



RUBY CANYON ENGINEERING

Verification Report for CAR887 City of Thomasville MSW Landfill

Reporting Period: March 1, 2011 – December 31, 2012

Prepared for:

City of Thomasville, Georgia

September 4, 2013

Ruby Canyon Engineering
743 Horizon Ct. Suite 385
Grand Junction, Colorado 81506
(970) 241-9298

Table of Contents

1.0	INTRODUCTION	2
1.1	PROJECT BACKGROUND & SITE DESCRIPTION.....	2
1.2	RESPONSIBLE PARTY	2
1.3	VERIFICATION TEAM	2
1.4	OBJECTIVES.....	2
1.5	SCOPE	2
1.6	VERIFICATION CRITERIA.....	3
2.0	VERIFICATION ACTIVITIES SUMMARY	3
3.0	VERIFICATION FINDINGS	4
3.1	ASSESSMENT OF THE GHG REDUCTION PROJECT OPERATIONS	4
3.2	GHG PROJECT BOUNDARY (SOURCES, SINKS, AND/OR RESERVOIRS)	4
3.3	PROJECT ELIGIBILITY CRITERIA	5
3.4	OWNERSHIP OF GENERATED REDUCTIONS.....	6
3.5	GHG MONITORING AND MANAGEMENT SYSTEMS	7
3.6	INSTRUMENT QA/QC.....	7
3.7	ASSESSMENT OF GHG EMISSION REDUCTIONS CALCULATIONS	8
4.0	VERIFICATION RESULTS	9
5.0	VERIFICATION STATEMENT.....	10

1.0 Introduction

Ruby Canyon Engineering was contracted to perform the first verification of the City of Thomasville MSW Landfill (Project) for the reporting period March 1, 2011 through December 31, 2012 to the Climate Action Reserve Landfill Project Protocol Version 3.0 (Protocol). The Project consists of the collection of landfill gas (LFG) from the landfill and its subsequent destruction by combustion in an open flare at the site. The Project is located near the City of Thomasville in Thomas County, Georgia, at the City of Thomasville Landfill (Landfill). The site address is 88 Landfill Road Thomasville, GA 31757.

1.1 Project Background & Site Description

The City of Thomasville Landfill opened in 1975 and is composed of four phases on 108 acres designated for municipal solid waste disposal. Phase I and Phase II are both closed and Phase III is active and consists of Construction and Demolition waste only. Phase IV includes active cells that receive municipal solid waste. The City of Thomasville Landfill is estimated to close in 2035.

The collection system was installed in 2010 with 18 vertical gas extraction wells and 10 leachate cleanouts located on Phase IV of the landfill. Initial testing and commissioning for the flare was completed and the Project came online officially on March 1, 2011.

The Project Developer is the City of Thomasville, Georgia (Thomasville), while the landfill owner is Thomas County, GA. The Project Developer owns the rights to all of the GHG credits that result from the Project.

1.2 Responsible Party

Project Developer: City of Thomasville, Georgia (Thomasville)

Landfill Owner: Thomas County, GA

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

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 was in compliance with the Climate Action Reserve's (CAR's) 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
- 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 of 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 Thomasville and CAR

1.6 Verification Criteria

Table 1 - Verification Criteria

Criteria	Details
Standard of Verification	• Climate Action Reserve Landfill Project Protocol Version 3.0 (December 2, 2009) • Errata and Clarifications to Landfill Project Protocol Version 3.0 (June 3, 2013) • CAR Program Manual (October 26, 2011) • CAR Verification Program Manual (December 20, 2010)
Verification Process	• CAR and ISO 14064-3 Specification with guidance for the validation and verification of greenhouse gas assertions
Level of Assurance	• Reasonable assurance
Materiality	• A +97% accuracy level (less than 3% error) because total annual ERs are greater than 25,000 tCO₂e but less than or equal to 100,000 tCO₂e.

2.0 Verification Activities Summary

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

- RCE completed a Notification of Verification Activities/Conflict of Interest (NOVA/COI) form to identify any potential conflict of interest with the Project or Project Developer. The NOVA/COI form was submitted to CAR's website and the COI assessment revealed no conflicts of interest and was approved by CAR on December 20, 2012.
- RCE held a verification kick-off meeting with Thomasville on January 9, 2013. During the kick-off meeting RCE was introduced to the Thomasville team, reviewed the verification objectives and process, reviewed the verification schedule, and requested the verification background documents.
- RCE began receiving the background verification documents via a document exchange platform from the Project Developer beginning on March 5, 2013.
- 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 March 6, 2013. During the site visit RCE confirmed the project boundaries, performed key personnel interviews, inspected the Project equipment, reviewed the source documents and calculations, 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 and record retention practices.
- RCE submitted requests for additional documentation, clarifications, and corrective actions to the Project Developer throughout the verification.
- RCE's senior internal reviewer conducted a review of the verification sampling, verification report and verification statement.
- RCE prepared a final verification report, verification statement and list of findings.
- RCE held an exit meeting with Thomasville on July 17, 2013.

3.0 Verification Findings

3.1 Assessment of the GHG Reduction Project Operations

The Project currently collects landfill gas from the City of Thomasville Landfill and destroys it via combustion through an open flare mounted on a flare skid adjacent to the landfill. The LFG is pulled from vertical extraction wells at the landfill. Prior to the installation of the project, there were no destruction devices in use at the landfill. RCE confirmed that the project is not a bioreactor and does not add any liquid, including leachate, in a controlled manner to the landfill.

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

Carbon dioxide and methane are the only GHGs included from the baseline and Project activities. The GHG 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. The sources, sinks and reservoirs of GHGs 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	• CH₄ vented to the atmosphere • Percent methane 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	• CH₄ from the incomplete combustion of LFG in the flare • CO₂ from the combustion of fossil fuels 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 four eligibility rules that a GHG Project Developer must meet in order to register reductions with CAR: Location, Project Start Date, Additionality, and Regulatory Compliance. Below is a summary of the CAR eligibility requirements and the Project's compliance to each requirement. This is the first crediting period for the Project beginning March 1st, 2011 and ending February 28th, 2021.

- **Eligibility Rule 1: Location**

The Project is a US-based landfill located near the City of Thomasville in Thomas County, GA USA. The Project therefore meets this eligibility requirement.

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

The Project began gas destruction by flaring on March 1st, 2011. The Project submittal form was submitted to the Reserve on June 6th, 2011 which is no more than six months after the Project start date. RCE reviewed the flare commissioning report and raw data from the chart recorder in support of this start date.

- **Eligibility 3: Additionality**
Performance Standard Test

Prior to the Project activity, the Landfill never collected or destroyed any LFG at the site. RCE confirmed this through visual inspection at the site, interviews with site personnel and through a review of images from Google earth that were taken before and after the Project commenced.

Thus, the Project passes the Performance Standard Test number 1 since it involves:

“Installation of a landfill gas collection system and a new qualifying destruction device at an eligible landfill where landfill gas has never been collected and destroyed prior to the project start date.”

Legal Requirement Test

RCE examined the procedures outlined in the Project Monitoring Plan that the Project Developer will follow to ascertain and demonstrate that the Project at all times passes the Legal Requirement Test. These procedures include Landfill personnel reviewing the Georgia Environmental Protection Department (GEPD) mail-outs and emails regarding any changes to landfill regulations in the state of Georgia. RCE confirmed that there are currently no laws or ordinances requiring the City of Thomasville Landfill to collect and destroy LFG.

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

The Landfill has a design capacity greater than 2.5 million megagrams (MG) or 2.5 million cubic meters. Due to its design capacity, the Landfill is subject to the emission reporting requirements under the New Source Performance Standards (NSPS) / Emission Guidelines for Municipal Solid Waste Landfills. RCE reviewed the Landfill's NSPS Tier 2 non-methane organic compound (NMOC) emissions rate report dated April 27, 2010 and confirmed that the NMOC emission rate for 2011 and 2012 was 6.4 and 6.5 MG respectively. This is below the 50 MG / year threshold as stipulated in the Protocol and therefore the Landfill is not required to install a gas collection and control system.

During the review of the supporting evidence, RCE did not observe any indication that the 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 Thomasville is following their Monitoring Plan procedures to assure they pass the Legal Requirement Test and the Project is in compliance with all federal, state and local regulations.

- **Eligibility 4: Regulatory Compliance**

RCE reviewed the procedures described in the Monitoring Plan to ensure that the Project remains in compliance with all applicable local, state, and federal requirements. RCE reviewed storm water permits, air permits, and solid waste permits for evidence that the project was in compliance with all environmental and regulatory requirements. During RCE's review there was no evidence of non-compliance found, and the procedures for ensuring regulatory compliance in the Monitoring Plan were being properly followed. 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 Generated Reductions

RCE reviewed the completed Attestation of Title which states that the City of Thomasville, Georgia owns the emission reduction credits generated by the Project. RCE also reviewed an agreement between Thomasville and Thomas County. This document clearly states that Thomasville has full legal and

beneficial title to emission reductions generated by the Project. The presented evidence clearly demonstrated that Thomasville holds the legal title and exclusive ownership rights of the emission reductions associated with 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 Thomasville personnel, the Landfill manager and 3rd party personnel. 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 project data include the LFG flow to the flare, temperature of the flare, and methane content of the LFG. The LFG flow is measured by a thermal mass flow meter, which is configured to 75 °F and 1 atm. RCE confirmed that the LFG flow was corrected to the Protocol required temperature and pressure of 60 °F and 1 atm in the emission reduction calculation spreadsheet through the application of equation 5.2.

During the site visit, RCE observed that the flow meter is installed correctly to allow for laminar flow of landfill gas. The flare temperature is measured by a thermocouple installed in the flare housing and this is used to monitor the operation of the flare. The methane content of the landfill gas was measured continuously using a Siemens Ultramat 23 gas analyzer. All data is measured continuously and recorded on ten- second intervals using a Eurotherm digital data recorder.

During the site visit RCE reviewed the data storage and retention policies of Thomasville and verified they were in conformance with the Protocol requirements and followed the Monitoring Plan.

3.6 Instrument QA/QC

During the course of this verification, RCE observed that all monitoring equipment was inspected and cleaned quarterly (June 23, 2011, September 30, 2011, December 20, 2011, March 29, 2012, June 12, 2012, September 27, 2012 and December 11, 2012) per the requirements of the Protocol. In addition to cleaning and inspection, both flow meters used during the reporting period and the gas analyzer were also field checked for accuracy on a quarterly basis by a third party calibration service. The two flow meters used during the reporting period were never outside the Protocol stipulated threshold of + / - 5 percent error.

The gas analyzer was found to be outside the + / - 5 percent threshold in the first quarter of 2012 during a field check performed by the third party calibration service. The gas analyzer was underreporting the fraction of methane in the LFG by 11 percent. Because the gas analyzer was found to be underreporting, the metered values were used without correction or where appropriate, weekly handheld methane analyzer readings were used in place of the continuous readings. The gas analyzer was also

calibrated by the certified service provider after the field check accorded per the Protocol requirements under Section 6.2 of a failed field check.

During the second quarter of 2012 the field check performed by the third party calibration service determined that there had been an equipment malfunction pertaining to the gas analyzer. Weekly methane measurements that had been taken by the landfill personnel were substituted into the GHG emission reduction calculations and the faulty part on the gas analyzer was replaced.

A portable methane analyzer was used to measure methane content of the LFG on a weekly basis when the gas analyzer encountered errors due to equipment malfunction. The portable instrument was used to acquire project data and was maintained and calibrated per the manufacturer's specifications, and calibrated at least annually by the manufacturer.

All equipment was also calibrated by the manufacturer prior to installation on-site and the monitoring plan states that all equipment will follow a factory calibration schedule outlined by the manufacturer or the Protocol throughout the life of the Project.

A field check for calibration accuracy was performed within two months of the end of the reporting period (December 10 - 11, 2012) for both the flow meter and methane analyzer, with the results indicating that all equipment was inside the +/- 5 percent threshold. In addition, the Project Monitoring Plan provides specific information on the details of the monitoring equipment, data unit and recording frequency, calibration and maintenance procedures, and relevant documents.

3.7 Assessment of GHG Emission 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 sampled monthly and daily selections of data and recalculated the monthly methane destroyed by the Project and compared these values to Thomasville's values in the spreadsheet. RCE also 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 default destruction efficiency of 96 percent was applied to the data because the destruction device is an open flare 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. 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.

RCE's calculations involved recalculation of LFG flow, checking that percent methane was correctly applied, confirming that weekly methane measurements were correctly applied and that a 10 percent discount factor was applied to the data due to uncertainties, checking and recalculating project fossil fuel use, and checking correct use of conversion factors. All calculations were checked against the

Project Developer's calculations with percent difference noted. The difference between RCE's and Thomasville's emission reductions was non-material.

4.0 Verification Results

Thomasville 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 emissions estimates and the source data used by the Project Developer to quantify the emission reductions in accordance with the CAR Landfill Project Protocol 3.0. The following is a summary of the verification results.

The Project proponents reported **37,244** metric tons CO₂e in 2011 and **45,316** metric tons CO₂e in 2012 as per the information provided in the Project calculation workbook. During the final review of the verification, RCE identified no material misstatements in the data or emissions calculations. The amounts of emission reductions verified are listed in Table 3.

During the verification process, RCE made several requests for Clarifications, Corrective Actions and supplemental documentation to complete the verification. Thomasville sufficiently addressed all corrective actions. Details of these requests are documented in RCE's List of Findings provided to CAR and Thomasville.

5.0 Verification Statement

RCE conducted a risk-based analysis of the City of Thomasville MSW Landfill Project (CAR887) 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 March 1, 2011 through December 31, 2012 and can be considered:

- in conformance with the CAR Landfill Project Protocol 3.0 standards
- 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 March 1, 2011 through December 31, 2012

Emissions Verified	Baseline Emissions CO₂e	Project Emissions CO₂e	Emission Reductions CO₂e
2011 Emission Reductions	37,270	26	37,244
2012 Emission Reductions	45,348	32	45,316
Total Emission Reductions	82,618	58	82,560

Lead Verifier Signature



Phillip Cunningham

Senior Internal Reviewer Signature



Bonny Crews