RUBY CANYON ENGINEERING

Verification Report for CAR409 McKinney Landfill

Reporting Period: January 1, 2015 – December 31, 2015

Prepared for:

Montauk Energy Capital, LLC

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1.0 Introduction **1**
1.1 Project Background & Site Description 1
1.2 Responsible Party 1
1.3 Verification Team 1
1.4 Objectives 1
1.5 Scope 1
1.6 Verification Criteria 2
2.0 Verification Activities Summary **2**
3.0 Verification Findings **3**
3.1 Assessment of the GHG Reduction Project Operations 3
3.2 GHG Project Boundary (sources, sinks and/or reservoirs) 3
3.3 Project Eligibility Criteria 4
3.4 Ownership of Generated Reductions 6
3.5 GHG Monitoring and Management Systems 6
3.6 Instrument QA/QC 7
3.7 Assessment of GHG Emissions Reductions Calculations 7
4.0 Verification Results **8**
5.0 Conclusion **9**

1.0 Introduction

Ruby Canyon Engineering (RCE) was contracted by Montauk Energy Capital, LLC (Montauk) to perform the repeat verification of the CAR409 McKinney Landfill project (Project) for the reporting period January 1, 2015 through December 31, 2015 to the Climate Action Reserve (Reserve) Landfill Project Reporting Protocol Version 2.0 (Protocol). The Project involves GHG emission reductions from the capture and use of methane from the municipal solid waste landfill located in McKinney, Texas.

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 municipal solid waste in 2004 and only accepted construction and demolition debris until its closure on December 31, 2008. The Project consists of a LFG collection system, and two Caterpillar gas engines and an open flare that combust the collected gas.

1.2 Responsible Party

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

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: Bonny Crews
Team Member: Jessica Stavole
Senior Internal Reviewer: Zach Eyler

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 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 annual 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
- Conduct a site visit to the McKinney Landfill
- Review the Project's evidence of environmental and regulatory requirements to ensure the project is additional
- Review evidence of the emission reductions ownership

- Review the Project's baseline emissions and check that the baseline and Project boundaries have not changed
- Review the Project's emission reduction calculations
- Review the Project documents and data against the verification criteria in Table 1
- Issue requests for additional data, clarifications and corrective actions as necessary
- Issue a verification report, list of findings and verification statement to Montauk and the Reserve

1.6 Verification Criteria

Table 1 – Verification Criteria

Criteria	Details
Standard of Verification	• Climate Action Reserve Landfill Project Reporting Protocol Version 2.0 (November 18, 2008) • Errata and Clarifications to Landfill Project Reporting Protocol Version 2.0 (June 18, 2015) • Climate Action Reserve Landfill Project Verification Protocol Version 2.0 (November 18, 2008) • Climate Action Reserve Program Manual (September 1, 2015) • Climate Action Reserve Verification Program Manual (December 20, 2010)
Verification Process	Climate Action Reserve 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 tCO_2e but less than or equal to 100,000 tCO_2e.

2.0 Verification Activities Summary

RCE has verified several previous reporting periods for the Project with associated site visits. The current verification began with Montauk selecting the RCE as the verification body. Prior to starting the verification, RCE developed a verification plan that was followed throughout the verification. The verification plan consisted of the following activities:

- RCE completed a Project NOVA/COI to identify any potential conflict of interest with the Project or Project Developer. The NOVA/COI form was submitted to the Reserve's website; the COI assessment revealed no conflicts of interest and was approved by the Reserve on November 10, 2015.
- RCE held a verification kick-off meeting with key Project personnel with Montauk on November 16, 2015. During the kick-off meeting RCE reviewed the verification objectives, verification process, and 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 December 3, 2015.
- 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 and clarifications to Montauk 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 Montauk on February 12, 2016.

3.0 Verification Findings

3.1 Assessment of the GHG Reduction Project Operations

The Project currently collects LFG from the McKinney Landfill and destroys it via combustion in two Caterpillar 3520 lean burn internal combustion engines (to produce electricity) each with a rated capacity of 1.6 MW; there is also an open candlestick flare to combust the LFG when the engines are not in operation.

The LFG collection system consists of a series of wellheads that gather gas from 36 vertical and horizontal extraction points. The collected gas is pulled by a blower into the main header line and routed to the engine and flare skids. Excess moisture is removed from the gas by a knockout vessel before it passes through the methane analyzer then to a split to either the engines or the flare. Since the construction of the Perennial Energy Incorporated (PEI) skid, the flare flow can be routed through the flare skid or through the PEI skid; the former only occurs during maintenance events. The Project uses a total of three flow meters: one is upstream of the flare for flow through the flare skid, one is upstream of the flare for flow through the PEI skid, and one is upstream of the two identical engines. Prior to the installation of the Project LFG collection and combustion system a passive solar flare connected to the landfill leachate riser system was installed at the site. The solar flare has not operated in several years but is included as a pre-project deduction.

RCE confirmed that the landfill is not a bioreactor and does not re-circulate leachate nor add any liquid other than leachate in a controlled fashion to accelerate or enhance the anaerobic biodegradation of the waste.

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

According to the Protocol only CO_2 and CH_4 GHGs are included from the baseline and Project activities. The baseline GHG emissions are all uncontrolled methane released to the atmosphere minus both the portion oxidized by soil bacteria and the methane destroyed in the pre-project device. The Project GHG emissions include methane from the incomplete combustion in the Project

destruction devices, fossil fuel use, and electricity use. Table 2 lists the sources of GHG emissions reviewed during the verification of the Project.

Table 2 – Project GHG Sources, Sinks and Reservoirs

Activity	GHG Sources, Sinks & Reservoirs
Baseline	• CH_4 vented to the atmosphere. • CH_4 destroyed in the passive flare. • Percent methane oxidized by soil bacteria. As the landfill is only partially covered with a synthetic liner, a 10% oxidation factor resulting from natural oxidation by soil bacteria was applied to the baseline emissions.
Project	• CH_4 incompletely destroyed in the engines and the flare • CO_2 from the combustion of fossil fuels used during operation and maintenance activities for the Project activity. • CO_2 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 the Reserve: location, project start date, additionality, and regulatory compliance. RCE previously verified the Project start date and location, and observed no changes from the last verification cycle.

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

- **Eligibility Rule 1: Location**

  The Project is at a US-based landfill located in the town of McKinney in Collin County, Texas, USA and the Project therefore meets this eligibility requirement.

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

  The McKinney Project began flaring gas on August 1, 2008. During a previous verification, RCE reviewed the flare purchase order, a start-up notification letter to the Texas Commission on Environemntal Quality, as well as a flare performance test report in support of the start date.

- **Eligibility 3: Additionality**
  <u>Performance Standard Test</u>

  The McKinney Landfill installed a non-qualifying passive solar flare prior to the Project start date. The non-qualifying destruction device was installed on the leachate collection riser system in 2006.

  RCE reviewed evidence of the pre-project passive solar flare in a previous verification. The reviewed evidence was sufficient for RCE to conclude that the pre-project flare was a non-qualifying destruction device that was installed voluntarily. The Project only considers LFG that was destroyed beyond that resulting from pre-project destruction system as additional.

  Therefore, the Project proponent meets the performance standard threshold under Option 2 of the Landfill Project Reporting Protocol Performance Standard Test. Option 2 states "If the landfill was previously collecting and destroying LFG using a destruction device which

would not qualify under this protocol (e.g. passive flares), the Project is additional under the following condition:

a. "Only the LFG destroyed beyond that resulting from the pre-project collection and destruction system is considered additional (i.e. those reductions resulting from the implementation of the new GHG reduction project)."

Legal Requirement Test

For the Legal Requirement Test, Project proponents must ensure that emission reductions achieved by the Project would not have occurred anyway in order to comply with federal, state, or local regulations, or other legally binding mandates.

In particular, the McKinney Landfill is subject to the New Source Performance Standards (NSPS) regulation which requires the facility to conduct Non-Methane Organic Compound (NMOC) emission rate testing. RCE reviewed the October 25, 2007 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 Texas Commission on Environmental Quality. No evidence was found that the McKinney Landfill should have to recalculate its NMOC emissions or that the McKinney Landfill has continued to accept waste which would increase its NMOC emissions.

The McKinney PDD and the McKinney Monitoring Plan detail the monitoring methods, frequency and the Project parameters monitored. Montauk also performs an annual environmental and legal requirements assessment and records their findings in the McKinney Environmental Audit Checklist to ensure the Project is not required to collect and combust their LFG.

RCE reviewed the PDD, Monitoring Plan and the annual McKinney Environmental Audit Checklist dated January 7, 2016 and confirmed that there is a clear and rigorous method in place to ensure the Project passes The Reserve's Legal Requirement Test. RCE also examined the Project's Attestation of Voluntary Implementation, on file with The Reserve that was signed by the Vice President and General Counsel of Montauk on January 5, 2016. The review indicated that Montauk is following their procedures and is in compliance with the Reserve's requirements.

Additionally, there are no local, Texas or Federal requirements for the installation of a LFG collection and destruction system at the McKinney Landfill. Therefore, the Project passes the Legal Requirement Test.

- **Eligibility 4: Regulatory Compliance**

  RCE examined the procedures outlined in the Project PDD and Monitoring Plan used to ensure their regulatory compliance, as well as a variety of submitted evidence demonstrating their current compliance. Evidence reviewed includes the Project's Attestation of Regulatory Compliance, signed by the Vice President and General Counsel of Montauk on January 5, 2016, on file with the Reserve. Other evidence reviewed includes air permits (flare permit and Title V air permit), waste water and solid waste permits. Lastly, RCE reviewed the current EPA ECHO database report for the landfill which showed no instances of non-compliance in 2015.

  RCE found the procedures for ensuring regulatory compliance in the Project PDD and 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 website.

3.4 Ownership of Generated Reductions

The North Texas Municipal Water Department entered into a Landfill Gas Rights Lease agreement on July 10, 2007 with McKinney LFG, LLC; a wholly-owned subsidiary of Montauk that transferred all rights to the LFG and environmental attributes associated with the McKinney Landfill to McKinney LFG, LLC. Montauk developed a contract agreement titled the "Environmental Attribute Assignment", executed January 1, 2010, that transferred all the rights to the LFG and all the associated environmental attributes from McKinney LFG, LLC to Montauk as of January 1, 2010.

The Environmental Attribute Assignment confirmed that Montauk is the sole owner and operator of the Project and sole owner of the emission reductions associated with the Project. To verify the ownership the Project's GHG emission reductions, RCE had reviewed during previous verifications the Landfill Gas Rights Lease agreement and the Environmental Attribute Assignment.

To verify Montauk's continued ownership of the generated emission reductions, RCE confirmed this with the Project Manager and reviewed the Attestation of Title, signed by the Vice President and General Counsel of Montauk on January 5, 2016 and on file with the Reserve, for evidence of ownership of the generated emission reductions.

3.5 GHG Monitoring and Management Systems

RCE reviewed the data management systems during the site visit and desktop review. The onsite review included an assessment of the Project data collection, processing and handling procedures, recordkeeping and data storage, the quality control and assurance procedures, 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 includes LFG flow, pressure, temperature, methane content of the LFG, and electricity output of the engines. With the installation of the combustion engines on the PEI skid, the Project allows for LFG flow and combustion either through the flare or the engines, or a combination. The outline of the various operating scenarios in the Monitoring Plan is accurate as determined by RCE at the site visit.

The PEI skid contains the combustion engines, blowers, and two Veris Verabar flow meters: one flow meter monitors the two engines while the other monitors the flare. Both Veris Verabar flow meters are configured to standard conditions of 60° F and 1 atm. The current operating system directs flow through either the engines or the flare at the PEI skid; flow to the flare through the extant flare skid is only conducted during times when the entire PEI skid is down. Flow through the extant flare skid did not occur during the reporting period. A Thermal Instrument 62-9/9500 flow meter continuously monitors the flow at 60° F and 1 atm prior to entering the extant flare skid. All three flow meters are positioned adequately to ensure laminar flow. The LFG methane content was continuously monitored using an ABB Natural Gas Chromatograph Model #NGC 8200. The instrument is programmed to perform daily self-calibrations against reference gases of known concentrations. The operation of the flare is continuously monitored by a thermocouple located within the flare shroud to record the temperature and operating hours of the flare. All electricity generated and sent to the grid from the engines is continuously monitored and recorded every 15 minutes using a revenue meter.

The Project LFG flow, methane content and flare temperature are digitally recorded by a Yokogawa DX1000 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; the LFG flow (standard cubic feet per day) and the average methane content of the LFG for each day is entered by the Field Technician into Generator and Flare Log spreadsheets. The electricity output from the revenue meter is retrieved on an as-needed basis. RCE conducted a risk-based review of the Generator Log, Flare Log, and Electricity Production workbook and found no material errors. RCE reviewed the Data Acquisition Procedures document and verified that the procedures were in conformance with Protocol requirements and that they were followed by Montauk.

RCE also reviewed the data storage and retention policies of Montauk 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, cleaned, and calibrated quarterly according to the requirements of the Protocol. All calibrations were conducted according to manufacturer guidance and indicated that all equipment in use was operating within the +/- 5% accuracy threshold. The Project gas analyzer was inspected, cleaned, and calibrated by a third party on January 7, 2015, April 21, 2015, July 13, 2015 and October 1, 2015. In addition, the Project Monitoring Plan provides specific information on the details of the monitoring equipment to include model and serial numbers, data unit and recording frequency, calibration and maintenance procedures, and relevant documents. RCE reviewed an email exchange between the Project Developer and ABB to confirm that Montauk is following the manufacturer's recommended guidance for instrument calibration, and thus is in conformance with the Protocol.

The Veris Verabar flow meters were inspected, cleaned, and calibrated by a third party on March 22, 2015, June 30, 2015, August 20, 2015, and December 14, 2015. All calibrations found the flow meters were operating within the Reserve's +/-5% accuracy threshold. RCE reviewed an email exchange between the Project Developer and Veris to confirm that Montauk is following the manufacturer's recommended guidance for instrument calibration, and thus is in conformance with the Protocol.

The Thermal Instruments flow meter did not measure any flow for the Project during the current reporting period; therefore, RCE did not review the QA/QC documents for this meter.

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 assessed the formulas and raw data inputs used to determine the emission reduction calculations as described in the McKinney PDD and the calculation spreadsheet in a similar manner to the previous verifications.

RCE first assessed the completeness of the raw data and how the data was transferred to the calculation spreadsheet. While there was no flow to the flare during the current Raw data from the Generator Log and Flare Log were compared to the daily gas flow volumes and methane gas concentrations recorded in the calculation spreadsheet. Next the formulas and raw data inputs were reviewed for compliance with the Protocol.

The GHG emissions calculations, pre-project deduction calculations and the Project emission reduction calculations were reviewed for compliance to the Protocol. A 96% destruction efficiency is assigned to the Project's flare, a 98% destruction efficiency is assigned to the pre-project solar

flare, and a 99.6% destruction efficiency is assigned to the Project engines. This destruction efficiency for the engines for the current reporting period was determined by independent testing conducted April 7, 2015; RCE reviewed the testing document for completeness. RCE confirmed that the proper destruction efficiency was applied to both the flare and engine data, and to the pre-project data. RCE confirmed that a 10% discount was applied to the baseline scenario and the pre-project methane destruction for the oxidation of methane by soil bacteria because the landfill does not have a synthetic cover. RCE examined the Project calculation methods and compared them to the Protocol.

During the reporting period there were also instances when the system was down, and landfill gas was not being destroyed. RCE confirmed that no GHG emission reductions were claimed for these periods of downtime. There were no instances of missing data, therefore Montauk did not employ the data substitution methodology during the current reporting period.

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

Lastly, RCE recalculated the total GHG emission reductions and compared the results to Montauk's calculations to determine if the GHG emissions reductions were materially correct. RCE determined that the emission reduction calculations followed the requirements of the Protocol and found no material misstatements during the final review of the Project GHG reductions calculations.

4.0 Verification Results

Montauk 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 Montauk to quantify the emission reductions in accordance with the Reserve Landfill Project Reporting Protocol 2.0. The following is a summary of the verification results.

The Project proponents reported emission reductions of 66,642 metric tons CO_2e in 2015 as per the information provided in the Project calculation workbook. During the final review, RCE identified no material misstatements in the data or emissions calculations. The emission reductions verified are listed in Table 3.

During the verification process, RCE made requests for clarifications and supplemental documentation to complete the verification. Montauk sufficiently addressed all items. The details of these requests are documented in RCE's List of Findings provided to the Reserve and Montauk.

5.0 Conclusion

RCE conducted a risk-based analysis of the CAR409 McKinney Landfill 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, 2015 through December 31, 2015 and can be considered:

- In conformance with the Reserve Landfill Project Reporting Protocol 2.0 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 January 1, 2015, through December 31, 2015

Emissions Verified	Baseline Emissions CO_2e (metric tons)	Preproject Discount (metric tons)	Project Emissions CO_2e (metric tons)	Emission Reductions CO_2e (metric tons)
2015	71,081	4,434	5	66,642

Lead Verifier Signature

Bonny Crews

Senior Internal Reviewer Signature

Zach Eyler