



Verification Report

CAR475 Gaston County Landfill Gas Destruction Project

Reporting Period: January 1, 2022 – December 31, 2022

Prepared for:

Gaston County Solid Waste and Recycling

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1.0 Introduction

Gaston County Solid Waste and Recycling (Gaston County) contracted Ruby Canyon Environmental, Inc. (RCE) to perform the verification of CAR475 Gaston County Landfill Gas Destruction Project (Project) for the reporting period January 1, 2022 through December 31, 2022 to the Climate Action Reserve (Reserve) Landfill Project Protocol Version 5.0 (Protocol). The Project involves greenhouse gas (GHG) emission reductions from the capture and destruction of landfill gas (LFG) from the project developer: Gaston County Solid Waste and Recycling, located in Dallas, North Carolina.

1.1 Project Background & Site Description

The Gaston County Landfill (Landfill) is an active landfill owned and operated by Gaston County Solid Waste and Recycling with a permitted design capacity of 6.1 million megagrams. The Landfill, which opened in 1988, covers 130.5 acres. The estimated date of landfill closure is 2029. The Gaston County Landfill has an active recycling facility at the site in addition to various administration offices.

A landfill gas collection and control system was voluntarily installed in 2008 and currently consists of 107 total landfill gas extraction wells and cleanouts associated collection piping and a blower/flare station. The Project destruction devices include a 4-inch open candlestick flare, a 10-inch open candlestick flare with a maximum capacity of 250 scfm and 2000 scfm, respectively, and three GE Jenbacher lean burn engines with 1.4 MW installed capacity each.

The Gaston County Landfill Gas Destruction Project began construction and operation in 2008. Blowers are used to extract the LFG and send it to the engines or to the open flares for destruction.

1.2 Responsible Party

Project Developer & Landfill Owner: Gaston County Solid Waste and Recycling
Technical Consultants: HDR Engineering Inc.

1.3 Verification Team

The RCE verification team consisted of the following individuals who were selected based upon verification experience and knowledge of the landfill methane sector.

Lead Verifier: Garrett Heidrick
Senior Internal Reviewer: Bonny Crews

1.4 Objectives

The goal of the verification activities was to ensure that the claimed GHG emission reductions were complete, consistent, accurate, transparent, and permanent and that the Project followed the Reserve's project additionality, monitoring, and reporting requirements. Furthermore, the verification activities ensure that the data provided to RCE are well documented and free of any material errors or omissions.

1.5 Scope

The scope of the verification consisted of the following independent and objective activities:

- Review the reporting period's Project Monitoring Plan;
- Review the Project data acquisition and quality control procedures;
- Review the Project's baseline emissions and confirm the baseline and Project boundaries;
- Review the Project's evidence of environmental and regulatory requirements to ensure that the Project is additional.
- Review the Project's emission reduction calculations;
- Review the Project documents and data against the criteria listed in Table 1;

- Issue requests for additional documentation, clarifications, non-material findings, and corrective actions as necessary; and
- Issue a verification report, verification statement, and list of findings to Gaston County and the Reserve.

1.6 Verification Criteria

Table 1 – Summary of Verification Criteria

Criteria	Details
Standard of Verification	<ul style="list-style-type: none"> • Climate Action Reserve Landfill Project Protocol Version 5.0 (April 24, 2019) • Climate Action Reserve Verification Program Manual (February 3, 2021) • Reserve Offset Program Manual (March 12, 2021)
Verification Process	The Reserve Verification Program Manual and ISO 14064-3:2006 Specification with guidance for the validation and verification of greenhouse gas assertions
Level of Assurance	Reasonable assurance
Materiality	99% accuracy level (less than 1% error) because emission reductions are over 100,000 tCO ₂ e annually.

2.0 Verification Activities Summary

The Verification process consisted of the following activities as outlined in the verification plan:

- RCE completed a NOVA/COI form to identify any potential conflict of interest with the Project, Gaston County, or technical consultants. The NOVA/COI form was submitted to the Reserve and the COI assessment revealed no conflicts of interest and was approved by the Reserve on April 19, 2023.
- RCE held a verification kick-off meeting with Gaston County on April 20, 2023. During the kick-off meeting RCE reviewed the verification objectives and process, reviewed the verification schedule, and requested the verification background documents.
- RCE performed a strategic review and risk assessment of the received data and support documents to understand the scope and areas of potential risk in the GHG emissions inventory.
- RCE developed a risk-based sampling plan based upon the strategic review and risk assessment. The verification plan and sampling plan were used throughout the verification and were revised as needed based upon additional risk assessments.
- RCE completed a site visit on May 23, 2023. During the site visit RCE performed key personnel interviews; inspected the Project equipment; and observed the onsite GHG management systems and data gathering, monitoring, and handling practices.
- RCE performed a risk-based desktop review of the submitted verification documents. The desktop review included an assessment of the GHG calculation methods and inputs, source data completeness, GHG management and monitoring systems, evidence of regulatory compliance, and record retention practices.
- RCE submitted requests for corrective actions, non-material findings, additional documentation, and clarifications, as necessary to Gaston County throughout the verification.
- RCE's senior internal reviewer conducted a review of the verification sampling, report, and statement.
- RCE issued a final verification report, verification statement, and list of findings.
- RCE held an exit meeting with Gaston County.

3.0 Verification Findings

3.1 Assessment of the GHG Emission Reductions Project Operations

The Landfill currently collects LFG and destroys it via combustion in three electricity-generating engines and a flare system with two open flares. The LFG is pulled by blowers located at the flare skid through a gas collection system that consists of vertical wells and a leachate collection and removal system. RCE confirmed that the project is not a bioreactor and does not add any liquid other than leachate in a controlled manner.

3.2 GHG Project Boundary (sources, sinks and/or reservoirs)

The Protocol designates that CO₂ and CH₄ are the only GHGs included from the baseline and Project activities. The project emissions must be deducted from the baseline emissions to calculate GHG emission reductions. These GHG sources include methane generated from biodegradation of the landfill waste vented to the atmosphere, methane consumed by soil bacteria through natural oxidation, incomplete combustion of methane via Project destruction devices, fossil fuel use, and electricity use. The sources of GHG emissions reviewed during the verification of the Project are listed in Table 2.

Table 2 – Summary of the Project GHG Sources, Sinks and Reservoirs

Activity	GHG Sources, Sinks & Reservoirs
Baseline	<ul style="list-style-type: none"> • CH₄ vented to the atmosphere. • Percent CH₄ oxidized by soil bacteria. As the landfill is not covered with a synthetic liner, a 10% oxidation factor resulting from natural oxidation by soil bacteria was applied to the baseline emissions.
Project	<ul style="list-style-type: none"> • CH₄ from the incomplete combustion of LFG sent to the engines and to the flare. • CO₂ from the combustion of fossil fuels for fixed and mobile sources used during operation and maintenance of the Project activity. • CO₂ resulting from the consumption of imported electricity.

3.3 Project Eligibility Criteria

The Protocol specifies four eligibility rules that a project must meet to register emission reductions with the Reserve: Location, Project Start Date, Additionality, and Regulatory Compliance. Below is a summary of the Reserve eligibility requirements and the Project’s compliance to each requirement.

- **Eligibility Rule 1: Location**

The Project is a US-based landfill located near Dallas, NC, USA. The Project therefore meets this eligibility requirement.

- **Eligibility Rule 2: Project Start Date**

RCE verified the Project start date during our review of the 2018 reporting period. The Project submittal form was submitted to the Reserve on June 13, 2019 for the second crediting period. The Project began gas destruction by flaring on November 18, 2008. RCE reviewed the Project Submittal form, drawings of the plan for flare construction and the initial verification report from 2012 in support of this start date.

- **Eligibility Rule 3: Additionality**

Performance Standard Test

During the first verification of the Project, RCE confirmed that the Project passes the Performance Standard Test option 2 according to the U.S. Landfill Project Protocol Version 5.0. Prior to Project activity, the Gaston County Landfill did not combust any landfill gas and only collected and passively vented the gas through the nine passive vents. The current Project involved the “Installation of a new qualifying destruction device at an eligible landfill where landfill gas is currently collected and vented but has never been destroyed in a manner prior to the project start date.”

Legal Requirement Test

During the site visit, RCE interviewed the Project Developer about the procedures to ensure that the Project meets environmental compliance requirements and the Legal Requirement Test. The Project Developer monitors federal, local, and state regulations to ensure that the Project is in environmental compliance and that there is no mandate to collect and combust LFG. RCE also reviewed the Project’s Monitoring Manual which defines how the Project continues to exceed the Legal Requirement Test including having an administrator maintain compliance and knowledge of any changes in regulatory requirements.

RCE also reviewed the Attestation of Voluntary Implementation form signed after the end of the reporting period and uploaded to the Reserve website which states that the project was implemented and established voluntarily.

The Gaston County Landfill is permitted to operate at a design capacity of 6,129,300 Mg of municipal solid waste. The design capacity triggered the NSPS Tier II NMOC emissions estimates reporting requirement. According to the Tier II Report from 2020, the NMOC emission rate for 2022 was 23.1 Mg/yr and is below the NSPS 34 Mg/yr NMOC threshold. The site is not estimated to exceed the 34 Mg threshold in the next five years.

During the review of the supporting evidence, RCE did not observe any indication that the Gaston County Landfill was mandated to collect and combust their LFG. Additionally, there are no local, state, or Federal mandatory requirements for the installation of a gas collection and combustion system. Therefore, the results of the regulatory review indicated that Gaston County is following their Monitoring Manual procedures to assure they pass the Legal Requirement Test, and the Project follows all Federal, State, and Local regulations.

- **Eligibility Rule 4: Regulatory Compliance**

To confirm the landfill and project were within regulatory compliance RCE searched the EPA’s Enforcement & Compliance History Online (ECHO) database and reviewed the State of North Carolina Department of Environmental Quality’s online resources.

No violations were noted on the EPA ECHO database and no complaints were found on the North Carolina Department of Environmental Quality database. Furthermore, a site inspection completed by North Carolina Department of Environmental Quality on 6/7/2022 showed no violations.

RCE confirmed signature of the Attestation of Regulatory Compliance, after the end of the reporting period, which was uploaded to the Reserve.

3.4 Ownership of Generated Emission Reductions

RCE reviewed evidence that Gaston County has ownership of the GHG emission reductions. Ownership documentation reviewed includes permits, and the contract agreement between Gaston County and Duke Carolinas—the buyer of the electricity generated by the Project—which states that Gaston County retains all emission reduction credits. Finally, RCE reviewed the completed Attestation of Title which was uploaded to the Reserve website following the end of the reporting period.

3.5 GHG Monitoring and Management Systems

RCE reviewed the data management systems during the site visit and desktop review. RCE completed the majority of the GHG management systems review during the site visit by observing the onsite procedures and interviewing the personnel responsible for the Project. The onsite review included an assessment of the Project data collection, processing and handling procedures, recordkeeping and data storage, quality control and assurance procedures, record retention systems, and a field tour of the Project equipment. The desktop review included a detailed review of the Project monitoring plan and its conformance to Protocol requirements. RCE confirmed that the Project monitoring plan was updated to ensure proper compliance with all QA/QC requirements in future reporting periods.

The primary data gathered for the Project during this reporting period includes LFG flow to the 4-inch flare, the 10-inch flare, and the engines; methane content of the LFG; the flare temperatures; and the energy production of the engines. Three Rosemount 2051 differential pressure flow meters in conjunction with Rosemount differential pressure transmitters were used to record flow to the two flares and engines at a standard temperature and pressure of 60°F and 1 atm. RCE confirmed that the positions of the flow meters are adequate to ensure laminar flow. A continuous methane analyzer, a Siemens Ultramat 23 gas analyzer, is used to measure methane content on a continuous basis.

The operation and temperature of the flares are continuously monitored by thermocouples. Operation of the engines is monitored through the power plant's SCADA system, which records electricity production data for each engine on a 15-minute basis. The LFG flow, concentration, and temperature data are recorded continuously via a PLC system which sends data to an electronic chart recorder. The data are exported in 10-minute intervals on a weekly basis. The Environmental Analyst at the landfill also records manual measurements in a Project logbook daily.

During the site visit RCE reviewed the data storage and retention policies of the Gaston County Landfill and verified they were in conformance with the Protocol requirements and followed the Monitoring Manual. All data are kept for a period of at least ten years after the information is generated or seven years after the last verification.

3.6 Instrument QA/QC

RCE reviewed evidence that the LFG flow meter and methane analyzer met all instrument QA/QC requirements as outlined in the Protocol for cleaning, inspection, and field calibration checks. The dates for the cleanings, inspections, and field calibration checks for each piece of monitoring equipment were reviewed by the lead verifier. The calibration, cleaning and inspection were conducted regularly throughout 2022 on the following days: 3/1/2022, 6/22/2022, 9/20/2022, and 12/13/2022, with activities and results documented in the verification plan.

In addition to the cleaning and inspection, the 3rd party technician, Pass II LLC, also calibrated the flow meters. The documentation indicated that the flow meters did not read outside of the ±5% threshold as required by the Protocol, and the as found/as left conditions of the meters were documented. The 3rd party technician also conducted quarterly cleaning/inspections of the Siemens Ultramat analyzer which also did not exceed the ±5% threshold. The analyzer was also calibrated on a quarterly basis by the 3rd party technician.

The Rosemount differential pressure transmitters do not have a manufacturer-defined calibration schedule and the user can define their own calibration schedule based on system parameters. Pass II has defined a quarterly calibration schedule for the Rosemount transmitters. Siemens recommends using a calibration gas annually to calibrate the unit. RCE confirmed that the Siemens Ultramat 23 was calibrated using calibration gas quarterly as well as auto-calibrated regularly by landfill staff. RCE confirmed that all equipment was calibrated at a greater frequency than required by the manufacturer.

3.7 Assessment of GHG Emission Reductions Calculations

The emission reduction calculation assessment included a review of Project assumptions, raw data inputs, and accuracy of calculations. RCE first assessed the completeness of the raw data and how the data are transferred to the calculation spreadsheet. Next, RCE reviewed the formulas and raw data inputs for accuracy and compliance with Protocol requirements. Lastly, RCE recalculated the GHG emission reductions and compared the results to Gaston County's Project calculations and determined that the GHG emission reduction calculations were materially correct.

During the desktop review, RCE compared the raw data to the LFG flow volumes, gas methane analysis, and temperature readings in Gaston County's emission reduction spreadsheet. The fossil fuel use and electricity data were also compared to the information in Gaston County's GHG emissions calculations. RCE's review consisted of data transcription tests, data completeness, spreadsheet functionality, and accuracy.

Within the emission reduction spreadsheet, flow data were eliminated when the flare temperature was below a threshold temperature of 500 °F. All flow to the engine is considered destroyed due to the presence of a safety shut off valve that RCE has confirmed the presence of during the site visit. A 96% and 93.6% destruction efficiency were assigned to the open flares and engines, respectively. Because the landfill is not covered with a synthetic liner, a 10% discount was applied to the baseline scenario for oxidation of methane by soil bacteria.

The net amount of methane destroyed by the Project was calculated, summed for the reporting period, and converted into CO₂ equivalents (CO₂e). Project emissions consisted of indirect emissions of CO₂ from electricity consumption, diesel fuel used for vehicles designated to project activities, and direct emissions of CO₂ from the combustion of propane which is used as pilot fuel for the flare. The Project emissions were calculated from the product of activity data multiplied by an appropriate emission factor. The total Project GHG reductions in CO₂e were calculated by subtracting the Project emissions from the net amount of methane destroyed by the Project in CO₂e. The total emission reductions for 2022 reporting period increased by approximately 13% compared to 2021 due to a greater GWP for methane.

RCE reviewed source documentation for Project emissions from purchased electricity and propane; confirmed that appropriate emission and conversion factors were used; and reviewed the use of Protocol equations for Project emissions in the GHG assertion.

Lastly, RCE recalculated the GHG emission reductions and compared the results to Gaston County's calculations to determine if there was a material difference. The difference between RCE's and Gaston County's emission reductions was non-material.

4.0 Verification Results

Gaston County provided sufficient documentation of its emission reductions, data collection procedures, and monitoring and quality control procedures. The verification process focused on verifying the emission reductions claimed and the source data used by Gaston County Solid Waste and Gaston County to quantify the emission reductions in accordance with the Reserve Landfill Project Protocol Version 5.0. The following is a summary of the verification results.

The Project reported total emission reductions of **115,191** metric tons of CO₂e from January 1, 2022 through December 31, 2022. During the final review, RCE identified no material misstatements in the data or emission reduction calculations. The emission reductions verified are listed in Table 4. During the verification process, RCE made requests for corrective actions, clarifications, and additional document requests to complete the verification. Gaston County sufficiently addressed all requests. The details of these requests are documented in RCE’s List of Findings provided to the Reserve and Gaston County.

5.0 Conclusion

RCE conducted a risk-based analysis of the CAR475 Gaston County Landfill Gas Destruction Project GHG assertion including a strategic review of the Project data and evidence. Based upon the processes and procedures and the evidence collected, RCE concludes that the GHG assertion is a fair representation of the Project emission reductions resulting from the capture and utilization of LFG during the reporting period January 1, 2022 through December 31, 2022 can be considered:

- In conformance with the Reserve Landfill Project Protocol 5.0,
- Without material discrepancy, and
- Verified to a reasonable level of assurance

The verified emission reductions are listed in Table 4.

Table 4 – Emission Reductions Verified for January 1, 2022 through December 31, 2022

Period	Baseline Emissions CO ₂ e (tonnes)	Project Emissions CO ₂ e (tonnes)	Emission Reductions CO ₂ e (tonnes)
2022	115,711	520	115,191

Note: Due to rounding, individual values might not equal totals and values are not representative of raw data used in the emission reductions calculation.

Lead Verifier Signature



Garrett Heidrick

Senior Internal Reviewer Signature



Bonny Crews