



**Verified Carbon
Standard**

CLINTON LANDFILL GAS COLLECTION AND COMBUSTION PROJECT VALIDATION REPORT



RUBY CANYON ENVIRONMENTAL

Document Prepared by Ruby Canyon Environmental, Inc.

Project Title	Clinton Landfill Gas Collection and Combustion Project
Version	4.0
Report ID	2021_RCE_VCS_12

Report Title	Clinton Landfill Gas Collection and Combustion Project Validation Report
Client	3Degrees Group, Inc.
Date of Issue	19 January 2022
Prepared By	Ruby Canyon Environmental, Inc.
Contact	743 Horizon Court, Suite 385

	Grand Junction, CO 81501 970.241.9298 npinette@rubycanyonenv.com www.rubycanyonenv.com
Approved by	Michael Coté
Work carried out by	Nina Pinette Phillip Cunningham

Summary:

3Degrees Group, Inc. (3Degrees) contracted Ruby Canyon Environmental, Inc. (RCE) to complete the validation for the renewal crediting period of the Clinton Landfill project, 1 July 2019 to 30 June 2029. The project activity is located at the Clinton Landfill in Clinton, Illinois, United States and consists of a landfill gas collection and control system (GCCS) that includes two open flares and two 1.6 MW engines. Part of the GCCS was in place prior to the start of the project to comply with regulatory requirements. The project achieves emission reductions through collection and destruction of the methane portion of landfill gas (LFG) via the flares and engines beyond what was required to be collected and destroyed in the baseline to comply with regulatory requirements.

The purpose of the validation for the renewal crediting period was to assess the project's compliance with the VCS Program Rules, version 4.1, dated 22 April 2021 and the CDM Large-Scale Consolidated Methodology ACM0001 Flaring or use of landfill gas v19.0, dated 14 June 2019 (ACM0001 Methodology) and all associated CDM Tools. The scope of the validation includes an assessment of the Project Description, dated 18 January 2022 (PD) and supporting data and documentation against the defined criteria.

During the validation process, RCE issued 12 findings which included 3 corrective action requests, 7 additional documentation requests, and 2 clarification requests. 3Degrees sufficiently addressed all findings. Details are included as Appendix B.

Based on documentation and explanations provided by 3Degrees, RCE concludes that the Project meets all relevant VCS requirements and appropriately applies the ACM0001 Methodology and Tools.

CONTENTS

1	INTRODUCTION	4
1.1	Objective	4
1.2	Scope and Criteria	4
1.3	Level of Assurance	4
1.4	Summary Description of the Project	4
2	VALIDATION PROCESS	5
2.1	Method and Criteria	5
2.2	Document Review	6
2.3	Interviews	6
2.4	Site Inspections	7
2.5	Resolution of Findings	7
3	VALIDATION FINDINGS	7
3.1	Project Details	7
3.2	Safeguards	9
3.3	Application of Methodology	10
3.4	Non-Permanence Risk Analysis	17
4	VALIDATION CONCLUSION	17
	APPENDIX A: DOCUMENTS REVIEWED	19
	APPENDIX B: LIST OF FINDINGS	20

1 INTRODUCTION

1.1 Objective

The purpose of the validation for the Project's renewal crediting period is to ensure that:

- The original baseline scenario is valid.
- The Project complies with the latest version of the CDM Tool to assess the validity of the original baseline.
- The project plan and GHG calculation methods are materially correct and meet the most recent ACM0001 Methodology tool requirements.
- The Project meets the requirements of the VCS program.
- The planned project could reasonably be expected to achieve the claimed emission reductions.

1.2 Scope and Criteria

This is the validation for the Project's renewal crediting period. The first crediting period was from 1 July 2009 to 30 June 2019. The second crediting period is from 1 July 2019 to 30 June 2029.

RCE assessed the Project Description (PD) against the following criteria:

- VCS Standard v4.1, 22 April 2021,
- VCS Program Guide, v4.0, 19 September 2019,
- CDM Large-Scale Consolidated Methodology ACM0001 Flaring or use of landfill gas v19.0, 14 June 2019 and all associated CDM tools,
- VCS Validation and Verification Manual version 3.2, 19 October 2016, and
- ISO 14064-3:2006 Greenhouse gases – Part 3: Specification with guidance for the validation and verification of greenhouse gas assertions

1.3 Level of Assurance

RCE conducted the validation to a reasonable level of assurance.

1.4 Summary Description of the Project

The Project is located at the Clinton Landfill in Clinton, Illinois at Landfill #2 and Landfill #3. Landfill #2 reached capacity in 2009 and Landfill #3 was opened. Prior to the Project, the baseline scenario included a landfill gas collection and destruction system that included 40 wells and two flares. That system was installed to maintain compliance with federal and state requirements to control nonmethane organic compounds (NMOCs) and landfill gas. The

Project activity consists of the voluntary collection and destruction of additional landfill gas via a system that includes a backup open flare and two 1.6MW caterpillar 3520C engines. The open flare in place prior to the start of the Project remains in place. The Project generates credits for the voluntary emission reductions over and above those achieved by the gas collection and destruction system in the baseline scenario.

2 VALIDATION PROCESS

2.1 Method and Criteria

RCE used a risk-based validation approach to develop the validation plan and sampling plan and to assess the Project against the criteria defined in Section 1.2 above.

The validation process included the following independent and objective activities:

- Select a validation team,
- Perform a Conflict of Interest Review,
- Conduct a kick-off meeting with *3Degrees*,
- Review the PD,
- Develop a validation plan and risk-based sampling plan,
- Review the previous crediting period PD, validation and verification reports,
- Review the validity of the original baseline scenario,
- Conduct a virtual site visit,
- Review the accuracy of the emission reduction projections for the crediting period,
- Review whether project activities are legally required,
- Confirm project ownership is accurately described in the PD,
- Confirm the application of the most recent version of the ACM0001 methodology and tools,
- Review the monitoring plan,
- Issue corrective action requests (CARs), additional documentation requests (ADRs), and clarification requests (CRs), as necessary,
- Issue a validation report, and
- Conduct an exit meeting with *3Degrees*.

The validation team was selected according to RCE's GHG Verification Policies & Procedures to ensure team members are qualified to perform validation activities pertaining to the Project. The validation team included the following individuals:

- Lead Validator: Nina Pinette
- Team Member: Phillip Cunningham
- Independent Reviewer: Michael Côté

RCE's primary activities for the validation of the renewal crediting period for the Project were reviewing the PD and supporting documents and conducting a virtual site visit to assess whether the Project's original baseline scenario is valid, the Project complies with the latest version of the CDM Tool to assess the validity of the original baseline; the PD and GHG calculation methods are materially correct and meet the most recent ACM0001 Methodology tool requirements, the Project meets the requirements of the VCS program, and the Project can reasonably be expected to achieve the claimed emission reductions. Following its review of the PD and supporting documents and the virtual site visit, RCE delivered a List of Findings to 3Degrees. 3Degrees provided sufficient responses to all requests.

2.2 Document Review

The validation included a review of the Project's PD and supporting documents to demonstrate compliance with the stated criteria and program requirements. RCE reviewed information in the PD against supporting evidence, specifically that the Project continues to demonstrate regulatory surplus, the baseline scenario is still valid, any methodology deviations are identified and justified, all SSRs are appropriately accounted for, all equipment is identified, and the monitoring plan is in compliance with VCS criteria. The documents reviewed are listed in Appendix A.

2.3 Interviews

As part of the validation activities, RCE conducted interviews with key personnel for the Project. RCE communicated throughout the validation with 3Degrees personnel responsible for the project including communicating data and document requests and validation findings. RCE also completed interviews with personnel at the Project during the virtual site visit.

Table 1. Validation Interviews

Name & Position	Organization	Items Discussed
Louise Bruning, Project Manager	3Degrees	Validation process and findings, Project ownership, PD, regulatory surplus of the project, Emission reduction calculations
Eden Harris, Carbon Associate	3Degrees	Validation process and findings
Andrew Whelpley, Program Manager	GFL Environmental	Project equipment including monitoring and metering instruments, QA/QC procedures for monitoring and metering equipment, data recording and collection
Kyle Martin, Compliance Specialist	GFL Environmental	Project history, project equipment

2.4 Site Inspections

RCE conducted a virtual site visit to the Project on 1 April 2021 using the real-time web meeting and screen sharing platform Zoom. The Lead Validator interviewed key personnel; reviewed GHG sources, sinks and reservoirs (SSRs); observed project components; viewed monitoring and metering equipment; discussed QA/QC procedures for monitoring and metering equipment; and reviewed data collection and aggregation procedures. The virtual site visit was conducted in accordance with the requirements of the International Accreditation Forum Mandatory Document for the Use of Information and Communication Technology (ICT) for Auditing/Assessment Purposes: Issue 2 (IAF MD4:2018).

Prior to the site visit, RCE assessed the risk of conducting a virtual site visit rather than an in-person site visit for the validation and determined the risk for material misstatements as a result to be low. RCE concluded that the ICT methods used for the virtual site visit were effective in achieving the validation objectives.

2.5 Resolution of Findings

RCE communicated findings to 3Degrees via its List of Findings document. Findings included three corrective action requests, seven additional documentation requests, and one clarification request. 3Degrees sufficiently resolved all requests during the validation process. The findings are included as Appendix B to this report.

2.5.1 Forward Action Requests

There were no forward action requests during the validation.

3 VALIDATION FINDINGS

3.1 Project Details

The project activity is a landfill gas collection and destruction project at the Clinton Landfill located at 9560 Heritage Road in Clinton, Illinois. The Project destruction devices are two flares and two 1.6MW caterpillar 3520C engines. The Project is conducted within the property owned by Clinton Landfill, Inc. at Clinton #2 and #3 landfills which share a physical border and are part of the same Illinois EPA Bureau of Air Permit. Clinton #2 was closed in 2010 and Clinton #3 was opened. The LFG collection system was initially installed to collect LFG from Clinton #2, but when the LFG began to decline in October 2015, the operators tied in Clinton #3. Flare #4 was installed in April 2021 to replace Flare #2, the flare historically serving as a backup to the engines. The Wabash Valley Power Authority, Inc. (dba Wabash Valley Alliance) owns the power plant and operates and maintains the Project. The Project is not a grouped project.

Prior to the Project, the baseline scenario was a landfill gas collection and destruction system installed in 1998 that included 40 wells and two open flares, Flare #1 and Flare #2. That system was installed to maintain compliance with federal and state requirements to control nonmethane organic compounds (NMOCs) and landfill gas. The amount of LFG collected and destroyed to comply with these regulatory requirements is appropriately excluded from the calculation of emission reductions.

RCE confirmed that all parties involved in the Project are appropriately identified in the PD. Clinton Landfill, identified on the landfill permits, and owned by GFL Environmental, owns and operates the landfill. Wabash Valley Power Authority, Inc.—dba Wabash Valley Alliance—(WVPA) owns the power plant and operates and maintains the Project. 3Degrees Group Inc. has rights to the emission reductions and is the project proponent. RCE confirmed that 3Degrees has right to the emission reductions per the Verified Emission Reduction Purchase Agreement between 3Degrees and WVPA.

The Project start date, which was validated during the validation of the initial crediting period, is January 24, 2007 which is the date on which the Project began delivering electricity to the grid. The initial crediting period was 1 July 2009 to 30 June 2019. The second crediting period is 1 July 2019 to 30 June 2029. The Project is estimated to generate 1,062,411 tCO_{2e} during the second crediting period. RCE reviewed the estimates and confirmed that this is reasonable and likely to occur.

The Project sells electricity to the local utility, Ameren, via a power purchase agreement. The renewable energy certificates (RECs) are bundled with the power sold to Ameren. This is allowable because the Project does not generate emission reductions for replacing grid electricity with renewable electricity.

The Project does not, and has never in the past, participated under other GHG programs nor has it been rejected by other GHG programs. It does not receive credits under emissions trading programs and other binding limits.

The landfill operates under multiple permits granted by the Illinois Environmental Protection Agency (IEPA). The Project is included on the Clinton Landfill's IEPA Air Permit. The landfill has a permit with the IEPA Bureau of Land to develop and operate the non-hazardous waste landfill and a National Pollutant Discharge Elimination System (NPDES) Permit. The Project also required permits for construction, issued in 2005, and permits for a landfill expansion and a second flare (flare #2) in 2010 and installation and operation of a new flare (flare #4) in 2021.

The Clinton Landfill exceeded the NMOC emissions threshold of 50 Mg/yr and was required to install an LFG collection and control system in 1998 to meet the requirements of 40 CFR Part 60 Subpart WWW, the New Source Performance Standards (NSPS) for municipal solid waste landfills. This is discussed in more detail in Section 3.3.4.

The Project contributes to sustainable development goals (SDGs) including SDG3 – Good health and well-being—by destroying methane as well as other volatile organic compounds (VOCs) many of which are listed as hazardous air pollutants (HAPs); SDG7—Affordable and clean energy—by generating and supplying renewable energy to the grid; and SDG8 – Decent work and economic growth—by creating permanent job positions at the Project.

3Degrees did not identify any commercially sensitive information. RCE concludes that project details included in the PD are accurate, complete, and provide an understanding of the nature of the Project. The Project has been implemented as described in the PD.

3.2 Safeguards

3.2.1 No Net Harm

No negative environmental and socio-economic impacts associated with the Project were identified by 3Degrees.

3.2.2 Local Stakeholder Consultation

For the renewal of the Project for the second crediting period, there were no additional local stakeholder consultations. There is also no evidence of comments or concerns from stakeholders that were brought forth during the initial crediting period. The PD describes the consultation efforts prior to the initial crediting period.

3.2.3 Environmental Impact

No environmental impact assessment was required for the Project prior to its implementation.

3.2.4 Public Comments

The Project did not receive any public comments.

3.2.5 AFOLU-Specific Safeguards

N/A, this is not an AFOLU project.

3.3 Application of Methodology

3.3.1 Title and Reference

CDM Large-Scale Consolidated Methodology ACM0001 Flaring or use of landfill gas v19.0, 14 June 2019 and all associated CDM tools:

- TOOL 03: Tool to calculate project or leakage CO₂ emissions from fossil fuel combustion, version 03.0
- TOOL 04: Emissions from solid waste disposal sites, version 08.0
- TOOL 05: Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation, version 03.0
- TOOL 06: Project emissions from flaring, version 03.0
- TOOL 08: Tool to determine the mass flow of a greenhouse gas in a gaseous stream, version 03.0
- TOOL 11: Assessment of the validity of the original/current baseline and update of the baseline at the renewal of the crediting period, version 03.0.1

3.3.2 Applicability

This validation is for the Project's renewal crediting period. RCE confirmed that the Project appropriately applied the ACM0001 Methodology Flaring or use of landfill gas v19.0 and that the project activity complies with each applicability condition in the Methodology. Specifically:

- The Project made an investment into an existing LFG capture system to increase the recovery rate of the captured LFG, and historical data on the amount of LFG captured and flared was available. RCE reviewed the baseline scenario with project personnel during the virtual site visit and validated that there had been no changes to pre-project conditions and implementation of the project activity since the Project's first crediting period. RCE concluded that the Project meets this applicability condition.
- The Project flares and/or uses the captured LFG to generate electricity, which RCE confirmed during the site visit. RCE concluded that the Project meets this applicability condition.
- The Project does not reduce the amount of organic waste that would be recycled in the absence of the project activity. RCE confirmed that management of SWDS is included as a monitored parameter in the Project Description and that the project proponent annually ensures that the operation of the project does not reduce the amount of organic waste being diverted from the Clinton landfill in the absence of the project activity. RCE concluded that the Project has a procedure in place to meet this applicability condition, and the verification of each monitoring period will assess the monitoring of management of SWDS.

- The most plausible baseline scenario is the partial atmospheric release of the LFG due to capture and destruction of LFG through flaring to comply with regulations. Furthermore, in the baseline scenario, electricity would be generated in the grid. See below for RCE's assessment of whether the baseline scenario is still valid.
- The methodology is not used in combination with other approved methodologies. RCE concluded that the Project meets this applicability condition because no emission reductions are claimed using other methodologies.
- The management of the SWDS is not deliberately changed in order to increase methane generation compared to the situation prior to the Project implementation. RCE confirmed that management of SWDS is included as a monitored parameter in the Project Description and that the project proponent annually ensures that management of the SWDS is not changed. RCE concluded that the Project has a procedure in place to meet this applicability condition, and the verification of each monitoring period will assess the monitoring of management of SWDS.

RCE also confirmed that the Project appropriately applied the relevant Tools and that the project activity complies with each applicability condition in those Tools. Specifically:

- TOOL03 – The tool is used to calculate project CO₂ emissions from the combustion of fossil fuels. RCE confirmed that the Project meets the applicability condition of the tool.
- TOOL04 – The tool is applied under application A where the project activity mitigates CH₄ emissions from a specific existing SWDS and emissions are mitigated by capturing and flaring or combusting the CH₄. RCE confirmed that the Project meets the applicability condition of the tool.
- TOOL05 - The tool is applied under scenario A where electricity consumption is from the grid only. The tool is not used to provide procedures to monitor electricity generated because the tool is used only to determine emissions from consumption of electricity by the project activity. Furthermore, captive renewable power generation technologies do not provide electricity in the project activity or in the baseline scenario and thus the project meets all applicability conditions in the tool.
- TOOL06 – The project activity flares LFG in open flares and CH₄ is the component with the highest concentration in the LFG – which is a biogenic source. The Project does not involve the use of auxiliary fuels. Thus RCE confirmed that the Project meets all applicability conditions in the tool.
- TOOL08 – The methodology ACM0001 involves measuring the flow and composition of flared gases for the determination of baseline and project emissions. CO₂ is not the particular and only gas of interest and ACM0001 specifies the gaseous stream the tool should be applied to; for which GHGs the mass flow should be determined;

in which time intervals the flow of the gaseous stream should be measured; and situations where the simplification offered for calculating the molecular mass of the gaseous stream is not valid. RCE confirmed that the Project meets all applicability conditions in the tool.

- TOOL11 – The Project used the tool to assess the continued validation of the baseline at the renewal of a crediting period, see below.

RCE confirmed that 3Degrees appropriately assessed whether the baseline scenario is still valid based on CDM TOOL 11 Assessment of the validity of the original/current baseline and update of the baseline at the renewal of the crediting period, and validated 3Degrees' assessment met the requirements of Tool 11 including:

- Assessing the compliance of the current baseline with the relevant mandatory national and/or sectoral policies,
- Assessing the impact of circumstances,
- Assessing whether the continuation of use of current baseline equipment(s) or an investment is the most likely scenario for the crediting period for which renewal is requested,
- Assessing the validity of the data and parameters, and
- Updating the current baseline and the data and parameters.

Specifically, RCE confirmed that the current baseline still complies with all relevant mandatory national and/or sectoral policies which have come into effect since the previous validation. Consistent with initial crediting period, the baseline scenario reflects the requirement to collect and control landfill gas to maintain compliance with federal and state requirements to control NMOCs.

3Degrees also updated data and parameters that were available at the validation of the initial crediting period.

RCE concluded that the ACM0001 Methodology is still applicable and that 3Degrees has appropriately applied any relevant CDM tools, consistent with the initial crediting period.

3.3.3 Project Boundary

The boundary of the Project includes the site where LFG is captured and where LFG is flared or combusted in the engines. RCE validated that all relevant sources and GHGs were included in the boundary during the virtual site inspection by viewing project equipment—including two project flares and two project engines—and interviewing site personnel. Additionally, RCE validated that the PD identifies and describes all relevant SSRs. There have been no changes to project SSRs for this second crediting period. One of the flares has been replaced, but there are still two flares combusting LFG at the Project.

3.3.4 Baseline Scenario

The Project's baseline scenario is the partial, but not total, atmospheric release of LFG; some LFG was flared in the baseline to comply with the requirements of 40 CFR Part 60 Subpart WWW, the New Source Performance Standards (NSPS) for municipal solid waste landfills which were also adopted by the state of Illinois in 35 IAC, Part 220. In the absence of the Project, the most likely scenario would be the release of LFG to the atmosphere that is not collected and destroyed by the baseline collection and control system.

The baseline collection and control system was installed in 1998 to meet the NSPS requirements. The baseline system met the requirements by demonstrating compliance with performance metrics and monitoring criteria to establish whether the system was adequate to control NMOC emissions including maintaining a negative pressure at all wellheads, ensuring the system design is sized to control the maximum predicted gas generation, and maintaining fewer than three monitored surface and subsurface methane exceedances within a quarter.

The amount of methane required to be collected and controlled in the baseline was based on the amount of methane in LFG that was collected and controlled in the year prior to the Project start, 2006, described in more detail in Section 3.3.6 below. The calculation has been modified slightly since the initial crediting period to account for all the methane collected and controlled, described in more detail in Section 3.3.6). The fraction of LFG that was recovered in the year prior to the implementation of the project activity is assumed to be the same fraction recovered under the project activity.

3Degrees used the CDM TOOL 11 to assess the validity of the original baseline scenario for the renewal of the Project crediting period. RCE reviewed the assessment and confirmed that the original baseline is still valid and justified, with the adjustment described above for the fraction of LFG recovered in the baseline scenario.

3.3.5 Additionality

Per Section 3.8.9 of the VCS Standard, the renewal of a project crediting period does not require a full reassessment of additionality but does require an assessment of regulatory surplus and update to the PD. 3Degrees provided an assessment of regulatory surplus confirming that there have been no changes to the requirement for the landfill to collect and control LFG. The requirement is the same as described for the baseline scenario in Section 3.3.4 above.

The Project added a new open flare in 2021 (flare #4); however, this flare replaced an existing flare (flare #2). The quantification for the fraction of LFG required to be collected and controlled in the baseline scenario remains the same.

RCE concludes that the Project's regulatory surplus and the validity of the original baseline scenario was demonstrated.

3.3.6 Quantification of GHG Emission Reductions and Removals

RCE assessed the methods to calculate emission reductions including baseline emissions and project emissions presented in the PD. RCE confirmed the equations and parameters are consistent with the ACM0001 Methodology and associated methodology tools, except as noted as deviations in Section 3.3.7 below.

Baseline emissions are quantified by subtracting the amount of methane that was required to be collected and controlled in the baseline from the methane collected and flared or used for electricity generation the engines in the Project activity and multiplying it by the fraction of methane not oxidized by soil bacteria and the global warming potential of methane.

The amount of methane in the LFG which is flared or used for electricity generation in the engines is based on the CDM Tool 08 to determine methane destroyed in the baseline. Methane is only considered to be destroyed when operation of the destruction device is recorded: operation of the engines is demonstrated by electricity generation and operation of the flares is demonstrated by flare temperature greater than 500°F. Mass flow of methane is determined by measuring the flow of the LFG on a volumetric wet basis using Option C in CDM Tool 08 and multiplying it by the volumetric fraction of methane in the LFG and the density of methane. The volumetric flow is corrected to standard conditions (68°F and 1 atm) based on the conditions of each flow meter. This deviation is described in more detail below in Section 3.3.7.

The amount of methane flared is determined by subtracting project emissions from flaring of the gas divided by the GWP of methane from the amount of methane sent to the flare. Project emissions from flaring are determined by applying the CDM Tool 06 and are the product of the GWP of methane multiplied by the mass flow of methane which is determined by multiplying by one minus the flare efficiency of 96%. This deviation is described in more detail below in Section 3.3.7.

The amount of methane that was required to be collected and controlled in the baseline is determined by applying Case 4 (requirement to destroy methane exists and LFG capture system exists) from the ACM0001 Methodology Table 3 as found in Equation 16. Case 4 requires the application of the larger of a Case 2 and Case 3 pre-project baseline scenario. Case 2 cannot be applied because the amount of methane required to be destroyed is not numerically defined by the regulations and/or permits, and thus the Project uses Case 3 and Equation 14 to determine the amount.

The amount of methane in the LFG which is captured and destroyed in the year prior to the Project implementation is determined using the data from one historic year (2006) prior to the start date of the Project, 3,889 tCH₄. This volume was validated for the initial crediting period of the Project. This amount is divided by the total amount of methane generated by the entire landfill in 2006 (calculated using the first-order decay model in the CDM Tool 04 Methodological Tool to determine methane emissions avoided from dumping waste at a solid

waste disposal site, 12,130 tCH₄). This volume was also validated for the initial crediting period of the Project. This results in 32.1% as the fraction of LFG that was recovered in the year prior to the implementation of the project activity; it is assumed that this will be the same fraction recovered under the project activity. This fraction has been updated for this crediting period renewal to reflect that 3,889 tCH₄ was collected and flared to comply with the requirements to collect and control NMOCs and LFG. Previously, 50% of that amount was used in the calculations, which was based on applying a default destruction efficiency of 50% to the LFG destroyed by the baseline flare.

Project emissions include emissions from consumption of electricity due to the Project activity and emissions from consumption of fossil fuels due to the Project activity. Project emissions from electricity consumption are determined using the CDM Tool 05 and are the product of the annual electricity consumption multiplied by the grid emission factor and the transmission and distribution line losses. The Project uses the U.S. EPA's eGRID emission factor, as described in more detail below in Section 3.3.7.

Project emissions from fossil fuel combustion are determined using the CDM Tool 03 and are the product of the quantity of fuel used multiplied by the emission coefficient of the fossil fuel. The Project uses small quantities of both propane and uses 2006 IPCC Guidelines default emission factors for CO₂ emissions as a deviation to determining emissions coefficients using the tool, as described below in Section 3.3.7.

As no leakage emissions are required to be quantified with ACM0001, GHG emission reductions are determined by subtracting project emissions from baseline emissions. RCE reviewed all ex-ante emission reduction estimates and confirmed the estimates to be in accordance with the ACM0001 Methodology and applicable CDM quantification tools.

3.3.7 Methodology Deviations

RCE assessed and approved four methodology deviations as described below:

1. Destruction efficiency: The Project uses a flare destruction efficiency of 96% for the Project flares instead of 50% as stated in the CDM Tool 06 Section 6.2. The 96% efficiency is used widely for offset projects in the U.S. and is included in other protocols and methodologies including those under the Climate Action Reserve's voluntary offsets program and the California Air Resources Board's compliance offset program. The Project limits claiming of emission reductions to times when the operability of the flare can be demonstrated by a flare thermocouple temperature reading of at least 500°F. RCE approved this methodology deviation because it more accurately reflects the amount of methane destroyed. This methodology deviation was approved throughout the Project's initial crediting period as well.
2. Use of the eGRID emission factor for Project emissions from consumption of electricity: The Project uses the most recent U.S. EPA eGRID emission factor for the relevant

eGRID subregion to calculate project emissions from the consumption of electricity rather than using methods described in CDM Tool 05. The eGRID emission factors are updated regularly and are widely used to calculate GHG emissions from electricity in the U.S. RCE approved this methodology deviation because it more accurately reflects the emissions from consumption of electricity.

3. Use of IPCC default CO₂ emission factors for fossil fuels: The Project uses emission factors from the 2006 IPCC Guidelines for National Greenhouse Gas Inventories rather than using CDM Tool 03 to determine emissions coefficients. IPCC emission factors are widely accepted and used to calculate GHG emissions. RCE approved this methodology deviation because it does not negatively impact the conservativeness of the quantification of GHG emission reductions.
4. Use of a standard temperature of 68°F: The Project uses a standard temperature of 68°F rather than the ACM0001 Methodology and methodological tools prescribed standard temperature of 32°F. Use of 68°F is more common at U.S. landfills, and in the U.S. gas industry in general, and assists the Project in maintaining consistency with industry standards while providing a more conservative methane correction. The Project corrects meter data to this standard temperature, when necessary, from any individual meter conditions that are not set to 68°F. RCE approved this methodology deviation because it does not negatively impact the conservativeness of the quantification of GHG emission reductions.

RCE confirmed that these deviations are applied only to Project monitoring and measurement approaches, do not negatively impact the conservativeness of the Project's GHG emission reductions, and result in improved accuracy overall. RCE concludes the deviations are valid.

3.3.8 Monitoring Plan

The PD includes all parameters required for monitoring according to ACM0001 and all associated CDM methodological tools. The Project's actively monitored variables include landfill gas flow to the engines and flares, methane content of the landfill gas, engine operating hours, flare temperature, and quantity of waste disposed at the landfill. Landfill gas flow is continuously measured with four flow meters coupled with transmitters during the crediting period: two Rosemount 3051 transmitters for flow to the engines and flare #2, one Rosemount 3095 transmitter for flow to flare #1, and one Sage thermal mass flow meter for flow to flare #4. Flare #4 was installed in 2021 to replace flare #2, and the flare #2 flow meter was removed from the Project with the flare. Methane concentration in LFG sent to the flares is measured by Siemens Ultramat 23 continuous gas analyzers and methane concentration in LFG sent to the engines is measured weekly by handheld analyzers, either an Elkins Earthworks Envision or a Landtec GEM5000.

Continuously monitored parameters—LFG flow, methane concentration, and flare thermocouple temperatures—are recorded to flash memory cards on the data recorders and are also backed up wirelessly to an online SCADA system.

Cumulative engine operating hours are recorded daily, and flare operation is monitored continuously using flare thermocouples. Waste disposed at the landfill is measured via scale readings which are submitted annually to the Illinois EPA. Annual values for the Project are obtained from annual reports.

The Project's monitoring plan includes information on monitoring roles and responsibilities, instrument calibration and maintenance requirements, facility operations information, data acquisition, data compilation, quality assurance and quality control processes and recordkeeping. RCE confirmed the Project monitoring plan adheres to all monitoring components of ACM0001 (and all associated methodology tools) and meets the monitoring plan requirements of the VCS Program.

3.4 Non-Permanence Risk Analysis

N/A for this project type.

4 VALIDATION CONCLUSION

Ruby Canyon Environmental validated the Project's renewal crediting period against the requirements of Version 4.1 of the VCS Standard and the CDM ACM0001 Methodology Flaring or use of landfill gas v19.0 and all associated CDM tools. Through a review of the PD (dated 18 January 2022), review of supporting information and documentation, and responses to any requests for corrective action, additional documentation, and clarification, RCE concludes that the Project meets all relevant VCS Program criteria, the Project's original baseline remains valid, and that the emission reductions attributable to the Project activity are additional to any emission reductions that would occur in the absence of the Project.

By destroying LFG in the flares and engines, the Project activity will result in a reduction of GHG emissions that is relevant, complete, consistent, accurate, transparent, and conservative.

3Degrees estimated the ex-ante emission reductions over the 10-year renewal crediting period from 1 July 2019 to 30 June 2029 to be 1,062,411 tCO₂e, resulting in an average of 106,241 tCO₂e annually. Based on the information provided, RCE concludes the Project is likely to achieve the estimated GHG emission reductions should the assumptions and operational conditions remain the same.

Lead Validator Signature

A handwritten signature in black ink that reads 'Nina Pinette' in a cursive script.

Nina Pinette
Senior Environmental Scientist

Independent Reviewer Signature

A handwritten signature in black ink that reads 'Michael M. Coté' in a cursive script.

Michael Coté
President

APPENDIX A: DOCUMENTS REVIEWED

Documents Reviewed during validation:

1. Ownership documents
2. Landfill and project permits
3. Pre-project LFG destruction
4. Equipment manuals and manufacturer calibration requirements
5. Monitoring and metering equipment standard conditions
6. Regulatory surplus summary
7. Initial crediting period PD
8. Initial crediting period validation report
9. Ex-ante emission reduction calculations

APPENDIX B: LIST OF FINDINGS

Action Item	Resolution
Corrective Action Requests	
1. Update the Project Description: a. Appropriately reflect other entities involved in the project - is WVPA name accurate? During the site visit it was indicated that the name may have changed recently. Both Wabash Valley Power Authority and Wabash Valley Power Association are used in the PD. - Per the Title V Permit, the landfill owner is Clinton Landfill, Inc. - Is there an additional project operator party that should be included? b. Update monitoring/metering equipment details throughout the PD - Flow meter model numbers (Rosemount model 3051 observed for the engines and 3095 for the flare). - Also include whether the factory calibration recommendations for the 3051 and 3095 models are both 5 years - Flare 4 information, if available (or remove inaccurate information) c. Section 5.1 - GWP_{CH4}: the current version of the standard requires use of AR4 GWPs - EF_{EL,j,y}: there is a more recent version of eGRID (2019) available - Op_{i,h}: is included only for “operating hours of the energy plant” but not the flare. The methodology identifies this parameter as “Operation of the equipment that consumes the LFG” and it is noted elsewhere in the PD that this is a monitored parameter. d. Section 5.3 - The instructions in the PD template specify to include details on the following: “The procedures for handling non-conformances with the validated monitoring plan.”	a. 11 May 2021: 3Degrees clarified in the PD that WVPA is Wabash Valley Power Associations, Inc. dba Wabash Valley Alliance and updated the landfill owner to "Clinton Landfill, Inc. (owned by Peoria Disposal Company – now GFL Environmental)". There are no other parties involved. b. 11 May 2021: Monitoring/metering equipment details were updated in the PD. There is a note about missing reference conditions on pg. 47. 9 August 2021: 3Degrees added reference conditions for the instruments that were missing. c. 11 May 2021: Since issuance of the finding, VCS Standard has been updated to include AR5 values. eGRID EF was updated to the latest factor (eGRID2019). There is still a reference to eGRID2018 in Section 3.6 (recommend that this be updated for consistency). Operating hours (thermocouple temperature) for the flare should be included as a monitored parameter in Section 5.1. 9 August 2021 The reference to eGRID was updated to the 2019 version. Operating hours of the flare was added as a parameter. d. 11 May 2021: Section 5.3 was updated
2. Revise the calculation method for the parameter FCH4,BL,x-1 (the amount of methane in the LFG which is captured and destroyed in the year prior to the Project implementation (tCH4/yr)) to reflect the amount of methane that was required to be collected and controlled/flared.	9 August 2021: 3Degrees appropriately revised the calculations.
3. Make any relevant revisions or additions to the PD to reflect the demonstration of regulatory surplus from the document provided via email on 4 August 2021.	9 August 2021: 3Degrees provided a revised PD.

Additional Documentation Requests	
1. Provide evidence of standard conditions for the LFG flow meters (e.g. factory calibration certificates or similar). PD states “60°F and 14.696psi at the engine and 60°F and 14.731 psi at the flares”	11 May 2021: 3Degrees provided evidence for the engine flow meter and the flare 1 flow meter. Waiting on Flare 2 and Flare 4. 9 August 2021: Sage calibration certificate was previously provided for Flare 4. Flare 2 has a Rosemount 3051 and which is the same as the meter for the engine; the standard conditions are the same as the engine meter. The standard conditions are identified in the revised version of the PD.
2. Provide photos of the engines.	1 April 2021: Following the virtual site visit, site personnel provided engine photos.
3. Provide documentation that WVPA owns rights to the LFG/environmental attributes associated with the destruction of LFG from the Clinton Landfill for the crediting period.	11 May 2021: 3Degrees explained that the Verified Emission Reduction Purchase Agreement between 3Degrees and WVPA states “WVPA is the owner of a landfill gas to energy project located at Clinton Landfill... and owns all of the environmental attributes associated with the destruction of the methane being collected from the landfill”.
4. Provide ownership evidence to demonstrate that 3Degrees meets the requirements for a project proponent. Project and jurisdictional proponents shall demonstrate that they have the legal right to control and operate project or program activities (Section 3.6 VCS Standard 4.0). Under the VCS Program, a project is only eligible where the project proponent can demonstrate project ownership. Project ownership is the legal right to control and operate the project activities. (Validation and Verification Manual v3.2, section 3.2.1)	27 April 2021: Verra provided clarification (for another project with a similar situation) that if 3Degrees “can demonstrate that the operators of the project have given you ownership of the emission reductions, that is sufficient to demonstrate project ownership and the right to be the project proponent.” 3Degrees’ contract with WVPA applies to all VERs generated 1/1/2018 – 12/31/2020 and shall expire when the parties have completed all obligations in respect to VERs generated through 12/31/2020. Is there an update to the contract which would be relevant to this renewal crediting period, 7/1/2019 – 6/30/2029? 11 May 2021: 3Degrees explained that it is in the process of renewing the contract. The existing contract covers vintages 2019 and 2020.
5. Provide evidence that there have been no changes to LFG collection and flaring requirements since installation of the baseline flare per 40 CFR §60.752/NMOC requirements. Additionally, provide: a. The original plan to comply with NMOC requirements. b. The plan referenced in the Title V permit, approved collection and control system design plan, dated April 15, 2017 or subsequent design plan. c. The most recent annual report detailing the performance metrics and monitoring criteria for NSPS/NMOC requirements.	11 May 2021: 3Degrees referenced the already provided Title V Permit and most recent GCCS plan and compliance certification.

6. Provide the landfill's approved collection and control system design plan, dated 15 April 2017 (referenced in the Title V Permit) and any updates, if applicable.	11 May 2021: 3Degrees referenced the most recent GCCS plan already provided.
7. Provide permits referenced in the PD and not provided as attachments--IEPA Bureau of Land permit No. 1996102-LF (expired permit provided).	5 May 2021: Permits provided.
Clarification Requests	
1. In Section 5.2 of the PD, the table for the parameter $v_{CH_4,t,wb}$ for Calculation Method specifies: "For handheld measurements, we take the 95% lower confidence interval of all methane measurements taken during the reporting period, in accordance with ACM0001." Clarify where this requirement is in the Methodology and/or revise the language in the PD.	11 May 2021: 3Degrees removed this language from the PD.
2. For the data/parameter TDLj,y clarify the source of data and provide additional detail. Also clarify whether the value applied is up-to-date.	16 August 2021: 3Degrees revised the PD to update the TDLj,y value and to provide a specific source (eGRID2019, to be updated when newer versions are released).