



RUBY CANYON ENGINEERING

Verification Report

CAR887 City of Thomasville MSW Landfill

Reporting Period: January 1, 2013 – December 31, 2013

Prepared for:

City of Thomasville

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1.0 Introduction

The City of Thomasville contracted Ruby Canyon Engineering (RCE) to perform the verification of the City of Thomasville MSW Landfill project (Project) for the reporting period January 1, 2013 through December 31, 2013 to the Climate Action Reserve (Reserve) Landfill Project Protocol Version 3.0 (Protocol). The Project involves GHG emission reductions from the capture and destruction of landfill gas (LFG) through an open flare at the City of Thomasville MSW Landfill (Landfill) located in Thomasville, Georgia.

1.1 Project Background & Site Description

The City of Thomasville Landfill opened in 1975 and is made up of four phases on 108 acres designated for construction and demolition and 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 2059.

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

City of Thomasville
Steve Sykes, City Manager
111 Victoria Place
Thomasville, GA 31792

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: Samantha Phillips
Senior Internal Reviewer: Nina Pinette

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'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 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, and corrective actions as necessary; and
- Issue a verification report, verification statement, and list of findings to Thomasville and the Reserve.

1.6 Verification Criteria

Table 1 – Summary of Verification Criteria

Criteria	Details
Standard of Verification	• The Reserve Landfill Project Protocol Version 3.0 (December 2, 2009) • Errata and Clarifications to Landfill Project Protocol Version 3.0 (January 21, 2014) • The Reserve Program Manual (October 26, 2011) • The Reserve Verification Program Manual (December 20, 2010)
Verification Process	The 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	97% accuracy level (less than 3% error) because total annual emission reductions are greater than 25,000 tCO ₂ e and less than 100,000 tCO ₂ e.

2.0 Verification Activities Summary

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

- RCE completed a Notification of Verification Activities and Conflict of Interest Assessment (NOVA/COI) form to identify any potential conflict of interest with the Project or Project Developer. 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 January 13, 2014.
- RCE held a verification kick-off meeting with Thomasville on January 22, 2014. 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 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 February 13, 2014. 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, additional documentation, and clarifications to Thomasville 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 Thomasville on June 19, 2014.

3.0 Verification Findings

3.1 Assessment of the GHG Emission Reductions Project Operations

The Project collects LFG from the City of Thomasville landfill and destroys it via combustion in an open flare mounted on a flare skid adjacent to the landfill. The LFG collection system pulls LFG using two blowers located at the flare skid. Prior to combustion, the LFG passes through a continuous methane analyzer and flow meter that measure methane concentration and LFG flow to the flare respectively. The methane concentration and landfill gas flow are both recorded on a dry basis.

Construction of the LFG collection system commenced on September 28, 2010, and it was fully operational on March 1, 2011. The collection system includes gas header and collection piping, eighteen vertical gas extraction wells, ten leachate cleanouts, condensate management structures, and a blower/flare skid. 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)

The Protocol designates that CO₂ and CH₄ are the only GHGs included from the baseline and Project activities. The GHG emission sources resulting from the Project activity must be deducted from the Project baseline in order to calculate GHG emission reductions. These GHGs include methane generated from biodegradation of the landfill waste vented to the atmosphere, methane consumed by soil bacteria through natural oxidation, methane destroyed in the Project destruction device, 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	• CH₄ vented to the atmosphere • Percent methane oxidized by soil bacteria. The entire landfill does not incorporate a synthetic cover as part of the final cap system; therefore a 10% oxidation factor is applied.
Project	• CH₄ from the incomplete combustion of LFG in the flare. • CO₂ from the combustion of fossil fuels 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 in order 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 U.S.-based landfill located in Thomasville, Georgia; it therefore meets this eligibility requirement.

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

The start date is defined as the date on which a qualifying destruction device becomes operational. During the Project's first reporting period, RCE confirmed a start date of March 1st, 2011.

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 Rule 3: Additionality**

Performance Standard Test

Prior to the Project activity, LFG was not collected and destroyed at the Landfill. RCE confirmed this through the site visit; no evidence was observed that would indicate there was ever a pre-project destruction device. In addition, RCE viewed historical photos of the Landfill from Google earth that were taken before and after the Project commenced. No evidence suggested that any destruction devices existed before the Project was implemented.

Thus, the Project passes the Performance Standard Test number 2 since it involves:

“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 any manner prior to the project start date.”

Legal Requirement Test

Project proponents must ensure that emission reductions achieved by the Project would not have occurred in the baseline case due to federal, state, or local regulations. The Landfill regularly reviews federal, state, and local regulations and permitting requirements to ensure the Landfill is in environmental compliance and not mandated to collect and combust LFG.

The Landfill has a design capacity above 2.5 million mega grams (Mg) and 2.5 million cubic meters of municipal solid waste. The facility is therefore required by the New Source Performance Standard (NSPS) regulation to conduct non-methane organic compound (NMOC) emission rate testing. Carlson Environmental Consultants, PC performed the most recent Tier II test on March 31 and April 1, 2010. RCE reviewed the results from the Tier II test which indicate that the estimated emission rate for 2013 was 6.7 Mg/year, below the 50 Mg/year regulatory threshold. Tier II testing is not required again until 2015.

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 Reserve website which states that the project was implemented and established voluntarily.

Based upon the personnel interviews and the documentation reviewed, RCE did not find any indication that the Landfill was mandated to collect and combust LFG. Additionally, there are no local, state or federal requirements mandating the installation of a LFG collection system at the Landfill. Therefore, the results of the review indicate that the Project Developer is following the Monitoring Plan procedures to ensure that the Project passes the legal requirements test at all times.

- **Eligibility Rule 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 Emission 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 demonstrates 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 third 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.

During the site visit, RCE observed that the flow meter is installed correctly to allow for laminar flow of landfill gas. 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 Thomasville used Protocol equation 5.2 to adjust the data to 60°F and 1 atm in the emission reduction calculation spreadsheet.

The flare temperature is measured by a thermocouple installed in the flare housing which 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

RCE confirmed that all monitoring equipment was inspected and cleaned quarterly (March 13, 2013, June 11-12, 2013, September 25, 2013, and December 12-13, 2013) with the as found/as left condition documented per the requirements of the Protocol. Golder Associates performed the quarterly cleaning and inspections and field checked the flow meter and the gas analyzer for accuracy on a quarterly basis and at the end of, but no more than two months prior to, the end date of the reporting period. The flow meter and gas analyzer were never outside the Protocol stipulated threshold of +/- 5 percent error. However, the portable instrument used to field check the Project equipment for accuracy was not maintained according to manufacturer's specifications. A variance request was approved by the Reserve in lieu of this requirement.

The project developer provided evidence to RCE that the current Project flow meter had been factory calibrated prior to installation at the site which took place in September 2012. Endress + Hauser recommends that devices located outside should be calibrated every 1-4 years depending on the extremes of the environment. The Endress + Hauser flow meter was factory calibrated on April 9, 2012 and is within the timeframe established by the manufacturer for calibration. Thomasville will factory calibrate Project flow meters every five years according to their monitoring plan. Siemens recommends that the Ultramat 23 be calibrated with calibration gas every 12 months. Golder Associates calibrates the Ultramat 23 every quarter using system calibration gas which exceeds this requirement.

3.7 Variance Request

Thomasville submitted a variance request to the Reserve regarding Protocol QA/QC requirements of portable instruments. The Protocol requires that “portable instrument[s] shall be maintained and calibrated per the manufacturer’s specifications, and calibrated at least annually by the manufacturer, by a laboratory approved by the manufacturer, or at an ISO 17025 accredited laboratory”. According to the Landtec GEM 2000 gas analyzer and extraction monitor operation manual, Landtec is the only authorized service center for the GEM family of instruments and all GEM 2000 instruments must be serviced every six months. Golder Associates used a GEM 2000 that was not serviced every six months and was not calibrated by Landtec.

The Reserve approved the variance request pursuant to the following conditions:

- The project developer has taken steps, such as updating the monitoring plan, to ensure that this requirement is met in the future, as confirmed by the verifier.
- If any calibration checks reveal the meter to be over-reporting by 5% or more, the data are appropriately discounted to compensate for this drift.

RCE reviewed an updated version of Thomasville’s monitoring plan and confirmed that the non-conformance was appropriately addressed and that the Monitoring Plan includes a reference to Landtec’s requirements for calibration and maintenance. RCE also confirmed that the Project Developer held a meeting with Golder Associates outlining Landtec’s requirements for the maintenance of the GEM 2000. The Lead Verifier confirmed that all of the calibration checks for the flow meter performed by Golder and Associates during the reporting period were within the +/- 5% threshold as defined by the Protocol.

3.8 Assessment of GHG Emission Reductions Calculations

RCE reviewed the emission reduction calculations assessment, 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 selections of data and recalculated the methane destroyed by the Project and compared these values to Thomasville’s values in their assertion 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 entire landfill does not incorporate a synthetic liner as part of the final cap system. 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, 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 differences noted. There were no instances of data substitution during this reporting period. The difference between RCE’s and Thomasville’s emission reductions was non-material.

4.0 Verification Results

Thomasville 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 Thomasville to quantify the emission reductions in accordance with the Reserve Landfill Project Protocol Version 3.0. The following is a summary of the verification results.

The Project reported emission reductions of 50,912 metric tons CO₂e for the current reporting period. During the final review, RCE identified no material misstatements in the data or emission reduction calculations. The emission reductions verified are listed in Table 3. During the verification process, RCE made requests for corrective actions and supplemental documentation to complete the verification. Thomasville sufficiently addressed all requests. The details of these requests are documented in RCE's List of Findings provided to the Reserve and Thomasville.

5.0 Conclusion

RCE conducted a risk-based analysis of the CAR887 City of Thomasville MSW 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 utilization of landfill gas during the reporting period January 1, 2013 through December 31, 2013 and can be considered:

- In conformance with the Reserve Landfill Project Protocol, Version 3.0,
- Without material discrepancy, and
- Verified to a reasonable level of assurance.

The verified emission reductions are listed in Table 3.

Table 3 - Emission Reductions Verified for January 1, 2013 through December 31, 2013

Emission Reductions	Baseline Emissions tCO₂e	Project Emissions tCO₂e	Emission Reductions tCO₂e
2013	50,936	24	50,912

Lead Verifier Signature



Phillip Cunningham

Senior Internal Reviewer Signature



Nina Pinette