Non-enclosed Flare Performance Test Report

Prepared for:

Forest Lawn Landfill, Inc.

June 28, 2023

IMPACT COMPLIANCE & TESTING

Report Certification

Non-enclosed Flare Performance Test

Forest Lawn Landfill
8230 West Forest Lawn Road, Three Oaks, MI 49128

This document has been reviewed by Forest Lawn Landfill representatives and approved for submittal to the Michigan Department of Environment, Great Lakes, and Energy (EGLE) – Air Quality Division as part of this Open Flare Performance Test Report.

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

Impact Compliance & Testing, Inc.

Christian Smith, M.S.

Environmental Consultant

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1 Introduction

The Forest Lawn Landfill (FLL) facility is owned and operated by the Forest Lawn Landfill, Inc located in Three Oaks, Michigan. FLL retained Impact Compliance & Testing (ICT) to conduct a non-enclosed (open) flare performance test on FLL's open flare (EUOPENFLARE). The open flare is utilized as a control system for the landfill gas (LFG) collection system which captures LFG generated within the landfill.

The test was performed as required by the facility's Title V Permit MI-ROP-N2407-2021b in accordance with FGOPENFLARE-OOO Condition V and FGOPENFLARE-AAAA Condition V. FLL is required to demonstrate compliance with 40 CFR 60.18 and 40 CFR 63.11 by conducting a performance test no later than 180-days (07-22-2023) after permit re-issuance (1-23-2023). ICT conducted the field work on May 5, 2023, in accordance with the previously referenced regulations and the test plan submitted to the Michigan Department of Environment, Great Lakes and Energy (EGLE) on April 13, 2023. EGLE approved a test date of less than 30-days from submittal of the Test Plan on April 19, 2023.

The names, addresses and telephone numbers of those involved with the open flare testing are listed in Table 1.1 below:

Table 1.1 – Contact Information

Name and Title	Company/Address	Phone Number
Maximilian Ehret Environmental Manager	FLL 4100 Frontage Road Hillside, IL	464-207-6949
Christian Smith Environmental Consultant	ICT 4180 Keller Rd. Ste B Holt, MI	313-920-8106
Summer Hitchens, Sr. Project Manager	ICT 37660 Hills Tech Dr. Farmington Hills, MI	734-357-8045

2 Summary of Results

The FLL open flare serves as the control device for the LFG collection system which captures LFG generated within the landfill. The flare is designed to meet the performance requirements of 40 CFR 60.18 at flows up to 4,000 scfm. The flare operated at an average measured inlet volumetric flow rate of approximately 2,200 scfm during the testing.

The results of the tests were:

- Visible emissions: 29 seconds of accumulated emission time,
- Average net heating value of the gas being combusted: 13.15 mega joules per standard cubic meter (MJ/m^3), and
- Average exhaust gas exit velocity: 36.35 feet per second (ft/sec).

The performance criteria are less than 5 minutes visible emissions in a 30-minute period, a net heating value of greater than 7.45 MJ/m3, and a maximum exit velocity less than 60 ft/sec.

The test results demonstrate the FLL open flare meets the performance requirements of 40 CFR 60.18, and thus satisfies the requirements of 63.1959(b)(2)(iii)(B)/62.16714(c)(2) at the test flow rate.

3 Sampling and Analytical Procedures

ICT conducted the measurements in accordance with USEPA approved alternative methods as explained in the test plan. A copy of the approved test plan is included in Appendix A. The test procedures are as summarized below:

3.1 Visual Determination of Fugitive Emissions from Material Sources and Smoke Emissions from Flares (Method 22, Alternative 42)

ICT conducted a single, 30-minute, non-continuous observation of the flare exhaust for smoke emissions. ICT observed continuously for 15 minutes, then took a break for one (1) hour, and resumed observation for another 15 minutes, to ensure completion of the full 30-minute period of observation time. A copy of Method 22 observation data is presented in Appendix B.

3.2 Determination of the Net Heating Value of the Landfill Gas (Method 3C, Alternative 42)

ICT used Method 3C to determine the net heating value of the landfill gas. ICT conducted two (2) 30-minute tests, one sample collected for backup, and submitted the samples to Air Technology Laboratories (ATL), City of Industry, California. ATL analyzed the sample for carbon dioxide (CO_2), methane (CH_4), nitrogen (N_2), and oxygen (O_2). The ATL analytical report is presented in Appendix C. Net heating values were then calculated in accordance with 40 CFR 63.1959(d)/62.16718(d) for the laboratory analyzed sample. The net heating value calculations have been included in Appendix D.

3.3 Stack Gas Velocity and Volumetric Flow Rate (Method 2C, Alternative 55)

On May 20, 2009, USEPA approved the use of a mass flow meter in place of Method 2C to measure the flow rate to a utility flare. This alternative stipulated the calculation had to be 'recent.' ICT used the flare flow meter to measure the flow rate at the flare. The flare's exhaust velocity calculations have been included in Appendix D.

4 Test Results and Discussion

ICT performed the performance testing in accordance with the test methods as proposed in the open flare test plan. Mr. Christian Smith performed the testing as detailed below. The flare operated as designated with no upset conditions during the test, therefore no re-testing was required. Additionally, during the three months prior to the test there was no significant maintenance activities performed on the non-enclosed flare. Find below a detailed discussion of the test methods utilized and discussion of the results and compliance status of the non-enclosed flares.

4.1 Method 22, Alternative 42

Visible emissions testing by Method 22, Alternative 42 was performed by Mr. Smith of ICT. Mr. Smith observed continuously for two non-consecutive 15-minute intervals, for a total of a 30-minute period of observation. A copy of Mr. Smith's observations including weather conditions and wind direction during the test are included with the field forms in Appendix B. A total of 29 seconds were observed during the total 30-minute period for the flare and therefore it is compliant with 40 CFR 60.18(f)(1) which requires less than 5 minutes of visible emissions during a 30-minute test period. The field readings are included in the field data provided in Appendix B.

4.2 Method 3C, Alternative 42

The net heating value of the gas being combusted in the flare was performed in accordance with Method 3C, Alternative 42. Mr. Smith performed the LFG sampling. During the performance test, two (2) gas samples were taken using 6-L Summa canisters and sent to ATL for analysis (one as a back-up). In addition, two (2) methane readings were taken using a LandTec GEM 5000 gas analyzer at the common header prior to the flare. The gas readings were taken prior to and after the collection of the LFG sample. The analytical data from ATL revealed that dilution occurred during the canister sampling as indicated by the drop in percent methane and increase in percent oxygen.

The results of the gas readings and laboratory analytical results are detailed in Table 5.1 below:

Table 5.1 – LFG & Analytical Results

Date	Time	CH_4 (%)	CO_2 (%)	O_2 (%)	Balance (%)	Heating Value (MJ/m^3)
5/5/2023	11:34	42.7	30.3	2.1	25.2	16.12
5/12/2023 (Laboratory Analysis)	11:58-12:30	20.0	14.0	13.0	58	7.55 (calculated)
5/5/2023	12:45	41.8	29.9	2.1	25.7	15.78

Sample calculations of the net heating value in accordance with 40 CFR 60.18(f)(3) can be found in Appendix D. As detailed in the above table and supporting calculations the net heating value for the LFG combusted in the flare is at least 7.45 MJ/m^3 and therefore is compliant with 40 CFR 60.18(f)(3).

4.3 Method 2C, Alternative 55

The actual exhaust velocity of the flare was determined by Method 2C, Alternative 55. During the testing period the flow rate to the flare was monitored by a mass flow meter and recorded in 5-minute intervals. The exhaust velocity was then determined by dividing the volumetric flow rate by the unobstructed cross-sectional area of the flare tip. The exhaust velocity at the beginning and end of the testing period are provided in Table 5.2 below:

Table 5.2 – Exhaust Velocity Readings

Date	Time	Flow (scfm)	Exit Velocity (ft/sec)
5/5/2023	11:58	2308	35.98
5/5/2023	12:30	2355	36.72

Sample calculations of the flare exhaust velocity calculations and recorded flow information are included in Appendix D. As detailed in the above table and supporting calculations, the actual exhaust velocity is less than 60 ft/sec and is therefore in compliance with 40 CFR 60.18(f)(4)(i).

4.4 Conclusions

The test results demonstrate the FLL open flare meets the performance requirements of 40 CFR 60.18, and thus also satisfies the requirements of 40 CFR 63.1959(d)/62.16718(d) at the test flow rate.