Central Charlton

LDAR Assessment of Small Glycol Dehydration Unit

ANR Pipeline Company Central Charlton Compressor Station

14490 Beckett Road
Johannesburg, Michigan

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TransCanada
In business to deliver

State Registration No. B7390

Prepared for
TransCanada
Houston, Texas

April 22, 2015

Bureau Veritas Project No. 11015-000006.00

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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 Permit (ROP) 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 specified in Rule 213(3)(b)(ii), and be made available to the Department of Environmental Quality, Air Quality Division upon request.

Source Name: ANR Storage Company, C Charlton Compressor Station — County: Otsego

Source Address: 14490 Beckett Road — City: Johannesburg

AQD Source ID (SRN): B7390 — ROP No.: MI-ROP-B7390-2012a — ROP Section No.: C and D

Please check the appropriate box(es):

☐ **Annual Compliance Certification (Pursuant to Rule 213(4)(c))**

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 ROP, 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 ROP.

☐ 2. During the entire reporting period this source was in compliance with all terms and conditions contained in the ROP, 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 ROP, unless otherwise indicated and described on the enclosed deviation report(s).

☐ **Semi-Annual (or More Frequent) Report Certification (Pursuant to Rule 213(3)(c))**

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

☐ 1. During the entire reporting period, **ALL** monitoring and associated recordkeeping requirements in the ROP 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 ROP 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 _____ To _____

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

Test Report evaluating compliance with 40 CFR 63, Subpart HHH for the existing small glycol dehydration unit. This form shall certify that the testing was conducted in accordance with the approved test plan and that the facility operating conditions were in compliance with permit requirements or at maximum routine operating conditions.

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

ANTHONY KORNAGA	DIRECTOR, FIELD OPERATIONS	248-205-7465
Name of Responsible Official (print or type)	Title	Phone Number
Anthony Kornaga		4/22/2015
Signature of Responsible Official		Date

* Photocopy this form as needed.

EQP 5736 (Rev 11-04)

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Executive Summary

TransCanada retained Bureau Veritas North America, Inc. to evaluate the closed-vent system at the ANR Pipeline Company (ANR) Central Charlton Compressor Station in Johannesburg, Michigan. TransCanada stores natural gas in underground reservoirs and transports gas via pipelines to other companies and end-users after the gas is processed through glycol dehydration units. Testing was conducted on the Central Charlton glycol dehydration unit. The purpose of the testing was to:

- Evaluate the glycol dehydration unit's closed-vent system for leaks.
- Evaluate compliance with 40 CFR Part 63, National Emissions Standards for Hazardous Air Pollutants for Source Categories, Subpart HHH, "National Emissions Standards for Hazardous Air pollutants for Natural Gas Transmission and Storage Facilities," incorporated in Michigan Department of Environmental Quality (MDEQ) Renewable Operating Permit (ROP) MI-ROP- B7390-2012a.

The glycol dehydration system is defined as an "existing small glycol dehydration unit" in accordance with 40 CFR 63, Subpart HHH, and subject to:

- Leak Detection and Repair (LDAR) standards.

The assessment was completed in accordance with United States Environmental Protection Agency (USEPA) Reference Method 21. The LDAR assessment was completed on February 24, 2015.

Detailed results of the LDAR assessment are presented in Table 3-2. Documentation of the LDAR assessment was recorded on LDAR Recordkeeping and Field Inspection Forms, which are included in Appendix B of this report. The results of the LDAR assessment are summarized in the following table.

LDAR Assessment Results

Date (2015)	Glycol Dehydration Unit	Number of Components Evaluated	Number of Readings Below Leak Criterion of 500 ppmv	Number of Readings Exceeding Leak Criterion of 500 ppmv	Comment
Feb 24	Central Charlton	21	21	0	No leaks detected

ppmv; part per million by volume

Based on the results of the LDAR assessment, no volatile organic compound (VOC) readings were measured at a concentration exceeding the criterion of a leak (i.e., 500 part per million by volume [ppmv]).

1.0 Introduction

1.1 Summary of Test Program

TransCanada retained Bureau Veritas North America, Inc. to evaluate the closed-vent system at the ANR Pipeline Company (ANR) Central Charlton Compressor Station in Johannesburg, Michigan. TransCanada stores natural gas in underground reservoirs and transports gas via pipelines to other companies and end-users after the gas is processed through glycol dehydration units. Testing was conducted on the Central Charlton glycol dehydration unit. The purpose of the testing was to:

- Evaluate the glycol dehydration unit's closed-vent system for leaks.
- Evaluate compliance with 40 CFR Part 63, National Emissions Standards for Hazardous Air Pollutants for Source Categories, Subpart HHH, "National Emissions Standards for Hazardous Air pollutants for Natural Gas Transmission and Storage Facilities," incorporated in Michigan Department of Environmental Quality (MDEQ) Renewable Operating Permit (ROP) MI-ROP- B7390-2012a.

The glycol dehydration system is defined as an "existing small glycol dehydration unit" in 40 CFR 63, Subpart HHH, and subject to:

- Leak Detection and Repair (LDAR) standards.

Leak Detection and Repair (LDAR)

The LDAR assessment was conducted following the LDAR plan that Bureau Veritas prepared which outlined procedures to detect volatile organic compound (VOC) leaks from equipment components of the closed-vent system and identify necessary repairs as required by 40 CFR 60, Subpart HHH and MDEQ MI-ROP-B7390-2012a.

When compliance with the emission standard is achieved using a control device or combination of control devices, the closed-vent system shall have no detectable emissions. A potential leak interface is evaluated to operate with no detectable organic emissions if the organic concentration is less than 500 parts per million by volume (ppmv).

Bureau Veritas conducted the following LDAR activities:

- Identified, tagged, and listed the components to be monitored and those that are difficult to inspect.
- Established procedures if the leak criterion is exceeded.
- Monitored components through initial visual inspection and LDAR monitoring following United States Environmental Protection Agency (USEPA) Method 21 guidelines.
- Communicated findings to TransCanada for leak repair (if applicable) and reporting by TransCanada.
- Reported the initial inspection findings.

Documentation of the LDAR assessment was recorded on LDAR Recordkeeping and Field Inspection Forms, which are included in Appendix B of this report.

On February 24, 2015, Bureau Veritas conducted the LDAR assessment for the Central Charlton unit. The sampling conducted is summarized below in Table 1-1.

Table 1-1
Sources Tested, Parameters, and Test Date

Source	Test Parameter	Test Date
Central Charlton (EUCTGDS001)		
Closed vent system components	VOC leaks	February 24, 2015

VOC: volatile organic compound

1.2 Key Personnel

Key personnel involved in this test program are listed in Table 1-2. Mr. Thomas Schmelter, Senior Project Manager with Bureau Veritas, led the testing program under the direction of Dr. Derek Wong, Director and Vice President with Bureau Veritas.

Mr. Jeff Punjak, Controls Specialist, Plant Reliability with TransCanada; Mr. Pedro Amieva, US Plant Reliability with TransCanada; Ms. Melinda Holdsworth, Environmental Air Emissions and GHG Advisor with TransCanada; and others coordinated with Bureau Veritas.

Portions of the testing were witnessed by Mr. William Rogers, Environmental Quality Analyst, with MDEQ.

Table 1-2
Key Personnel

TransCanada	
Jeff Punjak Controls Specialist, Plant Reliability TransCanada P.O. Box 336, Forest Road 241 Iron River, Wisconsin 54847 Phone: 248.205.7554 jeffrey_punjak@transcanada.com	Melinda Holdsworth Environmental Air Emissions & GHG Advisor TransCanada 700 Louisiana St., Suite 700 Houston, Texas 77002-2700 Phone: 832.320.5665 Melinda_Holdsworth@TransCanada.com Pedro Amieva US Plant Reliability TransCanada 717 Texas Street Houston, Texas 77002 Phone: 832.320.5839 pedro_amieva@transcanada.com
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Derek Wong, Ph.D., P.E. Director and Vice President Bureau Veritas North America, Inc. 22345 Roethel Drive Novi, Michigan 48375 Tel. 248.344.2669 Fax. 248.344.2656 derek.wong@us.bureauveritas.com	Thomas Schmelter Senior Project Manager Bureau Veritas North America, Inc. 22345 Roethel Drive Novi, Michigan 48375 Tel: 248.344.3003 Fax: 248.344.2656 thomas.schmelter@us.bureauveritas.com

2.0 Source and Sampling Locations

2.1 Process Description

ANR, a wholly owned subsidiary of TransCanada, operates natural gas pipeline systems that connect supply basins and markets throughout the Midwest and south to the Gulf of México. ANR owns and operates several facilities in Michigan that are used in both natural gas transmission and storage. The location evaluated as part of this test program is a natural gas transmission and compression station that operates a natural gas storage field.

The pipeline transports natural gas to and from the storage reservoir field. Natural gas is injected into an underground field in spring and summer and withdrawn in fall and winter for residential and commercial heating purposes. During injection, natural gas flows into the reservoir until the field pressure approaches pipeline pressure. When the pressures near equilibrium, one or more engines are used to compress the natural gas into the reservoir. Compression injection usually continues until the field reaches its maximum rated pressure.

During the storage period, natural gas absorbs hydrocarbons and water while in the underground geologic formation. Gas withdrawn from the storage field is conditioned through a glycol dehydration system to remove water. Dehydration is necessary in order to (1) meet contract sales specifications, (2) remove water vapor that may form hydrates, ice-like structures that can cause corrosion or plug equipment lines, and (3) to improve fuel heating values. Glycol dehydration is an absorption process in which a liquid glycol absorbent directly contacts the natural gas stream, which is circulated counter-current to the glycol flow, and absorbs water vapor in a contact tower or absorption column.

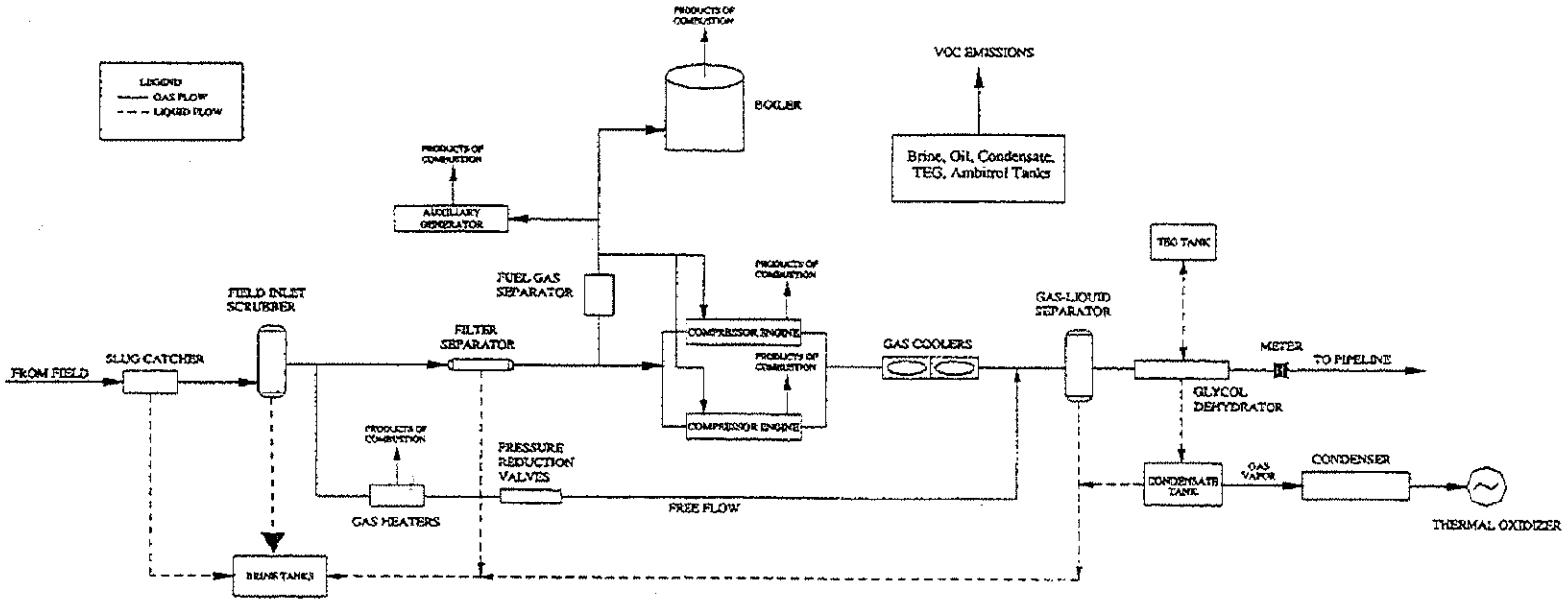
At the existing small glycol dehydration unit, natural gas is pumped into a tower, where the gas passes over a series of glycol trays. The glycol in these trays absorbs water and hydrocarbons in the natural gas. The conditioned natural gas can be fed into a separator to remove liquids that remain before being compressed and/or transported into the pipeline for distribution.

The rich, or "dirty," glycol that contains water and hydrocarbons accumulates in the bottom of the tower and is transported to a three-phase separator that separates heavy hydrocarbons from the glycol. The glycol is filtered before being transported into a re-boiler unit. The re-boiler evaporates water from the glycol. The resulting lean, or "clean," glycol is recirculated into the glycol tower.

Water from the re-boiler is condensed and transported to condensate and brine tanks, when necessary. The re-boiler vapors, which may contain volatile organic compounds (VOCs)—including HAPs such as BTEX—are directed to a condenser for control prior to exhausting to atmosphere.

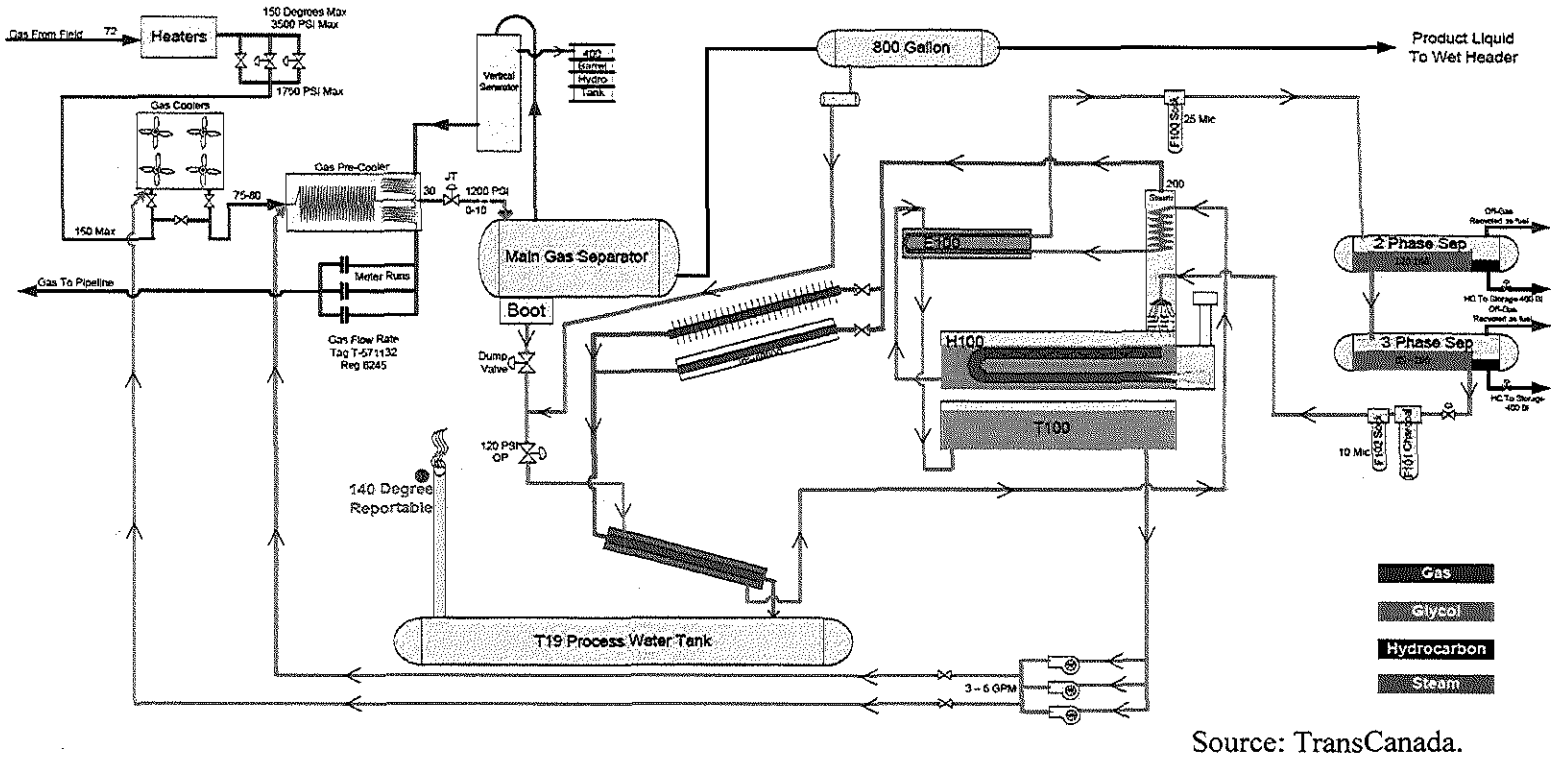
Figures 2-1 and 2-2 depict the general natural gas withdrawal and small glycol dehydration unit processes for Central Charlton.

The small glycol dehydration unit was assessed when natural gas was being processed at the maximum routine operating conditions.



Source: TransCanada.

Figure 2-1. General Gas Withdrawal Process Flow



Source: TransCanada.

Figure 2-2. Central Charlton Dehydration Unit Process Flow

2.2 LDAR Sampling Locations

The process equipment at the Central Charlton location that was evaluated for LDAR included valves, flanges, pressure relief devices, and other connections.

Bureau Veritas conducted the initial LDAR monitoring by inspecting closed-vent system joints, seams, or other connections that are permanently or semi-permanently sealed (e.g., a welded joint between two sections of hard piping or a bolted or gasketed ducting flange).

The inspection consisted of a (1) visual examination and (2) no-detectable-emission evaluation. The visual examination evaluated defects that could result in air emissions, such as visible cracks, holes, gaps in piping, loose connections, or broken or missing caps or other closure devices. The no-detectable-emissions evaluation was performed following USEPA Method 21 procedures discussed in Section 4.0.

Where metal wrap pipe insulation was present around a pipe joint, seam, or other connection and a visual inspection could not be performed without damage, the Method 21 monitoring was performed at the seams in the metal pipe wrap insulation near the inaccessible joint, seam, or other connection.

TransCanada identified the LDAR locations evaluated at the Central Charlton small glycol dehydration unit. The LDAR test locations are presented in Figure 2-3.

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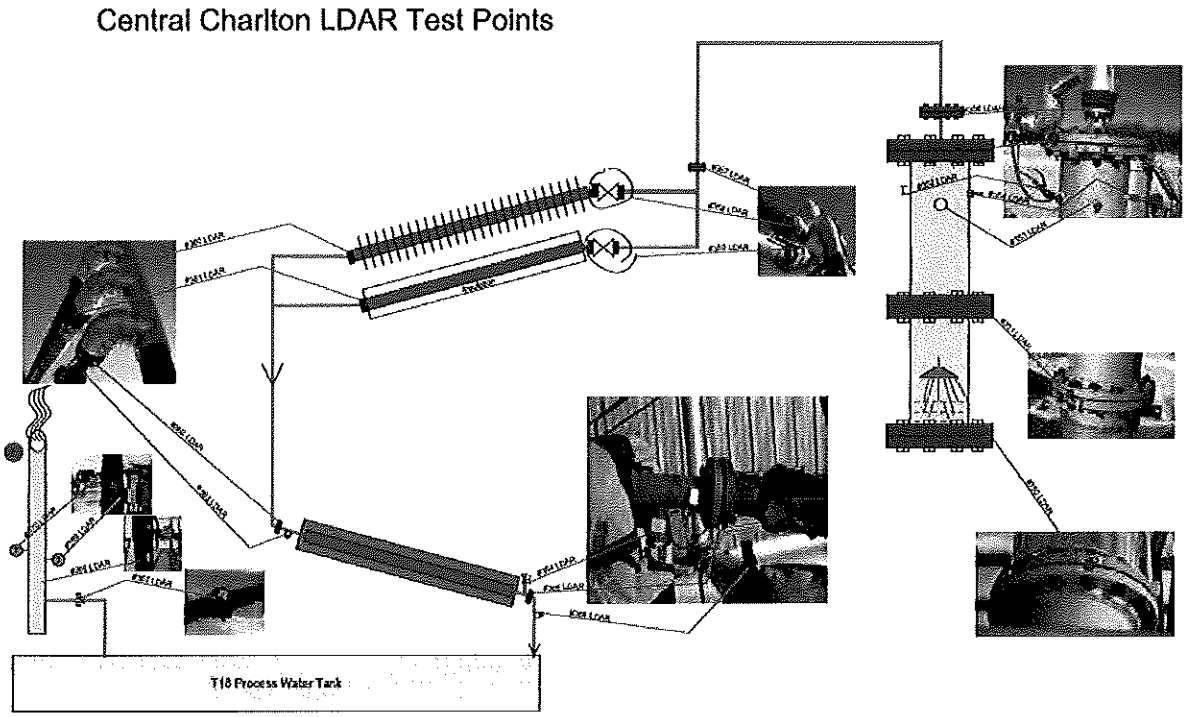

Figure 2-3. Central Charlton LDAR Sampling Locations

3.0 Results

3.1 Objective

The objective of the assessment was to evaluate the closed-vent system of the small glycol dehydration unit for:

- Leaks of VOCs.
- Compliance with 40 CFR Part 63, National Emissions Standards for Hazardous Air Pollutants for Source Categories, Subpart HHH, "National Emissions Standards for Hazardous Air pollutants for Natural Gas Transmission and Storage Facilities" incorporated in MDEQ MI-ROP- B7390-2012a.

Table 3-1 summarizes the sampling and analytical matrix.

Table 3-1
Test Matrix

Sampling Location	Sample/Type of Pollutant	Sampling Method	Analytical Method
Central Charlton (EUCTGDS001)	VOC leaks	21	Flame ionization detector

3.2 Field Test Changes and Issues

Communication between TransCanada, Bureau Veritas, and MDEQ allowed the testing to be completed without field test changes.

3.3 Summary of Results

Detailed results of the LDAR assessment are presented in Table 3-2. Documentation of the LDAR assessment was recorded on LDAR Recordkeeping and Field Inspection Forms, which are included in Appendix B of this report.

Table 3-2
Central Charlton LDAR Results - February 24, 2015

Tag	Description of Location	Device Type	Time Inspected	Yellow Tag† VOC Leak Inspection Readings (ppmv)	Red Tag‡ VOC Leak Inspection Readings (ppmv)	Leak Detected
350	Base of still column	Flange	9:30	-	15	No
351	Mid stream of still column	Flange	9:00	-	1.5	No
352	Pressure port	Pipe fitting	9:00	-	1.2	No
353	Spare port	Pipe fitting	9:01	-	1.0	No
354	Thermowell for temperature probe	Thermowell	9:01	-	1.1	No
355	Top Flange of still column (large)	Flange	9:02	-	0.9	No
356	Top Flange out of still column	Flange	9:02	-	1.1	No
357	Top Flange into condenser	Flange	9:11	-	0.6	No
358	Input Butterfly valve for finned condenser tube	Flange	9:12	-	0.4	No
359	Input Butterfly valve for insulated condenser tube	Flange	9:14	-	0.1	No
360	Output of finned condenser	Flange	9:14	-	0.3	No
361	Output of insulated condenser	Flange	9:15	-	0.6	No
362	Input to Glycol cooled condenser	Flange	9:21	-	0.6	No
363	Test port before Glycol cooled condenser	Pipe	9:21	-	0.6	No
364	Output from Glycol cooled condenser	Flange	9:22	0.3	-	No
365	Test port after Glycol cooled condenser valve	Pipe	9:23	0.2	-	No
366	Test port after condenser (plug)	Plug	9:23	0.6	-	No
367	Union out of tank to stack	Union	9:24	0.8	-	No
368	Spare port	Pipe fitting	9:24	0.7	-	No
369	Temperature gauge 1	Pipe fitting	9:24	0.2	-	No
370	Temperature gauge 2	Pipe fitting	9:25	0.4	-	No

ppmv: part per million by volume
-: not applicable
†: Yellow Tag refers to a component that is accessible and monitored initially and annually.
‡: Red Tag refers to a component that is difficult to access and is monitored initially and every 5 years.
Notes
1. Background VOC reading = between 0.2 and 10 ppmv
2. No detections exceeding leak criterion of 500 ppmv

Based on the results of the LDAR assessment, results no VOC readings were measured at a concentration exceeding the criterion of a leak (i.e., 500 ppmv).

4.0 Sampling and Analytical Procedures

4.1 Test Methods

Bureau Veritas evaluated the closed vent system for leaks using USEPA Method 21 identified in §63.1282 of Subpart HHH of 40 CFR Part 63—Test Methods, Compliance Procedures, and Compliance Demonstrations. Bureau Veritas conducted the testing using the method presented in Table 4-1.

Table 4-1
Sampling Method

Parameter	Location	Reference	
	Closed Vent System	Method	Title
VOC leaks	•	EPA 21	Determination of Volatile Organic Compound Leaks

4.1.1 Volatile Organic Compound Leaks (USEPA Method 21)

USEPA Method 21, "Determination of Volatile Organic Compound Leaks" was used to evaluate the closed vent system for leaks. The process equipment evaluated includes valves, flanges, pressure relief devices, and other connections. A potential leak interface is determined to operate with no detectable organic emissions if the organic concentration is less than 500 ppmv. Bureau Veritas used a Thermo Scientific TVA 1000 portable FID that met the specification of Method 21 Section 6.0 to evaluate VOC leaks from the process sources.

Prior to testing, the analyzer was calibrated by introducing the following calibration gas standards alternatively in triplicate:

- Zero gas: air containing less than 10 ppmv VOC.
- Calibration gas: a mixture of methane in air at a methane concentration of 493.5 parts per million by volume. The calibration precision criterion is ≤10 % of the calibration gas value.

During calibration, the response time of the analyzer was measured by introducing the zero gas and then the calibration gas. After the calibration gas was introduced, the time required to attain 90% of the final stable reading is the response time. The response time criterion is ≤30 seconds.

Because the small glycol dehydration unit is located within a covered structure, a background VOC concentration was measured. The local ambient VOC concentration was measured by

moving the instrument probe randomly within 3 to 6 feet from the closed vent system component to be monitored.

Although published response factors for the TVA 1000 are available, the measured VOC concentration was not converted to an "actual" concentration because the incoming process stream is natural gas and the majority of the VOCs in the closed vent system are likely to be methane. Thus, process system leaks were measured as methane, the calibration gas. Response factors for the analyzer calibrated using a methane standard are not applicable.

Inspection of the closed-vent system consisted of positioning the sampling probe at the surface of the component interface where a leak could occur. The probe was moved along the interface periphery while observing the instrument readout. If an increased concentration was observed, the sampling probe was slowly moved until the maximum concentration was obtained. The component was sampled for a minimum of twice the response time and if the maximum concentration, less the local ambient background VOC concentration, exceeded the leak definition, the data would have been recorded and reported to TransCanada for repair. No VOC readings were measured at a concentration exceeding the criterion of a leak.

4.2 Sampling Identification and Custody

Mr. Thomas Schmelter with Bureau Veritas was responsible for the handling and procurement of the data collected in the field. Mr. Schmelter ensured the data sheets were accounted for and completed.

Recovery and analytical procedures were not applicable to the sampling method used in this test program.

5.0 QA/QC Activities

Equipment used in this test program passed QA/QC procedures. Refer to Appendix A for equipment calibrations and inspection sheets. Field data sheets are presented in Appendix B. Computer-generated data sheets are presented within Appendix C.

5.1 Pretest QA/QC Activities

Before testing, the sampling equipment was cleaned, inspected, and calibrated according to procedures outlined in the applicable USEPA sampling method and USEPA's "Quality Assurance Handbook for Air Pollution Measurement Systems: Volume III, Stationary Source-Specific Methods."

5.2 QA/QC Audits

The results of select sampling and equipment QA/QC audits and the acceptable tolerance are presented in the following sections. Analyzer calibration and gas certification sheets are presented in Appendix A.

5.2.1 Instrument Analyzer QA/QC Audits

The Method 21 sampling described in Section 4.1 was audited for measurement accuracy and data reliability. The analyzer passed the applicable calibration criteria. The following table summarizes gas cylinders used during this test program. Refer to Appendix A for additional calibration data.

Table 5-1
Calibration Gas Cylinder Information

Parameter	Gas Vendor	Cylinder Serial Number	Cylinder Value	Expiration Date
Total hydrocarbons (THC)	The American Gas Group	EB0019307	<0.1 ppm	NA
Methane (CH_4)	Airgas	CC337690	493.5 ppm	September 27, 2020

5.3 QA/QC Checks for Data Reduction and Validation

The field data sheets were reviewed to evaluate whether data has been recorded and inputted appropriately. The computer data sheets were checked against the raw field data sheets for accuracy during review of the draft report.

5.4 QA/QC Problems

Equipment audits and QA/QC procedures demonstrate sample collection accuracy for the test runs.

6.0 Limitations

The information and opinions rendered in this report are exclusively for use by TransCanada. Bureau Veritas North America, Inc. will not distribute or publish this report without TransCanada's consent except as required by law or court order. The information and opinions are given in response to a limited assignment and should be implemented only in light of that assignment. Bureau Veritas North America, Inc. accepts responsibility for the competent performance of its duties in executing the assignment and preparing reports in accordance with the normal standards of the profession, but disclaims any responsibility for consequential damages.

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This report reviewed by:

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