91	94.00	317
25	3	0	2.00	93	91	92.00	316
26	3	5	2.00	95	91	93.00	318
27	3	10	2.00	96	91	93.50	318
28	3	15	2.00	97	91	94.00	318
29	3	20	2.00	97	91	94.00	318
30	3	25	2.00	97	91	94.00	318
31	3	30	2.00	97	92	94.50	318
32	3	35	2.00	98	92	95.00	318
33	3	40	2.00	98	92	95.00	319
34	3	45	2.00	98	92	95.00	319
35	3	50	2.00	98	92	95.00	319
36	3	55	2.00	98	92	95.00	320

TEST DATA - EPA Method 3A (O_2)

Number of Concentration Runs: 3

Analyzer Calibration

	Run 1	Run 2	Run 3	Average
Actual Concentration of the Mid-Level Calibration Gas (%)	9.728	9.728	9.728	9.73
Actual Concentration of the High-Level Calibration Gas (%)	20.48	20.48	20.48	20.48
Analyzer Span During Test Run (%)	20.48	20.48	20.48	20.48
Calibration Gas QA	**GOOD**	**GOOD**	**GOOD**	
Analyzer Calibration Response for Zero Gas (%)	0.05	0.05	0.05	0.05
Analyzer Calibration Response for Mid-Level Gas (%)	9.76	9.76	9.76	9.76
Analyzer Calibration Response for High Level Gas (%)	20.47	20.47	20.47	20.47
Initial System Calibration Response for Zero Gas (%)	0.05	0.05	0.05	0.05
Initial System Calibration Response for Upscale Gas (%)	9.76	9.76	9.76	9.76
Final System Calibration Response for Zero Gas (%)	0.03	0.03	0.03	0.03
Final System Calibration Response for Upscale Gas (%)	9.70	9.70	9.70	9.70

Analyzer Calibration QA

	Run 1	Run 2	Run 3	Average
Initial System Calibration Bias for Zero Gas (% of Span)	0.00	0.00	0.00	0.00
Initial System Calibration Bias for Upscale Gas (% of Span)	0.00	0.00	0.00	0.00
Final System Calibration Bias for Zero Gas (% of Span)	-0.10	-0.10	-0.10	-0.10
Final System Calibration Bias for Upscale Gas (% of Span)	-0.29	-0.29	-0.29	-0.29
System Drift for Zero Gas (% of Span)	-0.10	-0.10	-0.10	-0.10
System Drift for Upscale Gas (% of Span)	-0.29	-0.29	-0.29	-0.29
Analyzer Calibration Error for Zero Gas (% of Span)	0.24	0.24	0.24	0.24
Analyzer Calibration Error for Mid-Level Gas (% of Span)	0.16	0.16	0.16	0.16
Analyzer Calibration Error for High-Level Gas (% of Span)	-0.05	-0.05	-0.05	-0.05

CONCENTRATION CALCULATIONS - DRY SYSTEM

Calculate the Average Effluent Oxygen O_2 Concentration

	Run 1	Run 2	Run 3	Average
Average O_2 Concentration Indicated by Gas Analyzer, dry basis (%-dry)	9.74	8.70	9.06	9.17
Average of Initial and Final System Calibration Bias Check Responses for the Zero Gas (%)	0.04	0.04	0.04	0.04
Average of Initial and Final System Calibration Bias Check Responses for the Upscale Calibration Gas (%)	9.73	9.73	9.73	9.73
Average Effluent O_2 Concentration, dry basis (%-dry)	9.74	8.69	9.06	9.16

TEST DATA - EPA Method 3A (CO_2)

Number of Concentration Runs: 3

Analyzer Calibration

	Run 1	Run 2	Run 3	Average
Actual Concentration of the Mid-Level Calibration Gas (%)	10.11	10.11	10.11	10.11
Actual Concentration of the High-Level Calibration Gas (%)	20.65	20.65	20.65	20.65
Analyzer Span During Test Run (%)	20.65	20.65	20.65	20.65
Calibration Gas QA	**GOOD**	**GOOD**	**GOOD**	
Analyzer Calibration Response for Zero Gas (%)	0.05	0.05	0.05	0.05
Analyzer Calibration Response for Mid-Level Gas (%)	10.44	10.44	10.44	10.44
Analyzer Calibration Response for High Level Gas (%)	20.74	20.74	20.74	20.74
Initial System Calibration Response for Zero Gas (%)	0.05	0.05	0.05	0.05
Initial System Calibration Response for Upscale Gas (%)	10.44	10.44	10.44	10.44
Final System Calibration Response for Zero Gas (%)	0.10	0.10	0.10	0.10
Final System Calibration Response for Upscale Gas (%)	10.47	10.47	10.47	10.47

Analyzer Calibration QA

	Run 1	Run 2	Run 3	Average
Initial System Calibration Bias for Zero Gas (% of Span)	0.00	0.00	0.00	0.00
Initial System Calibration Bias for Upscale Gas (% of Span)	0.00	0.00	0.00	0.00
Final System Calibration Bias for Zero Gas (% of Span)	0.24	0.24	0.24	0.24
Final System Calibration Bias for Upscale Gas (% of Span)	0.15	0.15	0.15	0.15
System Drift for Zero Gas (% of Span)	0.24	0.24	0.24	0.24
System Drift for Upscale Gas (% of Span)	0.15	0.15	0.15	0.15
Analyzer Calibration Error for Zero Gas (% of Span)	0.24	0.24	0.24	0.24
Analyzer Calibration Error for Mid-Level Gas (% of Span)	1.60	1.60	1.60	1.60
Analyzer Calibration Error for High-Level Gas (% of Span)	0.44	0.44	0.44	0.44

CONCENTRATION CALCULATIONS - DRY SYSTEM

Calculate the Average Effluent Carbon Dioxide CO_2 Concentration

	Run 1	Run 2	Run 3	Average
Average CO_2 Concentration Indicated by Gas Analyzer, dry basis (%)	10.66	11.50	10.70	10.95
Average of Initial and Final System Calibration Bias Check Responses for the Zero Gas (%)	0.08	0.08	0.08	0.08
Average of Initial and Final System Calibration Bias Check Responses for the Upscale Calibration Gas (%)	10.46	10.46	10.46	10.46
Average Effluent CO_2 Concentration, dry basis (%)	10.31	11.12	10.35	10.59

TEST DATA - EPA Method 26A

DETAILED RESULTS

Emission Results:	Run 1	Run 2	Run 3	Average
Hydrogen Chloride (HCl) Emission Rate (lb/MMBtu)	0.00050	0.00038	0.00066	0.00051

LAB RESULTS HCL	Run 1	Run 2	Run 3	Average
HCl Total Mass in sample, (mHCl) (mg)	0.557	0.452	0.771	0.593
Volume of Dry Gas Sampled at Standard Conditions (Vmstdm) (dscm)	1.25	1.24	1.24	1.24
HCl Concentration, dry basis (ConcHCl) (mg/dscm)	0.44	0.37	0.62	0.48
HCl Concentration (ppmvd) Dry @ 68°F	0.29	0.24	0.41	0.31
HCl Concentration (ppmvw) Wet @ 68°F	0.26	0.21	0.36	0.28

US EPA Method 1 Traverse Point Determination - Performed on July 8, 2021

Relative Port Location	N	E	S	W
From Far Wall to Outside of Port (in.)	315.0	315.0	315.0	315.0
Nipple Length or Wall Thickness (in.)	9.0	9.0	9.0	9.0
Port Protrusion Length (opt) (in.)	0.0	0.0	0.0	0.0
Depth of Stack or Duct (in.)	306.0	306.0	306.0	306.0
Stack or Duct Type	Circular			
Port Hole Inner Diameter (in.)	–			
Stack or Duct Width (If Rectangular) (in.)				
Stack Outer Circumference (in.)				
Number of Ports Traversed	4			
Elevation of Meter Box from Ground Level (ft)	500			
Elevation of Ports from Ground Level (ft)	1000			
Stack Build-up (in.)	0.0			
Stack Cross-Sectional Diameter 1 (in)	306.0			
Stack Cross-Sectional Diameter 2 (in)	306.0			

Note:

Add nipple protrusion length to Point 1 only.
Actual nipple length = (length - protrusion)

Relocate to a distance equal to the inside diameter of the nozzle being used or to the above minimum distances, whichever is larger.

This Stack having a diameter greater than 24-inches, shall have no traverse points located within 1.0-inch of the stack wall.

"Vertical" or "Horizontal" Flow	Vertical
Direction of Flow	Up
"Velocity" or "Isokinetic" Traverse	Velocity

Port Distance Upstream from Flow Disturbance (in.)	1920.0
Diameters Upstream from Flow Disturbance (^{3} 0.5 De)	6.3
Minimum Traverse Points Needed for a Velocity Traverse *	12
Minimum Traverse Points Needed for a Isokinetic Traverse *	12

Port Distance Downstream from Flow Disturbance (in.)	4920.0
Diameters Downstream from Flow Disturbance (^{3} 2.0 De)	16.1
Minimum Traverse Points Needed for a Velocity Traverse *	12
Minimum Traverse Points Needed for a Isokinetic Traverse *	12

Minimum Traverse Points per Method 1	12
Number of Traverse Points for this Circular Stack or Duct	12
Point Overide	

Duct Area - in^2	73541.54
Duct Area - ft^2	510.7052

Port	Point	% of Duct Depth	Dist. From Inside Wall (Decimal)	Dist. From Outside Wall (Decimal)
1	1	4.4	13.5	22.5
1	2	14.6	44.7	53.7
1	3	29.6	90.6	99.6
2	1	4.4	13.5	22.5
2	2	14.6	44.7	53.7
2	3	29.6	90.6	99.6
3	1	4.4	13.5	22.5
3	2	14.6	44.7	53.7
3	3	29.6	90.6	99.6
4	1	4.4	13.5	22.5
4	2	14.6	44.7	53.7
4	3	29.6	90.6	99.6

MONTROSE
AIR QUALITY SERVICES

Sample Recovery & Calibration Check Datasheet

Page 1 of 1

Project Information

Date 9-20-21 Project # 011077

Customer / Facility DTE / BRPP

Unit ID / Sample Location Unit 2

Run # 1 Operator SJ

Equipment Identification

Ref. Thermometer 5

Hygrometer

Field Balance 23353092

Check Weights 5

Calipers

Balance Audit (Field balance must be within 0.5g of check weight mass)

Date	9-20-21		
Standard mass, g	500.0		
Field balance mass, g	499.7		

Ambient Conditions (Mobile Lab)

Relative humidity, %

Temperature, °F

Mobile lab #

Moisture Determination

SJ 9-20-21

		Run1			Run 2			Run 3		
	Contents	Initial	Final	Net	Initial	Final	Net	Initial	Final	Net
Knockout					758.9					
Impinger 1	N H_2SO_4	762.8	810.0	47.2	~~758.9~~	788.0	29.1	767.1	844.2	77.1
Impinger 2	"	749.3	790.2	40.9	761.6	807.4	45.8	752.6	780.9	28.3
Impinger 3	MT	650.1	662.1	12.0	656.1	675.5	19.4	662.1	666.9	4.8
Impinger 4										
Impinger 5										
Impinger 6										
Impinger 7										
Impinger 8										
Silica Gel		964.0	980.4	16.4	945.2	964.9	19.7	980.4	989.4	9.0
Line Rinse										
Train Net Gain (Vlc)				116.5			114			119.2

Nozzle Measurements (Difference between any two measurements must not be more than 0.004 in (0.1 mm))

Nozzle 1 diameters ___ D1 ___ D2 ___ D3 ___ Average

Nozzle 2 diameters ___ D1 ___ D2 ___ D3 ___ Average

Nozzle 3 diameters ___ D1 ___ D2 ___ D3 ___ Average

Nozzle Material ☐ quartz ☐ glass ☐ steel ☐ titanium ☐ inconel ☐ other

Probe Type ☑ heated ☐ unheated ☐ air-cooled ☐ water-cooled ☐ other

Probe Liner ☐ quartz ☑ glass ☐ steel ☐ Teflon ☐ other

Filter Information

Front Half: ☐ quartz fiber ☐ glass fiber ☑ Teflon ☐ Teflon/quartz ☐ other

Filter Number: Run 1: Run 2: Run 3: Run :

Back Half: ☐ quartz fiber ☐ glass fiber ☐ Teflon ☐ Teflon/quartz ☐ other

Reagent Information

Type	Lot Number
Recovery DI:	4103302

Sample Observations

QA/QC Check: Completeness ✓ Legibility ✓ Accuracy ✓ Specifications ✓

Checked by: SJ Team Leader: SJ

001AS-QMS-FM-226

US EPA Method 4 Gravimetric Determination for Moisture
US EPA Method 26A Sampling Train

RUN 1

	Initial Tare	Final Tare	Net Weights
Impinger No. 1	**762.8**	**810.0**	47.2
Impinger No. 2	**749.3**	**790.2**	40.9
Impinger No. 3	**650.1**	**662.1**	12.0
		Total Condensed:	**100.1**
Silica Gel	**964.0**	**980.4**	16.4
		Total Absorbed:	**16.4**
		Overall Total:	**116.5**

RUN 2

	Initial Tare	Final Tare	Net Weights
Impinger No. 1	**758.9**	**788.0**	29.1
Impinger No. 2	**761.6**	**807.4**	45.8
Impinger No. 3	**656.1**	**675.5**	19.4
		Total Condensed:	**94.3**
Silica Gel	**945.2**	**964.9**	19.7
		Total Absorbed:	**19.7**
		Overall Total:	**114.0**

RUN 3

	Initial Tare	Final Tare	Net Weights
Impinger No. 1	**767.1**	**844.2**	77.1
Impinger No. 2	**752.6**	**780.9**	28.3
Impinger No. 3	**662.1**	**666.9**	4.8
		Total Condensed:	**110.2**
Silica Gel	**980.4**	**989.4**	9.0
		Total Absorbed:	**9.0**
		Overall Total:	**119.2**

MONTROSE
AIR QUALITY SERVICES

EPA Method 26A Field Datasheet (Isokinetic)

Page 1 of 1

Project Information
Date 9/20/21 Project # PROJ - 011077
Customer/Facility DTE Belle River
Unit ID/Sample Location Unit 2
Run # 1 Operator SD/MN

Sampling Conditions
Static Pressure, in. H_2O -2.1 Ambient Temp, °F 73
Barometric Pressure, in. Hg 30.10 Ref. Barometer ID NOAA
Wind Speed / Direction — Precipitation, Y / [✓ N] type
Probe / Filter Temp Range, °F 248 ≥ 273

ALT 011	TC ID:	Ambient °F	Ref. °F
Stack	S-D	73	73
Probe	S-D	73	73
Filter Box	HB3		
Filter Exit			
Meter outlet	MB3	73	73
Impinger Exit	FCl	73	73
Other			

Ref. Thermometer ID Cal 1 Kit 5
Continuity Check ☐ Continuity w/ Proper Polarity
Notes:

Sampling Equipment IDs
Meterbox ID MB3
Umbilical ID UMB 4
Nozzle ID
Pitot / Probe ID S-D
Manometer ID MB3
Sensitivity 10" H_2O

Calibration
Meterbox Y 1.018
Meterbox ΔH@, in. H_2O 1.84
Nozzle diameter, Dn, in. —
Pitot coefficient, Cp .84
Manometer zero and level ☒ yes
K-Factor

Equipment Checks	Pre	Mid	Post
Pitot (+), pass @ in. H_2O	☑ @ 3"	☐ @	☐ @
Pitot (-), pass @ in. H_2O	☑ @ 4"	☐ @	☐ @
Pitot visual inspection	☐ pass	☐ pass	☐ pass
Nozzle visual inspection	☐ pass	☐ pass	☐ pass
Meter, cfm @ in. Hg	0.000@15"	@	0.000@ 6"
Intermediate leak check volume, ft^3		/	/

Traverse Point #	Elapsed Time	Clock Time 24hr	DGM Reading, Vm, ft^3	Velocity Head, ΔP in H_2O	Orifice Pressure Differential, ΔH		Stack Temp, °F	Probe Temp, °F	Filter Temp, °F		Impinger Exit Temp, °F	Dry Gas Meter Temperature, °F			Pump Vacuum, in. Hg
					Target	Actual			Box	Exit		Inlet	Outlet		
	0	9:55	584.460		2.0	2.0	~~314~~	251	262		57	81	79		5
	5		588.26				314	250	264		51	81	79		5
	10		592.05				314	257	270		49	84	80		5
	15		595.82				314	249	260		51	87	81		5
	20		599.58				314	262	263		54	88	82		5
	25		603.33				314	259	251		58	90	83		5
	30		607.07				314	249	273		62	90	83		5
	35		610.83				314	250	258		59	91	84		5
	40		614.59				314	257	263		61	92	85		5
	45		618.37				314	253	260		61	93	86		5
	50		622.16				314	252	259		61	93	86		5
	55		625.94				314	270	263		61	94	87		5
	60	10:55	629.708		↓	↓	315	269	261		60	94	87		5
Averages															

QA/QC Check: Completeness ✓ Legibility ✓ Accuracy ✓ Specifications ✓ Checked By SJ Team Leader SJ

MONTROSE
AIR QUALITY SERVICES

EPA Method 26A Field Datasheet (Isokinetic)

Page 1 of 1

Project Information
Date 9/20/21 Project # PROJ- 011077
Customer/Facility DTE Belle River
Unit ID/Sample Location
Run # 2 Operator SP/MN

Sampling Conditions
Static Pressure, in. H_2O -2.1 Ambient Temp, °F 75°
Barometric Pressure, in. Hg 30.10 Ref. Barometer ID NOAA
Wind Speed / Direction — Precipitation, Y [✓ N] type
Probe / Filter Temp Range, °F 248z273

ALT 011	TC ID:	Ambient °F	Ref. °F
Stack	S'D	73	73
Probe	S'D	73	73
Filter Box	HB 3		
Filter Exit			
Meter outlet	MB3	73	73
Impinger Exit	FC2	73	73
Other			

Ref. Thermometer ID
Continuity Check ☐ Continuity w/ Proper Polarity
Notes:

Sampling Equipment IDs
Meterbox ID MB3
Umbilical ID UMB 4
Nozzle ID —
Pitot / Probe ID S-D
Manometer ID MB3
Sensitivity 10" H2O

Calibration
Meterbox Y 1.018
Meterbox ΔH@, in. H_2O 1.84
Nozzle diameter, Dn, in. —
Pitot coefficient, Cp .84
Manometer zero and level ☒ yes
K-Factor

Equipment Checks	Pre	Mid	Post
Pitot (+), pass @ in. H_2O	☐ @	☐ @	☐ @
Pitot (-), pass @ in. H_2O	☐ @	☐ @	☐ @
Pitot visual inspection	☐ pass	☐ pass	☐ pass
Nozzle visual inspection	☐ pass	☐ pass	☐ pass
Meter, cfm @ in. Hg	0.000 @ 15"	@	.000 @ 6"
Intermediate leak check volume, ft^3		/	/

Traverse Point #	Elapsed Time	Clock Time 24hr	DGM Reading, Vm, ft^3	Velocity Head, ΔP in H_2O	Orifice Pressure Differential, ΔH		Stack Temp, °F	Probe Temp, °F	Filter Temp, °F		Impinger Exit Temp, °F	Dry Gas Meter Temperature, °F			Pump Vacuum, in. Hg
					Target	Actual			Box	Exit		Inlet	Outlet		
	0	11:00	629.858		2.0	2.0	315	250	260		59	93	88		5
	5		633.70				315	251	260		56	93	88		5
	10		637.49				316	255	261		53	94	88		5
	15		641.26				316	271	261		54	94	89		5
	20		645.02				316	258	259		59	95	89		5
	25		648.75				316	271	260		63	95	89		5
	30		652.47				316	270	260		64	95	89		5
	35		656.22				316	269	259		64	96	89		5
	40		659.95				316	264	260		65	96	90		5
	45		663.69				316	269	258		64	96	90		5
	50		667.43				317	271	260		64	96	90		5
	55		671.21				317	272	260		65	97	91		5
	60	12:00	674.998				317	265	259		66	97	91		5
Averages															

QA/QC Check: Completeness ✓ Legibility ✓ Accuracy ✓ Specifications ✓ Checked By SJ Team Leader SJ

MONTROSE
AIR QUALITY SERVICES

EPA Method 26A Field Datasheet (Isokinetic)

Page 1 of 1

Project Information

Date 9/20/21 Project # PROJ-011077

Customer/Facility DTE Belle River

Unit ID/Sample Location Unit 2

Run # 3 Operator SP/MN

Sampling Conditions

Static Pressure, in. H_2O -2.1 Ambient Temp, °F 77°

Barometric Pressure, in. Hg 30.10 Ref. Barometer ID NOAA

Wind Speed / Direction — Precipitation, Y / [✓ N] type

Probe / Filter Temp Range, °F 248 ≥ 273

ALT 011	TC ID:	Ambient °F	Ref. °F
Stack			
Probe			
Filter Box	Sec R1		
Filter Exit			
Meter outlet			
Impinger Exit			
Other			

Ref. Thermometer ID

Continuity Check ☐ Continuity w/ Proper Polarity

Notes:

Sampling Equipment IDs

Meterbox ID MB3

Umbilical ID UMB4

Nozzle ID —

Pitot / Probe ID S-D

Manometer ID MB3

Sensitivity 10" H_2O

Calibration

Meterbox Y 1.018

Meterbox ΔH@, in. H_2O 1.84

Nozzle diameter, Dn, in. —

Pitot coefficient, Cp .84

Manometer zero and level ☒ yes

K-Factor

Equipment Checks	Pre	Mid	Post
Pitot (+), pass @ in. H_2O	☐ @	☐ @	☐ @
Pitot (-), pass @ in. H_2O	☐ @	☐ @	☐ @
Pitot visual inspection	☐ pass	☐ pass	☐ pass
Nozzle visual inspection	☐ pass	☐ pass	☐ pass
Meter, cfm @ in. Hg	0.000 @ 14"	@	0.000 @ 6"
Intermediate leak check volume, ft³	/	/	

Traverse Point #	Elapsed Time	Clock Time 24hr	DGM Reading, Vm, ft³	Velocity Head, ΔP in H_2O	Orifice Pressure Differential, ΔH		Stack Temp, °F	Probe Temp, °F	Filter Temp, °F		Impinger Exit Temp, °F	Dry Gas Meter Temperature, °F			Pump Vacuum, in. Hg
					Target	Actual			Box	Exit		Inlet	Outlet		
	0	12:05	675.138		2.0	2.0	316	254	260		64	93	91		5
	5		678.94				318	263	259		46	95	91		5
	10		682.72				318	270	262		43	96	91		5
	15		686.51				318	253	260		44	97	91		5
	20		690.27				318	264	261		45	97	91		5
	25		694.03				318	270	261		45	97	91		5
	30		697.80				318	250	259		46	97	92		5
	35		701.55				318	259	259		48	98	92		5
	40		705.34				319	259	260		48	98	92		5
	45		709.17				319	252	261		48	98	92		5
	50		713.00				319	266	260		49	98	92		5
	55		716.84				320	255	260		49	98	92		5
	60	13:05	720.677		↓	↓	320	261	262		49	98	92		5
Averages															

QA/QC Check: Completeness ✓ Legibility ✓ Accuracy ✓ Specifications ✓ Checked By SJ Team Leader SJ

MAQS CEM Calibration Field Data Sheet

Page 1 of 1

Client DTE BRPP

Date 9-21-21

Analyzer #'s A

Operator SS

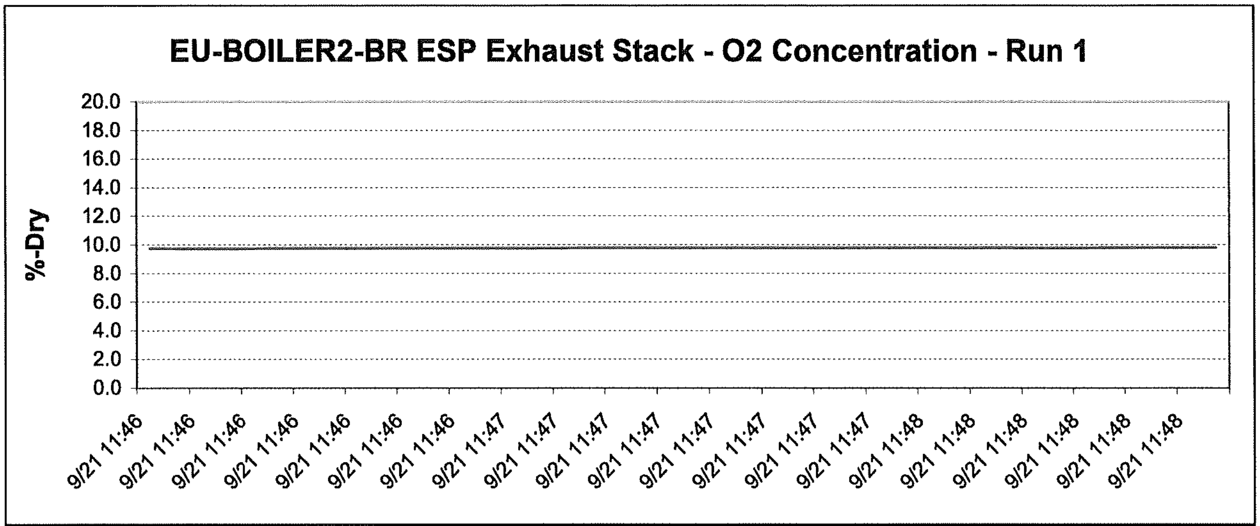
Sampling Location **Unit 2**

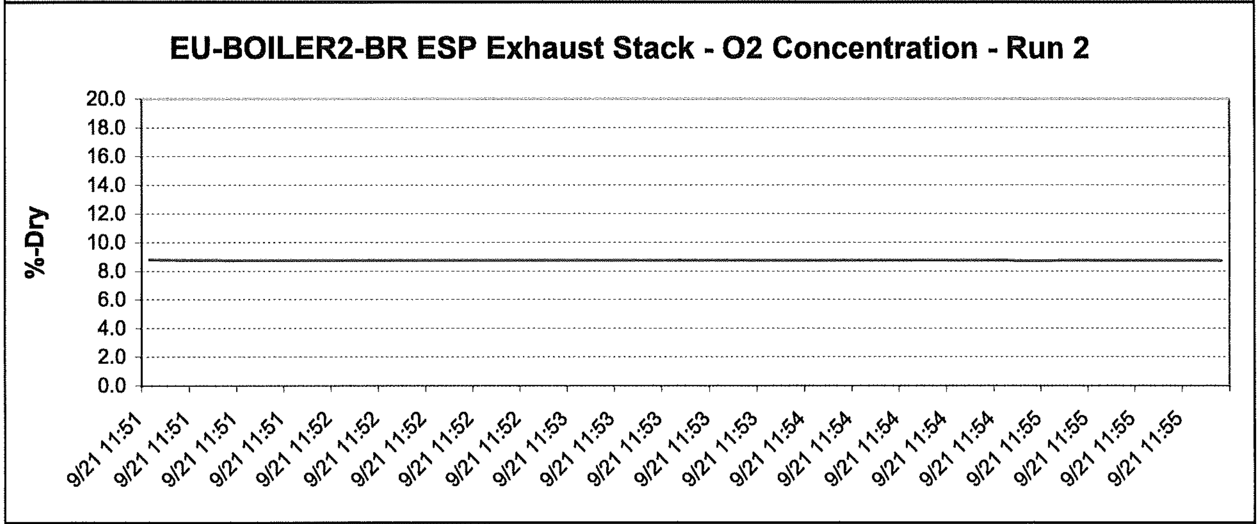
Range						
Cyinder Values	20.48 9.729	20.65 10.11				Environics # yes / [✓ no]
Time	Pollutant O^2	Pollutant CO^2	Pollutant	Pollutant	Pollutant	Notes: Run/Cal Info & File Name
1130	.04	.05				* 9-21-21 Precal
1133	20.46	20.71				
1137	9.76	10.44				
	9.7	10.6				* Run 1
	8.7	11.5				* run 2
	9.0	10.7				* run 3
1206	9.66	10.46				* Post cal
1206	.02	.09				

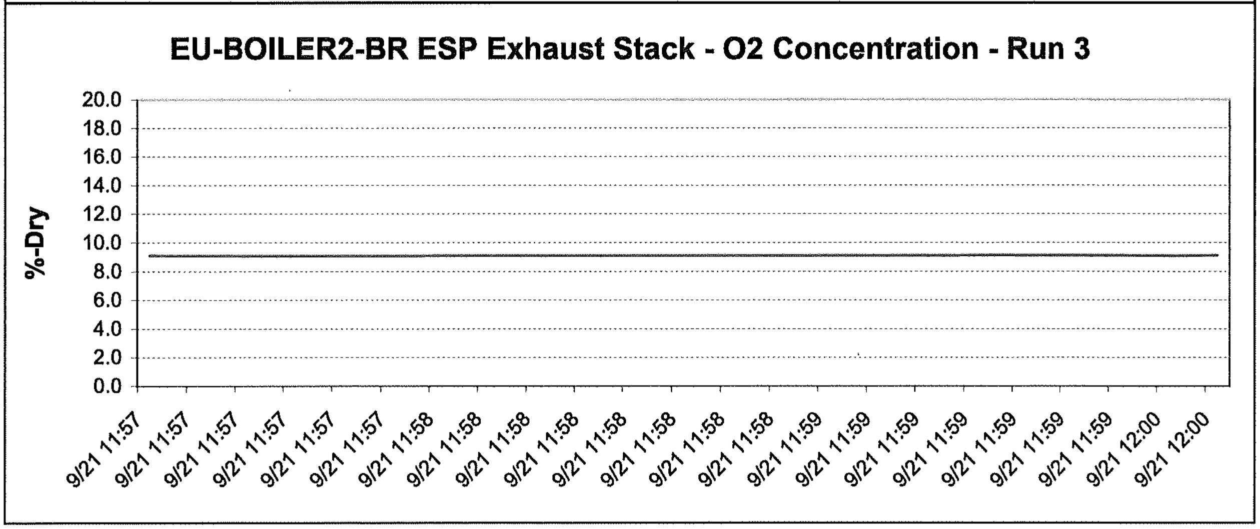
Cylinder Serial Numbers

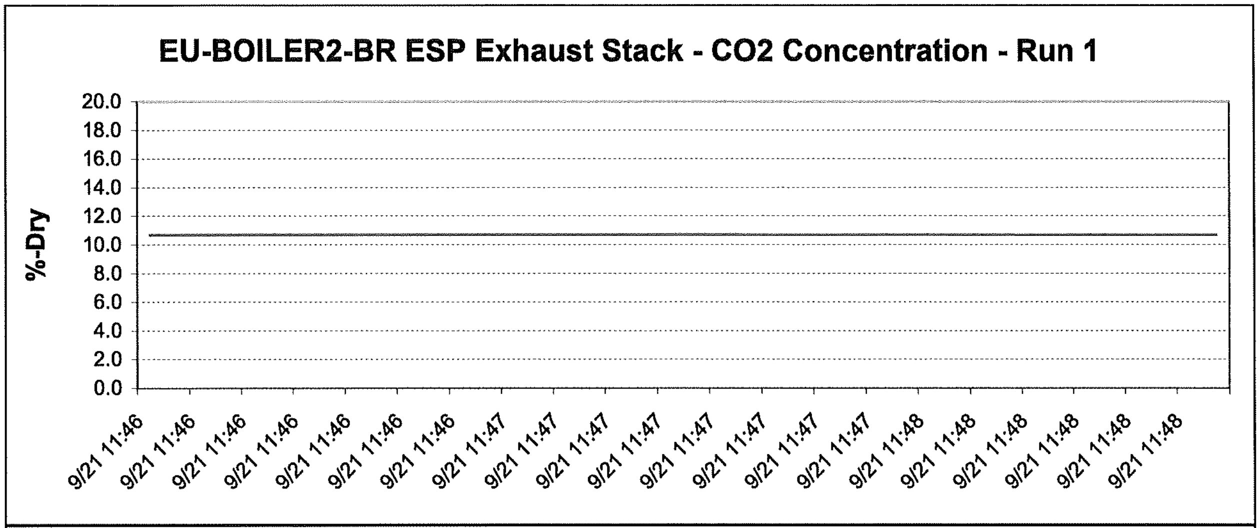
Revision 3.0
KL 1/6/14

	O^2	CO^2
Precal	.05	.05
	9.76	10.44
	20.47	20.74
r1	9.74	10.60
r2	8.70	11.50
r3	9.06	10.7
Postcal	.03	0.10
	9.7	10.47

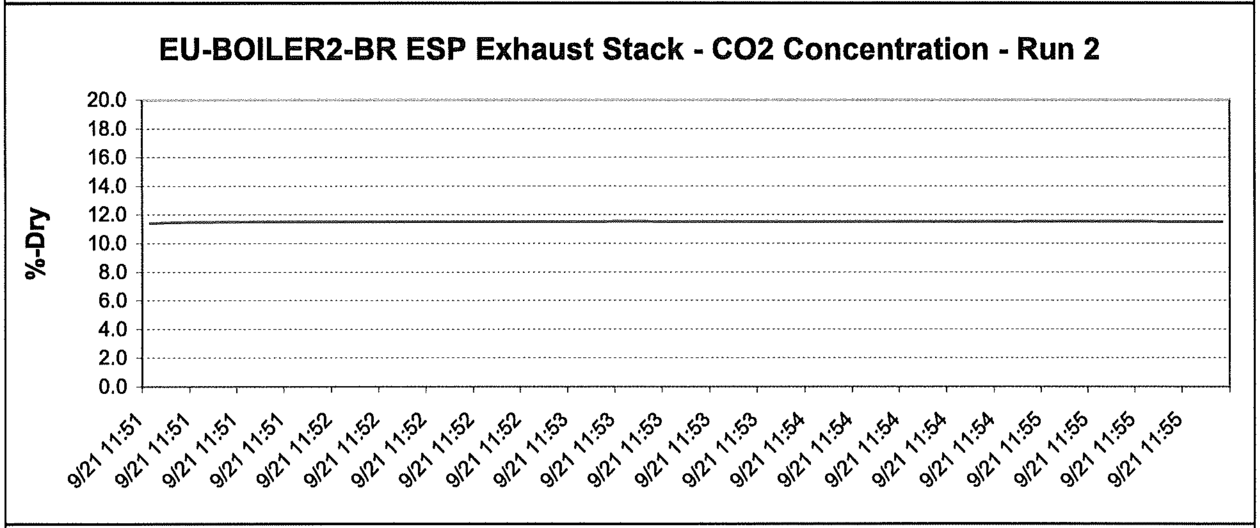

EU-BOILER2-BR ESP Exhaust Stack - O2 Concentration - Run 1
%-Dry
20.0
18.0
16.0
14.0
12.0
10.0
8.0
6.0
4.0
2.0
0.0
9/21 11:46
9/21 11:46
9/21 11:46
9/21 11:46
9/21 11:46
9/21 11:46
9/21 11:46
9/21 11:47
9/21 11:47
9/21 11:47
9/21 11:47
9/21 11:47
9/21 11:47
9/21 11:47
9/21 11:47
9/21 11:48
9/21 11:48
9/21 11:48
9/21 11:48
9/21 11:48
9/21 11:48


EU-BOILER2-BR ESP Exhaust Stack - O2 Concentration - Run 2
%-Dry
20.0
18.0
16.0
14.0
12.0
10.0
8.0
6.0
4.0
2.0
0.0
9/21 11:51
9/21 11:51
9/21 11:51
9/21 11:51
9/21 11:52
9/21 11:52
9/21 11:52
9/21 11:52
9/21 11:52
9/21 11:53
9/21 11:53
9/21 11:53
9/21 11:53
9/21 11:53
9/21 11:54
9/21 11:54
9/21 11:54
9/21 11:54
9/21 11:54
9/21 11:55
9/21 11:55
9/21 11:55
9/21 11:55

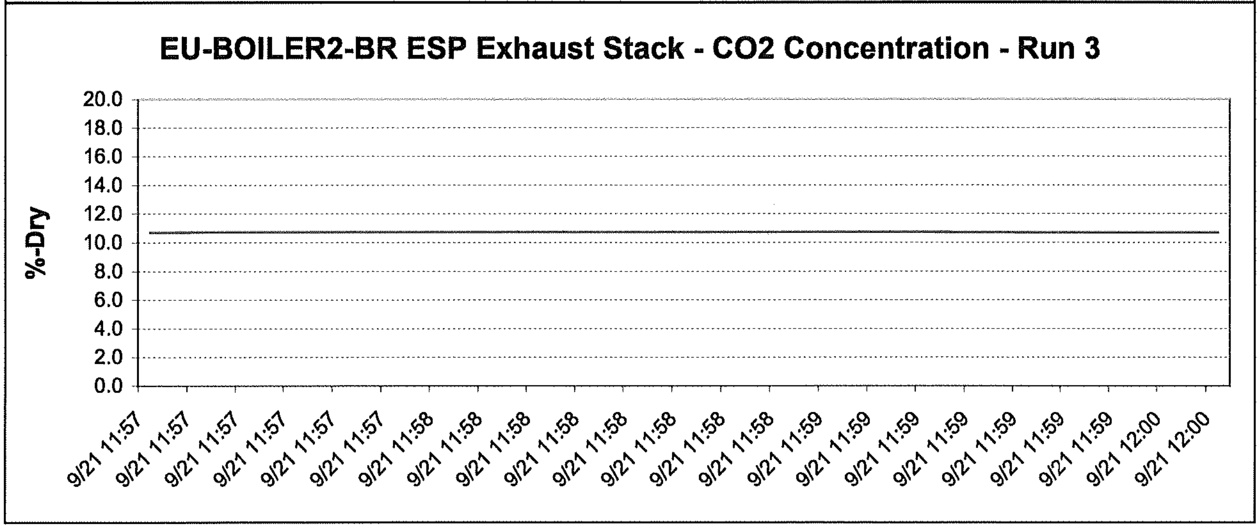

EU-BOILER2-BR ESP Exhaust Stack - O2 Concentration - Run 3
%-Dry
20.0
18.0
16.0
14.0
12.0
10.0
8.0
6.0
4.0
2.0
0.0
9/21 11:57
9/21 11:57
9/21 11:57
9/21 11:57
9/21 11:57
9/21 11:57
9/21 11:58
9/21 11:58
9/21 11:58
9/21 11:58
9/21 11:58
9/21 11:58
9/21 11:58
9/21 11:58
9/21 11:59
9/21 11:59
9/21 11:59
9/21 11:59
9/21 11:59
9/21 11:59
9/21 11:59
9/21 12:00
9/21 12:00



EU-BOILER2-BR ESP Exhaust Stack - CO2 Concentration - Run 1



EU-BOILER2-BR ESP Exhaust Stack - CO2 Concentration - Run 2



EU-BOILER2-BR ESP Exhaust Stack - CO2 Concentration - Run 3

Appendix A.3
Example Calculations

EPA Methods 3A, 4, and 26A Nomenclature and Sample Calculations

Run No. - 1

Constants

CO_2F_{wt}= 44.0
O_2F_{wt}= 32.0
CON_2F_{wt}= 28.0
H_2OF_{wt}= 18.015
ArF_{wt}= 40.0

in wg= 0.073529
gr= 0.000142857
mmBtu= 1000000 Btu
CF_{wt}= 12.011
PF_{wt}= 44.0962

NO_2F_{wt}= 46.01
COF_{wt}= 28.01
$H_2SO_4F_{wt}$= 98.08
T_{std}= 527.67

$HClF_{wt}$= 36.46
SO_2F_{wt}= 64.06
Cl_2F_{wt}= 70.91
P_{std}= 29.92

Stack Variables

P_{bar} =	30.10	in. Hg	barometric pressure
E_{box} =	500	ft	elevation difference between ground level and meter box
E_{sam} =	1000	ft	elevation difference between ground level and sampling ports
γ =	1.0180		gamma, dry gas meter calibration factor (dimensionless)
θ =	60.0	min	net run time (minutes)
V_{lc} =	116.5	g	total mass of liquid collected in impingers (g)
$\%CO_2$ =	10.31	%	percent CO_2 by volume (dry basis) (dimensionless)
$\%O_2$ =	9.74	%	percent O_2 by volume (dry basis) (dimensionless)
$\%N_2$ =	79.96	%	percent N_2 by volume (dry basis) (dimensionless)
A =	510.7052	ft^2	stack cross-sectional area
T_{savg} =	774.00	R	average absolute flue gas temperature (460R+tsavg °F)
ΔH =	2.00	in. wg	average pressure differential of orifice meter
T_m =	545.79	R	dry gas meter temperature (460R+tsavg °F)
V_m =	45.25	ft^3	volume of metered gas sample (dry actual cubic feet)
F_d =	9694.8365	ft^3/mmBtu	F-factor, dry standard cubic feet per million BTU

Calculated Stack Variables

Barometric pressure at sampling location

NOTE: Barometric pressure recorded at ground level

$$P_{sam} = P_{bar} - [(E_{sam} / 100 \text{ ft}) * 0.1 \text{ in. Hg}]$$

$$P_{sam} = 30.10 - ((1{,}000.0 / 100) * 0.1)$$

$$P_{sam} = 29.10 \text{ in. Hg}$$

Volume of dry gas sampled at standard conditions (dscf)

$$V_{mstd} = \gamma * Vm * [P_{bar} - ([(E_{box} / 100 \text{ ft}) * 0.1 \text{ in. Hg}] + (\Delta H / 13.6)) / P_{std}] * (T_{std} / T_m)$$

$$V_{mstd} = 1.0180 * 45.248 * ((30.10 - ((500.0 / 100) * 0.1) + (2.0000 / 13.6)) / 29.92) * (527.7 / 545.792)$$

$$V_{mstd} = 44.276 \text{ ft}^3$$

Volume of water vapor at standard conditions (68 °F, scf)

$$V_{wstd} = (0.04716 \text{ ft}^3/\text{g}) * Vlc$$

$$V_{wstd} = (0.04716 * 116.5)$$

$$V_{wstd} = 5.5 \text{ ft}^3$$

Percent moisture by volume as measured in flue gas

$\%H_2O$ (Measured) = 100 * [V_{wstd} / (V_{wstd} + V_{mstd})]

$\%H_2O$ (Measured) = 100 * (5.494 / (5.494 + 44.276))

$\%H_2O$ (Measured) = 11.04

$\%H_2O$ = 11.04

Dry mole fraction of flue gas (dimensionless)

M_{fd} = 1 - ($\%H_2O$ / 100)

M_{fd} = 1 - (11.04 / 100)

M_{fd} = 0.890

Dry molecular weight of flue gas (lb/lb-mole)

M_d = [($\%CO_2$ / 100) * 44.0] + [($\%O_2$ / 100) * 32.0] + [((100 - $\%CO_2$ - $\%O_2$) / 100) * 28.0]

M_d = ((10.31 / 100) * 44.0) + ((9.74 / 100) * 32.0) + (((100 - 10.31 - 9.74) / 100) * 28.0)

M_d = 30.04 lb/lb-mole

M_d = 30.04

Wet molecular weight of flue gas (lb/lb-mole)

M_s = M_d * M_{fd} + (H_2OF_{wt} * ($\%H_2O$ / 100))

M_s = 30.039 * 0.890 + 18.02 * (11.04 / 100)

M_s = 28.71 lb/lb-mole

Percent Excess Air

%EA = [$\%O_2$ - (0.5) * %CO] / [0.264 * (100 - $\%CO_2$ - $\%O_2$) - ($\%O_2$ - 0.5 * %CO)]

%EA = ((9.74 - (0.5) * 0.00) / (0.264 * (100 - 10.31 - 9.74) - (9.74 - 0.5 * 0.00))) * 100

%EA = 85.62 %

Method 26A Calculations

HCl concentration (ppmvd)

HClppmvd = 0.29 ppmvd

HCl mass emission rate (lb/MMBtu)

$MERHCl_{lbMMBtu}$ = (((ConcHClppwvd_1 * 36.461 * ultFd_1) / (385.3 * 10 ^ 6)) * (20.9 / (20.9 - O2_1)))

$MERHCl_{lbMMBtu}$ = 0.00050 lb/MMBtu