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LANDFILL GAS TEIR 2 NMOC TEST REPORT

Title:	Tier 2 Landfill Gas NMOC Sampling Results and Projected Five-Year NMOC Generation Rates
Report Date:	January 28, 2016
Test Date:	January 7, 2016

Facility Information	
Name	City Environmental Services Landfill, Inc. Hastings Landfill
Street Address	1899 N. M-43 Hwy
City, County	Hastings, Barry

Facility Permit Information			
State Registration No.:	N2952	ROP No.:	MI-ROP-N2952-2012

Testing Contractor	
Company	Derenzo Environmental Services
Mailing Address	39395 Schoolcraft Road Livonia, MI 48150
Phone	(734) 464-3880
Project No.	1506009

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TIER 2 LANDFILL GAS NMOC SAMPLING RESULTS AND PROJECTED FIVE-YEAR NMOC GENERATION RATES

1.0 INTRODUCTION

Waste Management of Michigan, Inc. (WMI) operates the City Environmental Services (CES) Hastings Landfill facility (Hastings Landfill) located at 1899 N. M-43 Hwy in Hastings, Barry County (State Registration No., SRN N2952). The facility is subject to the federal New Source Performance Standards (NSPS) for Municipal Solid Waste Landfills (40 CFR 60 Subpart WWW).

Landfill gas (LFG) Tier 2 non methane organic compound (NMOC) sampling and calculations performed in 2011 resulted in a projected NMOC generation rate of less than 50 megagrams per year (Mg/yr) through 2015. Therefore, the facility is not currently subject to the NMOC emission control standards specified in the NSPS.

LFG NMOC Tier 2 sampling was repeated in January 2016 and the results are presented in this report. The LFG NMOC sampling result was used to calculate the projected NMOC generation rate for the next five-year period (2016 through 2020) based on the amount of waste in-place and estimated waste placements rates.

The LFG sampling was performed by Robert Harvey of Derenzo Environmental Services. A test plan was submitted to the Michigan Department of Environmental Quality (MDEQ-AQD) prior to the sampling date. The project was coordinated by WMI representatives Mr. Donald Johnson and Chad Dammen.

Questions regarding this report should be directed to:

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2.0 SUMMARY OF RESULTS

WMI has installed an active LFG collection and control system (wellfield, gas blower and enclosed flare) that collects gas generated from the decomposition of waste within the Hastings Landfill.

A sample of the collected LFG was obtained from the main gas collection header, prior to the condensate knockout vessel and blower, and analyzed for fixed gases (USEPA Method 3C) and NMOC concentration (USEPA Method 25C). NMOC generation rates were calculated using the site-specific NMOC concentration result, historical and projected waste collection rates, and equations and default values specified in 40 CFR §60.754(a).

The LFG collected at the Hastings Landfill has a measured NMOC concentration of 227 parts per million by volume (ppmv) as hexane (C_6). The maximum projected NMOC generation rate for the next five (5) years (2016 through 2020) is less than 12 Mg/yr, which is less than the NSPS threshold of 50 Mg/yr for the mandatory installation of NMOC collection and control systems.

Table 1. Summary of NMOC sampling results and calculated NMOC generation rate

Year	NMOC Sampling Result (ppmv as hexane)	Calculated Waste-in-Place (Mg)	Calculated NMOC Generation Rate (Mg/yr)
2016	227	2,142,137	11.4
2017		2,194,417	11.5
2018		2,246,697	11.7
2019		2,298,977	11.8
2020		2,351,257	11.9

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3.0 SOURCE DESCRIPTION

3.1 Site Information and Permitting

Waste Management operates the Hastings Landfill located at 1899 N. M-43 Hwy in Hastings, Barry County. The stationary source is identified as SRN N2952 and has been issued Renewable Operating Permit MI-ROP-N2952-2012. The facility is permitted for a waste placement area of 48 acres; currently 33 acres of waste placement area have been constructed.

3.2 LFG Collection and Control

LFG is collected from vertical gas wells and associated gas conveyance piping using an active LFG collection system. A gas blower is operated to maintain adequate vacuum with the gas wellfield, which collects the gas and directs it to an enclosed flare for emission control. The LFG flow rate to the flare is monitored using a permanently installed flow meter.

Based on LFG sampling results and Tier 2 NMOC generation calculations, the landfill has a calculated NMOC generation rate that is less than 50 Mg/yr and is not subject to the NSPS NMOC collection and control emission standards. Therefore, the existing LFG collection and control system is considered voluntary (i.e., not required by the NSPS).

4.0 SAMPLING AND ANALYTICAL PROCEDURES

The Tier 2 sampling procedures in 40 CFR 60.754(a)(3) specify that ... *For active collection systems, samples may be collected from the common header pipe before the gas moving or condensate removal equipment.*

The existing LFG collection system provides appropriate coverage for the constructed waste placement area. Therefore, a sample of the LFG was obtained from the main gas collection header prior to the condensate knockout vessel and gas blower.

Prior to performing the sampling, the methane content of the collected LFG was verified with a hand-held direct read-out instrument to verify that its methane content is greater than 40%, which is a quality assurance requirement of the Tier 2 and Method 25C NMOC measurement procedures

Evacuated stainless steel canisters were used to draw LFG samples from the main collection header. The canisters were pre-conditioned by the contract laboratory with an inert gas (helium) to reduce flammability for shipping. Teflon® sample tubing was connected to a threaded coupling installed on the gas pipe and a sample control console was used to regulate sample flow to the evacuated canister. The sampling rate was controlled using an adjustable rotometer and the vacuum within the canister was monitoring using an analog vacuum gauge. The sample

floware and canister volume were recorded throughout each 30-minute sampling period until a canister vacuum of 3 inches of mercury (in. Hg) was achieved.

At the conclusion of the sampling event, the final canister vacuum was recorded and the canisters were shipped to Enthalpy Analytical / Triangle Environmental Services, Inc. (Research Triangle Park, North Carolina) for analysis. The canister vacuum was verified by the laboratory to check for any leakage during transport. Two canisters were filled with LFG and shipped to the contract laboratory. Three samples were obtained from one canister and analyzed using USEPA Method 25C, *Determination of Non Methane Organic Compounds (NMOC) in Landfill Gas* and USEPA Method 3C, *Determination of Carbon Dioxide, Methane, Nitrogen, and Oxygen from Stationary Sources*. The second canister was sent as a backup in case there were problems with the first canister.

5.0 TEST RESULTS AND CALCULATIONS

5.1 Operating Conditions During the Sampling Event

Prior to performing the LFG sampling, the methane content of the LFG was verified with a hand-held direct read-out instrument to verify that the LFG contained greater than 40% methane. The LFG readings at the time of the sampling event indicated a methane content of 50.5%.

The LFG wellfield and collection system operated normally during the sampling event. The LFG flowrate to the flare, as recorded by the installed gas flow meter, ranged between 238 and 245 standard cubic feet per minute (scfm).

Attachment 1 provides field data sheets and recorded operating information.

5.2 Sampling Results and NMOC Calculations

An integrated sample of the collected LFG from the main collection header was obtained using an evacuated stainless steel canister. Three (3) samples from this canister were analyzed using USEPA Methods 3C and 25C for fixed gas and NMOC content.

USEPA Method 3C analytical results indicate that the collected LFG contains an average of 50.3% methane (by volume), 0.8% oxygen (O_2), 14.1% nitrogen (N_2) and 34.2% carbon dioxide (CO_2). USEPA Method 25C analytical results indicate that the collected LFG contains an average of 1359 ppmv as carbon (C_1), which is equivalent to an NMOC concentration of 227 ppmv as hexane (C_6).

Table 2 presents a summary of the landfill gas sampling results from the January 7, 2016 sampling event.

Attachment 2 provides a copy of the Method 25C and Method 3C analytical report for the collected LFG.

5.3 NMOC Generation Calculations

The USEPA Landfill Gas Emissions Model (LandGEM version 3.02) was used to calculate NMOC generation rates using the equation specified in 40 CFR 60.754(a)(1)(i). According to 40 CFR 60.757(b)(1)(ii), the landfill owner/operator may submit an estimate of the NMOC generation rate for the next 5-year period based on the estimated waste acceptance rate for each year in lieu of individual annual reports. If the actual waste acceptance rate exceeds the estimated waste acceptance rate in any year reported in the 5-year estimate, the report must be revised.

The Hastings Landfill has reported waste acceptance rates ranging from 36,398 to 50,014 tons per year (33,089 to 45,467 Mg/yr) for calendar years 2011 through 2015. A waste acceptance rate of 57,508 tons per year (52,280 Mg/yr) was entered into the LandGEM program for calendar years 2016 through 2020 to allow for a potential 15% increase in waste acceptance rate over the next five years. LandGEM was executed using the measured site-specific NMOC concentration value (227 ppmv as hexane) and NSPS default values for:

- Methane generation constant, k (0.05 year-1) and
- Methane generation potential, Lo (170 cubic meters per megagram).

The calculated NMOC generation rate for calendar years 2016 through 2020 (5 years) is less than 12 Mg/yr.

Table 3 presents projected maximum waste collection rates and NMOC generation rates for calendar years 2016 through 2020

Attachment 3 provides report printouts from the USEPA LandGEM version 3.02 model.

5.4 Variations from Normal Sampling Procedures or Operating Conditions

The gas collection system was operated normally during the sampling event.

The LFG sampling was originally scheduled and performed in November 2015. However, analysis of the samples indicated that they had been diluted with air, presumably from a leak in the sampling system. The sampling was repeated on January 7, 2016. USEPA Method 3C analysis of the January 7, 2016 samples indicate a methane content of 50.3%, which verified integrity of the samples.

The laboratory reports for the discarded (diluted) samples are included in Attachment 4.

Report Prepared By:

Robert L. Harvey, P.E.
General Manager

Table 2. Landfill gas sampling data and results for samples obtained January 7, 2016

Parameter	Value		Measurement Method
LFG Flowrate to Flare	243	scfm	Installed flowmeter
LFG Methane (CH_4)	50.3	% vol	USEPA Method 3C
LFG Carbon Dioxide (CO_2)	34.2	% vol	USEPA Method 3C
LFG Oxygen (O_2)	0.8	% vol	USEPA Method 3C
LFG Nitrogen (N_2)	14.1	% vol	USEPA Method 3C
LFG NMOC (as carbon)	1359	ppmv C_1	USEPA Method 25C
LFG NMOC (as hexane)	227	ppmv C_6	USEPA Method 25C

Table 3. Projected maximum waste collection rates and five-year NMOC generation rates

Year	Waste Collection Rate (Mg/yr)	Calculated Waste-In-Place (Mg)	Calculated NMOC Generation Rate (Mg/yr)
2015	45,467†	2,096,670	11.3
2016	52,280	2,142,137	11.4
2017	52,280	2,194,417	11.5
2018	52,280	2,246,697	11.7
2019	52,280	2,298,977	11.8
2020	52,280	2,351,257	11.9

† Actual waste acceptance rate for calendar year 2015 (50,014 tons). Projected maximum waste collection for 2016-2020 based on a 15% increase from the 2015 waste acceptance value.