



## CLINTON LANDFILL



Document Prepared by 3Degrees Group, Inc.

|                          |                                                                                                                                          |
|--------------------------|------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Project Title</b>     | Clinton Landfill Gas Collection and Combustion Project                                                                                   |
| <b>Version</b>           | 3.2                                                                                                                                      |
| <b>Report ID</b>         | Clinton-2019-2021-v3.2                                                                                                                   |
| <b>Date of Issue</b>     | 22-April-2022                                                                                                                            |
| <b>Project ID</b>        | 318                                                                                                                                      |
| <b>Monitoring Period</b> | 01-July-2019 to 30-June-2021                                                                                                             |
| <b>Prepared By</b>       | 3Degrees Group, Inc.                                                                                                                     |
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# 1 PROJECT DETAILS

## 1.1 Summary Description of the Implementation Status of the Project

The Project activity is the capture and destruction of methane from the Clinton Landfill in Clinton, Illinois via combustion engines and flares. The generated electricity is sold to the local grid. However, the displacement of fossil fuels resulting from this activity is not included in this Project and emission reductions from the offsite use of electricity are not addressed in this Project Description (PD).

Originally permitted in 1989, the Clinton Landfill received approximately 200,000 metric tons of waste per year through 2009, including municipal solid waste and non-hazardous special waste. Landfill #2 reached capacity in 2009 and Landfill #3 was opened. Landfill #3 is due to reach capacity at around 20 million metric tons of waste in 2052.

In 1998, an active methane recovery and destruction system was constructed at Clinton Landfill to maintain compliance with federal and state standards regarding the control of non-methane organic compounds (NMOCs) and landfill gas (35 IAC, Part 220). This baseline methane capture and destruction included 40 wells and two flares (Flare #1 on Landfill #1 and Flare #2 on landfill #2) that preceded the development of the gas-to-energy Project.

The Project includes an active landfill gas collection system including wells, piping, blowers, meters and valves; a back-up open flare; two 1.6-MW Caterpillar 3520C engine generator sets; gas conditioning equipment; a building to house the generators; and associated interconnection and metering devices. Note that the gas collection system and an open flare were in place prior to the start of the Project in order to comply with regulation. This Project seeks credit for voluntary emissions reductions over and above those achieved by the gas collection system in the baseline scenario.

The Project's second crediting period spans from July 1, 2019 through June 30, 2029. This monitoring report covers the first reporting period of the second crediting period, July 1, 2019 through June 30, 2021. The total emission reductions generated during the current monitoring period are 225,312 metric tons of CO<sub>2</sub>e.

## 1.2 Sectoral Scope and Project Type

The proposed Project activity falls into Sectoral Scope 13 – Waste Handling and Disposal under the Clean Development Mechanism (CDM). The Project meets the criteria of a landfill gas Project activity as defined in the CDM Approved Consolidated Baseline Methodology ACM0001 Version 19, “Flaring or use of landfill gas.”

### 1.3 Project Proponent

|                   |                                                           |
|-------------------|-----------------------------------------------------------|
| Organization name | 3Degrees Group, Inc.                                      |
| Contact person    | Nick Facciola                                             |
| Title             | Director, Carbon Projects                                 |
| Address           | 235 Montgomery Street, Suite 320, San Francisco, CA 94104 |
| Telephone         | (415) 762-4727                                            |
| Email             | nick@3degrees.com                                         |

### 1.4 Other Entities Involved in the Project

|                     |                                                                   |
|---------------------|-------------------------------------------------------------------|
| Organization name   | Wabash Valley Power Associations, Inc. dba Wabash Valley Alliance |
| Role in the Project | Project Owner                                                     |
| Contact person      | Vicki Meyers                                                      |
| Title               | Manager, Power Supply                                             |
| Address             | 4700 N Sterling Ave, Peoria, IL 61615                             |
| Telephone           | (317) 481-2833                                                    |
| Email               | vickim@wvpa.com                                                   |

|                     |                                                     |
|---------------------|-----------------------------------------------------|
| Organization name   | Clinton Landfill, Inc. (owned by GFL Environmental) |
| Role in the Project | Landfill Owner                                      |
| Contact person      | Andrew Whelpley                                     |
| Title               | Hydrogeologist                                      |
| Address             | 4700 N Sterling Ave, Peoria, IL 61615               |
| Telephone           | (309) 495-1580                                      |
| Email               | awhelpley@gflenv.com                                |

### 1.5 Project Start Date

The project start date is January 24, 2007, the day on which the Project began delivering electricity to the grid.

## 1.6 Project Crediting Period

The second crediting period will run from July 1, 2019 – June 30, 2029, for a total length of ten years.

## 1.7 Project Location

The Clinton Landfill is located at 9560 Heritage Road in Clinton, Illinois 61727, in DeWitt County, about 25 miles south of Bloomington, IL. The landfill occupies approximately 157 acres of a 266-acre permitted site. The Project is conducted within the property owned by Clinton Landfill, Inc. This property's GPS coordinates are 40° 6' 51.411" N and -88° 57' 28.7994" W. The engines are housed in free-standing building along the northern edge of the waste area.

## 1.8 Title and Reference of Methodology

The approved methodology applied for this project is ACM0001, *"Flaring or use of landfill gas"* (Version 19). The project will apply the following tools:

- *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)*
- *TOOL 08: Tool to determine the mass flow of a greenhouse gas in a gaseous stream (version 3.0)*
- *TOOL 04: Emissions from solid waste disposal sites (version 8.0)*
- *TOOL 06: Project emissions from flaring (version 3.0)*
- *TOOL 05: Baseline, Project, and/or leakage emissions from electricity consumption and monitoring of electricity generation (version 3.0)*

*TOOL 03: Tool to calculate Project or leakage CO<sub>2</sub> emissions from fossil fuel combustion (version 3.0)*

## 1.9 Participation under other GHG Programs

Not applicable

## 1.10 Other Forms of Credit

The Project is not eligible for crediting under any Emissions Trading program or subject to any other Binding Limits. The reductions presented in this Monitoring Report do not create another form of environmental credit. However, at the Project facility, renewable energy generation produces renewable energy certificates (RECs). The RECs are purchased by Ameren, the alternative retail energy supplier that also purchases the generated electricity. This does not

pose a risk of double counting the emission reductions described in this monitoring report as they do not relate to the displacement of grid electricity by Project generation.

## 1.11 Sustainable Development Contributions

The project activities implemented during this monitoring period include the capture and destruction of landfill gas. Approximately 7,000 people live in nearby Clinton, IL and are currently benefiting from improved air quality as a result of the Project. In addition to local air quality benefits, the project transmits approximately 20,000 MWh of renewable energy to the grid annually.

Table 1 below provides an overview of the project's contributions to Sustainable Development Goals and Indicators.

Table 1: Sustainable Development Contributions

| Row number | SDG Target | SDG Indicator                                                      | Net Impact on SDG Indicator        | Current Project Contributions                                              | Contributions Over Project Lifetime                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|------------|------------|--------------------------------------------------------------------|------------------------------------|----------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1)         | 3.9        | Reduction in household and ambient air pollution                   | Implemented activities to decrease | 1,471,049,975 SCF of gas destroyed during this 24 month monitoring period  | The Project's landfill gas destruction greatly reduces hazardous air pollutants to local residents in area. In addition to methane and carbon dioxide, landfill gas contains a large number of other volatile organic compounds (VOCs), many of which are listed as hazardous air pollutants (HAPs) that pose threats to human health. Combustion of LFG serves to decrease its public health impact by destroying the majority of HAPs. The Natural Resources Defense Council performed an analysis comparing the overall toxicity of raw LFG to that of LFG combustion exhaust and found that raw landfill gas is approximately 24 times more carcinogenic to human health than landfill gas combustion exhaust. The total volume of gas destroyed by the project in its lifetime is 7,270,996,013 SCF, as verified in previous reporting periods, including gas destroyed during this monitoring period. |
| 2)         | 7.2        | 7.2.1 Renewable energy share in the total final energy consumption | Implemented activities to increase | 37,174 MWh generated by the project during this 24 month monitoring period | Annual generation of approximately 20,000 MWh supplies renewable energy to the grid. The total quantity of energy supplied to the grid in the project's lifetime is 204,287 MWh, as verified in previous reporting periods, including MWh sent to the grid during this monitoring period.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |

## 2 SAFEGUARDS

### 2.1 No Net Harm

We are not aware of any negative environmental or socio-economic impacts of this Project implementation.

### 2.2 Local Stakeholder Consultation

Prior to and after the Project start date, DeWitt Energy made a variety of efforts to reach out to both local leaders and the community at large. The purpose of this outreach was to explain the benefits of the Project to the public, to respond to questions and feedback, and to help ensure compliance with safety standards. Outreach efforts included the following activities:

- Edwin Ingalls, General Manager of DeWitt Energy, met with the county zoning board in the spring of 2005 to explain the Project and answer questions.
- DeWitt Energy twice hosted the fire chief and fire department for site visits during construction, to familiarize local emergency personnel with the design of the system.
- Ingalls presented the Project to the Rotary Club, an association of local business leaders, prior to the Project start date.
- After Project start, Ingalls presented the Project to the Central Illinois Mayor's Association.
- Ingalls has also made several local press appearances, including articles in the Clinton Daily Journal and a twenty-minute radio interview on WHOW.

Separately, the Project was subject to the extensive public consultation processes required by U.S. law. The United States has a longstanding tradition of public stakeholder consultation prior to granting environmental permits at the federal, state and municipal level. Typically, this includes measures to alert the public about the Project and ways to participate, through advertisements in relevant local media, town hall style meetings or other public hearings, an on-line option for offering comments and easy access to officials through postal mail and/or phone.

This Project's generators and flare required air quality permits pursuant to the U.S. Clean Air Act as sources of NO<sub>x</sub>, and therefore this Project was subject to Clean Air Act permitting and notice requirements. Those requirements are described in Attachment 4 of the PDD.

These outreach efforts did not yield any significant feedback from the community. A landfill gas collection and flaring system was already in place at the landfill at the time that the Project was developed, and the addition of a gas-to-energy plant at the site, financed by a private developer, was generally regarded as an uncontroversial and even positive community development. No records of feedback from these consultations exist, because no formal feedback was offered.

## 2.3 AFOLU-Specific Safeguards

This is not an AFOLU Project.

# 3 IMPLEMENTATION STATUS

## 3.1 Implementation Status of the Project Activity

The project was implemented and has been operational since 1/24/2007. During this reporting period, LFG has been sent to both the power plant and flares. Of the flares, gas is primarily sent to Flare #2, while Flare #1 is infrequently used. In 2021, the engines were removed and sent offsite for service, then re-installed in spring 2021. The site attempted to stagger the service to keep at least one engine running, but due to delays there is a period of no engine operation in March and April 2021. During the reporting period, data substitution was applied to Flare 2 methane readings, including a one-month period of unreliable methane readings in 2020 (additional details on this is provided below under data substitution).

## 3.2 Deviations

### 2.1.1 Methodology Deviations

The following deviations represent a deviation from criteria and procedures related to monitoring and measurement of GHG emission reductions set out in the methodology. The following deviations are provided because they are more appropriate than methodology defaults given the context of the Clinton Landfill Project.

**Data Substitution:** For the duration of 6/30/2020 to 7/31/2020, the continuous methane analyzer at Flare 2 reported faulty readings as low as 1-2% methane. There was typical landfill gas flow during this time and no data was missing. We believe that this issue was caused by the methane analyzer not receiving proper flow during this time, causing falsely low readings. As a form of data substitution, our calculations assign the 95% confidence interval of the concentration for all periods of typical Flare 2 performance throughout the reporting period to this period of faulty readings. The Flare 2 methane analyzer was checked for calibration/accuracy directly prior to this period, on 06/30/2020, when it was calibrated with span gas. The following quarterly check on 09/29/2020 also indicated no issues, error codes, or maintenance required. Therefore, we are confident in the analyzers' readings during the reporting period in general, except for this period of time where we believe the readings were faulty. This approach does not negatively impact the conservativeness of the quantification of GHG emission reductions. This deviation only relates to the criteria and procedures for measurement, and do not relate to any other part of the methodology.

### 2.1.2 Project Description Deviations

**Use of Flare #2 methane readings for both Flare 1 and the engines:** We apply methane concentration readings taken at Flare #2 for use at the engines and Flare1 since the destruction devices are adjacent to each other at the facility. For the engines, this conservatively uses a lower methane concentration (before gas is conditioned at the engines). Conservativeness is demonstrated in the project calculator through comparison of Flare #2 readings with handheld methane readings taken at the engines during this reporting period. Flare #2 read, on average, a methane concentration 0.8% lower than handheld readings. This deviation does not impact the applicability of the methodology, the project's additionality, or the appropriateness of the baseline scenario.

### 3.3 Grouped Projects

This is not a grouped project.

## 4 DATA AND PARAMETERS

### 4.1 Data and Parameters Available at Validation

|                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                           |
|----------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Data / Parameter                                                                             | Regulatory requirements relating to landfill gas Projects                                                                                                                                                                                                                                                                                                                                                 |
| Data unit                                                                                    | --                                                                                                                                                                                                                                                                                                                                                                                                        |
| Description                                                                                  | Regulatory requirements relating to landfill gas Projects                                                                                                                                                                                                                                                                                                                                                 |
| Source of data                                                                               | Publicly available information of United States' and State of Illinois' regulatory requirements relating to landfill gas. In particular, the landfill is regulated under Title 35 Illinois Administrative Code (35 IAC), Subtitle G: Land Pollution (Regulations) and under the Title V Clean Air Act Permit Program. The WVPA energy plant is also regulated under Title 40 Code of Federal Regulations. |
| Value applied                                                                                | --                                                                                                                                                                                                                                                                                                                                                                                                        |
| Justification of choice of data or description of measurement methods and procedures applied | Landfill operates under permits as outlined in Section 1.14. As part of the validation process, necessary permits are identified so that they may be tracked during Project monitoring.                                                                                                                                                                                                                   |
| Purpose of Data                                                                              | The information is used to assess the landfill's regulatory standing.                                                                                                                                                                                                                                                                                                                                     |

|          |     |
|----------|-----|
| Comments | N/A |
|----------|-----|

|                                                                                              |                                                                                                                                |
|----------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------|
| Data / Parameter                                                                             | $OX_{top\_layer}$                                                                                                              |
| Data unit                                                                                    | Dimensionless                                                                                                                  |
| Description                                                                                  | Fraction of methane that would be oxidized in the top layer of the SWDS in the baseline                                        |
| Source of data                                                                               | Consistent with how oxidation is accounted for in the methodological tool “ <i>Emissions from solid waste disposal sites</i> ” |
| Value applied                                                                                | 0.1                                                                                                                            |
| Justification of choice of data or description of measurement methods and procedures applied | Specified in methodology.                                                                                                      |
| Purpose of Data                                                                              | Baseline and Project Emissions calculations                                                                                    |
| Comments                                                                                     | N/A                                                                                                                            |

|                                                                                              |                                                                                                                                                                                       |
|----------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Data / Parameter                                                                             | $GWP_{CH_4}$                                                                                                                                                                          |
| Data unit                                                                                    | $tCO_2e/tCH_4$                                                                                                                                                                        |
| Description                                                                                  | Global warming potential of $CH_4$                                                                                                                                                    |
| Source of data                                                                               | IPCC’s Fifth Assessment Report                                                                                                                                                        |
| Value applied                                                                                | 28                                                                                                                                                                                    |
| Justification of choice of data or description of measurement methods and procedures applied | This term will be specified in the latest version of the VCS Standard, expected to be released in March 2021, and reflects the default value from IPCC Fifth Assessment Report (AR5). |
| Purpose of Data                                                                              | Baseline and Project Emissions calculations                                                                                                                                           |
| Comments                                                                                     | N/A                                                                                                                                                                                   |

|                  |                           |
|------------------|---------------------------|
| Data / Parameter | $F_{CH_4,PJ,y}$ (ex-ante) |
| Data unit        | $tCH_4/yr$                |

|                                                                                              |                                                                                            |
|----------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------|
| Description                                                                                  | Amount of methane in the LFG which is flared and/or used in the Project activity in year y |
| Source of data                                                                               | $F_{CH4,PJ,y} = \eta_{PJ} \times BE_{CH4,SWDS,y} / GWP_{CH4}$                              |
| Value applied                                                                                | See Attachment 17 of PDD                                                                   |
| Justification of choice of data or description of measurement methods and procedures applied | Calculated in the First Order Decay (FOD) model provided as Attachment 17 of PDD           |
| Purpose of Data                                                                              | Calculation of Project Emissions (ex-ante)                                                 |
| Comments                                                                                     | N/A                                                                                        |

|                                                                                              |                                                                        |
|----------------------------------------------------------------------------------------------|------------------------------------------------------------------------|
| Data / Parameter                                                                             | $\eta_{PJ}$                                                            |
| Data unit                                                                                    | Percent                                                                |
| Description                                                                                  | Efficiency of the LFG capture system installed in the Project activity |
| Source of data                                                                               | ACM0001 Methodology                                                    |
| Value applied                                                                                | 50%                                                                    |
| Justification of choice of data or description of measurement methods and procedures applied | This is the default value given by the methodology.                    |
| Purpose of Data                                                                              | Calculation of baseline emissions (ex-ante $F_{CH4,PJ,y}$ )            |
| Comments                                                                                     | N/A                                                                    |

|                                                                                              |                                                                                                                                                                                                                                  |
|----------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Data / Parameter                                                                             | $\eta_{\text{flare}}$                                                                                                                                                                                                            |
| Data unit                                                                                    | Percent                                                                                                                                                                                                                          |
| Description                                                                                  | Efficiency of the flare installed in the Project activity                                                                                                                                                                        |
| Source of data                                                                               | Climate Action Reserve's U.S. Landfill Protocol (v5).                                                                                                                                                                            |
| Value applied                                                                                | 96%                                                                                                                                                                                                                              |
| Justification of choice of data or description of measurement methods and procedures applied | Using a Methodology Deviation, the efficiency of the flare is set at 96% based on the value prescribed by the Climate Action Reserve's U.S. Landfill Protocol (v5). This value is widely accepted for U.S. landfill open flares. |
| Purpose of Data                                                                              | Calculation of Project emissions from flaring                                                                                                                                                                                    |
| Comments                                                                                     | This Methodology Deviation has been approved in previous reporting periods under the first crediting period.                                                                                                                     |

|                                                                                              |                                                                                                                                                                                                        |
|----------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Data / Parameter                                                                             | $F_{\text{CH}_4, \text{BL}, x-1}$                                                                                                                                                                      |
| Data unit                                                                                    | tCH <sub>4</sub> /yr                                                                                                                                                                                   |
| Description                                                                                  | Historical amount of methane in the LFG which is captured and destroyed in the year prior to implementation of the Project activity                                                                    |
| Source of data                                                                               | Value taken from initial validation                                                                                                                                                                    |
| Value applied                                                                                | 3,899                                                                                                                                                                                                  |
| Justification of choice of data or description of measurement methods and procedures applied | This value was determined at the initial validation and is maintained here. The data set and the calculations performed to determine baseline methane capture appears in Attachments 14 and 16 of PDD. |
| Purpose of Data                                                                              | Calculation of baseline methane destruction                                                                                                                                                            |
| Comments                                                                                     | N/A                                                                                                                                                                                                    |

|                                                                                              |                                                                                                                     |
|----------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------|
| Data / Parameter                                                                             | $FCH_{4,x-1}$                                                                                                       |
| Data unit                                                                                    | tCH <sub>4</sub> /yr                                                                                                |
| Description                                                                                  | Amount of methane which is generated in the SWDS in the year prior to the Project activity                          |
| Source of data                                                                               | Calculated in original PDD and shown in Attachments 16 and 17 of PDD (ex-ante model of landfill methane production) |
| Value applied                                                                                | 12,130                                                                                                              |
| Justification of choice of data or description of measurement methods and procedures applied | This value is a result of the decay model that predicts the annual methane production of the landfill.              |
| Purpose of Data                                                                              | Calculation of baseline methane destruction                                                                         |
| Comments                                                                                     | N/A                                                                                                                 |

|                                                                                              |                                                                                                                                                                                   |
|----------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Data / Parameter                                                                             | $BE_{CH_4,SWDS,y}$                                                                                                                                                                |
| Data unit                                                                                    | tCO <sub>2</sub> e/yr                                                                                                                                                             |
| Description                                                                                  | Amount of methane generated in calendar year y by the landfill in absence of any collection system                                                                                |
| Source of data                                                                               | Calculated per the tool “Emissions from solid waste disposal sites” at the time of the initial validation and recalculated at the time of the second crediting period validation. |
| Value applied                                                                                | See Attachment 17 of PDD                                                                                                                                                          |
| Justification of choice of data or description of measurement methods and procedures applied | The value was determined upon the second crediting period, updated from the initial validation to account for changed values and modeled for continued decay.                     |
| Purpose of Data                                                                              | Modeled value of the methane produced by the SWDS in a given year                                                                                                                 |
| Comments                                                                                     | Used for ex-ante estimation of the amount of methane that would have been generated in a given year, as well as to establish baseline scenario reductions                         |

|                  |                                            |
|------------------|--------------------------------------------|
| Data / Parameter | $F_{CH_4,BL,y} (ex-ante) = FCH_{4,hist,y}$ |
|------------------|--------------------------------------------|

|                                                                                              |                                                                                                                            |
|----------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------|
| Data unit                                                                                    | tCH <sub>4</sub> /yr                                                                                                       |
| Description                                                                                  | Amount of methane in the LFG that would be flared in the baseline in year y for the case of an existing LFG capture system |
| Source of data                                                                               | $0.321 \times F_{CH_4,PJ,y}$ (ex-ante)                                                                                     |
| Value applied                                                                                | Calculated                                                                                                                 |
| Justification of choice of data or description of measurement methods and procedures applied | This value was determined upon validation of the first crediting period.                                                   |
| Purpose of Data                                                                              | Calculation of baseline emissions                                                                                          |
| Comments                                                                                     | See Attachment 17 of PDD                                                                                                   |

|                                                                                              |                                                                                                                                                                 |
|----------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Data / Parameter                                                                             | EF <sub>EL,j,y</sub>                                                                                                                                            |
| Data unit                                                                                    | tCO <sub>2</sub> /MWh                                                                                                                                           |
| Description                                                                                  | Emission factor for electricity consumption from source j                                                                                                       |
| Source of data                                                                               | eGRID 2020data (released 1/27/2022)                                                                                                                             |
| Value applied                                                                                | 0.672                                                                                                                                                           |
| Justification of choice of data or description of measurement methods and procedures applied | This is a widely used and accepted source for grid emission factors.                                                                                            |
| Purpose of Data                                                                              | Calculating Project emissions from electricity use                                                                                                              |
| Comments                                                                                     | Clinton is in SRMW region. This parameter will be reviewed and updated as necessary to remain in agreement with the latest updates of the source documentation. |

|                  |                                                                                     |
|------------------|-------------------------------------------------------------------------------------|
| Data / Parameter | TDL <sub>j,y</sub>                                                                  |
| Data unit        | %                                                                                   |
| Description      | Transmission and distribution losses of providing electricity to source j in year y |
| Source of data   | eGRID 2020 data (released 1/27/2022)                                                |

|                                                                                              |                                                                                                                                      |
|----------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------|
| Value applied                                                                                | 5.3%                                                                                                                                 |
| Justification of choice of data or description of measurement methods and procedures applied | This is a widely used and accepted source for U.S. electricity grid data                                                             |
| Purpose of Data                                                                              | Calculating Project emissions from electricity use                                                                                   |
| Comments                                                                                     | This parameter will be reviewed and updated as necessary to remain in agreement with the latest updates of the source documentation. |

|                                                                                              |                                                                                                                                      |
|----------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------|
| Data / Parameter                                                                             | COEF <sub>i,y</sub>                                                                                                                  |
| Data unit                                                                                    | tCO <sub>2</sub> /gallon                                                                                                             |
| Description                                                                                  | Emission factor for fossil fuel type i                                                                                               |
| Source of data                                                                               | 2006 IPCC Guidelines for National Greenhouse Gas Inventories                                                                         |
| Value applied                                                                                | Various                                                                                                                              |
| Justification of choice of data or description of measurement methods and procedures applied | This is a widely used and accepted source for fossil fuel emission factors.                                                          |
| Purpose of Data                                                                              | Calculating Project emissions from fossil fuel use                                                                                   |
| Comments                                                                                     | This parameter will be reviewed and updated as necessary to remain in agreement with the latest updates of the source documentation. |

|                                                   |                                                                                                                                                                                                |
|---------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Data / Parameter                                  | $\rho_{CH_4}$                                                                                                                                                                                  |
| Data unit                                         | lbs. CH <sub>4</sub> /ft <sup>3</sup> wet landfill gas                                                                                                                                         |
| Description                                       | Methane density                                                                                                                                                                                |
| Source of data                                    | US EPA conversion factor, "Basic Concepts in Environmental Science"<br><a href="http://www.epa.gov/apti/bces/reference/reference.htm">http://www.epa.gov/apti/bces/reference/reference.htm</a> |
| Value applied                                     | 0.04162 lbs/ft <sup>3</sup>                                                                                                                                                                    |
| Justification of choice of data or description of | The molecular weight of methane (16.043 lb/lb mol) x P <sub>Reference</sub> / Universal Gas Constant (10.73                                                                                    |

|                                            |                                                                                                                                                                                           |
|--------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| measurement methods and procedures applied | $\text{psia} \cdot \text{ft}^3 / \text{lbmol} \cdot ^\circ \text{R} / T_{\text{Reference}}$ . $P_{\text{Reference}}$ and $T_{\text{Reference}}$ are at standard temperature and pressure. |
| Purpose of Data                            | Baseline and Project Emissions Calculations                                                                                                                                               |
| Comments                                   | Density as measured in US units per gas industry standard temperature and pressure: 1 atmosphere and 68°F, or 14.70 psia and 527.67 Rankine                                               |

|                                                                                              |                                                                                       |
|----------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
| Data / Parameter                                                                             | $P_n$                                                                                 |
| Data unit                                                                                    | psia                                                                                  |
| Description                                                                                  | Total pressure at normal conditions                                                   |
| Source of data                                                                               | Tool to determine the mass flow of a greenhouse gas in a gaseous stream, Version 03.0 |
| Value applied                                                                                | 14.70                                                                                 |
| Justification of choice of data or description of measurement methods and procedures applied | This is a physical value for atmospheric pressure                                     |
| Purpose of Data                                                                              | To determine methane density                                                          |
| Comments                                                                                     | N/A                                                                                   |

|                                                                                              |                                                                                       |
|----------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
| Data / Parameter                                                                             | $T_n$                                                                                 |
| Data unit                                                                                    | °R                                                                                    |
| Description                                                                                  | Temperature at normal conditions                                                      |
| Source of data                                                                               | Tool to determine the mass flow of a greenhouse gas in a gaseous stream, Version 03.0 |
| Value applied                                                                                | 527.67                                                                                |
| Justification of choice of data or description of measurement methods and procedures applied | This is a physical value for normal temperature                                       |
| Purpose of Data                                                                              | To determine methane density                                                          |

|          |                                                                                                                                                                                                        |
|----------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Comments | Note that the tool sets this value at 273.15 K. However, we find the value of 527.67 °R (68 °F) to be the more appropriate value for normal conditions. As such, calculations are based on this value. |
|----------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

|                                                                                              |                                                                                       |
|----------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
| Data / Parameter                                                                             | $MM_{CH_4}$                                                                           |
| Data unit                                                                                    | lb/lbmol                                                                              |
| Description                                                                                  | Molecular mass of methane                                                             |
| Source of data                                                                               | Tool to determine the mass flow of a greenhouse gas in a gaseous stream, Version 03.0 |
| Value applied                                                                                | 16.043                                                                                |
| Justification of choice of data or description of measurement methods and procedures applied | This is a physical value for molecular mass of methane.                               |
| Purpose of Data                                                                              | To determine methane density                                                          |
| Comments                                                                                     | N/A                                                                                   |

|                                                                                              |                                                                                       |
|----------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
| Data / Parameter                                                                             | $R_u$                                                                                 |
| Data unit                                                                                    | psia • ft <sup>3</sup> /lbmol • °R                                                    |
| Description                                                                                  | Universal ideal gases constant                                                        |
| Source of data                                                                               | Tool to determine the mass flow of a greenhouse gas in a gaseous stream, Version 03.0 |
| Value applied                                                                                | 10.73                                                                                 |
| Justification of choice of data or description of measurement methods and procedures applied | --                                                                                    |
| Purpose of Data                                                                              | To determine methane density                                                          |
| Comments                                                                                     | N/A                                                                                   |

The following parameters were used in the initial crediting period as part of the tool *Emissions from solid waste disposal sites* and defaults have been updated in the second crediting period in accordance with v08.0 and ACM0001 v19.

|                                                                                              |                                                            |
|----------------------------------------------------------------------------------------------|------------------------------------------------------------|
| Data / Parameter                                                                             | $\phi$ default                                             |
| Data unit                                                                                    | Unitless                                                   |
| Description                                                                                  | Model correction factor to account for model uncertainties |
| Source of data                                                                               | Emissions from solid waste disposal sites v08.0            |
| Value applied                                                                                | 0.75                                                       |
| Justification of choice of data or description of measurement methods and procedures applied | From Tool: Application A, default value                    |
| Purpose of Data                                                                              | Corrects for model uncertainties in baseline calculations  |
| Comments                                                                                     | N/A                                                        |

|                                                                                              |                                                                                                                                                                                                           |
|----------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Data / Parameter                                                                             | $f_y$                                                                                                                                                                                                     |
| Data unit                                                                                    | %                                                                                                                                                                                                         |
| Description                                                                                  | Fraction of methane captured at the SWDS and flared, combusted or used in another manner that prevents the emissions of methane to the atmosphere in year $y$                                             |
| Source of data                                                                               | Historic Project records and ongoing Project monitoring.                                                                                                                                                  |
| Value applied                                                                                | 0                                                                                                                                                                                                         |
| Justification of choice of data or description of measurement methods and procedures applied | This value references historical conditions and requirements that were in place when the Project underwent initial validation.                                                                            |
| Purpose of Data                                                                              | Accounts for any methane that is handled outside of the Project activity.                                                                                                                                 |
| Comments                                                                                     | According to ACM0001, this parameter “shall be assigned a value of 0 because the amount of LFG that would have been captured and destroyed is already accounted for in equation (2) of this methodology.” |

|                                                                       |                                                                                                                                                  |
|-----------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------|
| Data / Parameter                                                      | OX                                                                                                                                               |
| Data unit                                                             | Fraction                                                                                                                                         |
| Description                                                           | Oxidation factor (reflecting the amount of methane from SWDS that is oxidized in the soil or other material covering the waste)                  |
| Source of data                                                        | Based on an extensive review of published literature on this subject, including the IPCC 2006 Guidelines for National Greenhouse Gas Inventories |
| Value applied                                                         | 0.1                                                                                                                                              |
| Justification of choice of data or description of measurement methods | This term is given by the methodology.                                                                                                           |
| Purpose of data                                                       | Discounts the total methane produced to account for oxidation from soil or other covering materials.                                             |
| Comments                                                              | N/A                                                                                                                                              |

|                                                                       |                                                                    |
|-----------------------------------------------------------------------|--------------------------------------------------------------------|
| Data / Parameter                                                      | F                                                                  |
| Data unit                                                             | Unitless                                                           |
| Description                                                           | Fraction of methane in the SWDS gas (volume fraction)              |
| Source of data                                                        | IPCC 2006 Guidelines for National Greenhouse Gas Inventories       |
| Value applied                                                         | 0.5                                                                |
| Justification of choice of data or description of measurement methods | This term is given by the methodology.                             |
| Purpose of data                                                       | Reflects the methane fraction in the gas produced by the landfill. |
| Comments                                                              | N/A                                                                |

|                  |                                                                                                      |
|------------------|------------------------------------------------------------------------------------------------------|
| Data / Parameter | DOC <sub>f,y</sub>                                                                                   |
| Data unit        | Weight fraction                                                                                      |
| Description      | Default value for the fraction of degradable organic carbon (DOC) in MSW that decomposes in the SWDS |

|                  |                                                                                                          |                                |
|------------------|----------------------------------------------------------------------------------------------------------|--------------------------------|
| Data / Parameter | DOC <sub>j</sub>                                                                                         |                                |
| Data unit        | Fraction                                                                                                 |                                |
| Description      | Fraction of degradable organic carbon in the waste type j (weight fraction)                              |                                |
| Source of data   | IPCC 2006 Guidelines for National Greenhouse Gas Inventories (adapted from Volume 5, Tables 2.4 and 2.5) |                                |
| Value applied    | For MSW, the following values for the different waste types j should be applied:                         |                                |
|                  | Default values for DOC <sub>j</sub>                                                                      |                                |
|                  | Waste type j                                                                                             | DOC <sub>j</sub> (% wet waste) |

|                                                                       |                                                                      |    |
|-----------------------------------------------------------------------|----------------------------------------------------------------------|----|
|                                                                       | Wood and wood products                                               | 43 |
|                                                                       | Pulp, paper and cardboard (other than sludge)                        | 40 |
|                                                                       | Food, food waste, beverages and tobacco (other than sludge)          | 15 |
|                                                                       | Textiles                                                             | 24 |
|                                                                       | Garden, yard and park waste                                          | 20 |
|                                                                       | Glass, plastic, metal, other inert waste                             | 0  |
| Justification of choice of data or description of measurement methods | Default values from IPCC 2006 Guidelines                             |    |
| Purpose of data                                                       | Used to determine the fraction of organic content that is degradable |    |
| Comments                                                              | N/A                                                                  |    |

|                                                                       |                                                            |
|-----------------------------------------------------------------------|------------------------------------------------------------|
| Data / Parameter                                                      | $W_x$                                                      |
| Data unit                                                             | t                                                          |
| Description                                                           | Total amount of waste disposed in a SWDS in year x         |
| Source of data                                                        | Measurement by third-party reporting                       |
| Value applied                                                         | See Attachment 13 and Attachment 17 of PDD.                |
| Justification of choice of data or description of measurement methods | Total waste disposal is tracked and recorded historically. |
| Purpose of data                                                       | Used to calculate the ex-ante baseline emissions.          |
| Comments                                                              | N/A                                                        |

|                  |                             |
|------------------|-----------------------------|
| Data / Parameter | $k_j$                       |
| Data unit        | 1/yr                        |
| Description      | Decay rate per waste type j |

| Source of data                                                        | IPCC 2006 Guidelines for National Greenhouse Gas Inventories (adapted from Volume 5, Table 3.3)                                                                                                                                                                                                                                         |            |   |                                               |      |                                |      |                       |     |                                         |       |
|-----------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|---|-----------------------------------------------|------|--------------------------------|------|-----------------------|-----|-----------------------------------------|-------|
| Value applied                                                         | <table> <tr> <th>Waste Type</th><th>k</th></tr> <tr> <td>Pulp, paper, cardboard (not sludge), textiles</td><td>0.06</td></tr> <tr> <td>Wood, wood products, and straw</td><td>0.03</td></tr> <tr> <td>Garden and park waste</td><td>0.1</td></tr> <tr> <td>Food, food waste, sludge, bev &amp; tobacco</td><td>0.185</td></tr> </table> | Waste Type | k | Pulp, paper, cardboard (not sludge), textiles | 0.06 | Wood, wood products, and straw | 0.03 | Garden and park waste | 0.1 | Food, food waste, sludge, bev & tobacco | 0.185 |
| Waste Type                                                            | k                                                                                                                                                                                                                                                                                                                                       |            |   |                                               |      |                                |      |                       |     |                                         |       |
| Pulp, paper, cardboard (not sludge), textiles                         | 0.06                                                                                                                                                                                                                                                                                                                                    |            |   |                                               |      |                                |      |                       |     |                                         |       |
| Wood, wood products, and straw                                        | 0.03                                                                                                                                                                                                                                                                                                                                    |            |   |                                               |      |                                |      |                       |     |                                         |       |
| Garden and park waste                                                 | 0.1                                                                                                                                                                                                                                                                                                                                     |            |   |                                               |      |                                |      |                       |     |                                         |       |
| Food, food waste, sludge, bev & tobacco                               | 0.185                                                                                                                                                                                                                                                                                                                                   |            |   |                                               |      |                                |      |                       |     |                                         |       |
| Justification of choice of data or description of measurement methods | Default decay values used to model decay of waste in the landfill.                                                                                                                                                                                                                                                                      |            |   |                                               |      |                                |      |                       |     |                                         |       |
| Purpose of data                                                       | Calculation of baseline emissions.                                                                                                                                                                                                                                                                                                      |            |   |                                               |      |                                |      |                       |     |                                         |       |
| Comments                                                              | <p>At Clinton, the climatic conditions are as follows:</p> <p>Mean Avg. Temp = 11.5° C (NOAA 30-year normals)</p> <p>Mean Avg. Precip = 90.3 cm (NOAA 30-year normals)</p> <p>Potential Evapotranspiration = 63.6 cm (Thornthwaite method)</p> <p>MAP/PET = 1.420</p> <p>→ Boreal/Temperate, Wet</p>                                    |            |   |                                               |      |                                |      |                       |     |                                         |       |

## 4.2 Data and Parameters Monitored

|                                                                 |                                                                                                              |
|-----------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------|
| Data / Parameter                                                | Management of SWDS                                                                                           |
| Data unit                                                       | --                                                                                                           |
| Description                                                     | Management of SWDS                                                                                           |
| Source of data                                                  | Original design of the landfill and check-ins with Project staff on the continued operation of the facility. |
| Description of measurement methods and procedures to be applied | --                                                                                                           |
| Frequency of monitoring/recording                               | Annually                                                                                                     |

|                                |                                                                                                                                                                   |
|--------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Value applied                  | --                                                                                                                                                                |
| Monitoring equipment           | --                                                                                                                                                                |
| QA/QC procedures to be applied | --                                                                                                                                                                |
| Purpose of data                | Ensure that the operation of the Project does not reduce the amount of organic waste being diverted from the Clinton landfill in the absence of Project activity. |
| Calculation method             | --                                                                                                                                                                |
| Comments                       | The landfill is operating in the same manner as described in the PDD. All solid waste practices remain the same.                                                  |

|                                                                 |                                                                                                                     |
|-----------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------|
| Data / Parameter                                                | BE <sub>CH4,y</sub>                                                                                                 |
| Data unit                                                       | tCO <sub>2e</sub>                                                                                                   |
| Description                                                     | Baseline emissions from the SWDS in year y                                                                          |
| Source of data                                                  | $((1 - OX_{top\_layer}) * F_{CH4,PJ} - F_{CH4,BL}) * GWP_{CH4}$                                                     |
| Description of measurement methods and procedures to be applied | Calculated value based on other parameters                                                                          |
| Frequency of monitoring/recording                               | Calculated value                                                                                                    |
| Value applied                                                   | 2019 (6 months): 54,915<br>2020: 115,263<br>2021 (6 months): 55,232                                                 |
| Monitoring equipment                                            | N/A                                                                                                                 |
| QA/QC procedures to be applied                                  | N/A                                                                                                                 |
| Purpose of data                                                 | The emissions in year y if the baseline scenario were chosen instead of the Project scenario by the Project owners. |
| Calculation method                                              | $((1 - OX_{top\_layer}) * F_{CH4,PJ} - F_{CH4,BL}) * GWP_{CH4}$                                                     |

|                                                                 |                                                                                            |
|-----------------------------------------------------------------|--------------------------------------------------------------------------------------------|
| Comments                                                        | N/A                                                                                        |
| Data / Parameter                                                | $F_{CH_4,PJ,y}$ (ex-post)                                                                  |
| Data unit                                                       | tCH <sub>4</sub> /yr                                                                       |
| Description                                                     | Amount of methane in the LFG which is flared and/or used in the Project activity in year y |
| Source of data                                                  | Calculated value based on other parameters                                                 |
| Description of measurement methods and procedures to be applied | Calculated value based on other parameters                                                 |
| Frequency of monitoring/recording                               | Calculated value                                                                           |
| Value applied                                                   | 2019 (6 months): 3,385<br>2020: 7,105<br>2021 (6 months): 3,405                            |
| Monitoring equipment                                            | N/A                                                                                        |
| QA/QC procedures to be applied                                  | N/A                                                                                        |
| Purpose of data                                                 | The amount of methane that was used in the Project activity in year y                      |
| Calculation method                                              | $F_{CH_4,EL,y} + F_{CH_4,flare,y}$                                                         |
| Comments                                                        | N/A                                                                                        |

|                  |                                                                                            |
|------------------|--------------------------------------------------------------------------------------------|
| Data / Parameter | $F_{CH_4,EL,y}$ (ex-post)                                                                  |
| Data unit        | tCH <sub>4</sub> /yr                                                                       |
| Description      | Amount of methane in the LFG which is used for electricity generation in year y            |
| Source of data   | Determined using “Tool to determine the mass flow of a greenhouse gas in a gaseous stream” |

|                                                                 |                                                                                                      |
|-----------------------------------------------------------------|------------------------------------------------------------------------------------------------------|
| Description of measurement methods and procedures to be applied | Calculated value based on other parameters                                                           |
| Frequency of monitoring/recording                               | Calculated value                                                                                     |
| Value applied                                                   | 2019 (6 months): 1,674<br>2020: 3,456<br>2021 (6 months): 852                                        |
| Monitoring equipment                                            | N/A                                                                                                  |
| QA/QC procedures to be applied                                  | N/A                                                                                                  |
| Purpose of data                                                 | Determine methane destroyed by gensets                                                               |
| Calculation method                                              | Calculated using "Tool to determine the mass flow of a greenhouse gas in a gaseous stream"(Option C) |
| Comments                                                        | Equal to $F_{CH_4,t}$                                                                                |

|                                                                 |                                                                 |
|-----------------------------------------------------------------|-----------------------------------------------------------------|
| Data / Parameter                                                | $F_{CH_4,flare,y}$ (ex-post)                                    |
| Data unit                                                       | tCH <sub>4</sub> /yr                                            |
| Description                                                     | Amount of methane in the LFG which is flared in year y          |
| Source of data                                                  | Calculated value                                                |
| Description of measurement methods and procedures to be applied | Calculated value based on other parameters                      |
| Frequency of monitoring/recording                               | Calculated value                                                |
| Value applied                                                   | 2019 (6 months): 1,711<br>2020: 3,649<br>2021 (6 months): 2,327 |
| Monitoring equipment                                            | N/A                                                             |

|                                |                                                |
|--------------------------------|------------------------------------------------|
| QA/QC procedures to be applied | N/A                                            |
| Purpose of data                | Determine methane destroyed by flares          |
| Calculation method             | Calculated using Equation 4 in the methodology |
| Comments                       | N/A                                            |

|                                                                 |                                                                                                       |
|-----------------------------------------------------------------|-------------------------------------------------------------------------------------------------------|
| Data / Parameter                                                | $F_{CH_4, \text{sent flare}, y}$ (ex-post)                                                            |
| Data unit                                                       | tCH <sub>4</sub> /yr                                                                                  |
| Description                                                     | Amount of methane in the LFG which is sent to the flares in year y                                    |
| Source of data                                                  | Determined using “Tool to determine the mass flow of a greenhouse gas in a gaseous stream”            |
| Description of measurement methods and procedures to be applied | Calculated value based on other parameters                                                            |
| Frequency of monitoring/recording                               | Calculated value                                                                                      |
| Value applied                                                   | 2019 (6 months): 1,783<br>2020: 3,801<br>2021 (6 months): 2,659                                       |
| Monitoring equipment                                            | N/A                                                                                                   |
| QA/QC procedures to be applied                                  | N/A                                                                                                   |
| Purpose of data                                                 | Determine methane destroyed by flare                                                                  |
| Calculation method                                              | Calculated using “Tool to determine the mass flow of a greenhouse gas in a gaseous stream” (Option C) |
| Comments                                                        | Equal to $F_{CH_4, t}$ and $F_{CH_4, RG}$                                                             |

|                  |                        |
|------------------|------------------------|
| Data / Parameter | $PE_{\text{flare}, y}$ |
|------------------|------------------------|

|                                                                 |                                                          |
|-----------------------------------------------------------------|----------------------------------------------------------|
| Data unit                                                       | tCH <sub>4</sub> /yr                                     |
| Description                                                     | Project emissions from flaring in year y                 |
| Source of data                                                  | Determined using tool “Project emissions from flaring”   |
| Description of measurement methods and procedures to be applied | Calculated value based on other parameters               |
| Frequency of monitoring/recording                               | Calculated value                                         |
| Value applied                                                   | 2019 (6 months): 71<br>2020: 152<br>2021 (6 months): 106 |
| Monitoring equipment                                            | N/A                                                      |
| QA/QC procedures to be applied                                  | N/A                                                      |
| Purpose of data                                                 | Determine methane destroyed by flare                     |
| Calculation method                                              | Calculated using “Project emissions from flaring”        |
| Comments                                                        | N/A                                                      |

|                                                                 |                                                                  |
|-----------------------------------------------------------------|------------------------------------------------------------------|
| Data / Parameter                                                | F <sub>CH<sub>4</sub>,BL,y</sub> (ex-post)                       |
| Data unit                                                       | tCH <sub>4</sub> /yr                                             |
| Description                                                     | Amount of methane attributable to baseline destruction equipment |
| Source of data                                                  | $0.321 \times F_{CH_4,PJ,y}$ (ex-post)                           |
| Description of measurement methods and procedures to be applied | Calculated value based on other parameters                       |
| Frequency of monitoring/recording                               | Calculated value                                                 |
| Value applied                                                   | 2019 (6 months): 1,085                                           |

|                                |                                                           |
|--------------------------------|-----------------------------------------------------------|
|                                | 2020: 2,278<br>2021 (6 months): 1,092                     |
| Monitoring equipment           | N/A                                                       |
| QA/QC procedures to be applied | N/A                                                       |
| Purpose of data                | Determine methane destroyed by flare in baseline scenario |
| Calculation method             | $0.321 \times F_{CH_4,PJ,y}$ (ex-post)                    |
| Comments                       | N/A                                                       |

|                                                                 |                                                                                                                                                                                                                                                                                                                                                                   |
|-----------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Data / Parameter                                                | Op <sub>j,h</sub>                                                                                                                                                                                                                                                                                                                                                 |
| Data unit                                                       | Hours                                                                                                                                                                                                                                                                                                                                                             |
| Description                                                     | Operating hours of the energy plant                                                                                                                                                                                                                                                                                                                               |
| Source of data                                                  | Engine operating clock totalizer                                                                                                                                                                                                                                                                                                                                  |
| Description of measurement methods and procedures to be applied | Operating clock hours are kept showing monthly totalizer readings, which are used to demonstrate consistent operation by comparing against monthly gas flow and monthly power generation.                                                                                                                                                                         |
| Frequency of monitoring/recording                               | Daily                                                                                                                                                                                                                                                                                                                                                             |
| Value applied                                                   | Monthly operating hours                                                                                                                                                                                                                                                                                                                                           |
| Monitoring equipment                                            | Records of engine uptime                                                                                                                                                                                                                                                                                                                                          |
| QA/QC procedures to be applied                                  | N/A                                                                                                                                                                                                                                                                                                                                                               |
| Purpose of data                                                 | Calculation of the baseline and Project emissions                                                                                                                                                                                                                                                                                                                 |
| Calculation method                                              | N/A                                                                                                                                                                                                                                                                                                                                                               |
| Comments                                                        | <p>The gensets are equipped with shutoff valves that prevent gas from passing through and entering the atmosphere while the gensets are non-operational.</p> <p>For any period where one or more of the destruction devices are not operational, it will be demonstrated that the remaining devices have the capacity to destroy the gas flow recorded during</p> |

|                                                                        |                                                                                                                                                                                                                                                                                          |
|------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                        | the period, and if relevant, it will be shown that the output corresponds to the gas flow.                                                                                                                                                                                               |
| <b>Data / Parameter</b>                                                | $Op_{flare,h}$                                                                                                                                                                                                                                                                           |
| <b>Data unit</b>                                                       | Hours                                                                                                                                                                                                                                                                                    |
| <b>Description</b>                                                     | Operation of the flares                                                                                                                                                                                                                                                                  |
| <b>Source of data</b>                                                  | Flare thermocouple readings                                                                                                                                                                                                                                                              |
| <b>Description of measurement methods and procedures to be applied</b> | Any flow measured during periods when the flares' operating temperatures are less than 500 °F is considered uncombusted, and ignored in the calculation of emissions reductions.                                                                                                         |
| <b>Frequency of monitoring/recording</b>                               | Continuously                                                                                                                                                                                                                                                                             |
| <b>Value applied</b>                                                   | Monthly operating hours                                                                                                                                                                                                                                                                  |
| <b>Monitoring equipment</b>                                            | Thermocouple                                                                                                                                                                                                                                                                             |
| <b>QA/QC procedures to be applied</b>                                  | N/A                                                                                                                                                                                                                                                                                      |
| <b>Purpose of data</b>                                                 | Calculation of the baseline and Project emissions                                                                                                                                                                                                                                        |
| <b>Calculation method</b>                                              | N/A                                                                                                                                                                                                                                                                                      |
| <b>Comments</b>                                                        | For any period where one or more of the destruction devices are not operational, it will be demonstrated that the remaining devices have the capacity to destroy the gas flow recorded during the period, and if relevant, it will be shown that the output corresponds to the gas flow. |

|                                                                 |                                                                                                                                                                                                                                                                                                           |
|-----------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Data / Parameter                                                | EC <sub>PJ,j,y</sub>                                                                                                                                                                                                                                                                                      |
| Data unit                                                       | kWh                                                                                                                                                                                                                                                                                                       |
| Description                                                     | Quantity of electricity consumed by the Project source j in year y                                                                                                                                                                                                                                        |
| Source of data                                                  | Utility invoices                                                                                                                                                                                                                                                                                          |
| Description of measurement methods and procedures to be applied | N/A                                                                                                                                                                                                                                                                                                       |
| Frequency of monitoring/recording                               | Monitored continuously, bills provided monthly                                                                                                                                                                                                                                                            |
| Value applied                                                   | 2019 (6 months): 42,154<br>2020: 49,065<br>2021 (6 months): 47,396                                                                                                                                                                                                                                        |
| Monitoring equipment                                            | Revenue meter owned by utility                                                                                                                                                                                                                                                                            |
| QA/QC procedures to be applied                                  | Per power company's procedures. The utility has a vested interest in maintaining conservative calibration of the meters, with legal and financial ramifications that ensure meter accuracy. As such, the meter is assumed to be accurate based on the utility's operation and dependence on the readings. |
| Purpose of data                                                 | Calculation of Project emissions                                                                                                                                                                                                                                                                          |
| Calculation method                                              | N/A                                                                                                                                                                                                                                                                                                       |
| Comments                                                        | N/A                                                                                                                                                                                                                                                                                                       |

|                                                                 |                                                                                                                        |
|-----------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------|
| Data / Parameter                                                | $FC_{i,j,y}$                                                                                                           |
| Data unit                                                       | gallons                                                                                                                |
| Description                                                     | Fossil fuel of type i consumed in process j consumed by the Project Activity in year y. In this case, fuel is propane. |
| Source of data                                                  | Purchase invoices                                                                                                      |
| Description of measurement methods and procedures to be applied | N/A                                                                                                                    |
| Frequency of monitoring/recording                               | Data is recorded in the form of receipts for purchases.                                                                |
| Value applied                                                   | 2019 (6 months): 0<br>2020: 0<br>2021 (6 months): 0                                                                    |
| Monitoring equipment                                            | N/A                                                                                                                    |
| QA/QC procedures to be applied                                  | N/A                                                                                                                    |
| Purpose of data                                                 | Calculation of Project emissions                                                                                       |
| Calculation method                                              | N/A                                                                                                                    |
| Comments                                                        | N/A                                                                                                                    |

The following parameters were monitored for use in the *Tool to determine the mass flow of a greenhouse gas in a gaseous stream*.

|                                                                 |                                               |
|-----------------------------------------------------------------|-----------------------------------------------|
| Data / Parameter                                                | $V_{t,wb}$                                    |
| Data unit                                                       | ft <sup>3</sup> wet gas/m                     |
| Description                                                     | Volumetric flow of the LFG in flare or engine |
| Source of data                                                  | Flow meters                                   |
| Description of measurement methods and procedures to be applied | Data is captured by the datalogger.           |

|                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|-----------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                   | <p>The Rosemount Pressure Transmitters measure differential pressure, static pressure, and process temperature continuously and converts these parameters into a compensated mass flow value at the following reference conditions:</p> <p>Engine 3051 s/n 514151: 60°F and 14.73 psia.</p> <p>Flare 1 3095 s/n 41863: 60°F and 14.696 psia.</p> <p>Flare 2 3051 s/n 514152: 60°F and 14.73 psia.</p>                                      |
| Frequency of monitoring/recording | Continuously monitored, recorded on a 2-minute basis                                                                                                                                                                                                                                                                                                                                                                                       |
| Value applied                     | <p>Engines (SCF):</p> <p>2019 (6 months): 169,866,342</p> <p>2020: 353,882,205</p> <p>2021 (6 months): 93,178,681</p> <p>Flare 1 (SCF):</p> <p>2019 (6 months): 0</p> <p>2020: 3,627,293</p> <p>2021 (6 months): 26,699,288</p> <p>Flare 2 (SCF):</p> <p>2019 (6 months): 171,207,373</p> <p>2020: 387,181,962</p> <p>2021 (6 months): 265,406,831</p>                                                                                     |
| Monitoring equipment              | <p>Engines: Rosemount 3051 Pressure Transmitter s/n 514151</p> <p>Flare 1: Rosemount 3095 Pressure Transmitter s/n 41863</p> <p>Flare 2: Rosemount 3051 Pressure Transmitter s/n 514152</p>                                                                                                                                                                                                                                                |
| QA/QC procedures to be applied    | The flow meters are maintained and calibrated according to manufacturer specification.                                                                                                                                                                                                                                                                                                                                                     |
| Purpose of data                   | Calculation of the baseline and Project emissions.                                                                                                                                                                                                                                                                                                                                                                                         |
| Calculation method                | <p>Integrated logic of Yokogawa data loggers. Note that the meters are calibrated to give readings for the reference conditions listed above. Thus, meter readings are corrected to standard cubic feet for 68 °F using Equation 11 of the Tool to determine the mass flow of a greenhouse gas in a gaseous stream:</p> $V_{t,wb,n} = V_{t,wb} \times \left[ \left( \frac{T_n}{T_t} \right) \times \left( \frac{P_t}{P_n} \right) \right]$ |

|                                                                 |                                                                                                                                                                                                                                                                                                                |
|-----------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Comments                                                        | N/A                                                                                                                                                                                                                                                                                                            |
| Data / Parameter                                                | $v_{CH_4,t,wb}$                                                                                                                                                                                                                                                                                                |
| Data unit                                                       | ft <sup>3</sup> CH <sub>4</sub> /ft <sup>3</sup> wet gas                                                                                                                                                                                                                                                       |
| Description                                                     | Volumetric fraction of methane in a time interval t on a wet basis                                                                                                                                                                                                                                             |
| Source of data                                                  | GFL Environmental                                                                                                                                                                                                                                                                                              |
| Description of measurement methods and procedures to be applied | Captured by data logger for the continuous measurements and landfill staff for handheld measurements                                                                                                                                                                                                           |
| Frequency of monitoring/recording                               | Methane fraction is continuously monitored at the flares and monitored approximately weekly at the engines via hand held readings.                                                                                                                                                                             |
| Value applied                                                   | <p>Averages at engines:</p> <p>2019 (6 months): 55%</p> <p>2020: 52%</p> <p>2021 (6 months): 48%</p> <p>Averages at Flare 1:</p> <p>2019 (6 months): N/A</p> <p>2020: 50%</p> <p>2021 (6 months): 48%</p> <p>Averages at Flare 2:</p> <p>2019 (6 months): 55%</p> <p>2020: 52%</p> <p>2021 (6 months): 48%</p> |
| Monitoring equipment                                            | Siemens Ultramat 23 at each flare skid (S/Ns N1A2-146, N1A1-699) and a Landtec GEM hand held analyzer at the engine (S/N G500309). Please see Section 3.2 Deviations. For this reporting period we apply Flare 2 methane analyzer readings to the engines and Flare 1.                                         |
| QA/QC procedures to be applied                                  | The continuous gas analyzer (Siemens Ultramat) is calibrated quarterly in the field.                                                                                                                                                                                                                           |

|                    |                                                                                                                                                                                  |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                    | The hand held analyzers (Landtec) are calibrated to reference gases before use, as documented in the LFG Monitoring Field Reports. These meters are factory calibrated annually. |
| Purpose of data    | Calculation of the baseline and Project emissions                                                                                                                                |
| Calculation method | Integrated logic of data loggers for continuous measurements at the flares.                                                                                                      |
| Comments           | N/A                                                                                                                                                                              |

|                                                                 |                                                                                                                                                                                                                                                                |
|-----------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Data / Parameter                                                | $T_t$                                                                                                                                                                                                                                                          |
| Data unit                                                       | °F (or °R)                                                                                                                                                                                                                                                     |
| Description                                                     | Temperature of the gaseous stream to the power plant or flare in time interval t                                                                                                                                                                               |
| Source of data                                                  | GFL Environmental                                                                                                                                                                                                                                              |
| Description of measurement methods and procedures to be applied | Landfill gas temperature is monitored continuously, and automatically converted by the respective flow meter/transmitter into compensated total flow value at reference condition 60 °F. Readings are corrected to 68 °F (527.67 °R) for further calculations. |
| Frequency of monitoring/recording                               | Continuously                                                                                                                                                                                                                                                   |
| Value applied                                                   | N/A                                                                                                                                                                                                                                                            |
| Monitoring equipment                                            | Flow meters                                                                                                                                                                                                                                                    |
| QA/QC procedures to be applied                                  | The flow meters are maintained and calibrated according to manufacturer specification, which is every 5 years.                                                                                                                                                 |
| Purpose of data                                                 | Calculation of the baseline and Project emissions                                                                                                                                                                                                              |
| Calculation method                                              | N/A                                                                                                                                                                                                                                                            |
| Comments                                                        | N/A                                                                                                                                                                                                                                                            |

|                                                                 |                                                                                                                |
|-----------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------|
| Data / Parameter                                                | $P_t$                                                                                                          |
| Data unit                                                       | Atmospheres (or psia)                                                                                          |
| Description                                                     | Pressure of the gaseous stream to the power plant or flare in time interval t                                  |
| Source of data                                                  | Flow meters give readings for standard pressure of 1 atm (14.70 psia)                                          |
| Description of measurement methods and procedures to be applied | Flow meter readings                                                                                            |
| Frequency of monitoring/recording                               | Continuously                                                                                                   |
| Value applied                                                   | N/A                                                                                                            |
| Monitoring equipment                                            | Flow meters                                                                                                    |
| QA/QC procedures to be applied                                  | The flow meters are maintained and calibrated according to manufacturer specification, which is every 5 years. |
| Purpose of data                                                 | Calculation of baseline and Project emissions                                                                  |
| Calculation method                                              | N/A                                                                                                            |
| Comments                                                        | N/A                                                                                                            |

### 4.3 Monitoring Plan

The purpose of monitoring is to ensure the Project accomplishes its greenhouse gas reductions as expected by WVPA, and to ensure its emission reductions are creditable pursuant to this PD and the Voluntary Carbon Standard.

The data to be reported are:

- Total landfill gas captured
- Landfill gas flow to the generators and flares
- Landfill gas constituent concentration
- Operating hours of the generators
- Quantity of electricity generated
- Quantity of grid electricity used by Project equipment
- Quantity of waste disposed at the landfill

The origin, measurement techniques, monitoring time periods, responsibilities, and data quality management systems are described in below.

| Parameter                             | Data source                                                                                    | Frequency             | Party                                        | Notes                                                                                                                                     |
|---------------------------------------|------------------------------------------------------------------------------------------------|-----------------------|----------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------|
| Normalized flow to generators         | Continuous flow meter (Rosemount 3051 Transmitter)                                             | Captured continuously | Wabash operations technician                 | Continuous flow data is submitted periodically to 3Degrees                                                                                |
| Normalized flow to flares             | Continuous flow meter (Rosemount Transmitters 3095 and 3051, and Sage Thermal Mass Flow Meter) | Captured continuously | GFL Environmental technician                 | Continuous flow data is submitted periodically to 3Degrees                                                                                |
| Landfill gas temperature and pressure | Continuous flow meter                                                                          | Captured continuously | Wabash operations technician/ GFL technician | Flow readings are normalized to standard temperature and pressure by flow meter, thus temperature and pressure are not tracked separately |
| Total electricity generated           | kWh meters                                                                                     | Hourly                | Ameren                                       | Total generated electricity is reported in Wabash monthly electricity bills, used to verify methane destruction                           |
| Engine Operating Hours                | Operating hours meters                                                                         | Hourly                | Wabash operations technician                 | Cumulative engine operating hours are recorded daily                                                                                      |
| Flare Operating Hours                 | Flare Thermocouples                                                                            | Continuously          | GFL personnel                                | At temperatures above 500 °F, flare is assumed to be operational                                                                          |
| Methane fraction at flares            | Siemens Ultramat 23 continuous gas analyzers                                                   | Continuously          | GFL personnel                                | Continuous methane data is submitted periodically to 3Degrees                                                                             |
| Methane fraction at power plant       | Handheld meter (Elkins Earthworks Envision and Landtec GEM units)                              | At least twice weekly | GFL personnel                                | Methane data is aggregated in a spreadsheet manually and sent to 3Degrees periodically. Field calibration records also kept on meter      |

| Parameter                        | Data source                                      | Frequency    | Party         | Notes                                                                               |
|----------------------------------|--------------------------------------------------|--------------|---------------|-------------------------------------------------------------------------------------|
| Waste Disposed                   | Scale readings as submitted to Illinois EPA      | Annually     | GFL personnel | 3Degrees will collect this data annually from IEPA reports as they become available |
| Grid electricity used by Project | Electricity bills for WPVA/ GFL                  | Monthly      | GFL personnel |                                                                                     |
| Propane used by the Project      | Propane receipts for GFL                         | Periodically | GFL personnel |                                                                                     |
| Operating permits                | Wabash Valley Power personnel, GFL, Illinois EPA | Annually     | 3Degrees      | 3Degrees will ensure operating permits are valid and complete                       |

The following chart provides a summary of equipment calibration. Actual QA/QC procedures will depend on the specific pieces of equipment used. The equipment manufacturer's recommendations and guidance are provided in Attachment 1.

| Equipment                         | Calibration procedure                                          | Frequency                               | Responsible party                   |
|-----------------------------------|----------------------------------------------------------------|-----------------------------------------|-------------------------------------|
| Continuous flow meter             | Factory calibration, as recommended by manufacturer            | Per manufacturer's recommendation       | Factory-authorized representative   |
| Continuous methane analyzers      | Field calibrate against reference gases, record results        | Annually                                | GFL personnel technician            |
| Generator kilowatt-hour meter     | As recommended by manufacturer                                 | Not responsibility of Project operators | Ameren                              |
| Handheld gas constituent analyzer | Field calibrate against reference gas cylinder, record results | Daily prior to use                      | GFL personnel operations technician |
| Handheld gas constituent analyzer | Factory calibration                                            | At least annually                       | Factory-authorized representative   |

### Reporting Period Calibration Calendar:

| Siemens Ultramat (Flare 1) | Siemens Ultramat (Flare 2) | GEM-5000 s/n 500309 (Engines, handheld) | GEM-5000 s/n 500340 (Engines, handheld) | Rosemount Model 3095 (Flare 1)          | Rosemount Model 3051 (Flare 2)          | Rosemount Model 3051s (Engines)         |
|----------------------------|----------------------------|-----------------------------------------|-----------------------------------------|-----------------------------------------|-----------------------------------------|-----------------------------------------|
|                            |                            | 5/13/2019 cal                           |                                         | 6/26/2018                               | 6/26/2018                               | 7/20/2016; within compliance tolerances |
|                            |                            | 4/13/2021 cal                           | 12/17/2020 cal                          | 5/31/2019; within compliance tolerances | 5/31/2019; within compliance tolerances | 2/23/2021; within compliance tolerances |
|                            |                            |                                         |                                         | 5/20/2021; within compliance tolerances | 5/20/2021; within compliance tolerances |                                         |

Non-conformances with this monitoring plan are recorded and implemented as Project Description deviations in the relevant reporting period monitoring reports and corrective action is taken as appropriate/possible to return to conformance with the monitoring plan.

### Project Personnel and Responsibilities

GFL Environmental will be responsible for data collection and quality assurance for flare related data. Relevant staff includes Andrew Whelpley, Program Manager, and Kyle Martin, Compliance Specialist. Dedicated Yokogawa data recorders will continuously record gas flow, methane, and flare operating temperature for each flare. GFL is responsible for factory calibration of the meters related to the flares.

Wabash Valley Power has overall responsibility for operation and maintenance of the power plant. The primary data that they will retain relevant to effort is the engine hour logs. GFL will be responsible for data collection and quality assurance of the engine flow meter and collection of methane readings at the power plant and field calibration of the handheld methane analyzer.

3Degrees will be responsible for collating data, performing additional quality assurance checks, preparing Project emissions reductions calculations in accordance with the PD and ACM0001, and preparing monitoring reports and VCS documentation.

### Data Generation and Storage

Project data is generated on site by Project meters, or through utility bills/propane receipts. For the engines, data from Project meters will be backed up through manual records, i.e. totaled

flow, weekly methane readings, and engine operating hours will be entered into Excel spreadsheets for long-term storage. Utility bills will be stored on site, and also scanned for transfer to 3Degrees for analysis and storage.

Continuous flow, methane, and flare temperature data for the Project flares will be recorded to flash memory cards on the data recorders and also backed up wirelessly to an online SCADA system. Field calibration records for the flare flow meters, continuous methane analyzers, and the Landtec GEMs will be stored at GFL offices in Peoria, IL. Field calibration events for the Landtec GEM will be recorded manually in a weekly monitoring log. Utility bills and propane receipts will be stored on site in the Landfill offices and scanned for transfer to 3Degrees.

Project data will be submitted to 3Degrees in electronic format on an approximately quarterly basis. 3Degrees will receive flow, methane, and engine operating hours in Excel format with the exception of raw flow data in proprietary Yokogawa format (3Degrees has a viewer for this type of file and converts to an excel format for data processing). Utility bills and factory calibration certificates will be transmitted to 3Degrees in PDF form. These data submittals will form the basis of the 3Degrees' calculation of credits generated during each monitoring period. 3Degrees will also collect current copies of permits and ensure that all necessary permits are valid.

All Project data, documents, permits, and calculations will be stored on 3Degrees' cloud based server. 3Degrees will ensure that all the documents and records are maintained for at least two years after the end of the Project crediting period.

#### **Internal Auditing Procedures**

Quality Assurance will be provided by 3Degrees' independent review of all Project data and calibration records on a quarterly basis. 3Degrees' handling of Project data will include the following steps:

- Integration of new data submittals into past performance data;
- Review of data for anomalies, inconsistencies, and outlying data points;
- Completeness checks of data for gas quality, gas quantity, and evidence of destruction;
- Review of electricity generation and engine operating hours in relationship to Project performance.

3Degrees will work with GFL to resolve any issues identified during the quality assurance review.

## **5 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS**

## 5.1 Baseline Emissions

The baseline emissions are determined according to the following equations that are based on version 19 of ACM0001. Baseline emissions from electricity, heat generation, and natural gas usage do not apply to this Project, therefore the methodology equation reduces to:

$$BE_y = BE_{CH_4,y}$$

Where  $BE_{CH_4,y}$  is given by:

$$BE_{CH_4,y} = \left( (1 - OX_{top\_layer}) \times F_{CH_4,PJ,y} - F_{CH_4,BL,y} \right) \times GWP_{CH_4}$$

Where:

$OX_{top\_layer}$  = Fraction of methane in the LFG that would be oxidized in the top layer of the SWDS in the baseline (dimensionless), equal to 0.1

$F_{CH_4,PJ,y}$  = Amount of methane in the LFG which is flared and/or used in the Project activity in year y (t CO<sub>2</sub>e/yr)

$F_{CH_4,BL,y}$  = Amount of methane in the LFG that would be flared in the baseline in year y (t CO<sub>2</sub>e/yr)

$GWP_{CH_4}$  = Global warming potential of CH<sub>4</sub> (t CO<sub>2</sub>e/tCH<sub>4</sub>), equal to 28

As required by the methodology, we set  $OX_{top\_layer}$  to 0.1 to account for the effect of oxidation. Similarly, we set the GWP of methane to the default value of 28 from the IPCC Fifth Assessment Report. The value of  $F_{CH_4,PJ,y}$  is quantified ex-post from data produced during this reporting period.

Substituting the appropriate values gives:

$$BE_{CH_4,2019} = ((1 - 0.1) \times 3,385 - 1,085) \times 28 = 54,915$$

$$BE_{CH_4,2020} = ((1 - 0.1) \times 7,105 - 2,278) \times 28 = 115,263$$

$$BE_{CH_4,2021} = ((1 - 0.1) \times 3,405 - 1,092) \times 28 = 55,232$$

For the **ex-post** calculations, we use the following equation:

$$F_{CH_4,PJ,y} = F_{CH_4,flared,y} + F_{CH_4,EL,y}$$

Where:

$F_{CH_4,PJ,y}$  = Amount of methane in the LFG which is flared and/or used in the Project activity in year y (tCH<sub>4</sub>/yr)

$F_{CH_4,flared,y}$  = Amount of methane in the LFG which is destroyed by flaring in year y (tCH<sub>4</sub>/yr).

$F_{CH_4,EL,y}$  = Amount of methane in the LFG which is used for electricity generation in year y (tCH<sub>4</sub>/yr)

The terms  $F_{CH_4,flared,y}$  and  $F_{CH_4,EL,y}$  both rely on the “Tool to determine the mass flow of a greenhouse gas in a gaseous stream” to determine the methane destroyed in the baseline.

The term  $F_{CH_4,EL,y}$  is determined directly using the tool and monitoring the working hours of the power plant so that no emission reductions are claimed during non-working hours. This is taken into account by monitoring the kW production of the equipment utilizing the LFG to only claim engine destruction when an engine is operating in year y ( $Op_{j,m,y}$ ). Substituting the appropriate values gives:

$$F_{CH_4,PJ,2019} = F_{CH_4,flared,2019} + F_{CH_4,EL,2019} = 1,711 + 1,674 = 3,385$$

$$F_{CH_4,PJ,2020} = F_{CH_4,flared,2020} + F_{CH_4,EL,2020} = 3,649 + 3,456 = 7,105$$

$$F_{CH_4,PJ,2021} = F_{CH_4,flared,2021} + F_{CH_4,EL,2021} = 2,552 + 852 = 3,405$$

The term  $F_{CH_4,flared,y}$  is determined using Equation 4 in the methodology, as below:

$$F_{CH_4,flared,y} = F_{CH_4,sent\_flare} - \frac{PE_{flare,y}}{GWP_{CH_4}}$$

Where:

$F_{CH_4,flared,y}$  = Amount of methane in the LFG which is destroyed by flaring in year y (tCH<sub>4</sub>/yr)

$F_{CH_4,sent\_flare}$  = Amount of methane in the LFG which is sent to the flare in year y (tCH<sub>4</sub>/yr), determined using the “Tool to determine the mass flow of a greenhouse gas in a gaseous stream”

$PE_{flare,y}$  = Project emissions from flaring of the residual gas stream in year y (tCO<sub>2e</sub>/yr), determined using the tool “Project emission from flaring”

To determine both  $F_{CH_4,EL,y}$  (the mass flow of methane to the engines) and  $F_{CH_4,sent\_flare,y}$  (the mass flow of methane to the flare), we measure the flow of the LFG on a volumetric wet basis using measurement Option C and the following equations:

$$F_{CH_4,t} = F_{CH_4,EL,y} = F_{CH_4,sent\_flare,y} = V_{t,wb,n} \times v_{CH_4,t,wb} \times \rho_{CH_4,n}$$

With:

$$\rho_{CH_4,n} = \frac{P_n \times MM_{CH_4}}{R_u \times T_n}$$

Where:

$F_{CH_4,t}$  = Mass flow of methane in the LFG in time interval t (lb CH<sub>4</sub>/h).

$V_{t,wb,n}$  = Volumetric flow of the LFG in time interval t on a wet basis at normal conditions (ft<sup>3</sup> wet gas/h)

$v_{CH_4,t,wb}$  = Volumetric fraction of methane in the LFG in time interval  $t$  on a wet basis (ft<sup>3</sup> CH<sub>4</sub>/ft<sup>3</sup> wet gas)

$\rho_{CH_4,n}$  = Density of methane in the landfill gas at normal conditions (lb CH<sub>4</sub>/ft<sup>3</sup> wet landfill gas)

$P_n$  = Absolute pressure at normal conditions (1 atm or 14.70 psia)

$T_n$  = Temperature at normal conditions (68 °F, or 527.67 °R)

$MM_{CH_4}$  = Molecular mass of methane (lb/lbmol)

$R_u$  = Universal ideal gas constant (psia • ft<sup>3</sup>/lbmol • R)

The volumetric flow will be converted from conditions of the internally corrected meter output to normal conditions of temperature and pressure prescribed by the Tool, as needed using the equation below:

$$V_n = V_t \times \frac{T_n}{T_t} \times \frac{P_t}{P_n}$$

$PE_{flare,y}$  is determined using the tool “Project emissions from flaring” and the equation below:

$$PE_{flare,y} = GWP_{CH_4} \times \sum_{m=1}^{525600} F_{CH_4,RG,m} \times (1 - \eta_{flare,m}) \times 10^{-3}$$

Where:

$F_{CH_4,RG}$  = Mass flow of methane in the flare gas in minute  $m$  (kg)

$\eta_{flare}$  = The efficiency of the flare in minute  $m$

Note that the flare operability is monitored via thermocouple readings.

For the **ex-post** determination of the amount of methane that would have been captured and destroyed in the baseline term  $F_{CH_4,BL,y}$ , we use Case 4 as described in ACM0001 (a requirement to destroy methane exists and a LFG capture system exists).

For Case 4, ACM0001 states that  $F_{CH_4,BL,y}$  shall be determined based on information in contract or regulation requirements and data related to the existing LFG capture system, as follows:

$$F_{CH_4,BL,y} = \max\{F_{CH_4,BL,R,y}; F_{CH_4,BL,sys,y}\}$$

Where:

$F_{CH_4,BL,R,y}$  = Amount of methane in the LFG which is flared in the baseline due to a requirement in year  $y$  (t CH<sub>4</sub>/yr) – as determined by the procedures outlined in Case 2

$F_{CH_4,BL,sys,y}$  = Amount of methane in the LFG that would be flared in the baseline in year  $y$  for the case of an existing LFG capture system (t CH<sub>4</sub>/yr) – as determined by the procedures outlined in Case 3

For the Clinton Landfill, the amount of methane destroyed in the baseline scenario is not numerically defined by a regulation or a contract, therefore we follow the Case 3 steps to determine  $F_{CH_4,BL,y}$ :

$$F_{CH_4,BL,y} = F_{CH_4,BL,sys,y} = F_{CH_4,hist,y} = \frac{F_{CH_4,BL,x-1}}{F_{CH_4,x-1}} \times F_{CH_4,PJ,y}$$

Where:

$F_{CH_4,BL,x-1}$  = the amount of methane in the LFG which is captured and destroyed in the year prior to the Project implementation (tCH<sub>4</sub>/yr)

$F_{CH_4,x-1}$  = the amount of methane in the LFG generated in the SWDS in the year prior to the Project, and is calculated according to the methodological tool “Emissions from solid waste disposal sites” (tCH<sub>4</sub>/yr)

$F_{CH_4,PJ,y}$  is calculated as above.

$F_{CH_4,BL,x-1}$  is determined using the data from one historic year (2006) prior to the start date of the Project. This data and calculation are included as Attachments 14 and 16, and were developed as part of the Project’s validation of the first crediting period. As the analysis shows, in the year prior to the Project the baseline flare destroyed 3,889 tCH<sub>4</sub>.

$F_{CH_4,x-1}$  is calculated for the same time period, 2006, based on a first-order decay model described in the “Tool to determine methane emissions avoided from dumping waste at a solid waste disposal site.” In the baseline year, 2006, the site generated 12,130 tCH<sub>4</sub>.

Combining these terms, we arrive at:

$$F_{CH_4,BL,y} = \frac{F_{CH_4,BL,x-1}}{F_{CH_4,x-1}} \times F_{CH_4,PJ,y} = \frac{3,889}{12,130} \times F_{CH_4,PJ,y} = 0.321 \times F_{CH_4,PJ,y}$$

Substituting the appropriate values gives:

$$F_{CH_4,BL,2019} = 0.321 \times 3,385 = 1,085$$

$$F_{CH_4,BL,2020} = 0.321 \times 7,105 = 2,278$$

$$F_{CH_4,BL,2021} = 0.321 \times 3,405 = 1,092$$

## 5.2 Project Emissions

See Project Data Files A and B for detailed calculations and results. Results are also provided in section 4.2.

ACM0001 requires identification of changes in fossil fuel use and non-renewable electricity consumption that occur as a result of the Project implementation.

$$PE_y = PE_{EC,y} + PE_{FC,y} + PE_{DT,y} + PE_{SP,y}$$

Where:

$PE_y$  = Project emissions in year y (t CO<sub>2</sub>/yr)

$PE_{EC,y}$  = Emissions from consumption of electricity due to the Project activity in year y (t CO<sub>2</sub>/yr)

$PE_{FC,y}$  = Emissions from consumption of fossil fuels due to the Project activity, for purposes other than electricity generation, in year y (t CO<sub>2</sub>/yr)

$PE_{DT,y}$  = Emissions from the distribution of compressed/liquefied LFG using trucks, in year y (t CO<sub>2</sub>/yr)

$PE_{SP,y}$  = Emissions from the supply of LFG to consumers through a dedicated pipeline, in year y (t CO<sub>2</sub>/yr)

$PE_{DT,y}$  and  $PE_{SP,y}$  are not applicable to this Project and are both zero.

$PE_{EC,y}$  is determined according to the Methodological tool: *Baseline, Project, and/or leakage emissions from electricity consumption and monitoring of electricity generation* and applying the appropriate methodology deviation, as below

$$PE_{EC,y} = \sum_j (EC_{PJ,j,y} \times EF_{EL,j,y} \times (1 + TDL_{j,y}))$$

Where:

$EC_{PJ,j,y}$  = quantity of electricity consumed by the Project in year y (MWh/yr)

$EF_{EL,j,y}$  = emission factor for electricity generation for source j in year y (tCO<sub>2</sub>/MWh), from eGRID

$TDL_{j,y}$  = Average technical transmission and distribution losses for providing electricity to source j in year y

$PE_{FC,y}$  is determined according to the *Tool to calculate Project or leakage CO<sub>2</sub> emissions from fossil fuel combustion* and the appropriate methodology deviation, as below:

$$PE_{FC,y} = \sum_i (FC_{i,j,y} \times COEF_{i,y})$$

Where:

$FC_{i,j,y}$  = Quantity of fuel type i combusted in process j during the year y (mass or volume unit/yr)

$COEF_{i,y}$  = The CO<sub>2</sub> emission coefficient of fuel type i in year y (tCO<sub>2</sub>/mass or volume unit)

The project used 0 gallons of propane during this reporting period, thus:

$$PE_{2019} = 0 \times 0.006 = 0$$

$$PE_{2020} = 0 \times 0.006 = 0$$

$$PE_{2021} = 0 \times 0.006 = 0$$

### 5.3 Leakage

ACM0001 states that leakage effects are not accounted for under the methodology.

### 5.4 Net GHG Emission Reductions and Removals

Emission reductions are calculated as follows:

$$ER_y = BE_y - PE_y$$

Where:

$ER_y$  = Emission reductions in year y (t CO<sub>2</sub>e/yr)

$BE_y$  = Baseline emission in year y (t CO<sub>2</sub>e/yr)

$PE_y$  = Project emission in year y (t CO<sub>2</sub>e/yr)

| Year  | Baseline emissions or removals (tCO <sub>2</sub> e) | Project emissions or removals (tCO <sub>2</sub> e) | Leakage emissions (tCO <sub>2</sub> e) | Net GHG emission reductions or removals (tCO <sub>2</sub> e) |
|-------|-----------------------------------------------------|----------------------------------------------------|----------------------------------------|--------------------------------------------------------------|
| 2019  | 54,915                                              | 30                                                 | 0                                      | 54,886                                                       |
| 2020  | 115,263                                             | 35                                                 | 0                                      | 115,228                                                      |
| 2021  | 55,232                                              | 34                                                 | 0                                      | 55,198                                                       |
| Total | 225,410                                             | 98                                                 | 0                                      | 225,312                                                      |

## APPENDIX 1: ADDITIONAL INFORMATION

### Ownership of Emissions Reductions

Wabash Valley Power Association has exclusive right to extract landfill gas and shares the revenue from any sale of carbon credits with Clinton Landfill arising from the capture and destruction of landfill gas both within the power plant and from the flares. 3Degrees has exclusive right to market any VERs arising from the project (see “06-WVPA 2018 ERPA\_redacted.pdf” and “12-Certificate of Merger 3Degrees-Origin Climate – redacted.pdf”).

### Regulatory Compliance

#### *Wabash Valley Power Facility*

The Wabash Valley power plant has been operated in accordance with the law at all times during the reporting period. The project’s permit to operate is included with the report references folder.

A search for Enforcement Orders on the Illinois Environmental Protection Agency’s website<sup>1</sup> revealed no Enforcement Orders were ever issued to the facility.

#### *Clinton Landfill*

A search of the Illinois EPA Facility Compliance Tracking System<sup>2</sup> does not show any inspection violation notices issued to Clinton Landfill.

A search for Enforcement Orders on the Illinois Environmental Protection Agency’s website (see footnote 2) revealed that two Orders were issued to Clinton Landfill in the history of its operation. The first was issued on 7/22/2004, related to improper waste disposal procedures (see “Clinton Landfill 2004 Settlement.pdf”); this settlement was unrelated to the collection of landfill gas at the site. The second Enforcement Order was issued on 1/6/2011 for continued odor violations at the site starting in April 2009 (see “Clinton Landfill 2011 Settlement.pdf”). Related to these violations and the settlement, the Landfill installed a second flare, which became operational on June 24, 2010.

Since the validated project baseline deduction increases over time to account for gas that would have been required to be destroyed under NSPS rules at an operating (and therefore growing) landfill, the installation of the second flare does not affect the additionality of the project.

During the reporting period the landfill operated the gas system on its application for a Title V Clean Air Act permit (see “Flare 1 Modification CAAPP Construction Permit 10-28-2010.pdf” and

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<sup>1</sup> <http://www.epa.state.il.us/cgi-bin/en/orders/orders.pl>

<sup>2</sup> <http://epadata.epa.state.il.us/land/WebFACTS/index.asp>

“Flare 2 CAAPP Construction Permit 10-28-2010.pdf”, as well as “CAAPP Permit issued 06-23-15 expired 06-23-20” and “CAAPP Permit\_issued 04-06-21 expires 06-29-25 (mod)”.

### Manufacturer Maintenance Recommendations

The project has several meters that require regular maintenance as follows:

Three Rosemount 3095 Multivariable Mass Flow Transmitters, which requires a calibration every five years (see “Rosemount Cal Frequency Recommendation.pdf”, and “Rosemount Specifications.pdf”).

A portable gas analyzer Landtec GEM owned by Clinton Landfill, Inc. According to the manufacturer, this device should be field calibrated before every use in the field and factory calibrated annually (see “Landtec Service Recommendation.pdf” and “Landtec GEM5000\_Manual.pdf”).

Two Siemens Ultramat 23 continuous gas analyzers. These devices should be calibrated to span gas at least once a year (see page 2-12 on “Ultramat 23 Specifications.pdf”).

### Other Forms of GHG-Related Environmental Credit

The reductions presented in this monitoring report do not create another form of environmental credit. However, at the Project facility, renewable energy generation produces renewable energy certificates (RECs). The RECs are purchased by Ameren, the alternative retail energy supplier that also purchases the generated electricity.

Guidance from the VCS secretariat makes it clear that the project boundary can be drawn such that the methane destruction credits are separated from the indirect reductions from grid power sales, as indicated in the PDD:<sup>3</sup>

The VCS treats these projects the same way as the CDM. Both the reductions from the methane destruction and renewable energy generation can create VCUs as long as the project passes the VCS additionality test. Or the electricity generation can create RECs and the methane combustion can create VCUs.

Based on the above, the project boundary has been drawn to exclude the exported electricity. The Project itself has not sought or received another form of GHG-related environmental credit.

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<sup>3</sup> Personal correspondence with Erin Craig and acting VCS Program Manager. Feb 5, 2008.

## APPENDIX 2: EVIDENCE OF SDG CONTRIBUTIONS

### SDG 3 – Good health and well-being

- 3.9.1 Mortality rate attributed to household and ambient air pollution

The Project's landfill gas destruction reduces exposure of hazardous air pollutants (HAPs) to local residents. Findings by the Natural Resources Defense Council<sup>4</sup> demonstrate that raw landfill gas is approximately 24 times for carcinogenic to human health than landfill gas combustion exhaust. Improved air quality and local health benefits result from the Project activity.

### SDG 7- Affordable and clean energy

#### 7.2.1 Renewable energy share in the total final energy consumption

During this reporting period, the project generated 37,174 MWh of renewable energy. Below is a monthly generation summary. Monthly invoices from Wabash Power to the buyer have been provided to the verifier as supporting evidence of power generation.

| Month-Year | MWh generated and sold |
|------------|------------------------|
| Jul-19     | 1,593                  |
| Aug-19     | 1,869                  |
| Sep-19     | 1,788                  |
| Oct-19     | 1,246                  |
| Nov-19     | 1,091                  |
| Dec-19     | 2,141                  |
| Jan-20     | 2,147                  |
| Feb-20     | 1,930                  |
| Mar-20     | 1,871                  |
| Apr-20     | 1,957                  |
| May-20     | 1,957                  |
| Jun-20     | 1,725                  |
| Jul-20     | 2,088                  |
| Aug-20     | 1,721                  |
| Sep-20     | 1,654                  |
| Oct-20     | 2,074                  |
| Nov-20     | 2,024                  |
| Dec-20     | 1,464                  |
| Jan-21     | 1,046                  |
| Feb-21     | 792                    |

<sup>4</sup> Natural Resources Defense Council. March 2003. Is Landfill Gas Green Energy? Table 5. Available online: <https://www.nrdc.org/sites/default/files/lfg.pdf>

| Month-Year   | MWh generated and sold |
|--------------|------------------------|
| Mar-21       | 412                    |
| Apr-21       | 0                      |
| May-21       | 761                    |
| Jun-21       | 1,825                  |
| <b>TOTAL</b> | <b>37,174</b>          |

During previous reporting periods, the project generated 167,114 MWh of renewable energy. Below is a generation summary by reporting period.

| Reporting Period  | MWh generated and sold |
|-------------------|------------------------|
| 2010              | 23,070                 |
| 2011              | 13,576                 |
| 2012              | 10,277                 |
| 2013              | 13,698                 |
| Jan-Oct 2014      | 13,838                 |
| Nov 2014-Apr 2016 | 26,857                 |
| May-Dec 2016      | 14,262                 |
| 2017              | 20,746                 |
| 2018              | 20,290                 |
| Jan-Jun 2019      | 10,499                 |
| Jul 2019-Jun 2021 | 37,174                 |