



RUBY CANYON ENGINEERING

July – December, 2009 Reporting Period
Verification Report for the McKinney Landfill Gas Destruction &
Utilization Project

Prepared for:
Montauk Energy Capital LLC

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1.0 Introduction

Ruby Canyon Engineering (RCE) was contracted by Montauk Energy Capital, LLC (Montauk) to perform the repeat verification of the McKinney Landfill Gas Destruction and Utilization Project (“Project”) for the reporting period July 1, 2009 through December 31st, 2009 to the Climate Action Reserve. The Project involves GHG emission reductions from the capture and use of methane from the municipal solid waste landfill located in McKinney, Texas. RCE’s background and qualifications can be found in Appendix A.

1.1 Project Background & Site Description

The McKinney Landfill is an inactive municipal solid waste sanitary landfill that covers nearly 65 acres and is located approximately 30 miles north of Dallas Texas in the town of McKinney in Collin County, Texas. The McKinney Landfill began receiving waste in 1968 and ceased receiving putrescible municipal solid waste in 2004 and only accepted construction and demolition debris until its closure on December 31, 2008. The Project consists of a landfill gas (LFG) system and one open flare that combusts the collected gas. The Project has the option to install internal combustion engines to combust the gas and generate electricity in the future.

1.2 Responsible Party

Montauk Energy Capital, LLC
680 Andersen Drive
Foster Plaza 10, 5th Floor
Pittsburgh, PA 15220

1.3 Verification Team

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

Lead Verifier: Sally Phipps
Team Member: Michael Coté
Team Member: Greg Palmer
Senior 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 CAR 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 periodic verification consists of the following independent and objective activities:

- Review the reporting period’s Project Design Document
- Review the reporting period’s Project Monitoring Plan
- Review the Project Data Acquisition & QC Procedures

- Conduct a site visit to the McKinney Landfill
- Review the Project's baseline emission reductions and check that the baseline and Project boundaries have not changed
- Review the Project's emission reduction calculations
- Review of the Project documents and data against the requirements of the CAR Landfill Reporting Protocol 2.0, the Landfill Project Verification Protocol 2.0, the CAR Program Manual (February 23, 2009), and the CAR Verification Program Manual (June 17, 2009).
- Issue requests for clarifications and corrective actions as necessary
- Issue a verification report, list of findings and opinion to Montauk and CAR

1.6 Verification Criteria

Standard of Verification	Climate Action Reserve Landfill Reporting Protocol 2.0, Landfill Project Verification Protocol 2.0 and the International Standards Organization (ISO) 14064-3 Specification with guidance for the validation and verification of greenhouse gas assertions
Verification Process	CAR and ISO 14064-3
Level of Assurance	Reasonable assurance (95% materially correct)
Materiality	A +/-5 percent materiality threshold

2.0 Verification Activities Summary

The verification of the July 1, 2009 through December 31st, 2009 emission reductions is a repeat verification of the Project. The Project was already listed on the CAR website and the verification process began with Montauk selecting the RCE as the verification body.

Prior to starting the verification, RCE's developed verification plan that was followed throughout the verification. The verification plan consisted of the following activities

- Completion of a Project COI/NOVA form by RCE to identify any potential with the Project or Project developer. The COI/NOVA form was submitted to CAR's online website and the COI assessment revealed no conflicts of interest and was approved by CAR on February 11, 2010.
- A teleconference verification kick-off meeting was held with Sharon Frank and Adam Andara with Montauk on February 16, 2010. During the kick-off meeting RCE was introduced to the key personnel, reviewed the verification objectives and process, the verification schedule and requested the verification background documents.
- RCE received the background verification documents by email from Montauk on March 3, 2010 and three CDs of verification documents were received the week of the March 1, 2010.
- 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.
- A risk based site visit sampling plan and desktop sampling plan was developed based upon the strategic review and risk assessment. The verification plan, sampling plan and desktop sampling plan are used throughout the verification and were revised as needed based upon additional risk assessments.
- A site visit was conducted on March 12, 2010. 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.
- A risk-based desk-top review of the submitted verification documents was performed. The desk top 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.

- Requests for Clarifications & Corrective Actions were submitted to Montauk throughout the verification.
- A senior review of the verification sampling, report and opinion was conducted.
- A final verification report, verification opinion and listing of findings were developed.
- An exit meeting was held with the client on March 19, 2010.

3.0 Verification Findings

3.1 *Assessment of the GHG Reduction Project Operations*

The Project currently collects landfill gas (LFG) from the McKinney Landfill and destroys it via combustion through an open candlestick flare. The Project Design Document allows for LFG to also be destroyed in two Caterpillar 3520 lean burn internal combustion engines (to produce electricity) each with a rated capacity of 1.6 MW. However, no internal combustion engines were in operation and the verified Project consisted only of the gas collection system and candlestick flare.

The gas collection system consists of a series of wellheads that pull gas from 36 vertical and horizontal extraction points. The collected gas is pulled by a blower into the main header line which is then routed into the flare skid. Excess moisture is removed from the gas by various knockout vessels before it passes through the flow meter and eventually the candlestick flare. Prior to the installation of the Project gas collection and conveyance system a Passive Solar Flare that is connected to the landfill leachate riser system was installed at the site. The Solar flare is not utilized unless enough gas collects in the leachate lines that the solar flare must be operated.

During the site visit and desktop review RCE did not observe or see any evidence that Project design or operational boundaries had changed from the previous verification. The landfill remains closed, there were no new wells added to the Project, the caterpillar engines have not been installed and no new Project monitoring equipment was installed.

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

According to the CAR 2.0 Landfill Reporting Protocol only CO₂ and CH₄ GHG are included from the baseline and Project activities. The GHG emission sources resulting from the Project baseline and the Project activity must be deducted from the Project GHG emission reductions. GHGs are emitted result from methane oxidized in the soil, methane vented to the atmosphere, methane destroyed in the pre-Project and Project destruction devices, fossil fuel use and electricity use.

The sources of GHG emissions reviewed during the verification of the McKinney Landfill Gas Destruction and Utilization Project include:

Activity	GHG Sources, Sinks & Reservoirs
Baseline	• CH₄ vented to the atmosphere. • CH₄ destroyed in the Passive Flare • CO₂ from the oxidation of CH₄ 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	• CO₂ from the combustion of CH₄ 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 CAR Landfill Project Reporting Protocol 2.0 specifies three eligibility rules that GHG Project developer must meet in order to register reductions with the CAR. The three eligibility rules are location, Project operation start date and additionality requirements that consist of meeting the performance standard and exceeding any regulatory requirements. A complete assessment of the Project eligibility was performed by the verification body SGS during the first Project verification cycle and the results may be found in the report titled McKinney LFG Project Verification Report dated May 13, 2009.

No changes in the Project start date, location and Project equipment have occurred since the last verification cycle. To ensure that the Project was still additional, RCE performed a review of the Project regulatory requirements and evidence of compliance.

Below is a summary of the CAR eligibility rules and the Project's compliance to each requirement.

- **Eligibility Rule 1: Location:**
The Project is a US-based landfill located in the town of McKinney in Collins County, Texas, USA and therefore meets this eligibility requirement.
- **Eligibility Rule 2: Project Start Date:**
The Landfill Project Reporting Protocol 2.0 dated November 18, 2008 states that pre-existing projects must have a start date on or after January 1, 2001 and must be listed with the Reserve twelve months from the effective date of the protocol. The start date is defined as the date at which a qualifying destruction device becomes operational. The McKinney Project began flaring gas on August 1, 2008.
- **Eligibility 3: Additionality**
According to the CAR additionality requirements Project Developers must pass a Performance Standard test and a Regulatory test in order to show that the Project reductions are above and beyond business as usual.

The McKinney Landfill was previously collecting and destroying gas with a non-qualifying destruction device prior to implementation of the Project (a Passive Solar Flare) and considers only landfill gas destroyed beyond that resulting from the pre-Project passive collection and destruction system as additional. Therefore, the Project proponent meets the performance standard threshold under option 2.

For the Regulatory 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 McKinney Landfill is subject to NSPS regulation requiring the facility to conduct Non-Methane Organic Compound (NMOC) emission rate testing. During the first verification cycle the verification body SGS reviewed the Tier 2 NMOC test results at 41.5 Mg/year and the closure report indicating that the McKinney Landfill should not have to recalculate its NMOC emissions unless additional information on Tier 2 testing is required by the TCEQ.

During RCE's review of the McKinney regulatory compliance no evidence was found that the McKinney Landfill should have to recalculate its NMOC emissions or that landfill was continuing to accept waste which would increase its NMOC emissions.

In addition, RCE examined the procedures outlined in the McKinney Monitoring Plan used to ensure their regulatory compliance and variety of submitted evidence demonstrating their current compliance. Evidence reviewed includes the McKinney Attestation of Regulatory Compliance and Attestation of Voluntary Implementation signed by Vice President of Montauk Energy Capital, LLC on March 16, 2010 and on file with CAR. Other evidence reviewed includes the McKinney Environmental Audit for 2009, multiple air & water permits, the NMOC Emissions Rate Report and several email attestations from the North District Municipal Water District indicating compliance.

Additionally, there are no mandatory requirements for the installation of a gas collection and conveyance system. Therefore the results of the regulatory review indicated that McKinney is following their Monitoring Plan environmental regulatory quality assurance procedures and the Project is in compliance with all Federal, State and Local regulations.

3.4 Assessment of Information System Controls

The GHG management systems were reviewed during the site visit and during the desktop review. During the site visit the majority of the GHG management systems review took place and was achieved through observing the onsite procedures and interviewing the field technician and other key personnel. The onsite review included an assessment of the Project data collection, processing and handling procedures, recordkeeping and data storage, and the quality control and assurance procedures.

The primary data gathered for the Project is landfill gas flow, pressure, temperature and methane content of the landfill gas. A Thermal Instrument 62-9/9500 Flow Meter continuously monitors flow after the blower and a knockout prior to combustion in the candlestick flare. The position of the flow meter is adequate to ensure laminar flow. This meter was factory calibrated prior to installation and is quarterly calibrated in the field using a single point test with Pitot tube and manometer.

RCE reviewed the Flow Meter Pitot tube and manometer field calibration procedures, field notes and the calibration reports for the third and fourth quarter of 2009. The review indicated that the field calibration procedures are being followed and the calibrations reports show that the instruments are reporting accurate data.

Methane content is continuously monitored using the ABB Natural Gas Chromatograph Model # NGC 8200. The Gas analyzer was factory calibrated on May 30, 2008 at the onset of the Project. The instrument is programmed to perform daily self calibrations against reference gases of known concentrations. During the site visit the Total Flow Self calibration records for the Gas Chromatograph for the fourth quarter 2009 and the third quarter ABB representative calibration reports were reviewed. The fourth quarter ABB representative calibration report was not available during the site visit as it had not yet been provided by ABB to Montauk. However, during the desktop review the fourth quarter ABB representative calibration report was provided and reviewed by RCE. The review of the field and ABB instrument calibration reports indicated that the Gas Chromatograph is in calibration and recording data accurately.

The Project landfill gas flow, pressure and methane content is digitally recorded in a Yokogawa FX106 paperless chart recorder in one minute intervals and transmitted to the Montauk FTP internet site on an hourly basis. The data is downloaded weekly from the Montauk FTP site and the average methane content of the landfill gas for each day is entered into the McKinney LF Flare Log.

The operation of the flare is continuously monitored using a thermocouple located within the flare shroud to record the temperature and operating hours of the flare. Temperature readings are transmitted to the Yokogawa recorder and electronically transmitted to the Montauk FTP internet site on an hourly basis. An automatic valve is used to stop flow to the flare if the flame is extinguished. If the temperature drops below the specified threshold then 300°F the flare will shut down and temperature drop will be reflected in the Yokogawa data. In addition, site personnel observe the flare and notify the field technician in the event the flare is inoperable. All instances when the flare is down are recorded into the McKinney LF Flare log.

The Yokogawa data logger has a compact flash card with 2GB capacity and can retain approximately two months worth of raw data. In addition, data from the FTP website is downloaded weekly and transferred to Compact Disks for storage. A revised Data Acquisition & QC Procedures for the McKinney Landfill were submitted to incorporate the change from recording the flare downtime on a separate McKinney Downtime Log to recording the downtime on the McKinney LF Flare Log.

3.5 Assessment of GHG Emissions Reductions Calculations

The emission reduction calculation assessment included the review of Project assumptions, raw data inputs and accuracy of calculations. RCE first assessed the formulas and raw data inputs used to determine emission reduction calculations as described in the McKinney Project Design Document and the calculation spreadsheets in a similar manner to the previous verification.

RCE first assessed completeness of the raw data and how the data is transferred to the calculation spreadsheets. Next the formulas and raw data inputs were reviewed for compliance with the Landfill Project Reporting Protocol 2.0. Lastly RCE recalculated the GHG emissions and reductions and compared the results to McKinney calculations to determine if the GHG emissions were materially correct.

The Project raw data from the Montauk FTP site was compared to the gas flow volumes and methane gas concentrations recorded in the McKinney LF Flare Logs and the emissions calculation spreadsheets. The fossil fuel use and electricity use raw data from the invoice and receipts was also compared to the numbers used in the GHG emissions calculations. RCE sampled approximately 45 percent of the raw Project data and the selected samples review consisted of data transcription tests, data completeness and accuracy. No material errors in the raw data or data transfers from the Yokogawa site to flare logs or calculation spreadsheets were identified.

The GHG emissions calculations, pre-Project deduction calculations and the Project emission reduction calculations were reviewed for compliance to the CAR Landfill Project Reporting Protocol 2.0 calculation methodologies demonstrated in equations 5.1 and 5.2 of the protocol. A 96 percent destruction efficiency is assigned to the Project's combustion device and applied accordingly in emission reduction calculations. Because the landfill does not have a synthetic liner, a 10 percent discount is applied to the baseline scenario for bacterial oxidation of methane under the cap. RCE examined 100 percent the Project calculation methods and compared them to the protocol. No errors or issues of non-compliance to the CAR Landfill Project Reporting Protocol 2.0 were identified.

Due to the Project verification being a repeat verification the risk of calculation errors was deemed to be low. Daily samples from the months of August and October were selected randomly to recalculate the monthly CH₄ destroyed by the Project and pre-Project deductions from the passive solar flare. Since the volume of gas flow metered by the Thermal Instruments flow meter is recorded at a temperature of 70°F and one atmosphere, the flow readings were appropriately adjusted to a standard temperature and pressure of 60°F and one atmosphere per the Protocol's requirement. The average flow rates for each interval are multiplied for the length of the interval and then summed to determine total volumetric gas flow on a daily basis. This volume is converted to a mass flow using the density of methane at 60°F and one atmosphere of pressure.

As there was no missing data and all calibration tests were verified to be within a five percent margin of error no discount factor was applied to account for uncertainties. The net amount of methane destroyed by the Project was calculated per month, then summed for a six month total and converted into CO₂ equivalence. Project emissions for McKinney Landfill consisted of indirect emissions of CO₂ from electricity consumption and direct emissions of CO₂ from the combustion of propane to assist the flare. The pre-Project deductions in CO₂ equivalence consisted of the six month total of the monthly landfill gas that could be destroyed by passive solar flare that was installed before the Project activity.

The Project emissions were calculated from the product of activity data multiplied by an appropriate emission factor. The total Project GHG reductions in CO₂ equivalence were calculated by subtracting the Project Emissions and the pre-Project deductions from the net amount of methane destroyed by the Project in CO₂ equivalence. RCE found no material misstatements in the McKinney Landfill GHG reductions calculations and results.

4.0 Verification Results

Montauk provided sufficient evidence and good 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 Montauk Energy Capital, LLC to quantify the emissions reductions in accordance with the CAR Landfill Project Reporting Protocol 2.0. The following is a summary of the verification results.

The Project proponents reported 48,042 metric tons of CO₂ equivalence as per the information provided in the McKinney Calculation spreadsheet dated February 24, 2010. This was the initial value upon which the verification began. During the verification, no material misstatements were identified that necessitated corrective actions to the raw data or calculations performed by the Project proponent.

The amount of emission reductions verified resulted as follows:

Emission Reductions Verified for July 1, 2009 through December 31, 2009

Emissions Verified	CO₂e (metric tons)
Baseline Emissions	50,890
Project Emissions	.26
Project Electricity	33
Pre-Discount	2814
Total Emission Reductions	48,042

4.1 Findings Overview

During the verification process, RCE made several requests for Clarifications, Corrective Actions and supplemental documentation to complete the verification. In addition to these requests RCE also made several opportunities for improvement noted. According to RCE's verification procedures all Corrective Actions must be addressed by Montauk before a positive verification opinion will be submitted. In total 4 Corrective Actions and 5 Clarifications were requested and 6 opportunities for improvement were noted. The details of these requests are documented in the RCE Findings Overview form and attached separately from this report.

4.2 Conclusions

Based on the data collected and reviewed, the McKinney Landfill Gas Destruction and Utilization Project is considered in compliance with the guidelines of the Climate Action Reserve Landfill Gas Project Reporting and Verification Protocols 2.0. The emission reductions generated from the capture and destruction of landfill gas methane has been compiled in a transparent manner, protocols have been applied consistently; the data were found to be accurate within the uncertainty limits of the measurement equipment and emission reduction calculations were found to include all the required sources. No material errors or omissions have been identified for the period of July 1, 2009 to December 31, 2009. The Emission reduction CRT(s) are considered verified to a reasonable level of assurance.

4.3 Recommendation

The Verification Team Lead Verifier recommends that RCE issue a Verification Opinion stating the following.

Verification Statement

This verification statement documents that Ruby Canyon Engineering (RCE) has provided greenhouse gas (GHG) verification services to Montauk Energy Capital, LLC for the periodic verification of the McKinney Landfill Gas Destruction and Utilization Project (“Project”). The results of the verification find the Project in compliance with the Climate Action Reserve (CAR) Landfill Project Reporting Protocol 2.0.

RCE was contracted by Montauk Energy Capital, LLC to provide independent verification services for the Project’s GHG emission reductions assertion for the reporting period July 1, 2009 through December 31, 2009 based on the following parameters:

- *Level of assurance:* reasonable level of assurance;
- *Objectives of verification:* Assert that the claimed emission reductions to CAR Landfill Project Reporting Protocol 2.0 standards are materially correct, real and permanent;
- *Validation or verification criteria:* Verify to the CAR Landfill Project Reporting Protocol 2.0, Landfill Project Verification Protocol 2.0 and the International Standards Organization (ISO) 14064-3 standards;
- *Definition of materiality:* Misstatements of more than +/-5 percent of the GHG reduction assertion are considered material;
- *The data and information supporting the GHG assertion were:* actual July 1, 2009 through December 31, 2009 Project data that was not hypothetical or projected;
- *Scope, including:*
 - *Boundaries of the assertion:* McKinney Landfill - 500 East Old Mill Road, McKinney, Texas 75069 McKinney, Collin County, Texas. USA
 - Emission reductions arising from the capture and destruction of Landfill Gas Methane from the McKinney Landfill Gas Destruction and Utilization Project.

RCE conducted a risk based analysis of the McKinney Landfill GHG assertion where RCE performed a strategic review of the Project data and evidence. Based upon the processes and procedures and the evidence collected, RCE concludes with a reasonable level of assurance that the emission reductions at the Project resulting from the capture and destruction of landfill gas during the reporting period July 1, 2009 through December 31, 2009 can be considered:

- in conformance with the CAR Landfill Project Reporting Protocol 2.0 standards
- without material discrepancy, and
- verified to the minimum level of accuracy of at least 95 percent.

Verified Emission Reductions:

Emissions Verified	CO ₂ e (metric tons)
Total Emission Reductions	48,042

Lead Verifier Signature



Sally Phipps

Independent Internal Reviewer Signature



Bonny Crews

5.0 Lead Verifier Signature



Sally Phipps, Lead Verifier

6.0 Independent Internal Reviewer Signature



Bonny Crews, Senior Reviewer