



VERIFICATION REPORT FOR THE BLUE SOURCE SPARTANBURG COUNTY LANDFILL GAS COMBUSTION PROJECT



Document Prepared by First Environment, Inc.

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Summary:

This report is provided to Blue Source, LLC (Blue Source), and the Project Proponents, Lockhart Power (Lockhart), Milliken & Company (Milliken), and Spartanburg County DPW (Spartanburg) as a deliverable of the Verified Carbon Standard (VCS) project verification process for the Blue Source Spartanburg County Landfill Gas Combustion Project (the Project) located in Wellford, South Carolina.

The Project consists of three phases implemented at the Wellford Landfill. Phase I of the project involves flaring of landfill gas. Phase II involves the transport of landfill gas via pipeline to the Milliken Dewey Chemical Plant where the biogas is combusted in two steam boilers and a hot oil boiler. Phase III consists of destruction of landfill gas via Caterpillar 3520 engine-generator unit to produce electricity. All three Project Phases are currently active, and each achieves a net reduction in CO₂-equivalents through the avoidance of methane emissions and displacement of fossil fuel that otherwise would have been combusted in the boilers.

The verification process and scope consists of the independent third-party assessment of the implementation of the project and emission reduction assertion against the criteria stated in the Verified Carbon Standard (VCS) Standard, 19 September 2019, v4; the approved Clean Development Mechanism (CDM) Methodology ACM0001 "Consolidated baseline and monitoring methodology for landfill gas project activities," Version 11 and the validated VCS Project Description (VCS PD). The purpose of the verification is to ensure the project was implemented and monitored in accordance with the validated Project Description and underlying CDM Methodology.

During the verification process, First Environment, Inc. (First Environment) issued ten corrective action requests and three clarification requests, all of which were addressed sufficiently by Blue Source. No uncertainties were identified during the verification process. The Project claims emission reductions of 98,866 tonnes CO₂e for the period of January 1 through December 31, 2019. First Environment is reasonably assured that the Project meets all relevant VCS program requirements and correctly applies the CDM methodology ACM0001 (Version 11) and the validated VCS PD.

TABLE OFCONTENT

1	Introduction	1
1.1	Objective.....	1
1.2	Scope and Criteria	1
1.3	Level of Assurance.....	2
1.4	Summary Description of the Project.....	2
2	Verification Process	2
2.1	Method and Criteria.....	2
2.1.1	Conflict of Interest Review.....	2
2.1.2	Audit Team	3
2.1.3	Audit Kick-off	3
2.1.4	Project Description Review.....	3
2.1.5	Development of the Verification Plan.....	3
2.1.6	Site Visit	3
2.1.7	Desktop Review.....	3
2.1.8	Corrective Actions and Supplemental Information.....	3
2.1.9	Verification Reporting.....	3
2.2	Document Review	4
2.3	Interviews.....	4
2.4	Site Inspections.....	4
2.5	Resolution of Findings.....	4
2.5.1	Forward Action Requests	4
2.6	Eligibility for Validation Activities.....	4
3	Validation Findings	4
3.1	Participation under Other GHG Programs.....	5
3.2	Methodology Deviations	5
3.3	Project Description Deviations.....	6
3.4	Grouped Project.....	6
4	Verification Findings.....	7
4.1	Project Implementation Status.....	7
4.2	Safeguards.....	10
4.2.1	No Net Harm	10
4.2.2	Local Stakeholder Consultation	10
4.3	AFOLU-Specific Safeguards.....	10
4.4	Accuracy of GHG Emission Reduction and Removal Calculations.....	11
4.5	Quality of Evidence to Determine GHG Emission Reductions and Removals	12

4.6 Non-Permanence Risk Analysis.....	12
5 Verification Conclusion	12
APPENDIX A: Detailed Resolution of Findings	14

TABLES

TABLE 1: Meter QAQC 1.....	8
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1 Introduction

1.1 Objective

This report is provided to Blue Source, LLC (Blue Source) as a deliverable of the Verified Carbon Standard (VCS) project verification process for the Blue Source Spartanburg County Landfill Gas Combustion Project (the Project) located in Wellford, South Carolina. This report covers the verification of greenhouse gas (GHG) emission reductions from the avoidance of methane emissions from decomposing waste and the displacement of fossil fuel during the period from January 1 through December 31, 2019. First Environment, Inc. (First Environment) conducted the verification from January through March 2020.

During the verification process, Blue Source acted as the Project advisor for Lockhart Power (Lockhart), Milliken & Company (Milliken), and Spartanburg County DPW (Spartanburg), collectively “the Project Proponents.” As such, First Environment communicated directly with Blue Source regarding most verification activities.

1.2 Scope and Criteria

The specific scope metrics for the verification are outlined in the table below:

Reporting Period	January 1 – December 31, 2019
Emission Sources Verified	<i>Baseline Sources</i> - CH₄ emission reductions resulting from the destruction of landfill gas. - CO₂ emission reductions resulting from displacement of thermal energy generated from fossil fuels. <i>Project Sources</i> - CO₂ emissions from on-site fossil fuel consumption in support of the project activity. - CO₂ emissions from electricity consumption by the project activity - CH₄ emissions from uncombusted methane
Definition of Materiality	- Misstatements of greater than five percent of the Project's GHG assertion. The Project activity generated less than 300,000 tonnes of CO₂e per year and is therefore falls under the “Project” scale. - Qualitative non-conformities with Standards of Verification described below

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

Standards of Verification	- VCS Standard, 19 September 2019, v4 (VCS Standard) - Validated VCS Project Description (VCS PD), March 7, 2012 - Approved CDM Methodology ACM0001 “Consolidated baseline and monitoring methodology for landfill gas project activities”, Version 11
Verification Process	- VCS Standard, 19 September 2019, v4 - VCS Program Guide, Version 4, 19 September 2019 - ISO 14064-3: Specification with guidance for the validation and verification of greenhouse gas assertions, 2006

The Monitoring Report dated 6 April 2020; Version 2.5 titled “Blue Source Spartanburg County Landfill Gas Combustion Project” was also reviewed to inform the verification assessment.

1.3 Level of Assurance

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

1.4 Summary Description of the Project

The Project is located at the Wellford Landfill at 595 Little Mountain Road (Latitude: 35.001193, Longitude: -82.13042). Spartanburg is the owner and operator of the landfill and flare, while Milliken is the owner and operator of the boilers and Lockhart is the owner and operator of the engine. The Project consists of three phases: (1) expansion of the existing landfill gas collection system and destruction of landfill gas in an open flare; (2) implementation of a beneficial use project by which landfill gas is destroyed in off-site boilers at the Milliken Dewey Chemical plant; and (3) implementation of another beneficial use project by which landfill gas is destroyed in a Caterpillar 3520 engine-generator unit at the Lockhart power facility. These activities result in a net reduction of CO₂e emissions.

2 Verification Process

The verification process consisted of an assessment of the Project’s implementation, as described in the Monitoring Report, against the verification criteria described above, as well as an assessment of the GHG emission reduction assertion. Discrepancies between project documentation and the verification criteria were considered material and identified for corrective action. Deviations were evaluated on the basis of the requirements in ACM0001 and the VCS Standard and required appropriate justification.

2.1 Method and Criteria

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

- conflict of interest review;
- selection of Audit Team;
- kick-off meeting with Blue Source Team;
- review of the validated VCS PD;
- development of the verification plan and sampling plan;
- desktop review and evaluation of raw data, calculations, and supporting documentation for the period under review;
- follow-up interaction with Blue Source Team 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 GHG emission sources and reductions and 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.

2.1.1 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.

2.1.2 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:

Jeff Daley – Lead Verifier
Jay Wintergreen – Internal Reviewer

2.1.3 Audit Kick-off

The verification audit was initiated with a kick-off conference call on January 22, 2020 between First Environment and the Blue Source team. The communication focused on confirming the verification scope, objectives, criteria, schedule, and the data required for the verification.

2.1.4 Project Description Review

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

2.1.5 Development of the Verification Plan

The Audit 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 given 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 and established project deliverables. A separate sampling plan was designed to review all project elements in areas of high risk of inaccuracy or non-conformance.

2.1.6 Site Visit

Mr. Jeff Daley performed a site visit on February 14, 2019 as part of the previous verification process. The site visit included interviews with relevant site personnel and project stakeholders; review of the Project's operations; data collection procedures and information management systems; as well as assessments of the Project's controls for sources of potential errors and omissions. The site inspection included a tour of the landfill, all destruction devices, and all associated ancillary equipment (i.e., metering and data recording systems). First Environment conducted phone interviews with project personnel during the current verification to re-confirm project details. Therefore, another site visit during the current verification process was deemed unnecessary.

2.1.7 Desktop Review

The Audit Team performed a desktop review of the Monitoring Report, GHG emission reduction assertion, and supporting documentation, as further described in Section 2.2 below.

2.1.8 Corrective Actions and Supplemental Information

The Audit Team issued requests for supplemental information, corrective action, and clarification during the verification process. The corrective action and clarification requests and the responses provided by Blue Source are summarized in Appendix A.

2.1.9 Verification Reporting

Verification reporting documents the verification process and identifies its findings and results. Verification reporting consists of this report and a separate Deed of Representation to be submitted to Verra.

2.2 Document Review

During the verification process, First Environment reviewed the Project's Monitoring Report, GHG emission reduction assertion, and supporting documentation for the current verification period to ensure consistency with the VCS Standard, ACM0001, and the VCS PD. Discrepancies between project documentation and the verification criteria were considered material and identified for corrective action. Deviations required appropriate justification from Blue Source. Additionally, First Environment assessed the GHG emission reduction assertion and underlying monitoring data to determine if either contained material or immaterial misstatements. The results of these reviews are discussed in greater detail below.

2.3 Interviews

Through the course of verification activities, First Environment interviewed the following project personnel to inform the verification process:

- Tooraj Moulai – Blue Source; Director of Engineering & Technical Services,
- Isaac Smith – Blue Source; Carbon Solutions Analyst,
- Scott Thompson – Lockhart Power; Operations Manager.

2.4 Site Inspections

As described above, a site visit was performed on February 14, 2019 as part of the previous verification process.

2.5 Resolution of Findings

The Audit Team issued ten requests for corrective action and three requests for clarification during the verification process. There were no outstanding forward action requests from the validation or previous verification. Blue Source's responses were sufficient to resolve all requests. The corrective action and clarification requests and the responses provided are summarized in the table found in Appendix A.

2.5.1 Forward Action Requests

No forward action requests were issued during the verification process.

2.6 Eligibility for Validation Activities

First Environment is accredited to perform validation activities as described in Section 3 below for activities in Sectoral Scope 13 – Waste Handling and Disposal, which is the applicable scope for the approved CDM methodology ACM0001.

3 Validation Findings

As described in Section 3.3 below, three methodology deviations and four Project Description deviations were validated during the current reporting period. First Environment reviewed justification for each deviation, including supporting documentation, in order to confirm they were consistent with the underlying methodology and did not negatively impact the conservativeness or accuracy of the emission reductions. The validation process for the deviations consisted of an assessment of the Project's implementation, as described in the Monitoring Report and from discussions with Blue Source, against the validation criteria. The validation criteria considered in

the assessment of any deviations included the approved CDM methodology ACM0001, v11 and the VCS standard.

3.1 Participation under Other GHG Programs

During the verification process, First Environment reviewed written confirmation from Blue Source confirming that GHG emission reduction credits from the Project have not been registered under another GHG program.

First Environment concluded that the Project is eligible to participate under the VCS program.

3.2 Methodology Deviations

Section 4.1 identifies methodology deviations previously validated for the Project. Three methodology deviations were identified during the current reporting period.

- The VCS PD identifies equations to calculate methane destroyed based on the total amount of eligible landfill gas collected (LFG Project total,y) and the proportion of landfill gas sent to each destruction device. The total amount of eligible landfill gas collected is metered prior to the non-eligible portion of the landfill and also prior to any gas conditioning equipment. The equation format could result in higher emission reductions if LFG Project total,y is greater than the sum of landfill gas destroyed by all three destruction devices. Therefore, the sum of landfill gas destroyed by all three destruction devices is compared to the total amount of eligible landfill gas collected (LFG Project total,y), and the lesser of the two values is applied in the calculation of methane destroyed. First Environment approved this deviation because it meets the criteria for permitted methodology deviations. Specifically, this deviation is related to the criteria and procedures pertaining to monitoring or measurement set out in the methodology. Additionally, this deviation results in greater conservativeness in the emission reduction assertion.
- The ACM0001 methodology states that methane content of the landfill gas and the landfill gas flow must be measured on the same basis (either wet or dry). The methane content of the landfill gas sent to the Lockhart engine is measured on a wet basis prior to landfill gas treatment, while the flow is measured on a dry basis after landfill gas treatment. Measuring methane concentration on a wet basis and corresponding flow rate on a dry basis results in a conservative calculation of the fraction of methane in the landfill gas. This is because the resulting methane fraction of the landfill gas will be smaller when measured on a wet basis than if methane concentration were measured on a dry basis after the landfill gas is de-watered. First Environment approved this deviation because the proposed monitoring arrangement results in a conservative determination of the total quantity of methane destroyed by the engine.
- During periods in May, June, August and December 2019, a datalogger communication issue prevented methane concentration from being recorded. To account for methane concentration during these periods, methane data substitution was applied. The substitute methane value was calculated based on deducting one standard deviation from the average landfill methane concentration over the 16-month period of January 1, 2018 through April 30, 2019. First Environment approved this deviation because it meets the criteria for permitted deviations. Specifically, this deviation is related to the criteria and procedures pertaining to monitoring or measurement. The deviation results in a more accurate representation of methane concentration recorded by ensuring that the gap in methane concentration data is addressed and not overlooked. Additionally, the calculated substitute methane concentration that is applied during the gaps is very conservative relative to the typical methane concentration observed at the landfill.

3.3 Project Description Deviations

The following project description deviations are proposed in the Monitoring Report for the current reporting period:

- The VCS PD identifies that the flow meter used to measure flow sent to the Milliken facility is a Rosemount 3051 SFC-Compact conditioning mass flowmeter. The meter that is actually used is a Rosemount 2051 SFC-Compact conditioning mass flowmeter
- The global warming potential (GWP) of methane has been updated to the value reported in the IPCC's Fourth Assessment Report. This reflects policies allowed in accordance with the most recent version of the VCS Standard. First Environment approved this deviation because it is consistent with the most recent VCS Standard guidance.
- The VCS PDD states that the operability of the plant will be measured with a wattmeter, and that maintenance will be performed according to instrument manufacturer's recommendations. Engine kilowatt production is measured continuously and recorded every minute by the Duke Utility interconnect electricity meter. Calibration records for this meter are not available to the Project Proponents. However, this meter is a revenue meter from which utility invoicing is based off of and therefore is assumed to be accurate. First Environment approved this deviation because the overall risk of a revenue meter being inaccurate is low as this meter serves as the basis for financial transactions between the Project and the utility. Additionally, the data generated by this meter is not being directly used to quantify emission reductions generated by the Project activity.
- On March 26, 2019, the original open flare was removed and replaced with a new open flare which began operation on May 16, 2019. The new flare was installed in the same location as the original flare and landfill gas flow sent to the new flare is still being measured in the same location as the original flare. The new flare was installed as an upgrade to replace the original aging flare, and also has a larger capacity than the original flare. Based on the amount of landfill gas needing to be destroyed via the flare, the new flare contains a primary gas line that can handle approximately 1,800scfm, a secondary gas line that can handle approximately 300scfm, and a pilot line that uses landfill gas as a pilot fuel. The original Thermal Instruments flow meter was replaced by three Rosemount flow meters which measure gas flow on each of the flare gas lines. First Environment approved this deviation because the new flare is the same destruction device type (i.e., open flare) as the original flare, landfill gas flow is still being measured in the same location as previously measured, and no modifications to the landfill gas headers or piping layout have occurred. First Environment reviewed detailed design schematics, flow meter information and calibration records for the new flare. Additionally, First Environment interviewed Scott Thomson (Lockhart Power, Operation Manager) during the current reporting period to confirm the details of the new flare installation and operation.

The project deviations described above did not impact the applicability of the methodology, additionality, or the appropriateness of the baseline scenario, and the Project remained in conformance with all other ACM0001 and VCS requirements. In addition, Blue Source provided appropriate descriptions and justifications for all relevant deviations. All project deviations were deemed to be valid.

3.4 Grouped Project

Not Applicable. The Project is not a grouped project.

4 Verification Findings

4.1 Project Implementation Status

The Project is implemented according to the description provided in the VCS PD, except where noted in Section 3 above, and relative to previously validated deviations identified below. The Project became operational on April 29, 2010. The 10-year Project crediting period began on June 15, 2010 and ends on June 14, 2020. First Environment previously confirmed the Project's start date during validation. Emission reductions are claimed for LFG from the expanded gas collection system installed at the Wellford Landfill. The Project consists of three stages. Collected eligible landfill gas is destroyed in an open flare (Stage 1), two steam boilers and one hot oil boiler at the Milliken Dewey Chemical Plant (Stage 2), or in a Caterpillar 3520 engine-generator set to produce electricity (Stage 3). In addition to claiming emission reductions for the destruction of methane, emission reductions are also claimed for the displacement of natural gas in the Milliken Dewey Chemical Plant boilers.

No data and/or variables presented in the Monitoring Report differ from those stated in the VCS PD, except where noted in Sections 3.2 and 3.3 above or as described below. Similarly, the data collection and recordkeeping procedures were found to be consistent with those outlined in the monitoring plan described by the VCS PD and meet the requirements of ACM0001. The Project has adequate management and operational systems in place with respect to monitoring and reporting, as determined through observation during the site visit and the desktop review of project documentation.

During the verification process, First Environment reviewed written confirmation from Blue Source confirming that GHG emission reduction credits for the current reporting period have not been registered under another GHG program.

The Project activity does not claim emission reduction credits for the displacement of fossil generated electricity. Therefore, no double counting of environmental attributes associated with electricity production and carbon credits has occurred.

The following topics were discussed with project personnel during the previous verification site visit:

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

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

The total quantity of eligible LFG collected by the Project is continuously measured with a FCI thermal mass flow meter prior to co-mingling with the ineligible, pre-project gas stream. The quantity of LFG sent to the flare was continuously measured using a Thermal Instruments thermal mass flow meter until March 26, 2019. After the new flare was installed, the quantity of LFG sent to the flare was continuously measured using one of three Rosemount flow meters. The quantity of LFG sent to the Milliken Plant's boilers is continuously measured using a Rosemount 2051 SFC flow meter. The quantity of LFG sent to the engine is continuously measured using a Rosemount 3051 SFC flow meter. All flow data are recorded by the Project's SCADA system data recorder at least every 15 minutes. The data are also uploaded and stored on a separate server at the Lockhart facility.

The flow meters were calibrated in accordance with the requirements of the VCS PD. Table 1 below identifies the dates each meter was calibrated:

TABLE 1: Meter QAQC 1

Meter	Location	Dates of Use	Calibration Date	VCS PD calibration frequency
FCI Thermal Mass Flowmeter (s/n 324341)	Total Flow (LFG Project total,y).	Entire reporting period	11/8/2018	24 months
Thermal Instruments TI62/9 (s/n: 98181)	Flare (LFG flare,y); Original Flare	1/1/2019 – 3/26/2019	3/1/2018	18 months
Rosemount 2051 Flow Transmitter (s/n:21998)	Flare (LFG flare,y); New Flare – Primary gas line	5/22/2019 – 12/31/2019	11/4/2018; 1/6/2020	16 months
Rosemount 2051 Flow Transmitter (s/n:21997)	Flare (LFG flare,y); New Flare – Secondary gas line	5/22/2019 – 12/31/2019	11/3/2018; 1/6/2020	16 months
Rosemount 2051 Flow Transmitter (s/n:21996)	Flare (LFG flare,y); New Flare – Pilot flow	5/22/2019 – 12/31/2019	11/4/2018; 1/6/2020	16 months
Rosemount 3051 SFC (s/n: 43190)	Engine (LFG electricity,y)	Entire reporting period	1/4/2017	3 years
Rosemount 2051 SFC (s/n: 43317)	Boiler (LFG thermal,y)	Entire reporting period	1/4/2017	3 years

First Environment reviewed the calibration records for all flow meters identified in Table 1 to confirm that each meter was operating within the five percent accuracy threshold established by the Standard.

Methane concentration is monitored continuously using a Siemens Ultramat 23 gas analyzer. Methane concentration data are recorded by the Project's SCADA system data recorder at least every 15 minutes. The data are also uploaded and stored on a separate server at the Lockhart facility. The gas analyzer was calibrated on August 30, 2018 and August 13, 2019 by a third party (Wingo Services Company, Inc.). Additionally, the gas analyzer was field calibrated monthly by facility personnel. First Environment reviewed the results of all third-party and monthly calibrations, all of which identified that the gas analyzer was operating accurately and within the five percent accuracy threshold established by the Standard.

The open flare uses thermocouples to continuously monitor flare temperature as well as a UV eye to monitor the presence of a flame. The temperature is recorded by the SCADA system at least every 15 minutes. The flare is set to operate above a minimum temperature of 300°F. The flare system alarms at 300°F and automatically shuts down the blowers and flare if the temperature drops below 300°F or if the UV eye does not detect a flame. First Environment confirmed that no flow was recorded when the flare temperature was below this threshold.

The operation of the Lockhart energy plant is demonstrated by kilowatt production monitored continuously and recorded every minute.

As described below, operation of the Milliken plant boilers is satisfied through the use of failsafe shut off valves built into the control system on each boiler gas train that include two automatic valves that shut anytime the landfill gas line is switched off or the boilers goes down. This stops the flow of gas to the boilers.

The Project imports electricity from the grid. Electricity consumption is monitored using monthly utility invoices and maximum horsepower ratings for the boiler fans. The Project also consumes propane for the flare pilot light system. Consistent with the validated PD, propane consumption is conservatively determined from purchase invoices during the verification period.

The data collection and recordkeeping procedures were found to be consistent with those outlined in the monitoring plan described by the PD and meet the requirements of the ACM0001.

The following methodology deviations were previously validated for the Project during the Project's initial validation:

- The baseline discount (MDBL) which accounts for the amount of methane destroyed historically prior to the project activity is assumed to be zero. The basis for this deviation is that the Project collection system was designed and constructed independent of the pre-existing gas extraction wells. The Project gas collection wells are routed to a separate collection system, and the project eligible landfill gas does not comeingle with landfill gas from the pre-existing system until a point before the landfill gas is flared. The Project eligible landfill gas is metered prior to the point when the landfill gas is comingled. First Environment previously approved this methodology deviation during the validation process because the Project eligible landfill gas is isolated and metered prior to comingling with pre-project landfill gas.
- The default flare efficiency of the open flare was assigned a value of 98 percent as opposed to the 50 percent default efficiency for open flare as found in the "Tool to determine project emissions from flaring gases containing methane," Version 1.0. First Environment previously approved this methodology deviation during the validation process because the 98 percent flare efficiency is representative of the typical flare efficiency for an open flare operated under United States (US) Environmental Protection Agency (EPA) 40CFR60.18, as is the case for the project flare. Furthermore, the applied flare efficiency yields a more accurate representation of emission reductions.
- Project emissions resulting from purchased grid electricity are quantified by using a electricity emission factor sourced from the U.S. EPA eGRID database for the sub region in which the Project is located, as opposed to quantifying a grid electricity emission factor by using Tool to calculate the emission factor for an electricity system, or by applying a default electricity emission factor. First Environment previously approved this methodology deviation during the validation process because the U.S. EPA eGRID electricity factor more accurately represents the electricity grid in which the Project activity resides.
- The quantity of thermal energy produced utilizing landfill gas which in the absence of the project activity would have been produced from an on-site/off-site fossil fuel fired boiler, ETLFG_y, is required to be monitored continuously according to ACM0001. Such continuous monitoring is not appropriate for the project activity since the Milliken facility utilizes landfill gas in three separate boilers, all of which also burn natural gas, sometimes concurrently. Therefore, ETLFG_y is determined by multiplying the amount of methane utilized in Milliken's boilers by the NCV of methane and by the efficiency of the boilers. First Environment previously approved this methodology deviation during the validation process because it provides a more accurate and conservative representation of the amount of landfill gas consumed by the boilers.
- The Operation of the Project Boilers is not measured hourly as required according to ACM0001. This is due to the fact that the boilers also consume natural gas and therefore

can still be operational even when landfill gas is not being combusted. All landfill gas that is sent to the boilers is considered to be destroyed because the boilers have multiple fail-safes built into the control systems and automatic shutoff valves that close anytime the boilers are not in operation. First Environment previously approved this deviation during the validation process because the fail-safes ensure landfill gas destruction.

- Methane content and flow to the boilers is not measured on the same moisture basis as required by ACM0001. Instead, methane concentration is measured on a “wet” basis while flow is measured on a “dry” basis. Measuring methane concentration on a wet basis and flow rate on a dry basis results in a conservative calculation of the fraction of methane contained in the landfill gas because after the gas is de-watered, the methane fraction would be larger. If methane fraction is measured on a wet basis and flow is measured on a dry basis, the resulting volumetric flow of methane will always be lower than if both measurements were taken on the same moisture basis. First Environment previously approved this deviation during the validation process because it results in greater conservativeness of the emission reduction assertion.
- The ex-ante emission reduction estimates were not estimated using the CDM “Tool to determine methane emissions avoided from disposal of waste at a solid waste disposal site.” Instead, ex-ante emission reductions were estimated by using the US EPA LandGEM Landfill Gas Emissions model, which is the industry accepted standard for developing landfill gas curves in the United States. First Environment previously approved this deviation during the validation process because it does not impact the conservativeness of the future reporting period emission reductions.

The data collection and recordkeeping procedures utilized were found to be consistent with those outlined in the monitoring plan described in the VCS PD and meet the requirements of ACM0001, except where noted above.

The Project contributes to sustainable development objectives by creating energy while preventing the release of methane to the atmosphere.

Overall, the Project is implemented according to the description provided in the VCS PD (except where deviations are noted above), and the monitoring system implemented was found appropriate to the task of obtaining, recording, and compiling the monitored data and parameters

4.2 Safeguards

4.2.1 No Net Harm

The Project creates no negative environmental or socio-economic impacts.

4.2.2 Local Stakeholder Consultation

The Project operates in accordance with several permits to ensure protection of the environment. The landfill is owned by a public entity and therefore local stakeholders can submit input at any time to the Landfill Manager or Public Works Department. No ongoing comments or concerns were submitted during the reporting period.

4.3 AFOLU-Specific Safeguards

Not Applicable.

4.4 Accuracy of GHG Emission Reduction and Removal Calculations

Emission reductions are calculated ex-post using the approach indicated in ACM0001 and the validated PD. First Environment reviewed the emission reduction calculations for the verification period to ensure accuracy in the formulas applied and the raw data and default factors used as inputs. First Environment's review assessed whether emission reductions were free of material misstatement. The formulas were tested and found to be consistent with the calculations described in ACM0001 and the validated PD.

Landfill gas flow sent to the flare ($LFG_{\text{flare},y}$), engine ($LFG_{\text{engine},y}$), boilers ($LFG_{\text{thermal},y}$), and total eligible landfill gas ($LFG_{\text{project total},y}$) are measured continuously, and the methane fraction of the landfill gas (WCH_4,y) measured by the continuous gas analyzer are used to calculate the total amount of methane destroyed by the Project ($MD_{\text{project},y}$).

Landfill gas combusted by the flare ($LFG_{\text{flare},y}$) is measured continuously, and the methane fraction of the landfill gas (WCH_4,y) measured by the continuous gas analyzer are used to calculate the total amount of methane destroyed by the flare ($MD_{\text{flared},y}$). The total monthly quantities of landfill gas are determined by taking the continuous flow readings and summing them over the reporting period. The flare flow meters all automatically correct flow data to standard conditions of 60°F and 14.70 psi. Methane density consistent with the metered flow standard conditions (0.677kg/m³ at 60°F and 14.70psi) is multiplied by total methane flow to convert the methane destroyed from a volumetric flow to a mass flow. A thermocouple measures flare temperature to ensure methane destruction. Any flow data with associated flare temperatures below 300°F are excluded from emission reduction calculations.

Landfill gas combusted by the engine ($LFG_{\text{engine},y}$), and boilers ($LFG_{\text{thermal},y}$) is measured continuously, and the methane fraction of the landfill gas (WCH_4,y) measured by the continuous gas analyzer are used to calculate the total amount of methane destroyed by the engine ($MD_{\text{electricity},y}$), and boilers ($MD_{\text{thermal},y}$). The total monthly quantities of landfill gas are determined by taking the continuous flow readings and summing them over the reporting period. The flare and boiler flow meters automatically correct flow data to standard conditions of 60°F and 14.70 psi. Methane density consistent with the metered flow standard conditions (0.677kg/m³ at 60°F and 14.70psi) is multiplied by total methane flow to convert the methane destroyed from a volumetric flow to a mass flow.

The proportion of methane destroyed by each destruction device is determined by dividing the methane flow to each individual destruction device by the total methane flow sent to all destruction devices. The proportion of methane destroyed by each device is then multiplied by the lesser of either the total methane collected by the project or the sum of the methane destroyed by all destruction devices to determine the amount of methane destroyed by each device.

The quantity of thermal energy produced utilizing LFG in the boilers, which in the absence of the project activity would have been produced from natural gas fuel is accounted for as baseline emissions in accordance with the VCS PD. The thermal energy generated by the Project is determined by multiplying the quantity of project LFG fed to the boilers by the methane content, efficiency of the boilers, and the net calorific value of LFG. The thermal energy is multiplied by the emission factor for natural gas in order to determine the baseline emissions from displacement of fossil fuels.

Project emissions from uncombusted methane during flaring, fossil fuel usage, and grid purchased electricity consumption are deducted from the overall emission reductions created by the Project. Project emissions from uncombusted methane are calculated in accordance with Equation 10 of the VCS PD. Project emissions from fossil fuel usage are quantified by multiplying the activity data by the appropriate emission factor. Project emissions from electricity consumption are quantified by

multiplying the activity data by the appropriate emission factor and transmission and distribution loss factor.

As required by ACM0001, MD_{project} is determined by comparing the amount of methane destroyed against the amount of methane generated as calculated by the EPA LandGEM model. First Environment confirmed that the comparison had been made and that MD_{project} was appropriately determined from the metered quantities of methane destroyed, which was the lesser of the two values. Since LFG collected by the project system is monitored separately before comingling with the pre-project system, $MD_{\text{BL,y}}$ is taken as zero

The verification process focused on the evaluation of quantification spreadsheets to ensure that they were consistent with the formulas and equations described in ACM0001 and the VCS PD. Copies of the raw data used in the calculations, including flow and methane concentration data, and utility and other fossil fuel invoices, were compared with the values used in the final calculations and tested for transcription or mathematical errors. 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 PD.

The Audit Team performed an independent recalculation of the emission reductions from the verification period using the available raw data. Material misstatements were identified for correction by Blue Source as described in Section 2.5.

No material misstatements were observed in the final GHG assertion.

Overall, the GHG emission reductions were quantified correctly in accordance with the VCS PD and the ACM0001 methodology

4.5 Quality of Evidence to Determine GHG Emission Reductions and Removals

Blue Source provided adequate documentation for the emission reduction calculations as well as its management systems around the data collection process. Specifically, First Environment was provided a Monitoring Report prepared in accordance with the VCS program template, transparent calculation spreadsheets, calibration records, and data records associated with wastewater flow, biogas flow, methane concentration, electricity consumption, and fossil fuel consumption. Data was reviewed beginning from its original source of generation to confirm the accuracy of the information flow.

The evidence provided was consistent with the requirements of ACM0001 and the validated VCS PD and meets generally accepted evidentiary standards for best practice in GHG accounting.

4.6 Non-Permanence Risk Analysis

Not Applicable.

5 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 VCS Standard, the CDM methodology ACM0001 and the VCS PD.
- **Verification criteria:** VCS Standard, the CDM methodology ACM0001 and the VCS PD.
- **Definition of materiality:** Misstatements of greater than five percent of the GHG assertion and qualitative non-conformities with the validated VCS PD are considered material.
- **Scope, including:**
 - Boundaries of the assertion: Operations at the Wellford Landfill, Lockhart Energy Facility, and the Milliken Dewey Chemical Plant;
 - The physical infrastructure, facilities, and activities within the assertion: LFG collection and destruction operations, including the flare located at the Wellford Landfill, engine at the Lockhart Energy facility, and boilers located at the Milliken Dewey Chemical Plant; and
 - GHG sources, sinks, and reservoirs included within the assertion: Methane and carbon dioxide emission reductions expressed as carbon dioxide-equivalents and carbon dioxide emissions from the operation of project equipment; and

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 are:

- consistent with the VCS PD of March 7, 2012;
- in conformance with the VCS Standard, the CDM methodology ACM0001 (Version 11);
- without material discrepancy; and meeting the minimum level of accuracy of at least 95 percent.

Additionally, the deviations reviewed and approved during the current audit process are consistent with the VCS Standard and ACM0001 methodology, including all validation criteria therein.

Verification period: From 1-January-2019 to 31-December-2019.

Verified GHG emission reductions and removals in the above-verification period:

Year	Baseline emissions or removals (tCO ₂ e)	Project emissions or removals (tCO ₂ e)	Leakage emissions (tCO ₂ e)	Net GHG emission reductions or removals (tCO ₂ e)
2019	99,338	472	0	98,866
Total	99,338	472	0	98,866

APPENDIX A: Detailed Resolution of Findings

ID	Corrective Action Request	Participant Response	Verification Conclusion
1	Section 4.2 of the Monitoring Report does not identify the "Operation of the Lockhart energy plant" parameter.	Section 4.2 of the Monitoring Report has been revised to include the "Operation of the Lockhart energy plant" parameter.	Response is acceptable.
2	Emission reductions are being claimed for landfill gas destruction in the engines during periods when engine operability data is not available (i.e., February 2019, November 27-30th, etc..).	The emission reduction calculations and data analysis have been revised and only account flow to the engine as eligible when there is corresponding engine operability data.	Response is acceptable.
3	The flare flow meter (s/n 98181) was in use past the 18-month calibration frequency identified in the VCS PD.	This flare meter was not in use after May 2019 and therefore when it was used from January - March 2019 it was still within the 18-month calibration frequency as identified in the VCS PD. This flare meter was replaced with Rosemount meters when the new flare was installed in April/May 2019.	Response is acceptable.
4	Project emissions from flaring are not being accounted for in the emission reduction calculations from May - December 2019.	There was a formula error in the calculation workbook. The emission reduction calculations have been revised and now account for project emissions from flaring over the entire reporting period.	Response is acceptable.
5	The CO ₂ emission factor for propane is incorrect because it is obtained from an outdated carbon content coefficient factor (i.e., U.S. EPA Guidelines, Inventory of US Greenhouse Gas Emissions and Sinks, April 2019, a more recent version of this document is available).	The 2020 version of U.S. EPA Guidelines, Inventory of US Greenhouse Gas Emissions and Sinks is still in draft public comment format and has not been finalized. Therefore, the current 2019 factor being applied is still appropriate. Additionally, the difference between the two factors is immaterial and would have a negligible impact on the overall emission reduction assertion.	Response is acceptable.
6	The eGrid electricity emission factor applied in the calculation of project emissions from purchased electricity is incorrect (i.e., tCO ₂ equivalent).	The calculation of project emissions from purchased grid electricity have been revised and now apply the correct eGrid emission factor of 743.3lbCO ₂ /MWh.	Response is acceptable.
7	Emission reductions are not being calculated according to the procedure identified in Section 3.1 of the VCS PD, and according to the first methodology deviation as identified in 2.3.1 of the Monitoring Report.	The emission reduction calculations have been revised and are now calculated according to the procedure identified in the VCS PD.	Response is acceptable.

APPENDIX A: Detailed Resolution of Findings

ID	Corrective Action Request	Participant Response	Verification Conclusion
8	Eligible emission reductions for landfill gas sent to the flare are not being accounted for in the months of May, August, October, and December 2019.	The emission reductions have been revised to correct this issue and now account for landfill gas sent to the flare during these months.	Response is acceptable.
9	The new Rosemount flow meters currently used at the flare skid are not identified in Section 3.2 of the Monitoring Report as a project description deviation, and elsewhere throughout the Monitoring Report where appropriate.	The new Rosemount flow meters being used at the flare have been included in Section 3.2 of the Monitoring Report as a project description deviation and have also been identified throughout the Monitoring Report where appropriate.	Response is acceptable.
10	Section 3.2 of the Monitoring Report does not identify and justify the use of the methane data substitution that is being applied throughout the reporting period as a deviation.	Section 3.2 of the Monitoring Report has been revised to identify and justify the use of methane data substitution as a methodology deviation during periods when there was datalogger communication issues with the methane analyzer.	Response is acceptable.

ID	Clarification Request	Participant Response	Verification Conclusion
1	Please clarify why Section 4.2 of the Monitoring Report identifies "new" flare parameters (i.e., $PE_{flare,new}$, and $LFG_{flare,new}$).	As a result of the original flare being replaced in the beginning of the reporting period by the new flare, the parameters $LFG_{flare,new}$, and $PE_{flare,new}$ are included in the current reporting period for clarity purposes, and to distinguish between the old and new flare. As a result, the use of these parameter distinctions is included in the Monitoring Report as a Project Description Deviation.	Response is acceptable.
2	Please clarify how the landfill gas used as a flare pilot fuel is monitored.	The pilot landfill gas is measured using a Rosemount flow meter (s/n: 21996) on the flare gas pilot line.	Response is acceptable.
3	Please clarify why the calibration record for the Rosemount pilot flow transmitter (ID: FE-303) has the same serial number (i.e., 21996) as the calibration record for the Rosemount pressure transmitter (ID: PIT-302).	There was an error in the January 6, 2020 calibration reports. The pilot flow is measured with meter serial number 21996. The calibration record for the meter with device ID PIT-302 is a pressure transmitter on the secondary line and has a serial number of 21999. The calibration record for the pressure transmitter has been revised to identify the correct serial number.	Response is acceptable.