



RUBY CANYON ENGINEERING

Verification Report for CAR566 Mahoning Landfill
January 1, 2012 – December 31, 2012 Reporting Period

Prepared for:
Mahoning Landfill, Inc.

December 23, 2013

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1.0 Introduction

Ruby Canyon Engineering (RCE) was contracted by Waste Management to perform the verification of the Mahoning Landfill project (Project) for the reporting period January 1, 2012 through December 31, 2012 to the Climate Action Reserve (Reserve) Landfill Project Protocol Version 2.0 (Protocol). The Project involves GHG emission reductions from the capture and destruction of methane from the Mahoning Landfill, an active municipal solid waste landfill located in New Springfield, Ohio.

1.1 *Project Background & Site Description*

The Mahoning Landfill is owned and operated by Mahoning Landfill, Inc. (Mahoning), a wholly owned subsidiary of Waste Management. The Landfill opened in 1996 and consists of four cells. The landfill has a gas collection and control system (GCCS) that is made up of vertical gas extraction wells and horizontal gas collectors. Blowers are used to extract the landfill gas (LFG) and send it to an open flare for destruction. RCE confirmed that the project is not a bioreactor.

1.2 *Responsible Parties*

Project Developer: Mahoning Landfill, Inc.

Technical Consultant: First Environment, 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: Phillip Cunningham

Team Members: Nina Pinette, Samantha Phillips

Senior Internal Reviewer: Zach Eyster

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 was in compliance with the Reserve project additionality, monitoring, and reporting requirements. Furthermore, the verification activities ensure that the data provided to RCE is well documented and free of any material errors or omissions.

1.5 *Scope*

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

- Review the Project Monitoring Plan
- Conduct a site visit to the Project location
- Review the project data acquisition and quality control procedures
- Review the Project's baseline emissions and project boundaries
- Review the Project's emission reduction calculations
- Review the Project documents and data against the verification criteria in Table 1
- Issue requests for additional documentation, clarifications, and corrective actions as necessary
- Issue a verification report, verification statement, and list of findings to Mahoning and the Reserve

1.6 Verification Criteria

Table 1 – Verification Criteria

Criteria	
Standard of Verification	• Climate Action Reserve Landfill Project Protocol Version 2.0 • Errata and Clarifications to Landfill Project Protocol Version 2.0 (October 8, 2013) • Landfill Project Verification Protocol Version 2.0 • Climate Action Reserve Program Manual (October 26, 2011) • Climate Action Reserve Verification Program Manual (December 20, 2010)
Verification Process	• Climate Action Reserve Verification Program Manual and ISO 14064-3 Specification with guidance for the validation and verification of greenhouse gas assertions
Level of Assurance	• Reasonable assurance
Materiality	• A +99% accuracy level (less than 1% error) because total annual ERs are greater than 100,000 tCO₂e

2.0 Verification Activities Summary

This is the verification of the third reporting period of the Project under the Reserve from January 1, 2012 through December 31, 2012.

Prior to starting the verification, RCE developed a verification plan to be followed throughout the verification. The verification plan consisted of the following activities:

- RCE completed the Project NOVA/COI form to identify any potential conflicts of interest with the Project or Project developer. The NOVA/COI form was submitted to the Reserve's website, and the COI assessment revealed no conflicts of interest and was approved by the Reserve on October 24, 2013.
- RCE held a verification kickoff meeting with Mahoning on November 1, 2013. During the kickoff meeting RCE reviewed the verification objectives, verification process and the verification schedule.
- RCE performed a strategic review and risk assessment of the received data and support documents in order to understand the scope and areas of potential risk in the GHG emissions reductions.
- 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 conducted a site visit on November 21, 2013. 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 including an assessment of the GHG calculation methods and inputs, source data completeness, GHG management and monitoring systems, evidence of regulatory compliance, continued additionality, and record retention practices.
- RCE submitted requests for additional documentation, clarifications, and corrective actions to Mahoning throughout the verification as necessary.

- RCE's senior internal reviewer conducted a review of the verification sampling, verification report, and verification statement.
- RCE developed a final verification report, verification statement, and list of findings.
- RCE held an exit meeting with Mahoning on December 23, 2013.

3.0 Verification Findings

3.1 Assessment of the GHG Reduction Project Operations

The Project currently collects LFG and destroys it via combustion in an open utility flare. The LFG is pulled by a blower located at the flare skid through a gas collection system that consists of wellheads connected by underground header piping. Prior to combustion, the LFG passes through a condensate knockout tank and is then measured for flow, temperature, and methane content.

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

According to the Protocol, carbon dioxide and methane are the only GHGs included in the Project boundary from both the baseline and Project activities. The emissions resulting from the Project activity must be deducted from the Project baseline emissions in order to calculate total emission reductions. These Project emissions include carbon dioxide resulting from both the consumption of electricity from the grid and from the on-site destruction of fossil fuel related to Project activities. The calculation of baseline emissions takes into account the total methane destroyed based on the destruction efficiency of the Project flare and the oxidation of methane by soil bacteria.

Table 2 lists the sources of GHG emissions reviewed during the verification of the Project.

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

Activity	GHG Sources, Sinks & Reservoirs
Baseline	• CH₄ vented to the atmosphere. • Methane oxidized by soil bacteria. As the landfill is not covered with a synthetic liner, a 10 percent oxidation factor resulting from natural oxidation by soil bacteria was applied to the baseline emissions.
Project	• CH₄ from the incomplete combustion of LFG in the flare. • CO₂ from the combustion of fossil fuels (propane) used during operation and maintenance activities for the Project activity. • CO₂ resulting from the consumption of imported electricity.

3.3 Project Eligibility Criteria

The Protocol specifies three eligibility rules that a GHG Project Developer must meet in order to register reductions with the Reserve: Location, Project Start Date, and Additionality. 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 U.S.-based project located in New Springfield, Ohio, USA. The Project therefore meets this eligibility requirement.

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

RCE confirmed the Project start date during the verification of the first reporting period. LFG was first combusted with a temporary flare for testing purposes and was later replaced with a permanent flare. RCE examined the Blower/flare Station Data Sheet, the Well-field Monitoring Data Sheet, and the Daily Operations and Maintenance Activity Report which contains notes about LFG Specialties starting the landfill gas blower and flare. The temporary flare first combusted LFG on January 20, 2003 and the permanent flare became operational on April 22, 2003. RCE verified January 20, 2003 as the Project start date.

- **Eligibility Rule 3: Additionality**

Performance Standard Test

RCE confirmed that the Project meets the Performance Standard Test during the verification of the first reporting period. The Project meets the Test under option 1, “If the landfill is not currently collecting and destroying any landfill gas, the project is considered additional”.

The Regulatory Test

During the site visit, RCE interviewed Mahoning about the procedures to ensure that the Project meets environmental compliance requirements and the Regulatory Test. The Environmental Protection Manager periodically reviews federal, state, and local laws, statutes, and rules to confirm that the Project is in environmental compliance and that there is no mandate to collect and combust LFG. RCE confirmed that there are currently no laws or ordinances requiring the Mahoning Landfill to collect and destroy LFG. RCE also reviewed the Project’s Monitoring Plan which defines how the Project continues to exceed the Regulatory Test.

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 Mahoning Landfill is subject to the New Source Performance Standards and is therefore required to perform a regular NMOC test. RCE reviewed the most recent NMOC emissions report dated November 2008 which estimates the NMOC emissions at 13.34 Mg/year for 2012 which is below the NSPS NMOC threshold of 50 Mg/year.

During the review of the supporting evidence, RCE did not observe any indication that the Mahoning Landfill was mandated to collect and combust LFG. Additionally, there are no local, state or Federal mandatory requirements for the installation of a gas collection and combustion system. RCE also reviewed environmental and operating permits as well as records of environmental compliance. A search was performed using the Environmental Protection Agency’s Enforcement and Compliance history Online (ECHO) database. No evidence was found that the Landfill had any outstanding penalties and all inspections performed for the reporting period found the Landfill to be in compliance.

The results of the regulatory review indicated that the Mahoning Landfill is following their Monitoring Plan procedures to ensure that they pass the Legal Requirement Test and that the Project is in compliance with all federal, state and local regulations.

Finally, 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 GHG Reductions

RCE reviewed evidence that Mahoning retains ownership of the GHG emission reductions. Evidence included a Warranty Deed and Proof of Property Ownership which demonstrates that Mahoning owns the landfill and subsequently the rights to all generated emission reductions. RCE also reviewed the completed Attestation of Title which was uploaded to the Reserve website following the end of the reporting period. First Environment Inc. (technical consultant) does not retain any rights to the environmental attributes generated by the Project.

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 also confirmed that the Project was implemented according to the Monitoring Plan.

The primary data gathered for the Project during this reporting period includes LFG flow to the flare, methane content of the LFG, and flare temperature. A Thermal Instruments 9500 flow meter was used to record LFG flow. RCE confirmed via the calibration certificate issued for the flow meter that LFG is recorded at the Protocol required temperature and pressure of 60°F and 1 atm. RCE confirmed that the position of the flow meter is adequate to ensure laminar flow. Several Landtec GEM2000 portable gas analyzers were used to measure methane concentration on a weekly basis throughout the reporting period. Most of the readings were taken using a single analyzer while substitute GEM2000's were utilized when the primary methane analyzer was sent for factory calibration. The operation and temperature of the flare is continuously monitored by a thermocouple. The flow and temperature data is recorded continuously by a Yokogawa digital chart recorder. The LFG technician periodically downloads the data and uploads it to Waste Management's online Landfill Gas Monitoring System (LGMS) site.

During the site visit RCE reviewed the Project developer's data storage and retention policies and verified that they were in conformance with the Protocol requirements and followed the Monitoring Plan.

3.6 Instrument QA/QC

RCE reviewed evidence that the LFG flow meters and portable methane analyzers met instrument QA/QC requirements as outlined in the protocol for cleaning, inspection, and calibration field checks. The flow meter in use was inspected, cleaned, and checked for calibration accuracy on March 13, 2012, June 29, 2012, September 25, 2012, and December 12, 2012. All calibration checks indicated that the flow meter was within the +/-5 percent threshold as required by the Protocol. Thermal Instruments recommends that a calibration check be performed every 12 to 18 months. Because the flow meter was checked for calibration on a quarterly basis, the Project developer exceeded the requirements of the

manufacturer's recommendation for calibration checks. The flow meter was also factory calibrated on July 14, 2011 prior to the start of the reporting period.

The portable gas analyzer used throughout most of the reporting period (SN# 7702) was calibrated on May 10, 2012 and December 17, 2012. The "as received gas check readings" indicated that the instrument was reading methane content within the + / - 5% accuracy threshold as defined by the Protocol. LandTec recommends that a service be performed on their equipment on a semi-annual basis. The last reading used for this GEM 2000 was on November 9, 2012, prior to the 6 month calibration deadline. The portable gas analyzer was calibrated twice during the reporting period, and thus met the manufacturer requirement for calibration.

RCE confirmed that all other spare GEM 2000 analyzers used during the reporting period, except for the GEM 2000 analyzer with SN# 8595, were calibrated by the manufacturer within six months prior to use at the Project. For the week of May 23, 2012, the GEM 2000 analyzer with SN# 8595 was outside the six month calibration frequency. The Project Developer elected to use the missing data methodology as described in the Errata and Clarifications. This was the final week that this GEM 2000 analyzer was used during the reporting period. The "as received gas check readings" indicated that all of the GEM 2000 analyzers were reading methane content within the + / - 5% accuracy threshold.

In addition, all GEM 2000 analyzers used during the reporting period were calibrated with calibration gas before each weekly methane measurement was taken.

3.7 Assessment of GHG Emissions Reductions Calculations

The emission reduction calculations assessment included a review of the Project assumptions, raw data inputs, and accuracy of calculations. RCE first assessed the completeness of the raw data and how the data is transferred to the calculation spreadsheet. Next, the formulas and raw data inputs were reviewed for accuracy and compliance with the Protocol. RCE received .dad raw data files for the entire reporting period. These files were converted into .csv files and the entire reporting period credits were calculated and compared to Mahoning's final assertion. There was no material difference between RCE's final emission reduction number and Mahoning's final emission reduction number.

RCE reviewed the check built into the spreadsheet that totalizes flow only at times when the flare is operational (thermocouple readings greater than 500°F). RCE confirmed that the appropriate destruction efficiency was applied for the open flare (96%) and that a 10 percent discount was applied for the oxidation of methane by soil bacteria because the landfill does not have a synthetic cover. An additional 10 percent discount was applied to the emission reductions calculation because weekly methane measurements were taken throughout the reporting period.

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 Mahoning's calculation spreadsheet.

4.0 Verification Results

Mahoning provided sufficient evidence and documentation of their emission estimates, data collection procedures, and their monitoring and quality control procedures. The verification process focused on verifying the emission reduction calculations and the source data used to quantify the emission

reductions in accordance with the Climate Action Reserve Landfill Project Protocol Version 2.0. The following is a summary of the verification results.

The Project reported emission reductions of **108,487** metric tons CO₂e in 2012 as per the information provided in the Mahoning Landfill calculation spreadsheet. During final review, RCE identified no material misstatements in the data or emissions calculations. Table 3 defines the emission reductions verified for this reporting period.

During the verification process, RCE identified no material or non-material findings and Mahoning provided all relevant documents at the beginning of the verification.

5.0 Conclusion

RCE conducted a risk-based analysis of the Mahoning Landfill 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 destruction of landfill gas during the reporting period January 1, 2012 through December 31, 2012 and can be considered:

- In conformance with the Climate Action Reserve Landfill Project Protocol Version 2.0 and the Landfill Project Verification Protocol Version 2.0,
- Without material discrepancy, and
- Verified to a reasonable level of assurance

The verified emission reduction CRTs are listed in **Table 3**.

Table 3 Emission Reductions Verified for January 1, 2012 through December 31, 2012

Emissions Verified	Baseline Emissions CO₂e (metric tons)	Project Emissions CO₂e (metric tons)	Emission Reductions CO₂e (metric tons)
2012 Emission Reductions	108,656	169	108,487

Lead Verifier Signature



Phillip Cunningham

Senior Internal Reviewer Signature



Zach Eyler