

Verification Report for Rochelle Municipal Landfill—CAR1372

Climate Action Reserve

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1. Introduction

This report is provided to the Project Developer, Element Markets Emissions, LLC (Element Markets), as a deliverable of the Climate Action Reserve (CAR) project verification process. This report covers the verification of the Rochelle Municipal Landfill – CAR1372 (the Project) for the reporting period of January 1 through December 31, 2022.

Archaea Energy oversees daily operation of the energy plant and facilitates many aspects of project operation, data management, and reporting. Archaea Energy is the responsible party for the GHG statement under verification. Archaea Energy was responsible for the preparation and fair presentation of the GHG statement. First Environment is responsible for expressing the opinion below on the GHG statement based on the outcome of the verification process.

2. Objectives

The purpose of this verification was, through review of appropriate evidence, to establish that:

- the Project conforms to the requirements of the verification criteria, including all eligibility requirements, discussed in Section 4 of this report; and
- the data reported are accurate, complete, consistent, transparent, and free of material error or omission.

Verification objectives also included reaching a conclusion about the accuracy of the GHG statement and the conformity of the statement with criteria.

3. Verification Scope

Specific scope metrics for the verification are outlined in the table below:

Geographic Boundaries	Rochelle Municipal Landfill, Rochelle, Illinois
Emission Reduction Sources, Project Emissions, and Greenhouse Gases	Emissions reductions (expressed in units of Carbon Dioxide equivalents (CO ₂ e)) resulting from methane destruction; Project emissions from purchased electricity.
Reporting Period	January 1, 2022 through December 31, 2022
Data Sources	Metered Data and Emissions Reduction Calculations

4. Standards Used to Verify Emissions (Criteria)

The following table outlines the guidance and protocols used to conduct this verification:

Standard of Verification	• Climate Action Reserve Landfill Project Protocol, Version 5.0, April 24, 2019 (CAR Protocol) • Reserve Offset Program Manual, July 26, 2023
Verification Process	• Section 8 of the CAR Protocol • Climate Action Reserve Verification Program Manual, February 3, 2021 • ISO 14064-3: Specification with guidance for the verification and validation of greenhouse gas statements, 2019

Level of Assurance	• Reasonable assurance
Materiality	• Misstatements greater than one percent of the Project's emission reductions assertion are considered material • Qualitative non-conformities with the CAR Protocol are also considered material

5. Overview of the Verification Process

The verification process was utilized to gain an understanding of the Project's emission sources and reductions and to evaluate and verify the collection and handling of data, the calculations that lead to the results, and the means for reporting the associated data and results.

The following verification process was used:

- conflict of interest review;
- selection of Audit Team;
- verification preparations;
- initial interaction and kickoff meeting with Archaea Energy;
- development of the verification and evidence gathering plan;
- execution;
- site visit;
- assessment of raw data and calculations for period under review;
- follow-up interaction with the project developer for corrective action, clarification, or supplemental data as needed;
- Independent review; and
- final opinion and report submittal.

5.1 Conflict of Interest Review

Prior to beginning any verification project, First Environment conducts an evaluation to identify any potential conflicts of interest associated with the Project. No potential conflicts were found for this Project. First Environment received authorization to proceed with verification activities for the project developer from CAR in a notification dated March 14, 2023.

5.2 Audit Team

First Environment's Verification Team consisted of the following individuals who were selected based on their verification experience, as well as familiarity with landfill operations.

Lead Verifier – Jeff Daley
Verifier – Logan Simpson
Senior Internal Reviewer – Michael Carim

5.3 Strategic Analysis and Verification Preparations

First Environment performed pre-engagement activities to confirm the type of engagement, level of assurance, materiality thresholds, the objectives, criteria, and scope for verification activities.

First Environment also performed a strategic analysis to understand the activities and complexity of the project and to determine the nature and extent of the verification activities required. The strategic analysis was also used to develop sufficient understanding of the GHG-related activity and its relevant sector information to plan and conduct the verification.

5.4 Audit Kick-off

The verification was initiated with a kick-off meeting on March 17, 2023 with Archaea Energy. The meeting focused on confirming the scope, schedule, and data required for verification.

5.5 Development of the Verification and Evidence-Gathering Plans

The Audit Team formally documented its verification plan as well as determined the evidence gathering plan. The verification plan was developed based on the discussion of key elements of the project verification process during the kick-off meeting. The project developer was afforded the opportunity to comment on the key elements of the plan for verification. Based on items discussed and agreed upon with the project developer, the plan identified the First Environment project team members, project level of assurance, materiality threshold, and standards of evaluation and reporting for the verification. It also provided an outline of the verification process, established project deliverables, and presented a data-evidence gathering plan designed to review all project elements in areas of potentially high risk of inaccuracy or non-conformance.

5.6 Execution of Evidence Gathering Activities

The Audit Team executed the evidence-gathering activities. The verification was conducted according to the verification plan and the evidence-gathering activities according to the evidence-gathering plan.

5.7 Site Visit

Mr. Jeff Daley conducted a site visit on May 26, 2022 to assess the Project's data management systems and interview personnel relevant to the Project as part of the verification process for the previous reporting period. Consistent with the requirements of Section 7.3.3 of the Protocol and because it was confirmed during the current verification process that no significant changes have occurred, a site visit was deemed unnecessary for the current verification.

5.8 Emissions Reduction Data and Calculation Assessment

This assessment used information and insights gained during the previous steps to evaluate the collected data and the reported emissions reduction quantities and identify if either contained material or immaterial misstatements.

5.9 Corrective Actions and Supplemental Information

The team issued corrective action and clarification requests during the verification process. Archaea Energy provided sufficient responses to all corrective action and clarification requests.

5.10 Independent Review

Before verification reporting is released to the client, a First Environment lead verifier, who has not participated in the verification activities, conducts an independent review to confirm that all verification activities have been completed and provide the agreed upon level of assurance.

5.11 Verification Reporting and Opinion Issuance

Verification reporting, represented by this report, documents the verification process and identifies its findings and results. Verification reporting consists of this report for Element Markets, a verification opinion, and a list of findings, all to be submitted to the Climate Action Reserve.

6. Site's Conformance with Verification Criteria

6.1 Project Description

The Rochelle Municipal Landfill is located in Rochelle, Illinois and is owned by Rochelle Waste Disposal. The landfill opened in 1973 and currently receives municipal solid waste.

The Project consists of the voluntary collection and destruction of landfill gas in three Caterpillar 3520C Gensets and two open flares. The Landfill consists of Units 1-3, all of which are separate units from each other and incorporate geomembrane liners which prevent the migration of gas between units. The Project landfill gas (LFG) well field and active gas collection and control system installation was completed in 2009 and currently captures gas from all landfill Units for destruction in the engines or flares. Prior to this system, LFG was collected and flared from Unit 1 only. Because LFG from Unit 1 was destroyed prior to the Project activity, LFG methane flow from Unit 1 is not eligible for crediting. It was confirmed during the course of verification activities and attested to by Archaea Energy in writing that the Unit #1 header line valve remained closed for the duration of the reporting period. As allowable per a previously issued variance determination by CAR (2020-1-12-VAR-1-DET-CAR1372), and because it was confirmed that the Unit #1 header valve remained closed, a Unit #1 deduction is not needed for the current reporting period. Destruction of landfill gas in the flares is not being claimed during the current reporting period. The Project destroys landfill gas that otherwise would be vented to the atmosphere, resulting in a net reduction of CO₂-equivalents. The baseline scenario is defined as the installation of a new gas collection system on physically distinct cells where neither gas collection nor destruction has previously occurred.

6.2 Eligibility

The Project meets the eligibility requirements set forth in the CAR Protocol, as described below.

6.2.1 Ownership and Title

Rochelle Waste Disposal (an entity owned by the City of Rochelle) is the owner of the landfill. In October 2021, Archaea Energy acquired membership interest in Frontier Operation Services, LLC (former plant operator), and JL Evensol, LLC. The energy plant was previously owned by Rochelle Energy, LLC, a subsidiary of William Charles Energy, LLC. First Environment reviewed four affidavits signed by each party (i.e., Rochelle Waste Disposal, the City of Rochelle, William Charles Energy, and JL Evensol, LLC), all of which identify and confirm that JL Evensol, LLC retains ownership of the emission reduction credits associated with the destruction of landfill gas from the landfill. JL Evensol, LLC then entered into an agreement with Element Markets Emissions, LLC selling ownership of the carbon credits to Element Markets Emissions, LLC. These documents reasonably establish transfer of ownership from all involved entities to Element Markets Emissions, LLC.

Additionally, First Environment relied on the Attestation of Title completed by Element Markets for the current verification period. The Attestation is on file with CAR and was reviewed to confirm that it was completed correctly.

6.2.2 Project Start Date

First Environment confirmed that the Project meets CAR's start date requirements. The Project start date is June 12, 2009, which was confirmed through review of the Illinois Environmental Protection Agency (IEPA) approval of the Landfill Operating Permit modification which allowed the Unit #2 Gas Collection Control System (GCCS) to begin operation to collect and destroy methane; therefore, the identified start date is within 90 days of first flow of landfill gas from Unit #2.

The Project is currently within its second crediting period which spans from June 12, 2019 through June 11, 2029.

6.2.3 Additionality

The Project passes both the Performance Standard Test and the Legal Requirements Test, as described below.

6.2.3.1 Performance Standard Test

The Project consists of the installation of a new gas collection system on physically distinct cells where neither gas collection nor destruction has previously occurred and therefore exceeds the performance standard defined by the CAR Protocol, specifically Scenario 4 from the list provided in Section 3.4.1 of the CAR Protocol. The landfill previously collected and destroyed LFG in an open flare from Unit #1. It was also confirmed that the landfill does not add any liquid other than leachate into the waste mass in a controlled manner. Therefore, the landfill is not a bioreactor.

6.2.3.2 Legal Requirements Test

The landfill has a permitted capacity above the 2.5 million cubic meter threshold of municipal solid waste that triggers New Source Performance Standard (NSPS) requirements. As such, the most recent non-methane organic compounds (NMOC) emissions rate testing occurred on April 20, 2022. The NSPS Tier II Landfill Gas Sampling Test Report dated April 2022 was prepared in accordance with 40CFR60, Subpart XXX and serves as the five-year compliance report. The report identifies that the NMOC emission rate is estimated to be 26.17 Megagrams (Mg) per year in 2022, which is below the 34 Mg per year threshold established by the NSPS regulation. Therefore, the landfill is not required to operate an active collection system under NSPS requirements.

First Environment reviewed the facility's solid waste operating permit and applicable Title V permits to confirm that no other requirements for an active landfill gas collection and control system existed. This cursory review of permits, laws, and regulations indicated the voluntary nature of the Project.

Additionally, First Environment relied on the Attestation of Voluntary Implementation completed by Element Markets for the current verification period. The Attestation is on file with CAR and was reviewed to confirm that it was completed correctly.

6.2.4 Regulatory Compliance

First Environment reviewed the landfill's Solid Waste Permit, Title V Permit, and the energy plant's Title V Permit, and Wastewater Permit to determine regulatory compliance. First Environment generated compliance reports for both the landfill and energy plant on May 3, 2023 using the

Environmental Protection Agency's (EPA) Enforcement and Compliance History Online (ECHO) database. The following issue was identified in the ECHO database:

- Landfill: The ECHO report indicated that there were Discharge Monitoring Report (DMR) exceedances of nitrogen, zinc, iron, and copper throughout 2022. These are mineral exceedances from stormwater discharge at facility outfalls. First Environment determined from review of the ECHO Effluent Chart reports that these exceedances are not related to the Project activity.

No other evidence of noncompliance was identified during the reporting period.

Additionally, First Environment relied on the Attestation of Regulatory Compliance completed by Element Markets for the current verification period. The Attestation is on file with CAR and was reviewed to confirm that it was completed correctly.

6.3 Project Performance Against CAR Protocol and Project Management System

The Project was implemented in conformity with the CAR Protocol. Element Markets developed and implemented a Monitoring Plan to track relevant project parameters and data sources. The Monitoring Plan, including the Project Diagram, was reviewed to determine compliance with the protocol requirements. Based on observations made during the previous site visit and review of relevant project documentation, First Environment found the Monitoring Plan and Project Diagram to meet the requirements set forth by the CAR Protocol and the Project to be implemented in accordance with the Monitoring Plan. Additionally, First Environment confirmed during the course of verification activities that relevant individuals are properly trained to implement the Monitoring Plan.

6.3.1 Project Monitoring

The Project's monitoring conforms to the requirements of the CAR Protocol, as discussed below.

Landfill gas flow to the engines is measured continuously using a single-flow meter assembly consisting of a Veris Verabar flow element in conjunction with Rosemount Model 2051 pressure transmitters. Engine flow rates are standardized from ambient conditions to a standard temperature and pressure of 68°F and one atmosphere.

Methane concentration of the landfill gas was measured continuously using an Ecotec FAU-TDL continuous gas analyzer.

Both gas flow rates and methane concentration are measured on the same relative moisture basis. A SCADA system records the continuous flow rate and continuous methane concentration data at least once every 15 minutes.

Each engine is equipped with a safety shut-off valve that prevents biogas flow to the destruction devices when not operational.

Table 1 summarizes the Project monitoring system parameters and monitoring equipment employed by the Project.

TABLE 1: Monitoring Equipment *

Parameter	Monitoring Equipment	Frequency of Measurement	Frequency of Recording	Recording Device
Landfill gas flow	Veris Verabar / Rosemount pressure transmitters	Continuous	At least every 15 minutes	SCADA System
Methane Concentration	Ecotec FAU-TDL Continuous Gas Analyzer	Continuous	At least every 15 minutes	SCADA System
Hourly Operation of Destruction Device	Each engine is equipped with safety shut off device that prevents biogas flow to the destruction device when the destruction device is not operational.			

*Note: Unit #1 flow is not applicable to the current reporting period as described in Section 6.1 above, and therefore the Unit #1 flow meter is not included within this table.

6.3.2 Instrument Quality Assurance/Quality Control

Element Markets' instrument quality assurance/quality control (QA/QC) plan for the Project's monitoring equipment complies with CAR Protocol's requirements.

The engines' flow meter assembly is cleaned and inspected four times per year as specified in the Project's monitoring plan with as-found/as-left conditions documented. The flow meter and its components are field accuracy checked and calibrated in-situ to a range of conditions corresponding to the range of conditions as measured at the landfill by a third party (CML Enterprises Inc.) within two months of the end of the reporting period. First Environment reviewed documentation of all instrument inspections, field check, and calibrations. The as-found condition documented for the field accuracy check and calibration event indicated that the flow meter's components were operating within the required five percent accuracy range. The manufacturer recommends factory calibrations once every three years. The Project flow meter components are calibrated more frequently than manufacturer recommendations.

The gas analyzer is cleaned and inspected four times per year as specified in the Project's monitoring plan with as-found/as-left conditions documented and is field checked and calibrated in-situ by a third party (CML Enterprises, Inc.) within two months of the end of the reporting period. First Environment reviewed documentation of all instrument inspections, field check, and calibrations. The as-found condition documented for the field accuracy check and calibration event indicated that the gas analyzer was operating within the required five percent accuracy range. The manufacturer of the gas analyzer does not have a recommended calibration interval, only a recommended annual field check and therefore the Protocol five-year default calibration frequency applies.

Table 2 shows the dates when instrument QA/QC was performed.

TABLE 2: Instrument QA/QC

Monitoring Equipment	In Use	Inspection/cleaning	Field Accuracy Check	Calibration
Engines: Veris Veribar / Rosemount pressure transmitters	Entire reporting period	2/2/2022; 4/7/2022; 8/9/2022; 12/12/2022	12/12/2022	11/9/2021; 12/12/2022

Monitoring Equipment	In Use	Inspection/cleaning	Field Accuracy Check	Calibration
Ecotec FAU-TDL continuous gas analyzer	Entire reporting period	2/2/2022; 4/7/2022; 8/9/2022; 12/12/2022	12/12/2022	12/14/2021; 12/12/2022

6.3.3 Project Emissions

Project emissions sources and the associated monitoring methodology are summarized in Table 3.

TABLE 3: Project Emissions

Project Emissions Source	Monitoring
Consumption of Purchased Electricity to power the Project equipment	Monthly electrical utility bills

The Project activity and all ancillary equipment run off of a parasitic load from engine electricity production. The Project maintains data monitoring procedures for electricity consumption in the event there is grid electricity consumption. However, no grid electricity consumption was accounted for during the current reporting period as there was no extended engine plant downtime during the reporting period.

6.4 Emissions Reduction Calculation Assessment

The emission reduction calculations were reviewed to ensure accuracy in the formulas used and the raw data used as inputs. The formulas were tested to ensure consistency with the calculation methodology described in the CAR Protocol.

Total landfill gas flow is computed by multiplying the average landfill gas flow rate in a given interval by the length of the interval. Flow totals are aggregated on a daily basis. Metered gas flow volumes are recorded at standard conditions of one atmosphere of pressure and a temperature of 68°F by the engine flow meter. Engine flow data is then adjusted in the emission reduction calculations to a standard condition of one atmosphere of pressure and a temperature of 60°F. The total volume of methane destroyed by the Project was computed in daily intervals by multiplying the daily gas flow to the engines by the daily average of methane concentration measurements and is converted to a mass flow using the density of methane at 60°F and one atmosphere of pressure. The total quantity of methane destroyed by the Project is aggregated monthly and summed over the reporting period to obtain the total baseline emissions. Because one flow meter is monitoring flow to all three engines, it was confirmed through review of the raw flow data that during any intervals when one or more engines was not operational, the remaining engines had the available capacity to destroy all of the available landfill gas and that engine output corresponded to the flow of the gas. Additionally, it was confirmed during the previous site visit that the engines are designed in such a manner that it is physically impossible for gas to pass through while the engine(s) are non-operational, that each engine is equipped with an automatic safety shut-off valve, and that each engine is of identical destruction efficiency.

No data substitution was performed during the current reporting period.

The total emission reductions were determined by subtracting the Project emissions from the baseline emissions.

Table 4 summarizes the input parameters used in the emission reduction calculations.

TABLE 4: Input Parameters

Input Parameter	Name	Description/ Value
LFG _{i,t}	Total quantity of LFG	Aggregated daily from metered data, recorded at 68°F and one atmosphere of pressure.
PR _{CH₄,t}	Methane content	Averaged daily from continuous data.
DE _i	Default destruction efficiency	93.6% (Lean-burn Internal Combustion Engine)
OX	Oxidation Factor	10%
DF	Discount Factor	0%
GWP _{CH₄}	Global Warming Potential of Methane	28 (IPCC 5 th Assessment Report)

Copies of the raw data used in the calculations, including flow data and methane content data, were compared with the data used in the final calculations and tested for transcription or mathematical errors. A representative sample of raw data sources and calculations over the verification period were reviewed. First Environment performed recalculations of emission reductions for the entire verification period to assess whether they were free of material misstatement. First Environment found the emission reduction calculations to be free of material misstatement.

6.5 Approved Variance or Deviations

No new variances or deviations were obtained for the Project in this verification period. Forward looking guidance from a previously approved deviation was applied during this reporting period as discussed in Section 6.1.

7. Verification Conclusion

Based on the historical evidence collected and the assessments performed, First Environment concludes that the Project's GHG emissions reductions achieved through the collection and combustion of landfill gas for the reporting period of January 1 through December 31, 2022 can be considered with a reasonable level of assurance:

- in conformance with the verification criteria, and
- without material discrepancy.

Verified results show:

January 1 to December 31, 2022	Total
Baseline Emissions (tCO₂e)	106,207
Project Emissions (tCO₂e)	0
Emissions Reductions (tCO₂e)	106,207

8. Lead Verifier Signature



Jeff Daley
Senior Associate

9. Senior Internal Reviewer Signature



Michael Carim
Senior Associate