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ANR Pipeline Company

TransCanada US Pipelines
Air Compliance Group
700 Louisiana Street
Houston, Texas 77002

August 13, 2019

Ms. Karen Kajiya-Mills
EGLE, Air Quality Division
Constitution Hall, 2nd Floor South
525 West Allegan Street
Lansing, MI 48933
(517) 335-4874

FedEx: 7759 7268 1582

RE: Submittal of Emission Monitoring – Ozone Season – Test Report, ANR Bridgman Compressor Station (Permit # MI-ROP-N5575-2018)

Ms. Kajiya-Mills:

As operator of ANR Pipeline Company, TransCanada would like to submit the attached Ozone Season NO_x Monitoring Report for the Michigan Department of Environmental Quality – Air Quality Division's (MDEQ-AQD) review and approval. The unit tested is a Clark TCVC-20M internal combustion reciprocating engine, Unit EUBG009, located at ANR Bridgman Compressor Station, Berrien County, Michigan. As per Operational Permit requirements, Part C, Section VI.3.a.ii., perform NO_x monitoring during the ozone period of May 1st through September 30th.

The purpose of the monitoring was to comply with the Ozone Season Monitoring requirement in the ANR Compliance Plan submitted per R336.1818(3)(a) which was approved by MDEQ. The monitoring is in accordance with the testing option provided in R336.1818(4)(a)(ii)(A)(2). The emission monitoring was conducted in accordance with the test procedures outlined in the testing protocol dated May 16, 2019. The monitoring results demonstrate compliance with the state permit limit of the NO_x emission rate.

If you have any questions or concerns regarding this matter, please don't hesitate to contact me.

Thank You,

Tyrah Lydia

Tyrah Lydia
TransCanada US Pipelines
Environmental Advisor
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Carbon copy:

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Electronic copy:

Chris Waltman – Corporate Environmental
Bruce Bendes – Field Environmental
Mike Petitti – Field Work Planner

Emissions Test Report

Unit EUBG009:
(1) Clark TCVC-20M Natural Gas Fired Internal Combustion Reciprocating Engine

RO Permit No.: MI-ROP-N5575-2018

ANR Pipeline Company
Bridgman Compressor Station
Bridgman, Michigan

Date:	**August 5, 2019**
Prepared for:	**Michigan Department of Environmental Quality - Air Quality Division**
Prepared by:	**Tyrah Lydia** **Air Compliance Team** **(832) 320-5465**

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Ozone Season Monitoring for R336.1818(4)(a)(ii)
Portable Analyzer Monitoring for NOx
ANR – Bridgman Compressor Station (SRN: N5575)
August 5, 2019

1. Introduction

1.1. The Air Compliance Team of TransCanada's US Pipelines Central (ANR) conducted emissions monitoring at the ANR Bridgman Compressor Station pursuant to the Compliance Plan ANR submitted to comply with R336.1818(3)(a). The Compliance Plan has been approved by the MDEQ.

1.2. The purpose of the monitoring was to comply with the Ozone Season Monitoring requirement in the ANR Compliance Plan and is in accordance with R336.1818(4)(a)(ii)(A)(2). The monitoring demonstrates compliance with the projected NOx emission rate in the ANR Compliance Plan. As such, the following parameter was determined:

1.2.1. Bridgman Unit 9 – Emissions limit 6.6 g/bhp-hr of NOx

1.3. Notification of intent to test was provided through a letter to Ms. Karen Kajiya-Mills and the MDEQ Kalamazoo district office dated May 16, 2019. James Winger from TransCanada ANR conducted the monitoring on July 17, 2019.

1.4. Facility Location:

ANR BRIDGMAN COMPRESSOR STATION
3372 BROWNTOWN ROAD
BRIDGMAN, MI 49106

Facility Contact:
Chris Waltman
N4956 Oakcrest Dr
Bonduel, WI 54107
(715) 758-3341

2. Process Description

2.1. The affected engine at Bridgman is a Clark TCVC-20M rated at 12,000 horsepower, a natural gas fired reciprocating internal combustion compressor engine.

2.2. More specifically, the engine is used in the compression of natural gas from an initial "suction" pressure to a final "discharge" pressure, which creates the pressure gradient necessary to transport natural gas through ANR Pipeline's interstate pipeline system.

3. Methodology

3.1. American Society of Testing and Materials test method D6522-00: Standard Test Method for Determination of Nitrogen Oxides, Carbon Monoxide, and Oxygen Concentrations in Emissions from Natural Gas-Fired Reciprocating Engines, Combustion Turbines, Boilers, and Process Heaters Using Portable Analyzers was employed for determination of compliance with Section 1.2.1 of this test plan.

3.2. Method D6522-00 prescribes the use of an appropriate portable emission analyzer, utilizing electrochemical cells, which can meet the documented calibration and preparation requirements. The make and model of analyzer employed are documented in the test report.

3.3. Electrochemical cell operational theory is based on chemical reactions that produce electricity. Each cell utilizes diffusion limited oxidation and reduction reactions to produce an electrical potential between a sensing electrode and a counter electrode. The chemical reaction that occurs produces electricity and the amount of electricity produced is directly related to the concentration of the constituent in the exhaust gas. The electricity is thus measured to give a concentration of the constituent. The relationship between the concentration of the constituent and the amount of electricity that is produced is linear and thus it is easily converted to engineering units.

4. Sample System

4.1. Sample system components, as outlined in Method D6522-00, were utilized for testing. These components include, but are not limited to, sample probe, heated sample line, sample transport lines, calibration assembly, moisture removal system, particulate filter, sample pump, sample flow rate control, gas analyzer, data recorder, and external interference gas scrubber.

5. Instrument Preparation

5.1. This emission performance test program followed procedures prescribed in ASTM test method D6522-00. Being that the intent of this test program is NOx determination, the following requirements, outlined in Method D6522-00, were disregarded:

- All specifications regarding CO determination, including CO interference checks and calculations, and CO stability checks and calculations.

6. Sample Location

6.1. Due to the complexity of the test ports, a single sample test point was selected. Two stainless steel probes were inserted into the middle of the exhaust

stream of the dual exhaust pipes. These probes then joined to form a single flow to the heated sample line. This procedure was approved by the MDEQ personnel while on site during the 2007 Ozone Season emissions monitoring.

7. **Sample Time**
   7.1. Testing was conducted during normal engine operation, i.e. not during periods of startup, shutdown, or malfunction
   7.2. The relevant standard, Method D6522-00, stipulates that, during each test run, pollutant concentrations must be recorded at a frequency of no greater than once per minute; however, does not specify a standard duration for each test run.
   7.3. For the purposes of this emission performance test, and considering the specifications outlined above, a total of three test runs were employed for compliance determination. Each test run lasted for a period of 30-minutes. The data was recorded at the frequency of once per minute.

8. **Report Details**
   8.1. The engine was tested at the maximum load achievable based upon pipeline and ambient condition. As a result, the engine was tested at the average of 91.2 % of engine rated load condition.

9. **Results of Monitoring**
   9.1. A summary of test results can be seen in the table below. Detailed summaries of the unit's results are included in the Appendices.

Average Tested Horsepower (HP)	11,055
Average Tested Speed (RPM)	331
NOx (g/bhp-hr) permitted limit	6.6
Average measured NOx (g/bhp-hr)	4.7

MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY
AIR QUALITY DIVISION

RENEWABLE OPERATING PERMIT
REPORT CERTIFICATION

Authorized by 1994 P.A. 451, as amended. Failure to provide this information may result in civil and/or criminal penalties.

Reports submitted pursuant to R 336.1213 (Rule 213), subrules (3)(c) and/or (4)(c), of Michigan's Renewable Operating (RO) Permit program must be certified by a responsible official. Additional information regarding the reports and documentation listed below must be kept on file for at least 5 years, as described in General Condition No. 22 in the RO Permit and be made available to the Department of Environmental Quality, Air Quality Division upon request.

Source Name: ANR Pipeline Company, Bridgman Compressor Station County: Berrien

Source Address: 3372 Browntown Road City: Bridgman, MI

AQD Source ID (SRN): N5575 RO Permit No.: MI-ROP-N5575-2018 RO Permit Section No.: 1

Please check the appropriate box(es):

☐ **Annual Compliance Certification (General Condition No. 28 and No. 29 of the RO Permit)**

Reporting period (provide inclusive dates): From _____ To _____

☐ 1. During the entire reporting period, this source was in compliance with **ALL** terms and conditions contained in the RO Permit, each term and condition of which is identified and included by this reference. The method(s) used to determine compliance is/are the method(s) specified in the RO Permit.

☐ 2. During the entire reporting period this source was in compliance with all terms and conditions contained in the RO Permit, each term and condition of which is identified and included by this reference, **EXCEPT** for the deviations identified on the enclosed deviation report(s). The method used to determine compliance for each term and condition is the method specified in the RO Permit, unless otherwise indicated and described on the enclosed deviation report(s).

☐ **Semi-Annual (or More Frequent) Report Certification (General Condition No. 23 of the RO Permit)**

Reporting period (provide inclusive dates): From _____ To _____

☐ 1. During the entire reporting period, **ALL** monitoring and associated recordkeeping requirements in the RO Permit were met and no deviations from these requirements or any other terms or conditions occurred.

☐ 2. During the entire reporting period, all monitoring and associated recordkeeping requirements in the RO Permit were met and no deviations from these requirements or any other terms or conditions occurred, **EXCEPT** for the deviations identified on the enclosed deviation report(s).

☒ **Other Report Certification**

Reporting period (provide inclusive dates): From 5/1/2019 To 9/30/2019

Additional monitoring reports or other applicable documents required by the RO Permit are attached as described:

Ozone Season Monitoring for R336.1818(4)(a)(ii)

RECEIVED
AUG 14 2019
AQD KALAMAZOO

I certify that, based on information and belief formed after reasonable inquiry, the statements and information in this report and the supporting enclosures are true, accurate and complete.

W. Craig Rundle	Director of Operations	(708) 342-4701
Name of Responsible Official (print or type)	Title	Phone Number
W Craig Rundle		8/12/2019
Signature of Responsible Official		Date

* Photocopy this form as needed.

EQP 5736 (Rev 9/01)

Table of Contents

Appendix A

Section 1: EUBG009 Detailed Emission Summary

Section 2: EUBG009 Instrument Checks and Calibration

Section 3: EUBG009 Raw Test Run Data

Appendix B

Section 1: Calibration Certificates

Appendix A

Section 1: EUBG009 Detailed Emission Summary

- Emissions Data Sheet Summary
- Sample Calculations

Section 2: EUBG009 Instrument Checks and Calibration

- General Information
- Linearity Check
- NO Stability Check
- NO_2 Stability Check
- Calibration Error

Section 3: EUBG009 Raw Test Run Data

- Engine Operating Data
- Fuel Gas Analysis
- Run 1 - 3
- Stack Drawing

Section 1: EUBG009 Detailed Emission Summary

Emissions Data Sheet Summary
Sample Calculations

Data Summary

General Information

Start Date: 7/17/2019

Company: TC Energy

Station: Bridgman

Unit Information

Unit No.: TCVC-20m

Manufacturer: Clark

Model: TCVC-20

Rated BHP: 12000

Rated RPM: 345

Gas Analysis

Nitrogen: 0.3446 I - Butane: 0.0277

Carbon Dioxide: 0.1756 N - Butane: 0.0225

Methane: 91.4382 I - Pentane: 0.0048

Ethane: 7.5703 N - Pentane: 0.002

Propane: 0.4004 Hexane +: 0.00137

Total: 99.987

Test Data

General Data				
Run	1	2	3	Averages
Date	7/17/19	7/17/19	7/17/19	
Time	08:51:53	09:36:15	10:23:44	
Operating Data				
Horsepower	10,812	11,173	11,180	**11,055**
Speed	332	332	331	**331**
% Load	90.1%	93.1%	93.2%	**92.1%**
% Torque	93.7%	96.9%	97.1%	**95.9%**
Fuel Use (scfh)	74,468	76,920	77,230	**76,206**
UDHV (BTU/dscf)	1,074.2	1,074.2	1,074.2	**1,074.2**
Curve	4	5	5	**5**
AMP (psig)	24.08	24.00	24.08	**24.05**
AMT (^{o}F)	110.2	110.4	110.2	**110.2**
Suct. Press. (psig)	689	686	675	**683**
Suct. Temp. (^{o}F)	63.6	63.5	63.3	**63.5**
Disc. Press. (psig)	856	855	848	**853**
Disc. Temp. (^{o}F)	97.2	97.9	98.3	**97.8**
Emissions Data				
NO (ppm)	320.32	342.48	346.00	**336.27**
$NO_{Bias\ corrected}$ (ppm)	318.36	340.85	344.41	**334.54**
NO_2 (ppm)	54.42	55.52	56.71	**55.55**
$NO_{2\ Bias\ corrected}$ (ppm)	54.09	55.18	56.36	**55.21**
NO_X (ppm)	372.45	396.02	400.78	**389.75**
NO_X (ppm@ 15% O_2)	366.06	390.70	386.84	**381.20**
NO_X (lb/hr)	107.88	118.93	118.23	**115.01**
NO_X (g/bhp-hr)	4.5	4.8	4.8	**4.7**
NO_X (TPY)	472.5	520.9	517.8	**503.8**
O_2 (%)	14.90	14.92	14.79	**14.87**