TransCanada
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Great Lakes Gas Transmission Limited Partnership

TransCanada US Pipelines
Plant Reliability Department
700 Louisiana Street
Houston, Texas 77002

December 18, 2015

Ms. Karen Kajiya-Mills
MDEQ/AQD
Technical Programs Unit Supervisor
P.O. Box 30260
Lansing, MI 48909

RE: Submittal of Emissions Compliance Report, Great Lakes Gas Transmission Ltd. Partnership, Farwell Compressor Station (permit # MI-ROP-N5581-2013)

Dear Ms. Kajiya-Mills:

As operator of Great Lakes Gas Transmission Limited Partnership (GLGT), TransCanada would like to submit the attached emissions compliance report for MDEQ review and approval. The unit tested is a Solar Taurus 70 natural gas fired turbine, EU-UNIT1206, located at GLGT Farwell compressor station, Clare County, Michigan. As per Operational Permit requirements, Part C, Section V.1 & 2, NOx and CO emissions compliance has to be proven once within the effective dates of the mentioned permit, which expires in March 18, 2018.

The test was performed according to EPA Reference Method 7E for NOx determination, Method 10 for CO determination and 3A for Oxygen calculations, as outlined in our testing protocol submitted to your agency last October 15, 2015.

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

Thank You,

Roy Cannon
TransCanada US Pipelines
Emissions Testing Logistics & Reporting Specialist
Office: (832) 320-5465
Cell: (832) 483-0265
roy_cannon@transcanada.com

Paper copy: Mr. Chris Hare
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Melinda Holdsworth – Corporate Environmental
Brad Stermer – Environmental Specialist
Bruce Bendes – Field Environmental
Robert Lukens – Area Manager
Ronald White – Field Work Planner

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: GLGT Farwell Compressor Station — County: Clare

Source Address: 3400 Hickory Road — City: Lake George, MI 48633

AQD Source ID (SRN): N5581 — RO Permit No.: MI-ROP-N5581-2013 — 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 3/18/2013 To 3/18/2018

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

NOx and CO emissions testing report per permit condition C.V.1 & 2.

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.

Randy Schmidgall	Vicepresident US Operations	(832) 320-5511
Name of Responsible Official (print or type)	Title	Phone Number
Signature of Responsible Official		12/18/2015 Date

* Photocopy this form as needed.

EQP 5736 (Rev 9/01)

COMPLIANCE TEST REPORT
GREAT LAKES GAS TRANSMISSION LTD. PARTNERSHIP
FARWELL COMPRESSOR STATION
STATIONARY GAS TURBINE EU-UNIT 1206
LAKE GEORGE, MICHIGAN

Prepared for:

TransCanada
In business to deliver

TransCanada's GLGT Ltd. Partnership
Lake George, MI

Prepared by:

EQM

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

PN: 050614.0033

December 2015

PREFACE

I, Karl Mast, do hereby certify that the source emissions testing conducted at TransCanada 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 GLGT's Farwell Compressor Station in Lake George, MI.

Karl Mast
Test Supervisor

SUMMARY

The compliance testing was performed on the EU-Unit 1206 Stationary Gas Turbine in fulfillment of Michigan Department of Environmental Quality (MDEQ) permit no. MI-ROP-N5581-2013. The results of the testing are detailed in the following tables.

EU-UNIT 1206 Average NOx Test Results (NOx 25 ppmvd @ 15% O2)		
Load Condition	Results	Pass/Fail
High	16.79	Pass
Mid-High	12.18	Pass
Mid-Low	11.05	Pass
Low	12.58	Pass
Permit Limit	25	N.A.

EU-UNIT 1206 Average NOx Test Results (lb/hr)		
Load Condition	Results	Pass/Fail
High	4.82	Pass
Mid-High	3.21	Pass
Mid-Low	2.62	Pass
Low	2.62	Pass
Permit Limit	8.0	N.A.

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A – Field Test Data
B – Process Operating Data
C – Gas Certifications
D – Correspondence

1. INTRODUCTION

This report presents the results of the source emissions testing conducted by Environmental Quality Management, Inc. (EQ) for TransCanada's Great Lakes Gas Transmission Ltd. Partnership (GLGT) at Farwell compressor station, near Lake George, MI, which is located in Clare County.

The primary purpose of this testing program was to conduct emissions testing to determine compliance with operating permit No. MI-ROP-N5581-2013 for Stationary Unit EU-UNIT 1206 Turbine (EU 1206) at GLGT's gas compressor facility.

EQ's responsibility was to conduct the compliance testing for the O2, CO and NOx emissions rates and perform data reduction for conformance evaluation. GLGT'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 TransCanada's process operations, and Compliance testing. The Compliance testing conducted on the Turbine 1206 was performed on Thursday, November 19, 2015, from 9:00 A.M. to 2:04 P.M.

The following requirements were specific for the testing program:

1. Equipment calibrations performed and calibration data provided.
2. Three (3) twenty (20) -minute, minimum, O_2 and NOx test runs performed at the Turbine 1206 at four load conditions pursuant to EPA, Title 40, Code of Federal Regulations, Part 60, Appendix A.
3. Process manufacturing operations maintained at 100% of capacities and production 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_2 and NOx emissions determinations.
5. Stratification was found to be less than 5% in the turbine exhaust.

The testing program was approved by and/or coordinated with Roy Cannon, TransCanada's GLGT Company. The emission testing was performed by Karl Mast, Manager, Emission

Measurement & Project Manager, EQ, Zach Hill, Test Technician, EQ. The emission testing was observed by Rob Dickman of Michigan DEQ.

2. TEST RESULTS SUMMARY

The compliance testing was performed on the EU 1206 system in accordance with the requirements of the Title 40, Code of Federal Regulations, Part 60 (40 CFR 60, Appendix A) A summary of the test results is given below:

Table 1. Test Results Summary-NO_x (25 ppmvd @ 15% O_2)-EU 1206

EU-UNIT 1206 Average NOx Test Results (NOx 25 ppmvd @ 15% O2)		
Load Condition	Measured Limit	Pass/Fail
High	16.79	Pass
Mid-High	12.18	Pass
Mid-Low	11.05	Pass
Low	12.58	Pass
Permit Limit	25	N.A.

Table 2. Test Results Summary-NO_x (lb/hr)-EU 1206

EU-UNIT 1206 Average NOx Test Results (lb/hr)		
Load Condition	Measured Limit	Pass/Fail
High	4.82	Pass
Mid-High	3.21	Pass
Mid-Low	2.62	Pass
Low	2.62	Pass
Permit Limit	8.0	N.A.

Based on the information provided above, the Turbine 1206 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 Table 3-14.

Additional testing information may be found in Appendix A.

Table 3. Operating Parameters and Ambient Conditions-High Load-EU 1206

Run	1	2	3	Load 1 Average
Date	11/19/15	11/19/15	11/19/15	
Time	900-919	920-939	940-959	
Condition	HIGH	HIGH	HIGH	
Operating Parameters				
Turbine				
Horsepower	9,211.5	9,433.6	9,531.1	9,392.1
% Ambient Load	95.0	97.3	98.3	96.8
CT RPM	14,889.0	14,907.0	14,899.0	14,898.3
% CT Speed	99.3	99.4	99.3	99.3
PT RPM	9,515.0	9,669.0	9,767.0	9,650.3
% PT Speed	79.3	80.6	81.4	80.4
Compressor				
Measured Turbine Inlet Temperature Average - MGT (°F)	46.4	45.8	45.5	45.9
Compressor Suction Pressure (PSIG)	752	730	714	732
Compressor Suction Temperature (°F)	54.1	55.0	54.8	54.6
Compressor Discharge Pressure (PSIG)	860	864	867	863
Compressor Discharge Temperature (°F)	85.4	88.8	91.0	88.4
Compressor Flow (MMSCF/D)	743.6	711.9	687.7	714.4
Ambient Conditions				
Ambient Temperature (°F)	46.00	47.00	47.00	46.67
Barometric Pressure ("Hg)	28.42	28.42	28.44	28.43
Ambient Relative Humidity (%)	78.00	79.00	78.00	78.33
Absolute Humidity (grains/LB)	37.70	39.67	39.14	38.84

Table 4. Emissions Concentrations & Calculated Mass Emissions/Calculated Emissions Concentrations/Calculated Flows- High Load-EU 1206

Run	1	2	3	Load 1 Average
Date	11/19/15	11/19/15	11/19/15	
Time	900-919	920-939	940-959	
Condition	HIGH	HIGH	HIGH	
Emissions Concentrations & Calculated Mass Emissions				
NO_x ppm (BIAS Corrected)	14.21	15.74	16.28	15.41
NO_X g/BHP-HR	0.22	0.24	0.24	0.23
NOx lb/MMBTU factor	0.057	0.063	0.065	0.06
NO_X LB/HR	4.40	4.94	5.12	4.82
NO_X (ppm @ 15% O_2)	15.44	17.13	17.79	16.79
NOx LB/MMBTU	0.057	0.063	0.066	0.06
CO ppm (BIAS Corrected)	9.95	8.85	9.23	9.34
CO g/BHP-HR	0.09	0.08	0.08	0.09
CO LB/HR	1.87	1.69	1.77	1.78
CO (ppm @ 15% O_2)	10.81	9.63	10.08	10.18
% O_2 (BIAS Corrected)	15.47	15.48	15.50	15.48
Calculated Emissions Concentrations				
% O_2 (Wet)	14.47	14.48	14.50	14.48
Calculated Flows				
Fuel Flow - (SCFM)	1,225.2	1,239.8	1,237.3	1,234
Fuel Flow - (SCFH) From Screen	73,510	74,390	74,240	74,047
Exhaust Flow (LB/HR)	169,858	172,135	172,334	171,443
Exhaust Flow (WSCFM)	44,140	44,668	44,578	44,462
Air Flow (WSCFM)	41,503	42,076	42,146	41,908
Heat Rate (BTU/HP-HR)	7,586	7,496	7,404	7,495

** BASED ON FUEL SPECIFIC DRY F-FACTOR CALCULATION
* BASED ON CARBON BALANCE (STOICH. + O2)
- A/F IS TOTAL MASS RATIO

Table 5. Operating Parameters and Ambient Conditions- Mid-High Load-EU 1206

Run	10	11	12	Load 4 Average
Date	11/19/15	11/19/15	11/19/15	
Time	1305-1324	1325-1344	1345-1404	
Condition	MID HIGH	MID HIGH	MID HIGH	
Operating Parameters				
Turbine				
Horsepower	8,283.6	8,400.4	8,495.3	8,393.1
% Ambient Load	85.4	86.6	87.6	86.5
CT RPM	14,400	14,403	14,399	14,401
% CT Speed	96.0	96.0	96.0	96.0
PT RPM	9,621	9,721	9,812	9,718
% PT Speed	80.2	81.0	81.8	81.0
Compressor				
Measured Turbine Inlet Temperature Average - MGT (°F)	45.8	46.7	44.6	45.7
Compressor Suction Pressure (PSIG)	673	667	662	668
Compressor Suction Temperature (°F)	54.6	53.6	53.7	54.0
Compressor Discharge Pressure (PSIG)	883	887	891	887
Compressor Discharge Temperature (°F)	95.7	96.8	53.7	82.1
Compressor Flow (MMSCF/D)	566.6	549.1	538.2	551.3
Ambient Conditions				
Ambient Temperature (°F)	45.0	45.0	44.0	44.67
Barometric Pressure ("Hg)	28.49	28.49	28.50	28.49
Ambient Relative Humidity (%)	51.0	51.0	50.0	50.67
Absolute Humidity (grains/LB)	23.60	23.60	22.26	23.15

Table 6. Emissions Concentrations & Calculated Mass Emissions/Calculated Emissions Concentrations/Calculated Flows - Mid-High Load-EU 1206

Run	10	11	12	Load 4 Average
Date	11/19/15	11/19/15	11/19/15	
Time	1305-1324	1325-1344	1345-1404	
Condition	MID HIGH	MID HIGH	MID HIGH	
Emissions Concentrations & Calculated Mass Emissions				
NO_x ppm (BIAS Corrected)	9.60	10.81	10.72	10.38
NO_X g/BHP-HR	0.16	0.18	0.18	0.17
NOx lb/MMBTU factor	0.042	0.047	0.046	0.04
NO_X LB/HR	2.95	3.34	3.33	3.21
NO_X (ppm @ 15% O_2)	11.28	12.68	12.57	12.18
NOx LB/MMBTU	0.042	0.047	0.046	0.04
CO ppm (BIAS Corrected)	14.79	11.87	13.07	13.24
CO g/BHP-HR	0.15	0.12	0.13	0.13
CO LB/HR	2.77	2.23	2.47	2.49
CO (ppm @ 15% O_2)	17.38	13.92	15.33	15.55
% O_2 (BIAS Corrected)	15.88	15.87	15.87	15.87
Calculated Emissions Concentrations				
% O_2 (Wet)	17.14	17.17	17.11	17.14
Calculated Flows				
Fuel Flow - (SCFM)	1,125.8	1,132.3	1,138.7	1,132
Fuel Flow - (SCFH) From Screen	67,550	67,940	68,320	67,937
Exhaust Flow (LB/HR)	174,750	175,592	176,322	175,554
Exhaust Flow (WSCFM)	40,561	40,795	41,023	40,793
Air Flow (WSCFM)	41,220	41,376	41,607	41,401
Heat Rate (BTU/HP-HR)	7,752	7,688	7,645	7,695
** BASED ON FUEL SPECIFIC DRY F-FACTOR CALCULATION				
* BASED ON CARBON BALANCE (STOICH. + 02)				
- A/F IS TOTAL MASS RATIO				

Table 7. Operating Parameters and Ambient Conditions- Mid-Low Load-EU 1206

Run	4	5	6	Load 2 Average
Date	11/19/15	11/19/15	11/19/15	
Time	1015-1034	1035-1054	1055-1114	
Condition	MID LOW	MID LOW	MID LOW	
Operating Parameters				
Turbine				
Horsepower	6,661.8	6,675.7	6,704.6	6,680.7
% Ambient Load	68.7	68.8	69.1	68.9
CT RPM	13,902	13,902	13,904	13,902.7
% CT Speed	92.7	92.7	92.7	92.7
PT RPM	8,921	8,959	8,997	8,959.0
% PT Speed	74.3	74.7	75.0	74.7
Compressor				
Measured Turbine Inlet Temperature Average - MGT (°F)	45.5	45.6	45.8	45.6
Compressor Suction Pressure (PSIG)	697	691	684	691
Compressor Suction Temperature (°F)	54.3	54.8	54.5	54.5
Compressor Discharge Pressure (PSIG)	869	871	873	871
Compressor Discharge Temperature (°F)	89.4	91.0	91.7	90.7
Compressor Flow (MMSCF/D)	540.1	526.1	512.0	526.0
Ambient Conditions				
Ambient Temperature (°F)	45.00	45.00	45.00	45.00
Barometric Pressure ("Hg)	28.44	28.44	28.45	28.44
Ambient Relative Humidity (%)	79.00	79.00	79.00	79.00
Absolute Humidity (grains/LB)	36.73	36.73	36.72	36.73

Table 8. Emissions Concentrations & Calculated Mass Emissions/Calculated Emissions Concentrations/Calculated Flows - Mid-Low Load-EU 1206

Run	4	5	6	Load 2 Average
Date	11/19/15	11/19/15	11/19/15	
Time	1015-1034	1035-1054	1055-1114	
Condition	MID LOW	MID LOW	MID LOW	
Emissions Concentrations & Calculated Mass Emissions				
NO_x ppm (BIAS Corrected)	9.70	9.56	8.89	9.38
NO_X g/BHP-HR	0.18	0.18	0.17	0.18
NOx lb/MMBTU factor	0.042	0.042	0.039	0.04
NO_X LB/HR	2.69	2.68	2.50	2.62
NO_X (ppm @ 15% O_2)	11.33	11.28	10.53	11.05
NOx LB/MMBTU	0.042	0.042	0.039	0.04
CO ppm (BIAS Corrected)	13.59	12.59	13.17	13.12
CO g/BHP-HR	0.16	0.15	0.15	0.15
CO LB/HR	2.29	2.15	2.25	2.23
CO (ppm @ 15% O_2)	15.88	14.86	15.60	15.45
% O_2 (BIAS Corrected)	15.85	15.90	15.92	15.89
Calculated Emissions Concentrations				
% O_2 (Wet)	16.72	16.73	16.53	16.7
Calculated Flows				
Fuel Flow - (SCFM)	1,020.3	1,020.7	1,020.3	1,020
Fuel Flow - (SCFH) From Screen	61,220	61,240	61,220	61,227
Exhaust Flow (LB/HR)	157,511	158,983	158,760	158,418
Exhaust Flow (WSCFM)	36,760	36,772	36,760	36,764
Air Flow (WSCFM)	37,137	37,517	37,654	37,436
Heat Rate (BTU/HP-HR)	8,736	8,720	8,680	8,712
** BASED ON FUEL SPECIFIC DRY F-FACTOR CALCULATION				
* BASED ON CARBON BALANCE (STOICH. + O2)				
- A/F IS TOTAL MASS RATIO				

Table 9. Operating Parameters and Ambient Conditions- Low Load-EU 1206

Run	7	8	9	Load 3 Average
Date	11/19/15	11/19/15	11/19/15	
Time	1139-1158	1159-1218	1219-1238	
Condition	LOW	LOW	LOW	
Operating Parameters				
Turbine				
Horsepower	4,903.1	4,920.8	4,980.1	4,934.7
% Ambient Load	50.5	50.7	51.3	50.9
CT RPM	13,520	13,521	13,520	13,520.3
% CT Speed	90.1	90.1	90.1	91.6
PT RPM	8,368	8,409	8,447	8,408.0
% PT Speed	69.7	70.1	70.4	70.1
Compressor				
Measured Turbine Inlet Temperature Average - MGT (°F)	46.4	46.9	46.5	46.6
Compressor Suction Pressure (PSIG)	688	686	683	686
Compressor Suction Temperature (°F)	54.8	54.8	55.5	55
Compressor Discharge Pressure (PSIG)	872	874	875	873
Compressor Discharge Temperature (°F)	90.3	89.7	91.5	90.5
Compressor Flow (MMSCF/D)	407.4	398.5	395.5	400.5
Ambient Conditions				
Ambient Temperature (°F)	46.00	46.00	46.00	46.00
Barometric Pressure ("Hg)	28.47	28.47	28.47	28.47
Ambient Relative Humidity (%)	65.00	64.00	63.00	64.00
Absolute Humidity (grains/LB)	31.32	30.83	30.35	30.83

Table 10. Emissions Concentrations & Calculated Mass Emissions/Calculated Emissions Concentrations/Calculated Flows - Low Load-EU 1206

Run	7	8	9	Load 3 Average
Date	11/19/15	11/19/15	11/19/15	
Time	1139-1158	1159-1218	1219-1238	
Condition	LOW	LOW	LOW	
Emissions Concentrations & Calculated Mass Emissions				
NO_x ppm (BIAS Corrected)	9.79	10.33	10.49	10.20
NO_X g/BHP-HR	0.23	0.24	0.25	0.24
NOx lb/MMBTU factor	0.044	0.047	0.048	0.05
NO_X LB/HR	2.52	2.65	2.69	2.62
NO_X (ppm @ 15% O_2)	12.08	12.72	12.92	12.58
NOx LB/MMBTU	0.045	0.047	0.048	0.05
CO ppm (BIAS Corrected)	13.82	13.41	12.74	13.32
CO g/BHP-HR	0.20	0.19	0.18	0.19
CO LB/HR	2.17	2.10	1.99	2.08
CO (ppm @ 15% O_2)	17.06	16.52	15.69	16.42
% O_2 (BIAS Corrected)	16.12	16.11	16.11	16.11
Calculated Emissions Concentrations				
% O_2 (Wet)	16.98	17.00	17.04	17.01
Calculated Flows				
Fuel Flow - (SCFM)	897.3	896.5	895.8	897
Fuel Flow - (SCFH) From Screen	53,840	53,790	53,750	53,793
Exhaust Flow (LB/HR)	145,488	145,085	145,095	145,223
Exhaust Flow (WSCFM)	32,329	32,299	32,275	32,301
Air Flow (WSCFM)	34,485	34,382	34,356	34,408
Heat Rate (BTU/HP-HR)	10,438	10,391	10,260	10,363
** BASED ON FUEL SPECIFIC DRY F-FACTOR CALCULATION				
* BASED ON CARBON BALANCE (STOICH. + O2)				
- A/F IS TOTAL MASS RATIO				

Table 11. Gas Composition-AGA Standard-EU 1206

GAS COMPOSITION	(Based on AGA standard conditions of 14.73 psia and 60 F)					
Constituent	**Mol. Fraction**	**MW**	**weighted MW**	**DENSITY**	**Weighted Density**	
NITROGEN	0.013542	28.0134	0.3794	0.07399	0.00100	
CARBON DIOX.	0.006596	44.01	0.2903	0.11624	0.00077	
METHANE	0.90874	16.04315	14.5791	0.04237	0.03850	
ETHANE	0.063259	30.0703	1.9022	0.07942	0.00502	
PROPANE	0.00628	44.0975	0.2769	0.11647	0.00073	
I-BUTANE	0.00032	58.1246	0.0186	0.15352	0.00005	
N-BUTANE	0.000468	58.1246	0.0272	0.15352	0.00007	
I-PENTANE	0.000062	72.1518	0.0045	0.19057	0.00001	
N-PENTANE	0.000026	72.1518	0.0019	0.19057	0.00000	
HEXANE +	0.000038	95.958	0.0036	0.32000	0.00001	
	0.9993	17.4836	17.4836		0.04618	

Upper Dry Heat Value	1053.24	btu/dscf
Low Dry Heat Value	951	btu/dscf
Specific Gravity	0.6048	
DENSITY	0.0462	lb/cf

Total Carbons	1.064540492	Total H	4.074222

Constituent	LHV ideal	LHV(i) ideal	LHV(i) real	HHV ideal	HHV(i) ideal	HHV(i) real
NITROGEN		0.00	0.00		0	0
CARBON DIOX.		0.00	0.00		0	0
METHANE	911.5	828.32	830.23	1012	919.64488	921.77
ETHANE	1622.4	102.63	102.87	1773.7	112.2024883	112.46
PROPANE	2320.3	14.57	14.61	2522.1	15.838788	15.88
I-BUTANE	3007.3	0.96	0.96	3260.5	1.04336	1.05
N-BUTANE	3017.8	1.41	1.42	3270.1	1.5304068	1.53
I-PENTANE	3707.6	0.23	0.23	4011.1	0.2486882	0.25
N-PENTANE	3715.5	0.10	0.10	4018.2	0.1044732	0.10
HEXANE +	4900.5	0.19	0.19	5288.8	0.2009744	0.20
		LHV real	950.60		HHV real	1053.24

Constituent	SG	SG(i) ideal	b	b(i)	
NITROGEN	0.96723	0.013098229	0.0044	5.95848E-05	
CARBON DIOX.	1.51955	0.010022952	0.0197	0.000129941	Compressibility
METHANE	0.55392	0.503369261	0.0116	0.010541384	0.997696909
ETHANE	1.03824	0.065678024	0.0239	0.00151189	
PROPANE	1.52256	0.009561677	0.0344	0.000216032	
I-BUTANE	2.00684	0.000642189	0.0458	0.000014656	
N-BUTANE	2.00684	0.000939201	0.0478	2.23704E-05	
I-PENTANE	2.49115	0.000154451	0.0581	3.6022E-06	
N-PENTANE	2.49115	6.47699E-05	0.0631	1.6406E-06	
HEXANE +	3.3127	0.000125883	0.0802	3.0476E-06	
	SG real	0.604802051		0.012504149	

Table 12. Gas Composition-EPA Standard-EU 1206

GAS COMPOSITION	(Based onEPA standard conditions of 14.696 psia and 68 F)					
Constituent	Mol. Fraction	MW	weighted MW			
NITROGEN	0.0135	28.0134	0.3794			
CARBON DIOX.	0.0066	44.01	0.2903			
METHANE	0.9087	16.04315	14.5791	Carbon Wt. % :	0.731332	
ETHANE	0.0633	30.0703	1.9022	Hydrogen Wt. % :	0.234898	
PROPANE	0.0063	44.0975	0.2769	Oxygen Wt. % :	0.012072	
I-BUTANE	0.0003	58.1246	0.0186	Nitrogen Wt. % :	0.021698	
N-BUTANE	0.0005	58.1246	0.0272		1.0000	
I-PENTANE	0.0001	72.1518	0.0045			
N-PENTANE	0.0000	72.1518	0.0019			
HEXANE +	0.0000	95.958	0.0036			
	0.9993	MW	17.4836			
Upper Dry Heat Value	1051	btu/dscf	Mole Weight	17.4836	btu/dscf	
Low Dry Heat Value	952	btu/dscf	A F-Factor (calc)	8700	dscf/MMbtu	
Specific Gravity	0.6048					
Density	0.0464	lb/scf				
Total Carbons	1.0645	Total H	4.0743			

Constituent	LHV ideal	LHV(i) ideal	LHV(i) real	HHV ideal	HHV(i) ideal	HHV(i) real
NITROGEN		0.00	0.00		0	0
CARBON DIOX.		0.00	0.00		0	0
METHANE	913	829.68	831.59	1010	917.8274	919.95
ETHANE	1624	102.73	102.97	1769.6	111.9431264	112.20
PROPANE	2322	14.58	14.62	2516.1	15.801108	15.84
I-BUTANE	3010	0.96	0.97	3251.9	1.040608	1.04
N-BUTANE	3020	1.41	1.42	3262.3	1.5267564	1.53
I-PENTANE	3711	0.23	0.23	4000.9	0.2480558	0.25
N-PENTANE	3718	0.10	0.10	4008.9	0.1042314	0.10
HEXANE +	4904	0.19	0.19	5278	0.200564	0.20
		LHV real	952.08		HHV real	1051.11

Constituent	SG	SG(i) ideal	b	b(i)		
NITROGEN	0.96723	0.013098229	0.0044	5.95848E-05		
CARBON DIOX.	1.51955	0.010022952	0.0197	0.000129941	Compressibility	
METHANE	0.55392	0.503369261	0.0116	0.010541384	0.997696909	
ETHANE	1.03824	0.065678024	0.0239	0.00151189		
PROPANE	1.52256	0.009561677	0.0344	0.000216032		
I-BUTANE	2.00684	0.000642189	0.0458	0.000014656		
N-BUTANE	2.00684	0.000939201	0.0478	2.23704E-05		
I-PENTANE	2.49115	0.000154451	0.0581	3.6022E-06		
N-PENTANE	2.49115	6.47699E-05	0.0631	1.6406E-06		
HEXANE +	3.3127	0.000125883	0.0802	3.0476E-06		
	SG real	0.604802051		0.012504149		

3. PROCESS DESCRIPTION

TransCanada's GLGT Farwell Compressor Station is located in Lake George, Michigan and operates a Solar Taurus 70 stationary gas turbine burning only pipeline quality natural gas labeled as EU-UNIT 1206. The unit peak load HP rating is 9,700 at ISO conditions. The plant is located at 3400 Hickory Road, Lake George, MI.

The Solar Taurus 70 is a simple cycle, natural gas fired, single-shaft turbine. In a simple cycle turbine, filtered atmosphere air is first compressed by the axial with natural gas in the combustor. The hot exhaust gases expand through two turbine stages. The gas producer (G.P.) turbine drives the axial flow air while the power turbine (P.T.) drives the centrifugal pipeline compressor. The pipeline gas compressor moves natural gas through the pipeline by compressing it from an initial "suction" state to more compressed "discharge" state.

The following tables provide a summary of the rating and production data for the Turbine 1206:

Table 13. Turbine Rating Information-EU 1206

			Rated GG RPM:	**15,000**	**RPM**
			Rated PT RPM:	**12,000**	**RPM**
	Company:	**T.C.**	**Rated BHP:**	**9,700**	**BHP**
	Station:	**Farwell**			
	Unit:	**Unit 6**			
	Turbine Type:	**Solar**	**AGA UDHV :**	**1,053**	**btu/dscf**
	Date:	**11/19/2015**	**AGA LDHV :**	**951**	**btu/dscf**
			PCD_{ref} :	**342.0**	**PSIG**
			PCD_{ref} :	**356.1**	**PSIA**

Table 14. Production Data-Horse Power at ISO Conditions-EU 1206

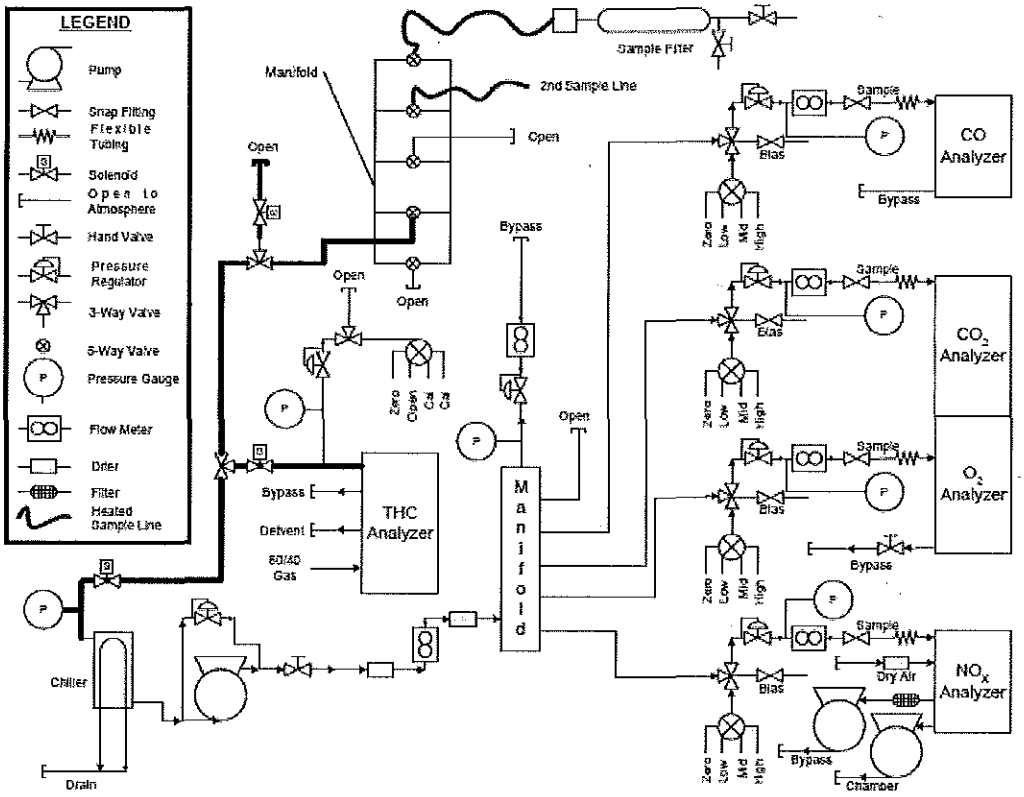
Horse Power at ISO Conditions-EU 1206		
Run No.	**High Load**	**Mid-High Load**
1	9,211.5	8,283.6
2	9,433.6	8,400.4
3	9,531.1	8,495.3
Average	9,392.1	8,393.1
Peak Load Rated HP	9,700	9,700

Table 15. Production Data-Horse Power at ISO Conditions-EU 1206

Horse Power at ISO Conditions-EU 1206		
Run No.	**Mid-Low**	**Low**
1	6,661.8	4,903.1
2	6,675.7	4,920.8
3	6,704.6	4,980.1
Average	6,680.7	4,934.7
Peak Load Rated HP	9,700	9,700

Additional information may be found in Appendix B.

Figure 1. Flow Schematic



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

4. TEST PROCEDURES

EQ and EQ'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 1 – Sample and Velocity Traverses for Stationary Sources
- U.S EPA Method 2 – Determination of Stack Gas Velocity and Volummetric Flow Rate (Type S Pitot Tube)
- 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 Moisture Content in Stack Gases
- 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)

USEPA Methods 3A, 7E and 10 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.

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:

- 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 for the Turbine EU 1206 are as follows:

Calibration Correction

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

Where:

C_{GAS}:	Corrected flue gas concentration (ppmvd)
C_R:	Flue gas concentration (ppmvd)
C_O:	Average of initial and final zero checks (ppmvd)
C_M:	Average of initial and final span checks (ppmvd)
C_{MA}:	Actual concentration of span gas (ppmvd)

EPA F-Factor

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

Where:

F_d:	Fuel specific F-factor, dscf/MMBtu
$H_{Wt\%}$:	Hydrogen weight percent
$C_{Wt\%}$:	Carbon weight percent
$N_{2Wt\%}$:	Nitrogen weight percent
$O_{2Wt\%}$:	Oxygen weight percent
GCV:	Heating value of the fuel, BTU/dscf
$\rho_{Fuel\ Gas}$:	Density of the fuel gas, lb/scf

NO_x Corrected to 15% O_2

$$Em = NO_x\left(\frac{5.9}{20.9 - \%O_2}\right)$$

Where:

E_m:	Pollutant concentration corrected to 15% O_2, ppm
NO_x:	Pollutant concentration, ppm
$\%O_2$:	Oxygen concentration in percent, measured on a dry basis

Mass Emissions Calculations

The F-factor Method and guidance from Part 75 will be used to calculate the mass emissions rates.

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

Where:

E_m:	Pollutant emission rate, lb/hr
C_d:	Pollutant concentration, lb/scf
F_d:	Fuel specific F-factor, dscf/MMBtu
$\%O_2$:	Oxygen concentration, dry basis
Q_h:	Fuel rate from calibrated AGA specified Meter, scfh.
GCV:	Heating value of the fuel, Btu/scf

To Convert from:	To	Multiply by:
ppm CO	lb/scf	7.268×10^{-8}
ppm NO_x	lb/scf	1.194×10^{-7}

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. EQ and EQ'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 Turbine EU-1206 at TransCanada's GLGT Company's Farwell Compressor Station located in Lake George, MI. The testing was conducted on November 19, 2015.

During the course of the testing, the Turbine EU-1206 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 Turbine EU-1206 emissions shall be determined by others.

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