COMPLIANCE TEST REPORT ANR PIPELINE-LINCOLN COMPRESSOR STATION EMERGENCY GENERATOR APU

January 24, 2023

Prepared for:



TC Energy's ANR Pipeline Company Lake George, MI

Prepared by:



Environmental Quality Management, Inc. 1280 Arrowhead Court Suite 2 Crown Point, IN 46307 (219) 661-9900 www.eqm.com

PN: 050816.0004

February 2023

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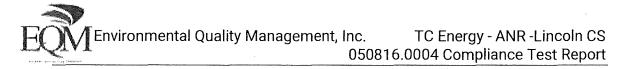
# PREFACE

I, Karl Mast, do hereby certify that the source emissions testing conducted at TC Energy in Lake George, MI was performed in accordance with the procedures set forth by the United States Environmental Protection Agency, and that the data and results submitted within this report are an exact representation of the testing.

Karl Mast Test Supervisor

I, Karl Mast, do hereby attest that all work on this project was performed under my direct supervision, and that this report accurately and authentically presents the source emissions testing conducted at ANR Pipeline's Lincoln Compressor Station in Lake George, MI.

Karl Mast Test Supervisor



# SUMMARY

The compliance testing was performed on the Caterpillar 3412C natural gas fired Generator labeled Emergency Engine (APU) in accordance with the requirements of Permit # ROP-N5586-2019 in order to comply with Title 40, Code of Federal Regulations, Part 60, Subpart JJJJ. The results of the testing are detailed in the following tables.

	APU-Summary Results					
Measured Unit	Run 1	Run 2	Run 3	Average	Permit Limit	Pass/Fail
NOx ppmvd @15% O2	41.45	41.47	40.83	41.25	160	Pass
CO ppmvd @ 15% O2	3.91	3.14	2.47	3.17	540	Pass
VOC ppmvd @ 15% O <sub>2</sub>	39.86	39.87	39.21	39.65	86	Pass



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### APPENDICES

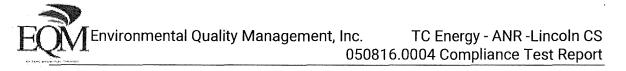
A – Field Test Data

B – Process Operating Data

C – Gas Certifications

D – Sample Calculations

E – Correspondence



# 1. INTRODUCTION

This report presents the results of the source emissions testing conducted by Environmental Quality Management, Inc. (EQM) for TC Energy's ANR Pipeline (ANR) at Lincoln compressor station, near Lake George, Michigan, which is located in Clare County. The primary purpose of this testing program was to conduct emissions testing to determine compliance with Permit # ROP-N5586-2019 for the Emergency Generator APU at ANR Pipeline's gas compressor facility.

EQM's responsibility was to conduct the compliance testing for the O2, CO, VOC, and NOx emissions rates and perform data reduction for conformance evaluation. ANR Pipeline's responsibility was to maintain process operating parameters and to assist in providing process operating data per compliance test requirements.

The following report provides information pertaining to TC Energy's process operations, and Compliance testing. The Compliance testing conducted on the Caterpillar 3412C Generator was performed on January 24, 2023, from 10:45 A.M. to 1:55 P.M.

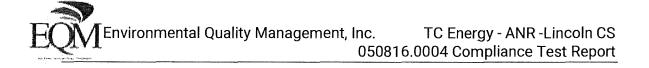
The following requirements were specific for the testing program:

- 1. Equipment calibrations performed, and calibration data provided.
- 2. Three (3) sixty (60) -minute, minimum, O<sub>2</sub>, CO, VOC and NOx test runs performed at Emergency Generator labeled Unit APU at maximum achievable load and speed according to pipeline conditions pursuant to EPA, Title 40, Code of Federal Regulations, Part 60, Subpart JJJJ. For determination of VOC concentrations, samples were analyzed as prescribed in Reference Method 18 and Method 25A per 40 CFR 60, Subpart JJJJ to reduce methane levels.
- 3. Process manufacturing operations maintained at 100 +/- 10 percent peak load condition, or at maximum achievable load according with ambient conditions, and fuel consumption rates recorded during the emissions testing periods.
- 4. All testing and analyses performed in accordance with current EPA test methodologies and analytical procedures for O<sub>2</sub>, CO, VOC and NOx emissions determinations.
- 5. Stratification was found to be less than 5% in the turbine exhausts.
- 6. Diluent corrected stratification test was performed in accordance with Subpart JJJJ.

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The testing program was approved by and/or coordinated with Pedro Amieva, TC Energy's ANR Pipeline Company. The emission testing was performed by Karl Mast, Project Manager, Zach Hill, Field Activities Lead, EQM, and Eli Mergle, Test Technician, EQM. Michigan CAT was contracted to supply the load bank for the testing. The emission testing was observed by Nathanael Gentle, MEGLE.



# 2. TEST RESULTS SUMMARY

The compliance testing was performed on the Generator APU2 in accordance with the requirements of the Title 40, Code of Federal Regulations, Part 60 (40 CFR 60, Appendix A [Subpart JJJJ]). A summary of the test results is given below:

		Table 1. AF	PU-Summary	Results		
Measured Unit	Run 1	Run 2	Run 3	Average	Permit Limit	Pass/Fail
NOx ppmvd @15% O2	41.45	41.47	40.83	41.25	160	Pass
CO ppmvd @ 15% O₂	3.91	3.14	2.47	3.17	540	Pass
VOC ppmvd @ 15% O <sub>2</sub>	39.86	39.87	39.21	39.65	86	Pass

Based on the information provided above, the Generator met the acceptance criteria during the course of the testing. A complete list of performance parameters for each test run that was performed at the stack sampling locations can be found in Tables 2-3.

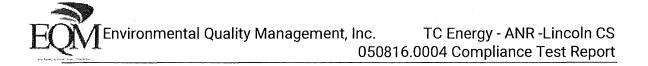
Additional testing information may be found in Appendix A.

# Table 2. Operating & Ambient Conditions, Concentrations, & EmissionsUnit APU

	Summary of Stack Ga	nerator-APU	col Neouilo	and a second secon	a di seta mang sa sakatina na Sakatina na Ka
		coln Compressor St	ation		
		ethod 3A, 7, 10, 18, 8	ROMAN AND CONTRACTORS OF A PROPERTY OF		40.00.000.000.000.000.000.000.000.000.0
	ne a superior substances de la companya de la compa	Page 1 of 1			
<del>.</del> ,	RUN NUMBER	0-1	0-2	0-3	
	RUN DATE	1/24/2023	1/24/2023	1/24/2023	Average
	RUN START	10:45	11:50	12:56	
	MEASURED DATA	rine (1999) and a state of the			·····
P <sub>bar</sub>	Barometric Pressure, inches Hg	28.904	28.891	28.874	28.89
B <sub>ws</sub>	Moisture, % by volume	16.66	16.74	16.65	16.7
				*	
errege erregeled, er aus anse	Kilowatts	453.0	r 453.0	453.0	453.0
				2. Challeman and A. China and Submitted V. P. J. M. Holds & Herman 2005 Life and an adversarial processing system and an adversarial system. Society of the adversaria processing processing adversarial system. Society of the adversarial system and adversarial system adversarial processing adversarial system. Society of the adversarial system adversarial adversarial system adversarial system adversarial system adversarial system. Society of the adversarial system adversarial system adversarial system adversarial system adversarial system. Society of the adversarial system adversarial system adversarial system adversarial system adversaria system adversarial system adversarial system adversarial system adversarial system adversarial system adversari system advers	
O <sub>2</sub>	Concentration PPM Dry	8.42	8.39	8.39	8.40
	Nitrogen Oxides				
NOx	Concentration PPM Dry	87.67	87.92	86.58	87.39
NOx	Concentration PPM Dry @ 15% O₂	41.45	41.47	40.83	41.25
2002.00 000 0000.000 00	Carbon Monoxide				
со	Concentration PPM Dry	8.28	6.65	5.23	6.72
со	Concentration PPM Dry @ 15% O <sub>2</sub>	3.91	3.14	2.47	3.17
	Total Hydrocarbons				
тнс	Concentration PPM Wet C1	1357.15	1325	1253.43	1311.86
THC	Concentration PPM Dry C1	1583.25	1546.81	1462.13	1530.73
CH₄	Concentration PPM Bag Sample	1330.3	1293.2	1212.7	1278.73
voc	Concentration PPM Dry C1	252.95	253.61	249.43	251.99
voc	Concentration PPM Dry C3	84.32	84.54	83.14	84.00
voc	Concentration PPM Dry @ 15% O <sub>2</sub>	39.86	39.87	39.21	39.65

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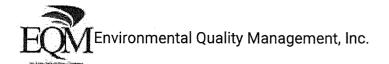
# 3. PROCESS DESCRIPTION

TC Energy's ANR Lincoln Compressor Station is located at 3991 South Hickory, Lake George, MI, Clare County. The plant operates a Caterpillar 3412C natural gas fired internal combustion reciprocating engine utilized for supporting energy needs for the station. It is rated at 755 HP and 500 KW.

The following tables provide a summary of the production rates for the Emergency Generator during the test:

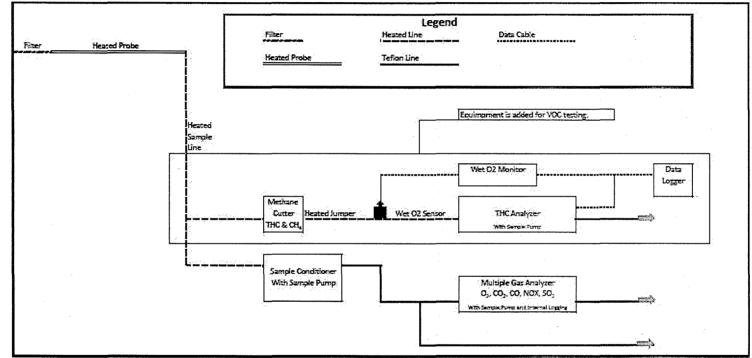
Table 3. Generator APU Production Data						
Unit/Measurement	Run 1	Run 2	Run 3	Average	Rated	% Load
<sup>1</sup> APU-HP	607.48	607.48	607.48	607.48	755 HP	80.46
APU-KW	453.0	453.0	453.0	453.0	500 KW	90.60

<sup>1</sup>Horsepower was calculated based on Kilowatt output, which was within the 90-100% operating range. More information may be found in Appendix A.



# Figure 1. Sampling Schematic

# Sampling Schematic



Additional Information pertaining to the Fuel Flows may be found in Appendix B.

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# 4. TEST PROCEDURES

EQM and EQM's affiliates and subcontractors use current U.S. EPA accepted testing methodologies in their Air Quality Programs as listed in the U.S. Code of Federal Regulations, Title 40, Part 60, Appendix A. For this testing program, the following specific methodologies were utilized:

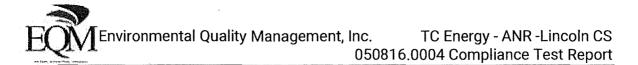
- U.S. EPA Method 3A Determination of Oxygen and Carbon Dioxide Concentrations in Emissions From Stationary Sources (Instrumental Analyzer Procedure)
- U.S. EPA Method 4 Determination of Moistures From Stationary Sources
- U.S. EPA Method 7E Determination of Nitrogen Oxides Emissions From Stationary Sources (Instrumental Analyzer Procedure)
- U.S. EPA Method 10 Determination of Carbon Monoxide Emissions From Stationary Sources (Instrumental Analyzer Procedure)
- U.S. EPA Method 18 Determination of VOC Emissions From Stationary Sources (Instrumental Analyzer Procedure)
- U.S. EPA Method 25A Determination of VOC Emissions From Stationary Sources (Instrumental Analyzer Procedure)

USEPA Methods 3A, 4, 7E, 10, 18 and 25A were performed at the Exhaust Stack sampling location by continuously extracting a gas sample from the stack through a single point stainless steel sample probe. The extracted sample was pulled through a series of filters to remove any particulate matter. Directly after the probe, the sample was conditioned by a series of refrigeration dryers to remove moisture from the gas stream. After the refrigeration dryers, the sample was transported through a Teflon® line to the analyzers. The flow of the stack gas sample was regulated at a constant rate to minimize drift. Moistures were determined by Method 4 (hot and wet oxygen monitor).

At the start of the day, each monitor was checked for calibration error by introducing zero, mid-range and high-range EPA Protocol 1 gases to the measurement system at a point upstream of the analyzers. In this report, the calibration error test is referred to as instrument calibration. The gas was injected into the sampling valve located at the outlet of the sampling probe. The bias test was conducted before and after each consecutive test run by introducing zero and upscale calibration gases for each monitor. The upscale calibration gases used for each monitor were the high calibration gases.

Measurement System Performance Specifications were as follows:

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- Analyzer Calibration Error Less than +/- 2% of the span of the zero, mid-range and high-range calibration gases.
- Sampling System Bias Less than +/-5% of the span for the zero, mid-range and high-range calibration gases.
- Zero Drift Less than +/-3% of the span over the period of each test run.
- Calibration Drift Less than +/-3% of the span over the period of each set of runs.

Calculations that were used in this testing event are as follows:

**Calibration Correction** 

$$C_{GAS} = \left(C_R - C_O\right) \frac{C_{MA}}{C_M - C_O}$$

# Where:

C <sub>GAS</sub> :	Corrected flue gas concentration (ppmvd)
C <sub>R</sub> :	Flue gas concentration (ppmvd)
Co:	Average of initial and final zero checks (ppmvd)
См:	Average of initial and final span checks (ppmvd)
C <sub>MA</sub> :	Actual concentration of span gas (ppmvd)

EPA F-Factor

$$F_{d} = \frac{\left[ \left( 3.64 \cdot H_{WP\%} \cdot 100 \right) + \left( 1.53 \cdot C_{WP\%} \cdot 100 \right) \right]}{\frac{GCV}{\rho_{FuelGas}}} \cdot 10^{6}$$
$$+ \frac{\left[ \left( 0.14 \cdot N_{2WP\%} \cdot 100 \right) - \left( 0.46 \cdot O_{2WP\%} \cdot 100 \right) \right]}{GCV} \cdot 10^{6}$$

Where:

<i>F</i> <sub>d</sub> : Fuel specific F-factor, dscf/MMBtu	
Hwt%: Hydrogen weight percent	
C <sub>Wt%</sub> : Carbon weight percent	
<i>N</i> <sub>2Wt%</sub> : Nitrogen weight percent	
<i>O</i> <sub>2Wt%</sub> : Oxygen weight percent	
GCV: Heating value of the fuel, BTU	/dscf

 $\rho_{FuelGas}$ 

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*P*Fuel Gas: Density of the fuel gas, lb/scf

Mass Emissions g/bhp-hr

$$Em = Cd \times Fd \times \frac{20.9}{(20.9 - \%O_2)} \times Qh \times \frac{GCV}{10^6} \times \frac{4536}{BHP}$$

# Where:

E <sub>m:</sub>	Pollutant concentration, NOx <sub>(g/bhp-hr)</sub>
Cd:	Pollutant concentration, NOx lb/scf
%O <sub>2</sub> :	Oxygen concentration in percent, measured on a dry basis
Fd:	Fuel specific F-factor, dscf/MMBtu
Qh:	Fuel rate, scf/hr
GCV:	Heating value fuel, Btu/scf
	To convert from ppmvd NOx to lb/scf NOx, multiply the

To convert from ppmvd CO to lb/scf CO, multiply the ppmvd value by 7.268 x  $10^{-8}$ 

Mass Emission Calculations lb/hr

$$NO_{\frac{h}{hr}} = C_d \times F_d \times \frac{209}{209 - \%O_2} \times Q_h \times \frac{GCV}{10^6}$$

ppmvd value by 1.194 x 10<sup>-7</sup>

# Where:

Cd:	Pollutant concentration, lb/scf
F <sub>d</sub> :	Fuel specific F-factor, dscf/MMBtu
Q <sub>h</sub> :	Fuel flow, scf/hr
%0 <sub>2</sub> :	Oxygen concentration in percent, measured on a dry basis

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GCV: Upper dry heating value of fuel, Btu/dscf

NO<sub>x</sub> Corrected to 15% O<sub>2</sub>

$$Em = NO_{X}\left(\frac{5.9}{20.9 - \% O_{2}}\right)$$

# Where:

E<sub>m:</sub> Pollutant concentration corrected to 15% O<sub>2</sub>, ppm NO<sub>x</sub>: Pollutant concentration, ppm

%O<sub>2</sub>: Oxygen concentration in percent, measured on a dry basis

NO Interference Response

$$INO = \left[ \left( \frac{R_{NO-NO2}}{C_{NO2G}} \times \frac{C_{NO2S}}{C_{NOxS}} \right) \right] \times 100$$

Where:

INO:	NO interference response (%)
RNO-NO2:	NO response to NO2 span gas (ppm NO)
C <sub>N02G</sub> .:	Concentration of NO <sub>2</sub> span gas (ppm NO2)
C <sub>N02S</sub> -:	Concentration of NO2 in stack gas (ppm NO2)
C <sub>NOxS</sub> :	Concentration of $NO_x$ in stack gas (ppm $NO_x$ )

# VOC ppm

$$VOC_{ppmvd} = \frac{THC_{ppmvw} - \frac{1}{3}CH_{4ppmvd} - \frac{2}{3}C_{2}H_{6ppmvd}}{1 - \left(\frac{\% H_{2}O}{100}\right)}$$

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VOC mass emissions calculations g/bhp-hr

$$VOC_{\frac{g}{hhp-hr}} = C_d \times F_d \times \frac{20.9}{20.9 - \%O_2} \times Q_h \times \frac{GCV}{10^6} \times \frac{453.6}{BHP}$$

Where:

Cd: Pollutant concentration, lb/scf

Fd: Fuel specific F-factor, dscf/MMBtu

Qh: Fuel flow, scf/hr

%02: Oxygen concentration in percent, measured on a dry basis

GCV: Upper dry heating value of fuel, Btu/dscf

VOC mass emissions calculations lb/hr

$$VOC_{\frac{g}{bhp-hr}} = C_d \times F_d \times \frac{20.9}{20.9 - \%O_2} \times Q_h \times \frac{GCV}{10^6}$$

<u>Where</u>:

- Cd: Pollutant concentration, lb/scf
- Fd: Fuel specific F-factor, dscf/MMBtu
- Qh: Fuel flow, scf/hr
- %02: Oxygen concentration in percent, measured on a dry basis

GCV: Upper dry heating value of fuel, Btu/dscf

To convert ppm to lb/scf	Multiply by
NOx	1.194x10 <sup>-7</sup>
VOC	1.1444x10 <sup>-7</sup>

GVC: Heating value of the fuel, Btu/scf

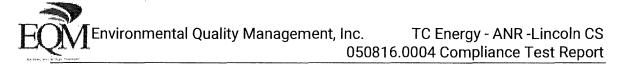


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# 5. QUALITY ASSURANCE PROCEDURES

Each reference method presented in the U.S. Code of Federal Regulations details the instrument calibration requirements, sample recovery and analysis, data reduction and verification, types of equipment required, and the appropriate sampling and analytical procedures to ensure maximum performance and accuracy. EQM and EQM's affiliates and subcontractors adhere to the guidelines for quality control set forth by the United States Environmental Protection Agency. These procedures are outlined in the following documents:

- Code of Federal Regulations, Title 40, Part 51
- Code of Federal Regulations, Title 40, Part 60
- Quality Assurance Handbook, Volume 1, EPA 600/9-76-005
- Quality Assurance Handbook, Volume 2, EPA 600/4-77-027a
- Quality Assurance Handbook, Volume 3, EPA 600/4-77-027b



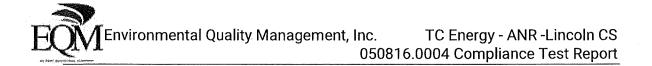
# 6. CONCLUSIONS

An Emissions Test was conducted on the Generator APU at TC Energy's ANR Pipeline Company's Lincoln Compressor Station located in Lake George, MI. The testing was conducted on January 24, 2023.

During the course of the testing, the Generator APU conformed to the requirements of Code of Federal Regulations, Title 40, Part 60, Appendix A.

The usefulness and/or significance of the emissions values presented in this document as they relate to the compliance status of the Generator emissions shall be determined by others.

For additional information pertaining to the testing program see Appendix E of this report.



# A. FIELD TEST DATA

Client TC Ener Location Lincoln M Test Location Generato Analyzer Horiba Serial Number 3480D65	/I br-APU PG-350 \ F4 348	30D6F4	METHANE CUTTER 3480D6F4	3480D6F4	3480D6F4	
Upscale Reponse < 0 Downscale Response < 0 CHANEL LABEL 0 ON=1 OFF=0 Min	60 < 60 < 1 1	< 60 < 60 <b>Nox</b> 1	< 60 < 60 CO 1	< 60 < 60 <b>VOC</b> 1	< 60 < 60 Wet O2 1	Bags
1 2 3 4 5 6	8,231 8,337 8,440	126.3 126.3 126.3 126.3 126.3 126.3				R1 1329 1330 1330 1331 1331
7 8 9 10 11 12		126.3 126.2 126.2 126.2 126.2 126.2				1330 1331 1331 1331 1330 1330,3
13 14 15 16 17 18		126.2 126.2 126.2 126.1 126.1 126.1				R2 1293 1293 1293 1293 1294
19 20 21 22 23 24		126.1 126.1 126.1 126 126 126 126				1294 1293 1293 1293 1293 1293 1293
25 26 27 28 29		126 126 126 126 126				R3 1213 1212 1213 1213 1213
30 31 32 33 34 35		126				1212 1213 1213 1213 1213 1213 1212
36 37 38 39 40 41						1212.7
42 43 44 45 46						
47 48 49 50 51 51						
53 54 55 56 57 58 59 60						
High Low Average Converter Percent		126.300 126.000 <b>99.76%</b>				
Strat % 1 Strat % 2 Strat % 3	8.231 8.337 8.440	-1.25% ( 0.01% S 1.25%	Under 5% or .5 ppm Single point			
Arverage	8,34		1			
Leak Check Pre Test Leak Check Post Test	Pass Pass					

Generator-APU

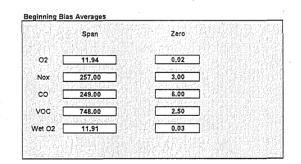
		Calibration Gass	es							
	Scale		High		Mid		Low		Zero	
2	21.90	RN1467	21.90	QN0066	11,90	]				
×	515.90	LL197491	515.90	BR0013976	259.000	1				
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0C	1490.00	RN1480	1490.00	BR0013976	745.000	LL197491	453.00	]		
Vet O2	21.90	RN1467	21.90	QN0066	11.90	egisperendelse Instantionen	(Sintestatora Pata) Internationalista	1		
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	High	Mid	Low
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co	digital de proposa	1	and prove the second second
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VOC	talland som för	1	
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Ca	libration Error Te	st						
	High		Mid		Low		Zero	
02	21.90	(ili) (ili)	11.90			alladda	0.00	yi naya
21.90	21.92	0.1%	11.79	-0.5%			0.00	0.0%
Nox	515.90		259.00				0.00	
515.90	516.10	0.0%	258.00	-0.2%			1.00	0.2%
со	507.70		255,00		0.00		0.00	
507.70	508.00	0.1%	254.00	-0.2%	0.00	0.0%	3.00	0.6%
Voc	1490,00		745.00		453.00		0.00	
1490.00	1493.00	0.2%	747.00	0.1%	451.00	-0.1%	1.00	0.1%
Wet O2	21.90	ka na ka	11.90		0.00		0.00	
21.90	21,93	0.1%	11.90	0.0%	0.00	0.0%	0.00	0.0%

	High	Mid	Low	Zero
02	21.92	11.79		0.00
Nox	516.10	258.00		1.00
co	508.00	254.00		3.00
voc	1493.00	747.00	451.00	1.00
Wet O2	21.93	11.90		0.00
fethane Cutter				
Response Test		0.00		
		457		

Beginning	Bias Check	1			
		Span	Bias	Zero	Blas
02		11.79 11.94	0.7%	0.00 0.02	0.1%
Nox		258.00 257.00	-0.2%	1.00 3.00	0.4%
со		254.00 249.00	-1.0%	3.00 6.00	0.6%
voc		747.00 748.00	0.1%	1.00 2.50	. 0.1%
Wet O2		11.90 11.91	0.0%	0.00 0.03	0.1%



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	CHANEL LABEL	02	Nox	со	voc	Wet O2	% Moisture		Actual Bias G					
	•••						,		High	Mid	Low	1		
<u>t Time</u> 10:4	<u>Min</u> 5 1	8.23	93.04	25,59	1375,47	7.11	15,78	O2 Nox		11.90				
	2	8.22	94.25	21.46	1335.25	7.19	14.42	co		255,00				
	3	8.34	93.00	18.35	1416.83	7.40	12.71	VOC		745.00		1		
	4	8.41	93.35	16.12	1301.41	7.50	12.21	Wet O2		11.90		]		
	5	8.44	87.03	14.80	1340.77	7.04	19.84							
	6 7	8.45 8,48	87.07 86.82	14.06 14.37	1321.93 1405.63	7.20 7.16	17.45							
	8	8,48	86,82	14.37	1343.84	7.16	18.50 20.29	Ending	Bias Check Span	Drift	Bias	Zero	Drift	Bia
	9	8,46	87,43	13,06	1323,15	7.41	14.24	02	11.94	UIIK	DRIS	0.02	Duit	Dia
	10	8,49	88,58	13,75	1322.73	7.01	21.14		11,96	0.1%	0.8%	0.01	0.0%	0,0
	11	8,48	86.42	12.77	1361.21	7.17	18.21						2000 (BAR)	
	12	8,49	86,75	12.06	1317,12	7.44	14.06		1.0			and the participants		
	13	8.49	89.30	11.87	1390.75	7.41	14.51	Nox	257,00		nie Leo.	3.00	1	
	14 15	8.47 8.47	90.21 90.27	12.93	1397.26 1404.04	7.47	13.45		260.00	0.6%	0.4%	4.00	0.2%	0.6%
	15	8.47	90.27 89.23	12.53 12.37	1329.22	7.12 7.04	19.02 20.45		1		and the second s			
	17	8.46	89.86	12.37	1326.44	7,32	15.70	co	249.00			6.00		
	18	8.47	91,31	12.25	1372.24	7.23	17.28		252.00	0.6%	-0.4%	5.00	-0.2%	0.4%
	19	8.49	91.94	12.40	1389.05	7.37	15.13		C. edu		<u>1 (66)</u>		· · · · · · · · · · · · · · · · · · ·	· · · · ·
	20	8.50	86.99	12.42	1373.43	7.19	18.27				- 1992 - T			
11:0	5 21 22	8,48 8,47	91.24 92,43	12.87 12.88	1408,55 1307,37	7.36 7.49	15.16	VOC	748.00	A 447	0.000	2,50	A 444	
	22 23	8.47	92,43 91,39	12.88	1307.37	7.49	13.15 17.26		750.00	0.1%	0,2%	3,30	0.1%	0,2%
	23	8.49	90.06	12.91	1411.30	7.21	17.78					1000 C		
	25	8.48	92,92	12.92	1397.78	7.03	20,70	Wet O2	11.91			0,03		
	26	8.49	88,22	12,93	1334,55	7,38	15.02	11 - F - F - F - F - F - F - F - F - F -	11.94	0.1%	0,2%	0.02	0.0%	0.1%
	27	8.49	88.84	12.81	1343.25	7.27	16.78							
	28	8.48	92.26	12.20	1395.39	7.26	16.82							
	29 30	8.48 8.49	92.32 89.01	12.38 12.39	1345.97 1376.46	7.27 7.16	16.63 18.57							
	31	8.49	92.72	12.39	1317.39	7.02		Ending Blas	Averanes					
	32	8.49	87.14	12.73	1416.71	7.25	17.03		span	9		Zero	77,000 / 1	1
	33	8.49	86.90	12.29	1342.35	7.17	18.42					1.1.1.1.1.1.1.1		
	34	8,47	90,60	12.30	1350.86	7.45	13,63	02	11,96	]		0.01		
	35	8.46	90.91	12.30	1319.32	7,46	13.39			<b>-</b>				
	36 37	8,47 8,45	89.83	12.74	1311.11	7.49	13,15	Nox	260.00	1		4.00		
	38	8.45	92.11 87.06	12.63 11.88	1337.02 1400.85	7.34 7.48	15.16 13.33	со	252.00	<b>1</b>		5,00	1944 - Alian I.	
	39	8,48	86.50	12,19	1351,61	7.47	13,56	Ŭ	1	le de ceite i	d far Herei	<u> </u>	204월 -	
	40	8.46	91.58	12.20	1315.40	7.18	17.86	VOC	750.00	1	신 물건이 다	3,30	torres -	
	41	8.47	88.20	13.11	1404.83	7.16	18.23							
	42	8.46	90.46	12.21	1363.93	7.09	19.32	Wet O2	11.94	<b>]</b>	신가 있었는데	0.02	1999 - E	
	43	8.48	88.77	12.21	1325.73	7.00	21.16							
	44 45	8.47 8.46	91.30 91.58	12.22 12.81	1316.74 1361.04	7.06 7.22	20.04 17,19							I
	45	8.45	91.58	12.81	1361.04	7.22	18,33							
	47	8.46	91.01	12.68	1408.11	7.33	15.48							
	48	8.48	91.57	12.09	1409.14	. 7.05	20,33							
	49	8.48	89.31	12.54	1408.78	7,33	15.62							
	50	8.48	89.03	12.09	1359.86	7.37	15.12							
	51 52	8.47 8.48	89.32 90.73	12.40 12.86	1309.34 1413.90	7.43 7.46	13,96 13,65							
	52	8.46	90.73	12,86	1329.38	7.46	13.65							
	54	8.47	87,91	12.69	1323.30	7.30	16.04							
	55	8.46	90,17	12.10	1418.29	7.30	15.97							
	56	8.44	91.58	11.96	1418.33	7.26	16.21							
	57	8.46	87.63	12.10	1348.03	7.17	18.06							
	58	8.45	89.04	11.65	1349.04	7.21	17.19							
	59 60	8.46 8.44	91,57 90,71	11,34 11,22	1365.90 1401.60	7.24 7.24	16,86							
	60 Average	8,44 8,459	90,71 89,819	11,22	1,362.05	7.24	16,60 16,66							
	raye	0,435	03.013	10,400	1002.00	1.20	10,00							
		8.42	87.67	8,28	1,357,15	7.23								

Date Client Location Test Location Run 1/24/2023 TC Energy Lincoln MI Generator-APU

1

	Date Client Location Test Location Run	1/24/2023 TC Energy Lincoln MI Generator-APU 2					. · · · ·	·						
	CHANEL LABEL	02	Nox	со	voc	Wet O2	% Moisture		Actual Bias Ga High	sses Mid	Low			
Start Time	Min							O2	1.1511	11.90		)		
	1:50	1 8.44	90,38	13.01	1318.34	7.07	19.33	Nox		259,00	Seconder.			
		2 8.48 3 8.45	87.85 92.63	12.42 12.87	1324.52 1303.09	7.22 7.05	17.32 19.84	CO VOC	and the state of the second	255.00 745.00		{		
	1	4 8.45	91.79	13.78	1322.14	7.27	16.21	Wet O2		11.90				
		5 8.46	91.50	12.76	1323.04	7.36	14.86						,	
		6 8.47 7 8.46	92.35 87.84	11.83 12.73	1323.58 1358.91	7.35 7.31	15.33 15.83	Ending	Bias Check	2				
		8 8,46	89,24	12.73	1343,64	7.47	13.25	chung	Span	Drift	Bias	Zero	Drift	Bias
		9 8,49	91.50	11.23	1357.04	7.47	13.64	O2	11,96			0.01		
		10 8.48	88,96	11.38	1351.08	7.31	16.13		12.00	0.2%	1.0%	0,07	0,3%	0.2%
		11 8.47 12 8.46	91,22 88,68	13.48 13.51	1303.83 1321.63	7.50 7.22	13.00 17.19							
		13 8.47	91.22	13.09	1364.00	7.02	20.60	Nox	260.00			4.00		
		14 8.46	93.75	13.37	1368.25	7.44	13.76		259.00	-0.2%	0.2%	4.60	0.1%	0.3%
		15 8.46	91,23	11.70	1368.93	7.22	17.18							ung synder Senteren der e
		16 8.47 17 8.45	89.82 92.35	12.75	1314.29 1368.05	7.15 7.35	18.43 14.97	со	252.00			5.00		
		18 8.48	90.38	11.84	1323.70	7.01	20.99		256.00	0,8%	0.4%	7.00	0,4%	0.2%
		19 8.47	89.82	12.61	1329.65	7.43	14.07					0.000000000		
		20 8.48 21 8.47	90.67 90.94	12.30 11.85	1344.03 1337.95	7.07	19.83 17.49	VOC	750.00			3,30		
14		22 8,46	90.94	12,31	1319,81	7.04	20.22		766,00	0.4%	0.6%	5.80	0,2%	0.2%
		23 8.47	90.09	11.71	1358.86	7.02	20,63							
		24 8.47	89,25	12,17	1302.10	7.40	14.39							
		25 8.47 26 8.50	89.54 92.08	12.31 11.86	1360.73 1317.84	7.02	20,62 19,80	Wet O2	11.94 11.97	0.1%	0.3%	0.02 0.05	0.1%	0.1%
		27 8.46	90.39	12.17	1345.93	7.25	16.65		1.07	0.170	0.3 /	0.05	<b>V.1</b> A	9.174
		28 8.47	88.99	12.18	1357.38	7.29	16.12							
		29 8.45	90.69	13.54	1368.87	7.42	13.88							
		30 8.45 31 8.44	91.26 91.55	12.32 12.50	1354.09 1350.22	7.42 7.46	13.90	Ending Bias	Averages					
		32 8.47	91.84	12.04	1310.09	7.00	21.03	Crang Dies	span			zero		]
		33 8.46	90,99	11.73	1348,79	7.42	14.07							
		34 8.46	93.25	11.42	1359.22	7.12	18,90	02	12.00			0,07		
		35 8,45 36 8,45	92.41 94.38	12.19 12.36	1345.05 1343.20	7.21 7.17	17.11 17.82	Nox	259.00			4,60		
•		37 8.45	89.88	12.65	1327.85	7.27	16.38							
		38 8.45	91.30	12.82	1338.97	7.06	19,70	CO	256,00			7,00		
		39 8,45	89.33	13.42	1324.31	7.01	20.58	3100	760 00			E on		
		40 8.46 41 8.47	91.02 89.90	12.82 13.42	1337.84 1359.54	7.46 7.34	13.42 15.45	V0C	756.00			5.80		
		42 8.47	89.89	11.74	1307.84	7.14	18.57	Wet O2	11.97			0.05		
		43 8.47	91.57	11.74	1320.18	7.26	16.66							
		44 8.47 45 8.46	89.88 90.44	11.74 12.97	1319.46 1311.03	7.38 7.24	14.74 16.80	<u></u>	1		· · · · · · · · · · · · · · · · · · ·		e organitati()	1
		45 8.46	90.44 90.71	12.97	1364,12	7.24	20,17							
		47 8.45	93,53	13.28	1335.46	7.30	15.83							
		48 8.47	94.10	12.37	1353.08	7.40	14.41							
		49 8.48 50 8.50	89.87 87.90	12.06 12.97	1364.51 1349,99	7.05 7.36	20.34 15.39							
		51 8,48	90.16	11.60	1348.43	7.46	13.72							
		52 8.45	92.13	11.46	1319,46	7.16	18.04							
		53 8.46	91.01	12.06	1316.76	7.28	16.33							
		54 8.46 55 8.44	89.04 88.48	12.21 13.29	1320.45 1345.72	7.19 7.39	17.67 14.22							
		56 8.45	95.52	12.84	1324.18	7.42	13.75							
		57 8.43	89.88	12.38	1323.32	7.36	14.67							
		58 8.43	92.42	12.84	1310.93	7.16	17.82							
		59 8.46 60 8.43	89.88 93.82	12,98 13,30	1305,12 1300,92	7.04 7.50	20.06 12.49							
	Average	8,463	90,933	12.47	1,335.69	7.25	16,74							
	<b>6</b>	•		~ ~ <b>~</b>	4 900 00									
	Corrected Avg	8.39	87.92	6.65	1,325.00									

Inter         Min         O         11.50         1.52         1.52         1.52         1.52         Nex         22         0.44         91.31         13.62         127.85         7.39         15.77         O         22.80.0         22						Actual Blas Gas		5 Moisture	Wet O2	voc	co	Nox	02	ANEL LABEL	
12:55       1       8.42       91.31       13.62       128.63       7.32       13.52       10.80       25.50       25.50       25.50       25.50       25.50       25.50       27.22       11.30       25.50       27.23       15.77       10.80       25.50       27.6			Low			High		r							
2         8.44         91.31         13.76         1277.85         7.29         1577         CO         255.00           4         8.46         89.66         12.26         103.77         7.49         13.77           4         8.46         89.66         11.42         1256.16         7.31         15.69           6         8.44         80.07         11.44         1226.17         7.31         15.69           6         8.47         89.62         11.49         127.65         7.37         1144           7         8.48         83.00         11.32         1255.57         7.36         14.61           10         8.44         83.00         13.32         1255.67         7.35         14.61           11         8.44         83.00         13.32         1255.67         7.38         14.61           14         8.49         93.53         12.40         1205.65         7.42         13.46           13         8.44         8.76         11.33         127.65         7.48         13.39           14         8.49         8.20         12.20         130.64         7.39         14.65           14         8.49         8.27								13.92	7 39	1280.63	13.62	91.03	8.42		
3         8.48         89.06         12.08         1303.87         7.49         1320         VOC         1745.00           5         8.44         83.00         11.44         1254.07         7.08         1831           6         8.44         83.00         11.44         1254.07         7.08         1831           6         8.47         80.47         1254         121.21         7.31         18.99         022         12.00         0           9         8.47         89.62         11.44         127.85         7.37         14.44         11.98         0.01         1         8.90         13.21         128.57         7.30         19.57         12.00         0.01         0.01         1         8.48         8.84         12.03         128.57         13.60         10.00         0.057         13.00         10.00         0.057         13.00         10.00         0.057         13.00         10.00         0.057         14.44         11.98         0.01%         10.00         0.057         13.00         14.44         10.00         0.02         0.00         0.02         10.00         0.02         10.00         0.02         10.00         0.02         10.00         0.00 <t< td=""><td></td><td>-</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></t<>		-													
5         8.44         93.00         11.94         1254.07         7.08         1937           7         8.49         90.47         1224.41         7.27         16.70         Ending Bits Check         3           8         8.43         90.47         11.94         1275.52         7.47         11.42         12.00         Drff         Bits           9         8.44         83.00         11.32         1255.52         7.47         11.42         12.00         A.1%         0.63           10         8.44         83.00         11.32         1255.52         7.47         11.42         11.99         A.1%         0.63           12         8.48         83.00         11.32         128.58         7.08         1167         167         167         168         259.00         259.00         259.00         259.00         259.00         259.00         259.00         259.00         269.00	· · ·			.00	745.00		VOC	13.27							
6         8.46         8.85.0         12.57         1317.50         7.07         19.72           8         8.47         90.47         12.44         12.41         7.21         15.70         Ending Biz Check 3           9         8.47         90.47         12.44         127.55         7.31         15.90         DZ         12.00           10         8.44         95.52         12.72         127.55         7.31         14.44         11.98         0.17.4         0.0           11         8.44         95.55         12.40         127.05         7.35         14.44         11.98         0.17.4         0.0           13         8.45         92.71         12.26         127.65         7.45         13.86         228.10         0.0.44         1.1           14         6.46         93.55         12.40         127.05         7.38         1.470         1.44         1.26         0.0.44         1.3         1.335         226.00         0.24         0.0         2.24         0.0         2.24         0.0         2.24         0.0         2.24         0.0         2.24         0.0         2.24         0.0         2.24         0.0         2.24         0.0         2.25<				90 [	11.90		Wet O2								
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $															
13:16 = 8 + 47 + 92.47 + 128.12 + 7.31 + 1590 = 58an - Drit = B 9 + 47 + 98.62 + 11.49 + 127.559 - 7.47 + 13.42 = 02 10 + 84.42 + 93.50 + 13.32 + 126.587 - 7.36 + 14.64 + 11.98 + 0.114 + 0.0 11 + 8.44 + 93.50 + 13.32 + 126.587 - 7.36 + 14.64 + 11.98 + 0.114 + 0.0 12 + 8.48 + 84.48 + 12.69 + 128.587 - 7.48 + 13.99 + 228.10 + 0.84 + 14.44 + 0.0 14 + 8.47 + 92.55 + 12.48 + 127.288 - 7.09 + 19.26 + Nex + 256.00 + 255.00 + 0.84 + 14.44 + 0.0 + 255.00 + 0.84 + 14.44 + 0.0 + 255.00 + 0.24 + 0.0 + 0.				,		Pine Cheek	Ending								
9       847       88.62       11.49       127.5       97.47       11.442       02       12.00         11       8.44       95.25       12.72       127.85       7.37       14.46       11.98       0.11%       0.0         12       8.48       89.49       12.28       7.09       19.27       11.48       0.11%       0.0         13       8.45       92.71       12.86       122.88       7.09       19.27       Nox       255.00       .255.00       .265.10       0.0%       1.0         16       8.46       93.55       12.40       127.05       7.45       11.38       .265.10       0.0%       1.0         16       8.47       88.89       12.06       1305.77       7.38       14.47       13.45       CO       255.00       .257.00       0.274       0.0         17       8.46       90.45       13.25       13.25       7.39       14.44       CO       255.00       .257.00       .257.00       .257.00       .257.00       .257.00       .257.00       .257.00       .257.00       .257.00       .257.00       .257.00       .257.00       .258.00       .257.00       .257.00       .257.00       .258.00       .257.00	Zero Drift	Zero D	Bias		Drift		Enoing								
10       8.44       95.25       12.72       1278.52       7.37       14.44       11.38       4.14       4.44       11.38       4.15       6.15         12       8.48       85.48       12.09       1285.58       7.08       19.67       Nox       256.00       7.45       13.36       256.00       257.00       9.12.44       8.48       26.9       12.04       10.07.77       7.38       14.44       CO       256.00       257.00       0.254       0.0.454       14.44       CO       256.00       0.254       0.0.454       14.44       CO       256.00       0.254       0.0       0.255       0.0       0.256       0.156       <	0.07						02								
12         8.46         8.46         12.68         12.28.62         7.08         19.67           14         8.49         93.55         12.40         1270.56         7.45         13.36           15         8.47         88.89         12.09         130.57         7.38         14.70           16         8.46         86.76         11.63         1270.56         7.13         18.51           17         8.47         88.29         11.24         130.447         7.40         14.44           18         8.45         91.56         11.31         122.41.43         7.39         14.41           20         8.46         80.71         13.31         1254.43         7.39         14.41           21         8.49         80.16         12.24         12.26.72         7.56         13.56           22         8.46         80.35         13.63         136.57         7.56         13.56           22         8.46         80.35         13.63         136.57         7.56         13.56           23         8.47         81.32         12.67         7.56         13.56           24         8.47         13.23         12.66         7.23			0,9%	%	-0.1%							95,25	8,44		
13         8.46         92.71         12.86         1227.86         7.45         13.96         Nox         289.00           15         8.47         98.98         12.09         1305.77         7.38         14.70         283.10         0.8%         14.10           16         8.48         88.76         11.63         1226.15         7.48         13.35         CO         256.00         256.00         256.00         256.00         256.00         257.00         0.2%         0.0         0.45         12.66         17.3         16.51         257.00         0.2%         0.0         0.2%         0.0         0.2%         0.0         0.2%         0.0         0.0         0.2%         0.0         0.2%         0.0         0.0%         1.1         12.256.16         7.13         16.51         257.00         0.2%         0.0         0.0%         1.1         0.0         0.0         0.0%         1.1         0.1         1.0         12.71         12.65.16         7.78         18.01         13.16         13.0         1.0         13.16         13.0         1.0         13.16         13.0         1.0         13.16         13.0         1.0         13.16         13.0         1.0         13.0 <td< td=""><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></td<>															
14         6.49         93.55         12.00         1270.56         7.45         13.98         223.10         0.85%         14           16         8.44         88.76         11.63         1276.15         7.43         13.35         CO         256.00         -		<ul> <li>Final state</li> </ul>	at har an			1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 -	아이 있어?								
15         8.47         98.89         12.09         1305.77         7.38         14.70         100         100         100         100         100         100         14.44         CO         256.00         126         100         14.44         CO         256.00         126         100         127         16.51         125.14         7.13         16.51         257.00         0.24         0.0           19         8.46         90.45         12.86         125.41         7.13         16.51         257.00         0.24         0.0           20         8.46         80.77         13.31         1254.43         7.39         14.41         13.49         VOC         756.00         170.00         0.94         14.4           23         8.47         91.60         12.71         12265.16         7.48         13.67         16.77         10.577 </td <td>4.60</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>Nox</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>	4.60						Nox								
13:16 = 8.46 = 8.76 = 11.63 = 1278 15 = 7.46 = 13.35 = CO = 255.00 = 276.00 = 277.	5.50 0.2%	5.50 0.3	1.0%	%	0.8%	263.10									
13:16 = 17 + 8.47 + 8.29 + 12.40 + 130447 + 7.40 + 14.44 + CO 255.00 + 25		-					<u></u>								
$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$	7.00	7.00				256.00	co								
19         8.46         80.45         12.86         1254.14         7.01         20.8           13:16         21         8.46         80.77         12.31         1254.43         7.39         14.41           21         8.46         90.74         12.25         1285.24         7.08         19.89         VOC         756.00         0.974         14.41           23         8.47         91.60         12.40         1298.79         7.15         18.50         770.00         0.974         14.41           23         8.46         91.60         12.71         128.54         7.30         15.77         Wet O2         11.97         0.45         0.45         0.99         0.99         0.99         0.99         0.15.77         12.84         7.33         17.07         19.68         11.95         0.1%         <			0.5%	%	0.2%		- 71-	18.51			13.17	91.58	8.45	18	
13:16       21       8.49       90.74       1225       12285.24       7.08       19.89       VOC       756.00       760.00       0.37%       11.41         23       8.47       91.60       12.40       1298.79       7.15       18.50       770.00       0.37%       11.41         24       8.46       91.60       12.71       1265.77       7.30       115.77       11.97       11.97       11.97       11.97       11.97       11.97       11.97       11.97       11.97       11.97       0.1%       0.27       0.48       91.64       11.80       1317.02       7.06       20.11       11.95       0.1%       0.27       0.44       91.04       11.80       1317.02       7.06       20.11       11.95       0.1%       0.27       0.37       15.36       11.94       129.82       7.37       15.36       56.44       8.47       91.32       12.24       12.25       127.24       7.49       13.39       0.2       11.94       13.93       0.2       11.93       1.99       9.44       8.47       91.29       12.25       127.21       7.40       14.35       14.56       14.56       14.56       14.56       14.56       14.56       14.56       14.56       14.5			- 14 B 12	- 19 C	- 11	a na fara		20.63							
22       8.48       92.15       11.94       1256.16       7.48       13.34       770.00       0.9%       1.1         23       8.47       91.60       12.01       1285.77       7.30       15.77         24       8.46       91.60       12.71       1285.77       7.30       15.77         25       8.46       91.89       12.71       1283.46       7.36       14.97         26       8.46       91.89       12.71       1283.46       7.36       14.97         28       8.47       91.22       12.06       126.78       7.06       19.98         29       8.47       91.22       12.04       127.06       7.23       17.07         30       8.50       96.87       11.80       1295.274       7.13       15.96         31       8.46       92.70       12.25       127.46       7.49       13.36       02       11.95         33       8.49       98.31       11.48       1290.67       7.49       13.36       02       11.95         34       8.46       87.91       12.42       1301.63       7.14       14.58       Nox       283.10         35       8.46       91.31<				- 11 - 11 - 11 - 11 - 11 - 11 - 11 - 1	1.14.14	1927									
23       8.47       91.60       12.40       1298.79       7.15       18.50         25       8.46       91.60       12.71       1265.77       7.30       15.77       14.68         25       8.46       91.89       12.71       128.46       7.36       14.97       11.97       0.14         26       8.46       91.89       12.71       128.46       7.36       19.97       13.99         28       8.47       92.73       12.26       123.62       7.37       15.36         29       8.47       92.73       12.80       123.62       7.37       15.36         30       8.50       85.66       11.94       129.66       7.23       17.07       19.68         31       8.48       82.47       12.40       129.62       7.37       15.36       59.84         33       8.49       93.3       11.48       128.02       7.49       13.39       02       11.95       02       11.95         33       8.49       91.29       12.25       127.21       7.40       13.56       Nox       263.10       15.97         36       8.46       91.31       12.26       129.11.57       7.08       19.5	5.80						VOC								13:16
24       8.46       91.60       12.71       1265.77       7.30       15.77         25       8.46       91.89       12.71       1283.46       7.36       14.97         27       8.48       91.04       11.80       1317.02       7.06       20.11         28       8.47       92.73       12.28       1207.68       19.99         29       8.47       91.32       12.40       1270.66       7.33       15.36         30       8.50       85.68       11.91       1289.42       7.37       15.36         31       8.48       92.44       12.40       1299.46       7.34       15.64         33       8.49       89.33       11.48       1280.87       7.18       18.16         34       8.47       91.22       12.25       127.44       14.456       Nox       263.10         35       8.48       87.91       12.40       130.16.3       7.14       14.56       Nox       263.10       0       21.198         36       8.47       91.22       12.25       127.21       7.40       14.35       Nox       263.10       0       25.70.0       0       25.70.0       0       25.70.0 <td< td=""><td>6.30 0.0%</td><td>6,30 0,0</td><td>1,5%</td><td>%</td><td>0.9%</td><td>770.00</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></td<>	6.30 0.0%	6,30 0,0	1,5%	%	0.9%	770.00									
25       8.46       89.35       13.63       1316.30       7.07       19.66       Wet C2       11.97       1.1.97         26       8.46       91.04       11.80       1317.02       7.06       20.11         28       8.47       92.73       12.28       1207.98       7.06       19.99         29       8.47       91.22       12.40       1270.66       7.23       17.07         30       8.50       85.68       11.94       1239.82       7.37       15.36         31       8.48       92.74       12.25       127.48       7.49       13.39         31       8.48       92.70       12.25       127.21       7.40       14.56         33       8.47       91.29       12.25       127.21       7.40       14.56         35       8.48       87.91       12.26       127.21       7.40       14.56         36       8.47       91.29       12.25       127.21       7.40       14.56         36       8.46       91.31       12.26       129.16       7.07       20.19         37       8.45       95.24       13.03       1254.37       7.44       13.45															
268.4691.8912.71128.3467.3614.9711.950.1%0.2 $27$ 8.4891.0411.80131.7027.0620.11 $28$ 8.4792.7312.261267.987.0619.98 $29$ 8.4791.3212.40129.467.2317.07 $30$ 8.5085.6811.94129.427.3715.36 $31$ 8.4892.4412.40129.467.3415.64 $32$ 8.5086.7711.801255.747.1319.18 $34$ 8.4792.7012.25127.217.4014.35 $36$ 8.4887.9112.401301.637.4114.56 $36$ 8.4887.9112.421301.637.4114.56 $36$ 8.4691.3112.26122.217.4014.35 $37$ 8.4595.2413.031254.307.0919.13 $38$ 8.5090.4613.411261.457.0720.19CO $257.00$ 16.0113.481281.337.1717.76VOC770.00 $41$ 8.4680.5113.171252.437.4618.46 $42$ 8.4793.5913.171252.437.4618.46 $44$ 8.4880.5913.171252.437.4618.46 $45$ 8.4691.0811.8013.2387.2517.21 $44$ 8.4880.5913.171252.	0.05	0.05				11.97	Wet O2								
27       8.48       91.04       11.80       1317.02       7.06       20.11         28       8.47       91.32       12.26       1270.66       7.23       17.07         30       8.50       85.68       11.94       1233.82       7.37       15.36         31       8.48       92.44       12.40       1299.46       7.34       15.64       Ending Bias Averages         32       8.50       88.77       11.80       1255.74       7.13       19.16       9pan         33       8.49       93.33       11.48       1280.87       7.49       13.39       02       11.98         34       8.47       91.22       1272.41       7.40       13.06       7.41       14.56         35       8.48       87.91       12.26       1272.21       7.40       14.35       Nox       203.10         36       8.47       91.29       12.25       1272.21       7.00       14.35       Nox       203.10       CO       257.00         36       8.46       91.31       12.64       1281.33       7.17       77.60       VOC       770.00         41       8.48       86.51       13.17       138.35       7.16<	0.08 0.1%		0.2%	%	-0.1%										
29       8.47       91.32       12.40       1270.66       7.23       17.07         30       8.50       8568       11.94       1238.22       7.37       15.36         31       8.48       92.44       12.40       1299.46       7.34       15.64         32       8.50       88.77       11.80       1255.74       7.13       19.18       span         33       8.49       98.33       11.48       120.87       7.49       13.39       02       11.88         34       8.47       92.70       12.25       1273.48       7.14       14.58       02       11.88         36       8.47       91.29       12.25       1272.21       7.40       14.35       Nox       223.10         37       8.50       90.46       11.34       1261.45       7.07       20.19       CO       257.00         39       8.46       91.31       12.26       1291.15       7.08       19.51       CO       257.00         41       8.48       88.51       13.17       138.36       7.17       17.76       VOC       770.00         41       8.48       93.59       13.17       1252.43       7.48       132.4									7.06	1317.02	11.80				
30       8.50       85.68       11.94       1293.62       7.37       15.36         31       8.48       92.44       1299.46       7.34       15.64       Ending Bins Averages         32       8.50       88.77       11.80       1255.74       7.13       19.18       span         33       8.49       89.33       11.48       1200.87       7.49       13.38       O2       11.88         34       8.47       92.70       12.25       127.148       7.18       18.10       O2       11.88         36       8.47       91.29       12.225       127.21       7.40       14.35       Nox       263.10         37       8.45       95.24       13.03       1254.30       7.07       20.19       CO       257.00         38       8.50       90.46       13.34       1261.45       7.07       20.19       CO       257.00         40       8.44       91.80       13.48       1281.33       7.17       17.76       VOC       770.00         41       8.48       89.59       12.72       127.48       7.34       15.50         42       8.47       90.25       13.35       12.71       12.74															
31       8.48       92.44       12.09       12.99       6       7.34       15.64       Ending Bias Averages         32       8.50       88.77       11.80       1255.74       7.13       19.18       span         33       8.49       89.33       11.48       1208.67       7.49       13.39       0.2       11.38         34       8.47       92.70       12.25       1273.48       7.16       18.10       0.2       11.38         35       8.48       87.91       12.26       1272.21       7.40       14.35       Nox       263.10         36       8.47       91.29       12.26       1272.21       7.40       14.35       Nox       263.10         38       8.50       90.46       11.34       1261.45       7.07       10.19       CO       257.00         40       8.44       91.60       13.48       1281.33       7.17       17.76       VOC       770.00         41       8.48       88.51       13.17       1226.43       7.48       132.6       132.6         43       8.50       80.99       11.80       1281.65       7.26       17.21         44       8.48       92.21															
32       8.50       88.77       11.80       1255.74       7.13       19.18       span         33       8.49       80.33       11.48       120.87       7.49       13.39       02       11.98         34       8.47       92.70       12.25       1273.48       7.18       18.10       02       11.98         35       8.48       87.91       12.40       1301.63       7.41       14.58       Nox       263.10         36       8.47       91.29       12.25       1272.21       7.40       14.35       Nox       263.10         38       8.50       90.46       13.31       12.26       129.15       7.07       20.19       CC       257.00         40       8.44       91.81       12.26       129.15       7.07       20.19       CC       257.00         41       8.48       86.51       13.17       138.36       7.16       18.66       11.95       11.95         42       8.47       90.59       13.17       1252.43       7.48       13.20       Vet O2       11.95         43       8.50       89.09       11.80       128.45       7.25       17.21         44       8.48 </td <td></td> <td>÷.</td> <td></td>		÷.													
33       8.49       89.33       11.48       1200.87       7.49       13.39         34       8.47       92.70       12.25       1273.48       7.18       18.10       O2       11.98         35       8.48       8.791       12.26       1273.48       7.18       18.10       O2       11.98         36       8.47       91.29       12.25       1272.21       7.40       14.35       Nox       263.10         37       8.45       95.24       13.03       12264.30       7.09       19.13       CO       257.00         39       8.46       91.31       12.26       1291.15       7.06       19.51       CO       257.00         40       8.44       91.60       13.48       1281.33       7.16       18.46       40       8.61       13.17       138.66       7.16       18.46         41       8.48       86.51       13.17       125.43       7.48       13.21       Wet O2       11.85         43       8.50       89.09       11.80       1281.85       7.25       17.21         43       8.50       90.81       18.01       132.18       7.35       15.41         44       8.48	zero	1 maga 1 1 1					naing Blas								
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $		2610				apan									
36       8.47       91.29       12.25       1272.21       7.40       14.35       Nox       263.10         37       8.45       95.24       13.03       1264.30       7.09       19.13       CO       257.00         38       8.50       90.46       11.34       1261.45       7.07       20.19       CO       257.00         39       8.46       91.31       12.26       1291.15       7.08       19.51       Voc       770.00         41       8.48       88.51       13.17       1318.36       7.16       18.46       Wet O2       11.85         42       8.47       93.59       13.17       1252.43       7.48       13.21       Wet O2       11.85         43       8.50       89.09       11.80       1281.85       7.25       17.21         44       8.48       92.21       12.57       1259.81       7.34       15.50         46       8.48       92.21       12.58       7.41       14.18       14.8         47       8.47       90.81       13.04       1285.15       7.26       16.64         49       8.50       90.82       12.58       7.31       19.19	0.09	0.09	1/4 C 🗖		1	11,98	02								
$\begin{array}{c c c c c c c c c c c c c c c c c c c $			jan se ta 🛏		ೆ ಕನ್ನಟ್ಟು							87.91			
38       8.50       90.46       11.34       1261.45       7.07       20.19       CO       257.00         39       8.46       91.31       12.26       1291.15       7.08       19.51       49.50       19.51       70.00       19.51       70.00       19.51       70.00       19.51       70.00       19.51       70.00       19.51       70.00       19.51       70.00       19.51       70.00       10.51       10.00       10.00       10.00       10.00       10.00       11.52       125.243       7.48       13.21       125.243       7.48       13.21       125.243       7.48       13.21       11.55<	5.50	5.50	na etitu 🕻		]	263,10	Nox								
$\begin{array}{c c c c c c c c c c c c c c c c c c c $			- 11 I		-										
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	7.70	7.70	en L		1	257.00	co								
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	6.30	6 20 ]	States 🗖		<b>-</b> 1000	770.00	NOC								
42     8,47     93,59     13,17     1252,43     7,48     13,21     Wet 02     11,95       43     8,50     89,09     11,80     1281,85     7,25     17,21       44     8,48     82,25     12,72     1277,48     7,04     20,40       45     8,48     92,21     12,57     1259,81     7,34     15,50       46     8,48     90,25     13,35     1271,86     7,41     14,18       47     8,47     90,25     13,35     1271,86     7,41     14,18       48     8,47     90,82     12,58     15,72     16,64       49     8,50     90,82     12,58     1273,13     7,20     17,93       51     8,50     89,15     11,81     130,560     7,13     19,19       52     8,48     88,60     13,04     128,529     7,18     17,97       54     8,47     90,02     12,59     125,59     7,22     17,31       55     8,47     90,02     12,59     7,17     18,63       56     8,49     90,04     11,67     127,80     7,33     15,63       56     8,49     90,04     11,67     127,80     7,29     16,56       57 </td <td>0.30</td> <td>0.30</td> <td></td> <td></td> <td>세 안 같습니다.</td> <td>110.00</td> <td>400</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>	0.30	0.30			세 안 같습니다.	110.00	400								
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	0.08	0.08	2627 <b>г</b>		1 200	11.95	Wet O2								
$      \begin{array}{ccccccccccccccccccccccccccccccc$	· · · · · · · · · · · · · · · · · · ·	· · ·			etas un									43	
46       8.48       91,08       11,80       1312,38       7,35       15,41         47       8.47       90,25       13,35       1271,86       7,41       14,18         48       8.47       90,25       13,35       1271,86       7,41       14,18         49       8.50       90,81       13,04       1285,15       7,26       16,64         49       8.50       90,82       12,58       1279,29       7,17       18,46         50       8.49       93,38       12,27       129,313       7,20       17,93         51       8.50       93,15       11,81       1305,50       7,47       13,55         52       8.48       86,00       13,04       1313,55       7,47       13,55         53       8.48       91,71       12,13       1258,29       7,18       17,97         54       8.47       90,02       12,59       1253,59       7,22       17,31         55       8.47       90,02       12,59       7,18       17,97       15,63         55       8.47       90,04       11,67       1273,03       7,29       16,56         56       8.49       90,04       11						10 C 10 C		20.40							
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$															
48       8.47       90.81       13.04       1285.15       7.26       16.64         49       8.50       90.82       12.58       1279.29       7.17       18.46         50       8.49       93.38       12.27       129.313       7.20       17.93         51       8.50       89.15       11.81       1305.60       7.13       19.19         52       8.48       89.01       10.44       1313.55       7.47       13.55         53       8.48       91.71       12.13       1258.29       7.18       17.97         54       8.47       90.02       12.59       1253.59       7.22       17.31         55       8.47       90.04       11.67       1273.03       7.29       16.63         56       8.49       90.04       11.67       1273.03       7.29       16.56         57       8.48       88.92       13.05       1276.18       7.41       14.56         58       8.48       88.92       13.05       1274.01       7.47       13.65         59       8.49       80.34       12.28       1255.17       7.35       15.32															
49       8.50       90.82       12.58       1279.29       7.17       18.46         50       8.49       93.38       12.27       1293.13       7.20       17.93         51       8.50       89.15       11.81       1305.60       7.13       19.19         52       8.48       88.60       13.04       1313.55       7.47       13.55         53       8.48       91.71       12.13       1258.29       7.18       17.97         54       8.47       90.02       12.59       1253.59       7.22       17.31         55       8.47       92.01       12.73       1254.63       7.33       15.63         56       8.49       90.04       11.67       1273.03       7.29       16.56         57       8.47       80.35       12.27       1254.33       7.11       19.25         58       8.48       80.92       13.05       1276.18       7.41       14.56         59       8.49       80.36       12.13       1224.01       7.42       13.65         60       8.48       80.92       13.05       1276.18       7.41       14.56         59       8.49       80.36															
50       8.49       93.38       12.27       129.313       7.20       17.93         51       8.50       89.15       11.81       1305.60       7.13       19.19         52       8.46       86.60       13.04       1313.55       7.47       13.55         53       8.46       91.71       12.13       1258.29       7.18       17.97         54       8.47       90.02       12.59       1253.59       7.22       17.31         56       8.47       92.01       12.73       1254.63       7.33       15.63         56       8.47       92.01       12.73       1254.33       7.29       16.56         57       8.47       80.04       11.67       127.303       7.29       16.56         58       8.48       89.92       13.05       127.67.18       7.41       14.56         58       8.48       89.92       13.05       127.67.18       7.41       14.56         59       8.49       83.66       12.13       1274.01       7.47       13.65         60       8.48       89.34       12.28       1225.17       7.35       15.32															
51       8.50       89.15       11.81       1305.60       7.13       19.19         52       8.48       89.60       13.04       1313.55       7.47       13.55         53       8.48       91.71       12.13       1258.29       7.18       17.97         54       8.47       90.02       12.59       1253.59       7.22       17.31         55       8.47       92.01       12.73       1254.63       7.33       15.63         56       8.49       90.04       11.67       1273.03       7.29       16.56         57       8.47       80.35       12.27       1254.33       7.11       19.25         58       8.48       80.92       13.05       1276.18       7.41       14.56         59       8.49       90.34       12.28       1225.17       7.35       15.32															
52     8.48     86.60     13.04     1313.55     7.47     13.55       53     8.48     91.71     12.13     1258.29     7.16     17.97       54     8.47     90.02     12.59     1253.59     7.22     17.31       55     8.47     92.01     12.73     1254.63     7.33     15.63       56     8.49     90.04     11.67     1273.03     7.29     16.56       57     8.47     88.35     12.27     1254.33     7.11     19.25       58     8.48     88.92     13.05     1276.18     7.41     14.56       59     8.49     80.36     12.13     1274.01     7.47     13.65       60     8.48     80.34     12.28     1225.17     7.35     15.32															
53            8.48            91.71            12.13            1258.29            7.18            17.97										1313,55	13.04	88,60	8.48	52	
55         8.47         92.01         12.73         1254.63         7.33         15.63           56         8.49         90.04         11.67         1273.03         7.29         16.56           57         8.47         83.55         12.27         1254.33         7.11         19.25           58         8.48         88.92         13.05         1276.18         7.41         14.56           59         8.49         88.36         12.13         1274.01         7.47         13.65           60         8.48         9.04         12.28         1255.17         7.35         15.32								17.97							
56         8.49         90.04         11.67         1273.03         7.29         16.56           57         8.47         88.35         12.27         1254.33         7.11         19.25           58         8.48         88.92         13.05         1276.18         7.41         14.56           59         8.49         88.36         12.13         1274.01         7.47         13.65           60         8.48         9.34         12.28         1255.17         7.35         15.32															
57         8.47         88.35         12.27         1254.33         7.11         19.25           58         8.48         88.92         13.05         1276.18         7.41         14.56           59         8.49         88.36         12.13         1274.01         7.47         13.65           60         8.48         90.34         12.28         1255.17         7.35         15.32															
58 8.48 88.92 13.05 1276.18 7.41 14.56 59 8.49 88.36 12.13 1274.01 7.47 13.65 60 8.48 90.34 12.28 1255.17 7.35 15.32															
59 8.49 88.36 12.13 1274.01 7.47 13.65 60 8.48 90.34 12.28 1255.17 7.35 15.32	1	1	(												
60 8.48 90.34 12.28 1255.17 7.35 15.32	1	1	1												
Average 8.472 90.626 12.46 1,279.59 7,27 16.65															,

Date 1/24/2023 Client TC Energy Location Lincoln MI Test Location Generator-APU Run 3

Corrected Avg

8,39

86,58

5,23

1,253,43

7.20

**REVIEWED** By Anova Frasure at 2:48 pm, Feb 03, 2023



# LOAD BANK TEST

# ENGINE DIVISION 1-800-833-1789

CUSTOMER NAM											W.O.#	42044
Environmenta GENERATOR SE	LQuality Manage				NTACT	dina tanàna dia kaominina d				TELEPHON	RF-WO-1	43916
Lake Gorge	LUCATION				NIAGI	ĸ	arol Ma	net		and the second	-776-6056	
ENGINE MODEL		SERIAL NO.							SE	RVICE MET		
Contractor of the second state of the second s	412C		S	PP002	67			STA		the second se		67
GENERATOR MO		SERIAL N	10. & SPE				KW RA		VOLTS		SERVICE L	EVEL
	D150			Y00266	6			500		480		
GENERATOR PA	CKAGE NUMBER	SERIAL N	10.					- 40		-		
							STAF	(i   U.	45 A.M EN	D 02:45	<u>IVI 1/24</u>	/2023
			V	OLT	S			S				
TIME	Hz	ĸw	Α	в	с	Α	в	С	OIL PRESS	COOLANT TEMP	AMBIENT TEMP	% LOAD
0	59	455	479	479	478	550	548	547	71	192	27	91%
0.5	59	454	479	479	478	549	549	546	64	192	27	91%
1	59	455	479	479	478	550	549	547	64	192	27	91%
1.5	59	454	479	478	478	549	549	547	64	192	27	91%
2	59	454	479	478	478	549	549	547	64	192	34	91%
2.5		455	480	479	478	550	549	547	64	192	34	91%
3		455	480	479	478	549	549	547	64	192	34	91%
3.5		456	480	480	478	550	549	547	64	192	34	91%
4		0										0%
4.5		0										0%
5		0									[	0%
5.5		0										0%
6		0										0%
6.5		0										0%
7		0										0%
7.5		0										0%
8		0										0%
					RECOM	MENDA	TIONS					
Load engine to	o 91-92% load w	hile perform	ing emis	sion tes	st.							-
SERVICE TECHN	NICIAN Key	vin Curtiss	DA	TE ##	## cus	STOMER	REPRE	SENTA	<b>FIVE</b>			

Average Volts	Average Amps	Equals	times 1.732/1000
•	548.333333	262468.8889	
478.666667	548	262309.3333	454.3197653
478.666667	548.666667	262628.4444	454.8724658
478.333333	548.333333	262286.1111	454.2795444
478.333333	548.333333	262286.1111	454.2795444
479	548.666667	262811.3333	455.1892293
479	548.333333	262651.6667	454.9126867
479.333333	548.666667	262994.2222	455.5059929
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0

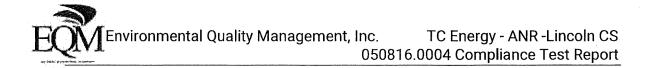
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Environmental Quality Management, Inc. TC Energy - ANR -Lincoln CS 050816.0004 Compliance Test Report

# **B. PROCESS OPERATING DATA**

lincolm 24 23 1041 RI 28.904 453 KW Poro 453 453 453 PSI 14.195 KW's 29 91 AT RH K1/ 132 453 15Ĵ 4SJ ЦSŻ Paro 28.891 KW's PSI Kh 14.189 33 KW'S AT K1/ 's 453 79 BH **R**3 453 28.874 KV's 8000 PSI 14.181 KV's KV's 453 453 33 AT KW's BH 453 76



# C. GAS CERTIFICATIONS



TIER 6 LABS 5353 W. SOUTHERN AVE. INDIANAPOLIS, IN 46241 317-536-5590

Cylinder Number:	RN1467				
Mixture Grade:	EPA Protocol Standard Gas Mixture				
Certificate Number:	3659A-05T5-C01				
Cylinder Fill Pressure:	2216 PSIG				

Certification Date: Expiration Date: Lot Number: Customer Part Number:

Do not use below 100 psi (0.7 megapascals)

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

Certified Concentrations								
Component Concentration Uncertainty Assay Dates								
Carbon Dioxide	18.0%	+/- 0.10% (absolute)	1/8/2020					
Oxygen	21.9%	+/- 0.10% (absolute)	1/8/2020					
Nitrogen	Balance							

Component	Analytical Principle	Make	Model	Serial	MPC Date
Carbon Dioxide	GC-TCD	Shimadzu	GC-8A	C10495021497SA	12/27/2019
Oxygen	GC-TCD	Shimadzu	GC-8A	C10495021497SA	12/12/2019

### **Reference Standards**

Serial Number	Lot	Expiration	Туре	Component	Balance	Concentration	Uncertainty (%)	NIST Reference
D685003	VSL	3/15/2024	PRM	CO2	N2	18.00%	0.018	VSL
D685109	VSL	9/14/2023	PRM	. 02	N2	21.00%	0.100	VSL

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

Preparer: Allison Martinez

Production Laboratory: Tier 5 Labs, LLC 5353 W. Southern Ave. Indianapolis, IN 46241 PGVP Vendor ID R12020

Reviewer: Abigail Helman



Cylinder Number: Mixture Grade: Certificate Number: Final Pressure:

QN0066	
EPA Protocol Calibr	ation Gas 1
25222C-04T5-C03	
2215	PSIG

	9/19/202
ssuance Date:	9/21/202
Expiration Date:	9/19/203
Batch Number:	25222C-
Part Number:	T5E 480

9/19	/2022	
9/21	/2022	
9/19	/2030	
2522	2C-04T5	
T5E	4800001-A8-2	

Do not use below 100 psi (0.7 megapascals) EPA Traceability Protocol for Gaseous Calibration Standards Procedure G1, EPA/600/R-12/531 May 2012

Certified Concentrations							
Component	Concentration	Analytical Unce	ertainty	Assay Dates			
Carbon Dioxide	10.1%	0.1%	Absolute	9/16/2022			
Oxygen	11.9:%	0.1%	Absolute	9/19/2022			
Nitrogen	Balance						

### **Anaytical Instrumentation**

Component	Analytical Principle	Make	Model	Serial	MPC Date
Carbon Dioxide	NDIR	Servomex	4100	900033	9/13/2022
Oxygen	GC-TCD	Shimadzu	GC-8A	C10495021497SA	9/12/2022

### **Reference Standards**

Serial Number	Lot	Expiration	Туре	Component	Balance	Concentration	Units	Uncertainty	Reference
CC466360	2287A-05T5	1/28/2028	GMIS	CO2	N2	16.17	. %	0.156	VSL
CC478959	0716A-01T5	2/19/2028	GMIS	02	N2	20.87	%	0.113	VSL
				A		to a second on the second sector to a second second	-		

Cylinder serial numbers in this batch: BR0013997 BR0013996 QN0066 TN10460

The calibration results published in this certificate were obtained using equipment and standards capable of producing results that are traceable to National Institute of Standards and Technology (NIST) and through NIST to the International System of Units (SI). The expanded uncertainties, if included on this certificate, use a coverage factor of k=2 to approximate the 95% confidence level of the measurement, unless otherwise noted. If uncertainties are not included on this certificate, they are available upon request. The nitrogen used as a component or balance gas as well as the oxygen used in air mixtures meets the requirements set forth in 40CFR1065.750. This calibration certificate applies only to the item described and shall not be reproduced other than in full, without written approval from the calibration facility. Calibration certificates without signatures are not valid. This calibration meets the requirements of ISO/IEC 17025-2017.

Analytical Chemist lié Peacock

Facility Manager John Schoolcraft

Production Laboratory: Tier 5 Labs PGVP Vendor ID R12022 5353 W Southern Ave Indianapolis, IN 46241



Cylinder Number: Mixture Grade: Certificate Number: Final Pressure:

RN1480 EPA Protocol Calibration Gas 2 23621A-02T5-C01 PSIG 2015

Certification Date:	9/15/20
Issuance Date:	9/15/20
Expiration Date:	9/15/20
Batch Number:	23621/
Part Number:	T5E 67

021 021 029 A-02T5 7M0001-A8-3

Do not use below 100 psi (0.7 megapascals) EPA Traceability Protocol for Gaseous Calibration Standards Procedure G2, EPA/600/R-12/531 May 2012

# Certified Concentrations

Component	Concentration	Analytical Unce	ertainty	Assay Dates
Carbon Monoxide	994 ppm	2 PPM	Absolute	9/2/2021
Methane	1490 ppm	10¦ppm	Absolute	8/31/2021
Nitric Oxide	982 ppm	2 ppm	Absolute	8/30/2021, 9/8/2021, 9/15/2021
Nitrogen	Balance	· · ·		

Anaytical Instrumentation
---------------------------

Component	Analytical Principle	Make	Model	Serial	MPC Date
Carbon Monoxide	NDIR	Horiba	VA-3111	PC062W1E	8/24/2021
Methane	GC-TCD/FID	Shimadzu	GC-2014	C11945605925	8/31/2021
Nitric Oxide	Chemiluminescence	Thermo	42i-HL	1101346887	9/10/2021

### Reference Standards

Serial Number	Lot	Expiration		Туре	(	Component	Balance	Concentration	Units	Uncertainty	Reference
EB0047969	3378A-03T5	4/2/2028	1	GMIS	:	co	N2	970.96	PPM	0.261	2637a
D791204	VSL	1/7/2025	:	VSL	•	CH4	· N2	1	%	0.2	VSL
D791257	VSL	1/8/2025	1	VSL	:	NO	N2	1501.7	РРМ	· 0.2	VSL

NOx = 992 PPM REFERENCE STANDARD ONLY

The calibration results published in this certificate were obtained using equipment and standards capable of producing results that are traceable to National Institute of Standards and Technology (NIST) and through NIST to the International System of Units (SI). The expanded uncertainties, if included on this certificate, use a coverage factor of k=2 to approximate the 95% confidence level of the measurement, unless otherwise noted. If uncertainties are not included on this certificate, they are available upon request. The nitrogen used as a component or balance gas as well as the oxygen used in all mixtures meets the requirements set forth in 40CFR165.750. This calibration certificate applies only to the item described and shall not be reproduced other than in full, without written approval from the calibration facility. Calibration certificates without signatures are not valid. This calibration meets the requirements of ISO/IEC 17025-2017.

rock Carlie Peakcock

Analytical Chemist

Production Laboratory: Tier 5 Labs PGVP Vendor ID R12021 5353 W Southern Ave Indianapolis, IN 46241

**Quality Manager** 

Allison Martinez



# Certificate of Analysis – EPA Protocol Gas

Customer: American Welding & Ga 5353 W Southern Ave Indianapolis, IN 46241	15			PO Number; Reference#; Date Filled; Customer Part #;	436242 CGS-10-24084 7/19/2022 CSG E76M001~			
Cylinder Number LL 197491		Size ALO	Concentration Basis Mole	Standard type EPA Protocol	Certificate ID 05-08172201			
Carbon Monoxide = Nitric Oxide = NOX = Methane = Nitrogen =	615.9 ppm	+/- 5.6 ppm +/- 4.1 ppm	Certified Concen	itration				
			Analytical Inform	ation				
Component Carbon Monoxide Nitric Oxide Mothane		Analyzer Ma Thermo Thermo Thermo	ike/Model/SN Nicolat 8700 APW10017 Nicolat 6700 APW10017 Nicolat 6700 APW10017	9 FT-IR	<b>e</b>	Last Calibra 7/11/2022 8/8/2022 8/5/2022	tion Date	
First Assay Date	8/9/2022				Second Assay I	Date	8/17/2022	
			Reference Stand	ard(s)				
Component Carbon Monoxide Ninic Oxide NOX Mothane Nitrogen		GMIS # 10-17515 10-17553 10-17553 10-22906-7	Cylinder # CC492875 CC337204 CC337204 E80001615		Concentration 501.2 ppm 483.0 ppm 485.2 ppm 599.9 ppm Balance Gas	Uncertainty +/- 3.8 ppm +/- 4.9 ppm +/- 2.0 ppm	Expiration Date 11/5/2025 11/13/2022 11/13/2022 3/17/2030	
CO, NO, and CH4 GMIS		411 C T C-						
Component Carbon Monoxide Nitric Oxide Nitrogen Oxides (NOx) Methane Nitrogen	SRM # 16800 16860 16860 PRM	N.I.S.T. Sam 2-J-46 42-14-40 42-14-40	ple # Cylinder # CAL017888 CAL017952 CAL017952 D970443		Concentration 490.4 ppm 493.1 ppm 493.7 ppm 600.6 ppm Balance Gas	Uncertainty +/- 2.0 ppm +/- 2.2 ppm +/- 2.3 ppm +/- 1.8 ppm	Expiration Date 9/20/2021 4/6/2023 4/6/2023 9/15/2026	

This calibration standard has been certified per the 2012 EPA Traceability Protocol, Document EPA 600/R-12/531, using the procedure Q1.

Do Not Use This Standard Below 100 psig (0.7 Megapascals).

Valve Outlet Connection CGA:	660
Mix Pressure(psig)@704	1700
Cadification Date:	8/17/2022
Stielf Life :	3 years
Expiration date:	8/17/2025

lag Centified By Lolley

Reviewed By Derek Hundmun

V Produced By: Coastal Specially Gas: (409) 981-7760 2150 Interstate 10 East, Boaumord, TX 77703 Coastal Specially Gas PQVP Vendor ID: 012022



# Certificate of Analysis – EPA Protocol Gas

Customer: Arbeitan Welding & Gas 5353 W Southern Avo, Indianapolis, IN 46241	4 							PO Number: Reference#: Date Filled: Customer Part #:	436242 CGS-10-2408- 7/19/2622 CSG E6M7001			
Cylinder Number BR0013976			Size Alq		Concentra	ation Bas Mol		Standard type EPA Protocol	Certificate ID 05-09152201			
Carbon Monoxide = Nitric Oxide = NOx = Methane = Nitrogen =	255   258   259   745   Bala	apm apm	+/- 1.6 +/- 1.4 +/- 2 p 25	ppm	Certifie	ed Con	centratic	<b>m</b>				
					Analyti	cal Info	ormation		ан 1917 - Сарана 1917 - Саран			
Component Carbon Monoxide Nitric Oxide Nitric Oxide Methane			Analya MKS Therm Therm MKS	0 0	421Q-HL 421-HL	EKVS131		7 Chemiluminescenc 7 Chemiluminescenc	e	Last Calibra 8/3/2022 7/25/2022 8/9/2022 8/8/2022	tion Date	
First Assay Date	8/8/2	022							Second Assay	Date	8/15/2022	
					Referen	nce Stá	indard(s	) )				
Component Carbon Monoxide Carbon Monoxide Nitric Oxide Nitric Oxide Methane Nitrögen			EB002 ALM04 ALM06	707,20 6553.2 7128,2 6143.2	0200508 0191025 0211021 0211021 0190103		ALM04712 ALM06614	N.I.S.T. Reference SRM 1681b 3 SRM 1680b 9 SRM 1687b 3 SRM 1687b 4 SRM 2751	Concentration 705 ppm 347 ppm 285 ppm 284 ppm 95,0 ppm Balance Gas	Uncertainty +/- 2.8 ppm +/- 1.2 ppm +/- 1.5 ppm +/- 1.5 ppm +/- 0.2 ppm	Expiration 11/9/2029 4/28/2028 3/22/2030 6/8/2030 1/11/2028	Date
This calibration standard lusing procedure G2. Do Not Use This Standard						'A Tracea	bility Protoco	l, Document EPA-600,	IR-12/531,			
Valva Gullet Connetison CI3A	<u>660</u> 1900											

 Value Outlet Connection CEA
 <u>900</u>

 Mix Pressure(psig)(070F)
 1900

 Centrolation Cate
 3/15/2022

 Shelf Life
 3 years

 Expression date
 8/13/2030

Contributed By Kally Nag 1

V Produced By. Red Ball Technical Gas Service: (860) 551-8150 555 Craig Kennedy Way, Shreveport, LA 71107 PGVP Vendor ID: G12022

Reviewed By: Junin Sof

SE	WELDING GAS.
	<b>Filus</b> Speciality Gases

AMERICAN WELDING AND GAS 3977 W. 83RD PL. MERRILLVILLE, IN 46410 219-750-9851

Product:	Nitrogen CEM		Minimum Purity:	99.9995%	
	·		Certification Date:	08 May 2019	
Mixture Grade:	5.5		Expiration Date:	09 May 2027	
·			Lot Number:	1289C-02T5	
Cylinder Fill Pressure:	2216 PSIG		Customer Part Number:	NI 80CEM	
	Do not	use below 100 psi (0	.7 megapascals)		

**Purity Specification** 

Analyte	Concentration	Assay Dates
Oxygen	< 0.67 PPM	5/8/2019
Moisture	< 0.375 PPM	5/8/2019
Total Hydrocarbons	< 0.05 PPM	5/8/2019
Total NOx	< 0.02 PPM	5/8/2019
Nitrous Oxide	< 0.02 PPM	5/8/2019
Carbon Monoxide	< 1 PPM	5/8/2019
Carbon Dioxide	< 10 PPM	

Cylinders in Lot				
LL191154	LL20486			
•				

### 40 CFR1065.750 Compliant

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

Eric Frymier Analyst:

Production Laboratory: Tier 5 Labs, LLC 5353W. Southern Ave. Indianapolis, IN 46241 PGVP Vendor ID R12019

Abby Helman Reviewer:



Making our planet more productive

### DocNumber: 299856



Praxair Distribution, Inc. 6055 Brent Drive Toledo OH 43611 Tel: +1 (419) 729-7732 Fax: +1 (419) 729-2411 PGVP ID: F12020

# **CERTIFICATE OF ANALYSIS / EPA PROTOCOL GAS**

**Customer & Order Information** 

PRAXAIR PKG CINCINNATI OH HP 8376 READING RD CINCINNATI OH 45237-1407

Certificate Issuance Date: 02/17/2020 Praxair Order Number: 71235316 Part Number: AI PR450E-AS Customer PO Number: 79223913

Fill Date: 01/30/2020 Lot Number: 700010030GB Cylinder Style & Outlet: AS CGA 590 Cylinder Pressure and Volume: 2000 psig 140 ft3

**Certified Concentration ProSpec EZ Cert** Expiration Date: NIST Traceable 02/14/2028 Cylinder Number: Expanded Uncertainty CC318494 457 ppm Propane ±4 ppm Balance Air

Term: 96 Months

For Reference Only:

**Certification Information:** 

Certification Date: 02/14/2020

Expiration Date: 02/14/2028

This cylinder was certified according to the 2012 EPA Traceability Protocol, Document #EPA-600/R-12/531, using Procedure G1. Uncertainty above is expressed as absolute expanded uncertainty at a level of confidence of approximately 95% with a coverage factor k = 2. Do Not Use this Standard if Pressure is less than 100 PSIG.

### Analytical Data:

(R=Reference Standard, Z=Zero Gas, C=Gas Candidate)

Oxygen 20.8 %

1.	Component:

Propane Type / Cylinder #: GMIS / CC239388 **Reference Standard:** Concentration / Uncertainty: 1017 ppm ±7 ppm Requested Concentration: 450 ppm Certified Concentration: 457 ppm Instrument Used: MKS 2030 Traceat Analytical Method: FTIR Last Multipoint Calibration: 01/27/2020 First Analysis Data: 02/14/2020 Date Z: 0 458 R: 1008 C: 454 Conc: R: 1008 Z: 0 C: 453 Conc: 457 Z: 0 C: 453 1008 Conc: 457 R: UOM: ppm Mean Test Assay: 457 ppm

			Expira	ition Date:	05/25/2024					
le to:	SRM # / Sample # / Cylinder #:				2646a / 103-C-40 / XF000887B					
5	SRM Concentration / Uncertainty:					979.1 PPM / ±6.6 ppm				
		SF	RM Expira	ation Date:	03/04	/2019				
s	econ	d Analy	sis Data:				Date			
	Z:	0	R:	0	C:	0	Conc:	0		
F	₹:	0	Z:	0	C:	0	Conc:	0		
1	Z:	0	C:	0	R:	0	Conc:	0		
U	OM:	ppm			Mean Test Assay: ppm					

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Edward E Zucal

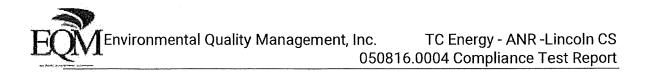
Mith Mount

Certified By

Analyzed By

Mike Monnette

Information contained herein has been prepared at your request by qualified experts within Praxair Distribution, Inc. While we believe that the information is accurate within the limits of the analytical methods employed and is complete to the extent of the specific analyses performed, we make no warranty or representation as to the suitability of the use of the information for any purpose. The information is offered with the understanding that any use of the information is at the sole discretion and risk of the user. In no event shall the liability of Praxair Distribution, Inc., arising out of the use of the information.



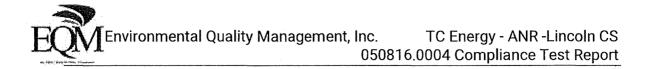
# D. SAMPLE CALCULATIONS

	······	NOx Gaseous Emis	sions Example (	Calculations		
Client TC Lincoln CS Unit Generator APU Load 100% Sample Train Data	Run Test Date	1 1/24/2023	Test Time	10:45 A.M.		
Reference Temperature, °R Concentration of gaseous species, ppmvd Molecular weight of gaseous species, lb/lb mo Stack O <sub>2</sub> % volume dry	e	528         T <sub>ref</sub> = (°F plus 460)           87.67         C           46.01         MWs           8.42         O2	MWs=	28.01 for CO 46.01 fo NOx 64.06 for SOx	pr Reported Example % Difference	om @ 15% O2 41.45 41.45 0.01
Kilowatts Grams in a pound Specific molar volume of an ideal gas at standa conditions, ft <sup>3</sup> /lb mole	rd	453 kW 453.592 385.3 SV				
Gaseous Emissions a. Concentration, ppm @ 15% O2 dry						
C <sub>3</sub> = (C)	[	<u>( 20.9 - 15.0 )</u> ( 20.9 - % O <sub>2</sub> )				
C <sub>3</sub> = 87.67	Ē	<u>(20.9 - 15.0)</u> 12.48				
C <sub>3</sub> = 41.45	ppm @ 159	% O2				

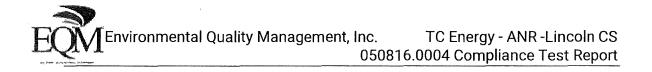
			CO Gaseous	Emissions Example Ca	alculations		
Client TC Linco Unit Generat Load 100 Sample Train Data	or APU	Run Test Date	1 1/24/2023	Test Time	10:45 A.M.		
	seous species, ppmvd f gaseous species, lb/lb mole		528     T <sub>ref</sub> = (°F plus       8.28     C       28.08     MWs       8.42     O2	460) MW <sub>s</sub> =	28.01 for CO 46.01 fo NOx 64.06 for SOx	pp Reported Example % Difference	m @ 15% O2 3.91 3.91 0.00
Kilowatts Grams in a pound conditions, ft <sup>3</sup> /lb m	ble		453 kW 453.592 385.3 SV				
Gaseous Emissions			1				
a. Concentration, p	om @ 15% O2 dry						
C <sub>3</sub>	= (C)	[	<u>(20.9 - 15.0)</u> (20.9 - % O₂)	] .			
C <sub>3</sub>	= 8.28	Ē	<u>(20.9 - 15.0)</u> 12.48	]			
C3	= 3.91	ppm @ 15%	01				

.

				VOC Ga	aseous Emissions Examp	e Calculations		
Client Unit Load Sample T	TC Lincoln CS Generator AF 100% rain Data		Run Test Date	1 1/24/2023	Test Time	10:45 A.M.		
,								opm @ 15% O2
Referenc	e Temperature,	°R		528 T <sub>ref</sub> = (°F p	olus 460)		Reported	39.86
Concentr	ation of gaseou	s species, ppmvd		84.32 C			Example	39.86
Molecula	r weight of gase	eous species, lb/lb mole		44.1 MW <sub>s</sub>	MW <sub>s</sub> =	28.01 for CO	% Difference	-0.01
Stack O <sub>2</sub> S	% volume dry			8.42 O <sub>2</sub>		46.01 fo NOx		
				-		64.06 for SOx		
Kilowatts				453 kW		44.1 C3H8		
Grams in	a pound			453.592		16.04 for CH4		
Gaseous	Emissions							
a. Concer	ntration, ppm @	) 15% O2 dry						
	C <sub>3</sub> =	(C)	ſ	<u>( 20.9 - 15.0 )</u> ( 20.9 - % O <sub>2</sub> )	]			
	C <sub>3</sub> =	84.32	Ī	<u>(20.9 - 15.0)</u> 12.48	]			
	C <sub>3</sub> =	39.86	 ppm @ 15%		-			



# E. CORRESPONDENCE



# EMISSION TEST PLAN DOCUMENTATION

Air Quality Test Plan Submittal Form



O

MICHIGAN DEPARTMENT OF ENVIRONMENT, GREAT LAKES, AND ENERGY

This form is for facilities and/or testing companies to submit test plans to the Michigan Department of Environment, Great Lakes, and Energy's (EGLE), Air Quality Division. Once submitted, the information will be automatically shared with the AQD District Office and Technical Programs Unit staff. If you have questions about this form or your submittal, please contact Jeremy Howe at HoweJ1@Mlchigan.gov or 231-878-6687.

Facility Information	
Facility Name*	
ANR Pipeline-Lincoln CS	
State Registration Number (SRN)*	
N5586	
Where will the test take place?	
Address*	
3991 South Hickory	
City*	
Lake George	
ZIP Code*	
48633	
County*	
Clare 🗸	
EGLE District: Bay City District	
-, -, -, -	

This is based on the county you select. This helps your submittal form get to the right people.

#### S Facility Contact Person\*

Pedro Amieva

Facility Contact Email\*

Pedro\_Amieva@tcenergy.com

Facility Contact Phone Number\*

832 320-5839

- Test Company Information

Test Company Name\*

Environmental Quality Management, Inc.

**Test Company Contact Person\*** 

Karl Mast

Test Company Contact Email\*

kmast@eqm.com

#### Test Company Contact Phone Number\*

219 776-6056

#### Test Details

Test Start Date\*

1/24/2023

#### Permit Number (PTI or ROP)\*

If no permit, state "No Permit"

ROP-N5586-2019

What Emission Unit(s)/Flexible Group(s) ID (List all) will be tested?\*

COMPLIANCE TEST REPORT ANR PIPELINE-LINCOLN COMPRESSOR STATION EMERGENCY GENERATOR APU

January 24, 2023

Prepared for:



TC Energy's ANR Pipeline Company Lake George, MI

Prepared by:



Environmental Quality Management, Inc. 1280 Arrowhead Court Suite 2 Crown Point, IN 46307 (219) 661-9900 www.eqm.com

PN: 050816.0004

February 2023

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Environmental Quality Management, Inc. TC Energy - ANR -Lincoln CS 050816.0004 Compliance Test Report

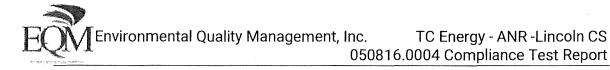
# PREFACE

I, Karl Mast, do hereby certify that the source emissions testing conducted at TC Energy in Lake George, MI was performed in accordance with the procedures set forth by the United States Environmental Protection Agency, and that the data and results submitted within this report are an exact representation of the testing.

Karl Mast Test Supervisor

I, Karl Mast, do hereby attest that all work on this project was performed under my direct supervision, and that this report accurately and authentically presents the source emissions testing conducted at ANR Pipeline's Lincoln Compressor Station in Lake George, MI.

Karl Mast Test Supervisor



# SUMMARY

The compliance testing was performed on the Caterpillar 3412C natural gas fired Generator labeled Emergency Engine (APU) in accordance with the requirements of Permit # ROP-N5586-2019 in order to comply with Title 40, Code of Federal Regulations, Part 60, Subpart JJJJ. The results of the testing are detailed in the following tables.

	APU-Summary Results					
Measured Unit	Run 1	Run 2	Run 3	Average	Permit Limit	Pass/Fail
NOx ppmvd @15% O2	41.45	41.47	40.83	41.25	160	Pass
CO ppmvd @ 15% O <sub>2</sub>	3.91	3.14	2.47	3.17	540	Pass
VOC ppmvd @ 15% O <sub>2</sub>	39.86	39.87	39.21	39.65	86	Pass



nc. TC Energy - ANR -Lincoln CS 050816.0004 Compliance Test Report Environmental Quality Management, Inc.

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3	Facility and Process Conditions	
4	Test Procedures	
5	Quality Assurance Procedures	
6	Conclusions	13

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3	Generator APU2 Production Data	5

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### **APPENDICES**

A - Field Test Data

B – Process Operating Data C – Gas Certifications

D - Sample Calculations

E – Correspondence

Environmental Quality Management, Inc. TC Energy - ANR -Lincoln CS 050816.0004 Compliance Test Report

# 1. INTRODUCTION

This report presents the results of the source emissions testing conducted by Environmental Quality Management, Inc. (EQM) for TC Energy's ANR Pipeline (ANR) at Lincoln compressor station, near Lake George, Michigan, which is located in Clare County. The primary purpose of this testing program was to conduct emissions testing to determine compliance with Permit # ROP-N5586-2019 for the Emergency Generator APU at ANR Pipeline's gas compressor facility.

EQM's responsibility was to conduct the compliance testing for the O2, CO, VOC, and NOx emissions rates and perform data reduction for conformance evaluation. ANR Pipeline's responsibility was to maintain process operating parameters and to assist in providing process operating data per compliance test requirements.

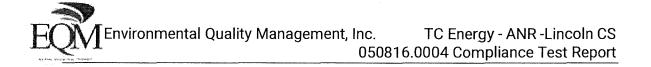
The following report provides information pertaining to TC Energy's process operations, and Compliance testing. The Compliance testing conducted on the Caterpillar 3412C Generator was performed on January 24, 2023, from 10:45 A.M. to 1:55 P.M.

The following requirements were specific for the testing program:

- 1. Equipment calibrations performed, and calibration data provided.
- 2. Three (3) sixty (60) -minute, minimum, O<sub>2</sub>, CO, VOC and NOx test runs performed at Emergency Generator labeled Unit APU at maximum achievable load and speed according to pipeline conditions pursuant to EPA, Title 40, Code of Federal Regulations, Part 60, Subpart JJJJ. For determination of VOC concentrations, samples were analyzed as prescribed in Reference Method 18 and Method 25A per 40 CFR 60, Subpart JJJJ to reduce methane levels.
- 3. Process manufacturing operations maintained at 100 +/- 10 percent peak load condition, or at maximum achievable load according with ambient conditions, and fuel consumption rates recorded during the emissions testing periods.
- 4. All testing and analyses performed in accordance with current EPA test methodologies and analytical procedures for O<sub>2</sub>, CO, VOC and NOx emissions determinations.
- 5. Stratification was found to be less than 5% in the turbine exhausts.
- 6. Diluent corrected stratification test was performed in accordance with Subpart JJJJ.
- February 2023



The testing program was approved by and/or coordinated with Pedro Amieva, TC Energy's ANR Pipeline Company. The emission testing was performed by Karl Mast, Project Manager, Zach Hill, Field Activities Lead, EQM, and Eli Mergle, Test Technician, EQM. Michigan CAT was contracted to supply the load bank for the testing. The emission testing was observed by Nathanael Gentle, MEGLE.



# 2. TEST RESULTS SUMMARY

The compliance testing was performed on the Generator APU2 in accordance with the requirements of the Title 40, Code of Federal Regulations, Part 60 (40 CFR 60, Appendix A [Subpart JJJJ]). A summary of the test results is given below:

en andre Gergen andre geral 1975 ber State en ger		Table 1. AF	PU-Summary	Results	en al Alexandra Green esta da Alexandra da Alexandra da Alexandr Alexandra da Alexandra da Alexandr	
Measured Unit	Run 1	Run 2	Run 3	Average	Permit Limit	Pass/Fail
NOx ppmvd @15% O2	41.45	41.47	40.83	41.25	160	Pass
CO ppmvd @ 15% O <sub>2</sub>	3.91	3.14	2.47	3.17	540	Pass
VOC ppmvd @ 15% O <sub>2</sub>	39.86	39.87	39.21	39.65	86	Pass

Based on the information provided above, the Generator met the acceptance criteria during the course of the testing. A complete list of performance parameters for each test run that was performed at the stack sampling locations can be found in Tables 2-3.

Additional testing information may be found in Appendix A.



# Table 2. Operating & Ambient Conditions, Concentrations, & Emissions Unit APU

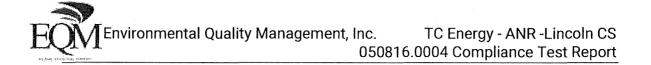
	Ge	nerator-APU	-				
		coln Compressor St	and a second				
		ethod 3A, 7, 10, 18, 8	& 25A				
		Page 1 of 1					
	RUN NUMBER	0-1	O-2	O-3			
مراجع مراجع	RUNDATE	1/24/2023	* 1/24/2023	1/24/2023	Average		
	RUN START	10:45	11:50	12:56			
	MEASURED DATA	an a	ang a sa s				
P <sub>bar</sub>	Barometric Pressure, inches Hg	28.904	28.891	28.874	28.89		
B <sub>ws</sub>	Moisture, % by volume	16.66	16.74	16.65	16.7		
	Kilowatts	453.0	453.0	453.0	453.0		
	<b>Nilowatts</b>	453.0	403.U	453.0	453.0		
	Oxygen			· · · · · · · · · · · · · · · · · · ·			
O <sub>2</sub>	Concentration PPM Dry	8.42	8.39	8.39	8.40		
	Nitrogen Oxides						
NOx	Concentration PPM Dry	87.67	87.92	86.58	87.39		
NOx	Concentration PPM Dry @ 15% O <sub>2</sub>	41.45	41.47	40.83	41.25		
	Carbon Monoxide						
со	Concentration PPM Dry	· 8.28	6.65	5.23	6.72		
CO	Concentration PPM Dry @ 15% O <sub>2</sub>	3.91	3.14	2.47	3.17		
	Total Hydrocarbons						
THC	Concentration PPM Wet C1	1357.15	1325	1253.43	1311.86		
THC	Concentration PPM Dry C1	1583.25	1546.81	1462.13	1530.73		
CH₄	Concentration PPM Bag Sample	1330.3	1293.2	1212.7	1278.73		
VOC	Concentration PPM Dry C1	252.95	253.61	249.43	251.99		
voc	Concentration PPM Dry C3	84.32	84.54	83.14	84.00		
VOC	Concentration PPM Dry @ 15% O <sub>2</sub>	39.86	39.87	39.21	39.65		

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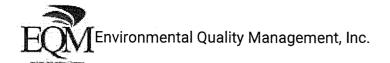
# 3. PROCESS DESCRIPTION

TC Energy's ANR Lincoln Compressor Station is located at 3991 South Hickory, Lake George, MI, Clare County. The plant operates a Caterpillar 3412C natural gas fired internal combustion reciprocating engine utilized for supporting energy needs for the station. It is rated at 755 HP and 500 KW.

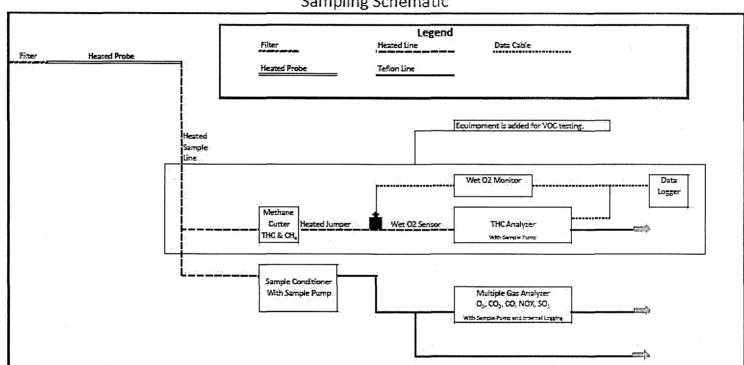
The following tables provide a summary of the production rates for the Emergency Generator during the test:

	Table	3. Generato	APU Produ	ction Data		an a
Unit/Measurement	Run 1	Run 2	Run 3	Average	Rated	% Load
<sup>1</sup> APU-HP	607.48	607.48	607.48	607.48	755 HP	80.46
APU-KW	453.0	453.0	453.0	453.0	500 KW	90.60

<sup>1</sup>Horsepower was calculated based on Kilowatt output, which was within the 90-100% operating range. More information may be found in Appendix A.



# Figure 1. Sampling Schematic



Sampling Schematic

Additional Information pertaining to the Fuel Flows may be found in Appendix B.

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# 4. TEST PROCEDURES

EQM and EQM's affiliates and subcontractors use current U.S. EPA accepted testing methodologies in their Air Quality Programs as listed in the U.S. Code of Federal Regulations, Title 40, Part 60, Appendix A. For this testing program, the following specific methodologies were utilized:

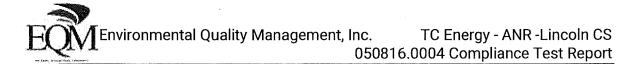
- U.S. EPA Method 3A Determination of Oxygen and Carbon Dioxide Concentrations in Emissions From Stationary Sources (Instrumental Analyzer Procedure)
- U.S. EPA Method 4 Determination of Moistures From Stationary Sources
- U.S. EPA Method 7E Determination of Nitrogen Oxides Emissions From Stationary Sources (Instrumental Analyzer Procedure)
- U.S. EPA Method 10 Determination of Carbon Monoxide Emissions From Stationary Sources (Instrumental Analyzer Procedure)
- U.S. EPA Method 18 Determination of VOC Emissions From Stationary Sources (Instrumental Analyzer Procedure)
- U.S. EPA Method 25A Determination of VOC Emissions From Stationary Sources (Instrumental Analyzer Procedure)

USEPA Methods 3A, 4, 7E, 10, 18 and 25A were performed at the Exhaust Stack sampling location by continuously extracting a gas sample from the stack through a single point stainless steel sample probe. The extracted sample was pulled through a series of filters to remove any particulate matter. Directly after the probe, the sample was conditioned by a series of refrigeration dryers to remove moisture from the gas stream. After the refrigeration dryers, the sample was transported through a Teflon® line to the analyzers. The flow of the stack gas sample was regulated at a constant rate to minimize drift. Moistures were determined by Method 4 (hot and wet oxygen monitor).

At the start of the day, each monitor was checked for calibration error by introducing zero, mid-range and high-range EPA Protocol 1 gases to the measurement system at a point upstream of the analyzers. In this report, the calibration error test is referred to as instrument calibration. The gas was injected into the sampling valve located at the outlet of the sampling probe. The bias test was conducted before and after each consecutive test run by introducing zero and upscale calibration gases for each monitor. The upscale calibration gases used for each monitor were the high calibration gases.

Measurement System Performance Specifications were as follows:

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- Analyzer Calibration Error Less than +/- 2% of the span of the zero, mid-range and high-range calibration gases.
- Sampling System Bias Less than +/-5% of the span for the zero, mid-range and high-range calibration gases.
- Zero Drift Less than +/-3% of the span over the period of each test run.
- Calibration Drift Less than +/-3% of the span over the period of each set of runs.

Calculations that were used in this testing event are as follows:

Calibration Correction

$$C_{GAS} = \left(C_R - C_O\right) \frac{C_{MA}}{C_M - C_O}$$

# <u>Where:</u>

C <sub>GAS</sub> :	Corrected flue gas concentration (ppmvd)
C <sub>R</sub> :	Flue gas concentration (ppmvd)
C <sub>0</sub> :	Average of initial and final zero checks (ppmvd)
C <sub>M</sub> :	Average of initial and final span checks (ppmvd)
Сма:	Actual concentration of span gas (ppmvd)

## **EPA F-Factor**

$$F_{d} = \frac{\left[ (3.64 \cdot H_{WP\%} \cdot 100) + (1.53 \cdot C_{WP\%} \cdot 100) \right]}{\frac{GCV}{\rho_{FuelGas}}} \cdot 10^{6}$$
$$+ \frac{\left[ (0.14 \cdot N_{2WP\%} \cdot 100) - (0.46 \cdot O_{2WP\%} \cdot 100) \right]}{\frac{GCV}{\rho_{FuelGas}}} \cdot 10^{6}$$

### Where:

Fd: Fuel specific F-factor, dscf/MMBtuHwt%:Hydrogen weight percentCwt%:Carbon weight percentN2wt%:Nitrogen weight percentO2wt%:Oxygen weight percentGCV:Heating value of the fuel, BTU/dscf

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 $\rho_{Fuel Gas}$ : Density of the fuel gas, lb/scf

Mass Emissions g/bhp-hr

$$Em = Cd \times Fd \times \frac{20.9}{(20.9 - \%O_2)} \times Qh \times \frac{GCV}{10^6} \times \frac{4536}{BHP}$$

### Where:

E <sub>m:</sub>	Pollutant concentration, NOx <sub>(g/bhp-hr)</sub>
Cd:	Pollutant concentration, NOx lb/scf
%O <sub>2</sub> :	Oxygen concentration in percent, measured on a dry basis
Fd:	Fuel specific F-factor, dscf/MMBtu
Qh:	Fuel rate, scf/hr
GCV:	Heating value fuel, Btu/scf
	To convert from ppmvd NOx to lb/scf NOx, multiply the
	ppmvd value by $1.194 \times 10^{-7}$

To convert from ppmvd CO to lb/scf CO, multiply the ppmvd value by 7.268 x  $10^{-8}$ 

Mass Emission Calculations lb/hr

$$NO_{\frac{h}{hr}} = C_d \times F_d \times \frac{209}{209 - \%O_2} \times Q_h \times \frac{GCV}{10^6}$$

# Where:

- *C<sub>d</sub>*: Pollutant concentration, lb/scf
- *F<sub>d</sub>*: Fuel specific F-factor, dscf/MMBtu
- *Q<sub>h</sub>:* Fuel flow, scf/hr
- %O<sub>2</sub>: Oxygen concentration in percent, measured on a dry basis

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GCV: Upper dry heating value of fuel, Btu/dscf

NO<sub>x</sub> Corrected to 15% O<sub>2</sub>

$$Em = NO_{X}\left(\frac{5.9}{20.9 - \% O_{2}}\right)$$

# Where:

E<sub>m:</sub> Pollutant concentration corrected to 15% O<sub>2</sub>, ppm

NO<sub>x</sub>: Pollutant concentration, ppm

%O2: Oxygen concentration in percent, measured on a dry basis

NO Interference Response

$$INO = \left[ \left( \frac{R_{NO-NO2}}{C_{NO2G}} \times \frac{C_{NO2S}}{C_{NOxS}} \right) \right] \times 100$$

Where:

NO:	NO interference response (%)
RNO-NO2:	NO response to NO2 span gas (ppm NO)
C <sub>NO2G</sub> -:	Concentration of NO <sub>2</sub> span gas (ppm NO2)
C <sub>NO2S</sub> -:	Concentration of NO2 in stack gas (ppm NO2)
C <sub>NOxs</sub> :	Concentration of $NO_x$ in stack gas (ppm $NO_x$ )

# VOC ppm

$$VOC_{ppmvd} = \frac{THC_{ppmvw} - \frac{1}{3}CH_{4ppmvd} - \frac{2}{3}C_{2}H_{6ppmvd}}{1 - \left(\frac{\%H_{2}O}{100}\right)}$$

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VOC mass emissions calculations g/bhp-hr

$$VOC_{\frac{g}{hhp-hr}} = C_d \times F_d \times \frac{20.9}{20.9 - \%O_2} \times Q_h \times \frac{GCV}{10^6} \times \frac{453.6}{BHP}$$

Where:

Cd: Pollutant concentration, lb/scf

Fd: Fuel specific F-factor, dscf/MMBtu

Qh: Fuel flow, scf/hr

%02: Oxygen concentration in percent, measured on a dry basis

GCV: Upper dry heating value of fuel, Btu/dscf

VOC mass emissions calculations lb/hr

$$VOC_{\frac{g}{bhp-hr}} = C_d \times F_d \times \frac{20.9}{20.9 - \%O_2} \times Q_h \times \frac{GCV}{10^6}$$

Where:

Cd: Pollutant concentration, lb/scf

Fd: Fuel specific F-factor, dscf/MMBtu

Qh: Fuel flow, scf/hr

%02: Oxygen concentration in percent, measured on a dry basis

GCV: Upper dry heating value of fuel, Btu/dscf

To convert ppm to	Multiply by
lb/scf	
NOx	1.194x10 <sup>-7</sup>
VOC	1.1444x10 <sup>-7</sup>

GVC: Heating value of the fuel, Btu/scf

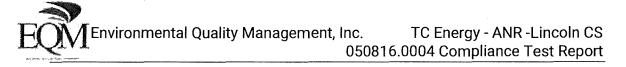
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# 5. QUALITY ASSURANCE PROCEDURES

Each reference method presented in the U.S. Code of Federal Regulations details the instrument calibration requirements, sample recovery and analysis, data reduction and verification, types of equipment required, and the appropriate sampling and analytical procedures to ensure maximum performance and accuracy. EQM and EQM's affiliates and subcontractors adhere to the guidelines for quality control set forth by the United States Environmental Protection Agency. These procedures are outlined in the following documents:

- Code of Federal Regulations, Title 40, Part 51
- Code of Federal Regulations, Title 40, Part 60
- Quality Assurance Handbook, Volume 1, EPA 600/9-76-005
- Quality Assurance Handbook, Volume 2, EPA 600/4-77-027a
- Quality Assurance Handbook, Volume 3, EPA 600/4-77-027b



# 6. CONCLUSIONS

An Emissions Test was conducted on the Generator APU at TC Energy's ANR Pipeline Company's Lincoln Compressor Station located in Lake George, MI. The testing was conducted on January 24, 2023.

During the course of the testing, the Generator APU conformed to the requirements of Code of Federal Regulations, Title 40, Part 60, Appendix A.

The usefulness and/or significance of the emissions values presented in this document as they relate to the compliance status of the Generator emissions shall be determined by others.

For additional information pertaining to the testing program see Appendix E of this report.