Derenzo Environmental Services
Consulting and Testing

AIR EMISSION TEST REPORT

Title	TEST REPORT FOR THE VERIFICATION OF AIR POLLUTANT EMISSIONS FOR AN ENCLOSED FLARE AND AN OPEN FLARE
Report Date	July 11, 2018
Test Date	May 17, 2018

Facility Information	
Name	Ameresco Woodland Meadows Romulus, LLC
Street Address	4620 Hannan Road
City, County	Canton, Wayne
SRN	P0317

Permit / Emission Unit Information	
Permit To Install No.:	61-16
Emission Units:	EUHBTUENCL and EUHBTUOPEN

Testing Contractor	
Company	Derenzo Environmental Services
Mailing Address	39395 Schoolcraft Road Livonia, MI 48150
Phone	(734) 464-3880
Project No.	1705006

AIR EMISSION TEST REPORT
FOR THE
VERIFICATION OF AIR POLLUTANT EMISSIONS FOR
AN ENCLOSED FLARE AND AN OPEN FLARE

AMERESCO WOODLAND MEADOWS ROMULUS, LLC

1.0 INTRODUCTION

Ameresco Woodland Meadows Romulus, LLC (Ameresco) operates a high Btu (HBtu) landfill gas (LFG) facility in Canton, Wayne County, Michigan (Facility State Registration No., SRN P0317). LFG recovered from the nearby Waste Management Woodland Meadows Recycle and Disposal Facility is processed for sale after it is conditioned. Waste gas generated by the process is controlled by flaring.

The facility has been issued Permit to Install (PTI) No. 61-16 for the operation of the HBtu facility. One (1) enclosed flare identified as emission unit EUHBTUENCL and one (1) open flare identified as emission unit EUHBTUOPEN operate under PTI No. 61-16, 40 CFR 60.752(b)(2)(iii)(B), 40 CFR 60.754(d), 40 CFR 60.758(b)(2), 40 CFR 52.21 (c) & (d), R336.1301, 40 CFR 60.18(c)(1), and 40 CFR 60.18(c)(3) (applicable requirements).

Conditions of PTI No. 61-16 specify that:

Within 60 days after achieving the maximum production rate, but not later than 180 days after commencement of initial startup, the permittee shall verify either the reduction of NMOC by 98 weight percent efficiency or the 20 ppmv outlet concentration level from EUHBTUENCL... (40 CFR 60.752(b)(2)(iii)(B), 40 CFR 60.754(d))

Within 60 days after achieving the maximum production rate, but not later than 180 days after commencement of initial startup, the permittee shall verify and quantify SO_2 emission rates from EUHBTUENCL... (R 336.1205(3), R336.2001, R336.2003, R336.2004, 40 CFR 52.21(c) & (d))

For the performance test required in 40 CFR 60.752(b)(2)(iii)(A), the net heating value of the combusted landfill gas as determined in 40 CFR 60.18(f)(3) is calculated from the concentration of methane in the landfill gas as measured by Method 3C... (40 CFR 60.752(b)(2)(iii)(A), 40 CFR 60.754(e))

Method 22 of appendix A to 40 CFR Part 60 shall be used to determine the compliance of EUHBTUOPEN with the visible emission provisions of this subpart. The observation period is 2 hours and shall be used according to Method 22. (40 CFR 60.18(f)(1), 40 CFR 60.752(b)(2)(iii)(A))

The compliance testing was performed by Derenzo Environmental Services (DES), a Michigan-based environmental consulting and testing company. DES representatives Tyler Wilson and Clay Gaffey performed the field sampling and measurements on May 17, 2018.

The exhaust gas sampling and analysis was performed using procedures specified in the Test Plan that was reviewed and approved by the MDEQ in the April 4, 2018 test plan approval letter. MDEQ representatives Mr. Mark Dziadosz, Ms. Regina Hines, and Ms. Jill Zimmerman observed portions of the testing project.

Questions regarding this emission test report should be directed to:

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Report Certification

This test report was prepared by Derenzo Environmental Services based on field sampling data collected by Derenzo Environmental Services. Facility process data were collected and provided Ameresco employees or representatives. This test report has been reviewed by Ameresco representatives and approved for submittal to the MDEQ.

I certify that the testing was conducted in accordance with the specified test methods and submitted test plan unless otherwise specified in this report. I believe the information provided in this report and its attachments are true, accurate, and complete.

Report Prepared By:	Reviewed By:
Tyler J. Wilson Livonia Office Supervisor Derenzo Environmental Services	Andy Rusnak, QSTI Technical Manager Derenzo Environmental Services

I certify that the facility and emission units were operated at maximum routine operating conditions for the test event. Based on information and belief formed after reasonable inquiry, the statements and information in this report are true, accurate and complete.

Responsible Official Certification:

Joseph P. DeManche
Executive Vice President
Ameresco Woodland Meadows Romulus LLC

2.0 SUMMARY OF TEST RESULTS AND OPERATING CONDITIONS

2.1 Purpose and Objective of the Tests

The enclosed flare (EUHBTUENCL) was tested for NMOC and SO_2 emissions to satisfy the conditions of applicable requirements that require these pollutant emission rates to be measured within 60 days after achieving the maximum production rate, but not later than 180 days after commencement of initial startup.

The open flare (EUHBTUOPEN) was tested for net heating value and gas exit velocity of the combusted landfill gas and visible emissions to satisfy the conditions of applicable requirements.

2.2 Operating Conditions During the Compliance Tests

The enclosed flare emission testing was performed while the flare was operated at the highest achievable operating load based on the amount of LFG and waste gas available. Waste gas flowrate (standard cubic feet per minute) and flare combustion temperature (°F) were recorded during the test periods by Ameresco representatives. The EUHBTUENCL inlet waste gas flowrate ranged between 2,406 and 2,571 scfm and the flare combustion temperature ranged between 1,682 and 1,762 °F.

The open flare emission testing was performed while the flare was operated at the highest achievable operating load based on the amount of available gas. Inlet waste gas flowrate (standard cubic feet per minute) was recorded during the test periods by Ameresco representatives. The EUHBTUOPEN inlet waste gas flowrate ranged between 737 and 1,142 scfm.

Table 2.1 presents a summary of the average enclosed flare operating conditions during the test periods.

Appendix B provides operating records provided by Ameresco representatives for the test periods.

2.3 Summary of Air Pollutant Sampling Results

The gases exhausted from the enclosed flare were sampled for three (3) one-hour test periods during the compliance testing performed May 17, 2018. The open flare demonstration was performed in accordance with procedures specified in USEPA Methods 2D, 22, and 3C.

Table 2.2 presents the average measured NMOC and SO_2 emissions for the enclosed flare (average of the three test periods for the enclosed flare) and applicable emission limits. The permitted NMOC and SO_2 emissions referenced in Table 2.2 are those specified in applicable requirements.

Table 2.3 presents a summary of the open flare demonstration test results.

Results of the enclosed flare and open flare performance tests demonstrate compliance with emission limits specified in applicable requirements and permit conditions.

Test results for each sampling period and comparison to the permitted emissions are presented in Section 6.0 of this report.

Table 2.1 Average operating conditions during the enclosed flare test periods

Emission Unit	Inlet Gas Flow to Flare (scfm)	Flare Combustion Temperature (°F)
EUHBTUENCL	2,497	1,724

Table 2.2 Average measured emission rates for the enclosed flare (three-test average)

Emission Unit	NMOC Emissions (ppmvd @ 3% O_2 as hexane)	SO_2 Emissions (lb/hr)
EUHBTUENCL	1.69	12.7
Emission Limit	*20*	*16.8*

Table 2.3 Summary of open flare demonstration test results

Emission Unit	Net Heating Value (Btu/scf)	Opacity (%)	Exit Velocity (ft/sec)
EUHBTUOPEN	548	0	21.5
Emission Limit[1]	*≥200*	*0*	*60*

Notes:
1. The open flare shall be operated with no visible emissions except for periods not to exceed a total of five (5) minutes during any two (2) consecutive hours.

3.0 SOURCE AND SAMPLING LOCATION DESCRIPTION

3.1 General Process Description

The Waste Management Woodland Meadows Recycle and Disposal Facility accepts and landfills municipal solid waste. The landfill generates landfill gas, which is collected using an active landfill gas collection system.

A portion of the collected LFG is routed to the Ameresco Woodland Meadows Romulus, LLC facility where it is processed for sale by compressing, dehydrating, and conditioning the gas in a two-stage pressure swing adsorption (PSA) system to remove carbon dioxide (CO_2), nitrogen (N_2), and other impurities. The gas is then further conditioned by removing any remaining oxygen (O_2) using a catalytic oxidation process before additional dehydration and pressurization and final delivery to a Detroit Edison Company Remote Metering Station.

The first stage of the PSA system (CO_2 PSA) removes CO_2 along with siloxanes, hydrocarbons, sulfides, and sulfur compounds. These compounds are removed from the process during regeneration of the PSA media and sent to an enclosed flare for destruction. Approximately 8% of the waste gas is methane. Because of the low Btu value of the waste gas, the enclosed flare uses LFG or waste gas from the second stage of the PSA as supplementary fuel.

The gas going to the second stage of the PSA (N_2 PSA) normally has negligible amounts of organics, sulfides, and other hydrocarbons, so the waste gas stream is primarily N_2, CO_2, trace amounts of O_2, and approximately 28-37% methane. The waste gas from the N_2 PSA is sent to on open flare for destruction.

3.2 Rated Capacities and Air Emission Controls

EUHBTUENCL has a design rated waste gas stream inlet capacity of 2,600 standard cubic feet per minute (scfm) and a maximum heat input capacity of 26.1 million British thermal units per hour (MMBtu/hr).

EUHBTUOPEN has a design rated gas stream inlet capacity of 1,440 scfm and a maximum heat input capacity of 32.8 million British thermal units per hour (MMBtu/hr).

3.3 Sampling Locations

The exhaust sampling ports for EUHBTUENCL are located near the top of the vertical combustion chamber, which has an inner diameter of 66.5 inches. There are four (4) sample ports, opposed 90°, that provide a sampling location 34.0 inches (0.5 duct diameters) upstream and >240 inches (>3.6 duct diameters) downstream from any flow disturbance and satisfies the USEPA Method 1 criteria for a representative sample location.

The EUHBTUOPEN inlet gas canister samples were collected from the 12.0 inch inlet piping, on the discharge side of the gas blower, prior to the open flare. Flowrate measurements for the EUHBTUOPEN inlet gas stream was obtained from a certified and calibrated, permanently installed flow meter. Visible emissions measurements for EUHBTUOPEN were determined by observing approximately one (1) stack length above the observer's line of sight.

Individual traverse points were determined in accordance with USEPA Method 1.

Appendix A provides diagrams of the emission test sampling locations.

4.0 SAMPLING AND ANALYTICAL PROCEDURES

A test protocol for the air emission testing was reviewed and approved by the MDEQ. This section provides a summary of the sampling and analytical procedures that were used during the testing periods.

4.1 Summary of Sampling Methods

USEPA Method 1	Enclosed flare exhaust gas velocity measurement locations were determined based on the physical stack arrangement and requirements in USEPA Method 1.
USEPA Method 2	Enclosed flare exhaust gas velocity pressure was determined using a Type-S Pitot tube connected to a red oil incline manometer; temperature was measured using a K-type thermocouple connected to the Pitot tube.
USEPA Method 3A	Enclosed flare exhaust gas O_2 and CO_2 content was determined using zirconia ion/paramagnetic and infrared instrumental analyzers, respectively.
USEPA Method 4	Enclosed flare exhaust gas moisture was determined based on the water weight gain in chilled impingers.
USEPA Method 6C	Enclosed flare exhaust gas SO_2 concentrations determined using an ultraviolet (UV) fluorescence instrumental analyzer.
USEPA Method 25A / ALT-097	Enclosed flare exhaust gas VOC (as NMHC) concentration was determined using a flame ionization analyzer equipped with a GC column.
USEPA Method 22	Open flare exhaust gas visible emissions observation was performed by a competent observer.
USEPA Method 3C	Open flare net heating value was determined by evacuated canister sampling.

4.2 Exhaust Gas Velocity Determination (USEPA Method 2)

The enclosed flare exhaust stack gas velocities and volumetric flow rates were determined using USEPA Method 2 prior to and after each test. An S-type Pitot tube connected to a red-oil manometer was used to determine velocity pressure at each traverse point across the stack cross section. Gas temperature was measured using a K-type thermocouple mounted to the Pitot tube. The Pitot tube and connective tubing were leak-checked onsite prior to the test event to verify the integrity of the measurement system.

The absence of significant cyclonic flow for the exhaust configuration was verified using an S-type Pitot tube and oil manometer. The Pitot tube was positioned at each velocity traverse point with the planes of the face openings of the Pitot tube perpendicular to the stack cross-sectional plane. The Pitot tube was then rotated to determine the null angle (rotational angle as measured from the perpendicular, or reference, position at which the differential pressure is equal to zero).

Appendix C provides exhaust gas flowrate calculations and field data sheets.

4.3 Exhaust Gas Molecular Weight Determination (USEPA Method 3A)

CO_2 and O_2 content in the enclosed flare exhaust gas streams were measured continuously throughout each test period in accordance with USEPA Method 3A. The CO_2 content of the exhaust was monitored using a Servomex 1440D single beam single wavelength (SBSW) infrared gas analyzer. The O_2 content of the exhaust was monitored using a Servomex 1440D gas analyzer that uses a paramagnetic sensor.

During each sampling period, a continuous sample of the exhaust gas stream was extracted from the stack using a stainless steel probe connected to a Teflon® heated sample line. The sampled gas was conditioned by removing moisture prior to being introduced to the analyzers; therefore, measurement of O_2 and CO_2 concentrations correspond to standard dry gas conditions. Instrument response data were recorded using an ESC Model 8816 data acquisition system that monitored the analog output of the instrumental analyzers continuously and logged data as one-minute averages.

Prior to, and at the conclusion of each test, the instruments were calibrated using upscale calibration and zero gas to determine analyzer calibration error and system bias (described in Section 5.0 of this document). Sampling times were recorded on field data sheets.

Appendix D provides O_2 and CO_2 calculation sheets. Raw instrument response data are provided in Appendix E.

4.4 Exhaust Gas Moisture Content (USEPA Method 4)

Moisture content of the enclosed flare exhaust gas streams were determined in accordance with USEPA Method 4 using a chilled impinger sampling train. The moisture sampling was performed concurrently with the instrumental analyzer sampling. During each sampling period a gas sample was extracted at a constant rate from the source where moisture was removed from the sampled gas stream using impingers that were submersed in an ice bath. At the conclusion of each sampling period, the moisture gain in the impingers was determined gravimetrically by weighing each impinger to determine net weight gain.

4.5 Measurement of Volatile Organic Compounds (USEPA Method 25A/ALT-096)

The enclosed flare VOC emission rate was determined by measuring the nonmethane organic compounds (NMOC) as nonmethane hydrocarbon compounds (NMHC) concentration in the enclosed flare exhaust gas. NMHC pollutant concentration was determined using a TEI Model 55i Methane / Nonmethane hydrocarbon analyzer. The TEI 55i analyzer contains an internal gas chromatograph column that separates methane from non-methane components. The concentration of NMHC in the sampled gas stream, after separation from methane, is determined relative to a propane standard using a flame ionization detector in accordance with USEPA Method 25A.

The USEPA Office of Air Quality Planning and Standards (OAQPS) has issued an alternate test method approving the use of the TEI 55-series analyzer as an effective instrument for measuring NMOC from enclosed flares in that it uses USEPA Method 25A and 18 (ALT-097).

Samples of the exhaust gas were delivered directly to the instrumental analyzer using the Teflon® heated sample line to prevent condensation. The sample to the NHMC analyzer was not conditioned to remove moisture. Therefore, VOC measurements correspond to standard conditions with no moisture correction (wet basis).

Prior to, and at the conclusion of each test, the instrument was calibrated using mid-range calibration (propane) and zero gas to determine analyzer calibration error and system bias (described in Section 5.0 of this document).

Appendix D provides VOC calculation sheets. Raw instrument response data for the NMHC analyzer is provided in Appendix E.

4.6 Measurement of Sulfur Dioxide Emissions (USEPA Method 6C)

SO_2 content in the enclosed flare exhaust gas stream was measured continuously throughout each test period in accordance with USEPA Method 6C. A Thermo Environmental, Inc. Model 43i pulsed ultraviolet fluorescence analyzer was used to determine SO_2 concentration.

Throughout each test period, a continuous sample of the exhaust gas was extracted from the stack using the Teflon® heated sample line and gas conditioning system and delivered to the instrumental analyzers. Instrument response for each analyzer was recorded on an ESC Model 8816 data acquisition system that logged data as one-minute averages. Prior to, and at the conclusion of each test, the instruments were calibrated using upscale calibration and zero gas to determine analyzer calibration error and system bias.

Appendix D provides SO_2 calculation sheets. Raw instrument response data is provided in Appendix E.

4.7 Measurement of Visible Emissions (USEPA Method 22)

Pursuant to §60.18(c) (1), flares shall be designed for and operated with no visible emissions except for periods not to exceed a total of 5 minutes during any two (2) consecutive hours.

A two-hour observation period was conducted on EUHBTUOPEN while in normal operation. Field records of the observation were completed which incorporate the data requirements of USEPA Method 22. Quality assurance/quality control (QA/QC) procedures and observation guidelines presented in USEPA Method 22 were followed for the proper execution of this portion of the test program.

Appendix C provides opacity data sheets.

4.8 Measurement of Open Flare Net Heating Value (USEPA Method 3C)

Pursuant to §60.18(c)(3)(B)(ii), open flares shall be used only when the net heating value of the combusted gas is at least 11.2 MJ/scm (300 Btu/scf) or greater if the open flare is steam-assisted or air-assisted; or when the net heating value of the combusted gas is at least 7.45 MJ/scm (200 Btu/scf) or greater if the open flare is non-assisted.

CO_2, CH_4, N_2, and O_2 gas content, and the net heating value of the gas stream, was determined in accordance with USEPA Method 3C.

In accordance with USEPA Method 3C, triplicate 30-minute integrated N_2 PSA waste gas samples were collected from the inlet piping to the flare on the discharge side of the gas blower, in high-pressure stainless steel cylinders. Samples were withdrawn from the open flare inlet duct gas stream at a constant sampling rate (i.e. non-isokinetically). The sampling train was configured using a stainless steel probe and a connecting Teflon® line with a flow control system, a 7-micron stainless steel particulate filter, and an evacuated stainless steel sample cylinder. The gas sampling was completed concurrent with the determination of visible emissions from the flare.

Prior to shipment to the sampling site, each stainless steel sample cylinder was leak checked at the laboratory, by evacuating the tank within 10 millimeters of mercury (mm Hg) absolute pressure and filled with helium to an absolute pressure of 345 mm Hg, and allowed to sit for at least 60 minutes. No change in vacuum was observed on a mercury manometer or vacuum gauge, each tank so they were considered to have an acceptable pre-test leak check. Final cylinder pressure was recorded at the sampling site prior to shipment to the laboratory. The cylinder pressure/vacuum was verified by laboratory personnel upon receipt to confirm sample container integrity.

The stainless steel canisters/cylinders were sealed upon the completion of each 30-minute test run. The samples were clearly and uniquely identified and shipped FedEx ground for analyses. ALS Environmental provided the sample canisters and performed laboratory analyses of the samples using USEPA Method 3C.

Net heating value determinations was performed by multiplying the Ideal Net Heating Value and the percent measured contributing analyte(s) found in the integrated gas samples.

Appendix G provides a laboratory report for the canister USEPA Method 3C analysis.

5.0 QA/QC ACTIVITIES

5.1 Sampling System Response Time Determination

The response time of the sampling system was determined prior to the compliance test program by introducing upscale gas and zero gas, in series, into the sampling system using a tee connection at the base of the sample probe. The elapsed time for the analyzer to display a reading of 95% of the expected concentration was determined using a stopwatch.

The TEI Model 43i analyzer exhibited the longest system response time at 46 seconds. Results of the response time determinations were recorded on field data sheets. For each test period, test data were collected once the sample probe was in position for at least twice the maximum system response time.

5.2 Gas Divider Certification (USEPA Method 205)

A STEC Model SGD-710C 10-step gas divider was used to obtain appropriate calibration span gases. The ten-step STEC gas divider was NIST certified (within the last 12 months) with a primary flow standard in accordance with Method 205. When cut with an appropriate zero gas, the ten-step STEC gas divider delivered calibration gas values ranging from 0% to 100% (in 10% step increments) of the USEPA Protocol 1 calibration gas that was introduced into the system. The field evaluation procedures presented in Section 3.2 of Method 205 were followed prior to use of gas divider. The field evaluation yielded no errors greater than 2% of the triplicate measured average and no errors greater than 2% from the expected values.

5.3 Instrumental Analyzer Interference Check

The instrumental analyzers used to measure SO_2, O_2 and CO_2 have had an interference response test preformed prior to their use in the field, pursuant to the interference response test procedures specified in USEPA Method 7E. The appropriate interference test gases (i.e., gases that would be encountered in the exhaust gas stream) were introduced into each analyzer, separately and as a mixture with the analyte that each analyzer is designed to measure. All of analyzers exhibited a composite deviation of less than 2.5% of the span for all measured interferent gases. No major analytical components of the analyzers have been replaced since performing the original interference tests.

5.4 Instrument Calibration and System Bias Checks

At the beginning of each day of the testing program, initial three-point instrument calibrations were performed for the SO_2, CO_2 and O_2 analyzers by injecting calibration gas directly into the inlet sample port for each instrument. System bias checks were performed prior to and at the conclusion of each sampling period by introducing the upscale calibration gas and zero gas into the sampling system (at the base of the stainless steel sampling probe prior to the particulate filter and Teflon® heated sample line) and determining the instrument response against the initial instrument calibration readings.

At the beginning of each test day, appropriate high-range, mid-range, and low-range span gases followed by a zero gas were introduced to the NMHC analyzer, in series at a tee connection, which is installed between the sample probe and the particulate filter, through a poppet check valve. After each one hour test period, mid-range and zero gases were re-introduced in series at the tee connection in the sampling system to check against the method's performance specifications for calibration drift and zero drift error.

The instruments were calibrated with USEPA Protocol 1 certified concentrations of CO_2, O_2, and SO_2 in nitrogen and zeroed using hydrocarbon free nitrogen. The NMHC (VOC) instrument was calibrated with USEPA Protocol 1 certified concentrations of propane in air and zeroed using hydrocarbon-free air. A STEC Model SGD-710C ten-step gas divider was used to obtain intermediate calibration gas concentrations as needed.

5.5 Determination of Exhaust Gas Stratification

A stratification test was performed for each exhaust stack. The stainless steel sample probe was positioned at sample points correlating to 16.7, 50.0 (centroid) and 83.3% of the stack diameter. Pollutant concentration data were recorded at each sample point for a minimum of twice the maximum system response time.

The recorded concentration data for each exhaust stack indicated that the measured SO_2 concentrations did not vary by more than 5% of the mean across the stack diameter. Therefore, the exhaust gas was considered to be unstratified and the compliance test sampling was performed at a single sampling location within each exhaust stack.

5.6 Laboratory QA Procedures

The open flare net heating value canister sample analyses were conducted by a qualified third-party laboratory according to the appropriate QA/QC procedures specified in USEPA Method 3C and are included in the final report provided by ALS Environmental.

5.7 Meter Box Calibrations

The Nutech Model 2010 sampling console, which was used for the enclosed flare exhaust gas moisture content sampling, was calibrated prior to and after the testing program. This calibration uses the critical orifice calibration technique presented in USEPA Method 5. The digital pyrometer in the metering console was calibrated using a NIST traceable Omega® Model CL 23A temperature calibrator.

Appendix F presents test equipment quality assurance data (instrument calibration and system bias check records, calibration gas and gas divider certifications, interference test results, meter box calibration records, stratification checks, cyclonic flow determinations sheets, Pitot tube and probe assembly calibration records).

6.0 <u>RESULTS</u>

6.1 Enclosed Flare Emissions

The enclosed flare, EUHBTUENCL, was tested for NMOC and SO_2 emissions. The measured air pollutant concentrations and emissions for each one-hour test period for EUHBTUENCL are presented in Table 6.1. The measured emissions are less than those specified in applicable requirements

- 20 ppmvd @ 3% O_2 as hexane for NMOC; and
- 16.8 lb/hr for SO_2.

6.2 Open Flare Test Results

The open flare, EUHBTUOPEN, was tested for net heating value of landfill gas, visible emissions, and gas exit velocity. The measured parameters for each period for EUHBTUOPEN are presented in Table 6.2. The measured parameters are in compliance with the specified in applicable requirements:

- ≥200 Btu/scf;
- 0% opacity (except for periods not to exceed a total of five (5) minutes during any two (2) consecutive hours); and
- Exit velocity less than 60 feet per second (ft/sec).

6.3 Variations from Normal Sampling Procedures or Operating Conditions

The testing for all pollutants was performed in accordance with the approved test protocols and any test method exceptions are noted below. The enclosed flare and open flare testing was performed while the flares were operated at the highest achievable operating load.

Test No. 3 for the enclosed flare was paused from 12:17 through 12:24 due to the analyzer test probe being accidentally removed from the stack during removal of the moisture sampling system. The test was continued at 12:25 to complete 60-minutes of data points for the one-hour test period.

The CO_2 concentration in the enclosed flare was over range for the Servomex 1440D instrument; therefore, one (1) tedlar bag exhaust gas sample was collected for each of the three (3) test periods and sent to ALS Environmental for analysis. A copy of the lab report is provided in Appendix G.

Table 6.1 Measured exhaust gas conditions and NMOC and SO_2 air pollutant emissions
Ameresco EUHBTUENCL

Test No. Test date Test period (24-hr clock)	1 5/17/18 800 - 900	2 5/17/18 946 - 1046	3 5/17/18 1122 - 1230	Three Test Average
Fuel flowrate (scfm)	2,529	2,525	2,438	2,497
Flare combustion temperature (°F)	1,730	1,717	1,725	1,724
Exhaust Gas Composition				
CO_2 content (% vol)	32.6	32.2	37.2	34.0
O_2 content (% vol)	3.15	3.69	3.86	3.57
Moisture (% vol)	10.8	10.1	10.3	10.4
Exhaust gas temperature (°F)	1,673	1,676	1,642	1,664
Exhaust gas flowrate (dscfm)	7,928	7,982	7,486	7,798
Non-Methane Organic Compounds				
NMOC conc. (ppmv)	5.00	2.61	1.26	2.96
NMOC emissions (ppmvd @ 3% O_2)	2.83	1.51	0.74	1.69
Permitted emissions (ppmvd @ 3% O_2)	-	-	-	20
Sulfur Dioxide				
SO_2 conc. (ppmvd)	161	167	160	163
SO_2 emissions (lb/hr)	12.7	13.3	12.0	12.7
Permitted emissions (lb/hr)	-	-	-	16.8

Table 6.2 Net heating value, exit velocity, and visible emissions
Ameresco EUHBTUOPEN

Test No. Test date Test period (24-hr clock)	1 5/17/18 1025 - 1055	2 5/17/18 1125 - 1155	3 5/17/18 1156 - 1226	Three Test Average
Fuel flowrate (scfm)	777	1,122	1,136	1,012
Waste gas methane content (%)	59.7	60.6	60.4	60.2
Net heating value (Btu/scf)	543	551	549	548
Permitted limit (Btu/scf)	-	-	-	≥200
Exit velocity (ft/sec)	16.5	23.8	24.1	21.5
Permitted limit (ft/sec)	-	-	-	60
Visible Emissions				
Opacity (%)	0	0	0	0
Permitted emissions (%)[1]	-	-	-	0

Notes:
1. The open flare shall be operated with no visible emissions except for periods not to exceed a total of five (5) minutes during any two (2) consecutive hours.