Riverview Land Preserve

Open Flare Performance Test Report

Tetra Tech Project No. 209-4231588.002

April 3, 2024

TETRA TECH

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PRESENTED TO

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REPORT CERTIFICATION

Open Flare Performance Test

Riverview Land Preserve
Riverview, Michigan

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

Adam Marshall
Project Engineer

Khaled Mahmood, P.E.
Client Manager

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APPENDICES

1.0 INTRODUCTION

1.1 SOURCE DESCRIPTION

The Riverview Land Preserve is a landfill owned and operated by the City of Riverview and is located in Riverview, Michigan. The facility accepts municipal waste consisting of mostly household and commercial waste. The facility also accepts non-hazardous special wastes. RLP owns and operates two (2) open flare units, Flare 1 which is permitted for maximum flow of 2,131 standard cubic feet per minute (scfm), and Flare 2 which is permitted for maximum flow of 4,700 scfm.

1.2 PERFORMANCE TEST DESCRIPTION

RLP retained Cornerstone Environmental Group, LLC - A Tetra Tech Company (Tetra Tech) to conduct open flare performance test of the 2,131 scfm Open Flare 1 and 4,700 scfm Open Flare 2 at RLP. The open flares are utilized to provide backup landfill gas (LFG) control when the Riverview Energy System (RES) plant is not operating or there is excess LFG beyond the capacity of the RES facility.

In accordance with the permit the performance test was required to be conducted within 180-days of permit issuance. MI-ROP-N4469-2023 was issued on August 15, 2023, requiring the test to be performed by February 11, 2024. EGLE approved the test plan on

Tetra Tech conducted the field work on February 6, 2024 in accordance with the test plan submitted to the Michigan Department of Environment, Great Lakes, and Energy (EGLE) on January 5, 2024. EGLE approved the test plan on January 30, 2024.

The name, address, and telephone number of those involved with the open flare testing are listed in the table below:

Name and Title	**Company**	**Phone Number**
Khaled Mahmood, P.E. Client Manager	Tetra Tech 39395 W 12 Mile Road Farmington Hills, MI 48331	(586) 588-0484
Adam Marshall Project Engineer	Tetra Tech 39395 W 12 Mile Road Farmington Hills, MI 48331	(313) 320-2533
Kevin Sisk Landfill Director	Riverview Land Preserve 20863 Grange Road Riverview, MI 48193	(734) 785-5927

2.0 SUMMARY OF RESULTS

The RLP open flares 1 and 2 serve as a back-up control devices for when the RES facility is not operating or there is excess LFG beyond the capacity of the RES plant. The flares are designed to meet the performance requirements of 40 CFR 60.18 at flows up to 2,131 scfm and 4,700 scfm, respectively. The flares operated at an average measured inlet volumetric flow rate of approximately 1,251 scfm and 2,999 scfm, respectively, during the testing.

The results of the tests were:

- Flare 1;
    - Visible emissions: no accumulated emission time;
    - Average net heating value of the gas being combusted: 17.50 mega joules per standard cubic meter (MJ/m3); and
    - Average exhaust gas exit velocity: 26.56 feet per second (ft./sec).
- Flare 2;
    - Visible emissions: no accumulated emission time;
    - Average net heating value of the gas being combusted: 17.37 mega joules per standard cubic meter (MJ/m3); and
    - Average exhaust gas exit velocity: 35.82 feet per second (ft./sec).

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

The test results demonstrate that RLP's open flares meet the performance requirements of 40 CFR 60.18.

3.0 SAMPLING AND ANALYTICAL PROCEDURES

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

3.1 VISUAL DETERMINATION OF FUGITIVE EMISSIONS FROM MATERIAL SOURCES AND SMOKE EMISSIONS FROM FLARES (METHOD 22, ALTERNATIVE 42)

For each flare, Tetra Tech conducted a single, 30 minute, non-continuous observation of the open flare exhaust for smoke emissions. Tetra Tech observed continuously for 15 minutes, then took a break for 5 minutes, and resumed observation until a full 30 minute period of observation time had accrued. 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)

Tetra Tech used Method 3C to determine the net heating value of the landfill gas. For each flare, Tetra Tech conducted a single (1) 30 minute test supplemented by two (2) methane readings per sample from a Landtec GEM 5000. Tetra Tech submitted the samples to Air Technology Laboratories, Inc. (Air Technology), City of Industry, California. Air Technology analyzed the samples for carbon dioxide (CO2), methane (CH4), nitrogen (N2), and oxygen (O2). The Air Technology laboratory analytical report is presented in Appendix C. Net heating values were then calculated for each flare in accordance with 40 CFR 60.754(e) for the two (2) methane readings as well as the laboratory analyzed sample. The net heating value calculations for the open flares 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 that the calibration had to be "recent". Tetra Tech used the flare flow meter to measure the flow rate at the open flares. The flow meter calibration documentation is presented in Appendix E. The open flare exhaust velocity calculations have been included in Appendix D.

4.0 TEST RESULTS AND DISCUSSION

Tetra Tech conducted the performance testing in accordance with the test methods as proposed in the open flare test plan. Mr. Adam Marshall performed the testing as detailed below. There was an issue with the initial flow readings at Flare 2, once the gas sample was taken site personnel removed the flow meter probe and cleaned it of condensate build up, once the probe was reinserted there was an immediate and notable increase in the recorded flow values. these flow values were more in line with those typically seen at Flare 2. Both Flares 1 & 2 operated at roughly 60% of their permitted maximum flow rates 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 open flare. Find below a detailed discussion of the test methods utilized, person or persons performing the testing, and discussion of the results and compliance status of the open flare.

4.1 METHOD 22, ALTERNATIVE 42

Visible emissions testing by Method 22, Alternative 42 was performed by Mr. Marshall of Tetra Tech. Mr. Marshall observed continuously for 15 minutes, then took a break for 5 minutes, and resumed observation until a full 30 minute period of observation time had accrued. A copy of Mr. Marshall's observations including weather conditions including wind direction during the test are included with the field forms in Appendix B. No visible emissions were observed during the testing period in compliance with 40 CFR 60.18(f)(1) which requires less than 5 minutes of visible emissions during a 30 minute test period.

4.2 METHOD 3C, ALTERNATIVE 42

The net heating value of the gas being combusted in the flare was tested by Method 3C, Alternative 42. Mr. Marshall performed the LFG sampling. During the performance test, for each flare, a gas sample was taken using two (2) 6-L Summa canister and sent to Air Technology Laboratory for analysis. In addition, for each flare two (2) methane readings per sample canister were taken using an Envision at the common header prior to the open flare. The gas readings were taken prior to and after the collection of the LFG samples.

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

Date	Time	CH_4 (%)	CO_2 (%)	O_2 (%)	Balance (%)	Heating Value (MJ/m^3)
Sample ID: Flare 1						
February 6, 2024	9:40	50.3	39.2	0.6	9.9	17.04 (calculated)
February 6, 2024 (Laboratory Analysis)	9:44 – 10:14	54.0	39.0	ND	9.1	18.29 (calculated)
February 6, 2024	10:18	50.7	40.2	0.5	8.6	17.17 (calculated)

Date	Time	CH_4 (%)	CO_2 (%)	O_2 (%)	Balance (%)	Heating Value (MJ/m^3)
Sample ID: Flare 2						
February 6, 2024	8:52	50.3	38.2	0.7	10.8	17.04 (calculated)
February 6, 2024 (Laboratory Analysis)	9:00 – 9:30	53.0	39.0	1.4	10	17.95 (calculated)
February 6, 2024	9:33	50.5	39.5	0.7	9.3	17.11 (calculated)

Sample calculations of the net heating values 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 values for the LFG combusted in the open flares are greater than 7.45 MJ/m3 and is therefore in compliance with 40 CFR 60.18(f)(3).

4.3 METHOD 2C, ALTERNATIVE 55

The actual exhaust velocity of the open flares was determined by Method 2C, Alternative 55. During the testing period the flow rate to the open flares was monitored by a mass flow meter and recorded in 10 minute intervals by a Yokogawa data recorder. The exhaust velocity was then determined by dividing the volumetric flow rate (obtained by Method 2C Alternative 55) 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 the below table:

Device	Date	Time	Average Flow (scfm)	Exit Velocity (ft/sec)
Flare 1	February 6, 2024	10:00 – 11:00	1429.2	30.34
Flare 1	February 6, 2024	11:00 – 12:00	1162.4	24.68
Flare 1	February 6, 2024	12:00 – 13:00	1161.9	24.67
Flare 2	February 6, 2024	12:30 – 13:30	3000.0	35.83
Flare 2	February 6, 2024	13:30 – 14:30	3003.5	35.87
Flare 2	February 6, 2024	14:30 – 15:30	2994.0	35.76

Sample calculations of the open flares 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 RLP open flares meets the performance requirements of 40 CFR 60.18.

5.0 LIMITATIONS

The work product included in the attached was undertaken in full conformity with generally accepted professional consulting principles and practices and to the fullest extent as allowed by law we expressly disclaim all warranties, express or implied, including warranties of merchantability or fitness for a particular purpose. The work product was completed in full conformity with the contract with our client and this document is solely for the use and reliance of our client (unless previously agreed upon that a third party could rely on the work product) and any reliance on this work product by an unapproved outside party is at such party's risk.

The work product herein (including opinions, conclusions, suggestions, etc.) was prepared based on the situations and circumstances as found at the time, location, scope, and goal of our performance and thus should be relied upon and used by our client recognizing these considerations and limitations. Cornerstone Environmental Group, LLC - A Tetra Tech Company shall not be liable for the consequences of any change in environmental standards, practices, or regulations following the completion of our work and there is no warrant to the veracity of information provided by third parties, or the partial utilization of this work product.