RECEIVED
SEP 13 2022
AIR QUALITY DIVISION

AIR EMISSION TEST REPORT
FOR THE
VERIFICATION OF AIR POLLUTANT EMISSIONS
FROM A
WASTE TREATMENT PROCESS

Prepared for:

EQ – The Environmental Quality Company
(Michigan Disposal Waste Treatment Plant)
SRN M4782

Test Date: July 12, 2022

ICT Project No.: 2200042
September 1, 2022

IMPACT
COMPLIANCE & TESTING

Report Certification

AIR EMISSION TEST REPORT
FOR THE
VERIFICATION OF AIR POLLUTANT EMISSIONS
FROM A
WASTE TREATMENT PROCESS

EQ – The Environmental Quality Company
(Michigan Disposal Waste Treatment Plant)
Belleville, MI

Report Certification

The material and data in this document were prepared under the supervision and direction of the undersigned.

Impact Compliance & Testing, Inc.

Tyler J. Wilson
Senior Project Manager

Table of Contents

List of Tables

List of Appendices

1.0 Introduction

US Ecology, Inc. (US Ecology) operates the EQ – The Environmental Quality Company (Michigan Disposal Waste Treatment Plant (MDWTP)) hazardous and nonhazardous waste processing facility located in Belleville, Wayne County, Michigan.

The State of Michigan Department of Environment, Great Lakes, and Energy – Air Quality Division (EGLE-AQD) has issued to EQ – The Environmental Quality Company (MDWTP) Renewable Operating Permit (ROP) No. MI-ROP-M4782-2010b for operation of the waste treatment facility, which consists of:

- Two (2) hazardous and nonhazardous liquid and solid waste processing lines (FG_EAST and FG_WEST).

EGLE-AQD has also issued FG_EAST Permit to Install (PTI) No. 108-12.

Air emission compliance testing was performed pursuant to conditions specified in ROP No. MI-ROP-M4782-2010b and PTI No. 108-12 for FG_EAST.

The compliance testing presented in this report was performed by Impact Compliance & Testing, Inc. (ICT), a Michigan-based environmental consulting and testing company. ICT representatives Tyler Wilson, Blake Beddow, and Andrew Eisenberg performed the field sampling and measurements July 12, 2022.

Compliance testing was performed for FG_EAST (FG_EAST consists of EU_SLUDGETANK12 and EU_STORAGETANK1). The compliance tests consisted of triplicate, one-hour sampling periods for the FG_EAST regenerative thermal oxidizer (RTO) for volatile organic compounds (VOC, as non-methane hydrocarbons (NMHC or NMOC)) destruction efficiency (DE), and VOC, hydrogen chloride (HCl), and speciated organic compounds, SOC (methylene chloride, benzene, 1,1,2,2-tetrachloroethane, carbon tetrachloride, chloroform, trichloroethene, and tetrachloroethene) emissions. RTO Inlet and exhaust gas velocity, moisture, oxygen (O_2) content, and carbon dioxide (CO_2) content were determined for each test period to calculate pollutant mass emission rates.

The exhaust gas sampling and analysis was performed using procedures specified in the Stack Test Protocol dated April 28, 2022, that was reviewed and approved by EGLE-AQD. Ms. Nazaret Sandoval and Mr. Andrew Riley of EGLE-AQD observed portions of the compliance testing.

Questions regarding this air emission test report should be directed to:

Tyler J. Wilson
Senior Project Manager
Impact Compliance & Testing, Inc.
37660 Hills Tech Drive
Farmington Hills, MI 48331
(734) 357-8046
Tyler.Wilson@impactCandT.com

Ms. Sylwia Scott
Environmental Manager
US Ecology, Inc.
49350 N. I-94 Service Drive
Belleville, MI 48111
(734) 699-6294
sylwia.scott@usecology.com

2.0 Summary of Test Results and Operating Conditions

2.1 Purpose and Objective of the Tests

Conditions of ROP No. MI-ROP-M4782-2010b and PTI No. 108-12 require EQ – The Environmental Quality Company (MDWTP) to test FG_EAST for VOC DE, and VOC, hydrogen chloride (HCl), and SOC (methylene chloride, benzene, 1,1,2,2-tetrachloroethane, carbon tetrachloride, chloroform, trichloroethene, and tetrachloroethene) emissions. The RTO used to control FG_EAST was tested during this compliance test event.

2.2 Operating Conditions During the Compliance Tests

The testing was performed while the FG_EAST processes were operated at routine, maximum achievable operating conditions. US Ecology representatives provided process data in 15-minute increments for each test period.

Appendix 2 provides operating records provided by US Ecology representatives for the test periods. Appendix 2 also includes a chemical breakdown of the waste processed at the time of the stack test along with the average VOC content of all waste processed on July 12, 2022.

Process data is presented in Tables 2.1 and 6.1.

2.3 Summary of Air Pollutant Sampling Results

The FG_EAST RTO inlet and exhaust gas streams were each sampled for three (3) one-hour test periods to determine VOC DE during the compliance testing performed July 12, 2022.

In addition, the FG_EAST RTO exhaust gas stream was sampled for three (3) one-hour test periods to determine air pollutant (VOC, HCl, methylene chloride (DCM), benzene, 1,1,2,2-tetrachloroethane (TeCA), carbon tetrachloride (CCl_4), chloroform ($CHCl_3$), trichloroethene (TCE), and tetrachloroethene (PCE)) emissions during the compliance testing performed July 12, 2022.

Table 2.2 presents the average measured VOC DE and air pollutant emission rates for FG_EAST (average of the three test periods).

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

Table 2.1 Average process operating conditions during the test periods

Emission Unit	Air Flowrate (scfm)	Pressure Drop Across Baghouse (in. H_2O)	RTO Chamber Temperature (°F)	RTO Set Point Temperature (°F)	Wet Scrubber Liquid pH	Scrubber Flowrate (gpm)
FG_EAST	20,148	3.4	1,570	1,565	8.9	296

Table 2.2 Average measured VOC DE and air pollutant emission rates (three-test average)

Emission Unit	VOC DE	VOC	HCl	DCM	Benzene	TeCA	CCl4	CHCl3	TCE	PCE
	(%)	(lb/hr)	(lb/hr)	(lb/hr)	(lb/hr)	(lb/hr)	(lb/hr)	(lb/hr)	(lb/hr)	(lb/hr)
FG_EAST	97.3	0.65	0.01	0.01	0.01	0.01	0.02	0.01	0.01	0.03
Permit Limit	***95***	***22.85***	***28.4***	***14.92***	***0.71***	***0.16***	***0.28***	***3.02***	***4.52***	***12.7***

3.0 Source and Sampling Location Description

3.1 General Process Description

EQ – The Environmental Quality Company (MDWTP) is permitted to operate FG_EAST at its facility. FG_EAST consists of four (4) hazardous waste storage and treatment tanks (Tanks E, F, G, and H). Waste in Tank G was being treated at the time of the stack test. All other tanks had waste in storage or were empty during the testing.

3.2 Rated Capacities and Air Emission Controls

FG_EAST is equipped with three (3) pollution control devices. Emissions are first routed through a fabric filter baghouse dust collector for particulate matter (PM) removal. Emissions are then routed through a RTO for VOC reduction. Finally, emissions are routed through a sodium hydroxide packed bed wet scrubber to reduce acid gas emissions.

The baghouse is operated to maintain a pressure drop across the unit of between 1.5 and 8.0 inches of water column (in. H_2O).

The RTO is operated to maintain a minimum combustion chamber temperature of 1,500 °F.

The caustic packed bed wet scrubber is operated with a pH greater than 7.3 and liquid flow rate of between 225 and 350 gallons per minute (gpm).

The process is required to maintain an exhaust flowrate of between 19,500 standard cubic feet per minute (scfm) and 26,400 scfm through the building.

Regularly scheduled maintenance required by the preventative maintenance program was completed prior to the compliance test event.

3.3 Sampling Locations

The sample ports for the RTO inlet stack for FG_EAST are located in a horizontal section of the duct, with an inner diameter of 36.0 inches. The RTO inlet stack is equipped with two (2) sample ports, opposed 90°, that provide a sampling location at least 0.5 duct diameters upstream and at least 2.0 duct diameters downstream from any flow disturbance.

The sample ports for the RTO exhaust stack for FG_EAST are located in a vertical section of the duct, with an inner diameter of 48.0 inches. The RTO exhaust stack is equipped with two (2) sample ports, opposed 90°, that provide a sampling location at least 0.5 duct diameters upstream and at least 2.0 duct diameters downstream from any flow disturbance.

All sample port locations satisfy the USEPA Method 1 criteria for a representative sample location. Individual traverse points were determined in accordance with USEPA Method 1.

Appendix 1 provides a diagram of the emission test sampling locations with actual stack dimension measurements.

4.0 Sampling and Analytical Procedures

A Stack Test Protocol for the air emission testing was reviewed and approved by EGLE-AQD. 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	RTO inlet and exhaust gas velocity measurement locations were determined based on the physical stack arrangement and requirements in USEPA Method 1.
USEPA Method 2	RTO inlet and 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. RTO inlet gas dry molecular weight was determined as specified in Section 8.6 of Method 2.
USEPA Method 4	RTO inlet gas moisture content was determined using wet bulb / dry bulb temperature measurements. RTO exhaust gas moisture content was determined based on the water weight gain in chilled impingers.
USEPA Method 3A	RTO exhaust gas O_2 and CO_2 content was determined using paramagnetic and infrared instrumental analyzers, respectively.
USEPA Method 18	RTO exhaust gas SOC by coated charcoal adsorption tube.
USEPA Method 25A	RTO inlet and exhaust gas VOC (as total hydrocarbon, THC) concentration was determined using flame ionization analyzers (FIA) compared to a propane standard.
USEPA Method 26A	RTO exhaust gas HCl concentration by isokinetic sampling and analysis by ion chromatography.

4.2 RTO Inlet and Exhaust Gas Velocity Determination (USEPA Method 2)

The RTO inlet and exhaust stack gas velocities and volumetric flow rates were determined using USEPA Method 2 for each test period (once during each test period for the RTO inlet stack; throughout each test period (isokinetically) for the RTO exhaust stack). 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 periodically throughout the test periods to verify the integrity of the measurement system.

The absence of significant cyclonic flow at each sampling location 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 3 provides gas flowrate calculations and field data sheets.

4.3 RTO Inlet Gas Molecular Weight Determination (USEPA Method 2)

The RTO inlet gas consists of gas that has been exhausted from the treatment building through the baghouse (i.e., prior to the RTO combustion source). This gas is expected to have ambient air concentrations of O_2 and CO_2. CO_2 and O_2 content for the RTO inlet was determined using a dry molecular weight of 29.00 per Section 8.6 in USEPA Method 2.

4.4 RTO Exhaust Gas Molecular Weight Determination (USEPA Method 3A)

CO_2 and O_2 content in the RTO exhaust gas stream 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 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 RTO 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 4 provides O_2 and CO_2 calculation sheets. Raw instrument response data are provided in Appendix 5.

4.5 RTO Inlet and Exhaust Gas Moisture Content (USEPA Method 4)

Moisture content of the RTO inlet gas was determined using the USEPA Method 4 approximation technique consisting of wet bulb / dry bulb temperature measurements using a type-K thermocouple and calibrated digital pyrometer in conjunction with a psychometric chart.

Moisture content of the RTO exhaust gas was determined in accordance with USEPA Method 4 using the USEPA Method 26A chilled isokinetic impinger sampling train. Exhaust gas moisture content measurements were performed concurrently with the instrumental analyzer sampling periods. 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.

4.6 RTO Exhaust Gas SOC Measurements (USEPA Method 18)

SOC concentrations in the RTO exhaust gas stream were determined using coated charcoal adsorption tubes, with glass wool plugs at each end, to adsorb organic vapors.

Samples of the RTO exhaust gas were delivered directly (split for use of two (2) flowmeters to control sampling rate/volume) to the coated charcoal adsorption tubes (one (1) spiked and one (1) not spiked per test period) using the Teflon® heated sample line to prevent condensation. The samples to the coated charcoal adsorption tubes were not conditioned to remove moisture. Each test period was performed for at least 60-minutes at 0.5 liters per minute (L/min), per coated charcoal adsorption tube, with regards to SOC detection limits.

At the end of each one-hour test period, the coated charcoal adsorption tubes were recovered, chilled, and shipped to a third-party laboratory (Enthalpy Analytical in Durham, North Carolina) for SOC analysis in accordance with USEPA Method 18.

Measured SOC concentrations in the RTO exhaust gas and RTO exhaust gas flowrates were used to calculate SOC mass emission rates (pounds per hour, lb/hr) for comparison to applicable SOC emission rate permit limits.

Appendix 3 provides a field data sheet for SOC sampling. Appendix 4 provides SOC calculation sheets. Appendix 7 provides a copy of the SOC laboratory analytical report.

4.7 RTO Inlet and Exhaust Gas VOC Measurements (USEPA Method 25A)

VOC concentrations were determined by measuring the total hydrocarbon (THC) concentrations in the RTO Inlet and Exhaust gases. THC pollutant concentration was determined using Thermo Environmental Instruments, Inc. (TEI) 51 and 51c flame ionization analyzers (FIA). The concentration of THC in the sampled gas streams is determined relative to a propane standard using flame ionization detectors in accordance with USEPA Method 25A.

Samples of the RTO inlet and exhaust gases were delivered directly to the instrumental analyzers using the Teflon® heated sample lines to prevent condensation. The samples to the THC analyzers were 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 instruments were calibrated using mid-range calibration (propane) and zero gas to determine analyzer drift (described in Section 5.0 of this document).

Measured VOC concentrations in the RTO exhaust gas and RTO exhaust gas flowrates were used to calculate VOC mass emission rates (pounds per hour, lb/hr) for comparison to the VOC emission rate permit limit.

In addition, measured VOC concentrations in the RTO inlet and exhaust gases, and RTO inlet and exhaust gas flowrates, were used to calculate VOC DE for comparison to the VOC DE permit limit.

Appendix 4 provides VOC calculation sheets. Raw instrument response data for the THC analyzers is provided in Appendix 5.

4.8 RTO Exhaust Gas HCl Measurements (USEPA Method 26A)

HCl concentrations in the RTO exhaust gas were determined using USEPA Method 26A. A sample of the exhaust gas was withdrawn from the exhaust stack at an isokinetic rate using a borosilicate-glass nozzle, a glass lined probe, a Teflon filter, flexible Teflon line to the first impinger, and a set of four (4) Greenberg-Smith (GS) impingers. The gas sample was bubbled through chilled impingers containing 0.1 normality sulfuric acid (0.1N H_2SO_4). The NaOH portion of the USEPA Method 26A sampling train was not used since halogen (Cl_2) concentrations were not included in the analysis.

The wetted portions of the sampling train were constructed of glass. A Teflon probe union was used.

At the end of each one-hour test period, the impinger solutions and rinses were recovered and shipped to a third-party laboratory (Enthalpy Analytical in Durham, North Carolina) for HCl analysis by ion chromatography (IC) analysis in accordance with USEPA Method 26A.

Measured HCl concentrations in the RTO exhaust gas and RTO exhaust gas flowrates were used to calculate HCl mass emission rates (pounds per hour, lb/hr) for comparison to the HCl emission rate permit limit.

Appendix 4 provides HCl calculation sheets. Appendix 7 provides a copy of the HCl laboratory analytical report.

5.0 QA/QC Activities

5.1 Flow Measurement Equipment

Prior to arriving onsite (or onsite prior to beginning compliance testing), the instruments used during the source test to measure exhaust gas properties and velocity (pyrometer, Pitot tube, and scale) were calibrated to specifications in the sampling methods.

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 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 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 THC analyzers, in series at tee connections, which are installed between the sample probes and the particulate filters, through poppet check valves. After each one-hour test period, mid-range and zero gases were re-introduced in series at the tee connections in the sampling systems to check against the method's performance specifications for analyzer drift.

The instruments were calibrated with USEPA Protocol 1 certified concentrations of CO_2 and O_2 in nitrogen and zeroed using hydrocarbon free nitrogen. The THC (VOC) instruments were 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 RTO Exhaust Gas Stratification

A stratification test was performed for the RTO 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 the RTO exhaust stack indicated that the measured O_2 concentrations did not vary by more than 5% of the mean across the stack diameter. Therefore, the RTO exhaust gas was considered to be unstratified and the compliance test sampling was performed at a single sampling location within the RTO exhaust stack.

5.6 System Response Time

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.

Sampling periods did not commence until the sampling probe had been in place for at least twice the greatest system response time.

5.7 HCl Recovery and Analysis

All recovered USEPA Method 26A impinger solutions and rinses were stored in appropriate HDPE bottles with Teflon® lined caps. The liquid level on each bottle was marked with a permanent marker prior to shipment and the caps were securely closed with tape. Blanks (one (1) high-purity water blank and one (1) blank solution prepared using 0.1 N H_2SO_4 and high-purity water) were analyzed by the laboratory in addition to the sample train solutions. QA/QC procedures used by the laboratory are included in the final report provided by Enthalpy Analytical.

5.8 SOC Recovery and Analysis

All recovered USEPA Method 18 coated charcoal adsorption tubes were capped and stored in a chilled container. Spiked samples were analyzed by the laboratory in addition to the test samples. All coated charcoal adsorption tubes were chilled for the duration of this compliance testing project (from the time they initially left the laboratory until the time they were returned to and analyzed by the laboratory). QA/QC procedures used by the laboratory are included in the final report provided by Enthalpy Analytical.

5.9 Meter Box Calibrations

The dry gas meter sampling console used for moisture testing was calibrated prior to and after the testing program. This calibration uses the critical orifice calibration technique presented in USEPA Method 5. The metering console calibration exhibited no data outside the acceptable ranges 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 6 presents test equipment quality assurance data (instrument calibration and system bias check records, calibration gas certifications, interference test results, meter box calibration records, and field equipment calibration records).

6.0 Results

6.1 Test Results and Allowable Limits

Process operating data and air pollutant measurement results for each one-hour test period are presented in Table 6.1.

FG_EAST has the following allowable emission limits specified in ROP No. MI-ROP-M4782-2010b:

- 14.92 lb/hr for DCM;
- 0.71 lb/hr for benzene;
- 0.16 lb/hr for TeCA;
- 0.28 lb/hr for CCl4;
- 3.02 lb/hr for CHCl3;
- 4.52 lb/hr for TCE;
- 12.7 lb/hr for PCE;
- 28.4 lb/hr for HCl; and
- 22.85 lb/hr and 95% DE for VOC.

The measured air pollutant emission rates and VOC DE for FG_EAST are less than the allowable limits specified in ROP No. MI-ROP-M4782-2010b.

6.2 Variations from Normal Sampling Procedures or Operating Conditions

The testing for all pollutants was performed in accordance with USEPA methods and the approved Stack Test Protocol. The FG_EAST processes were operated at routine, maximum achievable operating conditions and no variations from normal operating conditions occurred during the test periods.

There was a significant delay in testing between Test No. 1 and Test No. 2 due to high wind speed gusts greater than the allowable (safe) wind speed limits described in the operator manual for the aerial lift used to perform compliance testing. Test No. 2 was started after the ICT aerial lift operator determined that the wind speeds were safe and reasonable. All three (3) tests were completed on July 12, 2022 (within a 36-hour period). This procedure was discussed with and approved by EGLE-AQD representatives Ms. Nazaret Sandoval and Mr. Andrew Riley.

The amount of trichloroethylene and 1,1,2,2-tetrachloroethane recovered from the spiked M18 tubes exceeded the method required limits of 70% - 130%. The recovered amount of trichloroethylene from the spiked tube was 137% of the expected amount. The recovered amount of 1,1,2,2-tetrachloroethane was 41.6% of the expected amount. The results for trichloroethylene and 1,1,2,2-tetrachloroethane are reported as measured, both compounds were not detected and the calculated emission rates (based on the non-detection) are three orders of magnitude less than the permitted emission limit.

Table 6.1 Measured exhaust gas conditions, VOC DE, and air pollutant emission rates for FG_EAST

Test No.	1	2	3	
Test date	7/12/2022	7/12/2022	7/12/2022	Three Test
Test period (24-hr clock)	1033-1151*	2025-2133*	2210-2315*	Average
Air flowrate (scfm)	20,190	20,094	20,162	20,148
Baghouse pressure drop (in. H_2O)	3.3	3.5	3.4	3.4
RTO chamber temperature (°F)	1,569	1,571	1,570	1,570
RTO set point temperature (°F)	1,565	1,565	1,565	1,565
Wet scrubber liquid pH	8.9	9.1	8.7	8.9
Scrubber flowrate (gpm)	295	296	296	296
RTO Inlet Gas Composition				
CO_2 content (% vol)	0.00	0.00	0.00	0.00
O_2 content (% vol)	20.9	20.9	20.9	20.9
Moisture (% vol)	3.8	3.0	2.9	3.2
RTO Inlet gas temperature (°F)	96.5	89.8	90.8	92.4
RTO Inlet gas flowrate (dscfm)	18,749	19,369	19,631	19,250
RTO Inlet gas flowrate (scfm)	19,485	19,962	20,220	19,889
RTO Exhaust Gas Composition				
CO_2 content (% vol)	0.38	0.51	0.50	0.46
O_2 content (% vol)	20.7	20.6	20.6	20.6
Moisture (% vol)	6.48	6.22	6.09	6.26
RTO Exhaust gas temperature (°F)	100	99.2	99.3	99.6
RTO Exhaust gas flowrate (dscfm)	19,726	19,515	17,186	18,809
RTO Exhaust gas flowrate (scfm)	21,092	20,810	18,300	20,067
Volatile Organic Compounds				
Inlet VOC (lb/hr)	13.8	35.4	38.0	29.0
Exhaust VOC (lb/hr)	0.58	0.71	0.66	0.65
VOC permit limit (lb/hr)	-	-	-	*22.85*
VOC DE (%)	95.8	98.0	98.3	97.3
VOC DE permit limit (%)	-	-	-	*95*
Hydrogen Chloride				
Sample volume (dscf)	33.9	33.5	30.1	32.5
Exhaust HCl conc. (µg)	124	333	96.5	185
Exhaust HCl conc. (ppmvd)	0.09	0.24	0.08	0.14
HCl emissions (lb/hr)	0.01	0.03	0.01	0.01
HCl permit limit (lb/hr)	-	-	-	*28.4*

Note: Each VOC and HCl test period includes one (1) sample port change at the midpoint of the test.
Each test period consisted of in-stack sampling for at least 60-minutes.

Table 6.1 Measured exhaust gas conditions, VOC DE, and air pollutant emission rates for FG_EAST [continued]

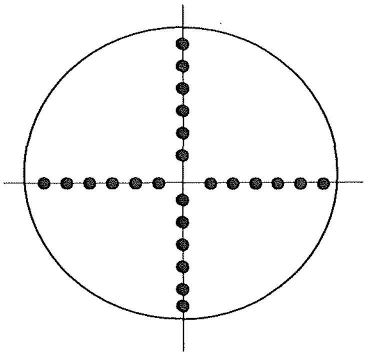
Test No. Test date Test period (24-hr clock)	1 7/12/2022 1033-1151*	2 7/12/2022 2025-2133*	3 7/12/2022 2210-2315*	Three Test Average
Methylene chloride				
Exhaust DCM conc. (µg)	2.95	2.95	2.95	2.95
Exhaust DCM conc. (ppmv)	0.02	0.02	0.03	0.02
DCM emissions (lb/hr)	0.006	0.007	0.006	0.006
DCM permit limit (lb/hr)	-	-	-	*14.92*
Benzene				
Exhaust benzene conc. (µg)	4.84	4.84	4.84	4.84
Exhaust benzene conc. (ppmv)	0.04	0.04	0.04	0.04
Benzene emissions (lb/hr)	0.009	0.010	0.009	0.010
Benzene permit limit (lb/hr)	-	-	-	*0.71*
1,1,2,2-tetrachloroethane				
Exhaust TeCA conc. (µg)	2.37	2.37	2.37	2.37
Exhaust TeCA conc. (ppmv)	0.02	0.02	0.02	0.02
TeCA emissions (lb/hr)	0.009	0.011	0.010	0.010
TeCA permit limit (lb/hr)	-	-	-	*0.16*
Carbon tetrachloride				
Exhaust CCl4 conc. (µg)	4.76	4.76	4.76	4.76
Exhaust CCl4 conc. (ppmv)	0.03	0.04	0.04	0.04
CCl4 emissions (lb/hr)	0.017	0.020	0.018	0.018
CCl4 permit limit (lb/hr)	-	-	-	*0.28*
Chloroform				
Exhaust CHCl3 conc. (µg)	2.50	2.50	2.50	2.50
Exhaust CHCl3 conc. (ppmv)	0.02	0.02	0.02	0.02
CHCl3 emissions (lb/hr)	0.007	0.008	0.007	0.008
CHCl3 permit limit (lb/hr)	-	-	-	*3.02*
Trichloroethene				
Exhaust TCE conc. (µg)	2.55	2.55	2.55	2.55
Exhaust TCE conc. (ppmv)	0.02	0.02	0.02	0.02
TCE emissions (lb/hr)	0.008	0.009	0.008	0.008
TCE permit limit (lb/hr)	-	-	-	*4.52*
Tetrachloroethene				
Exhaust PCE conc. (µg)	2.32	12.5	2.32	5.71
Exhaust PCE conc. (ppmv)	0.02	0.10	0.02	0.05
PCE emissions (lb/hr)	0.009	0.056	0.010	0.025
PCE permit limit (lb/hr)	-	-	-	*12.7*

Note: For the seven (7) SOC (DCM, benzene, TeCA, CCl4, CHCl3, TCE, and PCE), sampling continued during the sample port change because that sample probe stayed in the exhaust stack (did not change ports). The SOC were sampled at a flowrate of 0.5 L/min.

APPENDIX 1

- Sample Port Diagrams

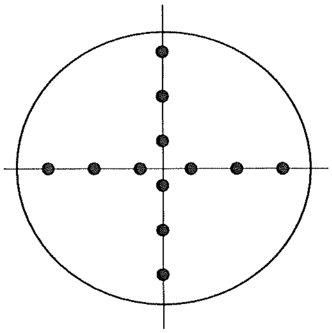
Inlet Duct Dia. = 36"



Velocity sample locations as measured from stack wall (in.)

1	1.00
2	2.41
3	4.25
4	6.37
5	9.00
6	12.82
7	23.18
8	27.00
9	29.63
10	31.75
11	33.59
12	35.00

Outlet Duct Dia. = 48"



Velocity sample locations as measured from stack wall (in.)

1	2.11
2	7.01
3	14.21
4	33.79
5	40.99
6	45.89

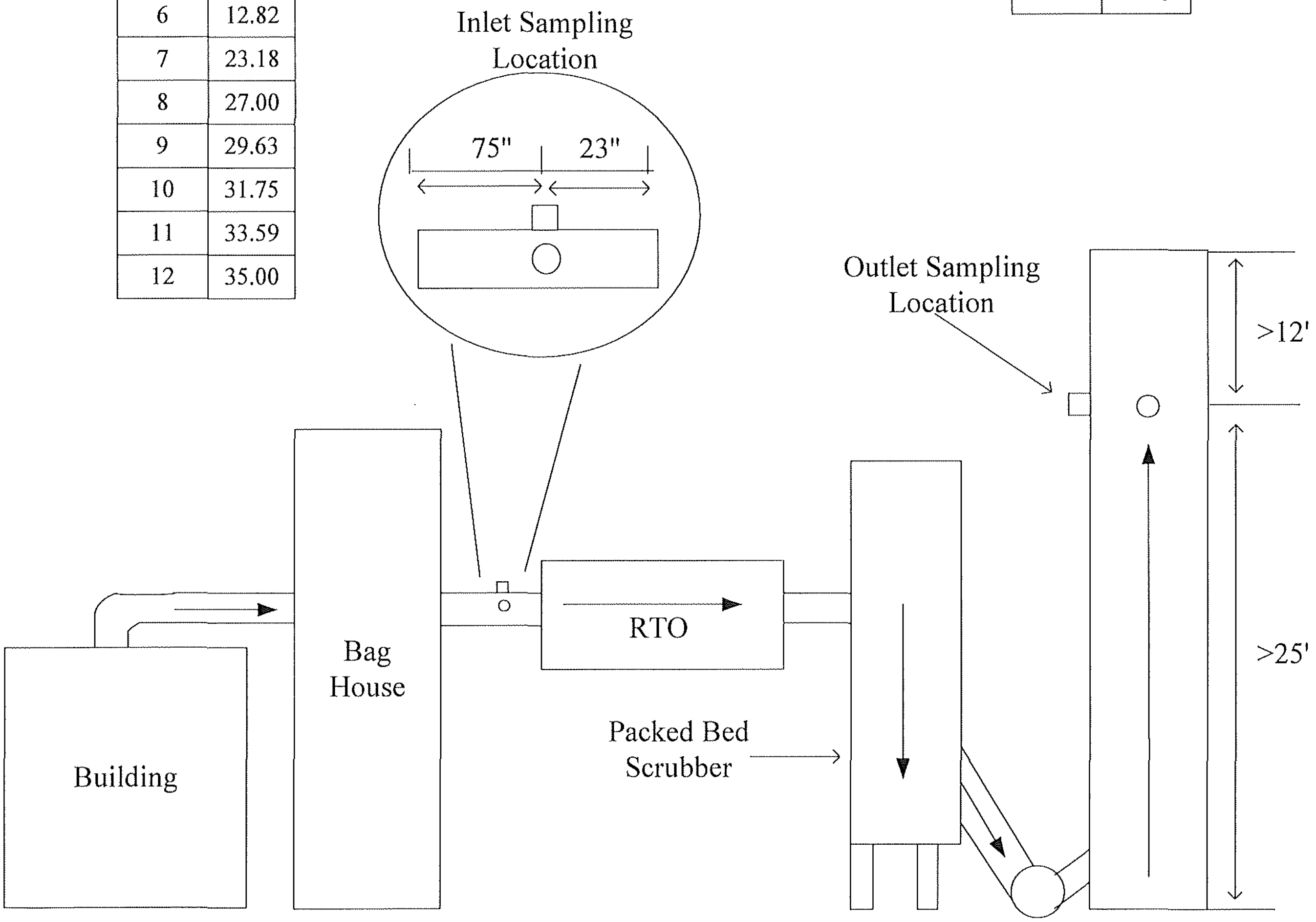


Figure 1 **FG_EAST RTO Inlet / Exhaust**	8/22/2022	**EQ-The Environmental Quality Company (MDWTP)** **Belleville, Michigan**		
Sampling locations for testing		Scale None	Sheet 1 of 1	IMPACT COMPLIANCE & TESTING