

# COMPLIANCE STACK EMISSION TEST REPORT

## NATURAL GAS-FIRED TURBINES NO. 1 (EUTURBINE1) AND NO. 2 (EUTURBINE2)

### Determination of Nitrogen Oxides and Carbon Monoxide Emissions

Utilizing US EPA Methods 3A, 7E, 10, and 19

Test Date(s): November 5, 2019  
State Registration Number: N7624  
Facility Name: Vector Pipeline LP-Washington Compressor Station  
Source Location: Washington Township, Michigan  
Permit: EGLE Renewable Operating Permit No. MI-ROP-N7624-2014

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### TEST RESULTS SUMMARY I

<b>Source Name:</b>	<b>Turbine No. 1</b>	
<b>Source ID Number:</b>	<b>EUTURBINE1</b>	
<b>Control Device:</b>	<b>DLN</b>	
<b>Test Date:</b>	<b>11/05/19</b>	
<b>Sampling Location:</b>	<b>Exhaust Duct</b>	
<b>Process Condition</b>	<b>93% NGP</b>	<b>100% NGP</b>
<b>Natural Gas Flowrate (kscf/hr)*</b>	<b>87.53</b>	<b>108.03</b>
<b>Nitrogen Oxides (NO<sub>x</sub>) Concentration Corrected to 15% O<sub>2</sub> (ppmvd)</b>	<b>8</b>	<b>7</b>
<i>Permit Limit - Nitrogen Oxides Concentration Corrected to 15% O<sub>2</sub> (ppmvd)</i>	<i>25</i>	<i>25</i>
<i>Emissions Results Below Permit Limit</i>	<i>YES</i>	<i>YES</i>
<b>NO<sub>x</sub> as (NO<sub>2</sub>) Emissions (lb/hr)</b>	<b>2.89</b>	<b>2.85</b>
<b>Carbon Monoxide Emissions (lb/hr)†</b>	<b>&lt;0.3</b>	<b>&lt;0.3</b>
<i>Permit Limit - Carbon Monoxide Emissions (lb/hr)</i>	<i>9.4</i>	<i>9.4</i>
<i>Emissions Results Below Permit Limit</i>	<i>YES</i>	<i>YES</i>
<b>Permit No.</b>	<b>EGLE Renewable Operating Permit No. MI-ROP-N7624-2014</b>	

\* Production data was provided by Vector Pipeline LP-Washington Compressor Station personnel.

† The compound was not present in quantities above the Minimum Detection Limit (MDL) of the analytical method.

## TEST RESULTS SUMMARY II

<b>Source Name:</b>	<b>Turbine No. 2</b>	
<b>Source ID Number:</b>	<b>EUTURBINE2</b>	
<b>Control Device:</b>	<b>DLN</b>	
<b>Test Date:</b>	<b>11/05/19</b>	
<b>Sampling Location:</b>	<b>Exhaust Duct</b>	
<b>Process Condition</b>	<b>93% NGP</b>	<b>100% NGP</b>
<b>Natural Gas Flowrate (kscf/hr)*</b>	<b>87.08</b>	<b>107.20</b>
<b>Nitrogen Oxides (NO<sub>x</sub>) Concentration Corrected to 15% O<sub>2</sub> (ppmvd)</b>	<b>13</b>	<b>6</b>
<i>Permit Limit - Nitrogen Oxides Concentration Corrected to 15% O<sub>2</sub> (ppmvd)</i>	<i>25</i>	<i>25</i>
<i>Emissions Results Below Permit Limit</i>	<i>YES</i>	<i>YES</i>
<b>NO<sub>x</sub> as (NO<sub>2</sub>) Emissions (lb/hr)</b>	<b>4.39</b>	<b>2.42</b>
<b>Carbon Monoxide Emissions (lb/hr)†</b>	<b>0.3</b>	<b>&lt;0.3</b>
<i>Permit Limit - Carbon Monoxide Emissions (lb/hr)</i>	<i>9.4</i>	<i>9.4</i>
<i>Emissions Results Below Permit Limit</i>	<i>YES</i>	<i>YES</i>
<b>Permit No.</b>	<b>EGLE Renewable Operating Permit No. MI-ROP-N7624-2014</b>	

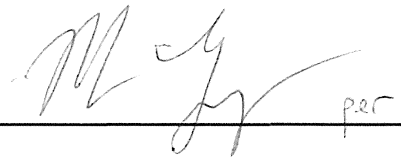
\* Production data was provided by Vector Pipeline LP-Washington Compressor Station personnel.

† The compound was not present in quantities above the Minimum Detection Limit (MDL) of the analytical method.

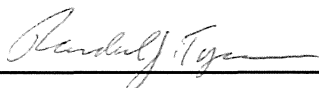
## REVIEW AND CERTIFICATION

The results of the Compliance Test conducted on November 5, 2019 are a product of the application of the United States Environmental Protection Agency (US EPA) Stationary Source Sampling Methods listed in 40 CFR Part 60, Appendix A, that were in effect at the time of this test.

All work, calculations, and other activities and tasks performed and presented in this document were carried out by me or under my direction and supervision. I hereby certify that, to the best of my knowledge, Montrose operated in conformance with the requirements of the Montrose Quality Management System and ASTM D7036-04 during this test project.

Signature:  per Date: 12-20-19  
Name: Mason Sakshaug Title: Field Project Manager

I have reviewed, technically and editorially, details, calculations, results, conclusions, and other appropriate written materials contained herein. I hereby certify that, to the best of my knowledge, the presented material is authentic, accurate, and conforms to the requirements of the Montrose Quality Management System and ASTM D7036-04.

Signature:  Date: 12-20-19  
Name: Randal Tysar Title: District Manager

## **1.0 INTRODUCTION**

### **1.1 SUMMARY OF TEST PROGRAM**

The Vector Pipeline LP-Washington Compressor Station (State Registration Number: N7624), located in Washington Township, Michigan, contracted Montrose Air Quality Services, LLC (Montrose) of Detroit, Michigan, to conduct compliance stack emission testing for their Natural Gas-Fired Turbines NO. 1 (EUTURBINE1) and NO. 2 (EUTURBINE2). Testing was performed to satisfy the emissions testing requirements pursuant to Michigan Department of Environment, Great Lakes and Energy (EGLE) Renewable Operating Permit No. MI-ROP-N7624-2014. The testing was performed on November 5, 2019.

Sampling was performed at the EUTURBINE1 Exhaust Duct and EUTURBINE2 Exhaust Duct to determine the emissions of nitrogen oxides (NO<sub>x</sub>) (as NO<sub>2</sub>) and carbon monoxide (CO). Testing was conducted during two different turbine operating conditions (93% NGP load and 100% NGP load). During this test, emissions from EUTURBINE1 and EUTURBINE2 were controlled using dry low NO<sub>x</sub> control (DLN) technology.

The test methods that were conducted during this test were US EPA Methods 3A, 7E, 10, and 19.

### **1.2 KEY PERSONNEL**

The key personnel who coordinated this test program (and their phone numbers) were:

- James Snider, Environmental Specialist, Vector Pipeline, 218-269-0591
- Karen Kajiya-Mills, Environmental Manager, Michigan Department of Environment, Great Lakes and Energy (EGLE), 517-284-6780
- Joyce Zhu, Environmental Manager, EGLE, 517-284-6780
- Regina Angelotti, Environmental Quality Analyst (EQA), EGLE, 313-418-0895
- Mason Sakshaug QI, Field Project Manager, Montrose, 989-323-0355

## **2.0 SUMMARY AND DISCUSSION OF TEST RESULTS**

### **2.1 OBJECTIVES AND TEST MATRIX**

The purpose of this test was to determine the emissions of NO<sub>x</sub> (as NO<sub>2</sub>) and CO at the EUTURBINE1 Exhaust Duct and EUTURBINE2 Exhaust Duct during two different operating conditions. Testing was performed to satisfy the emissions testing requirements pursuant to EGLE Renewable Operating Permit No. MI-ROP-N7624-2014.

The specific test objectives for this test are as follows:

- Measure the concentration of oxygen (O<sub>2</sub>), NO<sub>x</sub>, and CO at the EUTURBINE1 Exhaust Duct and EUTURBINE2 Exhaust Duct during two different operating conditions.
- Utilize the above variables, in conjunction with the calculated heat input rate, to determine the emissions of NO<sub>x</sub> (as NO<sub>2</sub>) and CO at the EUTURBINE1 Exhaust Duct and EUTURBINE2 Exhaust Duct during the two different operating conditions.

Table 2.1 presents the sampling matrix logs for this test.

### **2.2 FIELD TEST CHANGES AND PROBLEMS**

Single point sampling at the EUTURBINE1 Exhaust Duct and EUTURBINE2 Exhaust Ducts for O<sub>2</sub>, NO<sub>x</sub>, and CO concentration determinations was approved by on-site EGLE representative Regina Angelotti. Single point sampling at these locations were based on stratification tests performed at a test event conducted on September 14, 2017 (Project 049AS-237215). Tables 2.4 and 2.5 display the results of the stratification test.

### **2.3 PRESENTATION OF RESULTS**

Single sampling trains were utilized during each run at the EUTURBINE1 Exhaust Duct and EUTURBINE2 Exhaust Duct to determine the emissions of NO<sub>x</sub> (as NO<sub>2</sub>) and CO while the turbines operated at each NGP load. These sampling trains measured the duct gas concentrations of O<sub>2</sub>, NO<sub>x</sub>, and CO.

For each test run, the natural gas flowrates and the higher heating values (HHV) of the natural gas were utilized to calculate the heat input rate during each operating load. The natural gas flowrates and HHV were monitored and recorded by each turbine's data acquisition system.

Table 2.2 displays the emissions of NO<sub>x</sub> (as NO<sub>2</sub>) and CO measured at the EUTURBINE1 Exhaust Duct during 93% NGP Load and 100% NGP Load operating conditions.

Table 2.3 displays the emissions of NO<sub>x</sub> (as NO<sub>2</sub>) and CO measured at the EUTURBINE2 Exhaust Duct during 93% NGP Load and 100% NGP Load operating conditions.



CO concentration values in Tables 2.2 and 2.3 denoted with a '<' were measured to be below the minimum detection limit (MDL) of the applicable analytical method. CO mass emission rates denoted with a '<' in Tables 2.2 and 2.3 were calculated utilizing the applicable MDL concentration value instead of the "as measured" concentration value.

Tables 2.4 and 2.5 display the results of the Stratification Tests performed on September 14, 2017 at the EUTURBINE1 Exhaust Duct and EUTURBINE2 Exhaust Duct. As displayed, the sampling locations were within the range of the Stratification Acceptance Criteria as specified in US EPA Method 7E, Section 8.1.2. Single point traverses were utilized for the concentration runs at both turbine exhaust ducts during this test event. See Section 2.2 for details.

The graphs that present the raw, uncorrected concentration data measured in the field by the US EPA Method 3A, 7E, and 10 sampling systems at the EUTURBINE1 Exhaust Duct and EUTURBINE2 Exhaust Duct are located in Appendix Section B of this report.

Vector Pipeline LP-Washington Compressor Station  
November 2019 EUTURBINE1 and EUTURBINE2 Compliance Test

**TABLE 2.1**  
**SAMPLING MATRIX OF TEST METHODS UTILIZED**

Date	Run No.	NGP Load	Sampling Location	US EPA METHOD 3A (O <sub>2</sub> )	US EPA METHOD 7E (NO <sub>x</sub> )	US EPA METHOD 10 (CO)
				Sampling Time / Duration (min)	Sampling Time / Duration (min)	Sampling Time / Duration (min)
11/5/2019	1	93%	EUTURBINE1 Exhaust Duct	11:53 - 12:13 / 20	11:53 - 12:13 / 20	11:53 - 12:13 / 20
11/5/2019	2	93%	EUTURBINE1 Exhaust Duct	12:29 - 12:49 / 20	12:29 - 12:49 / 20	12:29 - 12:49 / 20
11/5/2019	3	93%	EUTURBINE1 Exhaust Duct	13:02 - 13:22 / 20	13:02 - 13:22 / 20	13:02 - 13:22 / 20
11/5/2019	1	100%	EUTURBINE1 Exhaust Duct	13:45 - 14:05 / 20	13:45 - 14:05 / 20	13:45 - 14:05 / 20
11/5/2019	2	100%	EUTURBINE1 Exhaust Duct	14:19 - 14:39 / 20	14:19 - 14:39 / 20	14:19 - 14:39 / 20
11/5/2019	4	100%	EUTURBINE1 Exhaust Duct	14:52 - 15:12 / 20	14:52 - 15:12 / 20	14:52 - 15:12 / 20
11/5/2019	1	93%	EUTURBINE2 Exhaust Duct	16:20 - 16:40 / 20	16:20 - 16:40 / 20	16:20 - 16:40 / 20
11/5/2019	2	93%	EUTURBINE2 Exhaust Duct	16:50 - 17:14 / 24	16:50 - 17:14 / 24	16:50 - 17:14 / 24
11/5/2019	3	93%	EUTURBINE2 Exhaust Duct	17:24 - 17:56 / 32	17:24 - 17:56 / 32	17:24 - 17:56 / 32
11/5/2019	1	100%	EUTURBINE2 Exhaust Duct	18:11 - 18:47 / 36	18:11 - 18:47 / 36	18:11 - 18:47 / 36
11/5/2019	2	100%	EUTURBINE2 Exhaust Duct	18:58 - 19:24 / 26	18:58 - 19:24 / 26	18:58 - 19:24 / 26
11/5/2019	3	100%	EUTURBINE2 Exhaust Duct	19:35 - 20:02 / 27	19:35 - 20:02 / 27	19:35 - 20:02 / 27

All times are Eastern Standard Time.

Vector Pipeline LP-Washington Compressor Station  
November 2019 EUTURBINE1 and EUTURBINE2 Compliance Test

**TABLE 2.2**  
**EMISSION RESULTS**

Parameter	EUTURBINE1 Exhaust Duct							
	CONDITION 1 - 93% NGP				CONDITION 2 - 100% NGP			
	Run 1	Run 2	Run 3	Average	Run 1	Run 2	Run 4	Average
Natural Gas Flowrate (kscf/hr)*	88.2	87.5	86.9	87.5	108	108	108	108
Natural Gas Heating Value (Btu/scf)*	1,074	1,073	1,073	1,073	1,075	1,075	1,075	1,075
Nitrogen Oxides Emissions (lb/hr) (as NO <sub>2</sub> )	2.94	2.85	2.89	2.90	2.81	2.89	2.85	2.85
Nitrogen Oxides Concentration Corrected to 15% O <sub>2</sub> (ppmvd)	8.44	8.24	8.42	8.37	6.56	6.75	6.66	6.66
Nitrogen Oxides Concentration (ppmvd)	7.09	6.92	7.06	7.02	5.81	5.98	5.89	5.89
Carbon Monoxide Emissions (lb/hr)†	<0.25	<0.25	<0.25	<0.25	<0.29	<0.29	<0.29	<0.29
Carbon Monoxide Concentration (ppmvd)†	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00
Percent by Volume Oxygen in Stack Gas (%-dry)	15.9	15.9	16.0	15.9	15.7	15.7	15.7	15.7
Measured Stack Inner Dimensions (in)§	91.0 X 91.0							

\* Process data was provided by Vector Pipeline LP personnel.

† The "<" symbol indicates that compound was below the Minimum Detection Limit (MDL) of the analytical method. See Section 2.3 for details.

§ The EUTURBINE1 Exhaust Duct was rectangular in shape.

**TABLE 2.3  
EMISSION RESULTS**

Parameter	EUTURBINE2 Exhaust Duct							
	CONDITION 1 - 93% NGP				CONDITION 2 - 100% NGP			
	Run 1	Run 2	Run 3	Average	Run 1	Run 2	Run 3	Average
Natural Gas Flowrate (ksf/hr)*	85.8	85.6	89.9	87.1	107	107	108	107
Natural Gas Heating Value (Btu/scf)*	1,075	1,075	1,075	1,075	1,075	1,075	1,075	1,075
Nitrogen Oxides Emissions (lb/hr) (as NO <sub>2</sub> )	4.31	4.45	4.42	4.39	2.46	2.41	2.41	2.42
Nitrogen Oxides Concentration Corrected to 15% O <sub>2</sub> (ppmvd)	12.7	13.1	12.4	12.7	5.82	5.67	5.64	5.71
Nitrogen Oxides Concentration (ppmvd)	10.5	11.2	10.6	10.8	5.11	5.00	4.97	5.03
Carbon Monoxide Emissions (lb/hr)†	0.30	0.31	0.43	0.34	0.39	<0.29	<0.29	<0.33
Carbon Monoxide Concentration (ppmvd)‡	1.19	1.27	1.68	1.38	1.34	<1.00	<1.00	<1.11
Percent by Volume Oxygen in Stack Gas (%-dry)	16.0	15.9	15.9	15.9	15.7	15.7	15.7	15.7
Measured Stack Inner Diameter (in)	91.0							

\* Process data was provided by Vector Pipeline LP personnel.

† The "<" symbol indicates that compound was below the Minimum Detection Limit (MDL) of the analytical method. See Section 2.3 for details.

‡ The EUTURBINE2 Exhaust Duct was rectangular in shape.

**TABLE 2.4**  
**12-POINT STRATIFICATION TEST - EUTURBINE1 EXHAUST DUCT**

Date Conducted: September 14, 2017			
Point Number	Duration	Oxygen	
	PASS	MINIMUM SINGLE POINT TRAVERSE	Difference from Mean
	(min)	(%)	(%)
1	3.0	16.20	0.17
2	3.0	16.30	0.27
3	3.0	16.30	0.27
4	3.0	16.10	0.07
5	3.0	16.20	0.17
6	3.0	16.20	0.17
7	3.0	15.90	-0.13
8	3.0	15.90	-0.13
9	3.0	15.90	-0.13
10	3.0	15.80	-0.23
11	3.0	15.80	-0.23
12	3.0	15.80	-0.23
	Mean	16.03	

**TABLE 2.5**  
**12-POINT STRATIFICATION TEST - EUTURBINE2 EXHAUST DUCT**

Date Conducted: September 14, 2017			
Point Number	Duration	Oxygen	
	PASS	MINIMUM SINGLE POINT TRAVERSE	Difference from Mean
	(min)	(%)	(%)
1	3.0	15.40	0.00
2	3.0	15.40	0.00
3	3.0	15.40	0.00
4	3.0	15.40	0.00
5	3.0	15.40	0.00
6	3.0	15.40	0.00
7	3.0	15.40	0.00
8	3.0	15.40	0.00
9	3.0	15.40	0.00
10	3.0	15.40	0.00
11	3.0	15.40	0.00
12	3.0	15.40	0.00
	Mean	15.40	

### **3.0 PLANT AND SAMPLING LOCATION DESCRIPTIONS**

#### **3.1 PROCESS DESCRIPTION AND OPERATION**

Vector Pipeline LP-Washington Compressor Station operates two natural gas-fired Mars 110 turbines (EUTURBINE1 and EUTURBINE2) which are rated at 15,000 horsepower at a heat input rate of 120 MMBtu/hr. Each turbine exhausts to a single duct.

These turbines are equipped with two separate shafts. The first shaft controls the speed of the compressor turbine (i.e., the NGP), and the second shaft controls the speed of power turbine and natural gas compressor. Each turbine can be regulated in terms of turbine load as well as power turbine and NGP rotational speeds.

Figure 3.1 depicts the process and sampling location schematic.

#### **3.2 CONTROL EQUIPMENT DESCRIPTION**

During this test, emissions from EUTURBINE1 and EUTURBINE2 were controlled using DLN technology.

#### **3.3 SAMPLING LOCATION(S)**

##### **3.3.1 EUTURBINE1 Exhaust Duct**

The EUTURBINE1 Exhaust Duct was rectangular in shape with a width and depth of 91.0-inches. The duct was oriented in the horizontal plane and was accessed from the ground. Five sampling ports were located equidistant from one another at a location that met US EPA Method 1, Section 11.1.1 criteria. During emission sampling at the EUTURBINE1 Exhaust Duct, a single point was used for duct gas O<sub>2</sub>, NO<sub>x</sub>, and CO concentration determinations.

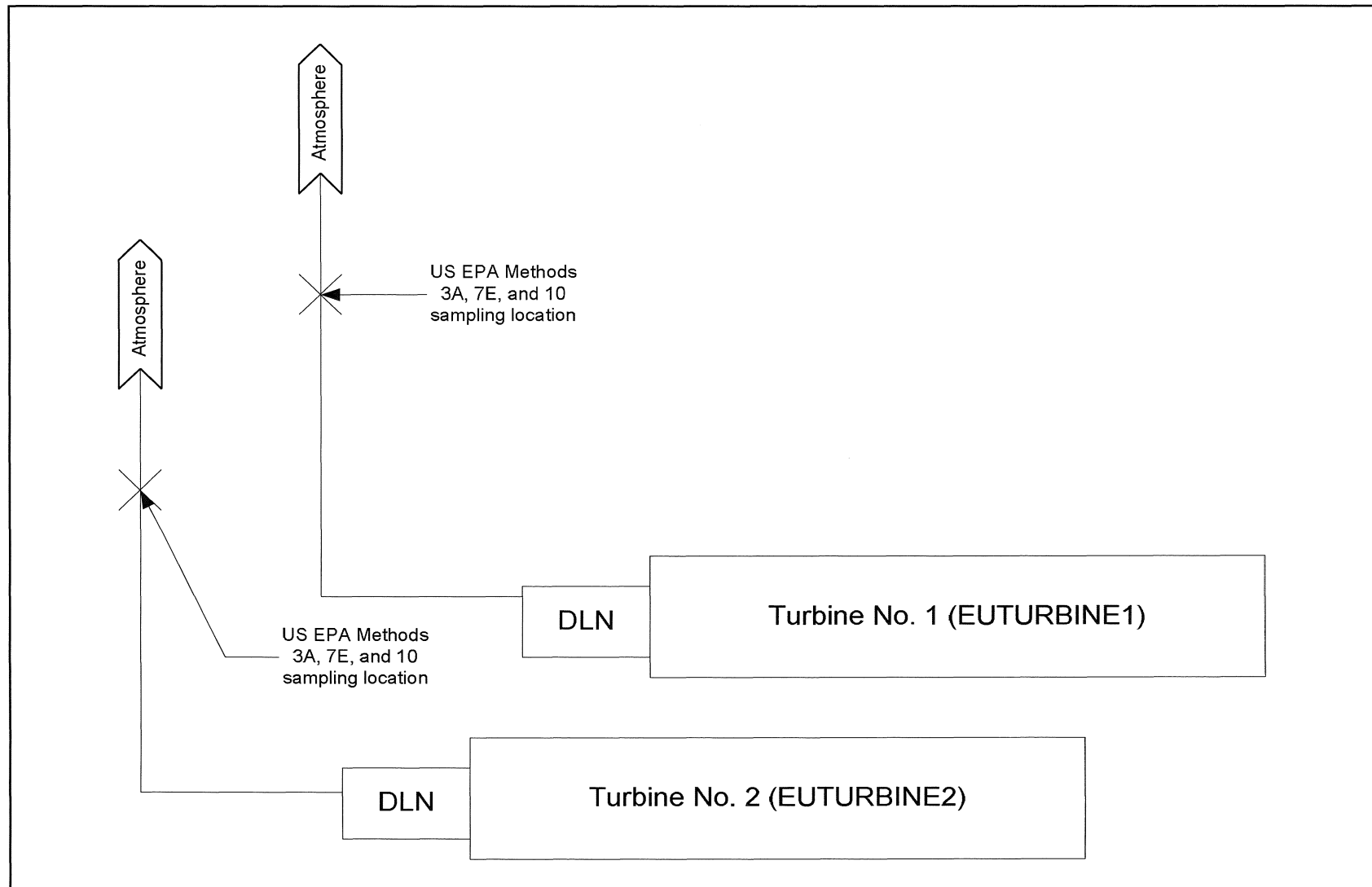
##### **3.3.2 EUTURBINE2 Exhaust Duct**

The EUTURBINE2 Exhaust Duct was rectangular in shape with a width and depth of 91.0-inches. The duct was oriented in the horizontal plane and was accessed from the ground. Five sampling ports were located equidistant from one another at a location that met US EPA Method 1, Section 11.1.1 criteria. During emission sampling at the EUTURBINE2 Exhaust Duct, a single point was used for duct gas O<sub>2</sub>, NO<sub>x</sub>, and CO concentration determinations.

#### **3.4 PROCESS SAMPLING LOCATION(S)**

The US EPA Reference Test Methods performed did not specifically require that process samples were to be taken during the performance of this testing event. It is in the best knowledge of Montrose that no process samples were obtained and therefore no process sampling location was identified in this report.

**FIGURE 3.1**  
**EUTURBINE1 AND EUTURBINE2 SAMPLING LOCATION SCHEMATIC**



## **4.0 SAMPLING AND ANALYTICAL PROCEDURES**

### **4.1 TEST METHODS**

#### **4.1.1 US EPA Method 3A: "Determination of Oxygen and Carbon Dioxide Concentrations in Emissions from Stationary Sources (Instrumental Analyzer Procedure)"**

Principle: A gas sample is continuously extracted from the effluent stream. A portion of the sample stream is conveyed to an instrumental analyzer(s) for determination of O<sub>2</sub> and CO<sub>2</sub> concentration(s). Performance specifications and test procedures are provided to ensure reliable data. This method was utilized in its entirety as per the procedures outlined in 40 CFR Part 60, Appendix A.

#### **4.1.2 US EPA Method 7E: "Determination of Nitrogen Oxides Emissions from Stationary Sources (Instrumental Analyzer Procedure)"**

Principle: A gas sample is continuously extracted from the effluent stream. A portion of the sample stream is conveyed to an instrumental analyzer for the determination of NO<sub>x</sub> concentration. NO and NO<sub>2</sub> may be measured separately or simultaneously. For the purposes of this method, NO<sub>x</sub> is the sum of NO and NO<sub>2</sub>. Performance specifications and test procedures are provided to ensure reliable data. This method was utilized in its entirety as per the procedures outlined in 40 CFR Part 60, Appendix A.

#### **4.1.3 US EPA Method 10: "Determination of Carbon Monoxide Emissions from Stationary Sources (Instrumental Analyzer Procedure)"**

Principle: A gas sample is continuously extracted from the effluent stream. A portion of the sample stream is conveyed to an instrumental analyzer for determination of CO concentration. Performance specifications and test procedures are provided to ensure reliable data. This method was utilized in its entirety as per the procedures outlined in 40 CFR Part 60, Appendix A.

#### **4.1.4 US EPA Method 19: "Determination of Sulfur Dioxide Removal Efficiency and Particulate Matter, Sulfur Dioxide, and Nitrogen Oxides Emission Rates"**

Principle: Oxygen (O<sub>2</sub>) or carbon dioxide (CO<sub>2</sub>) concentrations and appropriate F factors (ratios of combustion gas volumes to heat inputs) are used to calculate pollutant emission rates from pollutant concentrations.

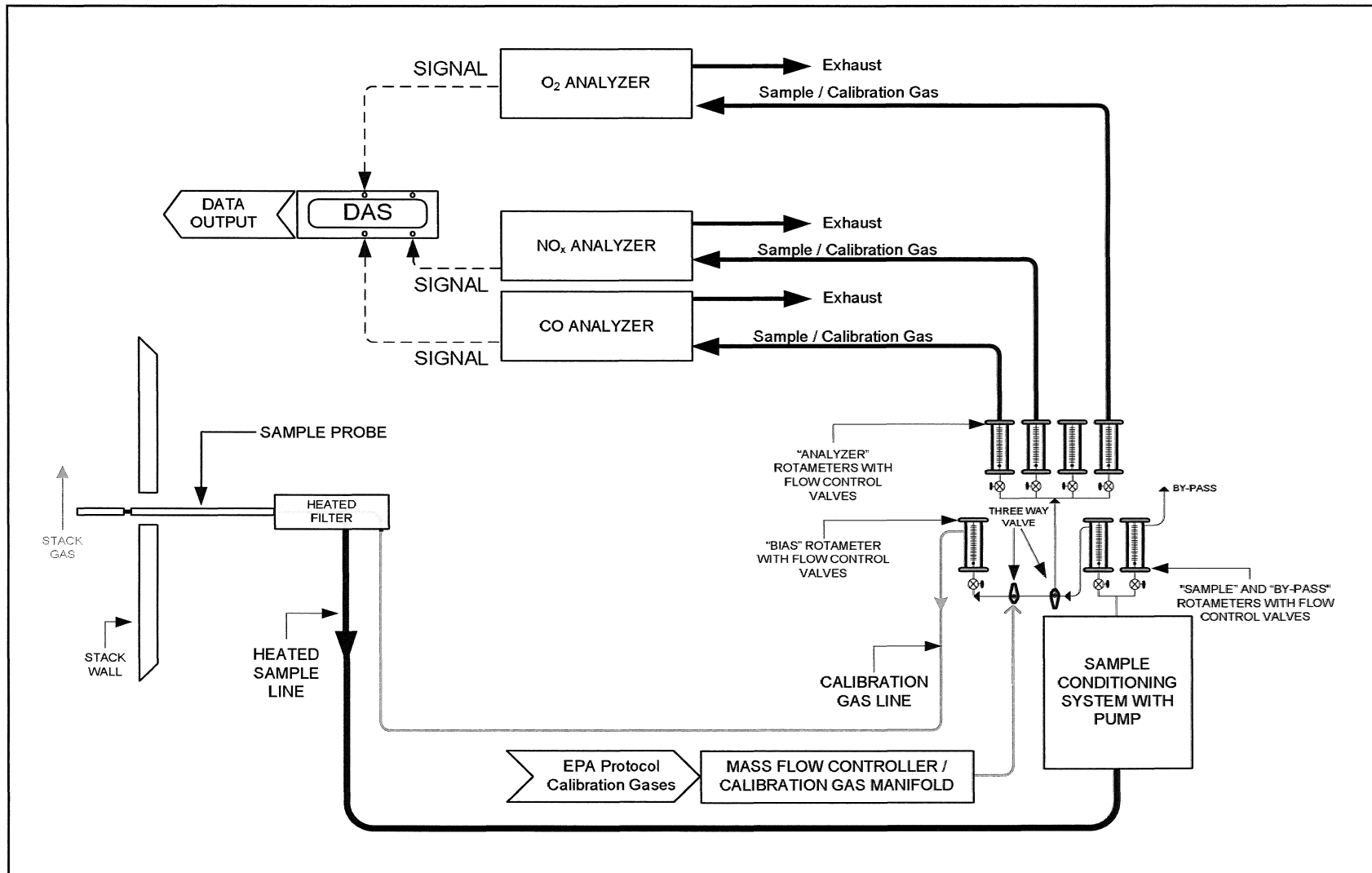
The sampling train utilized during this testing project is depicted in Figure 4.1.



## **4.2 PROCEDURES FOR OBTAINING PROCESS DATA**

Process data was recorded by Vector Pipeline LP-Washington Compressor Station personnel utilizing their typical record keeping procedures. Recorded process data was provided to Montrose personnel at the conclusion of this test event. The process data is located in Tables 2.2 and 2.3 and in Appendix Section A of this report.

**FIGURE 4.1**  
**US EPA METHODS 3A, 7E, AND 10 SAMPLING TRAIN SCHEMATIC**



## **5.0 INTERNAL QA/QC ACTIVITIES**

### **5.1 QA AUDITS**

Tables 5.1.1 to 5.5 illustrate the QA audits that were performed during this test.

Tables 5.1.1 to 5.2.3 illustrate the O<sub>2</sub>, NO<sub>x</sub>, and CO calibration audits which were performed at the EUTURBINE1 Exhaust Duct during this test (and integral to performing US EPA Method 3A, 7E, and 10 correctly) were all within the Measurement System Performance Specifications of  $\pm 3\%$  of span for the Zero and Calibration Drift Checks,  $\pm 5\%$  of span for the System Calibration Bias Checks, and  $\pm 2\%$  of span for the Calibration Error Checks.

Tables 5.3.1 to 5.4.3 illustrate the O<sub>2</sub>, NO<sub>x</sub>, and CO calibration audits which were performed at the EUTURBINE2 Exhaust Duct during this test (and integral to performing US EPA Method 3A, 7E, and 10 correctly) were all within the Measurement System Performance Specifications of  $\pm 3\%$  of span for the Zero and Calibration Drift Checks,  $\pm 5\%$  of span for the System Calibration Bias Checks, and  $\pm 2\%$  of span for the Calibration Error Checks.

Table 5.5 illustrates the NO<sub>x</sub> calibration audits which were performed on November 20, 2019 (and integral to performing US EPA Method 7E correctly) were all within the Measurement System Performance Specifications of  $\pm 3\%$  of span for the Zero and Calibration Drift Checks, and  $\pm 5\%$  of the respective cylinder concentrations for the Calibration Error Checks.

### **5.2 QA/QC PROBLEMS**

No QA/QC problems occurred during this test event.

### **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 presented in the report appendices.

**TABLE 5.1.1**  
**US EPA METHOD 3A (O<sub>2</sub>) ANALYZER CALIBRATION AND QA**

<b>EUTURBINE1 Exhaust Duct - 93% NGP Load</b>						
<b>OXYGEN ANALYZER</b>	<b>RUN 1</b>	<b>Acceptable</b>	<b>RUN 2</b>	<b>Acceptable</b>	<b>RUN 3</b>	<b>Acceptable</b>
Analyzer Span During Test Run (%)	20.1	YES	20.1	YES	20.1	YES
Initial System Calibration Response for Zero Gas (%)	0.11	N/A	0.09	N/A	0.08	N/A
Final System Calibration Response for Zero Gas (%)	0.09	N/A	0.08	N/A	0.08	N/A
Actual Concentration of the Upscale Calibration Gas (%)	10.07	N/A	10.07	N/A	10.07	N/A
Initial System Calibration Response for Upscale Gas (%)	9.99	N/A	9.95	N/A	9.89	N/A
Final System Calibration Response for Upscale Gas (%)	9.95	N/A	9.89	N/A	9.87	N/A
Initial System Calibration Bias for Zero Gas (% of Span)	0.30	YES	0.20	YES	0.15	YES
Final System Calibration Bias for Zero Gas (% of Span)	0.20	YES	0.15	YES	0.15	YES
Initial System Calibration Bias for Upscale Gas (% of Span)	-0.60	YES	-0.80	YES	-1.10	YES
Final System Calibration Bias for Upscale Gas (% of Span)	-0.80	YES	-1.10	YES	-1.20	YES
System Drift for Zero Gas (% of Span)	-0.10	YES	-0.05	YES	0.00	YES
System Drift for Upscale Gas (% of Span)	-0.20	YES	-0.30	YES	-0.10	YES
Analyzer Calibration Error for Zero Gas (% of Span)	0.25	YES	0.25	YES	0.25	YES
Analyzer Calibration Error for Mid-Level Gas (% of Span)	0.20	YES	0.20	YES	0.20	YES
Analyzer Calibration Error for High-Level Gas (% of Span)	0.00	YES	0.00	YES	0.00	YES

**TABLE 5.1.2**  
**US EPA METHOD 7E ANALYZER CALIBRATION AND QA**

<b>EUTURBINE1 Exhaust Duct - 93% NGP Load</b>						
<b>NITROGEN OXIDES ANALYZER</b>	<b>RUN 1</b>	<b>Acceptable</b>	<b>RUN 2</b>	<b>Acceptable</b>	<b>RUN 3</b>	<b>Acceptable</b>
Analyzer Span During Test Run (ppm)	50	YES	50	YES	50	YES
Initial System Calibration Response for Zero Gas (ppm)	-0.1	N/A	0.2	N/A	0.1	N/A
Final System Calibration Response for Zero Gas (ppm)	0.2	N/A	0.1	N/A	0.1	N/A
Actual Concentration of the Upscale Calibration Gas (ppm)	25.3	N/A	25.3	N/A	25.3	N/A
Initial System Calibration Response for Upscale Gas (ppm)	24.9	N/A	25.1	N/A	25.1	N/A
Final System Calibration Response for Upscale Gas (ppm)	25.1	N/A	25.1	N/A	25.1	N/A
Initial System Calibration Bias for Zero Gas (% of Span)	0.00	YES	0.48	YES	0.46	YES
Final System Calibration Bias for Zero Gas (% of Span)	0.48	YES	0.46	YES	0.42	YES
Initial System Calibration Bias for Upscale Gas (% of Span)	-0.44	YES	-0.16	YES	0.00	YES
Final System Calibration Bias for Upscale Gas (% of Span)	-0.16	YES	0.00	YES	-0.10	YES
System Drift for Zero Gas (% of Span)	0.48	YES	-0.02	YES	-0.04	YES
System Drift for Upscale Gas (% of Span)	0.28	YES	0.16	YES	-0.10	YES
Analyzer Calibration Error for Zero Gas (% of Span)	-0.18	YES	-0.18	YES	-0.18	YES
Analyzer Calibration Error for Mid-Level Gas (% of Span)	-0.30	YES	-0.30	YES	-0.30	YES
Analyzer Calibration Error for High-Level Gas (% of Span)	-0.02	YES	-0.02	YES	-0.02	YES

**TABLE 5.1.3**  
**US EPA METHOD 10 ANALYZER CALIBRATION AND QA**

<b>EUTURBINE1 Exhaust Duct - 93% NGP Load</b>						
<b>CARBON MONOXIDE ANALYZER</b>	<b>RUN 1</b>	<b>Acceptable</b>	<b>RUN 2</b>	<b>Acceptable</b>	<b>RUN 3</b>	<b>Acceptable</b>
Analyzer Span During Test Run (ppm)	50	YES	50	YES	50	YES
Initial System Calibration Response for Zero Gas (ppm)	-0.14	N/A	-0.06	N/A	-0.19	N/A
Final System Calibration Response for Zero Gas (ppm)	-0.06	N/A	-0.19	N/A	-0.15	N/A
Actual Concentration of the Upscale Calibration Gas (ppm)	25.5	N/A	25.5	N/A	25.5	N/A
Initial System Calibration Response for Upscale Gas (ppm)	24.8	N/A	24.8	N/A	24.8	N/A
Final System Calibration Response for Upscale Gas (ppm)	24.8	N/A	24.8	N/A	24.7	N/A
Initial System Calibration Bias for Zero Gas (% of Span)	-0.54	YES	-0.38	YES	-0.64	YES
Final System Calibration Bias for Zero Gas (% of Span)	-0.38	YES	-0.64	YES	-0.56	YES
Initial System Calibration Bias for Upscale Gas (% of Span)	-0.92	YES	-0.94	YES	-0.90	YES
Final System Calibration Bias for Upscale Gas (% of Span)	-0.94	YES	-0.90	YES	-1.16	YES
System Drift for Zero Gas (% of Span)	0.16	YES	-0.26	YES	0.08	YES
System Drift for Upscale Gas (% of Span)	-0.02	YES	0.04	YES	-0.26	YES
Analyzer Calibration Error for Zero Gas (% of Span)	0.26	YES	0.26	YES	0.26	YES
Analyzer Calibration Error for Mid-Level Gas (% of Span)	-0.48	YES	-0.48	YES	-0.48	YES
Analyzer Calibration Error for High-Level Gas (% of Span)	0.22	YES	0.22	YES	0.22	YES

**TABLE 5.2.1**  
**US EPA METHOD 3A (O<sub>2</sub>) ANALYZER CALIBRATION AND QA**

<b>EUTURBINE1 Exhaust Duct - 100% NGP Load</b>						
<b>OXYGEN ANALYZER</b>	<b>RUN 1</b>	<b>Acceptable</b>	<b>RUN 2</b>	<b>Acceptable</b>	<b>Run 4</b>	<b>Acceptable</b>
Analyzer Span During Test Run (%)	20.1	YES	20.1	YES	20.1	YES
Initial System Calibration Response for Zero Gas (%)	0.08	N/A	0.07	N/A	0.08	N/A
Final System Calibration Response for Zero Gas (%)	0.07	N/A	0.08	N/A	0.08	N/A
Actual Concentration of the Upscale Calibration Gas (%)	10.07	N/A	10.07	N/A	10.07	N/A
Initial System Calibration Response for Upscale Gas (%)	9.87	N/A	9.82	N/A	9.82	N/A
Final System Calibration Response for Upscale Gas (%)	9.82	N/A	9.82	N/A	9.81	N/A
Initial System Calibration Bias for Zero Gas (% of Span)	0.15	YES	0.10	YES	0.15	YES
Final System Calibration Bias for Zero Gas (% of Span)	0.10	YES	0.15	YES	0.15	YES
Initial System Calibration Bias for Upscale Gas (% of Span)	-1.20	YES	-1.44	YES	-1.44	YES
Final System Calibration Bias for Upscale Gas (% of Span)	-1.44	YES	-1.44	YES	-1.49	YES
System Drift for Zero Gas (% of Span)	-0.05	YES	0.05	YES	0.00	YES
System Drift for Upscale Gas (% of Span)	-0.25	YES	0.00	YES	-0.05	YES
Analyzer Calibration Error for Zero Gas (% of Span)	0.25	YES	0.25	YES	0.25	YES
Analyzer Calibration Error for Mid-Level Gas (% of Span)	0.20	YES	0.20	YES	0.20	YES
Analyzer Calibration Error for High-Level Gas (% of Span)	0.00	YES	0.00	YES	0.00	YES

**TABLE 5.2.2**  
**US EPA METHOD 7E ANALYZER CALIBRATION AND QA**

<b>EUTURBINE1 Exhaust Duct - 100% NGP Load</b>						
<b>NITROGEN OXIDES ANALYZER</b>	<b>RUN 1</b>	<b>Acceptable</b>	<b>RUN 2</b>	<b>Acceptable</b>	<b>Run 4</b>	<b>Acceptable</b>
Analyzer Span During Test Run (ppm)	50	YES	50	YES	50	YES
Initial System Calibration Response for Zero Gas (ppm)	0.1	N/A	0.1	N/A	0.1	N/A
Final System Calibration Response for Zero Gas (ppm)	0.1	N/A	0.1	N/A	0.1	N/A
Actual Concentration of the Upscale Calibration Gas (ppm)	25.3	N/A	25.3	N/A	25.3	N/A
Initial System Calibration Response for Upscale Gas (ppm)	25.1	N/A	25.1	N/A	25.1	N/A
Final System Calibration Response for Upscale Gas (ppm)	25.1	N/A	25.1	N/A	25.1	N/A
Initial System Calibration Bias for Zero Gas (% of Span)	0.42	YES	0.42	YES	0.38	YES
Final System Calibration Bias for Zero Gas (% of Span)	0.42	YES	0.38	YES	0.32	YES
Initial System Calibration Bias for Upscale Gas (% of Span)	-0.10	YES	-0.14	YES	-0.18	YES
Final System Calibration Bias for Upscale Gas (% of Span)	-0.14	YES	-0.18	YES	-0.04	YES
System Drift for Zero Gas (% of Span)	0.00	YES	-0.04	YES	-0.06	YES
System Drift for Upscale Gas (% of Span)	-0.04	YES	-0.04	YES	0.14	YES
Analyzer Calibration Error for Zero Gas (% of Span)	-0.18	YES	-0.18	YES	-0.18	YES
Analyzer Calibration Error for Mid-Level Gas (% of Span)	-0.30	YES	-0.30	YES	-0.30	YES
Analyzer Calibration Error for High-Level Gas (% of Span)	-0.02	YES	-0.02	YES	-0.02	YES



**TABLE 5.2.3**  
**US EPA METHOD 10 ANALYZER CALIBRATION AND QA**

<b>EUTURBINE1 Exhaust Duct - 100% NGP Load</b>						
<b>CARBON MONOXIDE ANALYZER</b>	<b>RUN 1</b>	<b>Acceptable</b>	<b>RUN 2</b>	<b>Acceptable</b>	<b>Run 4</b>	<b>Acceptable</b>
Analyzer Span During Test Run (ppm)	50	YES	50	YES	50	YES
Initial System Calibration Response for Zero Gas (ppm)	-0.15	N/A	-0.37	N/A	-0.26	N/A
Final System Calibration Response for Zero Gas (ppm)	-0.37	N/A	-0.26	N/A	-0.52	N/A
Actual Concentration of the Upscale Calibration Gas (ppm)	25.5	N/A	25.5	N/A	25.5	N/A
Initial System Calibration Response for Upscale Gas (ppm)	24.7	N/A	24.7	N/A	24.7	N/A
Final System Calibration Response for Upscale Gas (ppm)	24.7	N/A	24.7	N/A	24.6	N/A
Initial System Calibration Bias for Zero Gas (% of Span)	-0.56	YES	-1.00	YES	-0.78	YES
Final System Calibration Bias for Zero Gas (% of Span)	-1.00	YES	-0.78	YES	-1.30	YES
Initial System Calibration Bias for Upscale Gas (% of Span)	-1.16	YES	-1.12	YES	-1.16	YES
Final System Calibration Bias for Upscale Gas (% of Span)	-1.12	YES	-1.16	YES	-1.28	YES
System Drift for Zero Gas (% of Span)	-0.44	YES	0.22	YES	-0.52	YES
System Drift for Upscale Gas (% of Span)	0.04	YES	-0.04	YES	-0.12	YES
Analyzer Calibration Error for Zero Gas (% of Span)	0.26	YES	0.26	YES	0.26	YES
Analyzer Calibration Error for Mid-Level Gas (% of Span)	-0.48	YES	-0.48	YES	-0.48	YES
Analyzer Calibration Error for High-Level Gas (% of Span)	0.22	YES	0.22	YES	0.22	YES

**TABLE 5.3.1**  
**US EPA METHOD 3A (O<sub>2</sub>) ANALYZER CALIBRATION AND QA**

<b>EUTURBINE2 Exhaust Duct - 93% NGP Load</b>						
<b>OXYGEN ANALYZER</b>	<b>RUN 1</b>	<b>Acceptable</b>	<b>RUN 2</b>	<b>Acceptable</b>	<b>RUN 3</b>	<b>Acceptable</b>
Analyzer Span During Test Run (%)	20.1	YES	20.1	YES	20.1	YES
Initial System Calibration Response for Zero Gas (%)	0.08	N/A	0.08	N/A	0.07	N/A
Final System Calibration Response for Zero Gas (%)	0.08	N/A	0.07	N/A	0.07	N/A
Actual Concentration of the Upscale Calibration Gas (%)	10.07	N/A	10.07	N/A	10.07	N/A
Initial System Calibration Response for Upscale Gas (%)	9.81	N/A	9.87	N/A	9.90	N/A
Final System Calibration Response for Upscale Gas (%)	9.87	N/A	9.90	N/A	9.86	N/A
Initial System Calibration Bias for Zero Gas (% of Span)	0.15	YES	0.15	YES	0.10	YES
Final System Calibration Bias for Zero Gas (% of Span)	0.15	YES	0.10	YES	0.10	YES
Initial System Calibration Bias for Upscale Gas (% of Span)	-1.49	YES	-1.20	YES	-1.05	YES
Final System Calibration Bias for Upscale Gas (% of Span)	-1.20	YES	-1.05	YES	-1.25	YES
System Drift for Zero Gas (% of Span)	0.00	YES	-0.05	YES	0.00	YES
System Drift for Upscale Gas (% of Span)	0.30	YES	0.15	YES	-0.20	YES
Analyzer Calibration Error for Zero Gas (% of Span)	0.25	YES	0.25	YES	0.25	YES
Analyzer Calibration Error for Mid-Level Gas (% of Span)	0.20	YES	0.20	YES	0.20	YES
Analyzer Calibration Error for High-Level Gas (% of Span)	0.00	YES	0.00	YES	0.00	YES

**TABLE 5.3.2**  
**US EPA METHOD 7E ANALYZER CALIBRATION AND QA**

<b>EUTURBINE2 Exhaust Duct - 93% NGP Load</b>						
<b>NITROGEN OXIDES ANALYZER</b>	<b>RUN 1</b>	<b>Acceptable</b>	<b>RUN 2</b>	<b>Acceptable</b>	<b>RUN 3</b>	<b>Acceptable</b>
Analyzer Span During Test Run (ppm)	50	YES	50	YES	50	YES
Initial System Calibration Response for Zero Gas (ppm)	0.1	N/A	0.1	N/A	0.0	N/A
Final System Calibration Response for Zero Gas (ppm)	0.1	N/A	0.0	N/A	0.1	N/A
Actual Concentration of the Upscale Calibration Gas (ppm)	25.3	N/A	25.3	N/A	25.3	N/A
Initial System Calibration Response for Upscale Gas (ppm)	25.1	N/A	25.1	N/A	25.1	N/A
Final System Calibration Response for Upscale Gas (ppm)	25.1	N/A	25.1	N/A	25.1	N/A
Initial System Calibration Bias for Zero Gas (% of Span)	0.32	YES	0.38	YES	0.26	YES
Final System Calibration Bias for Zero Gas (% of Span)	0.38	YES	0.26	YES	0.28	YES
Initial System Calibration Bias for Upscale Gas (% of Span)	-0.04	YES	-0.02	YES	-0.12	YES
Final System Calibration Bias for Upscale Gas (% of Span)	-0.02	YES	-0.12	YES	-0.04	YES
System Drift for Zero Gas (% of Span)	0.06	YES	-0.12	YES	0.02	YES
System Drift for Upscale Gas (% of Span)	0.02	YES	-0.10	YES	0.08	YES
Analyzer Calibration Error for Zero Gas (% of Span)	-0.18	YES	-0.18	YES	-0.18	YES
Analyzer Calibration Error for Mid-Level Gas (% of Span)	-0.30	YES	-0.30	YES	-0.30	YES
Analyzer Calibration Error for High-Level Gas (% of Span)	-0.02	YES	-0.02	YES	-0.02	YES

**TABLE 5.3.3**  
**US EPA METHOD 10 ANALYZER CALIBRATION AND QA**

<b>EUTURBINE2 Exhaust Duct - 93% NGP Load</b>						
<b>CARBON MONOXIDE ANALYZER</b>	<b>RUN 1</b>	<b>Acceptable</b>	<b>RUN 2</b>	<b>Acceptable</b>	<b>RUN 3</b>	<b>Acceptable</b>
Analyzer Span During Test Run (ppm)	50	YES	50	YES	50	YES
Initial System Calibration Response for Zero Gas (ppm)	-0.52	N/A	-0.52	N/A	-0.31	N/A
Final System Calibration Response for Zero Gas (ppm)	-0.52	N/A	-0.31	N/A	-0.52	N/A
Actual Concentration of the Upscale Calibration Gas (ppm)	25.5	N/A	25.5	N/A	25.5	N/A
Initial System Calibration Response for Upscale Gas (ppm)	24.6	N/A	24.5	N/A	24.6	N/A
Final System Calibration Response for Upscale Gas (ppm)	24.5	N/A	24.6	N/A	24.5	N/A
Initial System Calibration Bias for Zero Gas (% of Span)	-1.30	YES	-1.30	YES	-0.88	YES
Final System Calibration Bias for Zero Gas (% of Span)	-1.30	YES	-0.88	YES	-1.30	YES
Initial System Calibration Bias for Upscale Gas (% of Span)	-1.28	YES	-1.48	YES	-1.36	YES
Final System Calibration Bias for Upscale Gas (% of Span)	-1.48	YES	-1.36	YES	-1.54	YES
System Drift for Zero Gas (% of Span)	0.00	YES	0.42	YES	-0.42	YES
System Drift for Upscale Gas (% of Span)	-0.20	YES	0.12	YES	-0.18	YES
Analyzer Calibration Error for Zero Gas (% of Span)	0.26	YES	0.26	YES	0.26	YES
Analyzer Calibration Error for Mid-Level Gas (% of Span)	-0.48	YES	-0.48	YES	-0.48	YES
Analyzer Calibration Error for High-Level Gas (% of Span)	0.22	YES	0.22	YES	0.22	YES

**TABLE 5.4.1**  
**US EPA METHOD 3A (O<sub>2</sub>) ANALYZER CALIBRATION AND QA**

<b>EUTURBINE2 Exhaust Duct - 100% NGP Load</b>						
<b>OXYGEN ANALYZER</b>	<b>RUN 1</b>	<b>Acceptable</b>	<b>RUN 2</b>	<b>Acceptable</b>	<b>RUN 3</b>	<b>Acceptable</b>
Analyzer Span During Test Run (%)	20.1	YES	20.1	YES	20.1	YES
Initial System Calibration Response for Zero Gas (%)	0.07	N/A	0.08	N/A	0.07	N/A
Final System Calibration Response for Zero Gas (%)	0.08	N/A	0.07	N/A	0.09	N/A
Actual Concentration of the Upscale Calibration Gas (%)	10.07	N/A	10.07	N/A	10.07	N/A
Initial System Calibration Response for Upscale Gas (%)	9.86	N/A	9.88	N/A	9.90	N/A
Final System Calibration Response for Upscale Gas (%)	9.88	N/A	9.90	N/A	9.92	N/A
Initial System Calibration Bias for Zero Gas (% of Span)	0.10	YES	0.15	YES	0.10	YES
Final System Calibration Bias for Zero Gas (% of Span)	0.15	YES	0.10	YES	0.20	YES
Initial System Calibration Bias for Upscale Gas (% of Span)	-1.25	YES	-1.15	YES	-1.05	YES
Final System Calibration Bias for Upscale Gas (% of Span)	-1.15	YES	-1.05	YES	-0.95	YES
System Drift for Zero Gas (% of Span)	0.05	YES	-0.05	YES	0.10	YES
System Drift for Upscale Gas (% of Span)	0.10	YES	0.10	YES	0.10	YES
Analyzer Calibration Error for Zero Gas (% of Span)	0.25	YES	0.25	YES	0.25	YES
Analyzer Calibration Error for Mid-Level Gas (% of Span)	0.20	YES	0.20	YES	0.20	YES
Analyzer Calibration Error for High-Level Gas (% of Span)	0.00	YES	0.00	YES	0.00	YES

**TABLE 5.4.2**  
**US EPA METHOD 7E ANALYZER CALIBRATION AND QA**

<b>EUTURBINE2 Exhaust Duct - 100% NGP Load</b>						
<b>NITROGEN OXIDES ANALYZER</b>	<b>RUN 1</b>	<b>Acceptable</b>	<b>RUN 2</b>	<b>Acceptable</b>	<b>RUN 3</b>	<b>Acceptable</b>
Analyzer Span During Test Run (ppm)	50	YES	50	YES	50	YES
Initial System Calibration Response for Zero Gas (ppm)	0.1	N/A	0.0	N/A	0.0	N/A
Final System Calibration Response for Zero Gas (ppm)	0.0	N/A	0.0	N/A	0.0	N/A
Actual Concentration of the Upscale Calibration Gas (ppm)	25.3	N/A	25.3	N/A	25.3	N/A
Initial System Calibration Response for Upscale Gas (ppm)	25.1	N/A	25.0	N/A	25.1	N/A
Final System Calibration Response for Upscale Gas (ppm)	25.0	N/A	25.1	N/A	25.0	N/A
Initial System Calibration Bias for Zero Gas (% of Span)	0.28	YES	0.24	YES	0.16	YES
Final System Calibration Bias for Zero Gas (% of Span)	0.24	YES	0.16	YES	0.16	YES
Initial System Calibration Bias for Upscale Gas (% of Span)	-0.04	YES	-0.34	YES	-0.14	YES
Final System Calibration Bias for Upscale Gas (% of Span)	-0.34	YES	-0.14	YES	-0.20	YES
System Drift for Zero Gas (% of Span)	-0.04	YES	-0.08	YES	0.00	YES
System Drift for Upscale Gas (% of Span)	-0.30	YES	0.20	YES	-0.06	YES
Analyzer Calibration Error for Zero Gas (% of Span)	-0.18	YES	-0.18	YES	-0.18	YES
Analyzer Calibration Error for Mid-Level Gas (% of Span)	-0.30	YES	-0.30	YES	-0.30	YES
Analyzer Calibration Error for High-Level Gas (% of Span)	-0.02	YES	-0.02	YES	-0.02	YES

**TABLE 5.4.3**  
**US EPA METHOD 10 ANALYZER CALIBRATION AND QA**

<b>EUTURBINE2 Exhaust Duct - 100% NGP Load</b>						
<b>CARBON MONOXIDE ANALYZER</b>	<b>RUN 1</b>	<b>Acceptable</b>	<b>RUN 2</b>	<b>Acceptable</b>	<b>RUN 3</b>	<b>Acceptable</b>
Analyzer Span During Test Run (ppm)	50	YES	50	YES	50	YES
Initial System Calibration Response for Zero Gas (ppm)	-0.52	N/A	-0.09	N/A	-0.20	N/A
Final System Calibration Response for Zero Gas (ppm)	-0.09	N/A	-0.20	N/A	-0.33	N/A
Actual Concentration of the Upscale Calibration Gas (ppm)	25.5	N/A	25.5	N/A	25.5	N/A
Initial System Calibration Response for Upscale Gas (ppm)	24.5	N/A	24.5	N/A	24.5	N/A
Final System Calibration Response for Upscale Gas (ppm)	24.5	N/A	24.5	N/A	24.5	N/A
Initial System Calibration Bias for Zero Gas (% of Span)	-1.30	YES	-0.44	YES	-0.66	YES
Final System Calibration Bias for Zero Gas (% of Span)	-0.44	YES	-0.66	YES	-0.92	YES
Initial System Calibration Bias for Upscale Gas (% of Span)	-1.54	YES	-1.61	YES	-1.54	YES
Final System Calibration Bias for Upscale Gas (% of Span)	-1.61	YES	-1.54	YES	-1.61	YES
System Drift for Zero Gas (% of Span)	0.86	YES	-0.22	YES	-0.26	YES
System Drift for Upscale Gas (% of Span)	-0.06	YES	0.06	YES	-0.06	YES
Analyzer Calibration Error for Zero Gas (% of Span)	0.26	YES	0.26	YES	0.26	YES
Analyzer Calibration Error for Mid-Level Gas (% of Span)	-0.48	YES	-0.48	YES	-0.48	YES
Analyzer Calibration Error for High-Level Gas (% of Span)	0.22	YES	0.22	YES	0.22	YES

**TABLE 5.5**  
**US EPA METHOD 7E NO<sub>x</sub> CONVERTER EFFICIENCY CHECK**

<b>Date / Time</b>	<b>Certified Cylinder Concentration (ppm NO<sub>2</sub>)</b>	<b>Analyzer Concentration (ppm NO<sub>x</sub>)</b>	<b>Conversion Efficiency (%)</b>	<b>Required Conversion Efficiency (%)</b>	<b>Acceptable</b>
11/20/2019 13:22	50.78	46.00	90.58	90.00	Yes

Analyzer ID: Thermo Electron Corp.-Model 42i  
Cylinder Number: CC507531