

Verification Report for the Henrico County Landfill Gas Combustion Project

Voluntary Carbon Standard 2007.1

August 2010

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Voluntary Carbon Standard Version 2007
19 November 2007

Verification Report:

Name of Verification company:	Date of the issue:
First Environment, Inc.	August 13, 2010
Report Title:	Approved by:
Verification Report for the Henrico County Landfill Gas Combustion Project	Jay Wintergreen
Client:	Project Title:
Blue Source LLC	Henrico County Landfill Gas Combustion Project
Summary:	
The Henrico County Landfill Gas Combustion Project voluntarily captures and destroys methane from the Springfield Road Landfill located in Henrico County, Virginia. The verification process consists of the independent third-party assessment of the project design and emission reduction assertion against the criteria stated in the Voluntary Carbon Standard 2007.1 (VCS), approved CDM Methodology ACM0001 (Version 10), and the validated Project Design Document (PDD). The project claims emission reductions of 20,776 metric tons of carbon dioxide equivalents (CO₂e) for the verification period of January 1, 2009 through May 31, 2010. During the verification process, First Environment issued several clarification and corrective action requests – all of which were addressed sufficiently by Blue Source. In summary, First Environment is reasonably assured that the Henrico County Landfill Gas Combustion Project meets all relevant VCS 2007.1 requirements and correctly applies the CDM Methodology ACM0001, with several minor deviations that were approved during the validation process.	
Work carried out by:	Number of pages:
Iris Caldwell Mary Pat Campbell Michael Carim Jeff Daley	12

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1.0 Introduction

This report is provided to Blue Source, LLC (Blue Source) as a deliverable of the Voluntary Carbon Standard 2007.1 (VCS) project verification process for the Henrico County Landfill Gas Combustion Project (the Project) located in Henrico County, Virginia. This report covers the verification of greenhouse gas (GHG) emission reductions from the destruction of landfill gas (LFG) by flare for the period of January 1, 2009 through May 31, 2010. First Environment, Inc. (First Environment) completed the verification in August 2010.

1.1. Objective

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

- the Project conforms to the requirements of the verification criteria discussed in Section 1.2; and
- the data reported are accurate, complete, consistent, transparent, and free of material misstatement or omissions.

1.2. Scope and Criteria

The Project creates emission reductions, expressed as metric tons of carbon dioxide equivalents (CO₂e), resulting from the destruction of LFG methane which would otherwise have been emitted directly to the atmosphere or destroyed in the small pre-existing collection and destruction system. Emission reductions are submitted for verification as part of the Voluntary Carbon Standard (VCS) 2007.1 project registration process.

The Project's emissions reductions have been quantified in accordance with the CDM methodology ACM0001, *Consolidated baseline and monitoring methodology for landfill gas project activities*, Version 10. First Environment conducted the validation of the Project's approach as outlined in the final VCS Project Design Document (PDD) dated November 17, 2009 and approved it in a validation report submitted to Blue Source on November 19, 2009. First Environment used the VCS 2007.1, validated PDD, and the CDM methodology ACM0001 (Version 10) as the basis for this verification. The verification covers the time period of January 1, 2009 through May 31, 2010. A material misstatement is defined as a difference of five percent of the total reported emissions reductions. Qualitative non-conformities with VCS 2007.1 and the validated VCS PDD are also considered material during the verification process.

1.3. VCS project Description

The Project voluntarily captures and destroys LFG methane from the Springfield Road Landfill located at 10600 Fords County Lane, Glen Allen, Virginia (latitude and longitude are 37°40'45" and -77°33'58", respectively). The Project consists of two stages. Stage 1 is the expansion of the pre-existing well field and replacement of a small candlestick flare with a larger capacity flare station. Stage 2 is the implementation of a beneficial use project where the LFG is destroyed in an on-site power generation facility and the resulting electricity is exported to the grid. During the current reporting period, only the flare system was in operation. The Project results in a net reduction of CO₂e emissions.

The PDD provides additional details regarding the site and gas collection system.

1.4. Level of assurance

First Environment and Blue Source have agreed that a reasonable level of assurance be applied for the Project.

2.0 Methodology

To review the Project's GHG information, the following verification process was used:

- conflict of interest review;
- selection of Audit Team;
- initial interaction with Blue Source contacts;
- review of the PDD;
- development of the verification and sampling plan;
- site visit focusing on control procedures around data collection;
- review and evaluation of raw data and calculations for period under review;
- follow-up interaction with project personnel for corrective action or supplemental data as needed; and
- final statement and report development.

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.

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.

Audit Team

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

Iris Caldwell – Lead Verifier
Mary Pat Campbell – Verifier
Michael Carim – Verifier
Jeff Daley – Verifier
Jay Wintergreen – Internal Reviewer

Audit Kick-Off

The verification audit was initiated with a kick-off conference call on January 8, 2010 between First Environment and the primary Blue Source contacts, Daniella Gorton and Kelly Campbell. The communication focused on confirming the verification scope, objectives, criteria, schedule, and the data required for the verification.

Project Design Document Review

The Audit Team reviewed the PDD as a basis for developing the verification plan.

Development of the Verification Plan

The team formally documented its verification plan as well as determined the data-sampling plan. The verification plan was developed based on discussion of key elements of the verification process during the kick-off meeting. Blue Source was afforded the opportunity to comment on key elements of the plan for verification. Based on items discussed and agreed upon with Blue Source, the plan identified the First Environment 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, established project deliverables, and presented a data-sampling plan designed to review all project elements in areas of high risk, inaccuracy, or non-conformance. The plan was provided to Blue Source on January 11, 2010.

Site Visit

First Environment performed a site visit on November 9, 2009 as part of the validation process. The site visit included review of site operations, data collection processes, and information management systems, as well as interviews with key project personnel. Blue Source confirmed that no significant operational or data management changes had occurred since the site visit; therefore, a repeat site visit for this verification period was deemed unnecessary.

Emissions Reduction Data and Calculation Assessment

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

Corrective Actions and Supplemental Information

The Audit Team issued several requests for supporting documentation, clarification (CL), and corrective action (CAR). Through communications with the Audit Team, Blue Source was able to adequately resolve all requests.

The corrective action and clarification requests and the responses provided by Blue Source are summarized in the tables below:

ID	Corrective Action Request	Client Response	Verification Conclusion
CAR-1	Please justify the 10 percent discount factor used for methane values from January through March 2009.	Blue Source indicated that they did not have documentation of the field calibrations performed on the GEMs from January through March. Since this recordkeeping requirement was not met, credits were not claimed from January through March 2009.	Response to CAR is acceptable.

ID	Corrective Action Request	Client Response	Verification Conclusion
CAR-2	The Monitoring Plan does not mention the gas analyzer used by Golder Associates during January through March.	Blue Source edited the Monitoring Plan to include the gas analyzer used from January through March.	Response to CAR is acceptable
CAR-3	The serial number is incorrectly cited in the Monitoring Plan for the gas analyzer used since April 2009.	Blue Source updated the Monitoring Plan to include the correct serial number for the Gas Analyzer.	Response to CAR is acceptable.
CAR-4	The Monitoring Plan incorrectly states that gas analyzer (Serial No.:GM08014) was calibrated in June 2008.	Blue Source updated the monitoring Plan to correctly indicate that the gas analyzer was calibrated in July 2008.	Response to CAR is acceptable.

ID	Clarification Request	Client Response	Verification Conclusion
CL-1	The calibration records indicate two different models of flow meters – 3095 and 1495. Please confirm which model is installed on site.	Blue Source provided clarification in the Monitoring Plan that the flow meter model installed on site is 3095. 1495 is the model number of the pressure transducer.	Response to CL is acceptable.
CL-2	The PDD and factory calibration of the flow meter indicate that the standard temperature of the flow meter is 70 °F. The January 2009 calibration indicates that the standard temperature of the flow meter is 68 °F. Please explain this discrepancy.	Blue Source provided clarification that 68 F is only a reference parameter for the calibration technician. It is not a field measured value, i.e., the meter is indeed correcting to 70 F as stated in the Monitoring Plan, not 68°F.	Response to CL is acceptable.
CL-3	Please confirm whether the as-found readings during the January 2009 flow meter calibration are within acceptable range and indicate that the meter was operating per the manufacturer's specifications.	Blue Source provided additional documentation from the calibration contractor indicating that the flow meter was operating within acceptable limits when calibrated in January 2009.	Response to CL is acceptable.
CL-4	Were calibrations performed on the portable methane analyzer prior to each use in January through March?	Blue Source provided confirmation that calibrations were performed on the gas analyzer prior to each use from January through March; however, no documentation is available.	Response to CL is not acceptable; see CAR-1.
CL-5	Clarify what dates the gas analyzer (Serial No.: GM08014) was used.	Blue Source confirmed that GM08014 was only used on May 13 and June 18, 2009.	Response to CL is acceptable.

ID	Clarification Request	Client Response	Verification Conclusion
CL-6	In the gas analyzer calibration data, does Device ID SRLFFLAR indicate the methane content reading taken at the flare skid?	Don Marickovich from Draper Associates confirmed that SRLFFLAR is the device ID for the methane reading taken at the flare skid.	Response to CL is acceptable.

Verification Reporting

Verification reporting, represented by this report, documents the verification process and identifies its findings and results. Verification reporting consists of this report and separate deed of representation to be submitted to VCSA.

3.0. Verification Findings

3.1. Remaining Issues, Including Any Material Discrepancy From Previous Validation

After validation, it was discovered that the methane density specified in the PDD was incorrectly calculated. The revised value of 0.000665 metric tons CH₄ / cubic meters CH₄ was used in the calculations for this reporting period. Additionally, as discussed further in Section 3.3 below, First Environment accepted a deviation from the PDD for this reporting period regarding manufacturer calibration of the gas analyzer. There are no other remaining issues or material discrepancies from the validation.

3.2. Project Implementation

The Project is implemented according to the description provided in the validated PDD and became operational on June 3, 2005. The Project's start date was confirmed during the validation stage. Stage 1 of the Project is completely operational, consisting of the expansion of the existing collection and destruction system and installation of a larger flare. Implementation of the project activity was confirmed on site. No data and/or variables presented in the monitoring report differ from those stated in the validated PDD.

Henrico County owns and operates the LFG collection system and flare station. Henrico County transferred their rights to GHG credits to Ingenco Renewable Development, LLC, who then contracted with Blue Source to monetize the emission reduction credits associated with the Project. First Environment reviewed evidence to confirm ownership of the environmental attributes associated with the LFG.

First Environment confirmed during the validation process that emission reduction credits will only be registered with the VCS.

3.3. Completeness of Monitoring

The Audit Team discussed the following topics with site staff during the site visit in November 2009, performed during the validation of the PDD, and confirmed them again during this verification:

- the data collection process to generate reports, and
- internal documents and protocols that set guidelines for the data collection process.

The information gathered during these discussions was used to assess the Project's management systems and its controls for sources of potential errors and omissions. The primary aspects of the project's monitoring plan are described below.

LFG flow fed to the open flare is monitored continuously using a Rosemount Orifice Plate Model 1495C flow meter. The meter takes readings twice a second and readings are plotted on a Yokogawa uR1000 strip chart recorder located at the flare station every 90 seconds. The landfill operator aggregates and enters daily and monthly flow totals into an Excel spreadsheet. The strip chart recorder malfunctioned twice during the reporting period – between June 18, 2009 and July 26, 2009 and between April 5, 2010 and May 4, 2010. Flow totalizer readings were taken both prior to and immediately following the recorder failure. The totalizer readings were used to calculate flow volumes for the periods when strip chart data was not available.

First Environment reviewed evidence of the flow meter factory calibration prior to installation on April 13, 2005, as well as field calibrations on January 7, 2009 and January 19, 2010. The field calibrations indicated that the meter was operating accurately.

Methane content is measured using a portable gas analyzer at least monthly. Over the verification period, methane content was monitored using four different Landtec GEM meters and two models: GEM2000 and GEM500. Analyzer GM07994 was used between January 2009 and March 2009. Analyzer GM11208 was used between April 2009 and May 31, 2010, except when Analyzer GM08014 was used on May 13, 2009 and June 18, 2009 and Analyzer GM05722 was used on February 18, 2010; February 19, 2010; and April 29, 2010. Gas analyzers were calibrated prior to each monthly reading by a contracted third party. Additionally, the gas analyzers were sent for manufacturer calibration on the following dates:

GM07994 Gas Analyzer: 10/03/08, 10/28/09

GM11208 Gas Analyzer: 09/24/08, 02/16/10

GM0814 Gas Analyzer: 07/22/08, 03/17/09, 02/24/10

GM05722 Gas Analyzer: 02/09/10

The necessary field calibration documentation for GM07994 was not maintained per the PDD; therefore, no credits were claimed from January through March 2009. Analyzer GM11208 was not calibrated by the manufacturer per the semi-annual schedule specified in the PDD. However, the factory calibration on February 16, 2010 indicated that the analyzer was operating within an acceptable accuracy range. This deviation from the PDD monitoring requirements was accepted on the basis that both the field calibrations and the as-found factory calibration indicated the meter was operating accurately; therefore, the accuracy of the methane data was not compromised.

Thermocouples are used to continuously monitor flare temperature. This information is also recorded on the strip chart. The flare system shuts down if the flare temperature is detected below 400°F. Operation of the thermocouples is checked at least monthly by a contracted third party. First Environment reviewed evidence of thermocouple field tests that were performed in January 2010.

The data collection and recordkeeping procedures utilized for the Project were found to be consistent with those outlined in the monitoring plan described in the validated PDD, except where noted above, and meet the requirements of ACM0001 (Version 10).

3.4. Accuracy of Emission Reduction Calculations

Emission reductions are calculated ex-post using the approach indicated in ACM0001 (Version 10) and the validated PDD.

Emission reduction calculations for the reporting period were reviewed to ensure accuracy in the formulas used and the raw data used as input. The formulas were tested and found to be consistent with the calculations described in ACM0001 (Version 10) and the validated PDD.

Project monitoring data for methane fraction (w_{CH_4}) and LFG collected and destroyed ($LFG_{flare,y}$) are used to calculate the amount of methane destroyed by the project activity ($MD_{project}$). The daily totalized flow volume and monthly methane fraction readings are obtained from the flare operations spreadsheet. A 95 percent confidence interval for the averaged monthly methane fraction values is determined and is applied to the entire verification period. Emission reductions from flaring are aggregated monthly.

The methane flow is corrected to normal cubic feet (Nft³) using the appropriate methane density for 70°F and one atmosphere, as defined as standard conditions by the flow meter manufacturer. A default flare efficiency of 50 percent is applied to the total methane flow to the flare.

Project emissions were subtracted from total emission reductions. Project emissions consisted of indirect emissions of CO₂ from electricity consumption and direct emissions of CO₂ from the combustion of propane as flare pilot fuel. Electricity consumption was determined from monthly utility invoices and propane consumption was determined from propane delivery invoices. Project emissions were quantified by multiplying the activity data by the appropriate emission factor specified in the validated PDD.

Three years of historical monitoring data were used to determine methane destroyed by the pre-project system ($MD_{BL,y}$). This quantity was subtracted from the total emission reductions for the verification period.

The verification process focused on the evaluation of quantification spreadsheets to ensure that they were consistent with the formulas and equations described in ACM0001 (Version 10) and the validated PDD. Copies of the raw data used in the calculations, including flow and methane content, and utility and fossil fuel invoices, were compared with the values used in the final calculations and tested for transcription or mathematical errors. The Audit Team compared raw strip chart data, when available, for at least one week each month with data used in the calculations. Methane fraction readings from the monthly log sheets were compared to the data used in the calculations. The calculations for the entire period were reviewed as well to determine whether they were free of material misstatement. All calculation methods and emission factors used to determine emission reductions were consistent with those outlined in the validated PDD. The Audit Team noted minor transcription and calculation errors, but they had an immaterial impact on the overall emissions reduction assertion.

3.5. Quality of Evidence to Determine Emission Reductions

Blue Source provided adequate documentation for the emissions estimates as well as its management systems around the data collection process. Evidence included calibration records, invoices, and electronic data associated with gas flow and methane content

monitoring. As mentioned above, the strip chart recorder malfunctioned twice over the reporting period and totalizer readings were used to determine flow volumes during these periods. First Environment reviewed evidence of the totalizer readings, which in one case had been rounded to the nearest million cubic feet on the log sheet. Blue Source conservatively calculated the flow volume given the uncertainty associated with rounding.

Evidence provided is consistent with the requirements of ACM0001 (Version 10) and the validated PDD and meets generally accepted evidentiary standards for best practice in GHG accounting.

3.6. Management and Operational System

Henrico County and Blue Source have adequate management and operational systems in place with respect to monitoring and reporting, as determined through observation during the initial site visit and desktop review of project documentation. Opportunities for improvement were identified during verification regarding flow data records and calibration frequency. Better control of flow data could be achieved by maintaining a daily written log with totalizer readings as a back up to the strip chart recorder readings. Additionally, moving forward, there is an opportunity for the Project to establish a more regular calibration schedule.

4.0. Verification conclusion

First Environment was retained to provide verification services for the Project's GHG emission reductions assertion based on the following fundamentals:

- *Level of assurance:* Reasonable assurance;
- *Objectives of verification:* To assure project conformance with the Voluntary Carbon Standard 2007.1, CDM Methodology ACM0001 (Version 10), and validated PDD;
- *Verification criteria:* Voluntary Carbon Standard 2007.1, CDM Methodology ACM0001 (Version 10), and validated PDD;
- *Definition of materiality:* Misstatements of more than five percent of the GHG reduction assertion and qualitative non-conformities with the validated PDD are considered material;
- *Scope, including:*
 - *Boundaries of the assertion:* Henrico County Landfill Operations;
 - *The physical infrastructure, facilities, and activities within the assertion:* Landfill gas collection and destruction operations;
 - *GHG sources, sinks, and reservoirs included within the assertion:* Methane emission reductions expressed as carbon dioxide-equivalents; and
 - *The time period for the assertion:* January 1, 2009- May 31, 2010.

Based on the assessments performed and the historical evidence collected, First Environment concludes with a reasonable level of assurance that the emissions reductions of the Project resulting from the capture and combustion of methane gas for the period of January 1, 2009 through May 31, 2010 are:

- consistent with the VCS PDD of November 17, 2009;
- in conformance with the Voluntary Carbon Standard 2007.1 and the CDM methodology ACM0001 (Version 10);

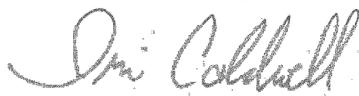
- without material discrepancy; and
- meeting the minimum level of accuracy of at least 95 percent.

Verified results show:

Reporting Period: January 1, 2009 – December 31, 2009	
Baseline Emissions (tCO ₂ -e)	13,502
Project Emissions (tCO ₂ -e)	15
Emissions Reductions (tCO ₂ -e)	13,487

Reporting Period: January 1, 2010 – May 31, 2010	
Baseline Emissions (tCO ₂ -e)	7,295
Project Emissions (tCO ₂ -e)	7
Emissions Reductions (tCO ₂ -e)	7,289

5.0. Lead Verifier Signature



Iris Caldwell
Engineer II

6.0. Internal Reviewer Signature



James Wintergreen
Senior Associate