

1 Introduction

Impact Compliance & Testing, Inc. (ICT) has conducted a Tier II landfill gas (LFG) test at the City Environmental Services Landfill (CES) located at 1869 North Broadway, Hastings, Michigan. The test was conducted on behalf of Hastings and took place on January 7, 2021. Those involved in the Tier II testing are listed below in Table 1.

Table 1 – Contact Information

Name and Title	Company and Address	Telephone Number
Mr. Robert Pliska	City Environmental Services LF 1899 North M-43 Hwy, Hastings, Michigan 49058	(906) 250-8717
Ms. Summer Hitchens Sr. Project Manager	Impact Compliance & Testing, Inc. 37660 Hills Tech Dr., Farmington Hills MI, 48331	(734) 357-8084
Mr. Clay Gaffey Environmental Consultant	Impact Compliance & Testing, Inc. 4180 Keller Rd. Ste B, Holt MI, 48842	(517) 268-0043

The purpose of the Tier II testing is to provide an updated five-year projected non-methane organic compound (NMOC) emission rate calculation submitted to the Michigan Department of Environment, Great Lakes and Energy (EGLE). This report is being submitted in accordance with the requirements of the New Source Performance Standards (NSPS) and Tier II Test Plan submitted December 17, 2020. The Tier II Test Plan was approved by Mr. Dave Morgan of EGLE on January 5, 2021. All correspondence is included in Appendix D.

The Tier II test results described in this report were used to obtain a site-specific NMOC concentration based on actual analytical data. The NMOC emission rate calculation was based on this data to yield a more accurate estimate of NMOC emissions from the facility. The results of this calculation were then used to assess the status of the facility in terms of LFG collection and control system requirements in accordance with NSPS. The annual estimated NMOC emission rate for 2020 is 9.28 Mg/yr. based upon the site-specific NMOC concentration of 178 ppmv-hexane.

2 Field Procedures

In accordance with the NSPS (40 CFR 60.754(a)(3)), the Tier II sampling protocol requires two (2) samples of LFG be collected for every hectare of landfill that retained waste for at least two years, up to a maximum of 50 samples. The standard Tier II test method requires penetration of the landfill surface and final cover to obtain LFG samples.

Under the provisions of the NSPS, the owner or operator of a landfill can propose an alternative method, subject to regulatory agency approval, to determine the site-specific NMOC concentration as specified in 40 CFR 60.754(a)(5). In consideration of this, CES requested a modified LFG sampling protocol previously outlined in the USEPA's "Municipal Solid Waste Landfill New Source Performance Standards (NSPS) and Emission Guidelines (EG) – Questions and Answers", November 1998. This method consists of collecting composite LFG samples from the LFG main header just prior to entering any type of treatment. Composite LFG samples from the GCCS are equivalent to a composite sample from LFG sample probes within the extents of the active GCCS. As such, the installed extraction wells would be serving as the LFG sample probes.

The samples were collected at the site as follows:

1. Prior to sampling, ICT personnel verified the GCCS wells or collectors had an applied vacuum at the time of the Tier II test.
2. Prior to collecting the LFG samples, a GEM meter, a portable LFG monitoring unit was used to measure oxygen, carbon dioxide, methane and balance gas concentrations as a check for any indication of air leaks in the LFG system. The concentrations were observed to be within the limits allowed under EPA Method 25C for NSPS Tier II testing.
3. A total of three (3), 4-liter Summa® passivated canisters were used to collect LFG samples from the main header. The sampling train for the canister was connected to the LFG header and purged for a period of 3-minutes.
4. The Summa® passivated canister was then connected to the sampling train and the canister valve opened. The LFG sample was collected at a rate of 420 milliliters per minute (ml/min) or less until there was slight vacuum remaining in the canister. At that point, the valve was closed.
5. The three canisters were then sent via Fed Ex to Advanced Technology Laboratories, Inc. (ATL) in the City of Industry, California for laboratory analysis. The canisters were analyzed using EPA Method 25C for NMOC with oxygen and nitrogen concentrations being determined by USEPA Method 3C.

3 Laboratory Results

The certified analytical results are presented in Appendix B. The equations provided in Section 6 of USEPA Method 25C were used to correct for dilution of the samples by water vapor, nitrogen and pressurization of the canister in the laboratory. Three (3) samples were drawn from each canister and analyzed by ATL.

The average of the three analytical results for each canister are shown in the following table and is expressed as total NMOC in parts per million (ppmv) as carbon. To convert the total NMOC by volume as hexane, each sample concentrations was divided by six. Each NMOC as hexane concentration was then based on the total number of samples and an average taken of all collected samples to determine a representative NMOC concentration in the LFG.

Table 2 – Analytical Results

Canister ID Number	Weighting Factor	NMOC as Carbon (ppmv)	NMOC as Hexane (ppmv) ¹	Weighted NMOC Average as Hexane (ppmv)
WMH - 1	1/3	1,000	167	178
WMH - 2	1/3	1,100	183	
WMH - 3	1/3	1,100	183	

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4 NMOC Emission Rate Results and Discussion

4.1 NMOC Emission Rate

The Tier II NMOC emission rate calculation was completed to provide an estimate of the NMOC emissions using the site-specific NMOC concentration for CES. The estimated Tier II NMOC emission rate was based on the historical annual refuse acceptance rate for the landfill through 2020 and a waste acceptance rate of 58,521 Mg/yr. through closure and a site-specific NMOC concentration of 178 ppmv-hexane determined by the Tier II testing at the site. The estimated 2020 NMOC emission rate for CES was calculated to be 9.28 Mg/yr. The NSPS Tier II NMOC emission rate calculations for the landfill are included in Appendix C. Landfill Gas Emission Model (version 3.03) was used to calculate yearly NMOC emission rates.

4.2 NMOC Emission Rate Discussion

The results indicate the NMOC emission rate is projected to remain 50 Mg/yr. for the next five year, which is the threshold that triggers mandatory gas collection and control standards in the NSPS. For the next five years, CES anticipates an average annual refuse acceptance rate of 64,373 Mg/yr., which accounts for a 10% increase from the 2020 waste intake.

Table 3 – Project NMOC Emission Rates

Year	Average Annual Waste Inflow Rate (Mg)	NMOC Emission Rate (Mg/yr)
2021	64,373	9.45
2022	64,373	9.67
2023	64,373	9.88
2024	64,373	10.08
2025	64,373	10.27

The NMOC emission rate calculations do not exceed 50 Mg/yr for the next 5-year period. This report will serve as the 5-year report for NSPS compliance as provided under 40 CFR 60.757(b)(1).

Appendix A
Field Data

APRCHEC 11:29 - 01/07/21 Baro: 29.49 "Hg

Channel	Adjusted	Initial	Previous	Units
CH ₄	46.2	30.2	%	%
CO ₂	30.2	1.8	%	%
O ₂	1.8	21.8	%	%
Bal	21.8			
Static P				"H ₂ O
Diff. P				"H ₂ O
Temp.				°F
Flow				SCFM
Power				e3BTU/h

Next ID Special Action Next

Control panel with buttons:

- 0: []
- 1: % &
- 2: ABC
- 3: DEF
- 4: GHI
- 5: JKL
- 6: MNO
- 7: PQRS
- 8: TUV
- 9: WXYZ

Navigation buttons: Left arrow, Right arrow, Up arrow, Down arrow, Home (house icon), Power (circle with line), Question mark (?), Sun (light icon), and a small white dot.

APRECHEC 12:06 - 01/07/21 Baro: 29.45"Hg

Channel	Adjusted	Initial	Previous	Units
CH4	46.5			%
CO2	31.2			%
O2	1.5			%
Bal	20.7			%
Static.P	"H2O			"H2O
Diff.P	"H2O			"H2O
Temp.	°F			°F
Flow	SCFM			SCFM
Power	e3BTU/h			e3BTU/h

Next ID Special Action Next

Navigation keypad with buttons: 1 (%), 2 (ABC), 3 (DEF), 4 (GHI), 5 (JKL), 6 (MNO), 7 (PQRS), 8 (TUV), 9 (WXYZ), 0, arrow keys, ? (help), list icon, sun icon, power icon, and a small white dot.

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15000

APRECHEC 12:41 - 01/07/21 Baro: 29.45 "Hg

Channel	Adjusted	Initial	Previous	Units
CH ₄		47.5	----	%
CO ₂		31.1	----	%
O ₂		1.3	----	%
Bal		20.0	----	%
Static.P			----	"H ₂ O
Diff.P			----	"H ₂ O
Temp.			----	°F
Flow			----	SCFM
Power			----	e3BTU/h

Next ID Special Action Next

Navigation and Control Panel:

- Top row: Three arrow keys (up, up, up) and a power button.
- Second row: Sun icon, list icon, question mark icon, power icon.
- Third row: 1 (% &), 2 (ABC), 3 (DEF)
- Fourth row: 4 (GHI), 5 (JKL), 6 (MNO) with left and right arrow keys.
- Fifth row: 7 (PQRS), 8 (TUV), 9 (WXYZ)
- Bottom row: 10 (0)