Monitoring report form for CDM project activity

(Version 06.0)

Complete this form in accordance with the instructions attached at the end of this form.

MONITORING REPORT		
Title of the project activity	Bangkok Kamphaeng Saen East : Landfill Gas to Electricity Project	
UNFCCC reference number of the project activity	3462	
Version number of the PDD applicable to this monitoring report	9	
Version number of this monitoring report	1	
Completion date of this monitoring report	22/01/2018	
Monitoring period number	8	
Duration of this monitoring period	01/11/2016 - 20/01/2018 (both dates inclusive)	
Monitoring report number for this monitoring report	1	
Project participants	Bangkok Greenpower Co., Ltd. Xentolar Holdings Limited Sindicatum Carbon Capital Ltd.	
Host Party	The Kingdom of Thailand	
Sectoral scopes	Sectoral Scope 13 - Waste Handling and Disposal	
Applied methodologies and standardized baselines	ACM0001 (Version 11) - "Consolidated baseline and monitoring methodology for landfill gas project activities"	
Amount of GHG emission reductions or net anthropogenic GHG removals achieved by the project activity in this monitoring period	Amount achieved before 1 January 2013	Amount achieved from 1 January 2013
	N/A	297,711 tCO_2e
Amount of GHG emission reductions or net anthropogenic GHG removals estimated ex ante for this monitoring period in the PDD	161,732 tCO_2e (estimated ex-ante emission reductions pro rata with the annual ex-ante estimated from 01/11/2016 - 20/01/2018 both dates inclusive)	

SECTION A. Description of project activity

A.1. General description of project activity

Bangkok Kamphaeng Saen East: Landfill Gas to Electricity Project (hereinafter is referred as “The Project”) extracts, captures and utilizes landfill gas (LFG) to generate electricity. The LFG is extracted and captured using Sindicatum Carbon Capital (ordered by Xentolar Holdings Limited, a project participant) proprietary LFG collection system and the electricity generated is exported to the Thailand electrical grid (Thai Grid).

Under the project activity, a fully integrated LFG collection system is installed and operated. When surplus LFG is available, due to engine maintenance or other site factors, LFG is sent to an enclosed ground flare where it is flared; thus minimising methane emissions and maximising carbon abatement. The average annual emission reductions of the project activity indicated in the PDD are approximately 273,081 tCO_2e yearly over the first 7-year crediting period.

The construction of landfill gas extraction pipe & gas collection system commenced in July 2009 and commissioning on February 2010. The Pre-treatment and three flares were installed from October 2009 to January 2010. Landfill gas has been extracted and combusted by flare since February 2010. The physical installation of the first four engines and construction of the grid connection was completed by the end of March 2010. Following commissioning the project exported electricity to the Thai Grid from April 2010. An additional 2 engines were installed during April 2011 and commissioned during May 2011. A further 2 engines were installed during December 2011 and commissioned during January 2012.

Total emission reductions achieved in this monitoring period are **297,711 tCO_2e**.

A.2. Location of project activity

The Project is located in the Kingdom of Thailand, at T. Sasimhum, A. Kamphaeng Saen, Nakhon Pathom, 73140. The geographic coordinates of the project are: longitude 14°3'50.62"N and latitude 99°56'50.96"E.

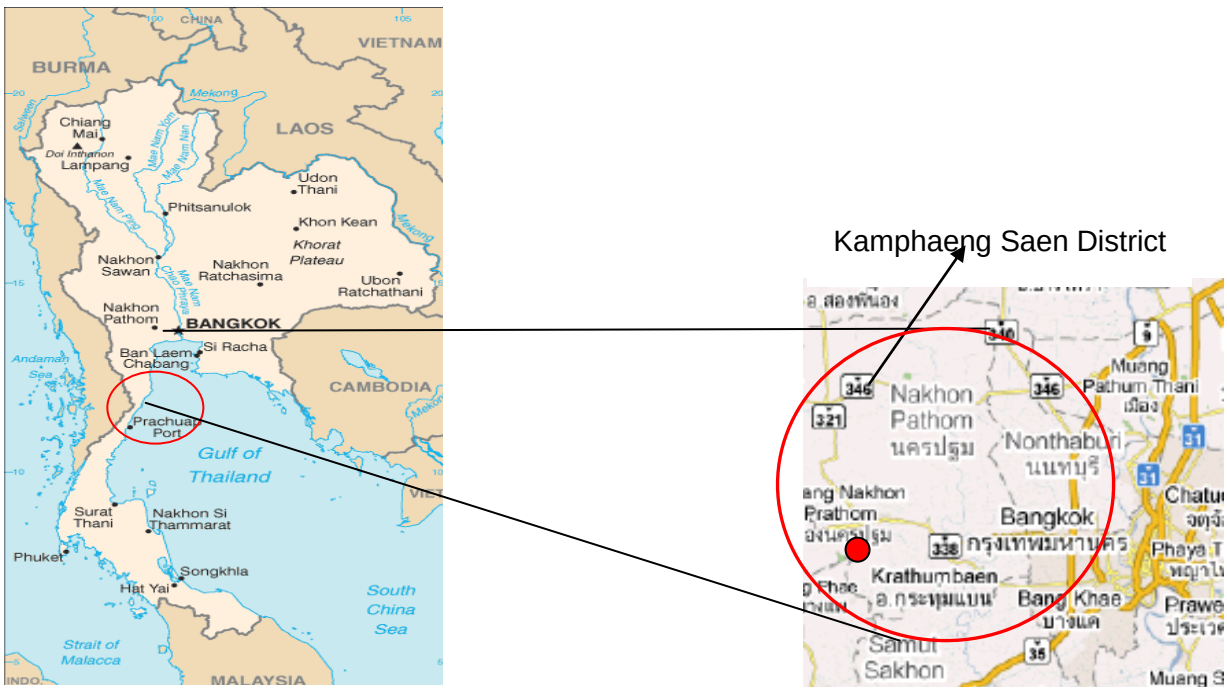

Figure A.2.1 Location of the project activity.

A.3. Parties and project participants

Parties involved	Project participants	Indicate if the Party involved wishes to be considered as project participant (Yes/No)
The Kingdom of Thailand (host)	Bangkok Greenpower Co., Ltd.	No
UK (Annex I)	Xentolar Holdings Limited	No
UK (Annex I)	Sindicatum Carbon Capital Ltd.	No

A.4. Reference to applied methodologies and standardized baselines

a) Baseline and monitoring methodology ACM0001 (Version 11) - "Consolidated baseline and monitoring methodology for landfill gas project activities";
b) "Tool for the demonstration and assessment of additionality" - Version 05.2
c) "Tool to determine project emissions from flaring gases containing methane" - Version 1
d) "Tool to calculate the emission factor for an electricity system" - Version 02
e) "Tool to determine methane emissions avoided from disposal of waste at a solid waste disposal site" - Version 04
f) "Tool to calculate baseline, project and/or leakage emissions from electricity consumption" - Version 1
g) "Tool to calculate project or leakage or CO_2 emissions from fossil fuel combustion (Version 02)

Detailed information regarding these methodologies and tools please refer to UNFCCC methodology website.

A.5. Crediting period type and duration

A renewable 7 years crediting period was chosen for the project activity. The start date of the crediting period was 21-01-2011.

SECTION B. Implementation of project activity

B.1. Description of implemented project activity

The project is extracting, capturing and utilizing landfill gas (LFG) from Kamphaeng Saen East Landfill to generate electricity. The electricity generated is exported to the Thai Grid. Whenever there is surplus LFG, due to engine maintenance or other site factors, LFG is sent to an enclosed ground flare where it is flared thus minimising methane emissions and maximising carbon abatement.

Landfill gas collection system:

High-density polyethylene (HDPE) horizontal collection pipes have been installed in the waste as an integral part of the tipping operation. These collection wells are augmented by additional horizontal and vertical collection wells. The collection pipes are connected via main carrier pipes to the LFG extraction plant and a negative pressure applied. The LFG, comprising approximately 50% methane and 50% carbon dioxide is used for power generation with any surplus gas flared. The SCC proprietary LFG system has been designed to optimise LFG recovery and utilisation and optimise carbon abatement, and is designed to overcome inherent problems associated with LFG projects in similar conditions.

The recovered LFG passes through the pre-treatment plant where moisture and particulates are removed prior to the power generating engines. The pre treatment plant is designed to ensure that the gas quality reaching the engines is in line with the manufacturer's requirements. A schematic layout of the pre treatment and utilisation plant is shown in Figure B.1-1 below. Power generation units have been installed in line with electrical infrastructure capacity and also to match the LFG recovery profile. Sufficient flare capacity has been installed to ensure that any surplus LFG is flared if engine capacity is insufficient or during periods of maintenance or breakdown. The interface control and system management has been designed to allow real time adjustment of system performance thus optimising gas utilisation and carbon abatement.

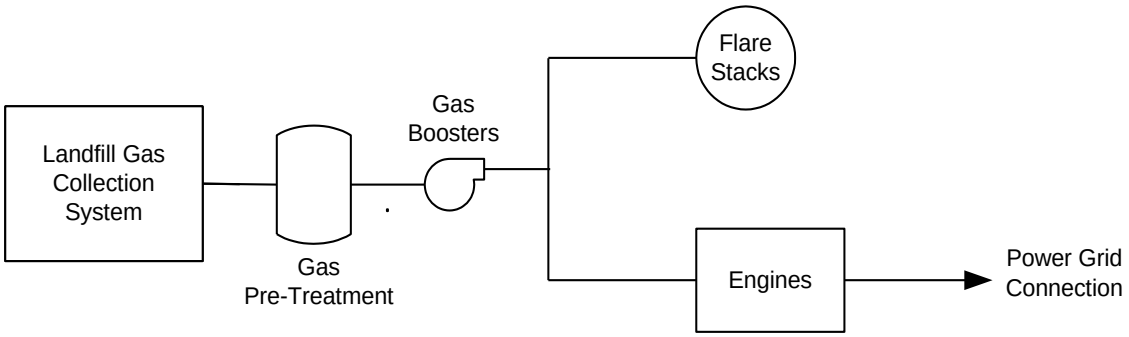

Figure B.1-1 Technical diagram of the project activity

LFG generator sets:

After the LFG has passed through the pre treatment plant the gas is sent to spark ignition power generation units. The electricity produced is distributed to the Thailand Electric Grid. Currently the project activity consists of 8 generator sets manufactured by GE Jenbacher. The specification for the generator sets are shown below:

Parameters	Generator Sets
Quantity	8
Style	4 strokes
Rated rotating speed	1500 r/minute
Rated power	1063 kW
Rated voltage	400 V
Rated frequency	50 Hz

The generator sets used by this project are designed for power generation by utilizing landfill gas.

Flare system:
The surplus gas is destroyed by a flare system. The combination of power generation and flare optimizes the destruction of landfill gas.

The flare installation used by this project meets all of the necessary conditions that are required by "Tool to determine project emissions from flaring gases containing methane" option a) for a default value of 90% for flare efficiency with continuous monitoring of compliance with the flare manufacture specifications. The flare system is equipped with a monitoring system to measure flow, pressure, methane concentration and the temperature in order to comply with the tool.

Below is a summary of the technical specification of the flare:

Parameters	**Flare**
Type	Enclosed Flare
Quantity	3
Capacity	2,000 Nm^3/h
Flare Temperature (°C)	500-1200
Methane Combustion Efficiency	>98%
Manufacturer	Nanjing Carbon Recycle Biomass Technology Co., Ltd

Specification of the installed monitoring equipment is detailed in the tables included in section D.

The three Flares were installed between October 2009 and January 2010. Landfill gas has been extracted and combusted by flares since February 2010, and the 3 Flares were completely commissioned on 25/06/2010. The physical installation of the first 4*1063kW engines and construction of the grid connection was completed by late March 2010. Following commissioning of the grid connection the project started to export power to the Thai Grid on 08/04/2010. An additional 2*1063kW engines (No. 5 & 6) were installed during April and commissioned during May 2011. An additional 2*1063kW engines (No. 7 & 8) were install during December 2011 and commissioned in January 2012. The dates of commissioning completion for the engines were as follows:

Engine	Commissioning Handover Date	Engine	Commissioning Handover Date
1	18/05/2010	5	20/04/2011
2	17/06/2010	6	20/05/2011
3	18/05/2010	7	27/01/2012
4	18/05/2010	8	27/01/2012

The project activity started to export power on 08/04/2010 at a capacity of 0.8MW, which was subsequently increased to 3MW on 03/06/2010, 4MW on 06/10/2010, 6MW on 26/05/2010 and 6.3MW on 12/07/2011; as each phase of the power generation plant has been granted approval by the Provincial Electricity Authority (PEA) and PEA has approval for the increase from 6.3MW to 8MW export on 18/07/2012.

Meanwhile, excessive landfill gas was also combusted by the flares in conjunction with power generation. At this stage, the combination of power generation and flaring optimizes the destruction of landfill gas. The landfill was closed in July 2015. The LFG is generated continuously. Thus, the existing generators are still operating. However, there will be no additional generator sets installation.

Therefore, emission reductions of methane destroyed by both flare and power generation occurred within this monitoring period and emission reductions calculated for both types of LFG destruction are included in this monitoring report.

This is the 8th monitoring report. The monitoring period covered by this monitoring report is **01/11/2016 – 20/01/2018 (both dates inclusive)**.

The individual engine operational time for this monitoring period is provided in section D.2 – operation of energy plant. Information regarding replacement schedule of monitoring equipment is referred to in Annex E.

Special events which impact on the operation of the project activity such as downtime, major, overhaul, equipment failure, that exceed more than 24 hours during this monitoring period are detailed in Annex F.

No events or situations may which impact the applicability of the methodology occurred during this monitoring period.B.2.Post registration changes

B.2. Post-registration changes

B.2.1. Temporary deviations from the registered monitoring plan, applied methodologies or standardized baselines

No temporary deviations from registered monitoring plan or applied methodology were applied during this monitoring period.

B.2.2. Corrections

Not applicable

B.2.3. Changes to the start date of the crediting period

There have been no changes to the start date of crediting period submitted or approved during this monitoring period with this monitoring report.

B.2.4. Inclusion of monitoring plan

Not applicable

B.2.5. Permanent changes to the registered monitoring plan, or permanent deviation of monitoring from the applied methodologies, standardized baselines, or other applied standards or tools

There have been no permanent changes from registered monitoring plan or applied methodology submitted or approved during this monitoring period with this monitoring report.

Previously, there has been a permanent change from registered monitoring plan made to include parameters related to the monitoring of project emissions from temporary fossil fuel consumption as a result of a change to the project design. These changes were approved by the UN secretariat; reference PRC-3462-001, on 8th Feb, 2013

B.2.6. Changes to project design

There have been no changes to the project design of the project activity submitted or approved during this monitoring period with this monitoring report.

Previously, there has been the change to the project design of the project activity due to the temporary fossil fuel consumption. These changes were approved by the UN secretariat, reference PRC-3462-001, on 8th Feb, 2013.

SECTION C. Description of monitoring system

In order to guarantee the quality of the data and data collection system, a detailed monitoring manual has been developed and implemented. This detailed monitoring manual (available for verification by the DOE) is based upon requirements set out in the PDD and monitoring plan.

Management structure for the implementation of monitoring plan

The project owner has established a specific CDM department and a CDM manager has been appointed to oversee that activities are carried out according to the monitoring plan. The organizational structure for the CDM department is shown below.

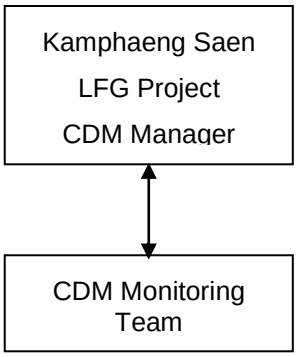

Figure C.1 Organisation Structure of the CDM Team

Responsibility and CDM management:

A CDM Manager is appointed with responsibility for monitoring all Project related activities and organizing training. The CDM Manager is responsible for overseeing the implementation of this procedure. Competency requirements for the position of CDM Manager are defined and applied to ensure that the CDM Manager is able to implement this procedure.

All calculations are checked and signed off by the CDM Manager who is also be responsible for preparing and checking the documents required for verification.

A CDM Monitoring Team, that reports directly to the CDM Manager, has day to day responsibilities for checking instrumentation, record keeping, data handling and data processing, filing, reporting, organizing repair and maintenance of monitoring equipment and ensuring the monitoring plan is adhered to as indicated in the approved PDD. The monitoring staffs have received technical training and refresher training as well as safety training to minimize exposure to workplace hazards.

A management level link has been established to ensure effective co-operation between landfill staff and CDM monitoring staff.

All relevant information, notes of meetings, data files, training records, maintenance records, defect reports, hard copy and computerized records of monitoring are kept at a designated location and arranged in an orderly and transparent manner to facilitate auditing as and when required.

Responsibilities, procedures, methods, equipment types and specifications are described in detail in a site-specific CDM monitoring manual.

The parameters monitored and the monitoring procedure applied for determination of the emission reductions is described in detail in section B.7.1 of the Project Design Document Version 9, dated 02/07/2012, and available upon the UNFCCC website:
http://cdm.unfccc.int/Projects/DB/SGS-UKL1267631662.24/view

An overview of the parameters monitored is provided in **Section D**.

The location of measurement devices is presented in Figure C.2 below:

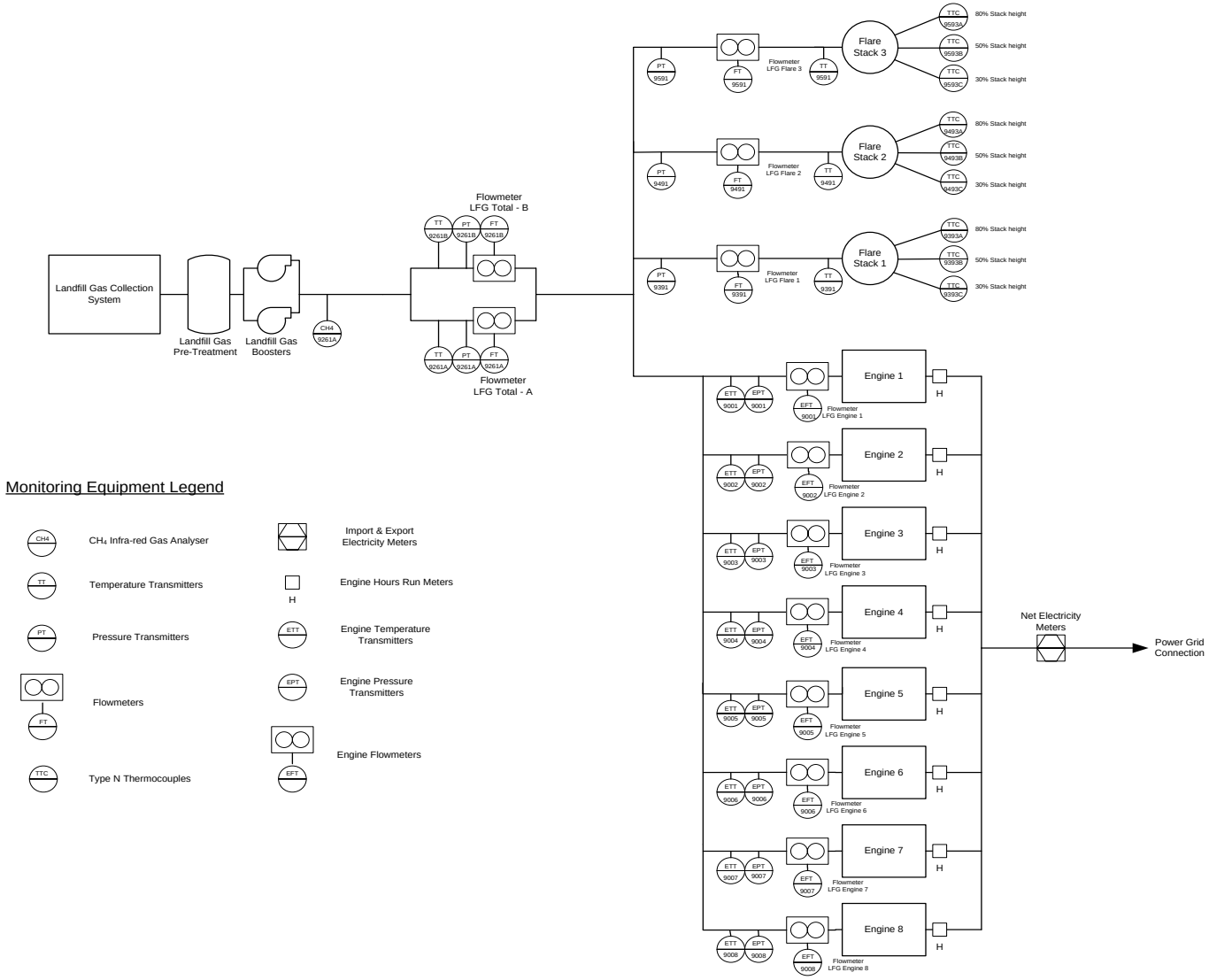

Figure C.2 - Location of the measurement devices[1]

[1] Details of monitoring equipment installation and calibration dates refer to Annex E

Data collection and management

- On-line monitoring

With the exception of the electricity, meters which are continual measured and manually recorded on monthly basis, monitoring equipment required to determine GHG emissions and emission reductions are monitored on-line from a central control point which records meter readings at one minute intervals.

- Manual data recording system

A manual data recording system to act as a back-up for the on-line monitoring system is in place. This involves completion of a log sheet that records flow meter readings on daily basis. Spot readings of other values (methane concentration, temperature and pressure) are also recorded periodically and at the times when flow meter readings are taken on daily basis.

- Regulatory requirements related to landfill gas projects

Although the methodology only requires recording at the renewal of the crediting period, the information related to all relevant policies and circumstances are collected and recorded annually. Information will be kept during crediting period and two years after.

- Data archiving

The on-line monitoring system automatically and periodically archives data in a safe manner. Electronic documents are saved for backup, with written documents and back-ups safely kept. Calibration data is saved electronically. All information related to monitoring such as meeting minutes, data documents, maintenance records, accident reports, hard copies as well as computer records, are kept at designated locations to ensure that the examination process is transparent and effective. These data will be stored until 2 years after the end of the crediting period.

Maintenance and calibration of meters

All meters are maintained as specified in the CDM monitoring manual and according to manufacturer specifications. All key meters are subject to a quality control regime that includes regular maintenance and calibration. Calibrations are carried out by the manufacturer or a suitably qualified external company. A record is maintained showing the location and unique identification number of each meter, the calibration status of that meter (when last calibrated, when next due for calibration) and who performs the calibration service. Calibration certificates will be retained for all meters until two years after the end of the crediting period.

Mass flow of methane supplied to the engines is corroborated by comparison with the sum of the gross engine power outputs, the relationship being a function of engine efficiency which can be considered a constant under the proposed maintenance regime.

Treatment of missing or corrupted data

When data in the on-line system are corrupted or missing whilst the generators are operating (as shown, for example, by electricity output) the missing data can be estimated by taking the lower or higher value of the parameter one hour before the error or one hour after the system restart. If there is evidence that neither of these values is representative, use the average value of the parameter from the previous 24 hours.

Any error is recorded in the log sheet and the occurrence of the error is investigated and rectified as soon as possible. If the on-line system is compromised for more than 24 hours, data is manually recorded. Manually recorded data is backup data for methane destruction amount and other key parameters. Any deficiencies in methane flow monitoring data are rectified by calculation from power generation data.

Any treatment of missing or corrupt data is detailed and available for verification by DOE.

Non-essential data

The on-line monitoring system also records "non-essential" data. Such data is termed non-essential because it is not directly listed in the CDM Monitoring Methodology, but it will constitute a means of corroborating the on-line system. Non-essential data may include measurements of net and gross output from individual generators, certificated conversion efficiency, waste deposition and any other data considered relevant to the project activity.

Document Control

The CDM Manager has implemented a document control system that ensures that the current versions of necessary documents are available at the point of use.

Audit function and management review

The CDM Manager arranges for an independent internal audit of the management system periodically and at least once per year. The auditor is not be involved in the daily operation of the project and if necessary, may be sourced from a third party. The auditor assesses the implementation of the monitoring procedure and the preparation of the monitoring report. Audit findings and steps taken to address findings are recorded and reviewed in a Management Review meeting (convened at least annually) at which time the effectiveness of these procedures will be reviewed and necessary changes implemented. The audit reports and annual review meeting notes are available to the verifying DOE.

SECTION D. Data and parameters

D.1. Data and parameters fixed ex ante

Data/Parameter	GWP_{CH4}
Unit	tCO_2e/tCH_4
Description	Global warming potential of CH_4
Source of data	IPCC and change from GWP of 21 to 25 according to decision 4/CMP7 and paragraph 66, EB69
Value(s) applied	25 after January 1st, 2013
Choice of data or measurement methods and procedures	As per ACM0001 version 11
Purpose of data/parameter	This data is used for baseline and project emission reduction calculations.
Additional comments	Shall be updated according to any future COP/MOP decisions

Data/Parameter	D_{CH4}
Unit	$tCH_4/ m^3 CH_4$
Description	Methane density
Source of data	ACM0001 version 11
Value(s) applied	0.0007168 (at standard temperature and pressure: 0 degree Celsius and 1.013 bar)
Choice of data or measurement methods and procedures	As per ACM0001 version 11
Purpose of data/parameter	This data is used for baseline emission calculations.
Additional comments	N/A

Data/Parameter	$CEF_{elec,BL,y}$ (the same parameter as $EF_{EL,}$)
Unit	tCO_2/MWh
Description	Grid emission factor of electricity

Source of data	Thai grid emission factor calculation
Value(s) applied	0.57420
Choice of data or measurement methods and procedures	As per "Tool to calculate the emission factor for an electricity system" Version 01.1
Purpose of data/parameter	This data is used for baseline emission and project emission calculations.
Additional comments	N/A

D.2. Data and parameters monitored

Data/Parameter	$LFG_{total,y}$
Unit	m^3
Description	Total amount of landfill gas captured at Normal Temperature and Pressure
Measured/calculated/ default	Measured
Source of data	Flow meter readings
Value(s) of monitored parameter	Refer to Emission Reductions spreadsheet
Monitoring equipment	• V-Cone Flow Meter – with associated Rosemount 3051CD differential pressure transmitter. • See specification details in Annex D. • See installation date, calibration dates and equipment validity periods in Annex E.
Measuring/reading/recording frequency	Continuous measuring/recorded every minute Data is aggregated monthly and yearly.
Calculation method (if applicable)	N/A
QA/QC procedures	Data is backed up and archived, where it is stored for two years longer than the crediting period or two years after the last issuance of CERs. For internal cross checking purposes the consistency of flow measurements is checked by examining the hourly flow balance. The conservative value is used for ER calculation. $(LFG_{flare,h} + LFG_{electricity,h}) = LFG_{total,h}$ Flow meter is calibrated according to the manufacturer's specifications. Calibrations are carried out by the manufacturer or a suitably qualified external company. Calibration and maintenance records are retained. On site staffs have received training in CDM monitoring and the maintenance requirements of the flow meters.
Purpose of data/parameter	For baseline emission calculation
Additional comments	N/A

Data/Parameter	$LFG_{flare,y}$ (The same as $FV_{RG,h}$, different nomenclature for ACM0001 (version 11) and "Tool to determine project emissions from flaring gases containing methane".)
Unit	m^3
Description	Amount of landfill gas flared at Normal Temperature and Pressure
Measured/calculated/ default	Measured
Source of data	Flow meter on the inlet to each flare.
Value(s) of monitored parameter	Refer to Emission Reductions spreadsheet
Monitoring equipment	• V-Cone Flow Meter –with associated Rosemount 3051CD differential pressure transmitter. • See specification details in Annex D. • See installation date, calibration dates and equipment validity periods in Annex E.

Measuring/reading/recording frequency	Continuous measuring/reading every minute. Data is aggregated monthly and yearly.
Calculation method (if applicable)	N/A
QA/QC procedures	Data is backed up and archived, where it is stored for two years longer than the crediting period or two years after the last issuance of CERs. For internal cross checking purposes the consistency of flow measurements is be checked by examining the hourly flow balance. The conservative value is used for ER calculation. ($LFG_{flare,h}$ + $LFG_{electricity,h}$) = $LFG_{total,h}$ Flow meter is calibrated according to the manufacturer's specifications. Calibrations are carried out by the manufacturer or a suitably qualified external company. Calibration and maintenance records are retained. On site staff have received training in CDM monitoring and the maintenance requirements of the flow meters.
Purpose of data/parameter	For baseline emission and project emission calculation
Additional comments	N/A

Data/Parameter	$LFG_{electricity,y}$
Unit	m^3
Description	Amount of landfill gas combusted in power plant at Normal Temperature and Pressure
Measured/calculated/ default	Measured
Source of data	Flow meter on the inlet to each generator.
Value(s) of monitored parameter	Refer to Emission Reductions spreadsheet
Monitoring equipment	• V-Cone Flow Meter –with associated Rosemount 3051CD differential pressure transmitter. • See specification details in Annex D. • See installation date, calibration dates and equipment validity periods in Annex E.
Measuring/reading/recording frequency	Continuous measuring/reading every minute. Data is aggregated monthly and yearly.
Calculation method (if applicable)	N/A
QA/QC procedures	Data is backed up and archived, where it is stored for the longer of two years longer than the crediting period or two years after the last issuance of CERs. For internal cross checking purposes the consistency of flow measurements is be checked by examining the hourly flow balance. The conservative value is used for ER calculation. ($LFG_{flare,h}$ + $LFG_{electricity,h}$) = $LFG_{total,h}$ Flow meter is calibrated according to the manufacturer's specifications. Calibrations are carried out by the manufacturer or a suitably qualified external company. Calibration and maintenance records are retained. On site staff have received training in CDM monitoring and the maintenance requirements of the flow meters.
Purpose of data/parameter	For baseline emission calculation
Additional comments	N/A

Data/Parameter	$PE_{flare,y}$
Unit	tCO_2e
Description	Project emissions from flaring of the residual gas stream in year *y*
Measured/calculated/ default	Calculated
Source of data	Calculated

Value(s) of monitored parameter	Refer to Emission Reductions spreadsheet
Monitoring equipment	N/A
Measuring/reading/recording frequency	N/A
Calculation method (if applicable)	The parameter is calculated as per "Tool to determine project emissions from flaring gases containing Methane".
QA/QC procedures	Regular maintenance should ensure optimal operation of flares. The enclosed flares are operated and maintained as per the specifications prescribed by the manufacturer.
Purpose of data/parameter	For project emission calculation
Additional comments	N/A

Data/Parameter	$\omega_{CH4,y}$ (The same parameter as $fv_{CH\ 4,RG,h}$ different nomenclature for ACM0001(version 11) and "Tool to determine project emissions from flaring gases containing methane" (version 1).)
Unit	m^3CH_4/m^3LFG
Description	Methane fraction in the landfill gas
Measured/calculated/ default	Measured
Source of data	Gas quality analyzer reading
Value(s) of monitored parameter	Refer to Emission Reductions spreadsheet
Monitoring equipment	• Infra-Red Gas Monitor. • See specification details in Annex D. • See installation date, calibration dates and equipment validity periods in Annex E.
Measuring/reading/recording frequency	Continuous measuring/reading every minute Data is aggregated monthly and yearly.
Calculation method (if applicable)	N/A
QA/QC procedures	Routine checks are performed by the CDM Monitoring Team to ensure proper functioning of the equipment. Any faults are reported to the CDM Manager for action. Monthly zero checks using atmospheric air or a certified nitrogen reference gas. Monthly site gas span undertaken using certified calibration gas. Gas analyser maintained and calibrated as per manufacturers recommendations. Data is backed up and archived where it is stored for the longer of two years longer than the crediting period or two years after the last issuance of CERs.
Purpose of data/parameter	For baseline emission calculation
Additional comments	N/A

Data/Parameter	T
Unit	°C
Description	Temperature of the landfill gas
Measured/calculated/ default	Measured
Source of data	Temperature probe in LFG pipe work between the gas treatment package and the generator sets / flares.
Value(s) of monitored parameter	Refer to Emission Reductions spreadsheet

Monitoring equipment	• Temperature Transmitter. • See specification details in Annex D. • See installation date, calibration dates and equipment validity periods in Annex E.
Measuring/reading/recording frequency	Continuous measuring/reading every minute
Calculation method (if applicable)	N/A
QA/QC procedures	Routine checks are performed by CDM Monitoring Team to ensure proper functioning of the equipment. Any faults are reported to the CDM Manager for action. Temperature probe maintained and calibrated as per manufacturers recommendations. Data is backed up and archived where it is stored for the longer of two years longer than the crediting period or two years after the last issuance of CER's.
Purpose of data/parameter	For baseline emission calculation
Additional comments	N/A

Data/Parameter	P
Unit	Pa
Description	Pressure of the landfill gas
Measured/calculated/ default	Measured
Source of data	Pressure transmitter mounted in the LFG pipe work between the gas treatment package and the generator sets / flares.
Value(s) of monitored parameter	Refer to Emission Reductions spreadsheet
Monitoring equipment	• Absolute Pressure Transmitter • See specification details in Annex D. • See installation date, calibration dates and equipment validity periods in Annex E.
Measuring/reading/recording frequency	Continuous measuring/reading every minute Data is aggregated monthly and yearly.
Calculation method (if applicable)	N/A
QA/QC procedures	Routine checks are performed by CDM Monitoring Team to ensure proper functioning of the equipment. Any faults are reported to the CDM Manager for action. Pressure Transmitter maintained and calibrated as per manufacturers recommendations. Data is backed up and archived where it is stored for the longer of two years longer than the crediting period or two years after the last issuance of CER's.
Purpose of data/parameter	For baseline emission calculation
Additional comments	N/A

Data/Parameter	EL_{LFG}
Unit	MWh
Description	Net quantity of electricity produced / exported using LFG
Measured/calculated/ default	Measured
Source of data	Electricity meter
Value(s) of monitored parameter	Refer to Emission Reductions spreadsheet

Monitoring equipment	• Electricity Meter • See specification details in Annex D. • See installation date, calibration dates and equipment validity periods in Annex E.
Measuring/reading/recording frequency	Continuously measured. Data is aggregated monthly and yearly.
Calculation method (if applicable)	N/A
QA/QC procedures	The electricity meters are maintained and calibrated according to manufacturer's instructions or the relevant regulations. Data will be archived for 2 years after the crediting period or two years after the last issuance of CERs. The data can be corroborated against financial data from the export of power to the grid.
Purpose of data/parameter	For baseline emission calculation
Additional comments	N/A

Data/Parameter	EL_{import} (The same parameter as ECPJ,j,y)
Unit	MWh
Description	Net amount of electricity imported from the grid for auxiliary use
Measured/calculated/ default	Measured
Source of data	Electricity meter
Value(s) of monitored parameter	Refer to Emission Reductions spreadsheet
Monitoring equipment	• Electricity Meter • See specification details in Annex D. • See installation date, calibration dates and equipment validity periods in Annex E.
Measuring/reading/recording frequency	Continuously measured. Data is aggregated monthly and yearly
Calculation method (if applicable)	N/A
QA/QC procedures	The electricity meters are maintained and calibrated according to manufacturer's instructions or the relevant regulations. Data will be archived for 2 years after the crediting period or two years after the last issuance of CERs. The data can be corroborated against financial data from the import of power from the grid
Purpose of data/parameter	For project emission calculation
Additional comments	N/A

Data/Parameter	Operation of the energy plant
Unit	Hours
Description	Operation of the energy plant
Measured/calculated/ default	Measured
Source of data	Measured with individual, software based, run meters on each generator set, readings taken from SCADA system

Value(s) of monitored parameter	Engine # 1: 6,127 hours run Engine # 2: 6,685 hours run Engine # 3: 5,264 hours run Engine # 4: 6,087 hours run Engine # 5: 8,415 hours run Engine # 6: 8,736 hours run Engine # 7: 7,999 hours run Engine # 8: 7,711 hours run (01/11/2016-12/01/2018 both dates inclusive)
Monitoring equipment	Run meters
Measuring/reading/recording frequency	Continuously Measured
Calculation method (if applicable)	N/A
QA/QC procedures	N/A
Purpose of data/parameter	For emission reductions calculation
Additional comments	N/A

Data/Parameter	T_{flare}
Unit	°C
Description	Temperature of the exhaust gas of the flare
Measured/calculated/ default	Measured
Source of data	Type N Temperature thermocouple mounted in flare stack
Value(s) of monitored parameter	Refer to Emission Reductions spreadsheet
Monitoring equipment	• Type N Thermocouple • See specification details in Annex D. • See installation date, calibration dates and equipment validity periods in Annex E.
Measuring/reading/recording frequency	Continuous measuring/reading every minute
Calculation method (if applicable)	N/A
QA/QC procedures	Routine checks are performed by Site Engineers to ensure proper functioning of the equipment. Any faults are reported to the CDM Manager for action. Thermocouple maintained and calibrated as per manufacturer's recommendations. Data is backed up and archived where it is stored for the longer of two years longer than the crediting period or two years after the last issuance of CER's.
Purpose of data/parameter	For project emission calculation
Additional comments	N/A

Data/Parameter	$TDL_{j,y}$
Unit	%
Description	Average technical transmission and distribution losses for providing electricity to Source *j*
Measured/calculated/ default	Calculated
Source of data	Table 40 Electric balance of national grid, page 62 of Annual Report Energy Balance in Thailand 2016 by DEDE Department Ministry of Energy, Thailand. Most recent, accurate and reliable published data available within the host country is applied.
Value(s) of monitored parameter	7.54

Monitoring equipment	N/A
Measuring/reading/recording frequency	Annually
Calculation method (if applicable)	<table><tr><td>Year</td><td>2016</td></tr><tr><td>Electric Supply Generation</td><td>187,640</td></tr><tr><td>Electric Supply Net Import</td><td>18,389</td></tr><tr><td>Station Service Consumed</td><td>3,300</td></tr><tr><td>Line Losses</td><td>12,225</td></tr><tr><td>Distribution loss</td><td>7.54 %</td></tr></table> Total distribution loss = (Station Service Consumed + Line Losses) / (Electric Supply Generation + Electric Supply Net Import)
QA/QC procedures	N/A
Purpose of data/parameter	For project emission calculation
Additional comments	N/A

Data/Parameter	Other flare operation parameters
Unit	°C, m^3CH_4/m^3LFG, and m^3
Description	The following parameters have been detailed earlier, however these parameters are also used to ensure that the flares are operating within their specifications and the flare efficiency default value is allocated accordingly: <table><tr><th>Parameter</th><th>Range for technical specifications</th></tr><tr><td>Temperature of flare exhaust gas (T_{flare},)</td><td>500 - 1,200 °C</td></tr><tr><td>Methane fraction in landfill gas ($\omega_{CH4,y}$)</td><td>25 – 65 %</td></tr><tr><td>Amount of landfill gas flared at Normal temperature and pressure (LFG_{flare})</td><td>300 - 2,000 Nm^3/h</td></tr></table> The flare efficiency is determined as set out in Annex A and B
Measured/calculated/ default	Measured
Source of data	• Temperature transmitter • Infra-Red Gas Monitor • V-Cone Flow Meter – with associated Rosemount 3051CD differential pressure transmitter
Value(s) of monitored parameter	Refer to emission reduction spreadsheet
Monitoring equipment	N/A
Measuring/reading/recording frequency	Continuously
Calculation method (if applicable)	N/A
QA/QC procedures	Refer to individual parameters
Purpose of data/parameter	For determination of default flare efficiency for project emission calculation
Additional comments	N/A

Data/Parameter	Regulatory requirements relating to landfill gas projects
Unit	-
Description	Regulatory requirements relating to landfill gas projects may affect the value of AF or $MD_{reg,y}$

Measured/calculated/ default	Measurements by project participants
Source of data	See details in Annex C.
Value(s) of monitored parameter	N/A
Monitoring equipment	N/A
Measuring/reading/recording frequency	Annually
Calculation method (if applicable)	N/A
QA/QC procedures	N/A
Purpose of data/parameter	For baseline emission calculation
Additional comments	N/A

Data/Parameter	$FC_{i,j,y}$
Unit	Mass or volume unit per year (e.g. ton/yr or m^3/yr)
Description	Quantity of fuel type i combusted in process j during the year y
Measured/calculated/ default	Measured
Source of data	Onsite measurements by project participants
Value(s) of monitored parameter	Refer to Emission Reductions spreadsheet
Monitoring equipment	Rulers
Measuring/reading/recording frequency	In cases where fuel is supplied from small daily tanks, rulers can be used to determine mass or volume of the fuel consumed. It shall have a book or record sheet of control for fuel consumed recording (on a daily basis or per shift).
Calculation method (if applicable)	N/A
QA/QC procedures	The consistency of metered fuel consumption quantities should be cross-checked by an annual energy balance that is based on purchased quantities and stock changes. Where the purchased fuel invoices can be identified specifically for the CDM project, the metered fuel consumption quantities should also be cross-checked with available purchase invoices from the financial records.
Purpose of data/parameter	For project emission calculation
Additional comments	N/A

Data/Parameter	$NCV_{i,y}$
Unit	GJ per mass or volume unit (e.g. GJ/m^3, GJ/ton)
Description	Weighted average net calorific value of fuel type i in year y
Measured/calculated/ default	0.03642 GJ/litre (Reference to Summary Report – the Study of Emission factor for an electricity generation of Thailand in Year 2010

Source of data	The following data sources may be used if the relevant conditions apply: Data source: a) Values provided by the fuel supplier in invoice — Conditions for using the data source: This is the preferred source b) Measurements by the project participants — If a) is not available c) Regional or national default values — If a) is not available d) IPCC default values at the upper limit of the uncertainly at a 95% confidence interval as provided in Table 1.2 of Chapter 1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG inventories — If a) is not available
Value(s) of monitored parameter	Refer to Emission Reductions spreadsheet
Monitoring equipment	N/A
Measuring/reading/recording frequency	N/A
Calculation method (if applicable)	The parameter is calculated as per "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion" (version 02).
QA/QC procedures	Verify if the values under a), b) and c) are within the uncertainty range of the IPCC default values as provided in Table 1.2, Vol. 2 of the 2006 IPCC Guidelines. If the values fall below this range collect additional information from the testing laboratory to justify the outcome or conduct additional measurements. The laboratories in a), b) or c) should have ISO17025 accreditation or justify that they can comply with similar quality standard.
Purpose of data/parameter	For project emission calculation.
Additional comments	Applicable where Option B of the "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion" (version 02) is used.

Data/Parameter	$EF_{CO2,i,y}$
Unit	tCO_2/GJ
Description	Weighted average CO_2 emission factor of fuel type i in year.
Measured/calculated/ default	0.07480 tCO_2/GJ (Diesel fuel is selected)
Source of data	IPCC default values at the upper limit of the uncertainly at a 95% confidence interval as provided in Table 1.4 of Chapter 1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG inventories.
Value(s) of monitored parameter	N/A
Monitoring equipment	N/A
Measuring/reading/recording frequency	For a) and b): Measurements should be undertaken in line with national or international fuel standards.
Calculation method (if applicable)	N/A
QA/QC procedures	N/A
Purpose of data/parameter	For project emission calculation.
Additional comments	Applicable where option B of the "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion" (version 02) is used.

D.3. Implementation of sampling plan

Not applicable

SECTION E. Calculation of emission reductions or net anthropogenic removals

E.1. Calculation of baseline emissions or baseline net removals

The formulae used for determination of the baseline emissions are described in section B.6.1 of the registered PDD for the project activity.

$$BE_y = (MD_{project,y} - MD_{BL,y}) * GWP_{CH4} + EL_{LFG,,y} * CEF_{elec,BL,y} + ET_{LFG,y} * CEF_{ther,BL,y} \quad (1)$$

Where:

BE_y = Baseline emission in year y(tCO_2e)

$MD_{project,y}$ = The amount of methane that would have been destroyed/combusted during year y (tCH_4) in project scenario

$MD_{BL,y}$ = The amount of methane that would have been destroyed/combusted during year y in the absence of the project due to regulatory and/or contractual requirement (tCH_4) this is zero for this project

GWP_{CH4} = Global Warming Potential value for methane of 25 after January 1st, 2013 ($tCO_2e/tCH4$).

$EL_{LFG,y}$ = Net quantity of electricity produced using LFG, which in the absence of this project activity would have been produced by power plants connected to the Thai Grid during year y(MWh)

$CEF_{elec,BL,y}$ = CO_2 emission factor of the Thai Grid(tCO_2e/MWh)

$ET_{LFG,y}$ = The quantity of thermal energy produced utilizing the landfill gas, which in the absence of project activity would have been produced from onsite/offsite fossil fuel fried boiler, during the year y (TJ)

$CEF_{ther,BL,y}$ = CO_2 emission intensity of the fuel used by boiler to generate thermal energy which is displaced by LFG based thermal energy generation (tCO_2e/TJ)

$MD_{project,y}$ is determined via the measured quantities of methane captured and destroyed by the project, either by flaring or as fuel to the gas engines, as detailed in equation 2 below.

$$MD_{project,y} = MD_{flared,y} + MD_{electricity,y} \quad (2)$$

Where:

$MD_{flared,y}$ = measured quantity of methane destruction in flares during the year y;

$MD_{electricity,y}$ = measured quantity of methane destruction in power plant during the year y;

$$MD_{electricity,y} = LFG_{electricity,y} * w_{CH4,y} * D_{CH4} \quad (3)$$

Where:

$LFG_{electricity,y}$ = quantity of LFG destroyed by the generators in m^3

$w_{CH4,y}$ = average concentration of methane in LFG (m^3CH_4/m^3LFG)

D_{CH4} = density of methane (tCH_4/m^3)

Including it in this equation takes account of the fact that $LFG_{electricity,y}$ is measured at the inlet to the generator.

$$MD_{flared,y} = (LFG_{flare,y} * w_{CH4,y} * D_{CH4}) - (PE_{flare\ y} / GWP_{CH\ 4}) \quad (4)$$

Where:

$LFG_{flared,y}$ = quantity of landfill gas fed to the flare during the year measured in cubic meters (m^3),

$W_{CH4,y}$ = the average methane fraction of the landfill gas as measured during the year and expressed as a fraction (m^3CH_4/m^3LFG);

D_{CH4} = methane density, ($tCH_4/m^3\ CH_4$)

$PE_{flare,y}$ = the project emissions from flaring of the residual gas stream in year y (tCO_2e)

$$PE_{flare,y} = \sum_{h=1}^{8760} TM_{RG,h} x (1 - \eta_{flare,h}) x GWP_{CH4} / 1000 \quad (5)$$

Where:

$PE_{flare,y}$ = Project emissions from flaring of the residual gas stream in year y (tCO_2e);

$TM_{RG,h}$ = Mass flow rate of methane in the residual gas in the hour h($kgCH_4/h$);

$\eta_{flare,h}$ = Flare efficiency in hour h(%), IPCC default value 90% is taken;

GWP_{CH4} = Global Warming Potential value for methane of 25 after January 1st, 2013 ($tCO_2e/tCH4$).

$$TM_{RG,h} = FV_{RG,h} \times fv_{CH4,RG,h} \times \rho_{CH4,n} \quad (6)$$

Where:

$TM_{RG,h}$ = Mass flow rate of methane in residual gas in the hour h (kg./h.);

$FV_{RG,h}$ = Volumetric flow rate of the residual gas in dry basis at normal condition in hour h ($m.^3/h.$);

$fv_{CH4,RG,h}$ = Volumetric fraction of methane in the residual gas on dry basis in hour h;

$\rho_{CH4,n}$ = Density of methane at normal condition (0.7168) (kg/m^3);

In the above formula, $LFG_{flare,y}$, $LFG_{flared,h}$, $\omega_{CH4,y}$, $\omega_{CH4,h}$ and $\eta_{flare,h}$ has been confirmed ex-post during project implementation.
The value of D_{CH4} under standard temperature and air pressure (1.013bar and 0°C) is 0.0007168 tCH_4/m^3CH_4.

In this project there is no thermal energy utilization from LFG: **$ET_{LFG,y} = 0$.** Similarly ***$MD_{BL,y}$* = 0** as there is no methane destruction due to regulatory and/or contractual requirements in the absence of this project.

The baselines emissions are calculated in the attached ER calculation excel spreadsheets, and a summary of the calculation results is provided in Tables 1 to 5 below

E.2. Calculation of project emissions or actual net removals

$$PE_y = PE_{EC,y} + PE_{FC,j.y} \quad (7)$$

Where:

$PE_{EC,y}$ = Emission from consumption of electricity in project case

$PE_{FC,j.y}$ = Emission from consumption of heat in the project case

Although $PE_{FC,j,y}$ does not normally need to be accounted for as there is no thermal generation by the project activity. In the case where fossil fuel is used in the project activity, CO_2 emission from fossil fuel combustion in process *j* are calculated based on the quantity of fuels combusted based on the quantity of fuels combusted and the CO_2 emission coefficient of those fuels,

$$PE_{FC,j,y} = \sum_i FC_{i,j,y} \times COEF_{i,y} \quad (8)$$

Where:

$PE_{FC,j,y}$ = Are the CO_2 emissions from fossil fuel combustion in process *j* during the year *y* (tCO_2/yr);

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

$COEF_{i,y}$ = Is the CO_2 emission coefficient of fuel type *i* in year *y* (tCO_2/mass or volume unit)

i = Are the fuel types combusted in process *j* during the year *y*

The CO_2 emission coefficient $COEF_{i,y}$ can be calculated using Option B due to the availability of data on the fossil fuel type *i*, as follows:

Option B: The CO_2 emission coefficient $COEF_{i,y}$ is calculated based on net calorific value and CO_2 emission factor of the fuel type *i*, as follows:

$$COEF_{i,y} = NCV_{i,y} \times EF_{CO2,i,y} \quad (9)$$

Where:

$COEF_{i,y}$ = Is the CO_2 emission coefficient of fuel type *i* in year *y* (tCO_2/mass or Volume unit)

$NCV_{i,y}$ = Is the weighted average net calorific value of the fuel type *i* in year *y* (GJ/mass or volume unit)

$EF_{CO2,i,y}$ = Is the weighted average CO_2 emission factor of fuel type *i* in year *y* (tCO_2/GJ)

i = Are the fuel types combusted in process *j* during the year *y*

Project emissions arise from consumption of grid electricity (*PEEC,y*) during periods when there is no on-site generation. *PEEC,y* is determined using the procedure described in Methodological "Tool to calculate baseline, project and/or leakage emissions from electricity consumption" Version 1.

$$PE_{EC,y} = EC_{P,y} \times EF_{EL,y} \times \left(1 + TDL_{j,y}\right) \quad (10)$$

Where:

$EC_{P,y}$ = Electricity imported from the grid and used in the project in year y (MWh/yr)

$EF_{EL,y}$ = CO_2 emission factor of the Thailand Grid in year y (tCO_2e/MWh)

TDL_y = Average technical transmission and distribution losses for providing electricity to the project in year y (fraction)

E.3. Calculation of leakage emissions

No Leakage effects need to be accounted under ACM0001 version 11.

E.4. Calculation of emission reductions or net anthropogenic removals

The projects emissions are calculated in the attached ER calculation excel spreadsheets, and a summary of the calculation results is provided in Table 6.

Emission reductions are calculated using ACM 0001 version 11, as follows:

$$ER_y = BE_y - PE_y \quad (11)$$

Where:

ER_y = Emission reductions in year y(tCO_2e/yr)
BE_y = Baseline emissions in year y(tCO_2e/yr)
PE_y = Project emissions in year y(tCO_2e/yr)

The emissions reductions are calculated in the attached ER calculation excel spreadsheets, and a summary of the calculation results is provided in Table 7.

See registered PDD for detailed information.
http://cdm.unfccc.int/UserManagement/FileStorage/R28ZCYKV731O6DHP9GSQ0LTUWJXF5N

Calculation sheets are provided below.

Notes on ER Calculations:

1. The flow of $LFG_{total,y}$, $LFG_{flare,y}$ and $LFG_{electricity,y}$ are measured using V-Cone pressure differential flow meters at each location as detailed in section D.2 above. At each V-cone flow measuring location an independent temperature transmitter and pressure transmitter is also installed to measure the LFG at this location. These working conditions are then used to convert the flow of LFG to NTP. The CH_4 volume flow is then converted to mass flow using the NTP methane density, a constant provided in the ACM0001 methodology.

The following table shows monthly total LFG collected by project and amount of LFG fed to each individual flare stack and each engine.

Table 1. Monthly net methane destruction attributed to the project activity

Date		Quantity of total Landfill gas captured measured in Nm^3	Quantity of Landfill gas fed to flare measured in Nm^3	Quantity of landfill gas fed to the power generators measured in Nm^3 *	Average value of concentration of methane in landfill gas m^3CH4/m^3LFG	Quantity of Methane Gas fed to the flare used for MD calculation in Nm^3	Quantity of Methane Gas fed to the power generators used for MD calculation in Nm^3
		LFG total, y	LFG flare, y	LFG Electricity, y *	wCH4,y	CH4 Flare, y	CH4 Electricity, y
01/11/2016	30/11/2016	2,774,545	37	2,771,315	44.42%	17	1,228,137
01/12/2016	31/12/2016	2,654,977	146	2,653,588	44.34%	68	1,172,834
01/01/2017	31/01/2017	2,513,292	1,342	2,505,985	44.89%	628	1,121,701
01/02/2017	28/02/2017	1,853,942	0	1,846,155	41.95%	0	838,248
01/03/2017	31/03/2017	2,927,169	1,073	2,916,610	43.32%	469	1,257,264
01/04/2017	30/04/2017	2,707,520	191	2,688,234	41.53%	83	1,114,482
01/05/2017	31/05/2017	2,565,485	33	2,557,245	40.83%	12	1,044,099
01/06/2017	30/06/2017	2,413,474	8	2,402,487	41.19%	4	987,322
01/07/2017	31/07/2017	2,657,772	0	2,644,646	41.19%	0	1,089,477
01/08/2017	31/08/2017	2,576,582	53	2,565,373	40.59%	23	1,038,636
01/09/2017	30/09/2017	2,405,352	207	2,329,932	41.73%	86	971,870
01/10/2017	31/10/2017	2,462,579	1,646	2,274,747	42.11%	779	966,594
01/11/2017	30/11/2017	2,403,648	252	2,229,024	42.80%	121	953,537
01/12/2017	31/12/2017	1,843,674	968	1,765,765	42.02%	451	739,078
01/01/2018	20/01/2018	1,668,199	197	1,540,958	41.77%	82	643,709
Remark:	* The Total LFG fed to compound, LFG fed to the flare and the power generators were compared with the LFGtotal in every minute. The lowest values of quantity of methane Gas fed to the flare and power generators are presented in this table and are used for calculation of MDProject,y at next step data process, according to QA/QC.						

Table 2. Methane destruction attributes to power generation

Date		Quantity of Methane Gas fed to the power generators measured in Nm^3	Methane density expressed in tonnes of methane per cubic meter of methane $tCH4/m^3CH4$	Quantity of methane destroyed by generator (tCH4)	Global warming potential of methane	Quantity of equivalent Carbon dioxide destroyed by power generation (tCO_2)
		CH4 Electricity, y	D CH4	MD electricity, y	GWP CH4	MD electricity, y
01/11/2016	30/11/2016	1,228,137	0.0007168	880	25	22,008
01/12/2016	31/12/2016	1,172,834	0.0007168	841	25	21,017
01/01/2017	31/01/2017	1,121,701	0.0007168	804	25	20,101
01/02/2017	28/02/2017	838,248	0.0007168	601	25	15,021
01/03/2017	31/03/2017	1,257,264	0.0007168	901	25	22,530
01/04/2017	30/04/2017	1,114,482	0.0007168	799	25	19,972
01/05/2017	31/05/2017	1,044,099	0.0007168	748	25	18,710
01/06/2017	30/06/2017	987,322	0.0007168	708	25	17,693
01/07/2017	31/07/2017	1,089,477	0.0007168	781	25	19,523
01/08/2017	31/08/2017	1,038,636	0.0007168	744	25	18,612
01/09/2017	30/09/2017	971,870	0.0007168	697	25	17,416
01/10/2017	31/10/2017	966,594	0.0007168	693	25	17,321
01/11/2017	30/11/2017	953,537	0.0007168	683	25	17,087
01/12/2017	31/12/2017	739,078	0.0007168	530	25	13,244
01/01/2018	20/01/2018	643,709	0.0007168	461	25	11,535
Remark:	** Data in this table are aggregated from hourly results; calculation formulas are used in hourly level.					

Table 3. Methane destruction attributes to LFG flaring

Flare 1

Date		Quantity of Methane Gas fed to the flare measured in Nm^3	Methane density expressed in tonnes of methane per cubic meter of methane $tCH4/m^3CH4$	Quantity of methane fed to flaring (tCH4)	Project emissions from flaring of the residual gas stream (tCH4)	Global warming potential of methane	Project emissions from flaring of the residual gas stream (tCO_2eq)	Quantity of methane destroyed by flaring (tCH4)
		CH4 total, y	D CH4		PE flare CH4, y	GWP CH_4	PE flare CO2, y	MD flare, y
01/11/2016	30/11/2016	0	0.0007168	0.00	0.00	25	0.00	0.00
01/12/2016	31/12/2016	0	0.0007168	0.00	0.00	25	0.00	0.00
01/01/2017	31/01/2017	0	0.0007168	0.00	0.00	25	0.00	0.00
01/02/2017	28/02/2017	0	0.0007168	0.00	0.00	25	0.00	0.00
01/03/2017	31/03/2017	461	0.0007168	0.33	0.33	25	8.26	0.00
01/04/2017	30/04/2017	0	0.0007168	0.00	0.00	25	0.00	0.00
01/05/2017	31/05/2017	0	0.0007168	0.00	0.00	25	0.00	0.00
01/06/2017	30/06/2017	0	0.0007168	0.00	0.00	25	0.00	0.00
01/07/2017	31/07/2017	0	0.0007168	0.00	0.00	25	0.00	0.00
01/08/2017	31/08/2017	0	0.0007168	0.00	0.00	25	0.00	0.00
01/09/2017	30/09/2017	0	0.0007168	0.00	0.00	25	0.00	0.00
01/10/2017	31/10/2017	0	0.0007168	0.00	0.00	25	0.00	0.00
01/11/2017	30/11/2017	0	0.0007168	0.00	0.00	25	0.00	0.00
01/12/2017	31/12/2017	0	0.0007168	0.00	0.00	25	0.00	0.00
01/01/2018	20/01/2018	0	0.0007168	0.00	0.00	25	0.00	0.00
Remark:	** Data in this table are aggregated from hourly results; calculation formulas are used in hourly level.							

Flare 2

Date		Quantity of Methane Gas fed to the flare measured in Nm^3	Methane density expressed in tonnes of methane per cubic meter of methane $tCH4/m^3CH4$	Quantity of methane fed to flaring (tCH4)	Project emissions from flaring of the residual gas stream (tCH4)	Global warming potential of methane	Project emissions from flaring of the residual gas stream (tCO_2eq)	Quantity of methane destroyed by flaring (tCH4)
		CH4 total, y	D CH4		PE flare CH4, y	GWP CH4	PE flare CO2, y	MD flare, y
01/11/2016	30/11/2016	17	0.0007168	0.01	0.01	25	0.31	0.00
01/12/2016	31/12/2016	68	0.0007168	0.05	0.05	25	1.22	0.00
01/01/2017	31/01/2017	628	0.0007168	0.45	0.45	25	11.26	0.00
01/02/2017	28/02/2017	0	0.0007168	0.00	0.00	25	0.01	0.00
01/03/2017	31/03/2017	7	0.0007168	0.00	0.00	25	0.12	0.00
01/04/2017	30/04/2017	83	0.0007168	0.06	0.06	25	1.49	0.00
01/05/2017	31/05/2017	12	0.0007168	0.01	0.01	25	0.23	0.00
01/06/2017	30/06/2017	4	0.0007168	0.00	0.00	25	0.07	0.00
01/07/2017	31/07/2017	0	0.0007168	0.00	0.00	25	0.01	0.00
01/08/2017	31/08/2017	23	0.0007168	0.02	0.02	25	0.41	0.00
01/09/2017	30/09/2017	86	0.0007168	0.06	0.06	25	1.42	0.01
01/10/2017	31/10/2017	779	0.0007168	0.56	0.46	25	11.51	0.10
01/11/2017	30/11/2017	121	0.0007168	0.09	0.09	25	2.18	0.00
01/12/2017	31/12/2017	451	0.0007168	0.32	0.31	25	7.66	0.02
01/01/2018	20/01/2018	83	0.0007168	0.06	0.06	25	1.49	0.00
Remark:	** Data in this table are aggregated from hourly results; calculation formulas are used in hourly level.							

Flare 3

Date		Quantity of Methane Gas fed to the flare measured in Nm^3	Methane density expressed in tonnes of methane per cubic meter of methane $tCH4/m^3CH4$	Quantity of methane fed to flaring (tCH4)	Project emissions from flaring of the residual gas stream (tCH4)	Global warming potential of methane	Project emissions from flaring of the residual gas stream (tCO_2eq)	Quantity of methane destroyed by flaring (tCH4)
		CH4 total, y	D CH4		PE flare CH4, y	GWP CH4	PE flare CO2, y	MD flare, y
01/11/2016	30/11/2016	0	0.0007168	0.00	0.00	25	0.00	0.00
01/12/2016	31/12/2016	0	0.0007168	0.00	0.00	25	0.00	0.00
01/01/2017	31/01/2017	0	0.0007168	0.00	0.00	25	0.00	0.00
01/02/2017	28/02/2017	0	0.0007168	0.00	0.00	25	0.00	0.00
01/03/2017	31/03/2017	2	0.0007168	0.00	0.00	25	0.04	0.00
01/04/2017	30/04/2017	0	0.0007168	0.00	0.00	25	0.00	0.00
01/05/2017	31/05/2017	0	0.0007168	0.00	0.00	25	0.00	0.00
01/06/2017	30/06/2017	0	0.0007168	0.00	0.00	25	0.00	0.00
01/07/2017	31/07/2017	0	0.0007168	0.00	0.00	25	0.00	0.00
01/08/2017	31/08/2017	0	0.0007168	0.00	0.00	25	0.00	0.00
01/09/2017	30/09/2017	0	0.0007168	0.00	0.00	25	0.01	0.00
01/10/2017	31/10/2017	0	0.0007168	0.00	0.00	25	0.00	0.00
01/11/2017	30/11/2017	0	0.0007168	0.00	0.00	25	0.00	0.00
01/12/2017	31/12/2017	0	0.0007168	0.00	0.00	25	0.00	0.00
01/01/2018	20/01/2018	0	0.0007168	0.00	0.00	25	0.00	0.00
Remark:	** Data in this table are aggregated from hourly results; calculation formulas are used in hourly level.							

Remarks: Flare efficiency determination is referred to scenario a) of “Tool to determine project emissions from flaring gases containing methane”.

The following table shows monthly net methane destruction attributed to the project activity and total emission reductions completed associated with project activity in this monitoring period.

Table 4. Monthly net methane destruction attributed to the project activity

Date		The amount of methane that have been destroyed in the project scenario (tCH4)	The amount of methane that have been destroyed in the absence of the project (tCH4)	Net methane destruction attributable to the project activity (tCH4)	Net methane destruction attributable to the project activity (tCO_2)
		MD project. Y	MD BL, y	MD project, y - MD BL, y	= (MD project, y - MD BL, y)*GWPCH4
01/11/2016	30/11/2016	880.33	0.00	880.33	22,008.22
01/12/2016	31/12/2016	840.69	0.00	840.69	21,017.18
01/01/2017	31/01/2017	804.03	0.00	804.03	20,100.87
01/02/2017	28/02/2017	600.86	0.00	600.86	15,021.40
01/03/2017	31/03/2017	901.21	0.00	901.21	22,530.16
01/04/2017	30/04/2017	798.86	0.00	798.86	19,971.51
01/05/2017	31/05/2017	748.41	0.00	748.41	18,710.24
01/06/2017	30/06/2017	707.71	0.00	707.71	17,692.81
01/07/2017	31/07/2017	780.94	0.00	780.94	19,523.43
01/08/2017	31/08/2017	744.49	0.00	744.49	18,612.36
01/09/2017	30/09/2017	696.64	0.00	696.64	17,416.05
01/10/2017	31/10/2017	692.95	0.00	692.95	17,323.81
01/11/2017	30/11/2017	683.50	0.00	683.50	17,087.39
01/12/2017	31/12/2017	529.79	0.00	529.79	13,244.69
01/01/2018	20/01/2018	461.41	0.00	461.41	11,535.26
Total 01/11/2016 – 20/01/2018 (both dates inclusive)					271,795

Table 5. Project emission from Diesel Generator

Date (inclusive)		Quantity of fossil fuel combustion (Diesel) (liters)	CO_2 emission coefficient of Diesel (tCO2/liter)	PE fc,j,y emission of heat (from fossil fuel combustion) to meet project requirement (tCO_2e)
		$\sum FC_{i,j,y}$	$COEF_{i,y}$	
01/11/2016	20/01/2018	0	0.0027	0

Table 6. The net amount of electricity exported to the grid

Date (inclusive)		Total amount of electricity exported (MWh)	CO_2 emissions intensity of the baseline source of electricity displaced (tCO_2e/MWh)	CO_2 emissions (exported electricity) (tCO_2e)
		$EL_{LFG, month}$	$CEF_{elec, BL, month}$	
01/11/2016	20/01/2018	45,150.09	0.5742	25,925

Table 7. The net amount of electricity imported for the project purpose (project emissions)

Date (inclusive)		Total amount of electricity imported (MWh)	CO_2 emissions intensity of the baseline source of electricity displaced (tCO_2e/MWh)	Average technical transmission and distribution losses for providing electricity	CO_2 emissions (imported electricity) (tCO_2e)
		$EL_{IM, month}$	$CEF_{elec, BL, month}$	$TDL_{,grid,month}$	
01/11/2016	20/01/2018	15.02	0.5742	7.54 %	9.35

Table 8. Total GHG Emission reductions of the monitoring period

Reporting Period	Net methane destruction attributable to the project activity (tCO_2)	CO_2 emissions intensity (imported electricity) (tCO_2e)	CO_2 emissions intensity (fossil fuel combustion) (tCO_2e)	CO_2 emissions intensity (exported electricity) (tCO_2e)	Total emission reductions (tCO_2e)
Total 01/11/2016 – 20/01/2018 (inclusive)	271,795	9.35	N/A	25,925	297,711

Table 9. Summary of GHG Emission reductions for the monitoring period

	Baseline GHG emissions or baseline net GHG removals ($t CO_2e$)	Project GHG emissions or actual net GHG removals ($t CO_2e$)	Leakage GHG emissions ($t CO_2e$)	GHG emission reductions or net anthropogenic GHG removals ($t CO_2e$)		
				Before 01/01/2013	From 01/01/2013	Total amount
Total	297,768	57	0	N/A	297,711	297,711

E.5. Comparison of emission reductions or net anthropogenic removals achieved with estimates in the registered PDD

Amount achieved during this monitoring period (t CO_2e)	Amount estimated ex ante (t CO_2e)
297,711	*2016 = 169,816 x 61 / 366 = 28,303 *2017 = 127,926 x 365 / 365 = 127,926 *2018 = 100,445 x 20/365 = 5,504 Total Monitoring Period = 161,732 (Case A) **2016 = 369,794 x 61 / 366 = 61,632 **2017 = 275,801 x 365 / 365 = 275,801 **2018 = 210,698 x 20/365 = 11,545 Total Monitoring Period = 348,978 (Case B)

* Estimated ex-ante emission reductions for year 2016,2017 and 2018 under waste scenario (reference, Case A included in the ER calculation spreadsheet of the registered PDD) pro rata with the annual ex-ante emission reductions from 1st November 2016 to 20st January 2018.

** Estimated ex-ante emission reduction of year 2016,2017 and 2018 under waste scenario Case B (reference, Case B included in the ER calculation spreadsheet of the registered PDD) pro rata with the annual ex-ante emission reductions from 1st November 2016 to 20st January 2018.

E.6. Remarks on increase in achieved emission reductions

The ex-ante emission reduction calculation included in the PDD estimates CER emission reduction under a Case A where the waste tipping was estimated to stop in 2014. It is estimated that a total of 161,732 tCO_2e for the current monitoring period (calculation as per table in section E.5). The CER emission reduction calculation spreadsheet validated by the DOE during the registration process also estimated a Case B whereby the waste tipping contracts are extended and waste tipping continued until the available void space is filled in 2017, under this scenario, the volume of landfill gas generated/destroyed would be higher and an estimate of 348,978 tCO_2e for the current monitoring period (calculation as per table in section E.5).

297,711 tCO_2e have actually been generated during the current monitoring period which is lower than the estimated value for Case B but more than Case A. Any increase compared to Case A is due to extended waste tipping contracts and waste tipping continuing for an additional one years until July 2015. Also, from 1st Jan 2013 a higher GWP (25) of methane used compared to the registered PDD which will lead to higher emission reductions.

Appendix 1. Contact information of project participants and responsible persons/entities

Project participant and/or responsible person/ entity	☒ Project participant ☒ Person/entity responsible for completing the CDM-MR-FORM
Organization name	Sindicatum Carbon Capital Ltd
Street/P.O. Box	Sindicatum Sustainable Resources Group, 80 Anson Road, #28-02,
Building	Fuji Xerox Towers
City	Singapore
State/region	
Postcode	079907
Country	Singapore
Telephone	+65 6732 8897
Fax	+65 6732 9767
E-mail	jay.mariyappan@sindicatum.com
Website	http://www.sindicatum.com
Contact person	Jay Mariyappan
Title	Managing Director, Delivery
Salutation	Mr
Last name	Mariyappan
Middle name	-
First name	Jay
Department	Delivery
Mobile	-
Direct fax	-
Direct tel.	-
Personal e-mail	jmariyappan@gmail.com

Annex A. Emission Reductions Calculation Sheets

Separate emission reductions calculation spreadsheets have been provided for the purpose of verification.

Annex B. Flare Efficiency

Refer to page 3 of the "Tool to determine project emissions from flaring gases containing methane" version 01, the temperature in the exhaust gas of the flare is measured to determine whether the flare is operating or not. The flare efficiency for enclosed flares shall be continuously monitored and determined as per the determination set by the tool.

The determination of project emissions from flaring gases containing methane is described in the registered PDD page 25 onwards.

Determination of the hourly flare efficiency:

In case of enclosed flares and use of the default value for the flare efficiency, the flare efficiency in the hour h ($h_{flare,h}$) is:

- 0% if the temperature in the exhaust gas of the flare (T_{flare}) is below 500°C for more than 20 minutes during the hour h.
- 50%, if the temperature in the exhaust gas of the flare (T_{flare}) is above 500°C for more than 40 minutes during the hour h, but the manufacturer's specifications on proper operation of the flare are not met at any point in time during the hour h.
- 90%, if the temperature in the exhaust gas of the flare (T_{flare}) is above 500°C for more than 40 minutes during the hour h and the manufacturer's specifications on proper operation of the flare are met continuously during the hour h.

The flare efficiency shall be determined as zero only in case of there is no record of the temperature of the exhaust gas of the flare or if the recorded temperature is less than 500°C for any particular hour.

The actual default values are taken from checking the temperatures of each flare (T_{flare}) from the minute data, and that the flare is being operated within the manufacturers specifications. The manufacturer's specifications indicated above specify that the flow should be between 300-2000 Nm3/h, and temperature (T_{flare}) between 500-1200 °C.

Methane composition is measured for operational purposes at least once daily, and it has been confirmed that the methane content of the LFG entering the flare is between 25-65% as mentioned in the flare specification.

If any non-compliance of the flow meter specification i.e. flow rate lower than 300 Nm3/hr or methane composition out of range 25-65% in the minute m, flare flow rate in that minute shall be adjusted to zero for conservative approach.
The assessment of the hourly flare efficiency using the above described criteria for the dataset covering the monitoring period will be verified by the DOE at the time of the site visit. The excel spreadsheet indicating flare efficiency for the reported period will be submitted to the DOE.

Annex C. Monitored Laws and Regulations

Regulation	Impact	Date of application
Public Health Act 1992	Stated in PDD. Governs the operation of the landfill and provides a mechanism for regulation by local administrative body via the issuance of the license to the landfill. Thung Bua Sub-district Administrative Organisation has not currently set out and specific regulations relating to the license. No impact on parameters monitored during the current crediting period.	1992
Act of Cleanliness and Tidiness of the Nation 1992	Has no requirement for LFG control, extraction or utilisation. No impact on parameters monitored during the current crediting period.	1992
Public Health Act (Issue 2) 2007	Repealed section 18 of Public Health Act 1992 and enforce section 9 of this act. Governs the operation of the landfill provides a mechanism for regulation by local administrative body via the issuance of the license to the landfill and not apply this amended law to the disposal of hazardous waste as defined by the factory laws. Currently, Thung Bua Sub-district Admistrative Organisation has not set out and announced the specific regulations relating to the license. No impact on parameters monitored during the current crediting period.	2007

Annex D. Specification of CDM Monitoring Equipment

Parameter	Instrument Type	Manufacturer	Instrument Model	Instrument Range	Accuracy	Calibration Requirements
LFG_{total}	V-Cone Flow Meter	Kingways	KVS14IIKD23FSN with Rosemount 3051 CD Differential Pressure Transmitter	750 - 7500 $m.^3$/hr.	±0.5%	2 yearly
LFG_{flare}	V-Cone Flow Meter	Kingways	KVS08IIKC23FSN with Rosemount 3051 CD Differential Pressure Transmitter	250 - 2500 $m.^3$/hr.	±0.5%	2 yearly
$LFG_{electricity}$	V-Cone Flow Meter	Kingways	KVS06IIKC23FSN with Rosemount 3051 CD Differential Pressure Transmitter	200 - 2000 $m.^3$/hr.	±0.5%	2 yearly
		Kingways	KVS06IIKC23FSN with Rosemount 3051 CD Differential Pressure Transmitter	100 - 1000 $m.^3$/hr.		
		KVS Lamways	RVM-VS06JF63N2 with Rosemount 3051 CD Differential Pressure Transmitter			
		Shanghai Kent	KVCFF150CD1N/6 with Rosemount 3051 CD Differential Pressure Transmitter			
ω_{CH4}	Infra Red Gas Analyser	Edinburgh Instruments Limited	Guardian Plus Infra-Red Gas Monitor	0 - 100%	± 2.0% Full Scale Deflection	Annually
T	Temperature Transmitter	Honeywell	STT830-171	- 58 to 500˚C	± (0.3+0.005|T|)˚C	Annually
		Inor	Mini iPAQ-HLP-PT100	-200to1000˚C	± 0.15 % of Temperature Span	Annually
P	Absolute Pressure Transmitter	Rosemount	Model 3051TA	0 - 207 kPa	± 0.075 % of span	Annually
EL_{LFG}	Electric Meter	EDMI	EDMI-Mk6 (Genius)	-	Class 0.5S	Annually
EL_{import}	Electric Meter	EDMI	EDMI-Mk6 (Genius)	-	Class 0.5S	Annually
T_{flare}	Type N Thermocouple	Honeywell	STT830-173	0 - 1200˚C	Accuracy Class II (allowable deviation ±(0.0075|t|))	Annually
		Uniflare	32-N-LTS-176-6.0-2I-TXLIN/EXI	0 - 1300˚C	Accuracy Class II (allowable deviation ±(0.0075|t|))	Annually
		Inor	Mini iPAQ-HLP-Type N	0 - 1200˚C	± 0.15 % of Temperature Span	Annually

Annex E. CDM Monitoring Equipment Installation & Calibration Dates

Notes:

1. Since LFG flow monitoring equipment consist of 2 components i.e. V-cone flow meter and differential pressure transmitter. Therefore, FT9261A, FT9261B, FT9391-FT9591 and EFT9001- EFT9008 serial no. information are presented as

"Serial no. of V-cone flow meter / serial no. of differential pressure transmitter"

2. "Equipment Start Date" and "Equipment End Date" mean the installation period of the individual equipment over the current monitoring period.
3. For EL_{LFG}, the electricity primary and secondary meter serial no. 205610126 / PEA 19936983 is the PEA's electricity meters which used for temporary during PEA's officer calibrate the permanent export meters as per the annual calibration schedule.
4. For EL_{import}, the electricity primary and secondary meter serial no. 205610065/ PEA 19936922 is the PEA's electricity meter which used for temporary during PEA's officer calibrate the permanent import meters as per the annual calibration schedule.
5. If the PEA registered no. (PEA no.) of any electricity meter used for monitoring the parameter EL_{LFG} and EL_{import} are available, the serial no. information are presented as

"Serial no. of electricity meter / PEA no. of electricity meter"

Name	Tag No.	Serial No.	Equipment Start Date	Equipment End Date	Calibration Certification Validity Period	Certificate Reference	Causes of Changing	Undertaken Person
LFG_{Total}	FT 9261 A	9062918 / 5058755	18-10-15	22-09-17	2015/09/25 to 2017/09/24	L1505-552	Calibration Due	PP-Thongchai
		9061214 / 5058732	22-09-17	15-03-19	2017/03/16 to 2019/03/15	L1703-344	On Duty	PP-Thongchai
	FT 9261 B	9061212 / 5058730	18-10-15	22-09-17	2015/12/11 to 2017/12/10	L1511-131	Calibration Due	PP-Thongchai
		9061213 / 5058731	22-09-17	15-03-19	2017/03/16 to 2019/03/15	L1703-343	On Duty	PP-Thongchai
LFG_{Flare}	FT 9391	9061209 / 5058737	03-06-15	09-03-17	2015/03/11 to 2017/03/10	L1502-518	Calibration Due	PP-Thongchai
		10071509 / 4959893	09-03-17	20-02-19	2017/02/21 to 2019/02/20	L1702-375	On Duty	PP-Thongchai
	FT 9491	9061205 / 5058733	11-04-15	09-03-17	2015/03/11 to 2017/03/10	L1502-520	Calibration Due	PP-Thongchai
		9062916 / 5058745	09-03-17	20-02-19	2017/02/21 to 2019/02/20	L1702-373	On Duty	PP-Thongchai
	FT 9591	9061210 / 5058738	11-04-15	09-03-17	2015/03/11 to 2017/03/10	L1502-519	Calibration Due	PP-Thongchai
		9061210 / 5058738	09-03-17	20-02-19	2017/02/21 to 2019/02/20	L1702-376	On Duty	PP-Thongchai

Annex E. CDM Monitoring Equipment Installation & Calibration Dates (Cont.)

Name	Tag No.	Serial No.	Equipment Start Date	Equipment End Date	Calibration Certification Validity Period	Certificate Reference	Causes of Changing	Undertaken Person
$LFG_{Electricity}$	EFT 9001	9062901 / 5058746	18-01-15	25-05-17	2015/06/29 to 2017/06/28	L1506-271	Calibration Due	PP-Thongchai
		9062902 / 5058747	25-05-17	08-03-19	2017/03/09 to 2019/03/08	L1702-380	On Duty	PP-Thongchai
	EFT 9002	9062903 / 5058756	24-07-15	25-05-17	2015/06/29 to 2017/06/28	L1506-272	Calibration Due	PP-Thongchai
		1104-0159 / 02443472	25-05-17	30-03-19	2017/03/31 to 2019/03/30	L1703-336	On Duty	PP-Thongchai
	EFT 9003	1104-0159 / 02443472	11-04-15	09-03-17	2015/03/11 to 2017/03/10	L1502-523	Calibration Due	PP-Thongchai
		10071501 / 5599591	09-03-17	20-02-19	2017/02/21 to 2019/02/20	L1702-374	On Duty	PP-Thongchai
	EFT 9004	1104-0160 / 02443474	11-04-15	09-03-17	2015/03/11 to 2017/03/10	L1502-522	Calibration Due	PP-Thongchai
		9062907 / 5058760	09-03-17	20-02-19	2017/02/21 to 2019/02/20	L1702-371	On Duty	PP-Thongchai
	EFT 9005	10071506 / 4964086	03-06-15	25-05-17	2015/05/30 to 2017/05/29	L1505-557	Calibration Due	PP-Thongchai
		1104-0160 / 02443474	25-05-17	30-03-19	2017/03/31 to 2019/03/30	L1703-337	On Duty	PP-Thongchai
	EFT 9006	10071505 / 5476725	03-06-15	25-05-17	2015/05/29 to 2017/05/28	L1505-556	Calibration Due	PP-Thongchai
		9062908 / 5058757	25-05-17	29-03-19	2017/03/30 to 2019/03/29	L1703-338	On Duty	PP-Thongchai
	EFT 9007	9062913 / 5058766	11-04-15	09-03-17	2015/03/11 to 2017/03/10	L1502-521	Calibration Due	PP-Thongchai
		9062911 / 5058764	09-03-17	20-02-19	2017/02/21 to 2019/02/20	L1702-372	On Duty	PP-Thongchai
	EFT 9008	10071502 / 5615483	03-06-15	25-05-17	2015/05/30 to 2017/05/29	L1505-555	Calibration Due	PP-Thongchai
		9062913 / 5058766	25-05-17	29-03-19	2017/03/30 to 2019/03/29	L1703-339	On Duty	PP-Thongchai
ω_{CH4}	CH4 9261 A	29684	26-08-16	23-08-17	2016/08/26 to 2017/08/25	C1608-3967	Calibration Due	PP-Thongchai
		29692	23-08-17	22-08-18	2017/08/23 to 2018/08/22	C1708-9890	On Duty	PP-Thongchai
T	TT 9261 A	080625360	14-07-16	06-07-17	2016/07/08 to 2017/07/07	16/1928	Calibration Due	PP-Thongchai
		N1249.693027	06-07-17	04-07-18	2017/07/05 to 2018/07/04	17/1830	On Duty	PP-Thongchai
	TT 9261 B	N1249.693062	14-07-16	06-07-17	2016/07/08 to 2017/07/07	16/1932	Calibration Due	PP-Thongchai
		N1439.851974	06-07-17	07-07-17	2017/07/05 to 2018/07/04	17/1832	On Duty	PP-Thongchai
	TT 9391	090536657	14-07-16	06-07-17	2016/07/08 to 2017/07/07	16/1930	Calibration Due	PP-Thongchai
		N1496.93093	06-07-17	04-07-18	2017/07/05 to 2018/07/04	17/1829	On Duty	PP-Thongchai
	TT 9491	080625400	14-07-16	06-07-17	2016/07/08 to 2017/07/07	16/1931	Calibration Due	PP-Thongchai
		N1249.693059	06-07-17	04-07-18	2017/07/05 to 2018/07/04	17/1833	On Duty	PP-Thongchai
	TT 9591	N1249.693066	14-07-16	06-07-17	2016/07/08 to 2017/07/07	16/1929	Calibration Due	PP-Thongchai
		N1439.851968	06-07-17	04-07-18	2017/07/05 to 2018/07/04	17/1834	On Duty	PP-Thongchai
	ETT 9001	N1029.139055	09-02-16	03-02-17	2016/02/08 to 2017/02/07	16/0486	Calibration Due	PP-Thongchai
		080638069	03-02-17	31-01-18	2017/02/01 to 2018/01/31	17/0331	On Duty	PP-Thongchai
	ETT 9002	080638042	07-07-16	03-02-17	2016/03/08 to 2017/03/07	16/0568	Calibration Due	PP-Thongchai
		080625431	03-02-17	19-05-17	2017/02/01 to 2018/01/31	17/0330	Reading Error	PP-Thongchai
		N1029.139055	19-05-17	31-01-18	2017/03/06 to 2018/03/05	17/0690	On Duty	PP-Thongchai

Annex E. CDM Monitoring Equipment Installation & Calibration Dates (Cont.)

Name	Tag No.	Serial No.	Equipment Start Date	Equipment End Date	Calibration Certification Validity Period	Certificate Reference	Causes of Changing	Undertaken Person
T	ETT 9003	100098212	09-02-16	03-02-17	2016/02/08 to 2017/02/07	16/0484	Calibration Due	PP-Thongchai
		100208533	03-02-17	31-01-18	2017/02/01 to 2018/01/31	17/0335	On Duty	PP-Thongchai
	ETT 9004	N1249.693067	07-07-16	03-02-17	2016/03/08 to 2017/03/07	16/0570	Calibration Due	PP-Thongchai
		N1249.693025	03-02-17	31-01-18	2017/02/01 to 2018/01/31	17/0334	On Duty	PP-Thongchai
	ETT 9005	090536658	09-02-16	03-02-17	2016/02/08 to 2017/02/07	16/0483	Calibration Due	PP-Thongchai
		N1249.693094	03-02-17	31-01-18	2017/02/01 to 2018/01/31	17/0326	On Duty	PP-Thongchai
	ETT 9006	N1029.139094	08-02-16	22-11-16	2015/11/23 to 2016/11/22	15/3627	Calibration Due	PP-Thongchai
		N1249.693079	22-11-16	03-02-17	2016/07/08 to 2017/07/07	16/1936	Reading Error	PP-Thongchai
		N1439.851965	03-02-17	31-01-18	2017/02/01 to 2018/01/31	17/0325	On Duty	PP-Thongchai
	ETT 9007	N1249.693072	07-07-16	03-02-17	2016/03/08 to 2017/03/07	16/3368	Calibration Due	PP-Thongchai
		N1029.139054	03-02-17	31-01-18	2017/02/01 to 2018/01/31	17/0324	On Duty	PP-Thongchai
	ETT 9008	080638069	08-02-16	03-02-17	2015/11/23 to 2016/11/22	15/3626	Calibration Due	PP-Thongchai
		080638042	03-02-17	31-01-18	2017/02/01 to 2018/01/31	17/0327	On Duty	PP-Thongchai
P	PT 9261 A	5466006	23-05-16	04-05-17	2016/05/16 to 2017/05/15	C1605-1579	Calibration Due	PP-Thongchai
		5466080	04-05-17	23-04-18	2017/05/04 to 2018/04/23	C1704-1976	On Duty	PP-Thongchai
	PT 9261 B	5466083	23-05-16	04-05-17	2016/05/16 to 2017/05/15	C1605-1584	Calibration Due	PP-Thongchai
		5466010	04-05-17	23-04-18	2017/05/04 to 2018/04/23	C1704-1977	On Duty	PP-Thongchai
	PT 9391	5466004	23-05-16	04-05-17	2016/05/16 to 2017/05/15	C1605-1578	Calibration Due	PP-Thongchai
		5466007	04-05-17	23-04-18	2017/04/24 to 2018/04/23	C1704-1978	On Duty	PP-Thongchai
	PT 9491	5466002	23-05-16	04-05-17	2016/05/16 to 2017/05/15	C1605-1576	Calibration Due	PP-Thongchai
		5466089	04-05-17	23-04-18	2017/04/24 to 2018/04/23	C1704-1979	On Duty	PP-Thongchai
	PT 9591	5466003	23-05-16	04-05-17	2016/05/16 to 2017/05/15	C1605-1577	Calibration Due	PP-Thongchai
		5466015	04-05-17	23-04-18	2017/04/24 to 2018/04/23	C1704-1975	On Duty	PP-Thongchai
	EPT 9001	02443481	23-05-16	04-05-17	2016/05/16 to 2017/05/15	C1605-1572	Calibration Due	PP-Thongchai
		02300672	04-05-17	23-04-18	2017/04/24 to 2018/04/23	C1704-1971	On Duty	PP-Thongchai
	EPT 9002	02150751	23-05-16	04-05-17	2016/05/16 to 2017/05/15	C1605-1593	Calibration Due	PP-Thongchai
		02777924	04-05-17	19-05-17	2017/04/24 to 2018/04/23	C1704-1973	Reading Error	PP-Thongchai
		02150751	19-05-17	23-04-18	2017/05/05 to 2018/05/04	C1705-462	On Duty	PP-Thongchai
	EPT 9003	02443480	23-05-16	04-05-17	2016/05/16 to 2017/05/15	C1605-1571	Calibration Due	PP-Thongchai
		02777924	04-05-17	23-04-18	2017/04/24 to 2018/04/23	C1704-1972	On Duty	PP-Thongchai
	EPT 9004	02150753	23-05-16	04-05-17	2016/05/16 to 2017/05/15	C1605-1592	Calibration Due	PP-Thongchai
		02443477	04-05-17	23-04-18	2017/04/24 to 2018/04/23	C1704-1970	On Duty	PP-Thongchai

Annex E. CDM Monitoring Equipment Installation & Calibration Dates (Cont.)

Name	Tag No.	Serial No.	Equipment Start Date	Equipment End Date	Calibration Certification Validity Period	Certificate Reference	Causes of Changing	Undertaken Person
P	EPT 9005	02166916	23-05-16	04-05-17	2016/05/16 to 2017/05/15	C1605-1594	Calibration Due	PP-Thongchai
		02166913	04-05-17	23-04-18	2017/04/24 to 2018/04/23	C1704-1981	On Duty	PP-Thongchai
	EPT 9006	02150750	23-05-16	04-05-17	2016/05/23 to 2017/05/22	C1605-1866	Calibration Due	PP-Thongchai
		02300684	04-05-17	23-04-18	2017/04/24 to 2018/04/23	C1704-1980	On Duty	PP-Thongchai
	EPT 9007	02715553	23-05-16	04-05-17	2016/05/23 to 2017/05/22	C1605-1853	Calibration Due	PP-Thongchai
		02166915	04-05-17	23-04-18	2017/04/24 to 2018/04/23	C1704-1974	On Duty	PP-Thongchai
	EPT 9008	02300673	23-05-16	19-05-17	2016/05/23 to 2017/05/22	C1605-1869	Calibration Due	PP-Thongchai
		02150753	19-05-17	04-05-18	2017/05/05 to 2018/05/04	C1705-464	On Duty	PP-Thongchai
EL_{LFG}	Primary	213140469	27-06-16	22-06-17	2016/06/27 to 2017/06/26	-	Calibration Due	PEA
		211327745	22-06-17	22-06-17	2017/03/01 to 2018/02/28	-	Spare Meter	PEA
		213140469	22-06-17	21-06-18	2017/06/22 to 2018/06/21	-	On Duty	PEA
	Secondary	212607309	27-06-16	22-06-17	2016/06/27 to 2017/06/26	-	Calibration Due	PEA
		PEA 20642701	22-06-17	22-06-17	2017/05/04 to 2018/05/03	-	Spare Meter	PEA
		212607309	22-06-17	21-06-18	2017/06/22 to 2018/06/21	-	On Duty	PEA
EL_{import}	Primary	201006718 / PEA15852219	27-06-16	22-06-17	2016/06/27 to 2017/06/26	-	Calibration Due	PEA
		PEA 20642678	22-06-17	22-06-17	2017/03/01 to 2018/02/28	-	Spare Meter	PEA
		201006718 / PEA15852219	22-06-17	21-06-18	2017/06/22 to 2018/06/21	-	On Duty	PEA
	Secondary	210422526	27-06-16	22-06-17	2016/06/27 to 2017/06/26	-	Calibration Due	PEA
		PEA 20642700	22-06-17	22-06-17	2017/06/04 to 2018/06/03	-	Spare Meter	PEA
		210422526	22-06-17	21-06-18	2017/06/22 to 2018/06/21	-	On Duty	PEA
T_{Flare}	TTC 9393A	080614381	23-02-16	09-02-17	2016/02/12 to 2017/02/11	16/0325	Calibration Due	PP-Thongchai
		N1249.683035	09-02-17	02-02-18	2017/02/03 to 2018/02/02	17/0345	On Duty	PP-Thongchai
	TTC 9393B	090326012	23-02-16	09-02-17	2016/02/12 to 2017/02/11	16/0321	Calibration Due	PP-Thongchai
		080614320	09-02-17	02-02-18	2017/02/03 to 2018/02/02	17/0342	On Duty	PP-Thongchai
	TTC 9393 C	080614298	23-02-16	09-02-17	2016/02/12 to 2017/02/11	16/0324	Calibration Due	PP-Thongchai
		080614321	09-02-17	08-12-17	2017/02/03 to 2018/02/02	17/0339	Reading Error	PP-Thongchai
		080614291	08-12-17	02-02-18	2017/04/29 to 2018/04/28	17/1090	On Duty	PP-Thongchai
	TTC 9493 A	080614323	23-02-16	09-02-17	2016/02/12 to 2017/02/11	16/0322	Calibration Due	PP-Thongchai
		080614290	09-02-17	02-02-18	2017/02/03 to 2018/02/02	17/0341	On Duty	PP-Thongchai
	TTC 9493 B	080614321	23-02-16	09-02-17	2016/02/12 to 2017/02/11	16/0318	Calibration Due	PP-Thongchai
		090326013	09-02-17	02-02-18	2017/02/03 to 2018/02/02	17/0340	On Duty	PP-Thongchai

Annex E. CDM Monitoring Equipment Installation & Calibration Dates (Cont.)

Name	Tag No.	Serial No.	Equipment Start Date	Equipment End Date	Calibration Certification Validity Period	Certificate Reference	Causes of Changing	Undertaken Person
T_{Flare}	TTC 9493 C	080614379	23-02-16	09-02-17	2016/02/12 to 2017/02/11	16/0320	Calibration Due	PP-Thongchai
		080614289	09-02-17	02-02-18	2017/02/03 to 2018/02/02	17/0343	On Duty	PP-Thongchai
	TTC 9593 A	090326006	23-02-16	09-02-17	2016/02/12 to 2017/02/11	16/0317	Calibration Due	PP-Thongchai
		090329527	09-02-17	02-02-18	2017/02/03 to 2018/02/02	17/0346	On Duty	PP-Thongchai
	TTC 9593 B	090326009	23-02-16	09-02-17	2016/02/12 to 2017/02/11	16/0323	Calibration Due	PP-Thongchai
		080614306	09-02-17	02-02-18	2017/02/03 to 2018/02/02	17/0344	On Duty	PP-Thongchai
	TTC 9593 C	090329544	23-02-16	09-02-17	2016/02/12 to 2017/02/11	16/0319	Calibration Due	PP-Thongchai
		080614305	09-02-17	02-02-18	2017/02/03 to 2018/02/02	17/0347	On Duty	PP-Thongchai

Annex F. Special Events Table

Start Time (UTC)	Finish Time (UTC)	Downtime (hr:mm)	DESCRIPTION OF EVENT	Impact on ER Calculation

Attachment. Instructions for completing this form

1. General instructions

1. When reporting on monitoring results and completing this form, in addition to applying the "CDM project standard for project activities" (hereinafter referred to as the project standard), the selected methodologies and, where applicable, the selected standardized baselines, consult the "Rules and Reference" section of the UNFCCC CDM website. This section contains all regulatory documents for the CDM, such as standards (including methodologies, and standardized baselines), procedures, tools, guidelines, clarifications, forms and the "Glossary: CDM terms".

2. Make any data, values and formulae included in spreadsheets accessible and verifiable.

3. Complete this form in English. Prepare all attached documents in English, or if their originals were prepared in another language, provide a full translation of the relevant sections of these documents in English.

4. Complete this form using the same format without modifying its font, headings or logo, and without any other alteration to the form.

5. Do not modify or delete tables and their columns in this form. Add rows to the tables as needed. Add additional appendices as needed.

6. If a section of the form is not applicable, explicitly state that the section is left blank intentionally.

7. Use an internationally recognized format for presentation of values. For example, use digit grouping in thousands and mark a decimal point with a dot (.), not with a comma (,).

8. Complete this form deleting this attachment.

2. Specific instructions

1. Indicate the following information on the cover page:
   (a) Title of the project activity;
   (b) UNFCCC reference number of the project activity;
   (c) Version number of the PDD applicable to this monitoring report;
   (d) Version number of this monitoring report;
   (e) Completion date of this monitoring report: Indicate the date in DD/MM/YYYY;
   (f) Monitoring period number: The monitoring period number is an ordinal number referring to the chronological order of monitoring periods (e.g. "first monitoring period");
   (g) Duration of this monitoring period: Indicate the duration with the first and last dates in DD/MM/YYYY – DD/MM/YYYY;
   (h) Monitoring report number for this monitoring period: Applicable when preparing multiple separate monitoring reports for the monitoring period for different batches of small-scale project activities in the registered bundle of small-scale project activities. To distinguish between such multiple separate monitoring reports, assign an ordinal number from 1 upwards (e.g. 1, 2, 3…*n*) to each monitoring report in the consecutive order;
   (i) Project participants;
   (j) Host Party;
   (k) Sectoral scopes: List all sectoral scopes applicable to the project activity;
   (l) Applied methodologies and standardized baselines: List all the methodologies and combination of methodologies, and where applicable, the standardized baselines, applied to the project activity;
   (m) Amount of GHG emission reductions or net anthropogenic GHG removals achieved by the project activity in this monitoring period: Provide the total amount in tonnes of CO_2 equivalent;
   (n) Amount of GHG emission reductions or net anthropogenic GHG removals estimated ex ante for this monitoring period in the PDD: Provide the total amount in tonnes of CO_2 equivalent based on the ex ante estimation in the PDD, with adjustment for the comparable period, as appropriate.

SECTION A. Description of project activity

A.1. General description of project activity

1. Provide a brief summary of the project activity in terms of the purpose of the project activity and the measures taken for GHG emission reductions or net anthropogenic GHG removals.

A.2. Location of project activity

1. Provide details of the physical/geographical location of the project activity, including physical address (host Party, region/state/province, city/town/community, street name and number) and a map, and if necessary, other information allowing for unique identification of the project activity (e.g. geographic coordinates).
2. Do not exceed one page for the description of location.

A.3. Parties and project participants

1. List in the table the Parties and the project participants involved in the project activity.

A.4. Reference to applied methodologies and standardized baselines

1. Indicate the exact reference (number, title, version) of:
   (a) The applied methodologies or combination of methodologies (e.g. ACM0001: "Large-scale consolidated methodology: Flaring or use of landfill gas" (version 15.0));
   (b) Any tools and other methodologies to which the applied methodologies refer (e.g. "Methodological tool: Tool for the demonstration and assessment of additionality" (version 07.0.0));
   (c) The applied standardized baselines, where applicable (e.g. ASB0001 "Standardized baseline: Grid emission factor for the Southern African power pool" (version 01.0)).
2. Refer to the UNFCCC CDM website for the exact reference of the applied methodologies, tools and standardized baselines.

A.5. Crediting period type and duration

1. Provide the type (fixed or renewable), and the duration (with the start and end dates in DD/MM/YYYY – DD/MM/YYYY) of the crediting period corresponding to this monitoring period.

SECTION B. Implementation of project activity

B.1. Description of implemented project activity

1. Provide information on the implementation status of the project activity in accordance with the applicable provisions on the description of implemented registered CDM project activities in the project standard, including:
   (a) Description of the installed technology, technical processes and equipment;
   (b) Information on the implementation and actual operation of the project activity, including relevant dates (e.g. construction, commissioning, start of operation).
2. For the description of the installed technologies, technical processes and equipment, include diagrams, where appropriate.
3. If applicable, present information on any post-registration changes to the project activity in section B.2 below.

B.2. Post-registration changes

B.2.1. Temporary deviations from the registered monitoring plan, applied methodologies or standardized baselines

1. Indicate whether there are temporary deviations from the registered monitoring plan, applied methodologies or standardized baselines during this monitoring period.
2. If there are such deviations, for each deviation, provide a description of the nature, extent and duration of the non-conforming monitoring period, and:
   (a) Propose alternative monitoring arrangements for the non-conforming monitoring period in accordance with the applicable provisions in the project standard; or
   (b) Apply the most conservative values approach in accordance with the applicable provisions in the project standard.
3. Provide the version number and the completion date of the DOE verification report.

B.2.2. Corrections

1. Indicate whether there are corrections to project information or parameters fixed at the registration or renewal of crediting period of the project activity.
2. If there are such corrections, list all the corrections since the registration of the project activity, separating them into the following categories:
   (a) Corrections that have been approved by the Board as applicable from the period prior to this monitoring period;
   (b) Corrections that have been approved by the Board as applicable from this monitoring period;
   (c) Corrections that are being submitted with this monitoring report as part of the request for issuance (post-registration change – issuance track) as applicable from this monitoring period.
3. For the corrections referred to in 1(a) and 1(b) above, provide the approval dates and reference numbers of the post-registration changes.
4. For the corrections referred to in 1(c) above, provide the version number and the completion date of the revised PDD and of the DOE validation report.

B.2.3. Changes to the start date of the crediting period

1. Indicate whether there are changes to the start date of the crediting period fixed at the registration of the project activity.
2. If there are such changes, list all the changes since the registration of the project activity, separating them into the following categories:
   (a) Changes that have been approved by the Board or notified to the secretariat and that do not affect the start of this monitoring period (i.e. any of the changed start dates are prior to the start of this monitoring period);
   (b) Change that has been approved by the Board or notified to the secretariat and that affects the start of this monitoring period (i.e. the changed start date is the start of this monitoring period);
   (c) Change that affects the start of this monitoring period and is being submitted with this monitoring report as part of the request for issuance (post-registration change – issuance track) and that affects the start of this monitoring period.
3. For the changes referred to in 1(a) and 1(b) above, provide the approval dates and reference numbers of the post-registration changes, or provide the notification date.
4. For the changes referred to in 1(c) above, provide the version number and the completion date of the revised PDD and of the DOE validation report.

B.2.4. Inclusion of monitoring plan

1. Indicate whether there is a post-registration change to include a monitoring plan into the PDD, for which the delayed submission of the monitoring plan was chosen by the project participants at the time of the registration of the project activity.
2. If there is such change, indicate which one of the following categories that the change falls under:
   (a) Inclusion has been approved by the Board as applicable from the period prior to this monitoring period;
   (b) Inclusion has been approved by the Board as applicable from this monitoring period (i.e. this is the first monitoring period for the project activity); or
   (c) Inclusion Is being submitted together with this monitoring report (post-registration change – issuance track) as applicable from this monitoring period.
3. For the case referred to in 1(a) or 1(b) above, provide the approval date and reference number of the post-registration change.
4. For the case referred to in 1(c) above, provide the version number and the completion date of the revised PDD and of the DOE validation report.

B.2.5. Permanent changes to the registered monitoring plan, or permanent deviation of monitoring from the applied methodologies, standardized baselines, or other applied standards or tools

1. Indicate whether there are permanent changes to the registered monitoring plan, or permanent deviation of monitoring from applied methodologies, applied standardized baseline, or other applied standards or tools.
2. If there are such changes, list all the changes since the registration of the project activity, separating them into the following categories:
   (a) Changes that have been approved by the Board as applicable from the period prior to this monitoring period;
   (b) Changes that have been approved by the Board as applicable from this monitoring period;
   (c) Changes that are being submitted with this monitoring report as part of the request for issuance (post-registration change - issuance track) as applicable from this monitoring period.
3. For the changes referred to in 1(a) and 1(b) above, provide the approval dates and reference numbers of the post-registration changes.
4. For the changes referred to in 1(c) above, provide the version number and the completion date of the revised PDD and of the DOE validation report.

B.2.6. Changes to project design

1. Indicate whether there are any changes to the project design of the project activity.
2. If there are such changes, list all the changes since the registration of the project activity, separating them into the following categories:
   (a) Changes that have been approved by the Board as applicable from the period prior to this monitoring period;
   (b) Changes that have been approved by the Board as applicable from this monitoring period;
   (c) Changes that are being submitted with this monitoring report as part of the request for issuance (post-registration changes - issuance track) as applicable from this monitoring period.
3. For the changes referred to in 1(a) and 1(b) above, provide the approval dates and reference numbers of the post-registration changes.
4. For the changes referred to in 1(c) above, provide the version number and the completion date of the revised PDD and of the DOE validation report.

SECTION C. Description of monitoring system

1. Provide a description of the monitoring system in accordance with the applicable provisions on the description of monitoring system in the project standard and the monitoring plan in the registered PDD. Include line diagrams showing all relevant monitoring points.

SECTION D. Data and parameters

1. Provide information on all data and parameters in accordance with the applicable provisions on data and parameters in the project standard, using the tables provided in sections D.1 and 0.
2. For “Purpose of data/parameter” in the tables in D.1 and 0, choose one of the following options:
   (a) Calculation of baseline emissions or baseline net GHG removals;
   (b) Calculation of project emissions or actual net GHG removals;
   (c) Calculation of leakage.
3. Where the applied standardized baselines standardize baseline emissions, apply the standardized values of the parameters in sections D.1 and/or 0 in accordance with the applicable provisions related to data and parameters in the project standard.

D.1. Data and parameters fixed ex ante

1. Include data that are fixed at the registration or at the renewal of crediting period of the project activity, and were used during this monitoring period, by replicating the information from the registered PDD.
2. For “Value(s) applied”, use one table to report multiple values referring to the same data and parameter, if applicable.

D.2. Data and parameters monitored

1. Include data and parameters that were monitored during this monitoring period.
2. For “Monitoring equipment” in the table, provide information on type, accuracy class, serial number, calibration frequency, date of last calibration and validity.
3. For “Value(s) of monitored parameter”, use one table to report multiple values referring to the same data and parameter, if applicable.
4. Describe details in spreadsheets if appropriate, attach them to the monitoring report, and provide the reference to the spreadsheets in this section.

D.3. Implementation of sampling plan

1. If a sampling plan was implemented to determine parameter values, provide a description of how the sampling for those parameters was implemented in accordance with the sampling plan in the registered monitoring plan, including the following information:
   (a) Description of implemented sampling design;
   (b) Collected data (attach and provide reference to spreadsheets, if necessary);
   (c) Analysis of the collected data;
   (d) Demonstration that the required confidence/precision has been met;
   (e) Demonstration that the samples were randomly selected and are representative of the population.
2. Attach to the monitoring report any spreadsheets to present full calculations or detailed information.

SECTION E. Calculation of emission reductions or net anthropogenic removals

1. For the parameter global warming potentials (GWPs), from 1 January 2013, apply the values adopted by decision 4/CMP.7 to calculate GHG emission reductions or net anthropogenic GHG removals achieved in the second commitment period of the Kyoto Protocol in accordance with the applicable provisions in the project standard.

E.1. Calculation of baseline emissions or baseline net removals

1. Provide sample calculations for all formulae used to calculate baseline GHG emissions or baseline net GHG removals, applying actual values. Attach spreadsheets to the monitoring report to present full calculations for this monitoring period.

E.2. Calculation of project emissions or actual net removals

1. Provide sample calculations for all formulae used to calculate project GHG emissions or actual net GHG removals, applying actual values. Attach spreadsheets to the monitoring report to present full calculations for this monitoring period.

E.3. Calculation of leakage emissions

1. Provide sample calculations for all formulae used to calculate leakage GHG emissions, applying actual values. Attach spreadsheets to the monitoring report to present full calculations for this monitoring period.

E.4. Calculation emission reductions or net anthropogenic removals

1. Summarize the results of sections E.1, E.2 and E.3 above, and provide GHG emission reductions or net anthropogenic GHG removals for this monitoring period, using the table.
2. If the monitoring period starts before 1 January 2013 and ends anytime thereafter, provide GHG emission reductions or net anthropogenic GHG removals achieved for the following two periods separately by allocating the raw data into the two periods in accordance with the applicable provisions in the project standard, and multiplying them with the applicable GWPs:
   (a) Before 1 January 2013 (first commitment period);
   (b) From 1 January 2013.

E.5. Comparison of emission reductions or net anthropogenic removals achieved with estimates in the registered PDD

1. Provide a comparison of the GHG emission reductions or net anthropogenic GHG removals achieved by the project activity during this monitoring period with the amount based on the ex ante estimation in the registered PDD.

E.6. Remarks on increase in achieved emission reductions

1. State whether the actual GHG emission reductions achieved is greater than the amount based on the ex ante estimation in the registered PDD. If so, explain the cause of any increase in the actual GHG emission reductions achieved by the project activity during this monitoring period, including all information that is different from that stated in the registered PDD.
2. This section is not applicable for afforestation and reforestation (A/R) project activities.

- - - - -

Document information

Version	*Date*	*Description*
06.0	7 June 2017	Revision to: • Ensure consistency with version 01.0 of the "CDM project standard for project activities" (CDM-EB93-A04-STAN); • Make editorial improvements.

Version	*Date*	*Description*
05.1	4 May 2015	Editorial revision to correct version numbering.
05.0	1 April 2015	Revisions to: • Include provisions related to delayed submission of a monitoring plan; • Provisions related to the Host Party; • Remove reference to programme of activities; • Overall editorial improvement.
04.0	25 June 2014	Revisions to: • Include the Attachment: Instructions for filling out the monitoring report form (these instructions supersede the "Guideline: Completing the monitoring report form" (Version 04.0)); • Include provisions related to standardized baselines; • Add contact information on a responsible person(s)/ entity(ies) for completing the CDM-MR-FORM in A.6 and Appendix 1; • Change the reference number from *F-CDM-MR* to *CDM-MR-FORM*; • Editorial improvement.
03.2	5 November 2013	Editorial revision to correct table in page 1.
03.1	2 January 2013	Editorial revision to correct table in section E.5.
03.0	3 December 2012	Revision required to introduce a provision on reporting actual emission reductions or net GHG removals by sinks for the period up to 31 December 2012 and the period from 1 January 2013 onwards (EB 70, Annex 11).
02.0	13 March 2012	Revision required to ensure consistency with the "Guidelines for completing the monitoring report form" (EB 66, Annex 20).
01.0	28 May 2010	EB 54, Annex 34. Initial adoption.

Decision Class: Regulatory
Document Type: Form
Business Function: Issuance
Keywords: monitoring report