

Derenzo and Associates, Inc.

Environmental Consultants

February 13, 2012

Mr. Syed Arif, P.E.
Emissions Monitoring Section Administrator
Florida Department of Environmental Protection
Bureau of Air Regulation
2600 Blair Stone Rd.
Mail Station 5510
Tallahassee, FL 32301

RECEIVED

FEB 20 2012

DIVISION OF AIR
RESOURCE MANAGEMENT

Subject: Stack Test Protocol for the Verification of Carbon Monoxide, Nitrogen Oxides, Hydrogen Chloride, Volatile Organic Compounds, and Opacity Emissions from a Landfill Gas-Fueled Internal Combustion Engine.

Dear Mr. Arif:

Derenzo and Associates, Inc. is forwarding a test plan for the verification of nitrogen oxides, carbon monoxide, hydrogen chloride, volatile organic compounds and opacity emissions from one of six (6) CAT Model No. G3520C 2,233 brake-horsepower landfill gas-fueled engines for the generation of up to a total of 9.6 megawatts (nominal rating) of electricity.

Testing is being conducted as required by Florida Department of Environmental Protection Permit PSD-FL-378C at the Brevard Energy, LLC-Central Disposal facility on March 26, 2012 by Derenzo and Associates Air Quality Services.

Contact information is provided in the enclosed Stack Test Protocol documentation, should you have any questions or require additional information.

Sincerely,

DERENZO AND ASSOCIATES, INC.



Michael Brack
Field Services Manager

c: Mr. Richard DiGia- President-Chief Executive Officer, Seminole Energy, LLC
Mr. Michael Laframboise – Vice President of Operations, Landfill Energy Systems
Ms. Wanda Parker-Garvin - Environmental Manager, FDEP

Enclosures

STACK TEST PROTOCOL

Report Title: Stack Test Protocol for the Verification of Carbon Monoxide, Nitrogen Oxides, Volatile Organic Compounds, Hydrogen Chloride, Sulfur Dioxide and Opacity Emissions from a Landfill Gas-Fueled Internal Combustion Engine

Submittal Date: February 13, 2012

Test Date(s): March 26, 2012

Facility Information	
Name:	Brevard Energy, LLC
Street Address:	2250 Adamson Rd.
City, County:	Cocoa, Brevard
Phone:	321-633-6789

Facility Permit Information			
DEP File No.:	0090069-010-AV	Permit No.:	PSD-FL-378C

Testing Contractor	
Company:	Derenzo and Associates, Inc.
Mailing Address:	39395 Schoolcraft Rd. Livonia, MI 48150
Phone:	(734) 464-3880
Project No.:	1201047

**STACK TEST PROTOCOL
FOR
AIR POLLUTANT EMISSIONS
FROM ONE
IC ENGINE - GENERATOR SET
OPERATED BY
BREVARD ENERGY, L.L.C.**

SCHEDULED TEST DATE: March 26, 2012

Brevard Energy, L.L.C. (Brevard Energy), operates six (6) Caterpillar (CAT) Model No. G3520C, 2,233 brake-horsepower landfill gas fired engines for the generation of up to a total of 9.6 megawatts (nominal rating) of electricity.

Installation and operation of the IC engines are permitted by the Florida Department of Environmental Protection (DEP), Air Construction Permit 0090068-010-AV. Permit No. PSD-FL-378C requires that annual performance tests be completed on one (1) of the six (6) IC engines, not previously tested, to verify the emission rates of carbon monoxide (CO), nitrogen oxides (NO_x), volatile organic compounds (VOC), hydrogen chloride (HCl), and opacity. Sulfur Dioxide (SO₂) emission factor determinations will be conducted by obtaining triplicate integrated samples of the engine fuel gas with subsequent analysis for sulfur bearing compounds.

The compliance test will consist of three (3) one-hour test periods, in which CO, NO_x, HCl, VOC, oxygen (O₂), carbon dioxide (CO₂) concentrations, and moisture content will be determined for the selected IC engine exhaust gas stream. One 60-minute opacity run will run concurrently with the isokinetic and instrumental analyzer sampling of the engine exhaust.

The compliance testing will be performed by Derenzo and Associates, Inc., a Michigan-based environmental consulting and testing company.

1. IDENTIFICATION AND DESCRIPTION OF THE SOURCE TO BE TESTED

1a. Contact Person(s) for Source and Test Plan Information

All questions concerning the source and test plan should be addressed to:

Mr. Damian Schmitt
Operations Manager
Brevard Energy LLC
46280 Dylan Drive, Suite 200
Novi, Mi 48377
(248) 380-3920

Mr. Michael Brack
Field Services Manager
Derenzo and Associates, Inc.
39395 Schoolcraft Rd.
Livonia, MI 48150
(734) 464-3880

1b. Identification and Description of Source to be Tested

Brevard Energy operates six CAT Model No. G3520C engines (identified as Emission Unit Nos.: 004-009). These engines are fueled with methane-rich gas, which is generated at the Central Disposal Facility in Cocoa, Fl, to power base load electricity generator operations. The FDEP Air Operation Permit requires the facility to perform annual testing on a different engine each year. Currently EU-006, EU-007, EU008, and EU -009 have been tested for compliance determination. The 2012 annual test event will be performed on one of the remaining Emission Units (EU-004 or EU-008).

1c. Type and Typical Quantity of Raw and Finished Materials Used in each Process

The IC engines are operated at base load conditions (i.e., 100% of design capacity). The amount of landfill gas that is used by each engine is dependent on its methane content. The upper and lower fuel use rate of each IC engine is approximately 580 - 440 cubic feet per minute (cfm).

1d. Description of Cyclical or Batch Operations

The IC engine operating conditions will be continuous and relatively constant for the entire time that base load electricity generation occurs (i.e., 100 percent of design capacity). The total number of IC engines that are operated at the facility may vary on a daily basis based on scheduled and unscheduled maintenance and repair activities.

1e. Basic Operating Parameters Used to Regulate the Process

Basic parameters that regulate engine operations are the combustion chamber temperatures and methane content of the landfill gas fuel. The air-to-fuel ratio is the only variable for the CAT Model G3520C engine.

1f. Rated Capacity of the Processes

The CAT Model No. G3520C engine will be tested while operations occur at (or near $\pm 10\%$ of design capacity) the following power generation and heat input rates:

- Engine Power: 2,233 brake horsepower
- Electricity Generation: 1,600 kilowatts
- Heat Input (HHV): 16.5 MMBtu/hr

1g. Permit Limits

Parameter	g/bhp-hr	lb/hr	lb/MMscf	TPY
CO	3.50	17.23	-	75.3
NO _x	0.60	2.95	-	12.94
VOC	0.28	1.37	-	5.99
HCl	-	-	10.9	1.66
SO ₂	-	2.64	-	11.55

2. DESCRIPTION OF THE CONTROL EQUIPMENT

2a. Type of Control Device

The CAT Model No. G3520C engines have no add on air pollution control equipment, emissions from each engine are exhausted directly to the atmosphere.

3. PERMIT NO.

Brevard Energy operates under Permit No. PSD-FL-378C issued by the Florida DEP.

4. POLLUTANTS TO BE MEASURED

One IC engine will be tested to verify the concentrations of CO, NO_x, VOC, and HCl, in the exhaust stack. Opacity observations will also be conducted as part of the compliance demonstration. Volumetric flowrate will be measured to calculate the CO, NO_x, VOC, and HCl mass emission rate (pounds per hour). Kilowatt output values will be recorded during the emissions testing to calculate the grams per brake horsepower-hour (g/bhp-hr) emission rates for NO_x, CO, and VOC.

5. DESCRIPTION OF SAMPLING TRAINS

The following table presents test methods that will be used to measure the specified engine pollutant emission and exhaust parameter:

Analyte	Sampling Methodology	Analytical Methodology
Velocity traverses	USEPA Method 1	Data Reduction
Volumetric flow rate	USEPA Method 2	Data Reduction
Oxygen and carbon dioxide	USEPA Method 3A	Zirconium Ion & NDIR
Moisture	USEPA Method 4	Gravimetric
Nitrogen oxides	USEPA Method 7E	Chemiluminescence
Opacity	USEPA Method 9	Visual – Certified Reader
Carbon monoxide	USEPA Method 10	NDIR
Sulfur Dioxide	USEPA Method 19	ASTM D-5504 and ASTM D-3588
HCl Emissions	USEPA Method 26A	Ion Chromatography
Non-Methane Hydrocarbons (VOC)	USEPA Method Alt 078	GC/FID instrumental analyzer
Chlorinated Compounds	USEPA Method TO15	GC/MS

Notes: NDIR denotes non-dispersive infrared; FIA denotes flame ionization analyzer;
GC denotes gas chromatography; MS denotes Mass Spectroscopy

Derenzo and Associates, Inc. will perform and complete the specified engine emission pollutant and exhaust parameter measurements in accordance with the following United States Environmental Protection Agency (USEPA) reference test methods:

- USEPA Methods 1 and 2 – Determination of sampling locations, traverse points, and stack gas velocity and flow rates.
- USEPA Method 3A – Determination of oxygen and carbon dioxide concentrations in emissions from stationary sources (instrumental analyzer procedure).
- USEPA Method 4 – Determination of moisture content in stack gases.
- USEPA Method 7E – Determination of nitrogen oxides emissions from stationary source (instrumental analyzer procedure).
- USEPA Method 9 – Visual determination of the Opacity of Emissions from Stationary Sources.
- USEPA Method 10 – Gas analysis for the determination of carbon monoxide in emissions from stationary sources (instrumental analyzer procedure);
- USEPA Method 19 – Determination of sulfur dioxide removal efficiency and particulate matter, sulfur dioxide, and nitrogen oxide emission rates.
- USEPA Method 26A – Determination of Hydrogen Halide and Halogen Emissions from Stationary Sources – Isokinetic Method.
- USEPA ALT-078; use of the Thermo Environmental Instruments Model 55C analyzer for measuring VOC (as NMHC) in IC engine exhaust gas.
- USEPA Method TO-15 – Determination of chlorine containing compound concentration using gas chromatography / mass spectrometry.

In addition to the sampling and analytical methods presented in the preceding text, the following method will be used as part of the engine emissions performance tests:

- USEPA Method 205, “Verification of Dilution Systems for Field Instrument Calibrations,” will be used to verify dilution system linearity.

6. DETAILED SAMPLING AND ANALYSIS PROCEDURES

The compliance test will consist of three (3) one-hour test periods, in which CO, NO_x, VOC, CH₄, HCl, O₂ and CO₂ concentration, and moisture content will be determined for the IC engine exhaust gas stream. One (1) 60-minute opacity run will run concurrently with the isokinetic and instrumental analyzer sampling of the engine exhaust. The concentration and exhaust gas flowrate measurements will be performed in the IC engine vertical exhaust stack.

Landfill gas samples shall also be collected during the performance test. During the HCl testing, landfill gas shall be collected into SUMMA canisters for determination of landfill gas chlorine content.

Attachment A provides a diagram of the proposed sampling locations. Attachment B presents information of a typical extractive gas sampling and conditioning system. Attachment C provides a diagram of the extractive gas system. The actual system used during the tests may vary slightly from that depicted in the diagram. Attachment D provides diagrams of the isokinetic sampling systems (USEPA Method 26A).

6.1 Velocity traverse locations, measurement of stack gas velocity (USEPA Method 1 and 2)

Prior to commencing the engine emission performance test field measurements, stack gas sampling locations (i.e., pollutant concentration and velocity pressure measurement locations) will be determined in accordance with procedures specified in USEPA Method 1.

To determine hourly pollutant emission rates, the stack gas velocity and volumetric flowrate will be measured using USEPA Method 2.

The exhaust gas velocity (pressure) measurements will be conducted at each traverse point of the stack with an S-type Pitot tube and red-oil manometer. Temperature measurements will be conducted at each traverse point using a K-type thermocouple and a calibrated digital thermometer. Once the molecular weight and moisture content of the engine exhaust gas is obtained, the stack exhaust volumetric flowrate will be determined.

Prior to performing the initial engine exhaust stack velocity traverse, and periodically throughout the test program, the S-type Pitot tube and manometer lines will be leak-checked at the test site. This check will be made by blowing into the impact opening of the Pitot tube until 3 or more inches of water are recorded on the manometer, then capping the impact opening and holding it closed for 15 seconds to ensure that it is leak free. The static pressure side of the Pitot tube will be leak-checked using the same procedure.

6.2 Measurement of carbon dioxide and oxygen concentrations (USEPA Method 3A)

Engine exhaust CO₂ and O₂ concentration and pollutant emission measurements will be performed concurrently during each test run sample period using an instrumental analyzer in accordance with Method 3A. A non-dispersive infrared (NDIR) gas analyzer will be used to measure the CO₂ concentrations of the engine exhaust gas. A zirconia ion gas analyzer will be used to measure the O₂ concentrations of the engine exhaust gas.

Attachment B provides information of a typical extractive gas sampling and conditioning system that will be used to deliver engine exhaust gas samples to the Method 3A instruments.

Engine exhaust CO₂ concentrations are expected to be approximately 12.0% by volume and 8.0% by volume for O₂. Therefore, the Method 3A instrument spans will be set to 15% by volume for CO₂ concentration measurements, and 25% by volume for O₂ concentration measurements.

6.3 Determination of moisture content via non-isokinetic sampling (USEPA Method 4)

Moisture content will be determined in accordance with USEPA Method 4 using a chilled impinger sampling train as a component of the USEPA Method 26A sampling procedures (i.e., not as a separate measurement train), which will be performed concurrently with the instrumental analyzer sampling methodologies. A gas sample will be continually extracted at a calculated rate from the source, where moisture will be removed from the sampled gas stream using impingers that are submersed in an ice bath, and determined gravimetrically.

6.4 Measurement of nitrogen oxides via instrumental analyzers (USEPA Method 7E)

Engine exhaust NO_x concentrations will be determined during each test run sample period using a chemiluminescence analyzer in accordance with USEPA Method 7E.

Samples of the engine exhaust gas will be delivered to the instrument analyzer using an extractive gas sampling system that prevents condensation or contamination of the sample. The exhaust gas samples will be conditioned (i.e., dried) prior to being introduced to the instrument analyzer. Therefore, NO_x measurements correspond to standard conditions with moisture correction (dry basis).

The specified instrument analyzer will be calibrated using certified NO_x concentrations in nitrogen.

The engine exhaust NO_x concentration is expected to be approximately 80-110 ppm (by volume). This value is based on the results of NO_x concentration measurements that have been performed on identical engine exhausts. Therefore, the instrument analyzer NO_x measurement range will be set to 200 ppm (by volume).

Attachment B provides information of a typical extractive gas sampling and conditioning system that will be used to deliver engine exhaust gas samples to the Method 7E instruments.

6.5 Measurement of carbon monoxide via instrumental analyzers (USEPA Method 10)

Engine exhaust CO concentrations will be determined during each test run sample period using a NDIR gas analyzer in accordance with USEPA Method 10 for direct measurement of CO concentration in exhaust gases.

Samples of the engine exhaust gas will be continuously delivered to the instrument analyzer using an extractive gas sampling system that prevents condensation and contamination of the sample. The engine exhaust gas samples will be conditioned (i.e., dried) prior to being introduced to the instrument analyzer. Therefore, CO measurements correspond to standard conditions with moisture correction (dry basis).

The instrument analyzer will be calibrated using certified CO concentrations.

The engine exhaust CO concentration is expected to be approximately 600 ppm (by volume). This value is based on the results of CO concentration measurements that have been performed on identical engine exhausts. Therefore, the instrument analyzer CO measurement range will be set to 1,000 ppm (by volume). The specific measurement span will be dependent upon the high-level calibration gas employed in the field (currently anticipated to be 981.2 ppmv).

Attachment B provides information of a typical extractive gas sampling and conditioning system that will be used to deliver engine exhaust gas samples to the Method 10 instruments.

6.6 Measurement of HCl concentrations (USEPA Method 26A)

Hydrogen chloride emissions will be determined isokinetically by drawing a sample of the engine exhaust gas through a glass nozzle, a glass lined probe, a quartz filter and into a solution of 0.1 Normality sulfuric acid (0.1 N H₂SO₄). The 0.1 N H₂SO₄ will be quantitatively recovered for analysis by Ion Chromatography. The NaOH fraction of the sampling train may be replaced with a dry knockout impinger, as chloride concentrations are not to be determined.

Attachment B provides information of the isokinetic sampling train that will be used to obtain HCl concentrations in the engine exhaust gas. Attachment D presents a typical sampling train diagram for Method 26A.

6.7 Opacity Determinations (USEPA Method 9)

USEPA Method 9 procedures will be used to evaluate the opacity of the outlet exhaust for one 60-minute run concurrent with isokinetic and instrumental analyzer sampling of the engine exhaust. In accordance with USEPA Method 9, the qualified observer will stand at a distance sufficient to provide a clear view of the emissions with the sun oriented in the 140° sector to his/her back. As much as possible, the line of vision will be approximately perpendicular to the plume direction.

Opacity observations will be made at the point of greatest opacity in the portion of the plume where condensed water vapor is not present. Observations will be made at 15-second intervals for the duration of the 60-minute testing period.

All visible emissions determinations will be performed by a qualified observer in accordance with USEPA Method 9, Section 3.

6.8 Sulfur Dioxide Measurements (USEPA 19)

Sulfur dioxide emissions will be determined by obtaining three separate integrated samples of the fuel used in the representative IC engine. The samples will be collected into a Tedlar bag and will be analyzed for sulfur bearing compounds and ultimate fuel analysis using ASTM D-5504 and ASTM D-3588, respectively, by Columbia Analytical Services, Simi Valley, California,

The SO₂ emission rate will be calculated by totaling the available sulfur atoms in the fuel gas (as lb/MMscf) and incorporating the ultimate analysis (%C/wt) and fuel usage rate (as scfm) from the test period. The resultant emission rate will be reported in units of lb/hr.

6.9 Measurement of VOC concentrations (USEPA Alt 078)

VOC as non-methane hydrocarbon (NMHC or NMOC) concentrations in the IC engine exhaust will be determined using a Thermo Environmental Instruments, Inc. (TEI), Model 55C Methane- NMHC flame ionization analyzer in accordance with USEPA Alternate Method (ALT) 078 for direct measurement of NMHC concentrations in exhaust gases for IC engines.

The TEI 55C is an automated batch analyzer that repeatedly collects and analyzes samples of the exhaust gas stream that are drawn into the instrument by the internal sampling pump. The sampled gas is separated by an internal gas chromatography (GC) column into methane and non-methane fractions and each fraction is analyzed separately using a flame ionization detector (FID), in accordance with USEPA Method 25A.

Samples of the exhaust gas will be delivered to the instrument analyzer using an extractive gas sampling system that prevents condensation or contamination of the sample. The exhaust gas samples will be delivered directly to the instrument analyzer. Therefore, VOC measurements correspond to standard conditions with no moisture correction (wet basis).

The specified instrument analyzer will be calibrated using certified propane concentrations in hydrocarbon-free air.

Based on previous IC engine testing, the VOC concentrations measured with the TEI Model 55C analyzer are expected to be approximately 10 to 40 ppmv for the exhaust, measured as propane.

Attachment B provides information of a typical extractive gas sampling and conditioning system that will be used to deliver engine exhaust gas samples to the TEI Model 55C analyzer.

Attachment D also provides the approval letter from the USEPA for the use of Test Method ALT-078 (TEI Model 55C Analyzer) for IC engines.

6.10 Determination of chlorine containing compound concentration (USEPA Method TO-15)

A representative sample of inlet landfill gas will be collected in evacuated stainless steel cylinders from the LFG common header at a location after the discharge side of the gas blower. The sampling system consists of a Teflon® connective tubing, a 7-micron stainless steel particulate filter, and an evacuated stainless steel sample cylinder.

Prior to shipment to the sampling site, the stainless steel sample cylinder will be 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. If no change in vacuum is observed on a mercury manometer or vacuum gauge, each tank is then considered to have an acceptable pre-test leak check. The gas sample will be drawn from the LFG header until the sampling cylinder absolute pressure was slightly below atmospheric pressure. Final cylinder pressure (absolute pressure or vacuum) will be recorded at the sampling site prior to shipment to the laboratory. The cylinder pressure/vacuum will be verified by laboratory personnel upon receipt to confirm sample container integrity.

The gas samples will be shipped to Air Toxics, Ltd. (Folsom, California) and analyzed for specific chlorinated hydrocarbons, according to the procedures specified in USPEA Compendium Method TO-15.

7. NUMBER AND LENGTH OF SAMPLING RUNS

The emission performance tests will consist of three (3), one-hour test runs for CO, NO_x, VOC, HCl, O₂, and CO₂ concentrations and moisture content measurement on the exhaust of one (1) CAT Model No. G3520C IC engine. A single, 60-minute opacity observation period will be performed for the compliance demonstration.

8. DIMENSIONED SKETCHES OF SAMPLING LOCATIONS

The following table presents information on the engine exhaust stack sampling location. Actual measurements for the specified stack parameters will be verified prior to conducting the engine performance tests and reported with the results.

Sampling Location	Nominal Stack Dia. (in.)	Up Stream/ Down Stream Distances (dia)		Discharge (orientation)	Rain Cap (presence)
Engine Exhaust	15.5	3.3	3.4	Vertical	None

9. ESTIMATED FLUE GAS CONDITIONS

Sampling Location	Temperature (°F)	Expected O ₂ Conc. (%)	Expected CO ₂ Conc. (%)	Expected Moisture (%)	Expected Flowrate (dscfm)
Engine Exhaust	930	8.0	12.0	13.0	4,500

10. PROJECTED PROCESS OPERATING CONDITIONS

For the compliance demonstration, the IC engine will be operated at base load conditions (i.e., 100% of design capacity). The generator that is powered by the IC engine is expected to produce approximately 1600 kW of electricity (+/- 10%).

11. PROCESS OR CONTROL EQUIPMENT DATA TO BE COLLECTED

For each compliance test-period, Brevard Energy will monitor and record the average hourly kilowatt output of the generator connected to the IC engine that is being tested. Fuel usage values are required to calculate pounds per million standard cubic feet (lb/MMscf) emission rates for HCl. The facility utilizes a calibrated gas usage metering device for the entire facility; however, individual engine fuel usage metering devices are not installed at the facility. The fuel usage values for the engine tested will be calculated based on the total facility-wide fuel used during the HCl compliance testing, divided by the number of engines operating during the test times.

12. CHAIN OF CUSTODY PROCEDURES

Chain-of-Custody documentation for laboratory analysis will be incorporated as part of the compliance report.

13. FIELD QA/QC PROCEDURES

13.1 Instrument Calibration and System Bias Checks

At the beginning of each test day, three-point instrument analyzer calibrations will be initially performed by injecting calibration gas directly into the inlet sample port for each instrument analyzer. System bias checks will be performed prior to, and at the conclusion of, each test run sample period by introducing the appropriate 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 verifying the instrument analyzer response against the initial instrument calibration readings.

The instrument analyzers will be calibrated with USEPA Protocol 1 certified CO₂, O₂, Propane, NO_x and CO concentrations in nitrogen and/or hydrocarbon free air and zeroed using nitrogen or hydrocarbon free air.

13.2 NO₂ – NO Converter Test

The NO₂ – NO conversion efficiency of the TEI Model 42c instrumental analyzer will be verified prior to the commencement of the performance tests. A USEPA Protocol 1 certified NO₂ calibration gas will be used to verify the efficiency of the NO₂ – NO converter. The instrument analyzer NO₂ – NO converter uses a catalyst at high temperatures to convert the NO₂ to NO for measurement. The conversion efficiency of the instrument analyzer will be deemed acceptable if the calculated NO₂ – NO conversion efficiency is greater than or equal to 90%.

13.3 Sampling System Response Time Determination

The response time of the sampling system will be determined prior to the commencement of the engine performance tests 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 will be determined using a stopwatch.

13.4 Determination of Exhaust Gas Stratification

Exhaust gas stratification measurements will be performed on the engine exhaust stack prior to the commencement of the performance tests. A stainless steel sample probe will be positioned at 3 pre-selected measurement points within the stack diameter. Pollutant concentration data will be recorded at each sample point for a minimum of twice the maximum system response time.

14. LABORATORY QA/QC PROCEDURES

Field blanks, as required by Method 26A, will be obtained and treated identical to the test samples.

15. TESTING PERSONNEL

The personnel conducting the engine performance tests will be selected from the following qualified Derenzo and Associates, Inc. employees.

1. Michael Brack, Field Services Manager
2. Andrew Rusnak, Environmental Engineer
3. Charles Scamp, Environmental Consultant
4. Tyler Wilson, Environmental Consultant
5. Daniel Wilson, Field Technician
6. Robert Bingham, Field Technician

Test Protocol Prepared By:



Daniel Wilson
Field Technician

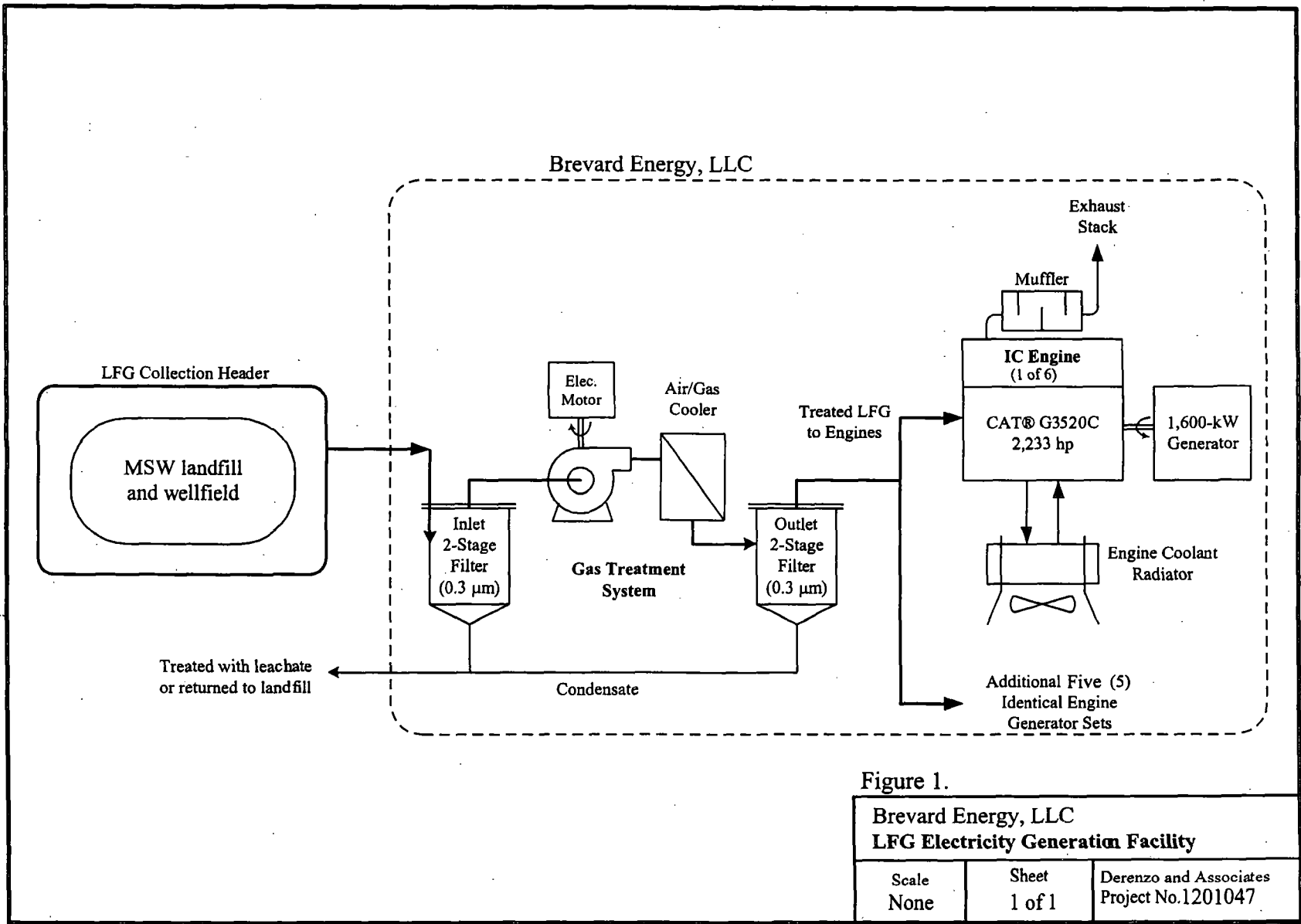
Test Protocol Reviewed By:



Michael Brack
Field Services Manager

ATTACHMENT A

- Brevard Energy Landfill Gas Electricity Generation Facility Process Flow
- Brevard Energy General Engine Operation Flow
- CAT Model G3520C Engine Exhaust Sampling Locations



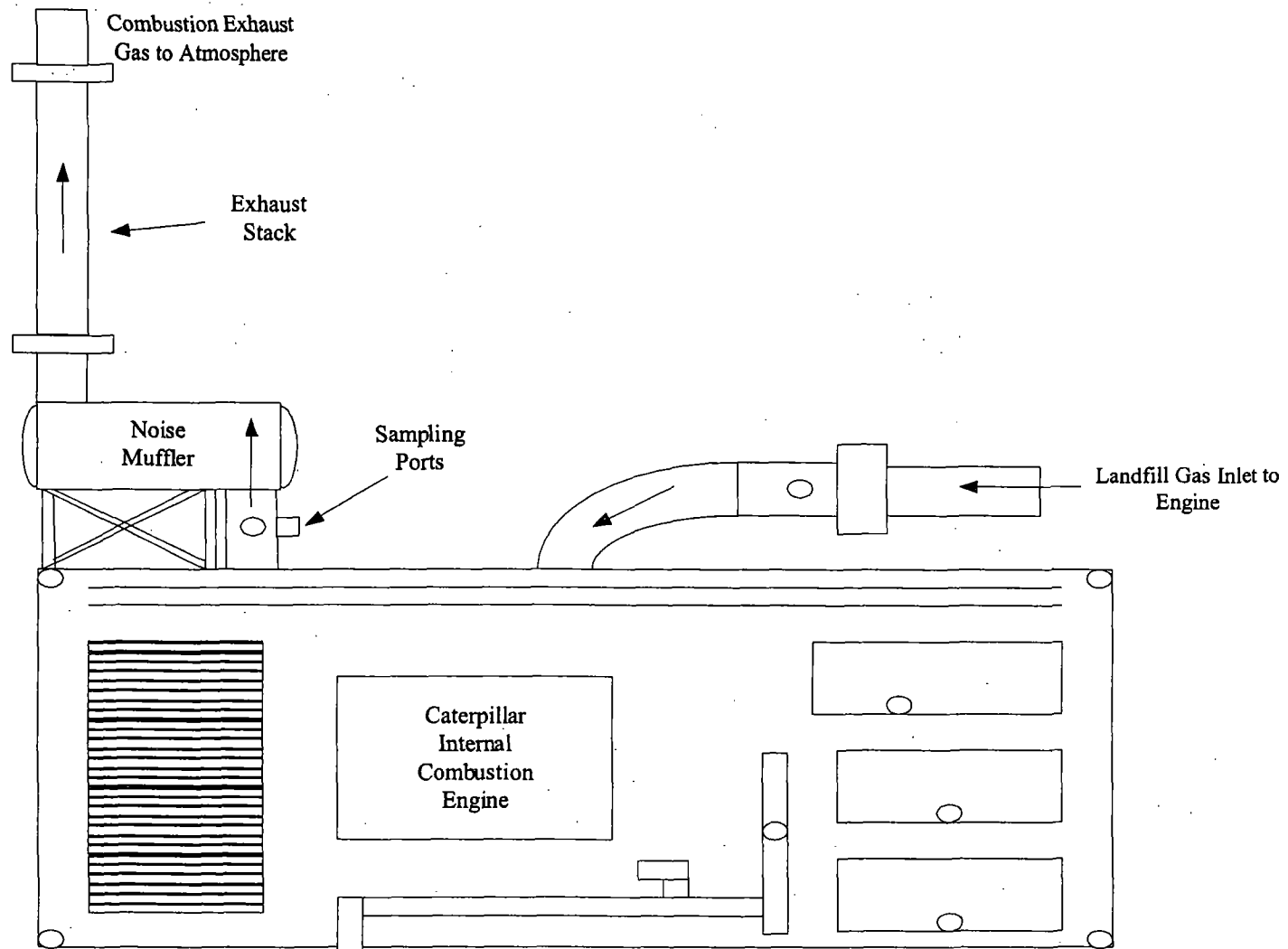
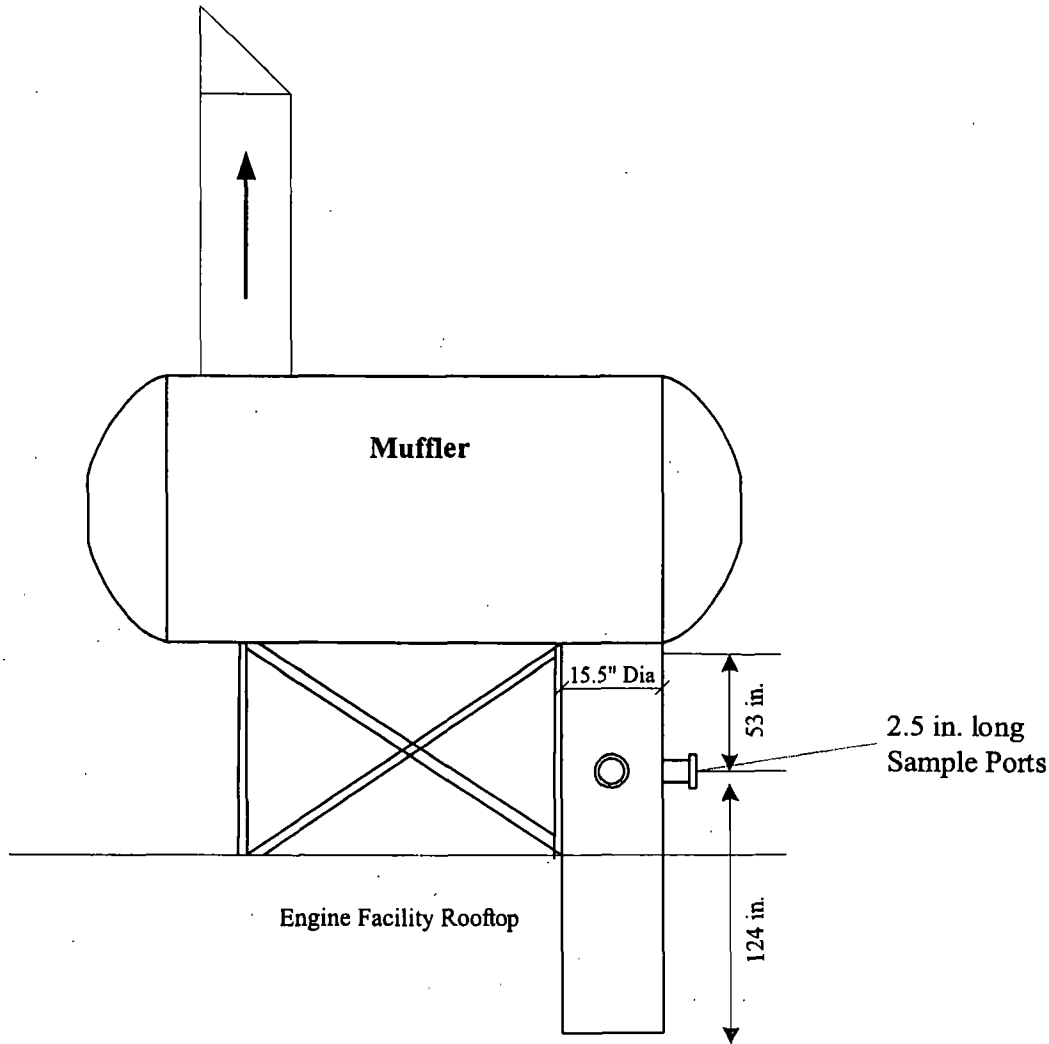


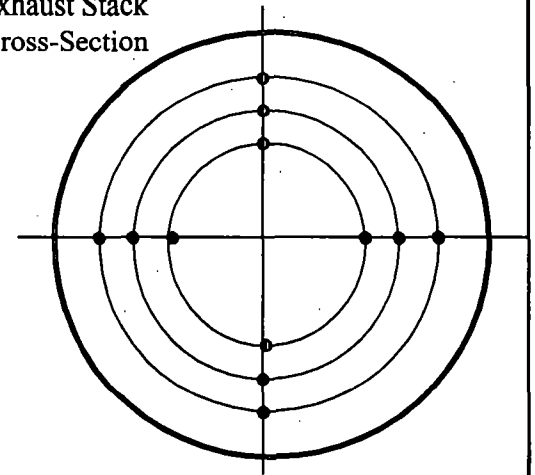
Figure 2

2/7/2012	Brevard Energy, LLC General Engine Operation Flow Diagram		
	Scale None	Sheet 1 of 1	Derenzo and Associates Project No. 1201047

Engine Exhausts



Exhaust Stack Cross-Section



Velocity sample locations as measured from sample port opening

Sample Port	
Pt. #	in.
1	3.18
2	4.76
3	7.09
4	13.41
5	15.74
6	17.32

Figure 3

**Brevard Energy, LLC
Exhaust Sample Locations**

Scale None	Sheet 1 of 1	Derenzo and Associates Project No. 1201047
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ATTACHMENT B

- Extractive Gas Sampling Procedures
- Isokinetic Gas Sampling Procedures
- Evacuated Canister Sampling System and Procedures

INSTRUMENT SAMPLING AND CALIBRATION PROCEDURES

1.0 Extractive Gas Sampling System for Instrumental Analyzers

The extractive gas sampling system that serves the instrumental analyzers used for Methods 3A, 7E, 10 and Alt 078 is configured as described below.

Sample probe - Stainless steel single opening probe placed at the required sampling location.

Three-way valve - A stainless steel three-way valve is installed between the sample probe and a stainless steel particulate filter to allow the introduction of calibration gases into the sampling system. The three-way valve is turned toward the desired gas flow direction during this sampling. During system bias checks, excess calibration gas exits the sampling probe tip to avoid the introduction of process gas or ambient air during calibration.

Tee and poppet check valve - A stainless steel "Tee" will be installed between the sample probe and a stainless steel particulate filter to allow the introduction of calibration gases through a stainless steel 10 psig poppet check valve into the sampling system. When sampling, the poppet check valve is normally closed, though upon the introduction of pressurized (i.e. > 10 psig) calibration gases from a remote

Teflon® line to the poppet check valve, the check valve opens and allows the calibration gases to be introduced near the base of the sample probe. During this dynamic calibration (or sampling system bias check) procedure, excess calibration gas exits the sampling probe tip to avoid the introduction of process gas during calibration.

Heated sample line - A heated Teflon® line is used to transport the sample gas from the stack to the instrument rack. The heated Teflon® line is equipped with a temperature controller which maintains the temperature of the sample line at approximately 250°F to prevent moisture condensation.

Sample pump and flow control valve - A single head 100% oil-free vacuum pump fitted with a stainless steel flow control valve is used to transfer sampled gases from the heated sample line to the instrumental analyzer. The vacuum pump is leak-free and non-reactive to the gases being sampled. Subsequent sample transport lines and fittings are either stainless steel or Teflon®.

Gas Conditioner - thermal-electric based condenser equipped with a peristaltic pump is used to remove moisture from the sampled gas stream that is directed to the instrumental analyzers, which require a conditioned (or dry) gas samples. From the moisture removal system, a sample gas manifold constructed of Teflon® transport lines and stainless steel Tee fittings is used to continuously deliver the sampled gas to the instrumental analyzers. Since the instrumental analyzers are equipped with internal sampling pumps, the end of the sample gas manifold is equipped with an atmospheric dump (or bypass discharge vent) to avoid over pressurization of the instrumental analyzers.

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Data Logger – A data logging system is used to record 1-minute average data from the analog output of the instrumental analyzers.

2.0 Instrumental Analyzer Quality Assurance / Calibration Procedures

Upon site arrival, the instrumental analyzers are set-up in accordance with the manufacturer's written recommended procedures. Upon setting the appropriate range for the instrument, zero and appropriate span gases are introduced sequential order to verify instrument accuracy (three-point analyzer calibration error test).

Prior to the first test run, appropriate upscale and low-range (zero) span gases are introduced in series at the three-way valve in the sampling system. This dynamic calibration procedure is the sampling system bias check, and the analyzer's response time is recorded.

The start of the test run occurs when the calibration gases are cleared from the sampling system and the data acquisition system records a consistent instrumental analyzer response on the stack gas sample (at least twice the system response time is allowed to verify representative readings).

At the conclusion of the sampling period, an appropriate upscale and low-range (zero) gases are re-introduced in series at the three-way valve in the sampling system to check against the method's performance specifications for calibration drift and zero drift error. If the drift error is within 3% of the span over the period of the test run, the test run will be considered acceptable.

Calibration gas dilution equipment

A STEC Model SGD-SC-5L five-step gas divider may potentially be used to obtain appropriate calibration span gases in the field, as necessary. The five-step gas divider is National Institute of Standards and Technology (NIST)-certified for primary flow standards in accordance with USEPA Method 205. When cut with an appropriate zero gas, the five-step gas divider delivers calibration gas values at 0, 20, 40, 60, 80, and 100% of the introduced USEPA Protocol 1 calibration gas. The field evaluation procedures described in Section 3.2 of USEPA Method 205 will be performed prior to the compliance testing program, in order to validate the use of the five-step gas divider.

3.0 Isokinetic Sampling System and Procedures for HCl

Hydrogen chloride concentrations and emission rates are determined by isokinetically drawing stack gas from the source through a filter and an absorbing solution. The filter collects particulate matter including halide salts but is not routinely recovered or analyzed. Acidic and alkaline absorbing solutions collect the gaseous hydrogen halides and halogens, respectively.

A preliminary traverse of the duct will be performed to determine duct velocity head and temperature distributions, as well as duct static pressure. Preliminary Method 3 and 4 runs

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will be performed to determine duct moisture and fixed gas content. Based on this information, a sample nozzle of appropriate inside diameter will be selected, and the impinger train charged as described accordingly. Traverse points will be marked on the probe. Sample time per traverse point will be calculated based on the total anticipated sampling time.

A "goose-neck" nozzle constructed of borosilicate glass or quartz will be connected via stainless steel Swagelok® fitting to a borosilicate glass probe liner within a stainless steel probe. Attached to the sample probe will be a Stausscheibe (Type S) pitot tube and type K thermocouple which will be used to measure duct velocity head pressure and temperature. The probe liner will be attached to a glass filter holder containing a quartz filter. The back half of the filter holder will be connected via connecting glassware, with temperature monitoring probe, to the impinger train.

The impinger train will consist of a set of impingers, connected in series and immersed in an ice bath. Crushed ice will be placed around the impingers to keep the temperatures of the gases leaving the last impinger at 68 °F or less. The train will be constructed and charged as follows:

modified Greenberg-Smith (G-S) impinger containing 100 ml of 0.1 N H₂SO₄;
modified G-S impinger containing 100 ml of 0.1 N H₂SO₄;
standard G-S impinger containing 100 ml of 0.1 N NaOH;
standard G-S impinger containing 100 ml of 0.1 N NaOH;
modified G-S impinger containing approximately 200 - 300 grams of pre-dried silica gel and glass fiber.

The 0.1 N NaOH impingers may be replaced with an empty knockout impinger, as chloride concentrations are not required for this compliance emissions testing event.

The sampling train will be followed in series by an umbilical line, dry gas meter and calibrated orifice connected to an inclined manometer. Type-K thermocouples will be used to measure the stack, impinger outlet, and dry gas meter inlet and outlet temperatures. A carbon vane pump will be used to provide the necessary vacuum for the sampling train.

Prior to performing the HCl sampling, preliminary flowrate measurements will be obtained for the proper operation of the metering console. Sample time per traverse point will be calculated based on the total anticipated sampling time (60 minutes).

The sample train will be assembled as completely as possible in the staging area and transported to the sampling site. Openings will be sealed with aluminum foil to prevent potential contamination of the sample train prior to final assembly. Once in the sampling area, each train will be assembled and each apparatus will be leak checked. Upon successful completion of the leak check, the initial dry gas meter reading will be recorded. The engine exhaust sampling locations will be selected based on the availability of straight duct, which meet the requirements of USEPA Method 1.

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The dry gas meter temperatures will be recorded on the data sheets. The isokinetic-sampling rate in terms of pressure drop across the calibrated orifice will be calculated and recorded on the data sheets. The pump and timer will be turned on, and the sample rate will be adjusted to correspond to the calculated isokinetic rate.

Once the sample rate is set, the following data will be recorded:

- Dry gas meter inlet and outlet temperatures
- Sample vacuum
- Probe temperature
- Impinger outlet temperature
- Filter holder outlet temperature
- Orifice differential pressure
- Sample volume (dry gas meter readings)

At the end of the sample time for the first point, the probe will be moved to the next point, and the measurements, calculations and recording of data will be repeated. Upon completion of sampling (each traverse), the probe, and nozzle will be removed from the port. The sampling train assembly will then be placed into the next traverse port and the previously described sampling procedures will be repeated.

When the sample run is complete, the final, dry gas meter reading will be recorded. The probe and filter assembly will be removed from the sampling port and allowed to cool. A post-test leak check will be performed on the sampling train at a vacuum at least as great as that of the highest sample vacuum measured during each sample run. The final leak rate will be recorded on the data sheets. The sample train will be sealed from contamination and transported to the staging area for recovery. Recovery will consist of the measurement of the liquid in the acid impingers to +1 ml by using a graduated cylinder or by weighing it to +0.5 g by using a balance. The impinger contents will be quantitatively transferred to a leak-free sample storage container. A rinse of the impingers and connecting glassware including the back portion of the filter holder (and flexible tubing, if used) with water and will be added to the storage container. The container will be sealed, shaken to mix, and labeled. The fluid level will be marked so that if any sample is lost during transport, a correction proportional to the lost volume can be applied.

The Alkaline impinger (or empty knockout impinger) catch will be measured and recorded for the determination of the stack gas moisture content.

The samples will be recovered into appropriate, pre-cleaned jars. The samples will be clearly and uniquely marked prior to shipment. Shipment will be performed in accordance with the prescribed procedures of the International Air Transport Association for dangerous goods if applicable.

4.0 Evacuated Canister Sampling System and Procedures for LFG Chlorine content

An evacuated SUMMA passivated sampling canister will be utilized to sample the landfill gas for chlorine analysis. The canister will be conditioned in accordance with US EPA Method TO-15 guidelines, which includes evacuation of the canister to within 10mm of absolute pressure and allowing the canister to sit for 30 minutes. The tank will be acceptable if no change more than ± 2 mm is noted. The leak check value will be included in the results report. The canister is then pre-charged with Helium for shipment purposes so that the samples will not be considered hazardous.

Sampling shall be conducted at a flow rate equivalent to filling the remainder of the canister so that it is approximately 80% full at the completion of the testing. Sampling shall be conducted at a flow rate of 50 – 70 cc/min. All sample train components shall consist of Teflon and stainless steel.

The samples will be clearly and uniquely marked prior to shipment. Chain-of-custody forms shall be prepared prior to departing the test site. Sample analysis shall be conducted using Air Toxics, LTD.

ATTACHMENT C

- **USEPA Method 3A/7E/10/Alt 078 Extractive Gas Sampling System Diagram**

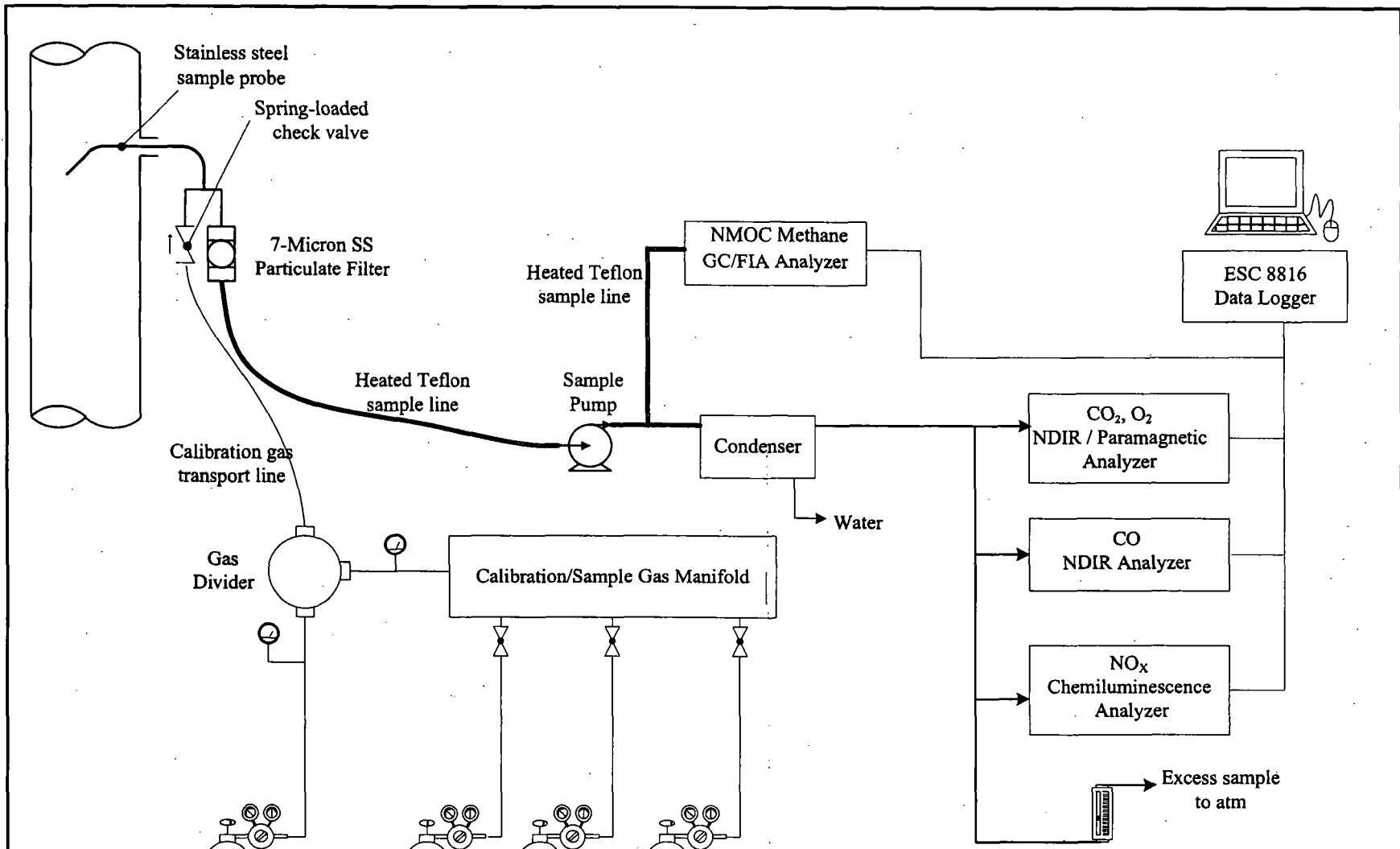
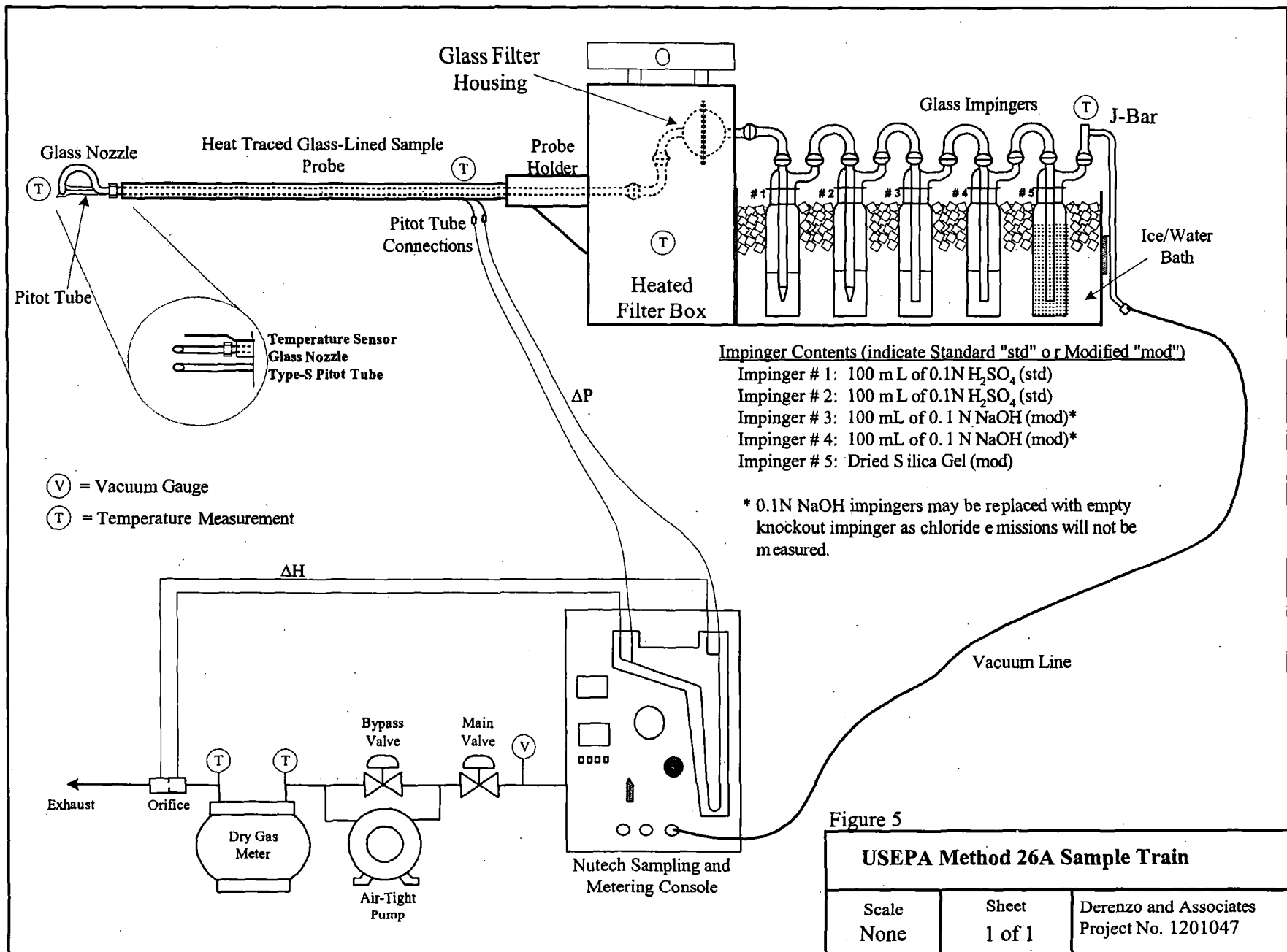


Figure 4

USEPA Method 3A/7E/10/ALT 078 Sample Train		
Scale None	Sheet 1 of 1	Derenzo and Associates Project No. 1201047

ATTACHMENT D

- USEPA Method 26A Isokinetic Sampling Train Diagram
- USEPA Alt 078 Approval Letter





UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
RESEARCH TRIANGLE PARK, NC 27711

JUL 21 2010

OFFICE OF
AIR QUALITY PLANNING
AND STANDARDS

Howard Schiff
TRC Companies Inc.
650 Suffolk Street
Wannalancit Mills
Lowell, MA 01854

Dear Mr. Schiff:

In an alternative methods approval letter dated February 25, 2010, we granted Derenzo & Associates permission to use the TECO Model 55C analyzer in place of Method 18 to measure methane from internal combustion engines subject to 40 CFR Part 60, Subpart JJJJ – Standards of Performance for Stationary Spark Ignition Internal Combustion Engines. You brought to our attention that the proposed analyzer more appropriately measures non-methane organics and should be allowed as an alternative to the “cutter” analyzers already allowed by the regulation.

We see your point and appreciate your bringing it to our attention. This letter grants approval to use the TECO Model 55C analyzer to measure non-methane organic compounds from Subpart JJJJ engines. The analyzer may also be used by others at other Subpart JJJJ engines. We will announce this as broadly applicable to all stationary spark ignition combustion engines on EPA’s web site (at <http://www.epa.gov/ttn/emc/tmethods.html#CatB>).

If you need further assistance, please contact Foston Curtis at (919) 541-1063 or Gary McAlister at (919) 541-1062.

Sincerely,

A handwritten signature in cursive script that reads "Connie Oldham".

Conniesue B. Oldham, Ph.D., Group Leader
Measurement Technology Group

cc: Michael Brack, Derenzo & Associates
Foston Curtis, E143-02
Gary McAlister E143-02