1.0 INTRODUCTION

1.1 SUMMARY OF TEST PROGRAM

DTE-St. Clair Power Plant (SCPP) (State Registration Number: B2796) contracted Montrose Air Quality Services, LLC (Montrose) to perform a compliance test program on the Coal-Fired Boiler No. 7 (EU-BOILER7-SC) at the DTE-SCPP facility located in East China Township, Michigan. Testing was performed on September 28, 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-BOILER7-SC
- 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)
9/28/2021	EU-BOILER7-SC	Moisture	EPA 4	3	60
9/28/2021	EU-BOILER7-SC	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-BOILER7-SC
SEPTEMBER 28, 2021

Parameter/Units	Average Results	Emission Limits
Hydrogen Chloride (HCl)		
lb/MMBtu	0.0022	0.0020

1.2 KEY PERSONNEL

A list of project participants is included below:

Facility Information

Source Location:	DTE-St. Clair Power Plant 4400 River Road East China, MI 48054	
Project Contact:	Mark Grigereit	Fred Meinecke
Role:	Principal Engineer	Sr. Environmental Technician
Company:	DTE	DTE
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	David Trahan
Title:	Client Project Manager	Field Project Manager
Telephone:	248-548-8070	248-548-8070
Email:	twessel@montrose-env.com	dtrahan@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
David Trahan	Montrose	Field Project Manager, QI
Michael Nummer	Montrose	Senior Field Technician
Mark Grigereit	DTE	Observer/Client Liaison

2.0 PLANT AND SAMPLING LOCATION DESCRIPTIONS

2.1 PROCESS DESCRIPTION, OPERATING, AND CONTROL EQUIPMENT

The DTE-SCPP employs the use of four coal-fired boilers (EU-BOILER2-SC, EU-BOILER6-SC, and EU-BOILER7-SC) to produce power throughout SE Michigan. Boiler No. 7 (EU-BOILER7-SC) is a combustion engineering boiler which operates as a base loaded unit capable of producing 3,580,000 pounds of steam per hour. The boiler's turbine generator was manufactured by Westinghouse and has a nominally rated capability of 460 MW.

EU-BOILER7-SC emissions are controlled by an American Standard ESP which has a collection efficiency of 99.6%. EU-BOILER7-SC 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		Number of Traverse Points
		Downstream EPA "B" (in./dia.)	Upstream EPA "A" (in./dia.)	
EU-BOILER7-SC ESP Exhaust Stack	192.0	3,384 / 17.6	3,192 / 16.6	Gaseous: 1

See Appendix A.1 for more information.

2.3 OPERATING CONDITIONS AND PROCESS DATA

Emission tests were performed while EU-BOILER7-SC 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 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 3-1.

3.1.2 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.

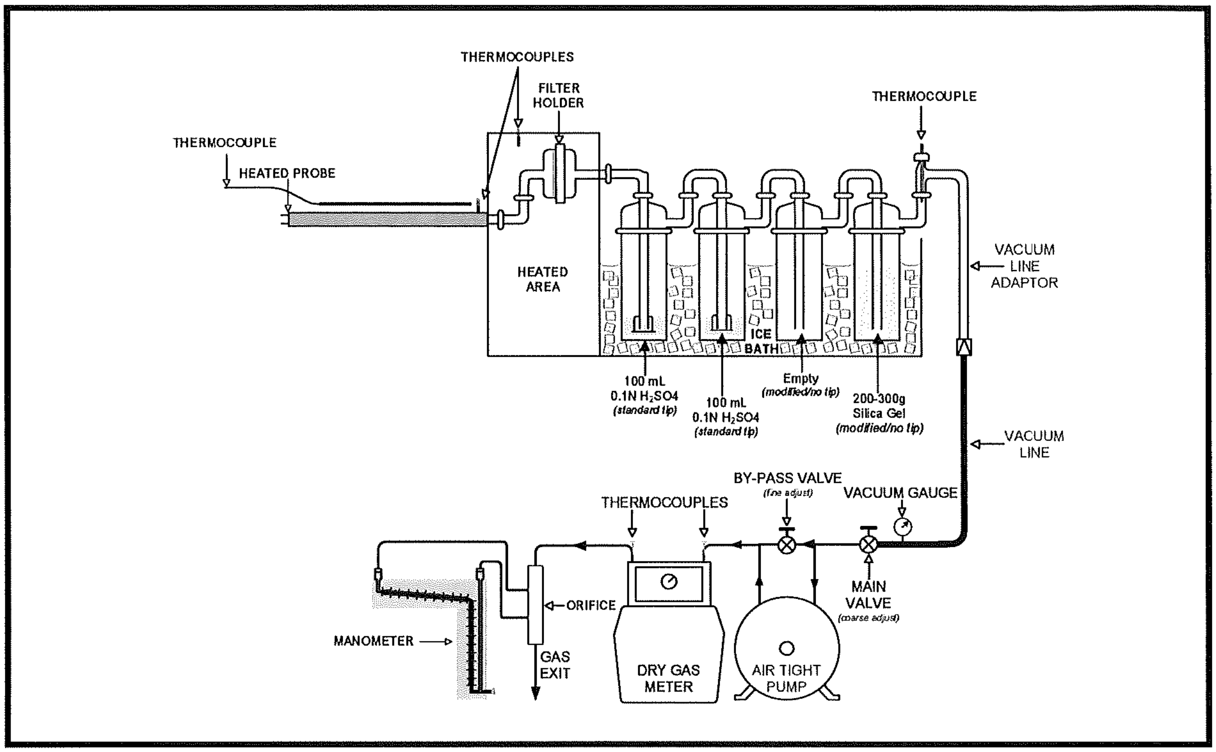
EPA Method 19 is used to calculate mass emission rates in units of lb/MMBtu. EPA Method 19, Table 19-2 contains a list of assigned fuel factors for different types of fuels, which can be used for these calculations.

3.1.3 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 3-1.

FIGURE 3-1
EPA METHOD 26 (HALIDES) SAMPLING TRAIN



3.2 PROCESS TEST METHODS

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

4.0 TEST DISCUSSION AND RESULTS

4.1 FIELD TEST DEVIATIONS AND EXCEPTIONS

Initially, EPA Method 3A was performed during this test event. However, the Run 3 oxygen (O_2) and carbon dioxide (CO_2) results were determined to be outside of the acceptable ratio. It was then decided that Montrose would use CO_2 data provided by DTE-Saint Clair Power Plant CEMS to determine the HCl emissions (lb/MMBtu).

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-BOILER7-SC

Run Number	1	2	3	Average
Date	9/28/2021	9/28/2021	9/28/2021	--
Time	11:10-12:10	12:25-13:25	13:35-14:35	--
Process Data				
F-Factor, scf/MMBtu	1843.2	1843.2	1843.2	1843.2
Flue Gas Parameters				
CO_2, % volume wet*	10.67	10.64	10.63	10.65
flue gas temperature, °F	276.0	275.4	275.0	275.5
moisture content, % volume	8.52	9.12	9.17	8.94
Hydrogen Chloride (HCl)				
ppmvw	1.35	1.24	1.37	1.32
lb/MMBtu	0.0022	0.0020	0.0023	0.0022

* The CO_2 % volume wet data was provided by facility personnel

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 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.

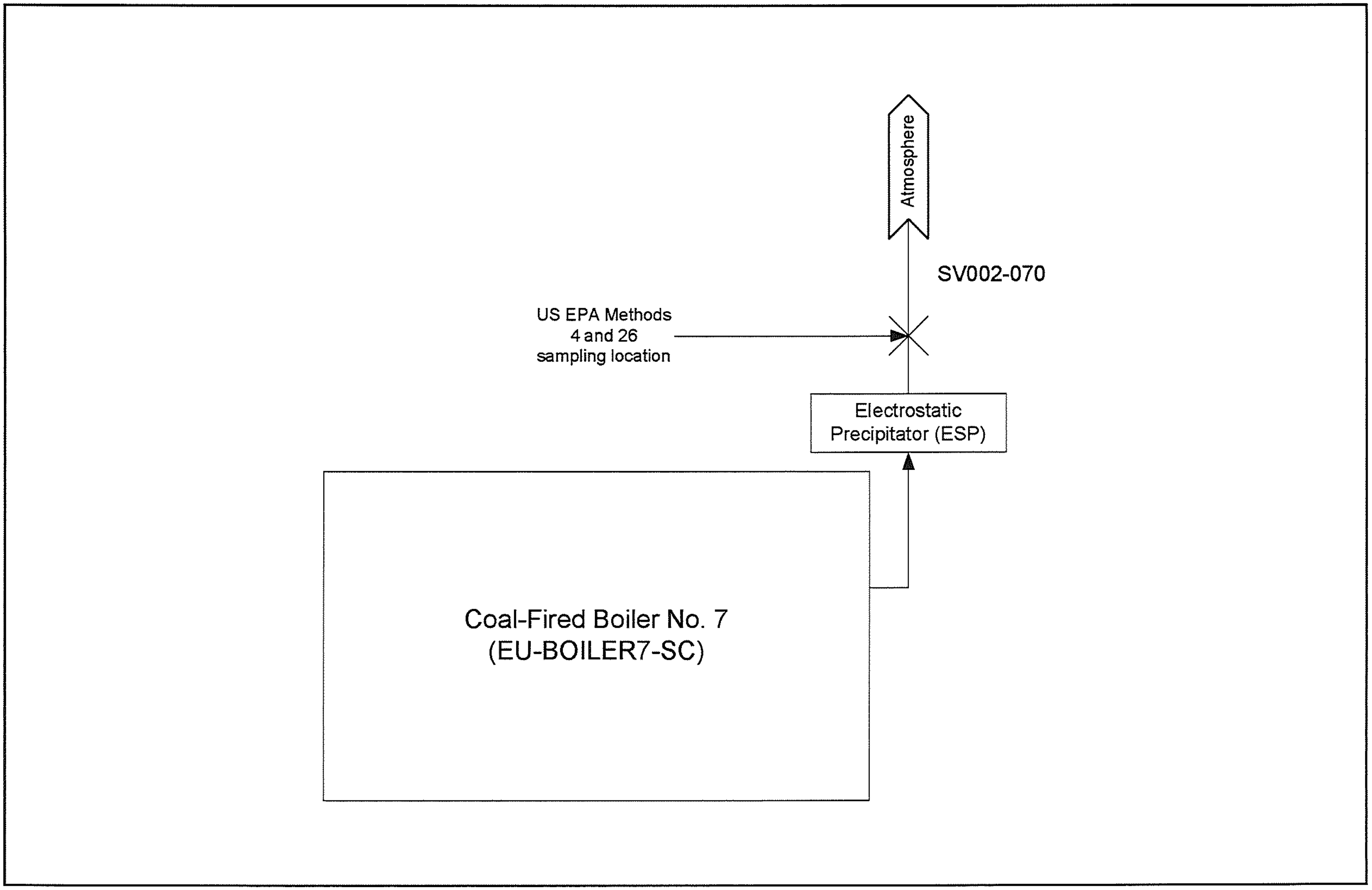
5.3 QUALITY STATEMENT

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-BOILER7-SC SAMPLING LOCATION SCHEMATIC



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Appendix A.2
EU-BOILER7-SC ESP Exhaust Stack Data Sheets

TEST DATA

	Run 1	Run 2	Run 3	Average
Number of Test Runs	3			
Traverse Points	12			
Stack Cross-Sectional Diameter 1 (**circular**) (in)	192.0	192.0	192.0	192.0
Stack Cross-Sectional Diameter 2 (**circular**) (in)	192.0	192.0	192.0	192.0
Barometric Pressure at Ground Level (Pbar) (in Hg)	30.01	30.03	30.02	30.02
Elevation Difference Between Ground Level and Meter Box Locations (ft)	580	580	580	580
Elevation Difference Between Ground Level and Sampling Locations (ft)	880	880	880	880
Initial Dry Gas Meter Reading (ft3)	454.880	500.190	546.100	
Final Dry Gas Meter Reading (ft3)	500.050	545.920	591.670	
Dry Gas Meter Calibration Factor (Gamma)	1.026	1.026	1.026	1.026
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)	80.0	81.8	85.7	82.5
Weight of Water Vapor Collected in Silica Gel (g)	8.3	13.8	9.9	10.7

Test Run Start Time (hrmin)	9/28/2021 11:10	9/28/2021 12:25	9/28/2021 13:35
Test Run Stop Time (hrmin)	9/28/2021 12:10	9/28/2021 13:25	9/28/2021 14:35

DETAILED RESULTS

Stack Gas Conditions

	Run 1	Run 2	Run 3	Average
Stack Cross-Sectional Area (A) (ft2)	201.06	201.06	201.06	201.06
Barometric Pressure at Sampling Location (in Hg)	29.13	29.15	29.14	29.14
Average Stack Gas Temperature (ts) (°F)	276.0	275.4	275.0	275.5
Average Stack Gas Temperature (Ts) (°R)	736.0	735.4	735.0	735.5
Percent by Volume Moisture as measured in Stack Gas (%H2O)	8.52	9.12	9.17	8.94

Test Results

	Run 1	Run 2	Run 3	Average
Volume of Dry Gas Sampled at Standard Conditions (Vmstd) (dscf)	44.691	44.950	44.648	44.763
Rate of Dry Gas Sampled at Standard Conditions (dscfm)	0.745	0.749	0.744	0.746
Dry Mole Fraction of Flue Gas (Mfd)	0.915	0.909	0.908	0.911
Average Pressure Differential of Orifice Meter (Delta H) (in H2O)	2.00	2.00	2.00	2.00
Average DGM Temperature (tm) (°F)	80.9	84.8	86.4	84.1
Average Dry Gas Meter Temperature (Tm) (°R)	540.9	544.8	546.4	544.1
Volume of Metered Gas Sample (Vm) (dry) (acf)	45.170	45.730	45.570	45.490

SAMPLING QA

	Run 1	Run 2	Run 3	Average
Post-Test Meter Calibration Check Value (Yqa)	1.048	1.038	1.043	1.043
Post-Test/Pre-Test Calibration Factor Difference (%)	-2.10	-1.18	-1.70	-1.66
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)	44.691	44.950	44.648	44.763

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	

Ultimate F Factor

Ultimate Analysis (Fuel) (Dry)	Run 1	Run 2	Run 3	Average
Percent Hydrogen (%H)	4.74	4.74	4.74	4.74
Percent Carbon (%C)	72.70	72.70	72.70	72.70
Percent Sulfur (%S)	0.91	0.91	0.91	0.91
Percent Nitrogen (%N)	1.02	1.02	1.02	1.02
Percent Oxygen (%O)	14.85	14.85	14.85	14.85
Percent Ash	5.78	5.78	5.78	5.78
Gross Caloric Value (GCV) (dry)	12661	12661	12661	12661
Determined Fc Factor (scf/million BTU)	1843.2	1843.2	1843.2	1843.2

MEASURED DATA FROM TEST RUNS

Point Count	Run #	Run Time (min)	Orifice Delta H (in H2O)	DGM Temp OUT (°F)	Average DGM Temp (°F)	Stack Temp (°F)
1	1	0	2.00	79	79.00	277
2	1	5	2.00	79	79.00	277
3	1	10	2.00	79	79.00	276
4	1	15	2.00	80	80.00	276
5	1	20	2.00	80	80.00	276
6	1	25	2.00	80	80.00	276
7	1	30	2.00	81	81.00	276
8	1	35	2.00	82	82.00	276
9	1	40	2.00	82	82.00	276
10	1	45	2.00	82	82.00	276
11	1	50	2.00	83	83.00	276
12	1	55	2.00	84	84.00	274
13	2	0	2.00	84	84.00	275
14	2	5	2.00	84	84.00	276
15	2	10	2.00	84	84.00	276
16	2	15	2.00	84	84.00	276
17	2	20	2.00	84	84.00	276
18	2	25	2.00	85	85.00	275
19	2	30	2.00	85	85.00	276
20	2	35	2.00	85	85.00	274
21	2	40	2.00	85	85.00	276
22	2	45	2.00	86	86.00	275
23	2	50	2.00	86	86.00	275
24	2	55	2.00	86	86.00	275
25	3	0	2.00	86	86.00	275
26	3	5	2.00	86	86.00	275
27	3	10	2.00	86	86.00	276
28	3	15	2.00	86	86.00	276
29	3	20	2.00	86	86.00	276
30	3	25	2.00	86	86.00	275
31	3	30	2.00	86	86.00	275
32	3	35	2.00	87	87.00	275
33	3	40	2.00	87	87.00	275
34	3	45	2.00	87	87.00	274
35	3	50	2.00	87	87.00	274
36	3	55	2.00	87	87.00	274

TEST DATA - CO_2

CONCENTRATION CALCULATIONS - WET 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, wet basis (%-wet)	10.67	10.64	10.63	10.65

* Provided by facility personnel

TEST DATA - EPA Method 26A

DETAILED RESULTS

Emission Results:	**Run 1**	**Run 2**	**Run 3**	**Average**
Hydrogen Chloride (HCl) Emission Rate (lb/MMBtu)	0.00221	0.00204	0.00225	0.00217

LAB RESULTS HCL	**Run 1**	**Run 2**	**Run 3**	**Average**
HCl Total Mass in sample, (mHCl) (mg)	2.83	2.64	2.90	2.79
Volume of Dry Gas Sampled at Standard Conditions (Vmstdm) (dscm)	1.27	1.27	1.26	1.27
HCl Concentration, dry basis (ConcHCl) (mg/dscm)	2.24	2.07	2.29	2.20
HCl Concentration (ppmvd) Dry @ 68°F	1.48	1.37	1.51	1.45
HCl Concentration (ppmvw) Wet @ 68°F	1.35	1.24	1.37	1.32

US EPA Method 1 Traverse Point Determination

Relative Port Location	Left	Right
From Far Wall to Outside of Port (in.)	200.0	200.0
Nipple Length or Wall Thickness (in.)	8.0	8.0
Port Protrusion Length (opt) (in.)	0.0	0.0
Depth of Stack or Duct (in.)	192.0	192.0
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)	580	
Elevation of Ports from Ground Level (ft)	880	
Stack Build-up (in.)	0.0	
Stack Cross-Sectional Diameter 1 (in)	192.0	
Stack Cross-Sectional Diameter 2 (in)	192.0	

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	Isokinetic

Port Distance Upstream from Flow Disturbance (in.)	3192.0
Diameters Upstream from Flow Disturbance (³ 0.5 De)	16.6
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.)	3384.0
Diameters Downstream from Flow Disturbance (³ 2.0 De)	17.6
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 28952.92
Duct Area - ft^2 201.0619

New Method 1 verified on 8/11/2021 by: MN/MY

Port	Point	% of Duct Depth	Dist. From Inside Wall (Decimal)	Dist. From Outside Wall (Decimal)
1	1	4.4	8.4	16.4
1	2	14.6	28.0	36.0
1	3	29.6	56.8	64.8
2	1	4.4	8.4	16.4
2	2	14.6	28.0	36.0
2	3	29.6	56.8	64.8
3	1	4.4	8.4	8.4
3	2	14.6	28.0	28.0
3	3	29.6	56.8	56.8
4	1	4.4	8.4	8.4
4	2	14.6	28.0	28.0
4	3	29.6	56.8	56.8

MONTROSE AIR QUALITY SERVICES

Sample Recovery & Calibration Check Data

Project Information

Date: 9-28-21 Project #: PROJ-008915

Customer / Facility: DTE SCPP

Unit ID / Sample Location: UNIT 7

Run #: 1, 2, 3 Operator: [initials]

Equipment Identification

Ref. Thermometer: CAL KIT 4

Hygrometer: —

Field Balance: SCALE 3

Check Weights: CAL KIT 4

Calipers: —

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

Date:	9-28-21			
Standard mass, g	500.0			
Field balance mass, g	500.0			

Ambient Conditions (Mobile Lab)

Relative humidity, %:

Temperature, °F:

Mobile lab #:

Moisture Determination

	Contents	Run 1 Initial	Run 1 Final	Run 1 Net Gain	Run 2 Initial	Run 2 Final	Run 2 Net Gain	Run 3 Initial	Run 3 Final	Run 3 Net Gain
Knockout										
Impinger 1	1N H2SO4	707.8	759.0	51.2	715.0	773.4	58.4	711.9	776.8	64.9
Impinger 2	1N H2SO4	726.1	748.1	22.0	731.8	747.8	16.0	739.8	755.3	15.5
Impinger 3	—	654.5	661.3	6.8	659.2	666.6	7.4	660.2	665.5	5.3
Impinger 4				=80			=81.8			=85.7
Impinger 5										
Impinger 6										
Impinger 7										
Impinger 8										
Silica Gel		942.0	950.3	8.3	909.7	923.5	13.8	936.5	946.4	9.9
Train Net Gain (Vlc)				88.3			95.6			95.6

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

	D1	D2	D3	Average
Nozzle 1 diameters				
Nozzle 2 diameters				
Nozzle 3 diameters				

Nozzle Material: ☐ quartz ☐ glass ☐ steel ☐ titanium ☐ inconel ☒ other NONE

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

Sample Observations

Run 1

Run 2

Run 3

QA/QC Check: Completeness: [initials] Legibility: [initials] Accuracy: [initials] Specifications: [initials]

Checked by: [initials] Team Leader: [initials]

001AS-OPS-RBETA

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

RUN 1

	Initial Tare	Final Tare	Net Weights
Impinger No. 1	**707.8**	**759.0**	51.2
Impinger No. 2	**726.1**	**748.1**	22.0
Impinger No. 3	**654.5**	**661.3**	6.8
		Total Condensed:	**80.0**
Silica Gel	**942.0**	**950.3**	8.3
		Total Absorbed:	**8.3**
		Overall Total:	**88.3**

RUN 2

	Initial Tare	Final Tare	Net Weights
Impinger No. 1	**715.0**	**773.4**	58.4
Impinger No. 2	**731.8**	**747.8**	16.0
Impinger No. 3	**659.2**	**666.6**	7.4
		Total Condensed:	**81.8**
Silica Gel	**909.7**	**923.5**	13.8
		Total Absorbed:	**13.8**
		Overall Total:	**95.6**

RUN 3

	Initial Tare	Final Tare	Net Weights
Impinger No. 1	**711.9**	**776.8**	64.9
Impinger No. 2	**739.8**	**755.3**	15.5
Impinger No. 3	**660.2**	**665.5**	5.3
		Total Condensed:	**85.7**
Silica Gel	**936.5**	**946.4**	9.9
		Total Absorbed:	**9.9**
		Overall Total:	**95.6**

MONTROSE AIR QUALITY SERVICES

EPA Method 26a Field Datasheet (Isokinetic)

Project Information		Sampling Conditions		ALT 011	TC ID:	Ambient °F	Ref. °F
Date	9-28-21 Project # 008915	Static Pressure, in. H_2O	— Ambient Temp, °F 63	Stack	5'K-1		
Customer/Facility	DTE SCPP	Barometric Pressure, in. Hg	30.01 Ref. Barometer ID NOAA	Probe	5'K-2		
Unit ID/Sample Location	Unit 7	Wind Speed / Direction	N 5 mph Precipitation, Y / (N) type	Filter Box	HB 2		
Run #	1 Operator Mike Nummer	Probe / Filter Temp Range, °F	248 ± 25	Filter Exit			

Sampling Equipment IDs		Calibration		Equipment Checks	Pre	Mid	Post
Meterbox ID	MB 12	Meterbox Y	1.026	Pitot (+), pass @ in. H_2O	☐ @	☐ @	☐ @
Umbilical ID	UMB 15	Meterbox ΔH@, in. H_2O	1.84	Pitot (-), pass @ in. H_2O	☐ @	☐ @	☐ @
Nozzle ID	—	Nozzle diameter, Dn, in.	—	Pitot visual inspection	☒ pass	☐ pass	☒ pass
Pitot / Probe ID	5' K	Pitot coefficient, Cp	—	Nozzle visual inspection	☐ pass	☒ pass	☐ pass
Manometer ID	MB 12	Manometer zero and level	☒ yes	Meter, cfm @ in. Hg	0.000 @ 15	@	0.000 @ 6
Sensitivity	0-10	K-Factor	—	Intermediate leak check volume, ft^3		/	/

Meter outlet	MB 12
Impinger Exit	FC 1
Other	
Ref. Thermometer ID	C
Continuity Check	☐ Continuity w/ Proper Polarity
Notes:	

Traverse Point #	Elapsed Time	Clock Time 24hr	DGM Reading, Vm, ft^3	Velocity Head, ΔP in H_2O	Orifice Pressure Differential, ΔH Target	ΔH Actual	Stack Temp, °F	Probe Temp, °F	Filter Temp, °F Box	Filter Temp, °F Exit	Impinger Exit Temp, °F	Dry Gas Meter Temperature, °F Inlet	DGM Outlet		Pump Vacuum, in. Hg
	0	11:10	454.88			2.0	277	258	258		62		79		2
	5		458.71			2.0	277	260	258		57		79		2
	10		462.48			2.0	276	260	259		55		79		2
	15		466.28			2.0	276	260	262		56		80		2
	20		470.11			2.0	276	261	250		59		80		2
	25		473.87			2.0	276	260	258		61		80		2
	30		477.63			2.0	276	261	260		59		81		2
	35		481.43			2.0	276	266	261		58		82		2
	40		485.19			2.0	276	260	259		56		82		2
	45		488.92			2.0	276	260	260		55		82		2
	50		492.65			2.0	276	260	260		55		83		2
	55		496.38			2.0	274	260	260		55		84		2
	60	12:10	500.05												
Averages															

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MONTROSE AIR QUALITY SERVICES

EPA Method 26a Field Datasheet (Isokinetic)

Project Information		Sampling Conditions				ALT 011	TC ID:	Ambient °F	Ref. °F
Date	9-28-21	Static Pressure, in. H_2O	–	Ambient Temp, °F	67	Stack			
Project #	008915	Barometric Pressure, in. Hg	30.03	Ref. Barometer ID	NOAA	Probe			
Customer/Facility	DTE SCPP	Wind Speed / Direction	N 6 mph	Precipitation, Y / N, type	N	Filter Box			
Unit ID/Sample Location	Unit 7	Probe / Filter Temp Range, °F	248 ± 25			Filter Exit			
Run #	2					Meter outlet			
Operator	Mike Nummer					Impinger Exit			
						Other			

Sampling Equipment IDs		Calibration	
Meterbox ID	MB 12	Meterbox Y	1.026
Umbilical ID	UMB 15	Meterbox ΔH@, in. H_2O	1.84
Nozzle ID	–	Nozzle diameter, Dn, in.	–
Pitot / Probe ID	5' K	Pitot coefficient, Cp	–
Manometer ID	MB 12	Manometer zero and level	☑ yes
Sensitivity	0-10"	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	@	0.000 @ 6
Intermediate leak check volume, ft³		/	/

Ref. Thermometer ID

Continuity Check ☐ Continuity w/ Proper Polarity

Notes:

Traverse Point #	Elapsed Time	Clock Time 24hr	DGM Reading, Vm, ft³	Velocity Head, ΔP in H_2O	Orifice Pressure Differential, ΔH Target	Orifice Pressure Differential, ΔH Actual	Stack Temp, °F	Probe Temp, °F	Filter Temp, °F Box	Filter Temp, °F Exit	Impinger Exit Temp, °F	Dry Gas Meter Temperature, °F Inlet	Dry Gas Meter Temperature, °F Outlet		Pump Vacuum, in. Hg
	0	12:25	500.19			2.0	275	261	261		66		84		2
	5		504.03			2.0	276	259	262		62		84		2
	10		507.85			2.0	276	260	261		58		84		2
	15		511.74			2.0	276	260	259		58		84		2
	20		515.48			2.0	276	261	260		58		84		2
	25		519.28			2.0	275	261	261		59		85		2
	30		523.10			2.0	276	261	260		60		85		2
	35		526.90			2.0	274	261	260		60		85		2
	40		530.70			2.0	276	260	259		61		85		2
	45		534.50			2.0	275	260	259		61		86		2
	50		538.31			2.0	275	260	261		60		86		2
	55		542.10			2.0	275	260	261		61		86		2
	60	13:25	545.92												
Averages															

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MONTROSE AIR QUALITY SERVICES

EPA Method 26a Field Datasheet (Isokinetic)

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Project Information

Date 9-28-21 Project # 008915

Customer/Facility DTE SCPP

Unit ID/Sample Location Unit 7

Run # 3 Operator Mike Nummer

Sampling Conditions

Static Pressure, in. H_2O — Ambient Temp, °F 68

Barometric Pressure, in. Hg 30.07 Ref. Barometer ID NOAA

Wind Speed / Direction NNE 6 mph Precipitation, Y / (N), type

Probe / Filter Temp Range, °F 248 ± 25

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

Ref. Thermometer ID

Continuity Check ☐ Continuity w/ Proper Polarity

Notes:

Sampling Equipment IDs

Meterbox ID MB 12

Umbilical ID UMB 15

Nozzle ID —

Pitot / Probe ID 5' K

Manometer ID MB 12

Sensitivity 0-10"

Calibration

Meterbox Y 1.026

Meterbox ΔH@, in. H_2O 1.84

Nozzle diameter, Dn, in. —

Pitot coefficient, Cp —

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	0.002 @ 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 Target	Orifice Pressure Differential, ΔH Actual	Stack Temp, °F	Probe Temp, °F	Filter Temp, °F Box	Filter Temp, °F Exit	Impinger Exit Temp, °F	Dry Gas Meter Temperature, °F Inlet	Dry Gas Meter Temperature, °F Outlet		Pump Vacuum, in. Hg
	0	13:35	546.10			2.0	275	261	260		60		86		2
	5		550.01			2.0	275	260	261		60		86		2
	10		553.83			2.0	276	260	259		52		86		2
	15		557.60			2.0	276	260	258		51		86		2
	20		561.37			2.0	276	260	261		56		86		2
	25		565.13			2.0	275	259	261		51		86		2
	30		568.92			2.0	275	260	259		51		86		2
	35		572.73			2.0	275	259	260		51		87		2
	40		576.51			2.0	275	259	263		51		87		2
	45		580.29			2.0	274	260	261		52		87		2
	50		584.07			2.0	274	260	262		52		87		2
	55		587.87			2.0	274	259	260		52		87		2
	60	14:35	591.67												
Averages															

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Appendix A.3
Example Calculations

EPA Methods 4 and 26 Nomenclature and Sample Calculations

Run No. - 1

Constants

CO_2F_{wt}= 44.0	in wg= 0.073529	NO_2F_{wt}= 46.01	$HClF_{wt}$= 36.46
O_2F_{wt}= 32.0	gr= 0.000142857	COF_{wt}= 28.01	SO_2F_{wt}= 64.06
CON_2F_{wt}= 28.0	mmBtu= 1000000 Btu	$H_2SO_4F_{wt}$= 98.08	Cl_2F_{wt}= 70.91
H_2OF_{wt}= 18.015	CF_{wt}= 12.011	T_{std}= 527.67	P_{std}= 29.92
ArF_{wt}= 40.0	PF_{wt}= 44.0962		

Stack Variables

P_{bar} =	30.01	in. Hg	barometric pressure
E_{box} =	580	ft	elevation difference between ground level and meter box
E_{sam} =	880	ft	elevation difference between ground level and sampling ports
γ =	1.0260		gamma, dry gas meter calibration factor (dimensionless)
θ =	60.0	min	net run time (minutes)
V_{lc} =	88.3	g	total mass of liquid collected in impingers (g)
$\%CO_2$ =	10.67	%	percent CO_2 by volume (wet basis) (dimensionless)
A =	201.0619	ft^2	stack cross-sectional area
T_{savg} =	736.00	R	average absolute flue gas temperature (460R+tsavg °F)
ΔH =	2.00	in. wg	average pressure differential of orifice meter
T_m =	540.92	R	dry gas meter temperature (460R+tsavg °F)
V_m =	45.17	ft^3	volume of metered gas sample (dry actual cubic feet)
Fc =	1843.1956	ft^3/mmBtu	F-factor, standard cubic feet per million BTU

Calculated Stack Variables

Barometric pressure at sampling location

NOTE: Barometric pressure recorded at ground level

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

$P_{sam} = 30.01 - ((880.0 / 100) * 0.1)$

$P_{sam} =$ 29.13 in. Hg

Volume of dry gas sampled at standard conditions (dscf)

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

$V_{mstd} = 1.0260 * 45.170 * ((30.01 - ((580.0 / 100) * 0.1) + (2.0000 / 13.6)) / 29.92) * (527.7 / 540.917)$

$V_{mstd} =$ 44.691 ft^3

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

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

$V_{wstd} = (0.04716 * 88.3)$

$V_{wstd} =$ 4.2 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 * (4.164 / (4.164 + 44.691))

$\%H_2O$ (Measured) = 8.52

$\%H_2O$ = 8.52

Dry mole fraction of flue gas (dimensionless)

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

M_{fd} = 1 - (8.52 / 100)

M_{fd} = 0.915

Method 26A Calculations

HCl concentration (ppmvd)

HClppmvd = 1.48 ppmvd

HCl concentration (ppmvw)

HClppmvw = HClppmvd * Mfd

HClppmvw = 1.35 ppmvw

HCl mass emission rate (lb/MMBtu)

$MERHCl_{lbMMBtu}$ = (((ConcHClppwv_1 * 36.461 * ultFc_1) / (385.3 * 10 ^ 6)) * (100 / $\%CO_2$)))

$MERHCl_{lbMMBtu}$ = 0.00221 lb/MMBtu