



Compliance Emissions Test Report

**Lansing Board of Water and Light (LBW&L)
Delta Energy Park Facility
Combustion Turbine Generator
DEPC2 Stack
3725 South Canal Road
Lansing, Michigan 48917
September 1, 2022**

**Report Submittal Date
September 28, 2022**

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Mostardi Platt

Report No. M223509B

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1.0 EXECUTIVE SUMMARY

Mostardi Platt performed a formaldehyde (CH₂O) compliance emissions test program on combustion turbine generator DEPC2 located at the Lansing Board of Water and Light's (LBW&L), Delta Energy Park in Lansing, Michigan. Testing was conducted in accordance with United States Environmental Protection Agency (USEPA) Methods 1, 3A, and 320, while operating the unit at/near the maximum potential operational load for the ambient temperature, pressure and humidity, while the unit was combusting natural gas.

The test location, test date, test parameters, and test methodologies are summarized below.

TEST INFORMATION			
Test Location	Test Date	Test Parameters	Test Methodologies
DEPC2	September 1, 2022	Oxygen (O ₂) and formaldehyde	USEPA Method 3A, 40CFR60, Appendix A and Method 320, 40CFR63, Appendix A

The purpose of this test program was to demonstrate formaldehyde concentrations meet the requirement of Table 1 of United States Environmental Protection Agency (USEPA) Title 40, Code of Federal Regulations, Part 63, Subpart YYYYY – “National Emission Standards for Hazardous Air Pollutants for Stationary Combustion Turbines”.

Selected results of the test program are summarized below. A complete summary of emission test results follows the narrative portion of this report.

TEST RESULTS		
Test Location	Formaldehyde Emission Limit	Formaldehyde Test Result
DEPC2	91 ppbvd @ 15% O ₂	35.9 ppbvd @ 15% O ₂

The identifications of the individuals associated with the test program are summarized below.

TEST PERSONNEL INFORMATION		
Location	Address	Contact
Test Coordinator	Lansing Board of Water and Light 1232 Haco Drive Lansing, Michigan 48912-1610	Nathan Hude Environmental Compliance Specialist (517) 702-6170 (phone) Nathan.hude@lbwl.com
Test Facility Representative	Lansing Board of Water and Light Delta Energy Park Facility 3725 South Canal Road Lansing, Michigan 48917	
Testing Company Representative	Mostardi Platt 888 Industrial Drive Elmhurst, Illinois 60126	Jeff Gross Project Manager (630) 993-2100 (phone) jgross@mp-mail.com

2.0 TEST METHODOLOGY

Emissions testing was conducted following the methods specified in 40CFR60 and 40CFR63, Appendix A. A schematic of the test section diagram is found in Appendix A and a schematic of the sampling train used is included in Appendix B. Calculation, nomenclature and sample calculations are included in Appendix C. Copies of analyzer print-outs for each test run are included in Appendix D and FTIR QA/QC is found in Appendix E.

The following methodologies were used during the test program:

2.1 Method 3A Oxygen (O₂) Determination

Stack gas O₂ concentrations were determined in accordance with USEPA Method 3A, 40CFR60, Appendix A. An ECOM analyzer was used to determine O₂ concentrations in the manner specified in the Method. The instrument was operated in the nominal range of 0% to 25% with the specific range determined by the high-level span calibration gas. High-range calibrations were performed using U.S. EPA Protocol gas. Zero nitrogen (a low ppm pollutant in balance nitrogen calibration gases) was introduced during other instrument calibrations to check instrument zero. High- and a mid-range % O₂ levels in balance nitrogen were also introduced. Zero and mid-range calibrations were performed using U.S. EPA Protocol gas after each test run. Copies of the gas cylinder certifications are found in Appendix F. This testing met the performance specifications as outlined in the Method.

2.2 Method 320 Fourier Transform Infrared (FTIR) Detector for Formaldehyde Determination

Extractive Fourier transform infrared (FTIR) spectrometry following USEPA Method 320 was performed for determination of formaldehyde.

FTIR technology works on the principle that most gases absorb infrared light. This is true for all compounds with the exception of homonuclear diatomic molecules and noble gases such as: N₂, O₂, H₂, He, Ne, and Ar. Vibrations, stretches, bends, and rotations within the bonds of a molecule determine the infrared absorption distinctiveness. The absorption creates a "fingerprint" which is unique to each given compound. The quantity of infrared light absorbed is proportional to the gas concentration. Most compounds have absorbencies at different infrared frequencies, thus allowing the simultaneous analysis of multiple compounds at one time. The FTIR software compares each sample spectrum to a user-selected list of calibration references and concentration data is generated.

FTIR data was collected using an MKS MultiGas 2030 FTIR spectrometer equipped with a low level detector in order to routinely quantify formaldehyde concentrations in the low double digit parts per billion range. Analyte spiking was performed to assure the ability of the FTIR to quantify analytes in the presence of effluent gas. All analyte spikes were introduced using an instrument grade stainless steel rotometer. All QA/QC procedures were within the acceptance criteria allowance of Method 320.

A stratification test was performed using oxygen (O₂) prior to the CH₂O testing. The results of the stratification test showed that all results were less than 5%. Consequently, all sampling was conducted from one port using one point. All samples below the FTIR detection limit of 10ppb for formaldehyde were corrected to the detection limit and used in averaging of each run.

FTIR QA/QC PROCEDURES						
QA/QC Specification	Purpose	Calibration Gas Analyte	Delivery	Frequency	Acceptance Criteria	Result
M320: Zero	Verify that the FTIR is free of contaminants & zero the FTIR	Nitrogen (zero)	Direct to FTIR	pre/post test	< MDL or Noise	Pass
M320: Calibration Transfer Standard (CTS) Direct	Verify FTIR stability, confirm optical path length	Methane	Direct to FTIR	pretest	+/- 5% cert. value	Pass
M320: CTS Response	Verify system stability, recovery, response time	Methane	Sampling System	Daily, pre/post test	+/- 5% of Direct Measurement	Pass
M320: Zero Response	Verify system is free of contaminants, system bias	Nitrogen (zero)	Sampling System	pretest	Bias correct data	Pass
M320: Analyte Spike	Verify system ability to deliver and quantify analyte of interest in the presence of other effluent gases	Formaldehyde	Dynamic Addition to Sampling System, ~1:10 effluent	pre test	+/- 30% theoretical recovery	Pass

Note: The determined concentrations from direct analyses were used in all system/spike recovery calculations.

CALIBRATION GAS STANDARDS				
Components	Concentration (ppm)	Vendor	Cylinder #	Standard Type
Methane	89.88	Airgas	CC326314	Certified Standard-Spec +/- 2%
Formaldehyde	1.09	SPECGAS, Inc.	CC522694	Certified Standard-Spec +/- 5%
N ₂ O	102			Certified Standard-Spec +/- 2%
Zero Nitrogen	0.0	Airgas	N/A	UHP Grade

Analyte Spiking

Formaldehyde spiking was performed prior to testing and before each test run to verify the ability of the sampling system to quantitatively deliver a sample containing formaldehyde from the base of the probe to the FTIR. Analyte spiking assures the ability of the FTIR sampling system to recover acid gases in the presence of effluent gas.

As part of the spiking procedure, samples were measured to determine native formaldehyde and moisture concentrations to be used in the spike recovery calculations. Moisture in the stack gas prior to spiking and during spiking was used to determine dilution ratios of the formaldehyde. The spike target dilution ratio was 1:10 or less. The following equation illustrates the percent recovery calculation:

$$DF = 1 - \frac{H2O (spike)}{(native)} \quad (\text{Sec. 9.2.3 (3) USEPA Method 320})$$

$$CS = DF * Spike_{dir} + Unspike(1 - DF) \quad (\text{Sec. 9.2.3 (4) USEPA Method 320})$$

- DF = Dilution factor of the spike gas
- Spike_{dir} = Concentration of the analyte in the spike standard measure by the FTIR directly
- CS = Expected concentration of the spiked samples
- Unspike = Native concentration of analytes in unspiked samples

Detection Limit

The detection limit of each analyte was calculated following Annex A2 of ASTM D6348-12 procedure using spectra that contained similar amounts of moisture.

FTIR DETECTION LIMITS			
Analyte	Detection Limit (ppbv wet)	Detection Limit (%v)	Detection Limit (%v wet)
Formaldehyde	10.0	—	—
Water	—	0.1	N/A

QA/QC data are found in Appendix E. Copies of gas cylinder certifications are found in Appendix F. All concentration data were recorded on a wet, volume basis. The sample and data collection followed the procedures outlined in Method 320.

3.0 TEST RESULTS SUMMARIES

Lansing Board of Water and Light Delta Energy Park DEPC2 Formaldehyde Summary								
Test No.	Date	Start Time	End Time	H2O% %v	O ₂ % dry	Formaldehyde ppbv wet*	Formaldehyde ppbv dry	Formaldehyde ppbv @ 15% O ₂
1	09/01/22	07:57	08:56	8.14	13.95	10.57	11.51	9.8
2	09/01/22	09:21	10:20	7.78	14.03	40.84	44.28	38.0
3	09/01/22	10:48	11:47	7.72	14.11	74.99	81.26	70.6
Average				7.88	14.03	42.13	45.68	39.5

*Corrected for formaldehyde recovery

4.0 CERTIFICATION

Mostardi Platt is pleased to have been of service to Lansing Board of Water and Light. If you have any questions regarding this test report, please do not hesitate to contact us at 630-993-2100.

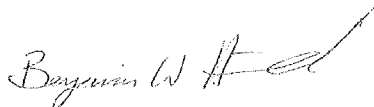
As project manager, I hereby certify that this test report represents a true and accurate summary of emissions test results and the methodologies employed to obtain those results, and the test program was performed in accordance with the methods specified in this test report.

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Jeffery M. Gross

Project Manager



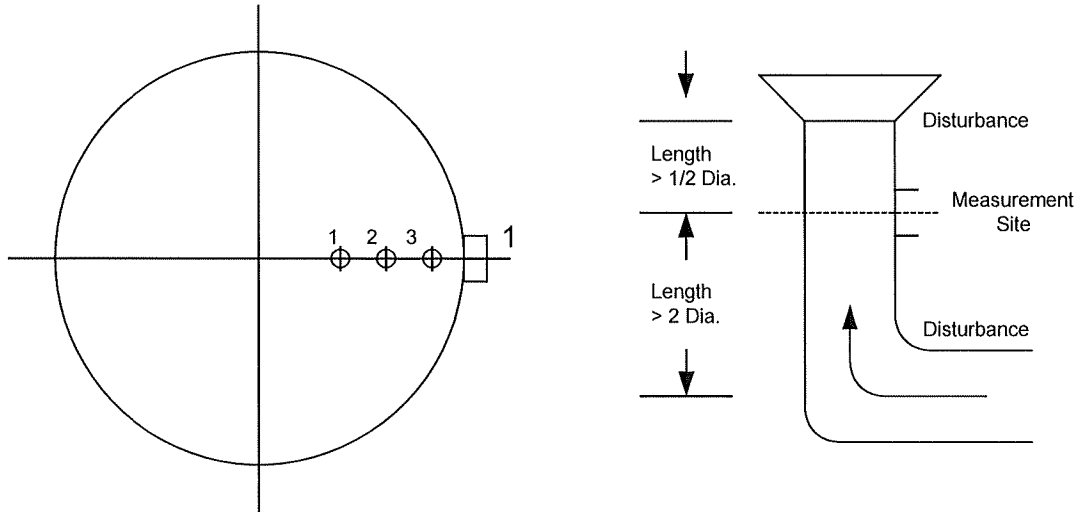
Benjamin W. Hendricks

Quality Assurance

APPENDICES

Appendix A - Test Section Diagram

GASEOUS TRAVERSE FOR ROUND DUCTS



Job: Lansing Board of Water and Light (LBW&L)
Delta Park Energy Park
Delta, Michigan

Date: September 1, 2022

Test Location: Combustion Turbine Generator DEPC2 Stack

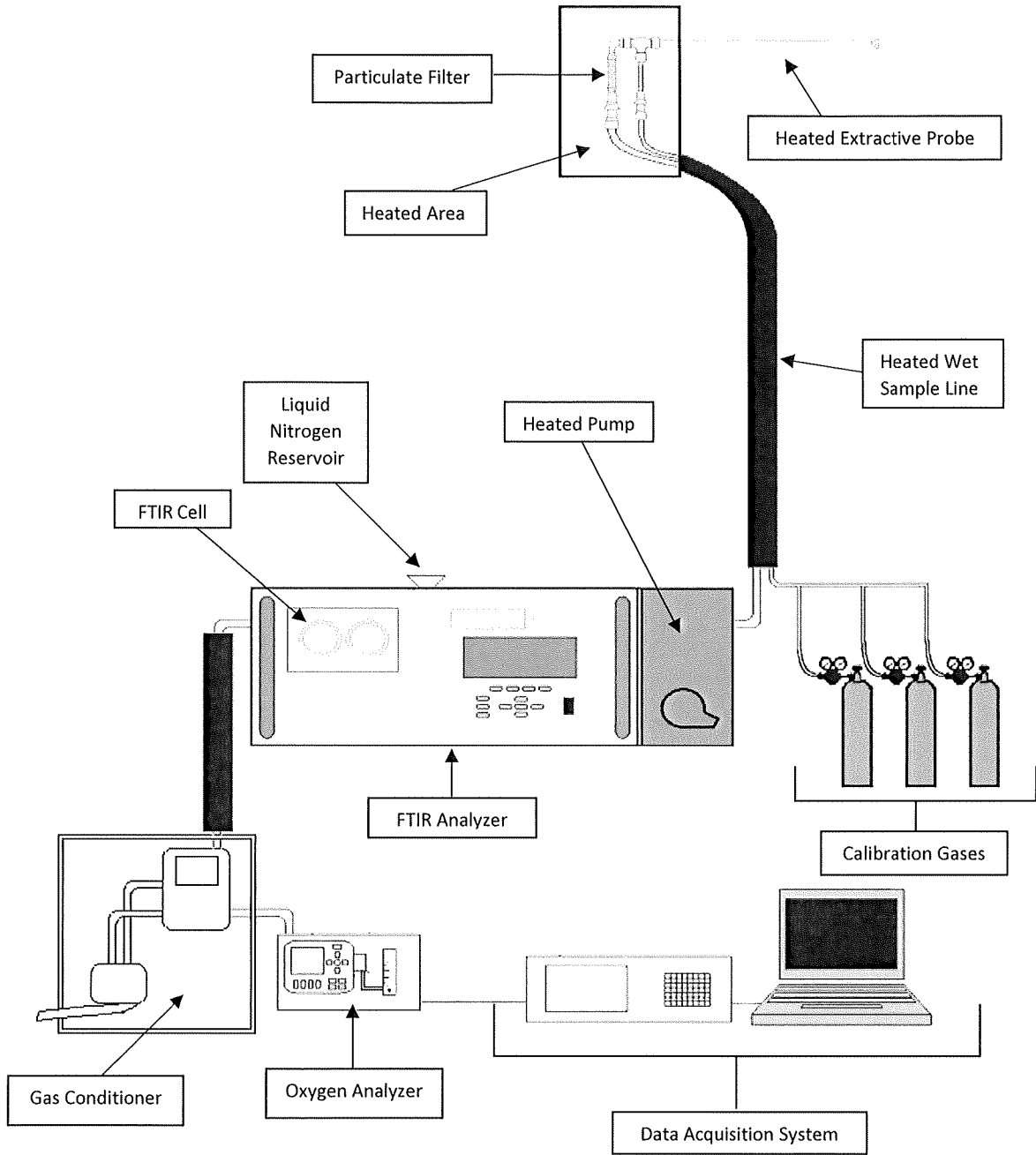
Duct Diameter: 11.901 Feet

Duct Area: 111.24 Square Feet

No. Sample Points: 3

Appendix B - Sample Train Diagram

USEPA Methods 3A and 320 – Sample Train Diagram



Appendix C - Calculation Nomenclature and Formulas

Client: Lansing Board of Water and Light
 Facility: Delta Energy Park
 Test Location: DEPC2
 Run: 1
 Date: 9/1/2022
 Method: 320
 Source Condition: Normal

Recovery % with Certified Transfer Standard System Purge

$$R_{cts} = \frac{Sys_{cts}}{D_{cts}} \times 100$$

$$Sys_{cts} = \underline{81.6}$$

$$D_{cts} = \underline{88.4}$$

$$R_{cts} = \underline{92.3\%}$$

Dilution Factor for Analyte Spiking

$$DF = \frac{H_2O_{spk}}{H_2O_{nat}}$$

$$H_2O_{spk} = \underline{5.978}$$

$$H_2O_{nat} = \underline{6.464}$$

$$DF = \underline{0.15}$$

Recovery % for Analyte Spike With Formaldehyde

$$R_x = \frac{Sp_{kx}}{(N_x \times (1-DF) + D_x \times DF)}$$

$$Sp_{kx} = \underline{103.2}$$

$$N_x = \underline{-14.4}$$

$$DF = \underline{0.15}$$

$$D_x = \underline{789.6}$$

$$R_x = \underline{0.1} \%$$

O2% Volume Dry Drift Correction

$$C_x = (C - Co) \times \frac{C_{ma}}{C_m - Co}$$

where:

C_{gas} = Effluent gas concentration, dry basis, ppm

C = Average gas concentration indicated by gas analyzer, dry basis, ppm

Co = Average of initial and final system calibration bias check responses for the zero gas, ppm

C_m = Average of initial and final system calibration bias check responses for the upscale calibration gas, ppm

C_{ma} = Actual concentration of the upscale calibration gas, ppm

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Method 320 Nomenclature Sheet

- C_x = Measured concentration of analyte in ppmv wet
- C_{xd} = Measured concentration of analyte in ppmv dry
- C_{xadj} = Measured concentration of analyte corrected to ppmv dry at 3%
- $C_{lb/dscf}$ = lbs of analyte per dscf of effluent gas
- $C_{lb/mmBTU}$ = lbs of analyte per million BTU heat input from the fuel combusted
- $C_{lb/mmBTU}$ = lbs of analyte per hour
- DF = Dilution factor based on tracer gas recovery
- D_{cts} = measured ppm concentration of the certified transfer standard direct to analyzer
- D_x = measured ppm concentration of analyte standard direct to analyzer
- D_{sf6} = measured ppm concentration of SF6 tracer gas standard direct to analyzer
- F_c = Factor representing ratio of volume of Carbon Dioxide Generated to Calorific Value of fuel
- N_x = Native Effluent analyte concentration prior to analyte spike
- R_{cts} = Recovery % of a certified transfer standard system purge
- R_x = Recovery % of a analyte system Spike
- Sys_{cts} = measured ppm concentration of the certified transfer standard system purge
- Spk_{sf6} = measured ppm concentration of SF6 tracer gas during analyte spike
- Spk_x = measured ppm concentration of analyte gas during analyte spike
- %CO₂ = percent carbon dioxide by volume wet basis
- %CO_{2D} = percent carbon dioxide by volume dry basis
- %H₂O = Measured concentration of H₂O in % volume
- %O₂ = percent oxygen by dry volume basis
- 385 = Volume of 1 lb mole of gas at at 68°F and 29.92 in Hg
- 10^{^6} = conversion of ppm v/v
- 36.453 = Molecular weight of HCl

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Pollutant Concentration Correction 15% for Percent Oxygen

$$C_{adj} = C_d \frac{20.9 - 15\%}{20.9 - \%O_2}$$

where:

C_{adj} = Pollutant concentration corrected to percent O₂

20.9-15% = Percent O₂, the defined O₂ correction value, percent

20.9 = Percent O₂ in air

%O₂ = Measured O₂ concentration dry basis, percent

C_d = Pollutant concentration measured, dry basis, ppm.

Appendix D – Reference Method Test Data

Compliance Stratification Test Results Summary
Lansing Board of Water and Light
Delta Energy Park
DEPC2
September 1, 2022

Number of Ports Sampled: 4
 Number of Points per Port: 3
 Total Number of Traverse Points: 12

Port No.	Point No.	Time	O ₂ %	Actual % Difference O ₂ %
1	1	6:48	14.00	0.48
	2	6:50	13.90	0.24
	3	6:52	13.90	0.24
2	1	6:55	13.90	0.24
	2	6:57	13.90	0.24
	3	6:59	13.90	0.24
3	1	7:02	13.90	0.24
	2	7:04	13.90	0.24
	3	7:06	14.00	0.48
4	1	7:10	14.00	0.48
	2	7:12	13.90	0.24
	3	7:14	14.00	0.48
Average			13.93	

Client: Lansing Board of Water and Light
 Facility: Delta Energy Park
 Project #: M223509

Test Location: DEPC2
 Date: 9/1/2022
 Operator: JMG
 FTIR s/n: 110212813

Operating Condition: Normal

Run 1

Date	Time	H2O%	Formaldehyde	Formaldehyde	O ₂
		%v	ppbv wet	ppbv wet R% Corrected	% dry
9/1/22	07:57:44	7.2	10.0	10.6	13.90
9/1/22	07:58:44	7.5	10.0	10.6	13.90
9/1/22	07:59:44	8.6	10.0	10.6	14.00
9/1/22	08:00:44	8.3	10.0	10.6	14.00
9/1/22	08:01:44	7.8	10.0	10.6	14.00
9/1/22	08:02:44	8.1	10.0	10.6	14.00
9/1/22	08:03:44	8.3	10.0	10.6	14.00
9/1/22	08:04:44	7.7	10.0	10.6	14.00
9/1/22	08:05:44	7.6	10.0	10.6	14.00
9/1/22	08:06:44	8.9	10.0	10.6	14.00
9/1/22	08:07:44	8.1	10.0	10.6	14.00
9/1/22	08:08:44	8.3	10.0	10.6	14.00
9/1/22	08:09:44	8.4	10.0	10.6	14.00
9/1/22	08:10:44	8.2	10.0	10.6	14.00
9/1/22	08:11:44	7.7	10.0	10.6	14.00
9/1/22	08:12:44	8.3	10.0	10.6	14.00
9/1/22	08:13:44	8.9	10.0	10.6	14.00
9/1/22	08:14:44	7.8	10.0	10.6	14.00
9/1/22	08:15:44	7.5	10.0	10.6	14.00
9/1/22	08:16:44	7.9	10.0	10.6	14.00
9/1/22	08:17:44	7.8	10.0	10.6	14.00
9/1/22	08:18:44	7.6	10.0	10.6	14.00
9/1/22	08:19:44	9.1	10.0	10.6	14.00
9/1/22	08:20:44	8.0	10.0	10.6	14.00
9/1/22	08:21:44	7.7	10.0	10.6	14.00
9/1/22	08:22:44	9.6	10.0	10.6	14.00
9/1/22	08:23:44	8.1	10.0	10.6	14.00
9/1/22	08:24:44	8.0	10.0	10.6	14.00
9/1/22	08:25:44	8.0	10.0	10.6	14.00
9/1/22	08:26:44	7.9	10.0	10.6	14.00
9/1/22	08:27:44	8.3	10.0	10.6	14.00
9/1/22	08:28:44	8.8	10.0	10.6	14.00
9/1/22	08:29:44	7.9	10.0	10.6	14.00
9/1/22	08:30:44	8.0	10.0	10.6	14.00
9/1/22	08:31:44	8.7	10.0	10.6	14.00
9/1/22	08:32:44	7.8	10.0	10.6	14.00
9/1/22	08:33:44	8.2	10.0	10.6	14.00
9/1/22	08:34:44	8.4	10.0	10.6	14.00
9/1/22	08:35:44	8.3	10.0	10.6	14.00
9/1/22	08:36:44	8.3	10.0	10.6	14.00
9/1/22	08:37:44	7.5	10.0	10.6	14.00
9/1/22	08:38:44	8.5	10.0	10.6	14.00
9/1/22	08:39:44	8.4	10.0	10.6	14.00
9/1/22	08:40:44	7.5	10.0	10.6	14.00
9/1/22	08:41:44	8.5	10.0	10.6	14.00
9/1/22	08:42:44	7.5	10.0	10.6	14.00
9/1/22	08:43:44	8.3	10.0	10.6	14.00
9/1/22	08:44:44	10.0	10.0	10.6	14.00
9/1/22	08:45:44	8.8	10.0	10.6	14.00
9/1/22	08:46:44	7.7	10.0	10.6	14.00
9/1/22	08:47:44	7.3	10.0	10.6	14.00
9/1/22	08:48:45	7.8	10.0	10.6	14.00
9/1/22	08:49:44	7.7	10.0	10.6	14.00
9/1/22	08:50:44	8.6	10.0	10.6	14.00
9/1/22	08:51:44	8.0	10.0	10.6	14.00
9/1/22	08:52:44	7.8	10.0	10.6	14.00
9/1/22	08:53:44	7.6	10.0	10.6	14.00
9/1/22	08:54:44	7.6	10.0	10.6	14.00
9/1/22	08:55:45	9.9	10.0	10.6	14.00
9/1/22	08:56:44	7.9	10.0	10.6	14.00
Average		8.1	10.0	10.6	14.0

Client: Lansing Board of Water and Light
 Facility: Delta Energy Park
 Project #: M223509

Test Location: DEPC2
 Date: 9/1/2022
 Operator: JMG
 FTIR s/n: 110212813

Operating Condition: Normal

Run 2

Date	Time	H2O% %v	Formaldehyde ppbv wet	Formaldehyde ppbv wet R% Corrected	O ₂ % dry
9/1/22	09:21:18	69717.6	31.5	31.5	14.00
9/1/22	09:22:18	70411.8	28.7	28.8	14.00
9/1/22	09:23:18	70864.3	30.7	30.7	14.00
9/1/22	09:24:18	71190.5	30.1	30.2	14.00
9/1/22	09:25:18	71158.1	25.7	25.7	14.00
9/1/22	09:26:18	70808.1	26.0	26.0	14.00
9/1/22	09:27:18	84292.5	39.4	39.5	14.00
9/1/22	09:28:18	73037.6	31.4	31.5	14.00
9/1/22	09:29:18	81232.1	37.3	37.3	14.00
9/1/22	09:30:18	77908.8	39.3	39.3	14.00
9/1/22	09:31:18	78742.8	36.6	36.7	14.00
9/1/22	09:32:18	83712.5	41.2	41.3	14.00
9/1/22	09:33:18	76224.6	37.3	37.3	14.10
9/1/22	09:34:18	73012.2	37.1	37.2	14.00
9/1/22	09:35:18	84684.9	41.8	41.8	14.10
9/1/22	09:36:18	74008.6	39.6	39.7	14.10
9/1/22	09:37:18	76507.6	36.6	36.6	14.10
9/1/22	09:38:18	85537.9	45.6	45.7	14.10
9/1/22	09:39:18	73850.9	43.9	44.0	14.10
9/1/22	09:40:18	76989.1	42.8	42.9	14.10
9/1/22	09:41:18	77683.1	42.4	42.5	14.10
9/1/22	09:42:18	79233.5	41.0	41.0	14.10
9/1/22	09:43:18	79216.0	45.1	45.2	14.10
9/1/22	09:44:18	82592.9	43.8	43.8	14.10
9/1/22	09:45:18	74722.2	40.7	40.7	14.10
9/1/22	09:46:18	76305.2	37.6	37.6	14.10
9/1/22	09:47:18	75121.3	40.0	40.0	14.10
9/1/22	09:48:18	89508.2	46.1	46.1	14.10
9/1/22	09:49:18	75695.3	41.5	41.6	14.10
9/1/22	09:50:18	77632.8	41.0	41.0	14.10
9/1/22	09:51:18	76252.2	42.4	42.5	14.10
9/1/22	09:52:18	75225.4	39.1	39.1	14.10
9/1/22	09:53:18	84143.4	42.2	42.2	14.10
9/1/22	09:54:18	82311.0	45.9	46.0	14.10
9/1/22	09:55:18	74125.7	43.8	43.9	14.10
9/1/22	09:56:18	71650.2	42.4	42.5	14.10
9/1/22	09:57:18	75767.0	43.1	43.1	14.10
9/1/22	09:58:18	92192.1	46.7	46.7	14.10
9/1/22	09:59:18	79493.7	45.7	45.8	14.10
9/1/22	10:00:18	86084.4	43.9	43.9	14.10
9/1/22	10:01:18	77710.6	45.9	46.0	14.10
9/1/22	10:02:18	83016.8	47.2	47.2	14.10
9/1/22	10:03:18	73840.2	41.9	42.0	14.10
9/1/22	10:04:18	79792.2	45.6	45.6	14.10
9/1/22	10:05:18	78574.6	46.0	46.0	14.10
9/1/22	10:06:18	72377.2	43.4	43.4	14.10
9/1/22	10:07:18	72006.8	41.5	41.6	14.10
9/1/22	10:08:19	71768.2	39.9	39.9	14.10
9/1/22	10:09:19	76781.0	41.5	41.6	14.10
9/1/22	10:10:19	91719.6	46.9	46.9	14.10
9/1/22	10:11:18	77440.1	45.3	45.4	14.10
9/1/22	10:12:19	85562.7	44.3	44.4	14.10
9/1/22	10:13:19	73578.0	42.1	42.2	14.10
9/1/22	10:14:19	83046.5	43.6	43.6	14.10
9/1/22	10:15:19	78094.0	41.3	41.3	14.10
9/1/22	10:16:19	74561.8	44.9	45.0	14.10
9/1/22	10:17:19	74790.3	38.7	38.7	14.10
9/1/22	10:18:19	74413.6	42.8	42.8	14.10
9/1/22	10:19:19	82269.6	42.5	42.6	14.10
9/1/22	10:20:19	76677.6	44.7	44.8	14.10
Average		7.8	40.8	40.8	14.1

Client: Lansing Board of Water and Light
 Facility: Delta Energy Park
 Project #: M223509

Test Location: DEPC2
 Date: 9/1/2022
 Operator: JMG
 FTIR s/n: 110212813

Operating Condition: Normal

Run 3

Date	Time	H2O% %v	Formaldehyde ppbv wet	Formaldehyde ppbv wet R% Corrected	O ₂ % dry
9/1/22	10:48:57	71398.9	50.8	50.4	14.10
9/1/22	10:49:57	72037.6	48.1	47.7	14.10
9/1/22	10:50:57	72669.4	49.2	48.8	14.20
9/1/22	10:51:58	85572.8	54.1	53.7	14.20
9/1/22	10:52:58	77079.0	59.1	58.6	14.10
9/1/22	10:53:58	73794.1	56.5	56.0	14.10
9/1/22	10:54:57	74377.9	57.0	56.6	14.20
9/1/22	10:55:58	75496.8	52.7	52.3	14.20
9/1/22	10:56:57	76451.6	51.0	50.6	14.20
9/1/22	10:57:58	88712.0	62.7	62.2	14.10
9/1/22	10:58:58	75204.0	61.3	60.7	14.10
9/1/22	10:59:58	72406.4	58.3	57.8	14.10
9/1/22	11:00:58	71949.7	57.6	57.1	14.10
9/1/22	11:01:58	71844.7	58.2	57.7	14.10
9/1/22	11:02:58	81903.9	57.8	57.4	14.10
9/1/22	11:03:58	80293.8	61.9	61.4	14.10
9/1/22	11:04:58	83534.0	65.3	64.8	14.10
9/1/22	11:05:58	74428.7	59.2	58.7	14.10
9/1/22	11:06:58	73086.7	59.6	59.1	14.10
9/1/22	11:07:58	75762.6	59.1	58.6	14.10
9/1/22	11:08:58	78624.2	63.8	63.3	14.10
9/1/22	11:09:58	80677.7	67.7	67.2	14.10
9/1/22	11:10:58	80410.2	66.3	65.7	14.10
9/1/22	11:11:58	77908.2	69.2	68.6	14.10
9/1/22	11:12:58	71973.4	67.1	66.6	14.10
9/1/22	11:13:58	70983.1	68.4	67.8	14.20
9/1/22	11:14:58	87288.0	67.7	67.1	14.20
9/1/22	11:15:58	75847.2	71.4	70.8	14.20
9/1/22	11:16:58	74818.4	70.9	70.3	14.20
9/1/22	11:17:58	74782.9	73.6	73.0	14.20
9/1/22	11:18:58	73912.3	76.3	75.7	14.20
9/1/22	11:19:58	79939.5	75.7	75.1	14.20
9/1/22	11:20:58	78342.2	77.8	77.1	14.20
9/1/22	11:21:58	76997.4	71.4	70.8	14.20
9/1/22	11:22:58	73227.0	78.3	77.7	14.20
9/1/22	11:23:58	72103.5	77.0	76.3	14.20
9/1/22	11:24:58	71196.8	82.3	81.6	14.20
9/1/22	11:25:58	85877.6	81.4	80.7	14.20
9/1/22	11:26:58	80755.0	83.8	83.1	14.20
9/1/22	11:27:58	75925.7	82.6	81.9	14.20
9/1/22	11:28:58	74956.2	81.1	80.4	14.20
9/1/22	11:29:58	76950.1	80.1	79.5	14.20
9/1/22	11:30:58	76154.3	84.3	83.6	14.20
9/1/22	11:31:58	84093.9	89.3	88.5	14.20
9/1/22	11:32:58	89934.3	96.5	95.7	14.20
9/1/22	11:33:58	77607.5	89.8	89.1	14.20
9/1/22	11:34:58	74453.5	92.7	91.9	14.10
9/1/22	11:35:58	73646.7	95.1	94.3	14.10
9/1/22	11:36:58	81924.3	93.7	92.9	14.10
9/1/22	11:37:58	74688.2	96.0	95.2	14.10
9/1/22	11:38:58	74414.2	100.5	99.6	14.20
9/1/22	11:39:59	74821.0	97.4	96.6	14.20
9/1/22	11:40:58	74649.1	101.5	100.7	14.20
9/1/22	11:41:58	84711.8	99.6	98.8	14.20
9/1/22	11:42:58	80571.8	100.5	99.6	14.20
9/1/22	11:43:58	81329.0	103.3	102.4	14.20
9/1/22	11:44:58	77206.7	102.4	101.6	14.20
9/1/22	11:45:58	73355.1	105.9	105.0	14.20
9/1/22	11:46:58	80948.8	107.7	106.9	14.10
9/1/22	11:47:58	77834.9	107.2	106.3	14.10
Average		7.7	75.6	75.0	14.2

Appendix E – QA/QC Data

Client: Lansing Board of Water and Light
 Facility: Delta Energy Park
 Project #: M223509
 Operating Condition: Normal

Test Location: DEPC2
 Date: 9/1/22
 Operator: JMG
 FTIR s/n: 110212813

Probe Length: 8.0 ft
 Sample Plane: Horizontal
 Port Length: 3.00 in.
 Port Size (diameter): 6 in.
 Port Type: Nipple
 Duct Shape: Circular
 Diameter: 11.901 ft
 Duct Area: 111.24 Sq. Ft.
 Upstream Diameters: >0.5
 Downstream Diameters: >2

Type	Compound	Cylinder ID	Cylinder Value	Expiration Date
Zero Gas	Nitrogen	Zero Nitrogen	0	NA
Certified Transfer Standard	CH4	CC326314	89.88	11/14/2027
Analyte Spike Gas	Formaldehyde	CC522694	1.09	12/13/2022
	N2O		102	

Client: Lansing Board of Water and Light
 Facility: Delta Energy Park
 Project #: M223509
 Operating Condition: Normal

Test Location: DEPC2
 Date: 9/1/2022
 Operator: JMG
 FTIR s/n: 110212813

Nitrogen (Zero) Direct to FTIR

Date	Time	H2O% %v	N2O ppmv wet	CH4 ppmv wet	Formaldehyde ppbv wet
9/1/22	07:20:33	0.3	-0.1	1.6	29.3
9/1/22	07:21:33	0.3	-0.1	1.6	21.5
9/1/22	07:21:33	0.3	-0.1	1.6	21.5

CTS, Direct to FTIR

Date	Time	H2O% %v	N2O ppmv wet	CH4 ppmv wet	Formaldehyde ppbv wet	Recovery % CH4
9/1/22	07:22:56	0.0	-14.3	88.0	397.3	97.9%
9/1/22	07:23:12	0.0	-14.5	88.4	399.8	98.3%
9/1/22	07:23:29	0.0	-14.6	88.5	394.1	98.4%
9/1/22	07:23:45	0.0	-14.5	88.5	397.2	98.5%
9/1/22	07:24:02	0.0	-14.4	88.5	403.7	98.4%
9/1/22	07:24:02	0.0	-14.4	88.5	403.7	98.4%
9/1/22	07:24:19	0.0	-14.3	88.5	399.7	98.5%
9/1/22	07:24:35	0.0	-14.4	88.5	398.0	98.5%
Average				88.4		98.4%

Analyte Direct to FTIR

Date	Time	H2O% %v	N2O ppmv wet	CH4 ppmv wet	Formaldehyde ppbv wet	Recovery % Formaldehyde
9/1/22	07:27:03	0.3	105.2	1.4	778.15	71.4%
9/1/22	07:27:19	0.3	105.4	1.4	776.86	71.3%
9/1/22	07:27:35	0.3	105.6	1.4	788.39	72.3%
9/1/22	07:27:52	0.3	105.0	1.4	790.01	72.5%
9/1/22	07:28:08	0.3	105.2	1.4	789.81	72.5%
9/1/22	07:28:25	0.3	105.0	1.4	798.54	73.3%
9/1/22	07:28:41	0.3	105.2	1.4	797.66	73.2%
9/1/22	07:28:41	0.3	105.2	1.4	797.66	73.2%
Average			105.2		789.63	72.4%

CTS, System Purge and Reponse Time Test

Date	Time	H2O% %v	N2O ppmv wet	CH4 ppmv wet	Formaldehyde ppbv wet	Recovery % CH4	Response Time
9/1/22	07:30:30	8.2	-1.5	1.1	2.6	1.3%	-
9/1/22	07:30:38	7.0	-2.8	41.2	291.5	46.6%	8
9/1/22	07:30:45	6.1	-11.6	73.5	302.3	83.1%	15
9/1/22	07:30:53	5.6	-10.9	79.1	270.2	89.4%	23
9/1/22	07:31:01	5.2	-12.5	80.7	317.3	91.3%	31
9/1/22	07:31:08	4.8	-12.8	81.6	318.3	92.3%	38

Zero Gas System Purge and Response Time Test

Date	Time	H2O% %v	N2O ppmv wet	CH4 ppmv wet	Formaldehyde ppbv wet	Response Time
9/1/22	07:34:09	1.7	-13.2	85.4	321.6	-
9/1/22	07:34:17	2.2	-10.9	70.8	277.0	8
9/1/22	07:34:25	4.6	-3.2	21.1	83.9	16
9/1/22	07:34:32	5.4	-2.2	12.3	42.9	23
9/1/22	07:34:40	4.5	-2.4	15.2	39.7	31
9/1/22	07:34:48	3.6	-0.8	4.6	-6.0	39
9/1/22	07:34:55	2.8	-0.4	2.8	-6.8	46
9/1/22	07:35:03	2.3	-0.5	2.4	-22.1	54

Client: Lansing Board of Water and Light
 Facility: Delta Energy Park
 Project #: M223509
 Operating Condition: Normal

Test Location: DEPC2
 Date: 9/1/2022
 Operator: JMG
 FTIR s/n: 110212813

Native Effluent Prior to Analyte Spike

Date	Time	H2O% %v	N2O ppmv wet	CH4 ppmv wet	Formaldehyde ppbv wet
9/1/22	07:40:06	6.5	-0.4	1.1	-12.6
9/1/22	07:40:23	6.5	-0.4	1.1	-15.3
9/1/22	07:40:23	6.5	-0.4	1.1	-15.3
		6.464			-14.4

Effluent Spike Using Analyte

Date	Time	H2O% %v	N2O ppmv wet	CH4 ppmv wet	Formaldehyde ppbv wet	Dilution Factor	Recovery % Formaldehyde
9/1/22	07:47:15	6.0	15.5	1.2	103.2	0.15	99.1%
9/1/22	07:47:31	6.1	12.8	1.2	80.3	0.12	96.2%
9/1/22	07:47:48	6.2	10.3	1.2	53.2	0.10	82.6%
9/1/22	07:48:04	6.2	9.9	1.2	50.5	0.09	82.8%
9/1/22	07:48:21	6.2	9.8	1.2	54.1	0.09	89.3%
9/1/22	07:48:37	6.2	9.8	1.2	48.3	0.09	80.2%
9/1/22	07:48:53	6.2	9.9	1.2	46.2	0.09	75.3%
9/1/22	07:48:53	6.2	9.9	1.2	46.2	0.09	75.3%
		11.0			60.3		85.1%

Native Effluent Prior to Analyte Spike

Date	Time	H2O% %v	N2O ppmv wet	CH4 ppmv wet	Formaldehyde ppbv wet
9/1/22	08:55:45	9.9	0.5	0.9	0.9
9/1/22	08:56:44	7.9	0.4	1.1	-0.1
9/1/22	08:56:44	7.9	0.4	1.1	-0.1
		8.568			0.2

Effluent Spike Using Analyte

Date	Time	H2O% %v	N2O ppmv wet	CH4 ppmv wet	Formaldehyde ppbv wet	Dilution Factor	Recovery % Formaldehyde
9/1/22	09:03:47	6.6	8.0	1.1	69.8	0.08	115.9%
9/1/22	09:04:03	6.6	7.8	1.1	69.0	0.07	117.8%
9/1/22	09:04:20	6.6	7.9	1.1	58.9	0.07	99.5%
9/1/22	09:04:36	6.6	7.8	1.1	56.8	0.07	97.0%
9/1/22	09:04:52	6.6	7.7	1.1	58.8	0.07	101.4%
9/1/22	09:05:09	6.7	8.0	1.1	61.1	0.08	101.5%
9/1/22	09:05:25	6.7	7.8	1.1	58.4	0.07	100.0%
9/1/22	09:05:25	6.7	7.8	1.1	58.4	0.07	100.0%
		7.8			61.4		104.1%

CTS, System Purge

Date	Time	H2O% %v	N2O ppmv wet	CH4 ppmv wet	Formaldehyde ppbv wet	Recovery % CH4
9/1/22	09:09:00	1.9	-13.3	85.1	350.8	94.7%
9/1/22	09:09:16	1.8	-13.5	85.2	349.1	94.8%
9/1/22	09:09:33	1.8	-13.4	85.3	345.3	94.9%
9/1/22	09:09:49	1.7	-13.2	85.4	342.6	95.0%
9/1/22	09:10:05	1.7	-13.3	85.5	343.5	95.1%
9/1/22	09:10:22	1.6	-13.4	85.5	345.9	95.2%
9/1/22	09:10:38	1.6	-13.3	85.6	344.3	95.3%
9/1/22	09:10:38	1.6	-13.3	85.6	344.3	95.3%

Native Effluent Prior to Analyte Spike

Date	Time	H2O% %v	N2O ppmv wet	CH4 ppmv wet	Formaldehyde ppbv wet
9/1/22	10:21:19	8.5	-1.4	0.7	45.4
9/1/22	10:22:19	7.3	-1.4	0.8	39.5
9/1/22	10:22:19	7.3	-1.4	0.8	39.5
		7.711			41.4

Client: Lansing Board of Water and Light
 Facility: Delta Energy Park
 Project #: M223509
 Operating Condition: Normal

Test Location: DEPC2
 Date: 9/1/2022
 Operator: JMG
 FTIR s/n: 110212813

Effluent Spike Using Analyte

Date	Time	H2O% %v	N2O ppmv wet	CH4 ppmv wet	Formaldehyde ppbv wet	Dilution Factor	Recovery % Formaldehyde
9/1/22	10:29:29	6.7	8.2	0.9	106.1	0.08	106.1%
9/1/22	10:29:45	6.7	8.2	0.9	103.6	0.08	104.0%
9/1/22	10:30:01	6.7	8.1	0.9	94.3	0.08	95.1%
9/1/22	10:30:18	6.7	8.4	0.9	93.4	0.08	92.5%
9/1/22	10:30:34	6.7	8.0	0.9	91.2	0.08	92.7%
9/1/22	10:30:51	6.7	7.8	0.9	86.3	0.07	88.9%
9/1/22	10:31:07	6.7	7.8	0.9	89.7	0.07	92.6%
9/1/22	10:31:07	6.7	7.8	0.9	89.7	0.07	92.6%
			8.0		94.3		95.6%

CTS, System Purge

Date	Time	H2O% %v	N2O ppmv wet	CH4 ppmv wet	Formaldehyde ppbv wet	Recovery % CH4
9/1/22	10:32:49	2.9	-12.9	83.8	383.7	93.3%
9/1/22	10:33:06	2.4	-13.0	84.5	387.6	94.0%
9/1/22	10:33:22	2.0	-13.0	84.9	395.9	94.5%
9/1/22	10:33:39	1.8	-13.1	85.2	389.1	94.8%
9/1/22	10:33:55	1.7	-13.0	85.3	389.6	95.0%
9/1/22	10:34:11	1.6	-12.9	85.5	384.5	95.1%
9/1/22	10:34:28	1.6	-13.0	85.6	386.5	95.2%
9/1/22	10:34:44	1.5	-13.0	85.7	384.6	95.3%

Native Effluent Prior to Analyte Spike

Date	Time	H2O% %v	N2O ppmv wet	CH4 ppmv wet	Formaldehyde ppbv wet
9/1/22	11:48:58	7.7	0.5	1.0	106.1
9/1/22	11:49:59	8.0	0.4	1.0	110.4
9/1/22	11:49:59	8.0	0.4	1.0	110.4
		7.927			108.9

Effluent Spike Using Analyte

Date	Time	H2O% %v	N2O ppmv wet	CH4 ppmv wet	Formaldehyde ppbv wet	Dilution Factor	Recovery % Formaldehyde
9/1/22	11:55:16	6.8	7.1	1.0	165.1	0.07	106.5%
9/1/22	11:55:32	6.8	7.1	1.0	168.8	0.07	109.2%
9/1/22	11:55:49	6.8	7.1	1.0	166.3	0.07	107.6%
9/1/22	11:56:05	6.8	7.0	1.0	164.3	0.07	106.6%
9/1/22	11:56:21	6.8	7.0	1.0	162.4	0.07	105.4%
9/1/22	11:56:38	6.9	6.9	1.0	154.6	0.07	100.8%
9/1/22	11:56:54	6.9	7.0	1.0	164.0	0.07	106.4%
9/1/22	11:56:54	6.9	7.0	1.0	164.0	0.07	106.4%
							106.1%

CTS, System Purge

Date	Time	H2O% %v	N2O ppmv wet	CH4 ppmv wet	Formaldehyde ppbv wet	Recovery % CH4
9/1/22	12:00:01	2.9	-12.8	83.4	455.4	92.8%
9/1/22	12:00:17	2.2	-13.0	84.6	445.8	94.1%
9/1/22	12:00:34	1.8	-13.2	85.0	460.0	94.6%
9/1/22	12:00:50	1.5	-13.3	85.4	458.5	95.0%
9/1/22	12:01:07	1.4	-13.0	85.6	452.2	95.2%
9/1/22	12:01:23	1.2	-13.4	85.8	463.4	95.4%
9/1/22	12:01:39	1.1	-13.4	86.0	467.5	95.6%
9/1/22	12:01:55	0.9	-13.5	86.1	460.6	95.8%

Client: Lansing Board of Water and Light
 Facility: Delta Energy Park
 Project #: M223509
 Operating Condition: Normal

Test Location: DEPC2
 Date: 9/1/2022
 Operator: JMG
 FTIR s/n: 110212813

CTS, Direct Purge

Date	Time	H2O% %v	N2O ppmv wet	CH4 ppmv wet	Formaldehyde ppbv wet	Recovery % CH4
9/1/22	12:12:45	0.0	-14.8	88.6	541.7	98.6%
9/1/22	12:13:01	0.0	-14.8	88.7	538.8	98.7%
9/1/22	12:13:17	0.0	-14.7	88.7	546.8	98.7%
9/1/22	12:13:34	0.0	-14.8	88.7	539.7	98.7%
9/1/22	12:13:50	0.0	-14.8	88.7	546.8	98.7%
9/1/22	12:14:07	0.0	-14.7	88.7	540.8	98.7%
9/1/22	12:14:23	0.0	-14.9	88.7	540.8	98.7%
9/1/22	12:14:23	0.0	-14.9	88.7	540.8	98.7%
Average				88.7		

N2, Direct Purge

Date	Time	H2O% %v	N2O ppmv wet	CH4 ppmv wet	Formaldehyde ppbv wet
9/1/22	12:20:27	0.3	0.0	1.5	178.3
9/1/22	12:21:28	0.3	-0.1	1.5	177.0
9/1/22	12:21:28	0.3	-0.1	1.5	177.0

Client: Lansing Board of Water and Light
 Facility: Delta Energy Park
 Project #: M223509
 Operating Condition: Normal

Test Location: DEPC2
 Date: 9/1/22
 Operator: JMG

Probe Length: 8.0 ft
 Sample Plane: Horizontal
 Port Length: 6.00 in.
 Port Size (diameter): 6 in.
 Port Type: Flange
 Duct Shape: Circular
 Diameter: 11.901 ft
 Duct Area: 111.24 Sq. Ft.
 Upstream Diameters: >0.5
 Downstream Diameters: >2
 Number of Ports Sampled: 1
 Number of Points per Port: 3
 Total Number of Traverse Points: 3

Type	Setting	Cylinder ID	Cylinder Value	Analyzer Response	Difference, % of Span	Expiration Date	Mid cylinder % of high cylinder
O2 % (dry)	Zero	Zero Nitrogen	0	0.00	0.00%	NA	
	Mid	CC464836	10.01	10.00	0.05%	8/1/2030	51.23%
	High	LL13939	19.54	19.50	0.20%	3/19/2026	

Type	RM Analyzer Make/Model	RM Analyzer s/n	Analyzer Span	RM Gas Span
O2 % (dry)	Ecom/1440	2040	25	19.54

Client: Lansing Board of Water and Light
 Facility: Delta Energy Park
 Fuel Type: Natural Gas
 Diluent: O2 %
 Correction Factor: 15

Location: DEPC2
 Date: 9/1/22
 Operator: JMG
 Project #: M223509

O2 % (dry) Correction Data

Run #	Cma	Precal	Postcal	Pre zero	Post zero	Co	Cm	C	Cgas	Span Bias	Span Drift	Zero Bias	Zero Drift
1	10.01	10.10	10.10	0.20	0.20	0.20	10.10	14.00	13.9	-0.51	0.00	-1.02	0.00
2	10.01	10.10	10.10	0.20	0.20	0.20	10.10	14.08	14.0	-0.51	0.00	-1.02	0.00
3	10.01	10.10	10.10	0.20	0.20	0.20	10.10	14.16	14.1	-0.51	0.00	-1.02	0.00

Calibration Corrected Data

Run #	Run Date	Start Time	End Time	O2 % (dry)
1	9/1/22	07:57:44	08:56:44	13.9
2	9/1/22	09:21:18	#N/A	14.0
3	9/1/22	10:48:57	#N/A	14.1

Client: Lansing Board of Water and Light
Facility: Delta Energy Park
Project #: M223509
Test Location: DEPC2
Operating Condition: Normal
Date: 9/1/22

Linearity Cal/Pre 1 Cal

<u>Time</u>	<u>O2 % (dry)</u>	
5:45	19.50	
5:46	19.50	
5:46	19.50	ih
5:46	19.50	
5:47	4.30	
5:47	0.00	
5:47	0.00	iz
5:48	0.00	
5:48	0.50	
5:48	10.00	
5:49	10.00	
5:49	10.00	im
5:49	10.00	
6:00	3.90	
6:00	0.70	
6:01	0.40	
6:01	0.30	
6:01	0.30	
6:02	0.30	
6:02	0.20	z
6:02	10.30	
6:03	9.70	
6:03	10.10	
6:03	10.10	m

Client: Lansing Board of Water and Li
 Facility: Delta Energy Park
 Project #: M223509

Test Location: DEPC2
 Operating Condition: Normal
 Date: 9/1/22

Post 1/Pre 2

<u>Time</u>	<u>O2 % (dry)</u>	
9:14	0.30	
9:14	0.30	
9:14	0.30	
9:15	0.20	
9:15	0.20	z
9:15	0.80	
9:16	9.20	
9:16	9.90	
9:16	10.10	m
9:17	10.10	

Post 2/Pre 3

<u>Time</u>	<u>O2 % (dry)</u>	
10:36	0.40	
10:36	0.40	
10:36	0.40	
10:37	0.30	
10:37	0.30	
10:37	0.20	
10:38	4.10	z
10:38	9.90	
10:39	10.10	m
10:39	10.10	
10:39	10.10	

Post 3

<u>Time</u>	<u>O2 % (dry)</u>	
12:04	0.30	
12:05	0.30	
12:05	0.30	
12:05	0.30	
12:06	0.30	
12:06	0.20	
12:06	0.20	z
12:07	0.20	
12:07	0.40	
12:07	10.80	
12:08	10.10	m
12:08	10.10	
12:08	10.10	

Appendix F – Gas Cylinder Certifications

SPECGAS, INC. **CERTIFICATE**

SPECGAS, Inc.
 88 Vincent Circle
 Warminster, PA. 18974
 Tel. 215 443 2600
 Fax. 215 443 2665
 WWW.SPECGASINC.COM



ANALYTICAL REPORT-PRODUCT CERTIFICATION

SOLD TO: Red Ball Oxygen
 PO Box 7316
 Shreveport, LA. 71137-7316

SHIP TO: Mostardi Plant Denver CO
 7002 West 48th Avenue Unit A
 Denver, CO 80216

DATE: 6/13/22
PO#: 4008464

CERTIFIED STANDARD MIXTURE

CYLINDER #	Component		Nominal	Actual
CC522694	FORMALDEHYDE	CH2O	1.00 ppm	1.09 ppm
	NITROUS OXIDE	N2O	100 ppm	102 ppm
	NITROGEN	N2	Balance	Balance

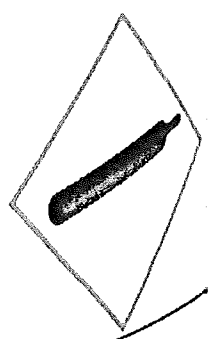
PRESSURE: 2000 psia
VALVE: CGA 350 s/s
CYL. SIZE: 150A"SGS" Sold
ANALYSIS DATE: 6/13/22
EXPIRATION DATE: 12/13/22
 UN 1956, Compressed Gas N.O.S.
 (Formaldehyde, Nitrogen) 2.2
Emergency Phone #: 1 800 535 5053

FORMALDEHYDE
 Blend Tolerance: +/- 20 %
 Analytical Tolerance: +/- 5 %

NITROUS OXIDE
 Blend Tolerance: +/- 5 %
 Analytical Tolerance: +/- 2 %

N.I.S.T.: Mixture was blended on a high resolution Scale (Sartorius Combiics 1, Serial # 29503041) Traceable to N.I.S.T. through test # 211106

4kg wt. (Serial #85424) Standards traceable to N.I.S.T. through weight & measures test # 2267372



Warning
 Contains gas under pressure
 May explode if heated
 May displace oxygen and cause rapid suffocation

ANALYST

[Handwritten Signature]

6/13/22
 DATE

CERTIFICATE OF ANALYSIS

Grade of Product: EPA Protocol

Part Number:	E02AI99E15A0571	Reference Number:	54-401654222-1
Cylinder Number:	CC326314	Cylinder Volume:	146.0 CF
Laboratory:	124 - Chicago (SAP) - IL	Cylinder Pressure:	2015 PSIG
PGVP Number:	B12019	Valve Outlet:	590
Gas Code:	CH4,BALA	Certification Date:	Nov 14, 2019

Expiration Date: Nov 14, 2027

Certification performed in accordance with "EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards (May 2012)" document EPA 600/R-12/531, using the assay procedures listed. Analytical Methodology does not require correction for analytical interference. This cylinder has a total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of this calibration mixture. All concentrations are on a mole/mole basis unless otherwise noted.

Do Not Use This Cylinder below 100 psig, i.e. 0.7 megapascals.

ANALYTICAL RESULTS					
Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty	Assay Dates
METHANE	90.00 PPM	89.88 PPM	G1	+/- 0.7% NIST Traceable	11/14/2019
AIR	Balance				

CALIBRATION STANDARDS					
Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
NTRM	99010618	ALM025017	100.2 PPM METHANE/AIR	+/- 0.6%	Apr 13, 2022

ANALYTICAL EQUIPMENT		
Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
Nicolet 6700 AHR0801332	FTIR	Oct 15, 2019

Triad Data Available Upon Request



Approved for Release

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OCT 13 2022

AIR QUALITY DIVISION

Page 1 of 54-401654222-1

CERTIFICATE OF ANALYSIS

Grade of Product: EPA PROTOCOL STANDARD

Part Number: E03NI80E15A0138	Reference Number: 54-402487829-1A
Cylinder Number: CC464836	Cylinder Volume: 141.0 CF
Laboratory: 124 - Chicago (SAP) - IL	Cylinder Pressure: 2015 PSIG
PGVP Number: B12022	Valve Outlet: 590
Gas Code: CO2,O2,BALN	Certification Date: Aug 01, 2022

Expiration Date: Aug 01, 2030

Certification performed in accordance with "EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards (May 2012)" document EPA 600/R-12/531, using the assay procedures listed. Analytical Methodology does not require correction for analytical interference. This cylinder has a total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of this calibration mixture. All concentrations are on a mole/mole basis unless otherwise noted.

Do Not Use This Cylinder below 100 psig, i.e. 0.7 megapascals.

ANALYTICAL RESULTS

Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty	Assay Dates
CARBON DIOXIDE	10.00 %	9.874 %	G1	+/- 0.6% NIST Traceable	08/01/2022
OXYGEN	10.00 %	10.01 %	G1	+/- 0.6% NIST Traceable	08/01/2022
NITROGEN	Balance				

CALIBRATION STANDARDS

Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
NTRM	190804-14	6162723Y	11.105 % CARBON DIOXIDE/NITROGEN	+/- 0.6%	Dec 04, 2025
NTRM	09060203	CC261244	9.961 % OXYGEN/NITROGEN	+/- 0.3%	Nov 05, 2024

ANALYTICAL EQUIPMENT

Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
CO2-1 HORIBA VIA-510 V1E3H7P5	NDIR	Jul 26, 2022
O2-1 HORIBA MPA-510 3VUYL9NR	Paramagnetic	Jul 13, 2022

Triad Data Available Upon Request



Approved for Release

CERTIFICATE OF ANALYSIS

Grade of Product: EPA Protocol

Part Number:	E03NI62E80A0014	Reference Number:	54-401150341-1
Cylinder Number:	LL13939	Cylinder Volume:	92.2 CF
Laboratory:	124 - Chicago (SAP) - IL	Cylinder Pressure:	2214 PSIG
PGVP Number:	B12018	Valve Outlet:	590
Gas Code:	CO2,O2,BALN	Certification Date:	Mar 19, 2018

Expiration Date: Mar 19, 2026

Certification performed in accordance with "EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards (May 2012)" document EPA 600/R-12/531, using the assay procedures listed. Analytical Methodology does not require correction for analytical interference. This cylinder has a total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of this calibration mixture. All concentrations are on a volume/volume basis unless otherwise noted.

Do Not Use This Cylinder below 100 psig, i.e. 0.7 megapascals.

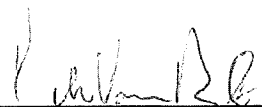
ANALYTICAL RESULTS					
Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty	Assay Dates
CARBON DIOXIDE	19.00 %	18.65 %	G1	+/- 0.8% NIST Traceable	03/19/2018
OXYGEN	19.00 %	19.54 %	G1	+/- 0.5% NIST Traceable	03/19/2018
NITROGEN	Balance				

CALIBRATION STANDARDS					
Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
NTRM	13060709	CC413602	16.939 % CARBON DIOXIDE/NITROGEN	+/- 0.6%	May 08, 2019
NTRM	09061418	CC273593	22.53 % OXYGEN/NITROGEN	+/- 0.4%	Mar 08, 2019

ANALYTICAL EQUIPMENT		
Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
CO2-1 HORIBA VIA-510 V1E3H7P5	NDIR	Feb 20, 2018
O2-1 HORIBA MPA-510 3VUYL9NR	Paramagnetic	Mar 19, 2018

Triad Data Available Upon Request





 Approved for Release

Appendix G – Plant Operating Data

EUCTGHRSG2 Bypass Stack Process Data, Run1

Date/Time	CTGHRSG2 LOADCTMW (MW) Value	CTGHRSG2 B_HEATIN (MMBTU/HR) Value	CTGHRSG2 B_GASFLW (HSCFH) Value	CTGHRSG2 B_NOXPPM (PPM) Value	CTGHRSG2 B_O2 (PERCENT) Value	CTGHRSG2 B_NXC (15PCTO2) Value	CTGHRSG2 B_NOX#MM (LB/MMBTU) Value
09/01/2022 07:57	53	505.3	4812.3	21.5	13.7	17.6	0.065
09/01/2022 07:58	53	505.9	4817.8	21.5	13.7	17.6	0.065
09/01/2022 07:59	53	505.9	4818	21.3	13.7	17.5	0.064
09/01/2022 08:00	53	506	4819.2	21.5	13.7	17.6	0.065
09/01/2022 08:01	53	506.6	4824.4	21.5	13.7	17.6	0.065
09/01/2022 08:02	53	506	4819.2	21.4	13.7	17.5	0.065
09/01/2022 08:03	53	505.9	4818.1	21.5	13.7	17.6	0.065
09/01/2022 08:04	53	506.4	4822.4	21.5	13.7	17.6	0.065
09/01/2022 08:05	53	506.8	4826.5	21.4	13.7	17.5	0.065
09/01/2022 08:06	53	503.5	4795.5	21.5	13.7	17.6	0.065
09/01/2022 08:07	53	506.6	4825	21.4	13.7	17.6	0.065
09/01/2022 08:08	53	504.8	4807.3	21.5	13.7	17.6	0.065
09/01/2022 08:09	53	504.9	4808.9	21.6	13.7	17.6	0.065
09/01/2022 08:10	53	505.5	4814.6	21.6	13.7	17.7	0.065
09/01/2022 08:11	53	504.6	4806	21.5	13.7	17.6	0.065
09/01/2022 08:12	53	504.4	4803.8	21.5	13.7	17.7	0.065
09/01/2022 08:13	53	506.1	4819.9	21.6	13.7	17.7	0.065
09/01/2022 08:14	53	504.3	4802.5	21.7	13.7	17.8	0.066
09/01/2022 08:15	53	504.4	4803.9	21.6	13.7	17.7	0.065
09/01/2022 08:16	52	503	4790.4	21.7	13.7	17.7	0.066
09/01/2022 08:17	52	502.4	4785	21.7	13.7	17.8	0.066
09/01/2022 08:18	52	502.6	4786.5	21.7	13.7	17.8	0.066
09/01/2022 08:19	53	505.6	4815	21.7	13.7	17.8	0.066
09/01/2022 08:20	52	503.1	4791.8	21.8	13.7	17.8	0.066
09/01/2022 08:21	52	501.6	4777.2	21.8	13.7	17.8	0.066
09/01/2022 08:22	52	502.4	4784.5	21.8	13.7	17.9	0.066
09/01/2022 08:23	52	503.1	4791.1	21.7	13.7	17.8	0.066
09/01/2022 08:24	52	503.9	4799.1	21.8	13.7	17.9	0.066
09/01/2022 08:25	52	501.9	4779.7	21.7	13.7	17.8	0.066
09/01/2022 08:26	52	504	4800.1	21.9	13.7	18	0.066
09/01/2022 08:27	52	501.8	4779.4	21.9	13.7	17.9	0.066
09/01/2022 08:28	52	501.4	4775.7	21.9	13.7	18	0.066
09/01/2022 08:29	52	502.3	4783.4	22	13.7	18.1	0.066
09/01/2022 08:30	52	502.1	4782	21.9	13.7	18	0.066
09/01/2022 08:31	52	501.4	4775.4	22	13.7	18.1	0.066
09/01/2022 08:32	52	501	4771.1	22	13.7	18.1	0.066
09/01/2022 08:33	52	502.2	4782.9	22	13.7	18.1	0.066
09/01/2022 08:34	52	501.2	4773.4	22.1	13.7	18.2	0.067
09/01/2022 08:35	52	501.7	4778.5	22.1	13.7	18.2	0.067
09/01/2022 08:36	52	501	4771	22.2	13.7	18.3	0.067
09/01/2022 08:37	52	500	4761.5	22.2	13.7	18.3	0.067
09/01/2022 08:38	52	498.5	4747.8	22.3	13.7	18.3	0.067
09/01/2022 08:39	52	498.2	4744.5	22.1	13.7	18.2	0.067
09/01/2022 08:40	52	499.8	4759.6	22.1	13.8	18.2	0.068
09/01/2022 08:41	52	499.7	4759.1	22.3	13.7	18.4	0.067
09/01/2022 08:42	52	497.2	4735.3	22.7	13.7	18.7	0.069
09/01/2022 08:43	52	498	4743.3	22.3	13.7	18.4	0.067
09/01/2022 08:44	52	499.1	4753.8	22.3	13.7	18.4	0.067
09/01/2022 08:45	52	498	4743.2	22.5	13.7	18.5	0.068
09/01/2022 08:46	52	497.6	4739.1	22.6	13.8	18.6	0.069
09/01/2022 08:47	52	496.7	4730.3	22.7	13.8	18.7	0.069
09/01/2022 08:48	52	496.6	4729.8	22.6	13.8	18.7	0.069
09/01/2022 08:49	52	495.4	4718.3	22.6	13.8	18.7	0.069
09/01/2022 08:50	52	496.3	4726.6	22.8	13.8	18.8	0.07
09/01/2022 08:51	52	496.3	4726.8	22.9	13.8	18.9	0.07
09/01/2022 08:52	52	497.1	4733.9	22.6	13.8	18.7	0.069
09/01/2022 08:53	52	497.7	4740.1	22.7	13.8	18.8	0.069
09/01/2022 08:54	52	497.8	4741.1	22.8	13.8	18.9	0.07
09/01/2022 08:55	52	495.2	4716.4	23.1	13.8	19.1	0.071
09/01/2022 08:56	52	496.2	4725.8	23	13.8	19	0.07
Average:	52.3	501.8	4778.6	22.0	13.7	18.1	0.067

EUCTGHRSG2 Bypass Stack Process Data, Run2

Date/Time	CTGHRSG2 LOADCTMW (MW) Value	CTGHRSG2 B_HEATIN (MMBTU/HR) Value	CTGHRSG2 B_GASFLW (HSCFH) Value	CTGHRSG2 B_NOXPPM (PPM) Value	CTGHRSG2 B_O2 (PERCENT) Value	CTGHRSG2 B_NXC (15PCTO2) Value	CTGHRSG2 B_NOX#MM (LB/MMBTU) Value
09/01/2022 09:21	51	490.7	4673.5	23.6	13.8	19.6	0.072
09/01/2022 09:22	51	492.8	4692.9	23.4	13.8	19.4	0.072
09/01/2022 09:23	51	491.6	4681.6	23.2	13.8	19.3	0.071
09/01/2022 09:24	51	492.4	4689.5	23.3	13.8	19.4	0.071
09/01/2022 09:25	51	489.7	4663.5	23.5	13.8	19.6	0.072
09/01/2022 09:26	51	490.3	4669.6	23.6	13.8	19.6	0.072
09/01/2022 09:27	51	491.7	4682.6	23.5	13.8	19.5	0.072
09/01/2022 09:28	51	491.3	4678.7	23.3	13.8	19.4	0.071
09/01/2022 09:29	51	490.8	4674.2	23.3	13.8	19.4	0.071
09/01/2022 09:30	51	491.5	4681.4	23.3	13.8	19.4	0.071
09/01/2022 09:31	51	491.4	4679.6	23.6	13.8	19.6	0.072
09/01/2022 09:32	51	491.5	4681.4	23.7	13.8	19.7	0.073
09/01/2022 09:33	51	491.8	4683.5	23.4	13.8	19.5	0.072
09/01/2022 09:34	51	491.6	4682.2	23.5	13.8	19.5	0.072
09/01/2022 09:35	51	490.7	4673.2	23.3	13.8	19.4	0.071
09/01/2022 09:36	51	489.5	4662.1	23.7	13.8	19.7	0.073
09/01/2022 09:37	51	489.8	4664.7	23.4	13.8	19.5	0.072
09/01/2022 09:38	51	488.3	4650.9	23.5	13.8	19.6	0.072
09/01/2022 09:39	51	489.4	4660.9	23.6	13.8	19.7	0.072
09/01/2022 09:40	51	488.5	4652.8	23.7	13.8	19.7	0.073
09/01/2022 09:41	51	490	4666.3	24	13.8	19.9	0.073
09/01/2022 09:42	51	489.1	4658.5	23.8	13.8	19.9	0.073
09/01/2022 09:43	51	487.7	4645	23.9	13.8	19.9	0.073
09/01/2022 09:44	51	488.4	4651.8	24	13.8	20	0.073
09/01/2022 09:45	51	489.9	4665.6	24.1	13.8	20.1	0.074
09/01/2022 09:46	51	490.6	4672.7	24	13.8	20	0.073
09/01/2022 09:47	51	490.6	4672.4	23.9	13.8	20	0.073
09/01/2022 09:48	51	487.3	4640.7	23.9	13.8	19.9	0.073
09/01/2022 09:49	51	488.1	4648.1	23.8	13.8	19.9	0.073
09/01/2022 09:50	51	487.9	4646.3	24.1	13.8	20.1	0.074
09/01/2022 09:51	51	487.1	4638.8	24	13.8	20	0.073
09/01/2022 09:52	51	488.8	4655.2	23.9	13.8	19.9	0.073
09/01/2022 09:53	51	487.9	4646.4	23.7	13.8	19.8	0.073
09/01/2022 09:54	51	488.4	4651.7	23.8	13.8	19.9	0.073
09/01/2022 09:55	51	487.2	4639.9	23.8	13.8	19.9	0.073
09/01/2022 09:56	51	487.7	4644.7	24	13.8	20	0.073
09/01/2022 09:57	51	487.9	4646.3	23.9	13.8	19.9	0.073
09/01/2022 09:58	50	485.7	4626.1	24.2	13.8	20.1	0.074
09/01/2022 09:59	50	485.5	4623.8	24.2	13.8	20.2	0.074
09/01/2022 10:00	50	487.2	4640.2	24.3	13.8	20.3	0.074
09/01/2022 10:01	50	485.4	4623.3	24.3	13.8	20.3	0.074
09/01/2022 10:02	50	486.3	4631.8	24.3	13.8	20.3	0.074
09/01/2022 10:03	50	486	4629	24.2	13.8	20.3	0.074
09/01/2022 10:04	50	486.1	4629.7	24.3	13.8	20.4	0.074
09/01/2022 10:05	50	485.7	4625.7	24.4	13.8	20.4	0.075
09/01/2022 10:06	50	486.7	4634.9	24.4	13.9	20.4	0.076
09/01/2022 10:07	50	486.5	4633.2	24.3	13.9	20.3	0.075
09/01/2022 10:08	50	484.6	4615.4	24.5	13.8	20.5	0.075
09/01/2022 10:09	50	487.2	4640	24.4	13.9	20.4	0.076
09/01/2022 10:10	50	486.9	4637.2	24.4	13.9	20.4	0.076
09/01/2022 10:11	50	486.9	4636.9	24.3	13.9	20.4	0.075
09/01/2022 10:12	50	486.3	4631.6	24.4	13.9	20.5	0.076
09/01/2022 10:13	50	485.1	4619.7	24.4	13.9	20.4	0.076
09/01/2022 10:14	50	487.5	4643.3	24.4	13.8	20.4	0.075
09/01/2022 10:15	50	485.7	4625.9	24.1	13.8	20.2	0.074
09/01/2022 10:16	50	484.8	4617.6	24.1	13.8	20.1	0.074
09/01/2022 10:17	50	486.3	4631.7	24.2	13.8	20.2	0.074
09/01/2022 10:18	50	486.5	4633.3	24	13.9	20	0.075
09/01/2022 10:19	50	487.1	4639.1	24.2	13.8	20.2	0.074
09/01/2022 10:20	50	484.6	4615.4	24.4	13.8	20.4	0.075
Average:	50.6	488.3	4650.9	23.9	13.8	19.9	0.073

EUCTGHRSG2 Bypass Stack Process Data, Run3

Date/Time	CTGHRSG2 LOADCTMW (MW) Value	CTGHRSG2 B_HEATIN (MMBTU/HR) Value	CTGHRSG2 B_GASFLW (HSCFH) Value	CTGHRSG2 B_NOXPPM (PPM) Value	CTGHRSG2 B_O2 (PERCENT) Value	CTGHRSG2 B_NXC (15PCTO2) Value	CTGHRSG2 B_NOX#MM (LB/MMBTU) Value
09/01/2022 10:48	50	482.8	4598.1	25.1	13.9	21	0.078
09/01/2022 10:49	50	484	4609.6	25	13.9	21	0.078
09/01/2022 10:50	50	482.9	4599	24.9	13.9	20.9	0.077
09/01/2022 10:51	50	483.4	4603.7	24.8	13.9	20.8	0.077
09/01/2022 10:52	50	482.8	4597.8	25	13.9	21	0.078
09/01/2022 10:53	50	482.8	4598.1	25.3	13.8	21.2	0.077
09/01/2022 10:54	50	481.5	4586.1	24.9	13.9	20.9	0.077
09/01/2022 10:55	50	482.6	4596.2	24.7	13.9	20.7	0.077
09/01/2022 10:56	50	482.8	4598.4	24.7	13.9	20.7	0.077
09/01/2022 10:57	50	483.6	4605.8	24.6	13.9	20.7	0.076
09/01/2022 10:58	50	482.9	4598.8	24.7	13.9	20.7	0.077
09/01/2022 10:59	50	484.7	4616.2	25.1	13.8	21	0.077
09/01/2022 11:00	50	482.6	4595.8	25	13.9	20.9	0.078
09/01/2022 11:01	50	484.6	4615	24.9	13.9	20.9	0.077
09/01/2022 11:02	50	482.8	4597.8	24.6	13.9	20.7	0.076
09/01/2022 11:03	50	480.8	4578.9	24.6	13.9	20.6	0.076
09/01/2022 11:04	50	482.7	4597.6	24.8	13.9	20.8	0.077
09/01/2022 11:05	50	484.1	4610	25.1	13.8	21	0.077
09/01/2022 11:06	50	483.3	4602.4	24.7	13.9	20.7	0.077
09/01/2022 11:07	50	484	4609.7	24.5	13.9	20.5	0.076
09/01/2022 11:08	50	483.1	4601.1	24.6	13.9	20.6	0.076
09/01/2022 11:09	50	483.3	4602.8	24.7	13.9	20.7	0.077
09/01/2022 11:10	50	480.9	4580.3	25	13.8	20.9	0.077
09/01/2022 11:11	50	480.4	4575.3	24.9	13.8	20.8	0.076
09/01/2022 11:12	50	481.2	4583	24.7	13.9	20.7	0.077
09/01/2022 11:13	50	480.9	4579.8	24.6	13.9	20.7	0.076
09/01/2022 11:14	50	480.3	4574.3	24.8	13.9	20.8	0.077
09/01/2022 11:15	50	482.4	4594	24.8	13.9	20.8	0.077
09/01/2022 11:16	50	482.2	4592.6	24.8	13.9	20.8	0.077
09/01/2022 11:17	50	481.5	4586.1	25	13.9	21	0.078
09/01/2022 11:18	50	481	4581.1	25	13.9	21	0.078
09/01/2022 11:19	50	479.2	4563.9	25.3	13.9	21.1	0.079
09/01/2022 11:20	50	480.3	4574.6	24.9	13.9	20.9	0.077
09/01/2022 11:21	50	479	4562.1	24.7	13.9	20.7	0.077
09/01/2022 11:22	50	480.5	4576.1	25	13.8	20.9	0.077
09/01/2022 11:23	50	481.3	4583.4	24.8	13.9	20.8	0.077
09/01/2022 11:24	50	480	4571.4	24.8	13.9	20.8	0.077
09/01/2022 11:25	50	481.7	4587.2	24.9	13.9	20.9	0.077
09/01/2022 11:26	50	481.1	4581.7	25.1	13.9	21.1	0.078
09/01/2022 11:27	50	481.3	4583.7	25	13.9	21	0.078
09/01/2022 11:28	50	481.6	4587.1	25	13.9	20.9	0.078
09/01/2022 11:29	50	480.3	4574.7	25.4	13.8	21.3	0.078
09/01/2022 11:30	49	478.7	4559.1	25.3	13.8	21.1	0.077
09/01/2022 11:31	49	479.1	4562.6	24.9	13.9	20.9	0.077
09/01/2022 11:32	50	480	4571.1	24.5	13.9	20.6	0.076
09/01/2022 11:33	50	481.3	4584	24.6	13.9	20.7	0.076
09/01/2022 11:34	50	480.8	4578.8	25.2	13.9	21.1	0.078
09/01/2022 11:35	49	478	4552.6	25.5	13.8	21.3	0.078
09/01/2022 11:36	49	477.8	4550.9	25.2	13.9	21.1	0.078
09/01/2022 11:37	49	478.2	4554.4	25	13.9	21	0.078
09/01/2022 11:38	49	478.9	4561.2	24.6	13.9	20.7	0.076
09/01/2022 11:39	49	479	4562	24.7	13.9	20.8	0.077
09/01/2022 11:40	49	478.8	4560.4	24.9	13.9	20.9	0.077
09/01/2022 11:41	49	480	4571.1	24.9	13.9	20.9	0.077
09/01/2022 11:42	49	479.8	4569.3	25	13.9	21	0.078
09/01/2022 11:43	49	478.1	4553.4	25.1	13.9	21	0.078
09/01/2022 11:44	49	480.5	4576.1	25	13.9	21	0.078
09/01/2022 11:45	50	481.1	4581.6	24.8	13.9	20.8	0.077
09/01/2022 11:46	50	480.4	4575.7	24.9	13.9	20.9	0.077
09/01/2022 11:47	49	479.9	4570.7	25.2	13.9	21.1	0.078
Average:	49.8	481.3	4583.4	24.9	13.9	20.9	0.077

END OF THE REPORT