FULTON COUNTY MUD ROAD LANDFILL CARBON OFFSET PROJECT

Document Prepared by Fulton County Department of Solid Waste and Barton & Loguidice, D.P.C.

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CONTENTS

1 PROJECT DETAILS

1.1 Summary Description of the Project

The Fulton County Mud Road Sanitary Landfill is located in the Town of Johnstown is an active permitted municipal solid waste (MSW) landfill that began accepting waste in 1989. The landfill consists of 10 constructed landfill cells, and it has additional capacity not yet constructed of approximately 6.0 million cubic yards.

In 2007, major upgrades and expansions to the existing landfill gas collection system were undertaken in order to produce enough landfill gas of sufficient quality for sale to a landfill gas to energy (LFGTE) plant. The County's energy partner, IES, began construction of the landfill gas to energy plant in July 2009 and began operating the plant in June 2010. The LFGTE plant combusts all of the landfill gas collected.

The project consists of the expansion and the improvement of the landfill gas collection system and the construction of a LFGTE plant to destroy the landfill gas. The project achieves greenhouse gas emissions reductions through the collection and destruction of methane from the landfill, which converts the methane to carbon dioxide and prevents the methane from being vented to the atmosphere. Collected landfill gas methane is combusted in two (2) internal combustion engines that are used to generate electricity.

The estimated annual average GHG emission reductions and removals is approximately 71,389 tCO2e, and the total over the 10-year crediting period is estimated to be approximately 713,892 tCO2e.

1.2 Sectoral Scope and Project Type

The project is a landfill gas collection and combustion project, which falls under the Clean Development Mechanism Sectoral Scope 13 – Waste Handling and Disposal. This is an individual project, not a grouped project.

1.3 Project Eligibility

The project is voluntary and reduces greenhouse gases as established in the Kyoto Protocol. It is supported by ACM0001, "Large-Scale Consolidated Methodology: Flaring or use of landfill gas, Version 19.0," a methodology approved under the Verified Carbon Standard program. Additionally, the program does not fall under one of the excluded project activities identified in the VCS Standard, Version 4.1. Therefore, the project is eligible under the VCS Program as it meets all of the requirements set out in Section 3.1 of the VCS Standard, Version 4.1.

1.4 Project Design

The project has been designed to include a single installation of an activity.

Eligibility Criteria

This is not a group project so this section is not relevant.

1.5 Project Proponent

Organization name	Fulton County Department of Solid Waste
Contact person	David Rhodes
Title	Director
Address	847 Mud Road, P.O. Box 28, Johnstown, NY 12095
Telephone	(518) 736-5501
Email	drhodes@fultoncountyny.gov

1.6 Other Entities Involved in the Project

Organization name	Archaea Energy (formerly Innovative Energy Systems, also formerly Aria Energy)
Contact person	Emily Zambuto
Title	Manager of Environmental Programs
Address	2999 Judge Road, Oakfield, NY 13125
Telephone	(585) 948-4616
Email	ezambuto@archaea.energy

Organization name	Environmental Attribute Advisors, LLC
Role in the project	Provides technical and strategic support for project development
Contact person	Denise Farrell
Title	President

Address	1095 Bridge Point Lane, Yorktown, NY 10598
Telephone	(917) 621-7165
Email	dfarrell@enviadvi.com

1.7 Ownership

Fulton County has exclusive ownership of the landfill and exclusively owns and operates the landfill gas collection system. The County has a sales agreement with Archaea Energy (formerly IES, also formerly Aria Energy) (Innovative/Fulton, LLC) in which the County retains the right of ownership, and therefore, the right of use, to the carbon offset credits generated from the combustion of landfill gas. Additionally, Archaea Energy has the right of use over emission reductions. Archaea Energy retains no ownership rights to the carbon offset credits. Relevant portions of the gas agreement between Fulton County and Innovative/Fulton, LLC will be provided during the validation.

1.8 Project Start Date

The project crediting period start date was June 4, 2010 as this was the first day that the LFGTE was operational for testing. The first full day of operation was June 5, 2010.

1.9 Project Crediting Period

The project completed a 10-year crediting period between June 4, 2010 and June 3, 2020. The project requests a renewal for another 10-year crediting period, with a range of June 4, 2020 – June 3, 2030.

1.10 Project Scale and Estimated GHG Emission Reductions or Removals

Project Scale	
Project	X
Large project	

Year	Estimated GHG emission reductions or removals (tCO_2e)
2020 (June 4, 2020 – December 31, 2020)	36,791.51
2021	65,423.34
2022	67,235.71
2023	68,913.76
2024	70,660.51
2025	71,906.00
2026	73,237.94
2027	74,471.16
2028	75,820.15
2029	76,670.21
2030 (January 1, 2030 – June 3, 2030)	32,761.52
Total estimated ERs	713,891.81
Total number of crediting years	10
Average annual ERs	71,389.18

The expected lifetime of the project is at least twenty years, dependent on the renewal of the operating contract. If the LFGTE plant was no longer operated, the landfill gas collection system would continue to operate with the flare. All improvements to the landfill gas collection system made to enable the LFGTE Plant to come online would be maintained.

1.11 Description of the Project Activity

The project consists of the expansion and the improvement of the landfill gas collection system and the construction of a LFGTE plant to destroy the landfill gas. The project achieves greenhouse gas emissions reductions through the collection and destruction of methane from the landfill, which converts the methane to carbon dioxide and prevents the methane from being vented to the atmosphere. Carbon dioxide from the landfill not collected by the landfill gas collection system are considered biogenic and would happen in the absence of the project.

The expansion and improvement of the landfill gas collection system was motivated by the need for additional, higher quality gas for the LFGTE plant and would not have occurred under the voluntary collection and flaring of the landfill gas in the baseline scenario. The project was implemented in two phases.

The first phase occurred from 2007 – 2009. In 2007, materials to expand the landfill gas collection system were purchased and the Board of Supervisors of Fulton County approved money to develop a carbon project. In 2008, the County signed the gas sales agreement and land lease agreement with IES and began construction on the landfill gas collection system upgrades and expansions. During this phase, the following project activities were conducted:

Installation of new vertical landfill gas extraction wells

Installation of new horizontal collection piping

Purchase of additional monitoring equipment, such as a new flow meter and gas analyzer

Installation of air-operated dewatering pumps for gas pumps

Installation of stainless steel deminster tank for gas flare

The second phase consisted of the construction and start-up of the LFGTE plant. In July 2009, construction began on the LFGTE plant, and it became fully operational in June 2010. The following activities were conducted during this phase:

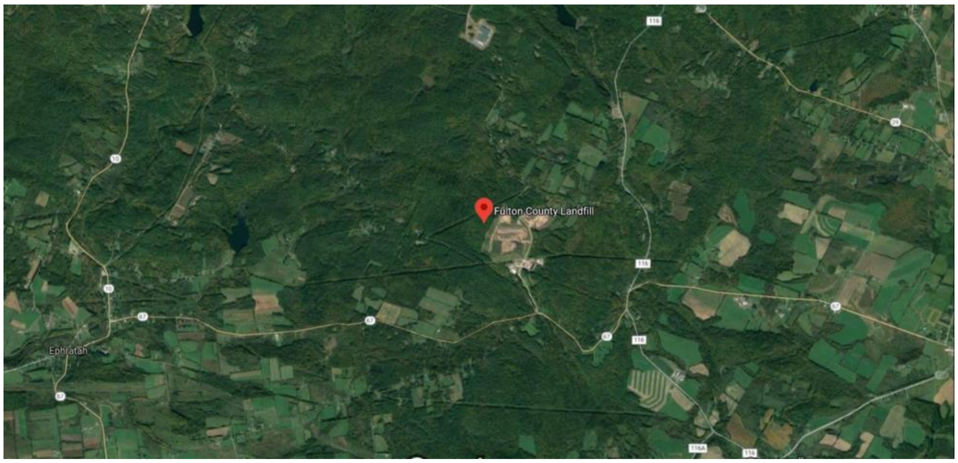
- Installation of two (2) Caterpillar G3520 internal combustion (IC) engine-generator sets, including flow meters
- Installation of landfill gas treatment equipment, including gas dewatering, filtration, and compression equipment
- Installation of a Siemens Ultramat 23 Gas Analyzer
- Installation of a Supervisory Control and Data Acquisition System (SCADA)
- Purchase of a Landtec GEM 2000
- Installation of connecting piping from the landfill to the LFGTE plant
- Installation of electrical equipment to connect the plant to the grid

In August 2012, two (2) new Thermal Instrument flow meters were installed in the LFGTE plant to provide improved data regarding landfill gas flow to the engines. No replacement flow meters have been installed.

The project destroys landfill gas through its combustion in the LFGTE Plant, and on rare occasions, through its combustion in a flare. No emission reductions are being claimed for landfill gas destroyed in the flare.

1.12 Project Location

The project is located at 847 Mud Road, Johnstown, New York in Fulton County. All project lands are owned by Fulton County. The map below shows the location in a local view. The GPS coordinates for the site are 43°00' 38.00" N and 74° 28' 22.44 "W.



Source: Imagery ©2021 Google (Google Maps)

1.13 Conditions Prior to Project Initiation

The landfill first accepted waste in 1989. In 1995, Fulton County installed five (5) passive candlestick flares around the perimeter of the landfill. No regulatory or other mandatory drives required the County to install these flares. The County installed them because it was concerned about the quantity of wet waste being received (46% of the total waste) and the potential resulting odor issues that might affect nearby residences.

In 1996 and 1997, the County oversaw the design and installation of a landfill gas collection system, including vertical and horizontal wells, a blower, and a central flare. The passive flares were removed. This work was voluntarily done to improve the odor control, although there were still neither a regulatory requirements nor complaints. System expansions occurred as necessary along with regular maintenance until 2007, when the project was planned.

Immediately prior to the project being installed, the landfill gas collection and destruction system included a central candlestick flare unit, a Hauck blower, and extensive monitoring equipment. A Dwyer DH3 Digihelic flow meter was used along with a NOVA continuous gas analyzer. A Landtec GEM 2000 or 500 was used periodically to verify the gas data. A SCADA system was used to record flow data. At times when the SCADA system was not operating properly, weekly flow measurement records were maintained. When the SCADA system was installed, it was expected to be a real-time monitoring tool only, and the necessary software and hardware components to download or export data was not purchased. As a result, no data from the SCAD system is available for historic flows. This SCADA system is no longer installed at the site and is discussed only to document why periodic weekly measurements are used to establish baseline flows rather than continuous monitoring.

Because the landfill and the methane it generates would exist with or without the project and the project itself generates no new greenhouse gas emissions, the project was clearly not implemented to generate GHG emissions for the purpose of their subsequent reduction, removal, or destruction.

1.14 Compliance with Laws, Statutes and Other Regulatory Frameworks

The project is in compliance with all applicable local, state and federal regulations. The landfill and the project are subject to three different permits but are not required to collect and destroy landfill gas as a condition of any of the permits or under any other local, State, or Federal regulations.

The landfill operates under a solid waste management facility permit issued by the New York Department of Environmental Conservation which it is required to have as an operating landfill. The landfill has DEC Permit #5-1728-00005/00003 and is in compliance with all requirements thereof. The landfill has never been subject to fines or had serious violations under its permit.

The landfill began accepting waste in 1989. In 2003, following an expansion, the facility exceeded the 2.5 million megagrams maximum design capacity threshold of the 1990 Clean Act Amendments New Source Performance Standards (NSPS), as specified in 40 CFR Part 60 Subpart WWW – Standards of Performance for Municipal Solid Waste Landfills. As a result, the landfill applied for and was issued a Title V permit, which became active on July 13, 2004 (DEC Permit #5-1728-00005/00006). As part of the requirements of this permit, the landfill must submit non-methane organic compound (NMOC) emissions testing results and calculations to the US Environmental Protection Agency (USEPA) every five years.

Following the September 2019 modification of 6 NYCRR Part 208 to incorporate EPA Emission Guideline for MSW Landfills 40 CFR Subpart Cf, the facility became subject to the revised NMOC regulatory threshold of 34 Mg/yr, while previously, per 40 CFR 60 Subpart WWW, the threshold was 50 Mg/yr.

The latest submission regarding the NMOC calculations occurred on January 30, 2021 based on Tier 2 testing conducted in 2016 to determine site-specific factors for the LANDGEM model and using current waste quantity data. Additional testing will occur in 2021 to update the site-specific factors as required by regulation every five years. Based on current waste-in-place and the site-specific NMOC concentration, the emission rate of NMOC is 9.38 Mg/year, which is less than the regulatory threshold of 50 Mg/year (34 Mg/year as per 40 CFR Subpart Cf and 6 NYCRR Part 208) that trigger the requirement to collect and destroy the landfill gas.

The facility will continue to comply with its Title V permit and calculate the NMOC emission rate on an annual basis for submission to NYSDEC and USEPA. If during the crediting period, the NMOC levels exceed the regulatory threshold and the landfill is required to install a landfill gas collection and destruction system, the project will only claim credits up to the date that the collection system must be operational.

The LFGTE plant operates under an air permit it obtained prior to becoming operational. The air permit is DEC Permit # 5-1728-00122/00003. This permit is managed by Archaea Energy as the operators of the LFGTE plant.

All data, calibrations, reports, and permits related to facility compliance are maintained on-site for five (5) years in accordance with the facilities' permits. The facility also maintains records for at least two (2) years after the end of the project crediting period.

1.15 Participation under Other GHG Programs

1.15.1 Projects Registered (or seeking registration) under Other GHG Program(s)

The project has not and does not plan to register with any other GHG program. The project does not and will not be required to participate in RGGI.

1.15.2 Projects Rejected by Other GHG Programs

The project has not applied to nor been rejected by any other GHG Program.

1.16 Other Forms of Credit

1.16.1 Emissions Trading Programs and Other Binding Limits

The project is neither participating in, nor required to participate in, any compliance emissions trading scheme and is not located in a jurisdiction with binding greenhouse gas emissions limits. This project does not fall under the umbrella of the Regional Greenhouse Gas Initiative program either as a regulated emitter or a credit provider.

1.16.2 Other Forms of Environmental Credit

This project has not created another form of environmental credits. The project is claiming carbon credits only for the destruction of landfill methane which would have been released to the atmosphere. The project is not claiming credits or any environmental attributes associated with the electricity produced from the landfill methane which displaces fossil fuel generated grid electricity. These potential carbon credits are owned by Fulton County's energy partner, Archaea Energy, who may choose to obtain Renewable Energy Credits (REC's) instead of the carbon credits.

1.17 Additional Information Relevant to the Project

Leakage Management

The project does not require a leakage management plan per ACM0001.

Commercially Sensitive Information

The following information is commercially sensitive and is not included in the PDD but will be provided to the validator and verifier as required:

- Gas sales agreement between Fulton County and Archaea Energy (Innovative/Fulton)
- Data relating to the financial investment in the project.

Sustainable Development

The project does not have any nationally stated sustainable development priorities.

Further Information

The PDD contains all necessary information in other sections.

2 SAFEGUARDS

2.1 No Net Harm

There are no known negative environmental or socio-economic impacts from this project.

2.2 Local Stakeholder Consultation

The project stakeholders are Fulton County, Archaea Energy and Environmental Attribute Advisors LLC. There is no other investment group or public groups involved in the project; therefore, no formal stakeholder consultations are required. However, because Fulton County is a public entity, County Board meetings, were matters relating to the project and updates are discussed, are open to the public and meeting notices and times are announced publicly. No comments regarding this project were received during the verification period.

2.3 Environmental Impact

No environmental impact assessment was required for this project. The installation and operation of a landfill gas collection and gas to energy system has a positive environmental benefit through the net reduction of greenhouse gases.

2.4 Public Comments

Because Fulton County is a public entity, County Board meetings, where matters relating to the project and updates are discussed, are open to the public and meeting notices and times are announced publicly. Meeting minutes are available upon request. No comments regarding this project have been received.

2.5 AFOLU-Specific Safeguards

This section does not apply.

3 APPLICATION OF METHODOLOGY

3.1 Title and Reference of Methodology

Approved consolidated baseline methodology ACM0001, Version 19.0, "Large-scale Consolidated Methodology: Flaring or Use of Landfill Gas."

The tools applied by the Project are:

Tool 3: "Tool to calculate project or leakage CO2 emissions from fossil fuel combustion" (Version 3.0)

Tool 5: "Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation" (Version 3.0)

Tool 8: "Tool to determine the mass flow of a greenhouse gas in a gaseous stream" (Version 3.0)

Tool 11: "Assessment of the validity of the original/current baseline and update of the baseline at the renewal of the crediting period" (Version 3.0.1)

3.2 Applicability of Methodology

The applicability criteria for ACM0001 require that:

- The project involves:
    a. Installing a new gas capture system in an existing or new (Greenfield) SWDS;
    b. Making an investment into an existing LFG capture system to increase recovery rate or change the use of the captured LFG, provided that:
        i. Captured gas was vented or flared and not used before implementing the project activity;
        ii. In the case of an existing active LFG capture system for which the amount of gas cannot be collected separately from the project system after it is implemented, historical data on the amount of LFG captured and flared is available;
    c. Flaring the LFG and/or use the captured LFG in any combination of the following ways:
        i. Generating electricity;
        ii. Generating heat; and/or
        iii. Supplying gas to customers through a natural gas distribution network;

iv. Supplying compressed/liquefied gas to customers using trucks;

v. Supplying the gas to customers through a dedicated pipeline

d. Not reducing the amount of organic waste that would be recycled in the absence of the project activity; and

- The baseline scenario is defined as:

a. Atmospheric release of landfill gas or flaring of captured gas;

b. Using captured gas to produce electricity; and / or

c. Use of captured gas to generate heat within the project boundary;

d. Use of captured gas to supply consumers through the natural gas distribution network;

e. For Greenfield SWDS, atmospheric release of the gas or flaring in a managed SWDS.

The proposed project activity is the use of captured gas to produce energy, meeting conditions (b)(i), (b)(ii), and (c)(i) for the project, and does not cause or result in the reduction of the amount of organic waste being recycled / disposed in the landfill, meeting condition (d). The County operates a composting program for organic waste. In addition, the County is required by the New York Food Donation and Food Scraps Recycling Law to take all reasonable precautions to not accept separated food scraps from "Designated Food Scraps Generators" for landfilling, which consist of select large quantity generators of food scraps. Also, the baseline scenario definition meets condition (b), using captured gas to produce electricity. Therefore, this methodology and the baseline scenario are applicable.

3.3 Project Boundary

Source		Gas	Included?	Justification/Explanation
Baseline	Emissions from decomposition of waste at the SWDS site	CO_2	No	CO2 emissions from the decomposition of organic waste are not accounted.
		CH_4	Yes	The major source of emissions in the baseline.
		N_2O	No	This is excluded because the emissions are very small compared to the methane. This is conservative.
	Emissions from electricity generation	CO_2	No	
		CH_4	No	

Source		Gas	Included?	Justification/Explanation
		N_2O	No	The project is not claiming emissions reductions from the generation of grid electricity, so these are not included.
	Emissions from heat generation	CO_2	No	The project does not include the generation of heat, so these are not included.
		CH_4	No	
		N_2O	No	
	Emissions from the use of natural gas	CO_2	No	The project does not include a natural gas distribution network for off-site distribution, so these are not included.
		CH_4	No	
		N_2O	No	
Project	Emissions from fossil fuel consumption for purposes other than electricity generation or transportation due to the project activity	CO_2	Yes	This may be an important emissions source.
		CH_4	No	This emissions source is expected to be very small and is excluded for simplicity.
		N_2O	No	This emissions source is expected to be very small and is excluded for simplicity.
	Electricity consumed from the grid	CO_2	Yes	This may be an important emissions source.
		CH_4	No	This emissions source is expected to be very small and is excluded for simplicity.
		N_2O	No	This emissions source is expected to be very small and is excluded for simplicity.
	Emissions from flaring	CO_2	No	The project is does not include flaring, so these are not included.
		CH_4	No	
		N_2O	No	
	Emissions from distribution of LFG using trucks and dedicated pipelines	CO_2	No	The project does not include a natural gas distribution network for off-site distribution, so these are not included.
		CH_4	No	
		N_2O	No	

The boundaries of the project include the landfill, the landfill gas collection system, the associated support equipment, and the LFGTE facility to the extent that it serves as the destruction device. The boundaries of this project have been drawn to exclude the electricity produced by the gas to energy facility. The project boundary also does not include the flare because no credits will be claimed for methane destroyed in the flare. A process flow diagram is included as Appendix A. A project boundary map can be found in Appendix B.

The project is not including the pre-project emissions sources of fossil fuels consumed, electricity consumed and emissions from incomplete combustion at the flare. This is conservative because using the ACM0001 formulas, including these emissions sources would reduce the calculated amount of methane destroyed pre-project and therefore increase the total amount of credits generated by the project. It is instead assumed that 100% of the landfill gas sent to the flare pre-project was destroyed.

3.4 Baseline Scenario

Assessment of Original Baseline Validity for Renewal

This PDD outlines the Project's 10-year crediting period renewal. Therefore, the validity of the original baseline shall be assessed in accordance with Section 3.8.9(2) of the VCS Standard, v4.1 using the "Methodological tool: Assessment of the validity of the original/current baseline and update of the baseline at the renewal of the crediting period, Version 3.0.1."

Step 1: Assess the validity of the current baseline for the next crediting period

Step 1.1: Assess compliance of the current baseline with relevant mandatory national and / or sectoral policies

The current baseline complies with all relevant mandatory national and sectoral policies which have come into effect after submission of the project activity for validation. Refer to Section 1.14 of this PDD for detailed information on the relevant regulations and information as to how the facility meets all stated requirements.

Step 1.2: Assess the impact of circumstances

The baseline scenario is not the continuation of the previous practice, and the conditions used to determine the baseline emissions in the previous crediting period, described in Section 3.5 of the 2012 PDD, are still valid.

Odor Control

In the previous practice scenario, the collected landfill gas is sent to the flare for odor control. The alternatives to the project, as discussed in Section 3.5 of the 2012 PDD, are still valid. Flaring landfill gas is still a standard practice at landfills. According to the 2020 Annual Certification Report and NMOC Emission Rate Letter Report, the landfill remains under the regulatory thresholds for NMOC, and therefore is still not required to have a landfill gas collection system nor is it required to destroy the gas. The landfill voluntarily expands the landfill gas collection system to improve air quality and for odor control. The offset revenue from the project determine if the gas is sent to the engines or the flare.

The circumstances regarding the potential to vent the landfill gas without collecting the gas in the landfill gas collection system or install an alternative power plant should there be interest in maintaining the electricity generation aspect of the project are still valid. Historical actions by the County to install and expand the landfill's landfill gas collection and control system and destroy the landfill gas for odor control make venting an unlikely choice. Installing an alternative power plant that does not rely on landfill gas but other fuels such as fossil fuel, renewable, or a cogeneration method would both require significant investment and would have to run in conjunction with the flare should the LFGTE facility not be active due to the County's historical desire for odor control.

Financial Investment

While the LFGTE facility and engines are used instead of the flare currently, they need to be maintained regularly, which incurs large expenses. The carbon credits offset revenue assist in paying for this maintenance and associated activities. Without them, running the engines and LFGTE facility would be costly. Thus, the landfill gas would be diverted to the backup flare, which is less expensive to maintain, and the engines would be removed from service.

The project still required a significant initial investment, and without credits obtained from the VCS program, would not likely have occurred from the onset; therefore, it is still additional.

Step 1.3: Assess 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.

The continuation of the current baseline scenario is the most likely scenario for this crediting period. The County currently maintains the existing flare as backup LFG control. The existing baseline flare and flare skid components have fully depreciated and would likely need to be replaced within the next five (5) years for them to be useful through the end of 2030, and a relatively significant investment would be required to purchase the replacements, remove the existing equipment from service and the facility, and install the new equipment. Note that the replacement does not change the functionality or capacity of the flare unless resulting from a newer model of the equipment.

At any time, the County may choose to replace equipment on a regular replacement schedule to maintain reasonable operability of the system. All equipment has a limited life-span, and regular replacement and maintenance are best management practices in the industry. Flare-associated equipment and LFGTE-associated equipment are no exception. Due to the equipment that existed before the project began requiring this replacement and maintenance as needed independent of the existence of the project, it doesn't change any of the baseline alternatives in the original. These best management practices would be employed in the original scenario, and thus, the original baseline. They are not being employed because of the project, rather, because of an operable flare is in the County's best interest for backup LFG control. Therefore, the pre-project baseline LFG destroyed would not be affected due to these replacements being required at the end of the technical lifetime of the equipment. Additionally, because credits are only being claimed for LFG destroyed by the engines and not the flare, this would not change the emission reduction credit generation in the renewed crediting period.

Step 1.4: Assessment of the validity of the data and parameters

The IPCC default value for the GWP, emission factor for electricity generation from the regional grid (NYUP), the energy content of diesel fuel, and weighted average CO2 emission factor of diesel fuel have been updated since the start of the project. These values were monitored during the crediting period and updated accordingly.

All other data and parameters are still valid.

Step 2: Update the current baseline and the data and parameters

Step 2.1: Update the current baseline

The current baseline has been updated with the most updated data and parameters. The original baseline was determined to be valid. Therefore, a full reassessment of the baseline was not undertaken.

Step 2.2: Update the data and parameters

All data and parameters shall be monitored and updated during the crediting period. Refer to Section 5.1 for parameters available at validation that have been updated for the renewed crediting period.

3.5 Additionality

Additionality is determined in accordance with the "Methodological tool: Combined tool to identify the baseline scenario and demonstrate additionality, Version 7.0." However, according to VCS Standard, v4.1 Section 3.8.9(1), a full assessment of additionality is not required when renewing the project crediting period, though a demonstration that the project is still not required by existing regulations is required. The initial project additionality assessment is presented in the 2012 project PDD.

As part of project additionality, regulatory surplus has been reviewed, and the project continues to operate voluntarily without regulatory requirement and meets the requirements of the VCS Program rules. The landfill and the project are subject to three different permits but are not required to collect and destroy landfill gas as a condition of any of the permits or under any other local, State, or Federal regulations. A detailed description of this review is provided in Section 1.14.

3.6 Methodology Deviations

The following methodology deviations will be used when quantifying the Project. These methodology deviations do not negatively impact the conservativeness of the quantification of GHG emission reductions or removals, and these deviations relate only to the criteria and procedures for monitoring or measurement and do not relate to any other part of the methodology.

The Methodology requires an ex-ante estimate of emission reductions by projecting future emissions of the landfill. The project has elected to use the US EPA LandGEM Landfill Gas Emissions model instead of CDM "Methodological tool: Emissions from solid waste disposal sites," Version 8.0 or ACM0001, Version 19.0 Equation 5. The US EPA LandGEM model is a first order decay rate model and is the US industry and regulatory standard for modelling landfill gas generation. This is more accurate for projecting landfill emissions in the future for landfills in the United States and was used in the ex-ante emissions reductions analysis and the landfill gas that would be destroyed in the absence of the project. Historical data from prior years of third party verified monitoring data was used to determine the ex-ante estimate of emission reductions. Therefore, this method is more accurate and does not negatively impact the conservativeness of the quantification of GHG emission reductions or removals.

The project has elected to use the US EPA's eGRID emissions factor to calculate emissions from grid electricity consumption rather than derive a factor or use the default provided in CDM "Methodological tool: Baseline, project, and/or leakage emissions from electricity consumption and monitoring of electricity generation, Version 3.0" as the eGRID factor is more accurate. Therefore, the results would be more accurate and does not negatively impact the conservativeness of the quantification of GHG emission reductions or removals.

The project has elected to use a calculated methane density based on the Airgas Safety Data Sheet (SDS) for Methane for calculating methane flow rather than derive a factor using equations provided in CDM "Methodological tool: Tool to determine the mass flow of a greenhouse gas in a gaseous stream, Version 3.0." The density described in the SDS is at standard temperature and pressure (STP), and since the landfill gas is measured, using a value converted from the SDS density would result in a more conservative methane flow calculation. This would result in emission reductions with equivalent accuracy and does not negatively impact the conservativeness of the quantification of GHG emission reductions or removals.

The project has elected to use the standard reference temperature of 70°F instead of the temperature of 32°F referenced in "Methodological tool: Tool to determine the mass flow of a greenhouse gas in a gaseous stream," v3.0 and ACM0001. This is more accurate than the tool's method because landfill gas temperature is closer to 70°F as it is measured at 60°F. The landfill gas temperature is corrected to a standard temperature of 70°F to match the temperature at which the referenced methane density was determined at, as specified in Section 5.1. This change does not negatively impact the conservativeness of the quantification of GHG emission reductions or removals.

The project has elected to use the engine hours run at the maximum fuel consumption of the model for the emergency generator due to this equipment rarely needing to be filled completely, which causes metering to be unreasonable. This would be instead of meters referenced in the "Methodology Tool: Tool to calculate project or leakage CO2 emissions from fossil fuel consumption," v3.0. This would result in more conservative emission reductions due to using the maximum fuel consumption rate (gal/hr) and the total engine run hours from the engine's non-resettable hour meter. This change does not negatively impact the conservativeness of the quantification of GHG emission reductions or removals.

4 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS

4.1 Baseline Emissions

Determining Baseline Emissions

Baseline emissions are calculated using the following equations.

As described in Section 1.7, no emission reductions are claimed for grid-connected electricity generation that is offset by electricity produced from the landfill gas destructed at the LFGTE facility. Also, no thermal energy is produced using the landfill gas, and the baseline year is 2006. Therefore, the equation for baseline emissions, Equation 1 of ACM0001, is simplified to:

$$BE_y = BE_{CH4,y} \qquad (1)$$

Where:

BE_y = Baseline emission in year y (tCO2e)

$BE_{CH4,y}$ = Baseline emissions of methane from the landfill in year y (tCO2e)

Determination of BE_{CH4}

Baseline emissions from the landfill are determined with the following equation, based on the quantity of methane captured and destroyed in baseline conditions. The effect of methane oxidation present in the baseline and absent in the project is taken into account as Equation 2 of ACM0001:

$$BE_{CH4} = \left[(1 - OX_{top\ layer}) \times F_{CH4,PJ,y} - F_{CH4,BL,y}\right] \times GWP_{CH4} \qquad (2)$$

Where:

$BE_{CH4,y}$ = Baseline emissions of methane from the landfill in year y (tCO2e)

$OX_{top\ layer}$ = Fraction of methane in the LFG that would be oxidized in the top layer of the landfill in the baseline (dimensionless)

$F_{CH4,PJ,y}$ = Amount of methane in the LFG which is flared and/or used to generate electricity in the project activity in year y (tCH_4)

$F_{CH4,BL,y}$ = Amount of methane in the LFG that would be flared in the baseline in year y (tCH_4)

GWP_{CH4} = Global Warming Potential value for methane for the reporting period is 28 (IPCC AR5) (tCO2e / tCH4)

y = Monitoring year

Therefore, Equation 1 becomes:

$$BE_y = BE_{CH4,y} = \left[\left(1 - OX_{top\ layer}\right) \times F_{CH4,PJ,y} - F_{CH4,BL,y}\right] \times GWP_{CH4} \quad (3)$$

Ex-Post Determination of $F_{CH4,PJ,y}$

Methane was not used in boilers, air heaters, glass melting furnaces, kilns, or natural gas distribution networks. Therefore, $F_{CH4,PJ,y}$ is the sum of the quantities of methane flared and used to generate electricity during the reported, simplified from Equation 3 of ACM0001.

$$F_{CH4,PJ,y} = F_{CH4,flared,y} + F_{CH4,EL,y} \quad (4)$$

Where:

$F_{CH4,PJ,y}$ = Amount of methane in the LFG which is flared and/or used to generate electricity in the project activity in year y (tCH_4)

$F_{CH4,flared,y}$ = Amount of methane in the LFG which is destroyed by flaring in year y (tCH4)

$F_{CH4,EL,y}$ = Amount of methane in the LFG which is destroyed by electricity generation in year y (tCH4)

Because in the project, the LFG is only sent to the engines for electricity generation with the flares used as emergency flares only with no emission reductions claimed for them, Equation (4) simplifies to:

$$F_{CH4,PJ,y} = F_{CH4,EL,y} \quad (5)$$

Equation 3 is thus becomes:

$$BE_y = BE_{CH4,y} = \left[\left(1 - OX_{top\ layer}\right) \times F_{CH4,EL,y} - F_{CH4,BL,y}\right] \times GWP_{CH4} \quad (6)$$

Determination of $F_{CH4,EL,y}$

LFG sent to the LFGTE is metered as a volume on a dry basis, and the methane concentration is also measured on a dry basis due to condensate being removed from the LFG prior to it being burned in the engines. This would initially indicate Option A of "Tool to determine the mass flow of a greenhouse gas in a gaseous stream, Version 3.0." As indicated in the tool, though, the gaseous stream would need to be demonstrated as dry as LFG is generally a wet gaseous stream. To do so, either the moisture content would need to be measured and demonstrated as less than or equal to 0.05 kg H2O/m^3 dry gas or the temperature of the gaseous stream would need to be demonstrated as less than 60 degrees C at the flow measure point. Because moisture is not measured, Option C is allowable as per Paragraph 24 of the Tool, which states to assume wet for calculations if no moisture monitoring is conducted. Therefore, Option C of "Tool to determine the mass flow of a greenhouse gas in a gaseous stream, Version 3.0" is used for the flow there as well. Because the project uses the LFGTE each year, the 'y' in the Equation 9 of the tool is retained.

$$F_{CH4,EL,y} = V_{t,wb,n} \times v_{i,t,wb} \times \rho_{i,n} \qquad (7)$$

Where:

$F_{CH4,EL,y}$ = Amount of methane in the LFG which is destroyed by electricity generation (tCH_4)

$V_{t,wb,n}$ = Quantity of landfill gas destroyed by the generation of electricity during the year (m^3)

$v_{i,t,wb}$ = Average methane fraction of the landfill gas as measured during the year and expressed as a fraction (m^3 CH4 / m^3 LFG)

$\rho_{i,n}$ = Methane density (tCH_4/m^3CH_4)

Equation 10 of CDM Tool “Tool to determine the mass flow of a greenhouse gas in a gaseous stream, Version 3.0” is not used to calculate the density of methane. Instead, the accepted STP density of methane is used. In order to use it, the LFG flow must be converted to STP if it is not metered at a standard temperature (70 degrees F.) or standard pressure (1 atm.). Equation 11 of the CDM Tool “Tool to determine the mass flow of a greenhouse gas in a gaseous stream, Version 3.0” converts from measured temperatures and pressures to STP. In the case that both the temperature and pressure recorded by the meters are not at STP, the following equation is used:

$$V_{t,wb,n} = V_{t,wb,measured} \times \left[\left(\frac{T_n}{T_{measured}}\right) \times \left(\frac{P_{measured}}{P_n}\right)\right] \qquad (8)$$

$V_{t,wb,n}$ = Quantity of landfill gas fed to the engines during the year at standard temperature and pressure (m^3)

$V_{t,wb,measured}$ = Quantity of landfill gas fed to the engines during the year as measured (m^3)

T_n = Temperature at standard temperature (R)

$T_{measured}$ = Temperature as measured (R)

$P_{measured}$ = Pressure as measured (atm)

P_n = Pressure at standard pressure (atm)

Because LFG flow is recorded at standard pressure of 1 atm., but at a standard temperature of 60 degrees F, it is simplified to the following:

$$V_{t,wb,n} = V_{t,wb,measured} \times \left(\frac{T_n}{T_{measured}}\right) \qquad (9)$$

Where:

$V_{t,wb,n}$ = Quantity of landfill gas fed to the engines during the year at standard temperature and pressure (m^3)

$V_{t,wb,measured}$ = Quantity of landfill gas fed to the engines during the year as measured (m^3)

T_n = Temperature at standard temperature (R)

$T_{measured}$ = Temperature as measured (R)

The $T_n/T_{measured}$ is referenced as the STP conversion factor, and the equation is used for converting LFG volumetric flow for gas destroyed by the flare and gas destroyed by the engines.

$$F_{CH4,EL,y} = V_{t,wb,n} \times v_{i,t,wb} \times \rho_{i,n} \quad (10)$$

The temperature is converted from degrees Fahrenheit (F) to Rankine (R) prior to being used in Equation 9 by adding 459.67.

Should meters in the future not record at standard pressure, Equation 8 would be used instead of Equation 9 to adjust for both temperature and pressure.

Determination of $F_{CH4,BL,y}$

$F_{CH4,BL,y}$ is the amount of methane that would have been flared in the absence of the project activity, and before the project activity, there was no requirement for the landfill to destroy the methane, and there was an existing LFG capture and destruction system. Therefore, the baseline scenario falls under Case 3 of ACM0001, listed in Table 3.

The calculation of methane that would have been flared in the absence of the project activity is done by using historical values for the flared landfill gas volumes and average methane fraction on a dry basis. The historical values used were from 2006 due to the project being defined as including the expansion and improvement of the landfill gas collection system in 2007, making 2006 the year before the project was implemented. Equations 13 and 14 from ACM0001 are used to calculate the flared baseline emissions for each project year:

$$F_{CH4,BL,sys,y} = F_{CH4,hist,y} \quad (11)$$

$$F_{CH4,hist,y} = \frac{F_{CH4,BL,2006}}{F_{CH4,2006}} \times F_{CH4,PJ,y} \quad (12)$$

Where:

$F_{CH4,hist,y}$ = Historical amount of methane in the LFG which is captured and destroyed (tCH4)

$F_{CH4,BL,2006}$ = Historical amount of methane in the LFG which is captured in 2006 (tCH4)

$F_{CH4,2006}$ = Amount of methane in the LFG generated by the landfill in 2006 (tCH4)

$F_{CH4,PJ,y}$ = Amount of methane in the LFG that is collected in project conditions in year y (tCH4)

In the same vein that LFG sent to the LFGTE currently is measured as a volume on a dry basis with the methane also measured on a dry basis; moisture was not measured in 2006 either. Thus, Equation 5 of Option C of the “Tool to determine the mass flow of a greenhouse gas in a gaseous stream, Version 3.0” is used again to determine the historical amount of methane in LFG captured in 2006. See the subsection, “Determination of $F_{CH4,EL,y}$” for more details.

$$F_{CH4,BL,2006} = V_{t,wb,n} \times v_{i,t,wb} \times \rho_{i,n} \quad (13)$$

Methane generated by the landfill is estimated using the US EPA LandGEM Landfill Gas Emissions Model.

Overall Ex-Post Determination of BE_{CH4}

BE_{CH4} is calculated using Equations 6, 7, 10, and 13, repeated below.

$$BE_y = BE_{CH4,y} = \left[\left(1 - OX_{top\ layer}\right) \times F_{CH4,EL,y} - F_{CH4,BL,2006}\right] \times GWP_{CH4} \quad (6)$$

$$F_{CH4,EL,y} = V_{t,wb,n} \times v_{i,t,wb} \times \rho_{i,n} \quad (7)$$

$$F_{CH4,EL,y} = V_{t,wb,n} \times v_{i,t,wb} \times \rho_{i,n} \quad (10)$$

$$F_{CH4,BL,2006} = V_{t,wb,n} \times v_{i,t,wb} \times \rho_{i,n} \quad (13)$$

Data Substitution Procedures

In cases where data is unavailable for a limited period of time, data substitution procedures will be used to quantify emission reductions for that time period. Data substitution will follow the principle of conservativeness, and the procedure is outlined in the appendix of CDM "Tool to determine the mass flow of a greenhouse gas in a gaseous stream, Version 3.0".

Duration of Missing Data	Data Substitution Procedure
Less than six hours	Use the weighted average of the four-hour period immediately before and after the outage
Six to 24 hours	Use the upper/lower bound of a 95% confidence interval of the data for a time period spanning the 24 hours prior to and 24 hours following the data outage, whichever results in a more conservative estimate of emission reductions
One to seven days	Use the upper/lower bound of a 95% confidence interval of the data for a time period spanning the 72 hours prior to and 72 hours following the data outage, whichever results in a more conservative estimate of emission reductions
Greater than seven days	No data may be substituted

4.2 Project Emissions

Determining Project Emissions

There are two (2) relevant sources of project emissions: indirect emissions related to the project's electricity consumption, and emissions related to the combustion of diesel fuel in equipment used for the project.

Project emissions are calculated by the following equation, simplified from Equation 22 of ACM0001:

$$PE_y = PE_{EC,y} + PE_{FC,Diesel,y} \qquad (14)$$

Where:

$PE_{EC,y}$ = Emissions from consumption of electricity in the project case.

$PE_{FC,Diesel,y}$ = Emissions from consumption of diesel in the project case.

y = monitoring period year

Determination of PE_{EC}

The LFGTE facility system is powered using electricity generated by the LFGTE facility which is considered biogenic electricity with no emissions. In rare occasions, when the LFGTE facility is not operating, the system utilizes a diesel back-up generator whose emissions are captured in the fossil fuel equation. The landfill gas collection system does not use electricity generated by the LFGTE facility, however. These emissions are included and are calculated following the latest version of the CDM Tool 5, “Methodological Tool: Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation, Version 3.0.”

Project emissions related to electricity consumption are calculated as follows (Equation 1 of the electricity tool):

$$PE_{EC,y} = EC_{PJ,Grid,y} \times EF_{EL,Grid,y} \times (1 + TDL_{Grid,y}) \qquad (15)$$

Where:

$PE_{EC,y}$ = Project emissions from electricity consumption in year y ($tCO2/yr$)

$EC_{PJ,Grid,y}$ = Quantity of electricity consumed by the project from the regional grid in year y (MWh/yr)

$EF_{ELGrid,y}$ = Emission factor for electricity generation from the regional grid in year y (tCO2/MWh)

$TDL_{Grid,y}$ = Average technical transmission and distribution losses for the regional grid in year y

Equations (2) and (3) of the electricity tool are omitted as calculation of the baseline and leakage electricity consumption are not required by ACM0001. Equations (4), (5), (6), (7) and (8) of the CDM tool are omitted as these are not relevant to the project.

For determination of the emission factor for electricity generation ($EF_{EL,j,y}$), the methodology presents a number of options. In this case, the electricity consumed is purchased from the regional grid and the applicable options are Option A1 and Option A2.

Option A1 is the calculation of a grid emission intensity factor following the methodology outlined in the “Methodological Tool: Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation, Version 3.0.” However, this process requires a lot of additional data and is a detailed, complex process which is not appropriate given the relative value of this emissions source.

Option A2 allows a default value to be used instead. Following ACM0001, only project emissions from electricity consumption are calculated; therefore, a default value of 1.3 tonnes CO2 per MWh would be applied. However, this does not seem in line with the emissions factors published by the United States Environmental Protection Agency for the region. The project falls under region NYUP (NPCC Upstate NY) which has an emissions factor of 0.105591 tCO2/MWh, according to eGrid2019 data[1]. The project will use this factor instead of the CDM default factor.

Determination of $PE_{FC,Diesel,y}$

The project emissions from fossil fuel combustion ($PE_{FC,Diesel,y}$) are calculated CDM "Methodological Tool: Tool to calculate project or leakage CO2 emissions from fossil fuel combustion, Version 3.0." This includes fossil fuel used by the project consists of diesel used in equipment for landfill and landfill gas collection system installation and maintenance, diesel used by the LFGTE plant's emergency generator, and propane used to start the flare if needed. Fuel consumption by equipment used solely for landfill and landfill gas collection system work, such as the drill rig and Kubota RTV, will be tracked directly. The excavator may occasionally be used for tasks unrelated to project activities, but most of its time is spent on project activities. While other equipment, such as a pickup truck, may periodically be used in project activities, project activities are a small fraction of their overall use, and there is no credible way to differentiate between project activity and non-project activity fuel consumption. The inclusion of all diesel consumed by the excavator serves to balance this. The LFGTE Plant emergency generator uses a small amount of diesel fuel each week for testing and will consume diesel in instances when the plant loses power from the grid. This fuel consumption will be using the engine operational hours at the maximum fuel consumption rate (gal/hr) due to the equipment rarely requiring to be filled completely.

Equation 1 of CDM "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion, Version 3.0" is used to calculate the project emissions due to diesel fuel usage:

$$PE_{FC,Diesel,y} = FC_{Diesel,y} \times COEF_{Diesel,y} \qquad (16)$$

The CO2 emission coefficient $COEF_{Diesel,y}$ is then calculated based on the net calorific value and the CO2 emission factor of the diesel fuel (Option B), as follows using Equation 4 of the fossil fuel tool:

$$COEF_{Diesel,y} = NCV_{Diesel,y} \times EF_{CO2,Diesel,y} \qquad (17)$$

Where:

$COEF_{Diesel,y}$ = the CO2 emission coefficient of diesel fuel used (tCO2/gallon)

[1] https://www.epa.gov/egrid (Emissions & Generation Resource Integrated Database (eGRID) | US EPA)

$NCV_{Diesel,y}$ = the weighted average net calorific value of diesel fuel (MMBtu/gallon)

$EF_{CO2,Diesel,y}$ = the weighted average CO2 emission factor of diesel (tCO2/MMBtu)

The CO2 emission coefficient $EF_{CO2,Diesel,y}$ used in the calculations (0.07315 tCO2/MMBtu) and the energy content of diesel fuel factor NCV_{Diesel} (0.1387 MMBtu/gallon) are from the U.S. Greenhouse Gas Inventory Report. Results were compared to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories to ensure consistency as required by the tool.

Operating Hours of the LFGTE Facility

The operating hours of the LFGTE Facility are monitored by Archaea management. The plant downtime event log is maintained and includes the periods when the entire LFGTE facility was down due to maintenance, testing, utility trips, or other known causes.

4.3 Leakage

Per ACM0001, no leakage effects need to be accounted.

4.4 Net GHG Emission Reductions and Removals

Estimating 10-Year Emission Reductions

GHG emissions reductions are calculated by subtracting the project emissions from the baseline emissions removals. A workbook was provided to the validator detailing these calculations.

$ER_y = BE_y - PE_y$ (Equation 18)

Where:

ER_y = Emission reductions in year y (tCO2e/yr)

BE_y = Baseline emissions in year y (tCO2e/yr)

PE_y = Project emissions in year y (tCO2e/yr)

Estimated emissions reductions are provided below. These values are for information only and are not included into the calculations for baseline or project emissions.

Year	Estimated baseline emissions or removals (tCO_2e)	Estimated project emissions or removals (tCO_2e)	Estimated leakage emissions (tCO_2e)	Estimated net GHG emission reductions or removals (tCO_2e)
2020[A]	36,835.72	44.21	0	36,791.51
2021	65,499.82	76.48	0	65,423.34
2022	67,312.19	76.48	0	67,235.71
2023	68,990.24	76.48	0	68,913.76
2024	70,737.20	76.69	0	70,660.51
2025	71,982.48	76.48	0	71,906.00
2026	73,314.41	76.48	0	73,237.94
2027	74,547.64	76.48	0	74,471.16
2028	75,896.84	76.69	0	75,820.15
2029	76,746.68	76.48	0	76,670.21
2030[A]	32,793.79	32.27	0	32,761.52
Total	**714,657.00**	**765.19**	**0**	**713,891.81**

[A]2020 and 2030 displayed as partial years.

Modeled Methane Generation

Projects must estimate the amount of emissions reductions by projecting the future greenhouse gas emissions of the landfill. ACM0001 requires the use of CDM "Methodological tool: Emissions from solid waste disposal sites." However, the project has elected to use the US EPA LandGEM Landfill Gas Emissions model, which is considered the best practice for predicting landfill emissions in the United States. The LandGEM model requires the following variables to determine the emissions at the landfill:

$$BE_{CH4,SWDS,y} = f(W, F, k, L_o)$$

Where:

$BE_{CH4,SWDS,y}$ = Methane emissions generated during the year y from waste disposal at the landfill during year y

F = fraction of methane in the landfill gas (volume fraction) (0.5)

W_x = Amount of waste disposed in the landfill in each year x (tons)

k = decay constant (1/yr)

L_o = Methane potential generation capacity (m^3/Mg)

At this time, there are no plans to expand the LFGTE Plant beyond the two engines installed, which can destroy up to 1,300 scfm of landfill gas with two engines fully operational, with the actual flow rate dependent upon the heating value of the landfill gas. The LandGEM model results demonstrate that the landfill will continue to support the two engine operation for lifetime of the project. The $BE_{CH4,SWDS,y}$ is estimated based on projected emissions based on the LandGEM model, using the average annual waste tonnage received between 2018 – 2020 for the annual waste acceptance for the years 2021 – 2030, and 50% methane in the LFG combusted. Actual waste tonnage received for 2020 was used in the model for 2020.

Due to LandGEM modelling the emissions at the landfill, not what is actually collected in the gas collection system, the following equation is used to account for collection efficiency and subsequently convert to tCO2e.

$$F_{CH4,PJ,n} = \eta_{PJ} \times BE_{CH4,SWDS,y}/GWP_{CH4} \qquad \text{(Equation 19)}$$

Where:

$F_{CH4,PJ,y}$ = Amount of methane in the LFG which is flared and/or used to generate electricity in the project activity in year y (tCH_4)

η_{PJ} = Collection efficiency of the landfill gas collection system (%)

$BE_{CH4,SWDS,y}$ = Methane emissions generated during the year y from waste disposal at the landfill during year y

GWP_{CH4} = Global Warming Potential value for methane for the reporting period is 28 (IPCC AR5) (tCO_2e / tCH_4)

5 MONITORING

5.1 Data and Parameters Available at Validation

Data / Parameter	$OX_{top\ layer}$
Data unit	Dimensionless
Description	Fraction of methane that would be oxidized in the top layer of the landfill in the baseline
Source of data	ACM0001, Version 19.0
Value applied	0.1
Justification of choice of data or description of measurement methods and procedures applied	Value provided in ACM0001, Version 19.0
Purpose of Data	Calculation of baseline emissions
Comments	Not applicable

Data / Parameter	GWP_{CH4}
Data unit	$tCO2e/tCH_4$
Description	Global warming potential of CH4
Source of data	IPCC
Value applied	28. GWP of 28 is used per the IPCC AR5 in accordance with the most recent VCS Project Standard, v4.1 Section 3.14.4. This value shall be updated according to any future Standard changes.
Justification of choice of data or description of measurement methods and procedures applied	IPCC-recommended global warming potential for methane.
Purpose of Data	Calculation of baseline emissions
Comments	Not applicable

Data / Parameter	$\rho_{i,n}$
Data unit	tCH_4/m^3CH4
Description	Methane Density
Source of data	Airgas Safety Data Sheet for Methane
Value applied	Project and pre-project (70 degrees F and 1 atm): 0.000679
Justification of choice of data or description of measurement methods and procedures applied	Converted from 0.0423 lb/ft^3: (0.0423 lb/ft^3 / 2.2 lb/kg * 0.001 tonnes/kg * 35.314 ft^3/m^3 = 0.000679)
Purpose of Data	Methane density at measured standard temperature and pressure.
Comments	D_{CH4}

Data / Parameter	F
Data unit	Dimensionless fraction
Description	Fraction of methane in the landfill gas (volume fraction)
Source of data	Default value in the USEPA LandGEM Model that is appropriate for the site.
Value applied	0.5
Justification of choice of data or description of measurement methods and procedures applied	US EPA default value for methane concentration. The landfill methane content is typically averages approximately this value.
Purpose of Data	Input parameter in the USEPA LandGEM Model
Comments	N/A

Data / Parameter	L_o
Data unit	m^3/Mg
Description	Potential methane generation capacity
Source of data	US EPA LandGEM Model
Value applied	100
Justification of choice of data or description of measurement methods and procedures applied	US EPA Title V Air Permit site-specific value for methane generation capacity, based on AP-42 guidance
Purpose of Data	Input parameter in the USEPA LandGEM Model
Comments	N/A
Data / Parameter	k

Data unit	yr^{-1}
Description	Decay rate (Methane generation rate)
Source of data	US EPA LandGEM model
Value applied	0.077
Justification of choice of data or description of measurement methods and procedures applied	US EPA Title V Air Permit site-specific value for methane generation rate, based on annual precipitation at the landfill.
Purpose of Data	Input parameter in the USEPA LandGEM Model
Comments	N/A

Data / Parameter	W
Data unit	Tons
Description	Amount of waste deposited in landfill
Source of data	Receipts of total waste received at the landfill
Value applied	Varies per year
Justification of choice of data or description of measurement methods and procedures applied	Measured annual waste acceptance
Purpose of Data	Input parameter in the USEPA LandGEM Model
Comments	N/A

Data / Parameter	$F_{CH,2006}$ (2006 baseline)
Data unit	tCH4
Description	Landfill gas generated by the landfill in 2006.
Source of data	US EPA LandGEM Landfill Gas Emissions
Value applied	3,753.67
Justification of choice of data or description of measurement methods and procedures applied	US EPA model is more appropriate for US landfills than the CDM approach.
Purpose of Data	Parameter used in calculating baseline emissions
Comments	N/A

Data / Parameter	$F_{CH4,BL,2006}$ (2006 baseline)
Data unit	tCH4

Description	Landfill gas sent to flare in pre-project conditions; landfill gas that would have been destroyed in the absence of the project
Source of data	Flow meter readings
Value applied	2020: 1,257.38 2021: 2,235.82 2022: 2,297.69 2023: 2,354.97 2024: 2,414.60 2025: 2,457.11 2026: 2,502.57 2027: 2,544.67 2028: 2,590.72 2029: 2,619.73 2030: 1,119.41
Justification of choice of data or description of measurement methods and procedures applied	Conservative assumption based on available data. Calculated based on extrapolated data of methane captured and destroyed by the flare and the USEPA LandGEM Landfill Gas Emissions model for methane generated by the landfill in 2006.
Purpose of Data	Parameter used in calculating baseline emissions
Comments	N/A

Data / Parameter	$BE_{CH4,SWDS,y}$
Data unit	tCO2e/yr
Description	Amount of methane in the LFG that is generated from the SWDS in the baseline scenario in year y
Source of data	US EPA LandGEM Landfill Gas Emissions
Value applied	Varies by year of the ex-ante estimate; used to demonstrate that the landfill could theoretically produce more gas than our estimates show – See calculation in PDD
Justification of choice of data or description of measurement methods and procedures applied	US EPA model is more appropriate for US landfills than the CDM approach.
Purpose of Data	Parameter used in calculating baseline emissions
Comments	N/A

Data / Parameter	T_n
Data unit	R (Rankine)
Description	Temperature at standard temperature

Source of data	-
Value applied	529.67
Justification of choice of data or description of measurement methods and procedures applied	-
Purpose of Data	-
Comments	N/A

Data / Parameter	P_n
Data unit	atm
Description	Pressure at standard pressure
Source of data	-
Value applied	1
Justification of choice of data or description of measurement methods and procedures applied	-
Purpose of Data	-
Comments	N/A

Data / Parameter	η_{PJ}
Data unit	%
Description	Collection efficiency of the landfill gas collection system
Source of data	AP-42 section 2.4
Value applied	75%
Justification of choice of data or description of measurement methods and procedures applied	AP-42 is an accepted method to calculate emissions from various sources such as landfills.
Purpose of Data	Calculating the ex-ante landfill gas destroyed in the project compared to the landfill gas generated by the landfill as calculated in LandGEM.
Comments	75% is typically considered the average “default” collection efficiency for the landfill gas collection system at landfills not required to have gas collection systems per NSPS regulation.

5.2 Data and Parameters Monitored

No parameters relating to the flare were monitored because it is outside the boundary of the project. This includes propane consumption, flare efficiency, propane emissions factors, propane NCV, and project emissions associated with the flare. Factors relating to displaced grid electricity and displaced thermal energy are not included because the project is not seeking credits for displaced grid electricity or displaced thermal energy. These include ELLFG and ETLFG and the related emissions factors for each. Temperature and pressure are not measured separately from the landfill gas flows as both meters measure these variables and automatically adjust the readings.

Data / Parameter	Management of SWDS
Data unit	-
Description	Management of SWDS
Source of data	Original design of the landfill, technical specifications for the management of the SWDS, and local and national regulations
Description of measurement methods and procedures to be applied	Refer to the original design of the landfill to ensure that any practice used to ensure that any practice to increase methane generation have been occurring prior to the implementation of the project activity. Any change in the management of the SWDS after the implementation of the project activity must be justified by referring to technical or regulatory specifications.
Frequency of monitoring/recording	Annually
Value applied	-
Monitoring equipment	-
QA/QC procedures to be applied	-
Purpose of the data	Identify changes in project and ensure the operation of the project does not change the handling of organic waste disposal.
Calculation method	-
Comments	-

Data / Parameter	$v_{i,t,wb}$
Data unit	Percent
Description	Fraction of methane in the landfill gas
Source of data	Direct measurements from a Siemens analyzer

Description of measurement methods and procedures to be applied	Continuous monitoring on a dry basis via the Siemens analyzer
Frequency of monitoring/recording	Measured and recorded at least every 15 minutes.
Value applied	50%
Monitoring equipment	Siemens Ultramat 23 S/N N1LD421
QA/QC procedures to be applied	The analyzer has an accuracy of less than 1% of the reading and a repeatability of less than 1%. It is calibrated at least annually onsite by a trained technician using zero verification with certified calibration gases (e.g. N_2) and at least one reading verification with a standard gas (single calibration gas or mixture calibration gas) . All calibrations shall have a certificate provided by the manufacturer and shall be under their validity period. It shall also be calibrated monthly by a trained FCSDSW or Archaea personnel.
Purpose of the data	Calculation of baseline emissions.
Calculation method	Measured value (one data point at least every 15 minutes)
Comments	If onsite calibration checks show a drift of 5% or more, a conservative drift factor will be applied to the calculations from the time/date of correction and back to time/date of the last onsite calibration with a drift of less than 5%. If the continuous gas readings are not available, portable gas analyzer data will be used to record measurements daily. Per CDM Tool 8, this is allowed as long as continuous monitoring of the flow rate is maintained and monitored for fluctuations greater than +/- 20%. Data substitution will be applied in accordance with the rules detailed in CDM tool 8.

Data / Parameter	$V_{t,wb,n}$
Data unit	m^3
Description	Quantity landfill gas sent to the engines
Source of data	Measurements from flow meters (meters record data in standard cubic feet (scf) which is converted to cubic meters for the calculations)
Description of measurement methods and procedures to be applied	Continuous monitoring on a dry basis via flow meters
Frequency of monitoring/recording	Measured and recorded at least every 15 minutes.

Value applied	Projected Calculation for Ex-Ante Estimates: 2020: 8,533,801 m^3 LFG 2021: 15,174,469 m^3 LFG 2022: 15,594,344 m^3 LFG 2023: 15,983,101 m^3 LFG 2024: 16,387,824 m^3 LFG 2025: 16,676,319 m^3 LFG 2026: 16,984,892 m^3 LFG 2027: 17,270,596 m^3 LFG 2028: 17,583,167 m^3 LFG 2029: 17,780,052 m^3 LFG 2030: 7,597,400 m^3 CH4 Based on 2018-2020 data
Monitoring equipment	Each engine has a Thermal Instruments Model 62-9/9500 mass flow meter. These meters are accurate to +/- 1% full scale. The meters automatically correct for temperature and pressure to 60 degrees F and 1 atm.
QA/QC procedures to be applied	Factory calibrated at least once every 18 months per manufacturer. During periods when a flow meter is removed for factory calibration, a "loaner" meter provided by the manufacturer will be installed to maintain continuous flow monitoring. This meter will be provided with a calibration certificate. Electrical Connections: Periodically inspect the cable connections on terminal strips and terminal blocks. Verify that the connections are tight and physically sound with no sign of corrosion.
Purpose of the data	Calculation of baseline emissions.
Calculation method	These readings provide $LFG_{electricity}$. LFG_{total} is obtained by calculating the sum of the two engine flows.
Comments	

Data / Parameter	$F_{CH4,PJ,y}$
Data unit	m^3
Description	Quantity of methane flow sent to the engines

Source of data	Measurements from flow meters (meters record data in standard cubic feet (scf) which is converted to cubic meters for the calculations)
Description of measurement methods and procedures to be applied	Calculated based on landfill gas flow and methane concentration.
Frequency of monitoring/recording	Calculations based on data measured and recorded at least every 15 minutes.
Value applied	Projected Calculation for Ex-Ante Estimates: 2020: 4,266,901 m^3 CH4 2021: 7,587,235 m^3 CH4 2022: 7,797,172 m^3 CH4 2023: 7,991,551 m^3 CH4 2024: 8,193,912 m^3 CH4 2025: 8,338,160 m^3 CH4 2026: 8,492,446 m^3 CH4 2027: 8,635,298 m^3 CH4 2028: 8,791,584 m^3 CH4 2029: 8,890,026 m^3 CH4 2030: 3,798,700 m^3 CH4 Based on 2018-2020 data
Monitoring equipment	-
QA/QC procedures to be applied	-
Purpose of the data	Calculation of baseline emissions.
Calculation method	Calculation based on Equation 9 from the “Tool to determine the mass flow of a greenhouse gas in a gaseous stream” (Version 3.0).
Comments	

Data / Parameter	$OP_{Engine,h}$
Data unit	Hours
Description	Logs the hours the plant is operational, which is based on electricity (kWh) production data for each engine.
Source of data	Measurements from the SCADA system and manual operator logs

Description of measurement methods and procedures to be applied	Operators will maintain logs of downtime based on electricity (kWh) production of each engine generator set. In addition, an auto-dialer informs the operator of the time when engines are down, and the operator records the date and time of the occurrence in a spreadsheet log. The operator then records the date and time when the engines are turned back on.
Frequency of monitoring/recording	SCADA system provides continuous readings; Operators record downtime whenever a disruption occurs and reviewed monthly.
Value applied	8,760
Monitoring equipment	SCADA system
QA/QC procedures to be applied	Data logs checked monthly to ensure data accuracy. See Section 5.3.
Purpose of the data	Calculation of baseline emissions
Calculation method	N/A
Comments	N/A

Data / Parameter	$EF_{EL,Grid,y}$
Data unit	tCO2/MWh
Description	Emission factor for electricity consumed in year
Source of data	US EPA eGRID2019 (February 23, 2021) data
Description of measurement methods and procedures to be applied	This value converted from the pounds CO2/MWh provided by the US EPA.
Frequency of monitoring/recording	Annual
Value applied	0.105591 tCO2/MWh
Monitoring equipment	N/A
QA/QC procedures to be applied	N/A
Purpose of the data	Calculation of project emissions
Calculation method	232.3 lbs CO2/MWH*0.454545455 kg/lbs*0.001 tonnes/kg = 0.105591 tonnes CO2/MWh
Comments	Most recent version of eGRID used for verifications.

Data / Parameter	$TDL_{Grid,y}$

Data unit	Percent
Description	Average technical transmission and distribution losses for grid in year y
Source of data	Energy Information Administration (EIA) Department of Energy (DOE) Monthly Energy Review (MER) November 2020: Chapter 2 Energy Consumption by Sector. P. 60.
Description of measurement methods and procedures to be applied	N/A
Frequency of monitoring/recording	Annual
Value applied	7%
Monitoring equipment	N/A
QA/QC procedures to be applied	N/A
Purpose of the data	Calculation of project emissions
Calculation method	N/A
Comments	This data will be reviewed each year to ensure that the most current value is used.

Data / Parameter	$EC_{PJ,Grid,y}$
Data unit	MWh
Description	Amount of grid electricity consumed by the project
Source of data	National Grid Bills
Description of measurement methods and procedures to be applied	Collect utility bills
Frequency of monitoring/recording	Continuous measurement and monthly recording
Value applied	Ex-Ante Projected Calculation: 479.60 MWh/yr based on 2017-2019 data
Monitoring equipment	N/A
QA/QC procedures to be applied	See Section 5.3
Purpose of the data	Calculation of project emissions

Calculation method	Annual aggregation.
Comments	N/A

Data / Parameter	$FC_{Diesel,y}$
Data unit	Gallons
Description	Amount of diesel fuel used.
Source of data	Metered fuel usage at fueling station for all but the emergency generator. Gauges on each machine. Emergency generator hours log and corresponding fuel consumption rate.
Description of measurement methods and procedures to be applied	The fuel consumed by the excavators will be logged directly by recording the amount of fuel added to the excavators. The fuel consumed by the drill rig and Kubota RTV will be logged directly by recording the amount of fuel added to the RTV. Emergency generator hour log used to determine hours per year of operation. Maximum fuel consumption factor of 7.9 gallons/hour to determine total gallons used.
Frequency of monitoring/recording	Data gathered quarterly and compiled annually.
Value applied	Ex-Ante Projected Calculation: 2,197.2 gallons based on 2017-2019 data
Monitoring equipment	N/A
QA/QC procedures to be applied	Procedures are in accordance with Section 5.3.
Purpose of the data	Calculation of project emissions
Calculation method	Equation 1 from "Tool to calculate project or leakage CO2 emissions from fossil fuel combustion"
Comments	N/A

Data / Parameter	NCV_{Diesel}
Data unit	MMBtu/gallon
Description	Energy content of diesel
Source of data	US Greenhouse Gas Inventory Report April 14, 2021
Description of measurement methods and procedures to be applied	This was converted from the MMBtu/barrel data provided by the USEPA for Other Oil (>400 deg. F). 5.825 MMBtu/barrel / 42 gallons/barrel = 0.1387 MMBtu/gallon
Frequency of monitoring/recording	Annual
Value applied	0.1387 MMBtu/gallon
Monitoring equipment	N/A
QA/QC procedures to be applied	N/A
Purpose of the data	Calculation of project emissions
Calculation method	This was converted from the MMBtu/barrel data provided by the USEPA. 5.825 MMBtu/barrel / 42 gallons/barrel = 0.1387 MMBtu/gallon
Comments	Most recent version of Greenhouse Gas Inventory Report used (April 2021 issue).

Data / Parameter	$EF_{CO2,y}$
Data unit	tCO2 /MMBtu
Description	CO2 emissions factor for diesel
Source of data	US Greenhouse Gas Inventory Report April 13, 2020
Description of measurement methods and procedures to be applied	This was converted from the MMT C/QBtu data provided by the US EPA. 19.95 MMT C/QBtu*1E-15 QBtu/Btu * 1E6btu/MMBtu*1E6 t/MMT * 3.66667 t CO2/t C = 0.07315 t CO2/ MMBtu.
Frequency of monitoring/recording	Annual
Value applied	0.07315 t CO2 / MMBtu
Monitoring equipment	N/A
QA/QC procedures to be applied	N/A
Purpose of the data	Calculation of project emissions

Calculation method	This was converted from the MMT C/QBtu data provided by the US EPA. 19.95 MMT C/QBtu*1E-15 QBtu/Btu * 1E6btu/MMBtu*1E6 t/MMT * 3.66667 t CO2/t C = 0.07315 t CO2/ MMBtu.
Comments	Most recent version of Greenhouse Gas Inventory Report used.

Data / Parameter	$BE_{CH4,SWDS,y}$
Data unit	m³ CH4
Description	Methane emissions generated during the year from waste disposal at landfill
Source of data	US EPA LandGEM Landfill Gas Emissions
Description of measurement methods and procedures to be applied	Uses W, F, k, and Lo parameters identified in Section 4.1 for use in the US EPA model.
Frequency of monitoring/recording	Annual
Value applied	Ex-Ante Projected Calculation: June 4, 2020 – December 31, 2020: 5,577,596 m^3 2021: 9,917,861 m^3 2022: 10,192,286 m^3 2023: 10,446,374 m^3 2024: 10,710,896 m^3 2025: 10,899,453 m^3 2026: 11,101,133 m^3 2027: 11,287,865 m^3 2028: 11,492,159 m^3 2029: 11,620,840 m^3 January 1, 2030 – June 3, 2030: 4,965,575 m^3 Based on 2018-2020 data
Monitoring equipment	N/A
QA/QC procedures to be applied	N/A
Purpose of the data	Comparison of actual LFG destroyed with the total quantity of landfill gas generated by the landfill according to the LandGEM model.
Calculation method	US EPA LandGEM

Comments	N/A

Data / Parameter	$T_{measured}$
Data unit	R
Description	Temperature of the gaseous stream as measured
Source of data	Flow meter manufacturer's specifications
Description of measurement methods and procedures to be applied	N/A
Frequency of monitoring/recording	At least once every 18 months
Value applied	519.67 (60°F)
Monitoring equipment	N/A
QA/QC procedures to be applied	N/A
Purpose of the data	Convert measured landfill gas flow to standard temperature and pressure
Calculation method	N/A
Comments	N/A

Data / Parameter	$P_{measured}$
Data unit	atm
Description	Pressure of the gaseous stream as measured
Source of data	Flow meter manufacturer's specifications
Description of measurement methods and procedures to be applied	N/A
Frequency of monitoring/recording	At least once every 18 months
Value applied	1
Monitoring equipment	N/A
QA/QC procedures to be applied	N/A
Purpose of the data	Convert measured landfill gas flow to standard temperature and pressure
Calculation method	N/A

Comments	N/A

5.3 Monitoring Plan

The Project Monitoring Plan is provided below. The Plan includes responsibilities and competencies, and methods for generating, recording, storing, aggregating, collating and reporting data on monitored parameters.

Pre-Project Monitoring

Monitoring in the pre-project scenario was discussed in Section 1.13. The weekly methane and flow data recorded by the DSW staff in 2006 was used. The flow meter used to collect this data is still installed at the flare but will not be used in project monitoring as the flare is outside the boundary of the project. It is a Veris-Verabar flow meter with an accuracy of +/- 0.5% of flow rate, with Serial # V2306.01.1 and Model # V100-05-H-R1. It corrected the flow to 70 degrees F and 1 atm. To gather methane data, the DSW staff used a NOVA analyzer. The analyzer was initially calibrated in 2005 when it was purchased. In 2007, the analyzer was serviced but the calibration records are not available. The gas quality data was periodically checked using a GEM 500 to confirm the readings. In addition, the DSW staff logged the number of hours each week that the flare was operational. This data allows the amount of methane destroyed in the flare in 2006 to be calculated.

Because the weekly data is not as high quality as the continuous readings, the calculations performed using this data erred on the side of conservatism. For each month, the highest flow reading and the highest methane content reading were determined. These were multiplied by the total hours of operation for the flare to determine the total quantity of methane destroyed for the month. It was also assumed that all methane was destroyed by the flare.

Project Monitoring

Facility Operation

The LFGTE facility is continuously monitored for normal operation by a Supervisory Control and Data Acquisition System (SCADA) that was installed with the construction of the LFGTE facility. The SCADA system is PLC-based and provides data acquisition for the components of the gas conditioning system, engines, and electrical generation system. Data acquisition begins at the PLC level and includes various equipment readings and equipment status reports that are communicated to SCADA as required. A control panel for each major piece of equipment is provided with a PLC outfitted with a modbus communications protocol and alarms. The LFGTE facility is monitored and maintained 24/7 by a full-time plant operator. Should any alarms trigger, the auto-dialer will activate.

Operational disruptions are manually recorded by the LFGTE facility personnel in the *Plant Downtime Event Log* and can also be identified in the data logs generated by the electronic data-logger (SCADA). The manual and electronic logs are checked monthly against each other to ensure data accuracy. The checks are performed by Archaea Management and if any erroneous data is identified further investigation occurs. Archaea Management reviews the flow, vacuum, temperature, and gas concentration data to identify system disruptions. Expected ranges exist for each of the destruction devices. For example, the expected LFG consumption rate for a single engine is 450 - 650 scfm and the expected methane concentration range for the facility is 45-55%. Variations can exist in the landfill gas flow and quality.

Facility-wide interruptions (scheduled or un-scheduled) and their respective durations are accounted for and are reported each month.

<u>Data Acquisition</u>

The following information is continuously measured and recorded in real time via the use of gas flow meters, gas analyzers, vacuum sensors and a PLC program based SCADA system.

- Landfill gas flow (scfm)
- Methane concentration (%)
- Oxygen concentration (%)
- Landfill vacuum
- Landfill gas temperature (°F)
- Hours of operation

Manual readings are also taken by Archaea, as backup, once a day. Each morning, readings are taken and recorded by the LFGTE Facility Operator for information such as:

- Landfill gas flow (scfm – total and each engine)
- Methane concentration (%)
- Hours of operation and downtime

If any of the destruction devices experiences a shutdown event, it's recorded by the LFGTE facility Operators in the daily logs. The logs contain the dates and times when events occurred, the dates and times when the system was restored to operation and an indication of the component that was responsible for each event.

Fossil fuel usage data, including the date, equipment, equipment number, driver, and gallons recorded by the meter located at the fueling station, are recorded and compiled for each filling operation in the facility log.

<u>Data Compilation</u>

Archaea is responsible for all monitoring conducted within the LFGTE facility. Fulton County utilizes a weekly and monthly check list to ensure that the necessary monitoring occurs. Fulton County reviews data from Archaea on a monthly basis and reviews the emissions reductions calculations annually. The calculations are performed by the County's engineering consultant and reviewed for completeness and accuracy by the Director of FCDSW in conformance with the FCDSW procedures for regulatory compliance reporting.

Meter Calibrations

Siemens Ultramat 23 Gas Analyzer Calibrations:

The gas analyzer will be calibrated on-site at the Fulton LFGTE facility on an annual basis by a certified technician. A member of FCDSW or Archaea plant operator who has been trained by a certified technician will perform monthly calibrations as well.

Thermal Instruments Flow Meters:

Fulton County Landfill personnel are responsible for maintaining calibration of the flow meters located on each generator set. Thermal Instrument technicians utilizing NIST traceable equipment perform the calibrations. The flow meters will be sent offsite for factory calibration at least every 18 months in accordance with the manufacturer directions. Calibrated replacement meters are used while meters are sent for factory calibration.

Recordkeeping

All monitoring and calibration records shall be maintained on-site for a period of at least five (5) years as required by 6 NYCRR Part 201-6.4(c)(2) in accordance with the facility's Title V air permit, and at least two (2) years after the end of the project crediting period..

Roles and Responsibilities

Daily – Archaea Energy personnel record, in parallel with the automatic recording system, information such as:

- Landfill gas flow (scfm)
- Methane concentration (%)
- Oxygen (%)
- Collection System Vacuum
- Hours of operation
- Power output

The LFGTE facility data is also available on a web-based real-time system which is checked several times during the day by Archaea management from remote locations (office, home, etc) via the internet.

The LFGTE facility is connected to a supervised alarm switch and an auto-dialer. Archaea personnel is notified (24/7) by auto-dialer to address any problems.

Monthly

- Blower greasing (conducted by FCDSW only if flare has been operational during that month)
- Gas collection system balancing and data recording for collection point (gas quality and vacuum) (conducted by FCDSW)
- Evaluate monthly data from the LFGTE facility

Internal Audits and Data Non-Conformities

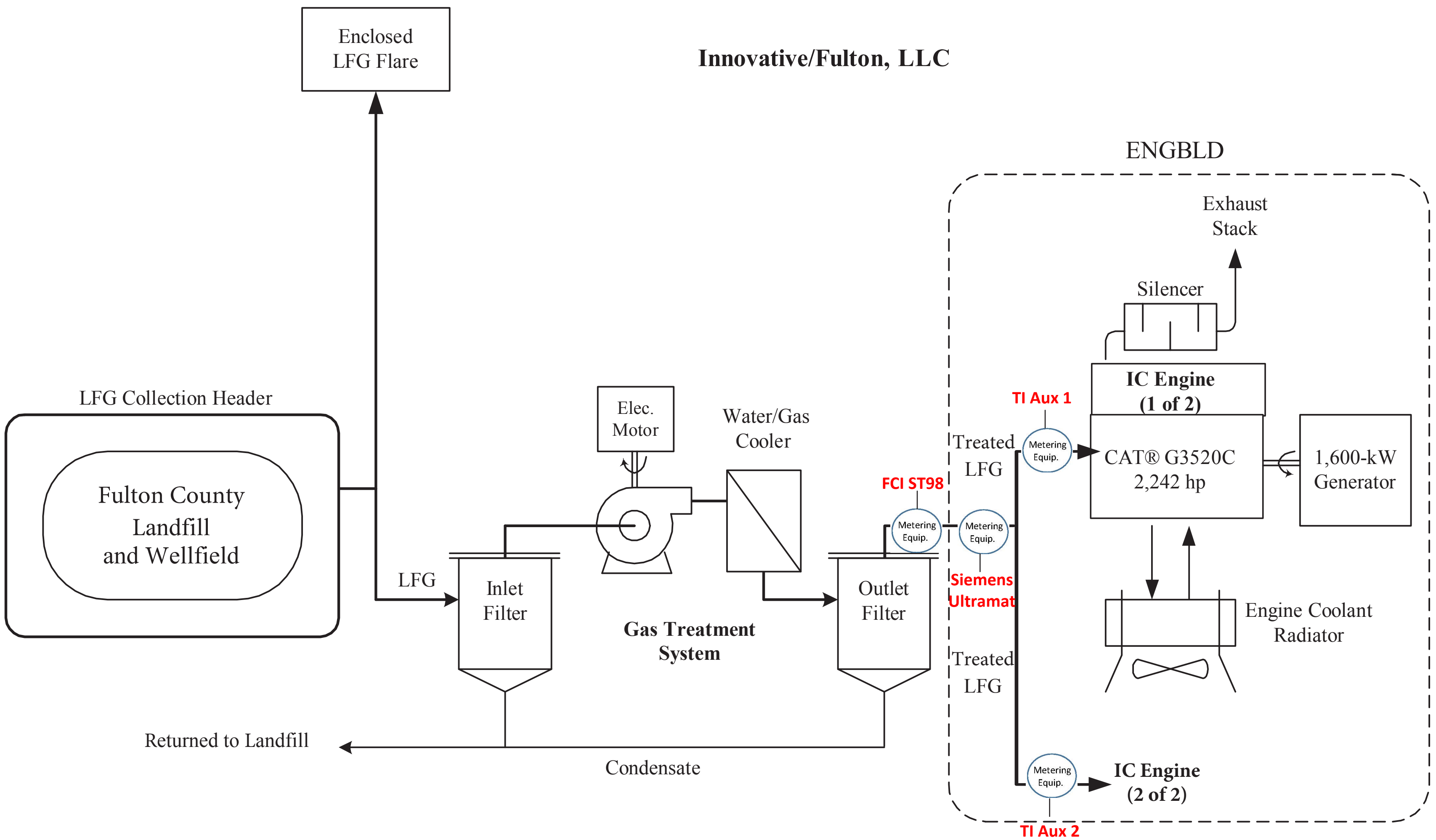
Quality assurance is provided by an independent review of project data and monitoring QA/QC records at the end of each monitoring period. This includes:

- Review of data for anomalies and outlying data points
- Review of calibration reports to ensure meters are operating within specified thresholds
- Completeness check of data
- Review of operating data and cross checking raw data records.

Non-conformities with the PDD are reported throughout the year to Fulton County management upon discovery and are documented with the project documents to be reviewed during the verification period. Any non-conformities are addressed immediately upon discovery.

APPENDIX A: PROCESS FLOW DIAGRAM

The following document describes the methane production and reduction activities occurring at the facility.

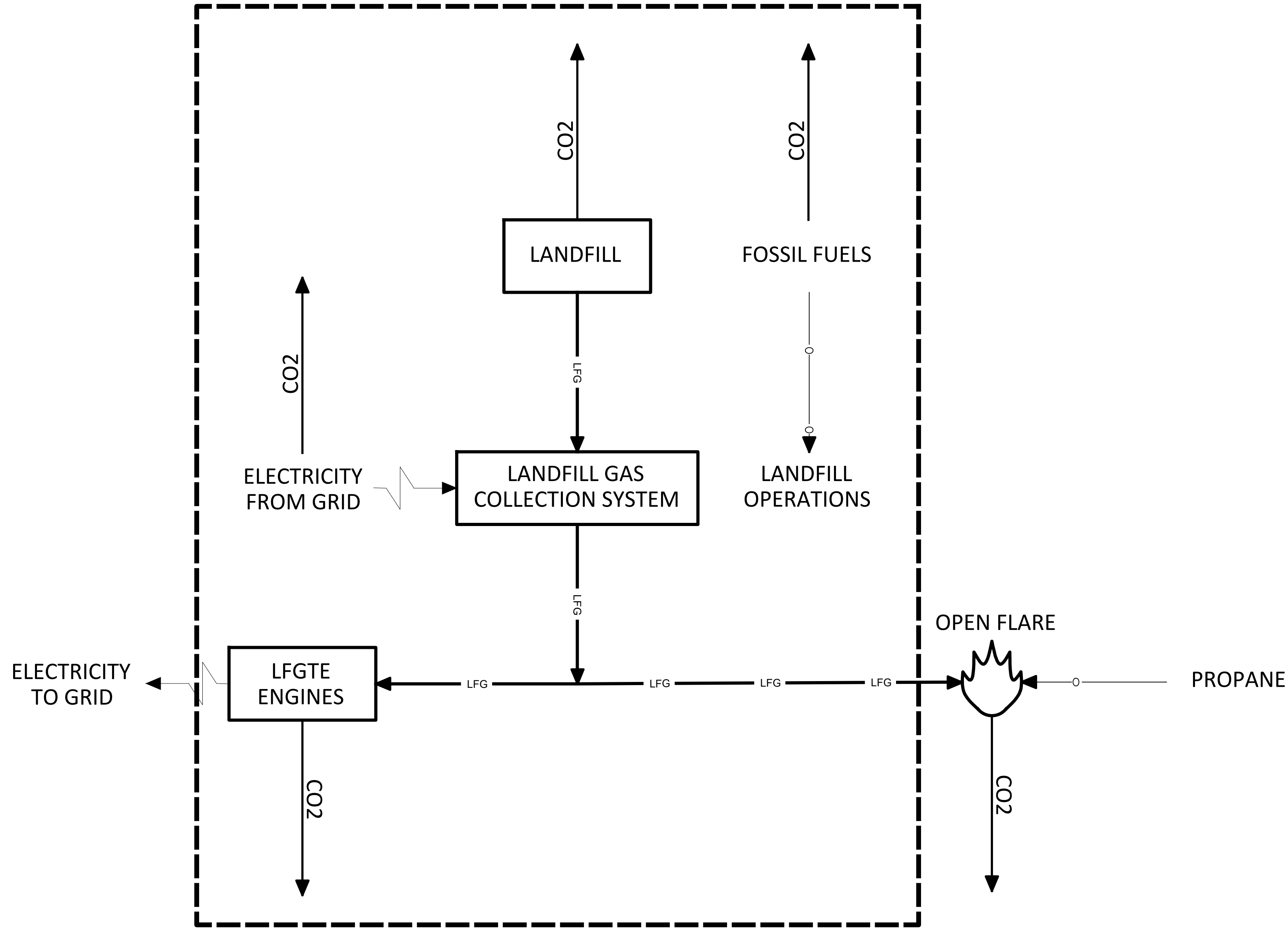


Innovative/Fulton, LLC LFG Electricity Generation Facility		
Scale None	Sheet 1 of 1	**Process Flow Diagram**

APPENDIX B: PROJECT BOUNDARY

The following document describes the landfill boundary.

Plotted: Jul 06, 2021 - 10:52AM SYR By: bgh
Z:\BL-Vault\ID2\18217AD2-1C71-4823-8927-99D5C4054147\0\2317000-2317999\2317846\L\L\307046 APPXB Project Boundary (ID 2317846).dwg



443 Electronics Parkway
Liverpool, NY
13088

Barton & Loguidice, D.P.C.

Date	Scale
JULY 2021	NOT TO SCALE

LEGEND

PROJECT BOUNDARY
ELECTRICITY FLOW
FOSSIL FUEL FLOW
LFG LANDFILL GAS FLOW

FULTON COUNTY
FULTON COUNTY MUD ROAD LANDFILL
VERIFIED CARBON STANDARD 2020

PROJECT BOUNDARY MAP

CITY OF JOHNSTOWN FULTON COUNTY, NEW YORK

Figure Number
B

Project Number
307.046.020