Verification Report for the Coffee County Sanitary Landfill Gas Collection System—CAR 467 Elba, Alabama

Climate Action Reserve

March 2015

Prepared for: Coffee County Sanitary Landfill
P.O. Box 428
New Brockton, Alabama 36351

Prepared by: First Environment, Inc.
730 W. Lake Street, Suite 164
Chicago, Illinois 60661

TABLE OF CONTENTS

TABLES

1. Introduction

This report is provided to Coffee County Commission (Coffee County) as a deliverable of the Climate Action Reserve (CAR) project verification process. This report covers the verification of the Coffee County Sanitary Landfill Gas Collection System – CAR467 (the Project) for the period from January 1 through December 31, 2014.]First Environment, Inc. (First Environment) conducted the verification from the date of the kickoff meeting through March 6, 2015.

2. Objectives

The purpose of this verification was, through review of appropriate evidence, to establish that:

- the Project conforms to the requirements of the verification criteria, including all eligibility requirements, discussed in Section 4 of this report; and
- the data reported are accurate, complete, consistent, transparent, and free of material error or omission.

3. Verification Scope

Specific scope metrics for the verification are outlined in the table below:

Geographic Boundaries	Coffee County Sanitary Landfill, Elba, Alabama
Emission Reduction Sources, Project Emissions, and Greenhouse Gases	Emissions reductions (expressed in units of Carbon Dioxide equivalents (CO_2e)) resulting from methane destruction; Project emissions of CO_2 from fossil fuel combustion and purchased electricity.
Reporting Period	January 1 through December 31, 2014
Data Sources	Metered Data and Emissions Reduction Calculations

4. Standards Used to Verify Emissions (Criteria)

The following table outlines the guidance and protocols used to conduct this verification:

Standard of Verification	• Climate Action Reserve U.S. Landfill Project Protocol, Version 3.0, December 2, 2009 (CAR Protocol) • Climate Action Reserve Landfill Project Protocol Version 3.0 Errata & Clarification, January 14, 2015 (Errata and Clarification) • Climate Action Reserve Program Manual, October 26, 2011
Verification Process	• Section 8 of the CAR Protocol, Version 3.0, December 2, 2009 • Errata and Clarification • Climate Action Reserve Verification Program Manual, December 20, 2010 • ISO 14064-3: Specification with guidance for the validation and verification of greenhouse gas assertions, 2006

Level of Assurance	• Reasonable assurance
Materiality	• Misstatements greater than three percent of the Project's emission reductions assertion are considered material • Qualitative non-conformities with the CAR Protocol are also considered material

5. Overview of the Verification Process

The verification process was utilized to gain an understanding of the Project's emission sources and reductions, to evaluate and verify the collection and handling of data, the calculations that lead to the results, and the means for reporting the associated data and results.

The following verification process was used:

- conflict of interest review;
- selection of Verification Team;
- initial interaction and kickoff meeting with Coffee County;
- development of the verification and sampling plan;
- review of management and data collection system;
- site visit;
- assessment of raw data and calculations for period under review;
- follow-up interaction with Coffee County for corrective action, clarification, or supplemental data as needed; and
- final statement and report submittal.

5.1 Conflict of Interest Review

Prior to beginning any verification project, First Environment conducts an evaluation to identify any potential conflicts of interest associated with the Project. No potential conflicts were found for this Project. First Environment also received authorization to proceed with verification activities for Coffee County from CAR in a notification dated October 24, 2014.

5.2 Verification Team

First Environment's Verification Team consisted of the following individuals who were selected based on their verification experience, as well as familiarity with landfill operations.

Lead Verifier – Jeff Daley
Verifier – Liam Gallagher
Senior Internal Reviewer – Michael Carim

5.3 Verification Kick-off

The verification was initiated with a kick-off meeting on November 18, 2014 with Coffee County. The meeting focused on confirming the scope, schedule, and data required for verification.

5.4 Development of the Verification Plan

The Verification Team formally documented its verification plan as well as determined the data-sampling plan. The verification plan was developed based on the discussion of key elements of the project verification process during the kick-off meeting. Coffee County was afforded the opportunity to comment on the key elements of the plan for verification. Based on items discussed and agreed upon with Coffee County, the plan identified the First Environment project team members, project level of assurance, materiality threshold, and standards of evaluation and reporting for the verification. It also provided an outline of the verification process and established project deliverables. A separate data-sampling plan was designed to review all project elements in areas of potentially high risk of inaccuracy or non-conformance.

5.5 Site Visit

Mr. Jeff Daley conducted a site visit on January 8, 2015 to assess the Project's data management systems and interview personnel relevant to the Project for the verification period.

5.6 Emissions Reduction Data and Calculation Assessment

This assessment used information and insights gained during the previous steps to evaluate the collected data and the reported emissions reduction quantities, and identify if either contained material or immaterial misstatements.

5.7 Corrective Actions and Supplemental Information

The team issued requests for corrective action during the verification process. Coffee County provided sufficient responses to all requests.

5.8 Verification Reporting

Verification reporting, represented by this report, documents the verification process and identifies its findings and results. Verification reporting consists of this report for Coffee County, a verification statement, and a list of findings to be submitted to the CAR.

6. Site's Conformance with Verification Criteria

6.1 Project Description

The Coffee County Sanitary Landfill is an active municipal landfill located in Elba, Alabama. The landfill started accepting waste in 1993 and currently consists of Cells 1 through 6B.

The Project collects and combusts landfill gas in an open flare. The Project had three voluntarily installed passive flares that were used for positive pressure release and odor control prior to the Project's start date. All discounts for pre-Project destruction devices are accounted for in the baseline emissions for the current reporting period, and were verified during the Project's initial reporting period.

6.2 Eligibility

The Coffee County Sanitary Landfill Gas Collection System meets the eligibility requirements set forth in the CAR Protocol, as described below.

6.2.1 Ownership and Title

Coffee County is the owner and developer of the landfill and as such holds title to the associated emission reduction credits. First Environment reviewed operating permits held by Coffee County to confirm that Coffee County is the owner of the Project and consequently owns the right to any emission reduction credits generated by it. The ownership status was also confirmed at the site visit.

Additionally, First Environment relied on the Attestation of Title completed by Coffee County for the current reporting period to establish ownership of greenhouse gas (GHG) emission reductions. The Attestation is on file with CAR and was reviewed to confirm that it was completed correctly.

6.2.2 Project Start Date

First Environment confirmed that the Project meets CAR's start date requirements. The Project start date is October 1, 2009, which was confirmed during the initial verification through gas collection system installation records.

6.2.3 Additionality

The Project passes both the Performance Standard Test and the Legal Requirements Test, as described below.

6.2.3.1 Performance Standard Test

The Project consists of the installation of a landfill gas collection and control system and therefore exceeds the performance standard defined by the CAR protocol, specifically Scenario 3 from the list provided in Section 3.4.1 of the CAR Protocol, because LFG was collected and destroyed by passive flares in the baseline scenario. It was also confirmed at the site visit that the landfill is not a bioreactor.

6.2.3.2 Legal Requirements Test

The landfill's Title V Permit, Solid Waste Handling Permit, and Tier 2 test results were reviewed during this verification period to confirm conformance with the Legal Requirement Test. The Coffee County Landfill is subject to New Source Performance Standard (NSPS) rules requiring the facility to conduct Non-Methane Organic Compound (NMOC) emission rate testing. The most recent Tier II Test was conducted on May 26, 2011, with the NMOC emission rate results for 2014 calculated to be 5.3 Mg/yr, well below the 50 Mg/yr threshold that would require the installation of a gas collection and control system.

To further inform the assessment of regulatory additionality, First Environment performed a cursory review of the landfill's Title V permit from the Alabama Department of Environmental Management (ADEM), dated August 13, 2012, which states the Gas Collection and Combustion System (GCCS) does not require an Air Permit Amendment in accordance with ADEM Administrative Rule R. 335-3-10-.02(75), and that the landfill is currently not subject to the standards of 40CFR Part 60, Subpart WWW. Additionally, a review of the Alabama Department of Natural Resources for regulations of municipal solid waste landfills was also performed. These cursory reviews of permits, laws, and regulations indicated that the Project is not required by regulation; therefore, the Project passes the CAR Landfill Protocol's Legal Requirement Test.

Additionally, First Environment relied on the Attestation of Voluntary Implementation completed by Coffee County for the current reporting period. The Attestation is on file with CAR and was reviewed to confirm that it was completed correctly.

6.2.4 Regulatory Compliance

First Environment reviewed the landfill's Solid Waste Permit, Major Source Operating Permit, National Pollution Discharge and Elimination Permit, generated a regulatory compliance report on March 3, 2015 using Environmental Protection Agency's (EPA) Enforcement and Compliance History Online (ECHO) database, and interviewed Coffee County personnel to determine regulatory compliance. This cursory review of permits, EPA ECHO regulatory report, and interviews conducted indicated that the site was in compliance and no violations of permits occurred during the reporting period.

Additionally, First Environment relied on the Attestation of Regulatory Compliance completed by Coffee County for the current reporting period. The Attestation is on file with CAR and was reviewed to confirm that it was completed correctly.

6.3 Project Performance Against CAR Protocol and Project Management System

The Project was implemented in conformity with the CAR Protocol. Coffee County developed and implemented a Monitoring Plan to track relevant project parameters and data sources. The Monitoring Plan, including the Project Diagram, was reviewed to determine compliance with the CAR Protocol requirements. Based on observations made during the site visit and review of relevant Project documentation, First Environment found the Monitoring Plan and the Project Diagram to meet the requirements set forth by the CAR Protocol and the Project to be implemented in accordance with the Monitoring Plan.

6.3.1 Project Monitoring

A Landtec (FIT-112) flow meter continuously measures landfill gas (LFG) flow, temperature, and pressure of the gas stream. The meter standardizes flow readings to a pressure of one atmosphere and a temperature of 60ºF. The meter was pulled from the field on July 8, 2014 for factory calibration and was not returned to service until October 16, 2014. During this time period, no flow data was recorded. As a result of the missing data, Coffee County requested a monitoring variance as discussed in Section 6.5 below.

A Landtec AEM System FAU Continuous Gas Analyzer measures gas composition for methane. The landfill utilized three identical continuous gas analyzers throughout the current reporting period in order to facilitate manufacturer factory calibration requirements.

Both gas flow rates and methane concentration are measured on the same relative moisture basis.

The flare incorporates a thermocouple to monitor flare temperature and is designed to shutdown the flare when the temperature drops below the set point of 400ºF.

A Landtec AEMS PLC system records gas flow and methane concentration data every four minutes. Flare temperature data is recorded every four minutes using a Yokogawa digital chart recorder. The Yokogawa digital chart recorder also serves as a redundant recording system for gas flow and methane concentration. All recorded data is exported to Microsoft Excel by Coffee County's consultants, CDG, for review and quantification.

Table 1 summarizes the Project monitoring system parameters and monitoring equipment employed by the project.

TABLE 1: Monitoring Equipment

Parameter	Monitoring Equipment	Frequency of Measurement	Frequency of Recording	Recording Device
Landfill gas flow	Landtec (FIT-112) flow meter	Continuous	Every 4 minutes	AEMS PLC and Yokogawa data recorder
Methane Concentration	Landtec AEMS FAU Continuous Gas Analyzer	Continuous	Every 4 minutes	AEMS PLC and Yokogawa data recorder
Hourly Operation of Destruction Device	Thermocouple	Continuous	Every 4 minutes	Yokogawa data recorder

6.3.2 Instrument Quality Assurance/Quality Control

Coffee County's instrument quality assurance/quality control (QA/QC) plan for the Project's monitoring equipment complies with requirements of the CAR Protocol.

The flow sensor associated with the Landtec flow meter is field checked by a third party for accuracy on a monthly basis, including at least once within the last two months of the end of the reporting period, and is also cleaned/inspected monthly with as-found/as-left conditions documented. The manufacturer recommends calibration every five years. The flow meter was most recently calibrated on October 3, 2014. First Environment reviewed all third-party field accuracy checks performed during the current reporting period, which indicated the flow meter was operating within the required five percent accuracy threshold, with the exception of the following two instances:

- the January 14, 2014 accuracy check; and
- the June 18, 2014 accuracy check.

The procedures of Errata and Clarification #15 (January 14, 2015) were not documented for the January 14, 2014 field check event (which indicated the meter was under reporting flow). As such, Coffee County requested a monitoring variance as discussed in Section 6.5 below.

After a subsequent probe cleaning and second accuracy check during the June 18, 2014 field check (which indicated the meter was over reporting flow), the meter was found to be within the required five percent threshold. As a result of the failed as-found check and subsequent cleaning and successful second accuracy check, flow data was adjusted accordingly based on the "as-found" drift documented during the field accuracy check. This adjustment was performed in accordance with Errata and Clarification #15 (January 14, 2015).

The landfill used two primary gas analyzers (s/n: 8973 and 8803) and a spare (s/n: GA08640) which are switched out every six months and returned to the factory for calibration. The Landtec AEMS System FAU gas analyzers are field checked by a third party for accuracy on a quarterly basis, including one check within the last two months of the end of the reporting period. The analyzers are cleaned and inspected on a monthly basis with as-found/as-left conditions documented, and are factory calibrated for every six months of in-service time, per manufacturer's requirements. During the current reporting period, analyzer s/n 8803 was found to be in service for nine days past the manufacturer's six month in-service requirement. As a result, a monitoring variance was requested as discussed in Section 6.5 below. First Environment reviewed all third-party field accuracy checks performed during the current reporting period, which indicated the analyzers were operating within the required five percent accuracy threshold.

Additionally, First Environment confirmed that the instruments used to perform the third-party field calibration accuracy check of the continuous methane analyzers were calibrated and maintained per manufacturer's requirements.

Table 2 shows the dates during the current reporting period when instrument QA/QC was performed.

TABLE 2: Instrument QA/QC

Monitoring Equipment	Calibration	Field Checked	Inspected/Cleaned
Landtec (FIT-112) flow meter In service: 1/1/2014 – 7/8/2014; 10/16/2014 – 12/31/2014	8/26/2011; 10/3/2014	1/14/2014; 2/19/2014; 3/21/2014; 4/29/2014; 5/30/2014; 6/18/2014; 11/11/2014; 12/18/2014	1/14/2014; 2/19/2014; 3/21/2014; 4/29/2014; 5/30/2014; 6/18/2014; 11/11/2014; 12/18/2014
Landtec FAU Continuous Gas Analyzer (s/n: 8803) In service: 1/1/2014 - 2/7/2014; 4/28/2014 - 10/27/2014; 12/29/2014 - 12/31/2014	5/3/2013; 3/19/2014; 12/15/2014	6/19/2014; 9/29/2014	1/14/2014; 4/29/2014; 5/30/2014; 6/19/2014; 7/8/2014; 8/19/2014; 9/29/2014; 10/15/2014
Landtec FAU Continuous Gas Analyzer (s/n: 8973) In service: 2/21/2014 – 4/28/2014; 10/27/2014 - 12/29/2014	2/12/2014; 6/24/2014	3/21/2014; 12/18/2014	11/11/2014; 12/18/2014
Landtec FAU Continuous Gas Analyzer (s/n: GA08640, spare analyzer) In service: 2/7/2014 – 2/21/2014	2/5/2014	N/A	2/19/2014

6.3.3 Project Emissions

Project emissions sources and the associated monitoring methodology are summarized in Table 3.

TABLE 3: Project Emissions

Project Emissions Source	Monitoring
Consumption of Purchased Electricity	Monthly Utility Invoices
Propane consumption	Purchase Invoices

6.4 Emissions Reduction Calculation Assessment

The emission reduction calculations were reviewed to ensure accuracy in the formulas used and the raw data used as inputs. The formulas were tested to ensure consistency with the calculation methodology described in the CAR Protocol.

The Pre-Project Destruction calculations were performed in accordance with the CAR Protocol. The calculated yearly total was divided by 365 to yield a daily value, which was then multiplied by the total days per month to yield the monthly Pre-Project Destruction Value.

Total landfill gas flow is computed by multiplying the average landfill gas flow rate in a given interval by the length of the interval. Flow totals are aggregated on a daily basis. Metered gas flow volumes were automatically corrected to standard conditions at one atmosphere of pressure and a temperature of 60ºF by the Landtec flow meter. The total volume of methane destroyed by the Project was computed in daily intervals by multiplying the daily gas flow to the flare by the daily average of methane concentration measurements and is converted to a mass flow using the density of methane at 60ºF and one atmosphere of pressure. The total quantity of methane destroyed by the Project is aggregated monthly and summed over the reporting period to obtain the total baseline emissions. Project emissions were calculated by multiplying activity data by an appropriate emission factor. The total emission reductions were determined by subtracting the pre-project discount and project emissions from the baseline emissions.

Table 4 summarizes the input parameters used in the emission reduction calculations.

TABLE 4: Input Parameters

Input Parameter	Name	Description/ Value
$LFG_{i,t}$	Total quantity of landfill gas sent to the flare	Summed daily from metered data, internally corrected to 60ºF and one atm
$PR_{CH4,t}$	Methane content	Averaged daily from continuously recorded data
DE_i	Default destruction efficiency	96% - Open flare
OX	Oxidation Factor	10%
DF	Discount Factor	0%
Flare Temperature Cut-off	Metered data below corresponding temperature cut-off are excluded from calculations.	500ºF
EF_{FF}	Propane emission factor	5.74 kg CO_2/gal
EF_{EL}	Purchased electricity emission factor	1,354.09 lbs. CO_2/MWh

Copies of the raw data used in the calculations, including flow data and methane content data, were compared with the data used in the final calculations and tested for transcription or mathematical errors. A representative sample of raw data sources and all calculations over the entire verification period were reviewed. First Environment performed recalculations of emission reductions for the entire reporting period to assess whether they were free of material misstatement. First Environment found the emission reduction calculations to be free of material misstatement.

6.5 Approved Variance or Deviations

Coffee County requested a variance from the CAR Protocol for the current reporting period, as noted above. The variance was requested to allow for the use of a flow data substitution method to apply during the July through October data gap when no flow data was recorded, address the lack of as left documentation relevant to the January flow meter accuracy check, and to use data from a methane analyzer that was in service past the manufacturer's calibration requirements. The variance request was approved by CAR on February 25, 2015 (2014-1-12-VAR-DET-CAR467) for the period of January 1 through December 31, 2014. Table 5 summarizes the specific conditions of the variance approval and First Environment's verification conclusion.

TABLE 5: Assessment of Variance Requirements

Variance Requirement	Verification Conclusion
Flow data may be substituted, limited to weeks in which a third-party flow reading has been recorded, provided that operational data is available for the project destruction device. The flow value used during these eligible time frames should be equal to the lower 95% confidence limit of the flow data recorded during the week following the installation of the repaired flow meter, as this data was determined to be the most conservative option – corroborated by the higher readings recorded by the third-party service.	First Environment confirmed that flow data was correctly substituted according to the conditions of the variance. The 95% confidence limit was calculated using flow data recorded during the first full week after the flow meter was installed and was confirmed to be the most conservative option. Flow data was only substituted during weeks where the third-party took weekly pitot tube flow readings (9 out of the 15 affected weeks) and during periods when the destruction device was confirmed to be operational.
Factory calibration for the flow meter will be waived following the failed field check, provided that data is appropriately scaled according to the guidance in Section 6.2 of the Landfill Project Protocol, v3.0	The flow meter field check on January 14, 2014 indicated that the flow meter was under reporting flow by six percent, and therefore flow data can be used without correction per the guidance in Section 6.2 of the Protocol. Coffee County conservatively applies a six percent flow reduction from February 19, 2014 (date of subsequent successful field check) back to the beginning of the reporting period.
Data obtained from the gas analyzer while it was beyond its calibration date may be used without adjustment;	First Environment confirmed that methane concentration data obtained by the affected analyzer was used without adjustment.
The verifier confirms that all other QA/QC requirements have been met during this reporting period.	First Environment confirmed that all other QA/QC requirements have been met as discussed in Section 6.3.2 above.

7. Verification Conclusion

Based on the evidence collected and the assessments performed, First Environment concludes that the Project's GHG emissions reductions achieved through the collection and combustion of landfill gas for the period January 1 through December 31, 2014 can be considered with a reasonable level of assurance:

- in conformance with the verification criteria, and
- without material discrepancy.

Verified results show:

Reporting Period: January 1 to December 31, 2014	Total
Baseline Emissions (tCO_2e)	50,337
Project Emissions (tCO_2e)	77
Emissions Reductions (tCO_2e)	50,260

8. Lead Verifier Signature

Jeff Daley
Environmental Specialist

9. Senior Internal Reviewer Signature

Michael Carim
Senior Associate