



JOBURG LANDFILL GAS TO ENERGY PROJECT



Project title	<i>Joburg Landfill Gas to Energy Project</i>
Project ID	1240
Monitoring period	<i>01-November-2024 to 31- October-2025</i>
Original date of issue	<i>23-October-2025</i>
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VCS Standard Version	<i>Version 4.7</i>
Prepared by	<i>ENERGY Joburg RF (PTY) LTD</i>

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1 PROJECT DETAILS

1.1 Summary Description of the Implementation Status of the Project

The Joburg Landfill Gas to Energy Project (the “Project”) developed by Energy Joburg RF (Pty) Ltd. (the “Project Proponent”) is a landfill gas (hereafter, “LFG”) collection and utilisation project at the Johannesburg landfill sites located in Johannesburg, South Africa (the “Host Country”).

The objective of the project is to collect and destroy/utilise the LFG generated at five Johannesburg landfill sites. The project activity consists of two distinct stages:

1. LFG is captured and destroyed by using an LFG flare. The purpose of LFG flaring is to dispose of the flammable constituents, particularly methane, safely, and to control odour nuisance, health risks, and adverse environmental impacts. Hence, investment will be made in a highly efficient gas collection system and flaring equipment.

2. The captured LFG will be fed to the LFG flare and modular electricity generation plants. The generators will combust the LFG methane to produce electricity for internal use and/or export to a local power purchaser. Excess LFG and all gas collected during periods when electricity is not produced, will be flared.

Prior to implementation of the project activity, the LFG was being freely emitted into the atmosphere resulting in GHG emissions. The Project involves the destruction/utilisation of methane emissions as well as the displacement of electricity from the South African coal-based grid, resulting in a consequent reduction in CO₂ emissions. In the baseline scenario, the LFG would have been released into the atmosphere resulting in GHG (CH₄) emissions to the atmosphere. The electricity would have been produced in the fossil fuel based South African grid resulting in CO₂ emissions.

Emission reductions are produced by the capture and destruction/utilisation of LFG and the displacement of coal-based electricity from the grid by the generation of electricity from captured LFG. The annual average and total GHG emission reductions for the second crediting period is 911,369 tCO_{2e} with total GHG emission reduction of 227,834 tCO_{2e} for this monitoring period. The project includes five sites. The Robinson Deep site has one Biogas 2000Nm³/h flare was commissioned on 27-May-2011 and three ENER-G 1140KW electricity generation plants were commissioned on 26-November-2016. The Marie Louise landfill site one Biogas 2000Nm³/h flare was commissioned on 04-May-2012 and one ENER-G 1140KW electricity generation was commissioned on 25-January-2018. The Goudkoppies one Biogas 2000Nm³/h flare and two ENER-G 1140KW electricity generation components were commissioned on 25-April-2017. The last two sites, namely Linbro Park and Ennerdale sites, are currently not constructed and will remain within the basket to projects, subject to economic drivers required to commit to build these sites.

1.2 Audit History

Audit Type	Period	Program	Validation/verification body name	Number of years
Validation	27-May-2011--26-May-2021	VCS	Carbon Check	10
Verification	27-May-2011 – 11-November-2012	VCS	Carbon Check South Africa	1 year, 168 days (5 months and 15 days)
Validation	12-November 2014 --11 - November-2020	CDM	Bureau Veritas	7
Verification	12-November-2012 – 20-April-2013	CDM	Carbon Check South Africa	160 days (5 months and 8 days)
Verification	01-May-2013 – 31- August 2014	CDM	Carbon Check South Africa	1 year, 123 days (4 months)
Verification	01-September 2014 - 31-March 2018	CDM	Carbon Check India	3 years, 212 Days (7 months)
Verification	1-April 2018 – 11-November-2019	CDM	Carbon Check India	1 year, 225 Days (6 months and 11 days)
Verification	12-November-2019 – 26-May-2021	VCS	AENOR INTERNACIONAL S.A.U	1 year, 196 Days (6 months and 14 days)
Validation	12-November-2020 – 11 November 2027	CDM	TUV Nord	7
Validation	27-May-2021 – 26-May-2031	<u>VCS</u>	<u>AENOR INTERNACIONAL S.A.U</u>	10

Verification	27-May-2021 - 31-December-2022	<u>VCS</u>	<u>Carbon Check (India) Private Limited</u>	1 year, 219 days (7 months and 4 days)
Verification	1-January-2023 - 30-November-2023	<u>VCS</u>	<u>Carbon Check (India) Private Limited</u>	334 days (11 months)
Verification	1-December-2023 - 31-October-2024	<u>VCS</u>	<u>Carbon Check (India) Private Limited</u>	336 days (11 months)
Verification	1-November-2024 - 31-October-2025	<u>VCS</u>	<u>Carbon Check (India) Private Limited</u>	365 days (12 months)
Total	27- May- 2011 - 26- May- 2031	<u>CDM/VCS</u>	<u>UNFCCC/VERRA</u>	20 years crediting period 4896 days (13 year 5 months and 4 days) monitoring period

1.3 Sectoral Scope and Project Type

Sectoral scope ¹	Sectoral Scope 13 - Waste Handling and Disposal Conditional sectoral scope 1 - Energy industries (renewable - / non-renewable sources)
Project activity type	Destruction of methane emissions and displacement of a more GHG intensive service, Waste Handling and Disposal and electricity generation.

The project is not a grouped project but rather a basket of five separate sites under one basket project registration with multiple project activity instances. There is no intention to add any additional sites outside of the ones listed above.

1.4 Project Proponent

Organization name	ENERGY Joburg RF (PTY) Limited ¹
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1.The name of the project proponent changed from ENER-G Systems Joburg to ENERGY Joburg RF in 2016.

Contact person	David Cornish
Title	Director
Address	Unit 2, The Firs, 5 Humber Street, Woodmead, Johannesburg, South Africa.
Telephone	+27 118038245
Email	dcornish@gessa.co.za

1.5 Other Entities Involved in the Project

Organization name	Promethium Carbon
Role in the project	Promethium Carbon has assisted in the developed the Project Description document and can be contacted for queries related to the VCS process.
Contact person	Robbie Louw
Title	Director: Promethium Carbon
Address	32 Peter Place, The Courtyards, 1st floor block 2, Bryanston 2060
Telephone	+27 (0) 11 706 8185
Email	Robbie@promethium.co.za

1.6 Project Start Date

Project start date	27-May-2011
Justification	This is the date of the commissioning certificate issued supplier for the first plant started at Robinson Deep.

1.7 Project Crediting Period

Crediting period	Seven years, twice renewable ☒ Ten years, fixed ☐ Other (state the selected crediting period and justify how it conforms with the VCS Program requirements)
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Start and end date of
first or fixed crediting
period

27-May-2021 to 26-May-2031

1.8 Project Location

The project activity sites are located in Johannesburg, in the Gauteng Province of South Africa.

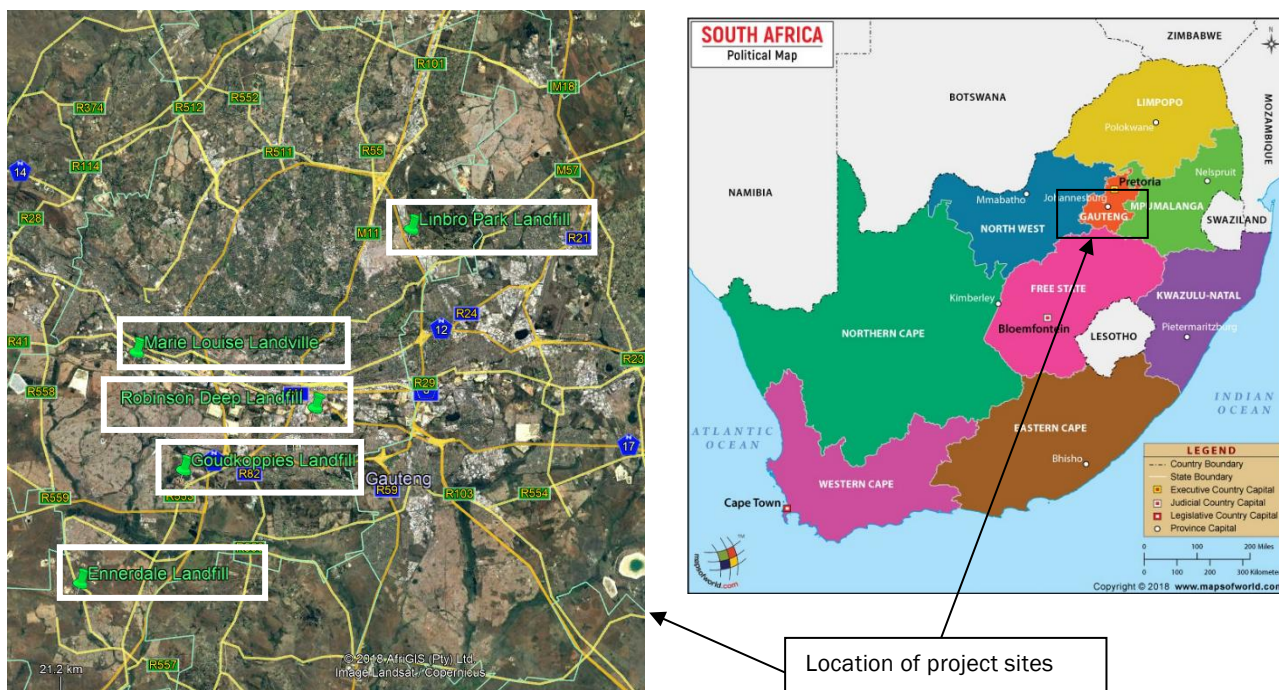


Figure: Locations of the project activity sites

The project activity sites are located at the following addresses and co-ordinates:

- Linbro Park Landfill - Marlboro Drive, Sandton: 26° 05' 41.85" S & 28° 07' 13.43" E;
- Marie Louise Landfill - Dobsonville Drive, Roodepoort: 26° 11' 23.89" S & 27° 53' 00.13" E;
- Robinson Deep Landfill – Turffontein Road, Turffontein: 26° 13' 59.03" S & 28° 02' 14.77" E;
- Goudkoppies – Houthammer Road, Devland, Lenasia: 26° 16' 52.31" S & 27° 55' 24.93" E; and
- Ennerdale Landfill – Old Lawley Road, Lawley: 26° 22' 07.78" S & 27° 50' 02.80" E.

1.9 Title and Reference of Methodology

Type (methodology, tool or module).	Reference ID, if applicable	Title	Version
Methodology	ACM0001	Large-scale Consolidated Methodology Flaring or use of landfill gas	Version 19
Tool	TOOL02	Combined tool to identify the baseline scenario and demonstrate additionality	Version 07.0
Tool	TOOL03	Tool to calculate project or leakage CO2 emissions from fossil fuel combustion	Version 03.0
Tool	TOOL04	Emissions from solid waste disposal sites	Version 08.0
Tool	TOOL05	Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation	Version 03.0
Tool	TOOL06	Project emissions from flaring	Version 04.0
Tool	TOOL07	Tool to calculate the emission factor for an electricity system	Version 07.0
Tool	TOOL08	Tool to determine the mass flow of a greenhouse gas in a gaseous stream	Version 03.0
Tool	TOOL011	Assessment of the validity of the original/current baseline and update of the baseline at the renewal of the crediting period	Version 03.0.1
Standardized Baseline	ASB0040-2018	Grid emission factor for the Southern Africa power pool	Version 01.0

1.10 Double Counting and Participation under Other GHG Programs

1.10.1 No Double Issuance

Is the project receiving or seeking credit for reductions and removals from a project activity under another GHG program?

☐ Yes ☒ No

1.10.2 Registration in Other GHG Programs

Is the project registered or seeking registration under any other GHG programs?

☒ Yes

☐ No

The project is also registered with the UNFCCC with registration number 6797. When Article 6 of the Paris agreement was signed the UNFCCC was no longer able to issue any further ERs until the new Supervisory Body was established and the rules for Article 6 were established. As a result, the project was transferred to VERRA and a gap validation completed in August 2021 for the period from 27-May-2021 to 26-May-2031.

1.11 Double Claiming, Other Forms of Credit, and Scope 3 Emissions

1.11.1 No Double Claiming with Emissions Trading Programs or Binding Emission Limits

Are project reductions and removals or project activities also included in an emissions trading program or binding emission limit? See the *VCS Program Definitions* for definitions of emissions trading program and binding emission limit.

☐ Yes

☒ No

The Project does not engage in any other environmental crediting activities.

The project does produce VCUs from grid displaced electricity which will form part of the Supply Chain with the City of Joburg and Pickitup, but will be classified as scope 2 emissions as the product is electricity and is distributed by the national utility. The volume of emission reductions for this monitoring period is 26,137tCO₂e.

David Cornish

From: David Cornish <dcornish@gessa.co.za>
Sent: Wednesday, 03 May 2023 12:13
To: 'Central Purchasing Agency'
Cc: 'RE_LG_0029_001 Renewables3'
Subject: Carbon Emission reductions Scope 3 and scope 2 emissions

Dear Buyer

The Seller would like to confirm that the emission reductions produced by the Joburg Landfill gas to electricity project for the displacement of brown power through the supply of renewable green electricity are claimed by the project under its registration with VERRA. The electricity supplied by ENERGY Joburg to the Buyer must not result in the Buyer claiming additional emission reductions against any limits, targets and or taxes as this would trigger double counting.

We trust that the above is well received and should there be any further queries please do not hesitate to contact the undersigned.

Regards,

David Cornish
General Manager

ENERGY Systems SA (PTY) LTD
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Mobile: +27 (0) 83 385 0661
Skype: davidcornish9214
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1.11.2 No Double Claiming with Other Forms of Environmental Credit

Has the project activity sought, received, or is planning to receive credit from another GHG-related environmental credit system? See the *VCS Program Definitions* for definition of GHG-related environmental credit system.

☐ Yes

☒ No

1.11.3 Supply Chain (Scope 3) Emissions

Do the project activities affect the emissions footprint of any product(s) (goods or services) that are part of a supply chain?

☐ Yes

☒ No

1.12 Sustainable Development Contributions

No new project activities were implemented during this monitoring period.

The project activity uses landfill gas for electricity generation. The SD contributions addresses Goal 13 “Take urgent action to combat climate change and its impacts” but more specifically 13.2.1 and the project contributes to the reduction of greenhouse gases. In addition as a point of interest the project also addresses goal 7.2 by increasing renewable energy in the energy mix for South Africa although this is not mentioned in the PD. The emission reductions are monitored and reported to UNFCCC or VCS and electrical energy is metered and reported to the Independent Power Producers Office in South Africa in terms of the REIPPP (Renewable energy independent Power Producers Procurement Programme) which is a programme implement by the South African government to stimulate renewable energy in the energy mix.

Table 1: Sustainable Development Contributions

Row number	SDG Target	SDG Indicator	Net Impact on SDG Indicator	Current Project Contributions	Contributions Over Project Lifetime
1)	13.0 Take urgent action to combat climate change and its impacts.	Tonnes of greenhouse gas emissions avoided or removed	Implemented activities to increase	The project has through the continued collection and utilization of landfill gas reduced the greenhouse gas emissions for this monitoring period by 227,833tons of CO _{2e} .	The project has decreased greenhouse gas emissions by a total of 1,888,557 CO _{2e} over the project lifetime.
2)	3.9 (By 2030, substantially reduce the number of deaths and illnesses from hazardous chemicals and air, water and soil pollution and contamination.	3.9.1 Mortality rate attributed to household and ambient air pollution. By reducing the landfill gas linked to Total CH ₄ (tonnes) destroyed we are able contribute to an improvement in the air quality and this has direct health benefits as published in the International Journal of Epidemiology, 2016, 806–815.	Implemented activities to increase	The project has through the continued collection and utilization of landfill gas reduced the greenhouse gas emissions for this monitoring period by 8,014.6 tonnes CH ₄ .	To date the project has reduced 74,943tonnes CH ₄ .over the life of the project.

3)	7.2 By 2030, increase substantially the share of renewable energy in the global energy mix.	7.2: By 2030, increase substantially the share of renewable energy in the global energy mix. This used the Total LFG (Nm ³ /h) destroyed and/or utilized for renewable energy generation.	Implemented activities to increase	The project has through the continued collection and utilization of landfill gas reduced the greenhouse gas emissions for this monitoring period by average of ~2,426.25Nm ³ /h. This gas is used to generate renewable electricity.	The project has decreased greenhouse gas emissions by an average of 2161Nm ³ /h over the project lifetime.
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Impact 1 and 2 (gas flow) will be monitored by measuring the total landfill gas that is combustion and/or utilised to generate renewable electricity by the project. The monitoring system consists flow meters that record the total flow of landfill gas extracted from the site and conveyed to the flare and generators. This improved air quality which is linked to increases in general health and wellbeing of communities living in and around the landfill sites. There are numerous studies and reports detailing the negative effects caused by landfill gas on the general health communities and we have shared some of these reports and studies along with the supporting evidence for the parameter. The evidence of actual reductions for this monitoring period is contained the monthly ER calculation sheets and the excel spreadsheets titled “Consolidated ER Sheet 1 November 2024 to 31 October 2025 V3” as evidence of the above.

Impact 3 (renewable energy) will be measured by electricity metering equipment, which will measure the net renewable energy generated by the project. This is linked to increased renewable generation and contributing to decarbonising the electricity sector in South Africa. This is evidenced by the Power sale agreement with Unilever and supported by the commercial invoices to the buyer of this electricity which was submitted as part of the audit pack. We have however use SGD 7.2 as this is a better fit as the categorisation of the SDG goals have changed since the project was registered and activity better suites the SDG target of 7.2.

Impact 1,2 and 3 (avoided tCO₂e) will be measured as per the parameters and monitoring plan outlined in section 5 of this Project Description. This improved air quality which is linked to increases in general health and wellbeing of communities around the landfill sites not to mention a reduction in a green house gas. The evidence for this is contained the monthly ER calculation sheets and the excel spreadsheets titled “Consolidated ER Sheet 1 November 2024 to 31 October 2025 V3” as evidence of the above.

All of the above SDG parameters are part of the South African Governments portfolio of SDG goals as reflected in the 2024 SDG report provided with Audit Pack in which some of the improvements, in particular renewable electricity, are driven by project of this nature.

1.13 Commercially Sensitive Information

No information has been excluded from the public version of the monitoring report.

2 SAFEGUARDS AND STAKEHOLDER ENGAGEMENT

2.1 Stakeholder Engagement and Consultation

2.1.1 Stakeholder Identification

Stakeholder Identification	The Public Participation process (PPP) was initiated through the use of site notices, Background Information Documents (BID's), and the media in the form of advertisements. Public Meetings were held during the week 23 – 27-February-2009. An Authorities Meeting was held on the 27-February-2009 at WSP's main boardroom. As a result, a general Issues Trail for each site has been developed and formed part of the final EIA and EMP Report. All reports went on public review for a period of four weeks initially, from 7-August until 4-September-2009. The public review period for the EIA and EMP Reports were extended due to delays from DEAT for an additional three weeks. Interested & Affected Parties (I&APs) were identified by placing official notices of the EIA process for the proposed development in the national newspaper, "The Citizen" on 19-February-2009. In addition advertisements were placed in "The Citizen" and "The Sowetan" newspapers on the 07-August-2009. The reports went on public review for a period of four weeks from 07-August-2009 to 04-September-2009 at appropriate public venues in the areas of the landfills.
Legal or customary tenure/access rights	There were no access rights and or conflicting rights as the site had been operating as legacy landfill sites. The landfill gas project has secured the rights to use the gas with the City Of Johannesburg who own and operate the landfill site.
Stakeholder diversity and changes over time	The stakeholders range from ward councilors (political) to private individuals and businesses. These interested parties cover the spectrum for both social and ethnic backgrounds. As the project has matured we have had more and more interest from academic institutions who like to use the site for education and reference purposes.
Expected changes in well-being	As the project improved the air quality there can only be improvements in the well being of the surrounding communities. This was evidenced by a local news agent

	publishing a story about the improved air quality of the site after the project implementation.
Location of stakeholders	The location of the stakeholders are typically located within a few kilometers of the landfill sites themselves. There are nearby neighborhoods and businesses of Turfontien and Soweto.
Location of resources	Not applicable to the landfill gas to electricity project.

2.1.2 Stakeholder Consultation and Ongoing Communication

Ongoing consultation	Ongoing engagement with the local community takes place through the Landfill monitoring committee meetings. These take place every six months which are set up and managed by Pickup who are the landfill site owners and operators. These meetings are open meetings and anyone can attend and communicated with interested and affected parties as to the dates and time of the meeting and the location. Community stakeholders then sign an attendance register and both Pickup and ENERGY Joburg make representations on the performance and status of the landfill site and landfill gas project respectively. Minutes of the meeting are taken and then circulated to the attendees. In addition to this the project has notice boards on site with contact details and a full project description notice board describing the project activities. We have a register and procedure for logging any contact with interested and affected parties. Outside of the monitoring committee meetings held at Marie Lousie all our side have formal information boards that fully describe the projects and its activities and provides contact details for our team should any one of the public need to make contact and raise any concerns and or grievance. Any complaints and or grievance is logged in a register and addressed through increased engagement with the interested and affected parties through both formal informal responses depending on the nature of the complaint and followed up with minutes of these meetings
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	to ensure that the issue is given due consideration and corrective action is taken to close out any issues raised.		
Date(s) of stakeholder consultation	23-August-2024		
	22-November-2024		
	21-February-2025		
	23-May-2025		
	22-August-2025		
	Additional site visits by interested and affected parties.		
	Pickit-up/IFC solid waste sector	Tuesday, 28 January 2025 12:00-13:30	Robinson Deep, Turfontein No compliant received from visitors
	SABIA	Thursday, 4 September 2025 12:00 – 13:00	Robinson Deep, Turfontein No compliant received from visitors
	GIZ	Tuesday, 16 September 2025 09:00 – 10:00	Robinson Deep, Turfontein No compliant received from visitors
	Buffalo City Municipality – General Manager	Tuesday, 29 September 2025 10:00 – 11:00	Robinson Deep, Turfontein No compliant received from visitors
	City Of Johannesburg delegates	Wednesday, 01 October 2025 15:00 – 16:00	Robinson Deep, Turfontein No compliant received from visitors

	Nersa Delegates	Thursday,30 October 2025	Robinson Deep, Turfontein
			No compliant received from visitors
Communication of monitored results	The project proponent ensures that the project activity is an agenda item for every meeting. The minutes are circulated to all that attend the meetings as record of the issues discussed with the expected action items.		
Consultation records	The monitoring results are maintained through attendance registers and by taking minutes of the above meetings which are circulated to all parties who attend and also registered in the above-mentioned public consultation register		
Stakeholder input	To date we have not had any actionable comments and or queries raised during these meetings or via email and mobile phone call with regards to the landfill gas utilisation project. The queries and or comments we revied have been positive and supportive for the project activities as this improves the working conditions for the informal pickers on the site. Other queries are linked to job creation or vacant posts and opportunities within the project for local service providers. We have attached attendance registers and minutes of the meetings as reference.		

2.1.3 Free, Prior, and Informed Consent

Consent	The Project proponent undertook the Public Participation Process (PPP) according to the requirements of the NEMA EIA regulations stipulated in Chapter 6 (Section 56 to 59) of R. 385. The PPP ensures transparency of the project and provides an open channel of communication between the authorities, the public, and the project team. WSP as the independent consultant undertook the PPP through the use of site notices, Background Information Documents (BID's), and the media in the form of advertisements. Public Meetings were held during the week 23 – 27-
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	February-2009. An Authorities Meeting was held on the 27-February-2009 at WSP's main boardroom. As a result, a general Issues Trail for each site has been developed and formed part of the final EIA and EMP Report. All reports went on public review for a period of four weeks initially, from 7-August until 4-September-2009. The public review period for the EIA and EMP Reports were extended due to delays from DEAT for an additional three weeks. The objectives of the PPP are as follows: To ensure an open and transparent EIA and consultation process; To identify and inform I&APs of the proposed project and associated EIA process; Establish communication between the I&APs and WSP; Provide an opportunity for I&APs to raise their issues, concerns and questions and ensure that these are considered in the EIA process; Ensure that I&APs have an opportunity to make a meaningful contribution towards decision making by the lead authority; and Develop an Issues Trail of all issues, concerns, and questions raised during the PPP and other I&AP consultation processes.
Outcome of FPIC	Notes of each I&AP and comments from I&AP's were compiled and recorded and made available to the authorities as part of the approval process and where applicable such comments and inputs contributed to the environmental management plan adopted by the project.

2.1.4 Grievance Redress Procedure

Grievances received	Resolution and outcome
None	Not applicable

2.1.5 Public Comments

Summary of comments received	Actions taken
23-August-2024 Members of the committee requested a site visit to see the processes and plant.	Energy Joburg representative is waiting for the committee to set a date and will facilitate the site visit.
21 February 2025	Comments were limited to the type of community projects ENERGY Joburg sponsored and this was outlined as underprivileged schools and did not include yellow plant.
23 May 2025	Comments were limited to illegal dumping.
22 August 2025	No Comments related to the landfill gas project.

Below is a list of site visits facilitated by the owner for interested and affected parties during this monitoring period.

Pickit-up/IFC solid waste sector	Tuesday, 28 January 2025 12:00-13:30	Robinson Deep, Turfontein	No compliant received from visitors
SABIA	Thursday, 4 September 2025 12:00 – 13:00	Robinson Deep, Turfontein	No compliant received from visitors
GIZ	Tuesday, 16 September 2025 09:00 – 10:00	Robinson Deep, Turfontein	No compliant received from visitors

Buffalo City Municipality – General Manager	Tuesday, 29 September 2025 10:00 – 11:00	Robinson Deep, Turfontein	No compliant received from visitors
City Of Johannesburg delegates	Wednesday, 01 October 2025 15:00 – 16:00	Robinson Deep, Turfontein	No compliant received from visitors
Nersa Delegates	Thursday, 30 October 2025	Robinson Deep, Turfontein	No compliant received from visitors

As this is the projects second crediting period, we have not included comments received during the project initiation and public consultation process as these are extensive. These were provided as separate I&AP reports as noted in section 2.1.3 above and provided at Validation. These are available on request. We have only noted comments received during this monitoring period.

2.2 Risks to Stakeholders and the Environment

2.2.1 Management Experience

ENERGY Joburg RF (PTY) Ltd is the owner of numerous landfill gas utilization projects within South Africa and has a long track record of operating landfill projects that comply with the environmental regulations in South Africa. In 2009 ENERGY Joburg RF (PTY) Ltd embarked on the development of its first CDM project at the Robinson Deep landfill site which was build and commissioned in May 2011. ENERGY Joburg RF (PTY) Ltd along with the ENERGY Systems operations staff that operated and managed the project and generate carbon credits jointly implemented and monitored the projects that where then registered under the UNFCCC CDM mechanism. Both entities have to date accumulated over a decade each of experience in operating, maintaining and getting issuance of credits for landfill gas to electricity projects both under the UNFCCC and VCS platforms. Both parties have extensive experience in validation, verification and implementation of monitoring systems to successfully implement these types of projects. Please refer to section 4.3 below for the specific roles and responsibilities for the teams involved in the day to day project operations.

2.2.2 Risk assessment

	Risk identified	Mitigation or preventative measure taken
Natural and human-induced risks to stakeholders' wellbeing	Uncontrolled release of landfill gas Noise impact	Plant is designed to prevent venting of gas Plant designed to within noise limit specifications
Risks to stakeholder participation	No Risk	Undertaken by an independent government registered practitioner.
Working conditions	<i>Health and Safety and employment equity</i>	Adoption of an employment equity policy and compliance with the Basic Conditions of Employment Act and the Occupational Health and Safety Act.
Safety of women and girls	No risk identified	The project is being developed on an existing active landfill site operated by the City of Joburg.
Safety of minority and marginalized groups, including children	No risk identified	The project is being developed on an existing active landfill site operated by the City of Joburg
Pollutants (air, noise, discharges to water, generation of waste, and release of hazardous materials and chemical pesticides and fertilizers)	Noise and air pollution.	The plant was designed to maintain low noise levels that complied with South African noise emission levels at less than 69db at 10m from the plant. The pollutants generated from the project had a net environmental benefit and reduced odors for the neighboring communities. An Environmental Management Plan (EMP) was developed for the project activity which addressed all the potential impacts and the mitigation measures to be adopted.

2.3 Respect for Human Rights and Equity

2.3.1 Labor and Work

Risks identified ²		Mitigation or preventative measure(s) taken
Discrimination	Potential discrimination	The project entry operates the business within the law of the Republic of South Africa which has a robust constitution and employment equity laws which firmly stand against discrimination of any sort. Copies of the Employment Equity Act detailing workers rights are posted at every site as reference for staff to reinforce these rights and access to information about their rights. In addition the companies employment equity policy states the following: “ d) Not discriminate against its employees with respect to employment or occupation on such grounds as race, colour, sex, religion, political opinion, national extraction or social origin, unless selectivity concerning employee characteristics furthers established governmental policies which specifically promote greater equality of employment opportunity or relates to the inherent requirements of a job.”

² The identified risks and commensurate mitigation or preventative measure(s) for forced labor, child labor, and human trafficking, must be inclusive of staff and contracted workers employed by third parties.

Sexual harassment	Potential sexual harassment	The project entry operates the business within the law of the Republic of South Africa which has a robust constitution and employment equity laws which firmly stand against discrimination of any sort. The South African Constitution and its associated laws address sexual harassment by protecting the rights to dignity, equality, and fair labour practices. Sexual harassment is legally recognized as a form of unfair discrimination and a barrier to equality, prohibiting it in both the workplace and other contexts. This is enforced through legislation like the Employment Equity Act and the Protection from Harassment Act, which mandate prevention, provide clear complaint procedures, and offer legal recourse for victims.
Gender equity in labor and work	Potential gender equity in labor and work.	The project entry operates the business within the law of the Republic of South Africa which has a robust constitution and employment equity laws which firmly stand against discrimination of any sort. Copies of the Employment Equity Act detailing workers' rights are posted at every site as reference for staff to reinforce these rights and access to information about their rights. In addition the companies employment equity policy states the following: “ d) Not discriminate against its employees with respect to

		employment or occupation on such grounds as race, colour, sex, religion, political opinion, national extraction or social origin, unless selectivity concerning employee characteristics furthers established governmental policies which specifically promote greater equality of employment opportunity or relates to the inherent requirements of a job.”
Forced labor	Potential forced labor	The company does not engage in human trafficking, forced labor, and child labor as this is illegal and contrary to the company's' employment policies as copied below: a) Respect the right of its employees to be represented by trade unions and other bona fide representatives of employees, and engage in constructive negotiations, either individually or through employers' associations, with such representatives with a view to reaching agreements on employment conditions; b) Contribute to the effective abolition of child labour; c) Contribute to the elimination of all forms of forced or compulsory labour; d) Not discriminate against its employees with respect to employment or occupation on such grounds as race, colour, sex, religion, political opinion, national extraction or social origin, unless selectivity concerning employee characteristics furthers

		established governmental policies which specifically promote greater equality of employment opportunity or relates to the inherent requirements of a job. e) Provide facilities to employee representatives as may be necessary to assist in the development of effective collective agreements; f) Provide information to employee representatives which is needed for meaningful negotiations on conditions of employment; g) Promote consultation and co-operation between employer and employees and their representatives on matters of mutual concern. h) Provide information to employees and their representatives which enables them to obtain a true and fair view of the performance of the ENERGY Joburg or, where appropriate, the enterprise as a whole. i) Observe standards of employment and industrial relations not less favourable than those observed by comparable employers in the host country; j) Take adequate steps to ensure occupational health and safety in its operations.
Child labor	No risk	The company does not engage in human trafficking, forced labor, and child labor as this is illegal and contrary to the company's

		employment policies as copied below: a) Respect the right of its employees to be represented by trade unions and other bona fide representatives of employees, and engage in constructive negotiations, either individually or through employers' associations, with such representatives with a view to reaching agreements on employment conditions; b) Contribute to the effective abolition of child labour; c) Contribute to the elimination of all forms of forced or compulsory labour; d) Not discriminate against its employees with respect to employment or occupation on such grounds as race, colour, sex, religion, political opinion, national extraction or social origin, unless selectivity concerning employee characteristics furthers established governmental policies which specifically promote greater equality of employment opportunity or relates to the inherent requirements of a job. e) Provide facilities to employee representatives as may be necessary to assist in the development of effective collective agreements; f) Provide information to employee representatives which is needed for meaningful negotiations on conditions of employment;
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		g) Promote consultation and co-operation between employer and employees and their representatives on matters of mutual concern. h) Provide information to employees and their representatives which enables them to obtain a true and fair view of the performance of the ENERGY Joburg or, where appropriate, the enterprise as a whole. i) Observe standards of employment and industrial relations not less favourable than those observed by comparable employers in the host country; j) Take adequate steps to ensure occupational health and safety in its operations.
Human trafficking	No risk	This is against the law and project proponent does not operate outside of the law.

2.3.2 Human Rights

Risks identified	Mitigation or preventative measure(s) taken
Risk of poor employment and human rights awareness.	The Project proponent in implementing the project complies with the South Africa Constitution and the laws of the country which protect human rights. This is further outlined in the Employment Equity Act, Occupational Health and Safety Act and many other

	laws to which the project complies. This is covered in the company's employment equity policy document.
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2.3.3 Indigenous Peoples and Cultural Heritage

Risks identified	Mitigation(s) or preventative measure taken
No risk identified	The project has no interaction with cultural heritage as the project activity takes place on an existing municipal owned landfill site which has been in place for over 30 years and as such there is no cultural and or heritage links to the project activity on the site.

2.3.4 Property Rights

Risks identified	Mitigation or preventative measure(s) taken
None	Note Applicable

2.3.5 Benefit Sharing

Summary of the benefit sharing plan	Not applicable as we do not own the land we have only secured the right to the gas.
Benefit sharing during the monitoring period	Not applicable

2.4 Ecosystem Health

	Risk identified	Mitigation or preventative measure taken during the monitoring period
Impacts on biodiversity and ecosystems	None	The landfill site was already established when the project was developed and the site continues to operate under the ownership of the City of Johannesburg.
Soil degradation and soil erosion	None	The landfill site was already established when the project was developed and the site continues to operate under the ownership of the City of Johannesburg.
Water consumption and stress	None	None as water is not used in the project process.

2.4.1 Rare, Threatened, and Endangered species

Species or habitat	The landfill site is owned and operated by a third party and has done so for over 20 years and is located in a urban setting. PP has secured the rights to use the gas we have not had any impact on the species or habitat.
Areas needed for habitat connectivity	Not applicable.

	Risks identified	Mitigation or preventative measure(s) taken
Habitats for rare, threatened, and endangered species	Not applicable	Not applicable
Areas for habitat connectivity	Not applicable	Not applicable

2.4.2 Introduction of species

Not applicable as the project activity does not include any planting of vegetation of any kind.

Species introduced	Classification	Justification for use	Adverse effects and mitigation
Not applicable			

As the site is an operation landfill in an urban setting there is no invasive species to note.

Existing invasive species	Mitigation measures to prevent the spread or continued existence of invasive species
Not applicable	

	Risks identified	Mitigation or preventative measure(s) taken
Invasive species	No risk identified	

2.4.3 Ecosystem conversion

	Risks identified	Mitigation or preventative measure(s) taken
Ecosystem conversion	No risk identified	

3 IMPLEMENTATION STATUS

3.1 Implementation Status of the Project Activity

The project includes five landfill sites. The Robinson Deep one Biogas 2000Nm³/h flare was commissioned on 27-May-2011 and three ENER-G 1140KW electricity generation plants were commissioned on 26-November-2016. The Marie Louise landfill site one Biogas 2000Nm³/h flare was commissioned on 04-May-2012 and one ENER-G 1140KW electricity generation was commissioned on 25-January-2018. The Goudkoppies one Biogas 2000Nm³/h flare and two ENER-G 1140KW electricity generation units that were commissioned on 25-April-2017. The last

two sites, namely Linbro Park and Ennerdale sites, are currently not constructed and will remain within the basket to projects, subject to economic drivers required to commit to build these sites.

The operations on all three sites run on a 24 hour basis 365 days a year with the electricity generation being the base operational state. The only time that the generation plants don't run would be due to scheduled and or unscheduled maintenance, breakdowns and or network outages. When there is a network outage the back-up diesel generator on site will start and the flare will operate even if the generator is not able to operate and export power. So overall there is very limited period of total downtime for the entire facility as we are able to operate one or the other plant depending on the nature of the breakdown or network outage. As all the data for the operation of the plant is logged in one-minute intervals, we are able to show in each month the amount of downtime per site which results in no emissions being collected and no credits being generated.

Operational uptime for the generation units is the best indicator of the plant availability and operations.

Generator operational hours	Closing reading 31 October 2024	Closing reading 31 October 2025	Hours
Marie Louise 1582	45971	53919	7948
Robinson Deep 1587	54051	60690	6639
Robinson Deep 1588	50274	54861	4587
Robinson Deep 1589	52529	57218	4689
Goudkoppies 1584	18001	22695	4694
Goudkoppies 1590	29141	35041	5900

Flare Operating hours

Flare hours Robinson Deep	8487
Flare hours Marie Louise	8295
Flare hours Goudkoppies	8315

It is worth noting that for sites like Robinson Deep where we have three generators and only enough gas to run two at a time that we are able to share the work load between the generators. For a site like Marie Louise where there is only one generator this reflects the level of plant availability that we are able to maintain in a year at circa 90.7%.

3.2 Deviations

3.2.1 Methodology Deviations

There have been no methodology deviations during this monitoring period.

3.2.2 Project Description Deviations

In the current Project Description (PD) registered with VERRA there are only two Targets categories listed under the Sustainable Development Goals (SDGs) namely 13.0 and 3. The Target for SDG 3 is split into two separate activities with the one being reduction of methane and linked to health and the second linked to the use of landfill gas for power generation. However, in accordance with Section 3.17.1 of the VCS Standard, Version 4.7, a minimum of three SDG contributions must be reported for each monitoring period.

In this regard, SDG 7 as this best aligns with the above mentioned use of landfill gas and has now been incorporated into the project's SDG contribution set to ensure compliance with the applicable requirement. This inclusion does not necessitate any additional or supplementary data collection, as the relevant information is already embedded within the existing project activities.

Going forward, SDG 7 will be consistently monitored and reported in all subsequent monitoring periods alongside the other applicable SDGs. It is further clarified that the inclusion of SDG 7 does not have any impact on baseline emissions, additionality assessment, leakage, or any other core carbon accounting parameters of the project

3.3 Grouped Projects

This is not a grouped project.

3.4 Baseline Reassessment

Did the project undergo baseline reassessment during the monitoring period?

☐ Yes ☒ No

4 DATA AND PARAMETERS

4.1 Data and Parameters Available at Validation

Data / Parameter	GWP _{CH4}
Data unit	tCO ₂ e/tCH ₄
Description	Global Warming Potential of methane
Source of data	IPCC (Fourth Assessment Report)

Value applied	28
Justification of choice of data or description of measurement methods and procedures applied	In line with values adopted in VCS Standard V4.7 From 1 st January 2021 onwards GWP CH ₄ 28 value from IPCC AR5 ·
Purpose of Data	Calculation of baseline emissions or baseline net GHG removals by sinks
Comments	This parameter is in line with the values adopted by decision 4/CMP.

Data / Parameter	EF _{EL} or EF _{grid, CM, y}																	
Data unit	tCO ₂ /MWh																	
Description	Combined margin emission factor for the grid in year y																	
Source of data	Calculated using TOOL07 “Tool to calculate the emission factor for an electricity systems” version 07.0																	
Value applied	0.9647																	
Justification of choice of data or description of measurement methods and procedures applied	<table><tr><th rowspan="2">Parameter</th><th rowspan="2">Unit</th><th rowspan="2">Description</th><th rowspan="2">Applicable project types</th><th colspan="3">Applicable values</th></tr><tr><th>First crediting period</th><th>Second crediting period</th><th>Third crediting period</th></tr><tr><td>EF_{grid, CM, y}</td><td>tCO₂/MWh</td><td>Combined margin CO₂ emission factor for interconnected electricity system of the SAPP</td><td>All project activities except wind and solar power generation</td><td>0.9481</td><td>0.9091</td><td>0.9091</td></tr></table>	Parameter	Unit	Description	Applicable project types	Applicable values			First crediting period	Second crediting period	Third crediting period	EF _{grid, CM, y}	tCO ₂ /MWh	Combined margin CO ₂ emission factor for interconnected electricity system of the SAPP	All project activities except wind and solar power generation	0.9481	0.9091	0.9091
	Parameter					Unit	Description	Applicable project types	Applicable values									
First crediting period		Second crediting period	Third crediting period															
EF _{grid, CM, y}	tCO ₂ /MWh	Combined margin CO ₂ emission factor for interconnected electricity system of the SAPP	All project activities except wind and solar power generation	0.9481	0.9091	0.9091												
	Above from PD. Below is from current Eskom report Eskom Annual Reports 2024 Page 78 and 2025 report page 106																	
Purpose of Data	Calculation of baseline emissions																	
Comments	None																	

Data / Parameter	Φ_{default}
Data unit	-
Description	Model correction factor to account for model uncertainties

Source of data	Methodological TOOL04: Emissions from solid waste disposal sites, Version 08.0
Value applied	0.75
Justification of choice of data or description of measurement methods and procedures applied	Application A is as the project activity mitigates methane emissions from existing SWDSs in Gauteng. The sites are therefore dry sites
Purpose of Data	Calculation of baseline emissions
Comments	None

Data / Parameter	OX
Data unit	-
Description	Oxidation factor (reflecting the amount of methane from SWDS that is oxidized in the soil or other material covering the waste)
Source of data	Methodological TOOL04: Emissions from solid waste disposal sites, Version 08.0
Value applied	0.1
Justification of choice of data or description of measurement methods and procedures applied	Default value
Purpose of Data	Calculation of baseline emissions
Comments	None

Data / Parameter	F
Data unit	-
Description	Fraction of methane in the SWDS gas (volume fraction)

Source of data	Methodological TOOL04: Emissions from solid waste disposal sites, Version 08.0
Value applied	0.5
Justification of choice of data or description of measurement methods and procedures applied	Default value from the TOOL04 “Emissions from solid waste disposal sites” Version 8.
Purpose of Data	Calculation of baseline emissions
Comments	None

Data / Parameter	$DOC_{f,default}$
Data unit	Weight fraction
Description	Default value for the fraction of degradable organic carbon (DOC) in MSW that decomposes in the SWDS
Source of data	IPCC 2006 Guidelines for National Greenhouse Gas Inventories
Value applied	0.5
Justification of choice of data or description of measurement methods and procedures applied	Default value as defined in the “ <i>Tool to determine methane emissions avoided from disposal of waste at a solid waste disposal site</i> ” Version 8.
Purpose of Data	Calculation of baseline emissions
Comments	None

Data / Parameter	$MCF_{default}$
Data unit	-
Description	Methane Correction Factor
Source of data	Methodological TOOL04: Emissions from solid waste disposal sites, Version 08.0
Value applied	1.0
Justification of choice of data or description of	1.0 for anaerobic managed solid waste disposal sites. Default value as defined in the methodological TOOL04: Emissions from solid waste disposal sites, Version 08.0

measurement methods and procedures applied	(for a site with controlled placement of waste, cover material, and levelling of the waste) was used.
Purpose of Data	Calculation of baseline emissions
Comments	The methane correction factor (MCF) accounts for the fact that unmanaged SWDSs produce less methane from a given amount of waste than managed SWDSs, since a larger fraction of waste decomposes aerobically in the top layers of unmanaged SWDSs.

Data / Parameter	DOC _j												
Data unit	-												
Description	Fraction of degradable organic carbon in the waste type j.												
Source of data	Methodological TOOL04: Emissions from solid waste disposal sites, Version 08.0												
Value applied	The following values for the different waste types j are applied: <table border="1"> <tr> <td>Wood and wood products</td><td>43</td></tr> <tr> <td>Pulp, paper and cardboard (other than sludge)</td><td>40</td></tr> <tr> <td>Food, food waste, beverages and tobacco (other than sludge)</td><td>15</td></tr> <tr> <td>Textiles</td><td>24</td></tr> <tr> <td>Garden, yard and park waste</td><td>20</td></tr> <tr> <td>Glass, plastic, metal, other inert waste</td><td>0</td></tr> </table>	Wood and wood products	43	Pulp, paper and cardboard (other than sludge)	40	Food, food waste, beverages and tobacco (other than sludge)	15	Textiles	24	Garden, yard and park waste	20	Glass, plastic, metal, other inert waste	0
Wood and wood products	43												
Pulp, paper and cardboard (other than sludge)	40												
Food, food waste, beverages and tobacco (other than sludge)	15												
Textiles	24												
Garden, yard and park waste	20												
Glass, plastic, metal, other inert waste	0												
Justification of choice of data or description of measurement methods and procedures applied	In accordance with the methodological TOOL04: Emissions from solid waste disposal sites, Version 08.0.												
Purpose of Data	Calculation of baseline emissions												
Comments	The values applied are for wet waste.												

Data / Parameter	k _j																																						
Data unit	-																																						
Description	Decay rate for the waste type j																																						
Source of data	Methodological TOOL04: Emissions from solid waste disposal sites, Version 08.0																																						
Value applied	<table><tr><th colspan="2" rowspan="2">Waste type j</th><th colspan="2">Boreal and Temperate (MAT≤20°C)</th><th colspan="2">Tropical (MAT>20°C)</th></tr><tr><th>Dry (MAP/PET <1)</th><th>Wet (MAP/PET >1)</th><th>Dry (MAP< 1000m m)</th><th>Wet (MAP > 1000 mm)</th></tr><tr><td rowspan="2">Slowly degrading</td><td>Pulp, paper, cardboard (other than sludge), textiles</td><td>0.04</td><td>0.06</td><td>0.045</td><td>0.07</td></tr><tr><td>Wood, wood products and straw</td><td>0.02</td><td>0.03</td><td>0.025</td><td>0.035</td></tr><tr><td>Moderately degrading</td><td>Other (non-food) organic putrescible garden and park waste</td><td>0.05</td><td>0.10</td><td>0.065</td><td>0.17</td></tr><tr><td>Rapidly degrading</td><td>Food, food waste, sewage sludge, beverages and tobacco</td><td>0.06</td><td>0.185</td><td>0.085</td><td>0.40</td></tr></table>						Waste type j		Boreal and Temperate (MAT≤20°C)		Tropical (MAT>20°C)		Dry (MAP/PET <1)	Wet (MAP/PET >1)	Dry (MAP< 1000m m)	Wet (MAP > 1000 mm)	Slowly degrading	Pulp, paper, cardboard (other than sludge), textiles	0.04	0.06	0.045	0.07	Wood, wood products and straw	0.02	0.03	0.025	0.035	Moderately degrading	Other (non-food) organic putrescible garden and park waste	0.05	0.10	0.065	0.17	Rapidly degrading	Food, food waste, sewage sludge, beverages and tobacco	0.06	0.185	0.085	0.40
Waste type j		Boreal and Temperate (MAT≤20°C)		Tropical (MAT>20°C)																																			
		Dry (MAP/PET <1)	Wet (MAP/PET >1)	Dry (MAP< 1000m m)	Wet (MAP > 1000 mm)																																		
Slowly degrading	Pulp, paper, cardboard (other than sludge), textiles	0.04	0.06	0.045	0.07																																		
	Wood, wood products and straw	0.02	0.03	0.025	0.035																																		
Moderately degrading	Other (non-food) organic putrescible garden and park waste	0.05	0.10	0.065	0.17																																		
Rapidly degrading	Food, food waste, sewage sludge, beverages and tobacco	0.06	0.185	0.085	0.40																																		
Justification of choice of data or description of measurement methods and procedures applied	As per the methodological TOOL04: Emissions from solid waste disposal sites, Version 08.0																																						
Purpose of Data	Calculation of baseline emissions																																						
Comments	The values applied are for Boreal & temperate (MAT < 20 °C) and dry (MAP < 1,000mm) conditions. Proof of the climate data for Johannesburg from the South African Weather Service will be provided to the DOE upon request																																						

Data / Parameter	f_y
Data unit	-

Description	Fraction of methane captured at the SWDS and flared, combusted or used in another manner that prevents the emissions of methane to the atmosphere in year y
Source of data	Methodological TOOL04: Emissions from solid waste disposal sites, Version 08.0
Value applied	0
Justification of choice of data or description of measurement methods and procedures applied	In accordance with paragraph 38(a) of the applied methodology, ' f_y in the tool shall be assigned a value of 0 because the amount of LFG that would have been captured and destroyed is already accounted for in equation 2 of this methodology'.
Purpose of Data	Calculation of baseline emissions
Comments	None

Data / Parameter	W_x
Data unit	Tonnes
Description	Amount of solid waste type j disposed in the SWDS in year x
Source of data	Landfill Operator
Value applied	Ex ante data provided at validation
Justification of choice of data or description of measurement methods and procedures applied	Data is taken from historical records of landfill operation and aggregated annually.
Purpose of Data	Calculation of baseline emissions
Comments	This is determined once ex-ante for the purpose of estimating emission reductions.

Data / Parameter	$NCV_{i,y}$
Data 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 the year y
Source of data	IPCC default values as provided in Table 1.2 of Chapter 1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories.
Value applied	0.0433 TJ/t

Justification of choice of data or description of measurement methods and procedures applied	This parameter will only be used if and when there is fossil fuel consumption. Fossil fuel consumption will be monitored as stated in Section B.7.1.
Purpose of Data	Calculation of project emissions.
Comments	None

Data / Parameter	$EF_{CO_2,i,y}$
Data unit	tCO ₂ /GJ
Description	Weighted average CO ₂ emission factor of fuel type <i>i</i> in the year <i>y</i>
Source of data	IPCC default values as provided in Table 1.4 of Chapter 1 of Vol.2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories.
Value applied	74.8 tCO ₂ /TJ
Justification of choice of data or description of measurement methods and procedures applied	Values are taken from IPCC (2006) for diesel ³ . Any future revision of IPCC guidelines will be taken into account at the renewal of the crediting period.
Purpose of Data	Calculation of project emissions
Comments	This parameter will <i>only</i> be used if and when there is fossil fuel consumption. Fossil fuel consumption will be monitored as stated in Section B.7.1.

Data / Parameter	η_{PJ}
Data unit	-
Description	Efficiency of the LFG capture system that will be installed in the project activity
Source of data	ACM0001 version 19
Value applied	0.5

³ This is used for illustrative reasons for ex-ante estimations, as the fossil fuel used in the project activity may be subject to change. Thus the actual $EF_{CO_2,i,y}$ from the fuel consumed shall be used for ex-post ER calculations.

Justification of choice of data or description of measurement methods and procedures applied	Since the technical specifications are not available for the LFG capture system, a default value of 50% is applied for the purposes of ex-ante emissions estimation.
Purpose of Data	Calculation of baseline emissions
Comments	None

Data / Parameter	SPEC _{flare}			
Data unit	Temperature (°C) Flow rate or heat flux (kg/h or m ³ /h) Maintenance schedule (N° of days)			
Description	Manufacturer's flare specifications for temperature, flow rate and maintenance schedule.			
Source of data	Flare Manufacturer			
Value applied		Temperature (°C)	Flow rate m ³ /h)	Maintenance schedule
	Min	700°C	400m ³ /h	Not applicable.
	Max	1,200°C	2,000m ³ /h	The maintenance schedule is not required if Option A (default flare efficiency option specified in the TOOL06 titled 'Project emissions from flaring, v4') is selected to determine flare efficiency of an enclosed flare
Justification of choice of data or description of measurement methods and procedures applied	The values were taken from the specifications provided by the flare manufacturer. These specifications stipulate the operating ranges for temperature and flow rate.			

Purpose of Data	Calculation of baseline emissions
Comments	None

Data / Parameter	Ru
Data unit	Pa.m ³ /kmol.k
Description	Universal ideal gases constant
Source of data	“Tool to determine the mass flow of a greenhouse gas in a gaseous stream”, Version 03.0
Value applied	8.314
Justification of choice of data or description of measurement methods and procedures applied	“Tool to determine the mass flow of a greenhouse gas in a gaseous stream”, Version 03.0
Purpose of Data	Calculation of baseline emissions
Comments	None

Data / Parameter	MM _i
Data unit	kg/kmol
Description	Molecular mass of greenhouse gas <i>i</i>
Source of data	“Tool to determine the mass flow of a greenhouse gas in a gaseous stream”, Version 03.0
Value applied	Methane: 16.04 Nitrogen: 28.01
Justification of choice of data or description of measurement methods and procedures applied	“The molecular mass of Methane is 16.04 kg/kmol as per the “Tool to determine the mass flow of a greenhouse gas in a gaseous stream”, Version 03.0
Purpose of Data	Calculation of baseline emissions
Comments	None

Data / Parameter	P_n
Data unit	Pa
Description	Total pressure at normal conditions
Source of data	“Tool to determine the mass flow of a greenhouse gas in a gaseous stream”, Version 03.0
Value applied	101.325 Pa
Justification of choice of data or description of measurement methods and procedures applied	“Tool to determine the mass flow of a greenhouse gas in a gaseous stream”, Version 03.0
Purpose of Data	Calculation of baseline emissions
Comments	None

Data / Parameter	T_n
Data unit	K
Description	Temperature at normal conditions
Source of data	“Tool to determine the mass flow of a greenhouse gas in a gaseous stream”, Version 03.0
Value applied	273.15 K
Justification of choice of data or description of measurement methods and procedures applied	“Tool to determine the mass flow of a greenhouse gas in a gaseous stream”, Version 03.0
Purpose of Data	Calculation of baseline emissions
Comments	None

Data / Parameter	$\eta_{\text{flare},m}$
Data unit	-
Description	Flare efficiency for the minute m
Source of data	Methodological Tool “Project emissions from flaring” Version 04.0

Value applied	0.8
Justification of choice of data or description of measurement methods and procedures applied	The flare efficiency for the minute m is 80% when the following two conditions are met to demonstrate that the low-height flare is operating: 1. The temperature of the flare (TEG_m) and the flow rate of the residual gas to the flare (FRG_m) is within the manufacturer's specification for the flare ($SPEC_{flare}$) in minute m; and 2. The flame is detected in minute m ($Flame_m$). Otherwise $\eta_{flare,m}$ is 0%.
Purpose of Data	Calculation of baseline emissions
Comments	In accordance with paragraph 23 of the tool "Project emissions from flaring" Version 04.0. The applied efficiency has been adjusted to 80% from the default of 90% as the flares are defined as low height flares.

4.2 Data and Parameters Monitored

Data / Parameter	Management of SWDS
Data unit	-
Description	Management of SWDS
Source of data	Use different sources of data: (a) Original design of the landfill; (b) Technical specifications for the management of the SWDS; (c) Local or national regulations
Description of measurement methods and procedures to be applied	Waste Management Licenses: - Ennerdale Landfill: 002/09-10/W0030 - Goudkoppies Landfill: 16/2/7/C211/D11/Z1/P15 - Linbro Park Landfill: 16/2/7/A210/D173/Z1/P1 (no change site closed) - Marie Louise Landfill: 16/2/7/C221/D11/Z3/P65 - Robinson Deep Landfill: 16/2/7/C221/D11/22/P22
Frequency of monitoring/recording	Annual
Value monitored	Annual

Monitoring equipment	The waste management license is granted by a governmental department (3 rd party)
QA/QC procedures to be applied	The waste management license is granted by a governmental department (3 rd party)
Purpose of the data	Calculation of baseline emissions
Calculation method	None
Comments	None

Data / Parameter	Op _{j,h}
Data unit	-
Description	Operation of the equipment that consumes the LFG
Source of data	Project participants
Description of measurement methods and procedures to be applied	For each equipment unit j using the LFG monitor that the plant is operating in hour h by the monitoring any one or more of the following three parameters: - The operating temperature of the flare will be measured using a thermocouple located within the combustion chamber of the flare. The minimum operating temperature is 700 °C and the maximum operating temperature is 1200 °C; - A UV sensor will be located in the combustion chamber and used to detect a flame; - Products generated: electricity generated. Op_{j,h}=0 when: - One of more temperature measurements are missing or below the minimum threshold in hour h (instantaneous measurements are made at least every minute); - Flame is not detected continuously in hour h (instantaneous measurements are made at least every minute); - No products are generated in the hour h Otherwise, Op_{j,h}=1
Frequency of monitoring/recording	The monitoring is continuous using digital hour meters in the flare PLC and the generator controller. The hours run for the flare is additional adjusted/calculated using the above logic test when the data is downloaded and subjected to the above logic test,

	This documented and reported in the monthly workbooks and monthly returns. On the generators this data is recorded once a month and reflected in the monthly returns for production and maintenance purposes.
Value monitored	Hours runs for each unit at the below sites Robinson Deep Flare 8487h Generator 1587 6639h Generator 1588 4587h Generator 1589 4689h Marie Louise Flare 8295h Generator 1582 7948h Goudkoppies Flare 8315h Generator 1584 4694h Generator 1590 5900h
Monitoring equipment	Flare program logic controller and Comap generator management units on generators. Robinson Deep Flare Serial Number: 0010931-1-1 Generator 1587 Serial number: 23330448 Generator 1588 Serial number: 2333044C Generator 1589 Serial number: 23330446 Marie Louise Flare Serial Number: 0011104-1-1 Generator 1582 Serial Number: 23240094

	Goudkoppies Flare Serial Number: 0012274-1-1 Generator 1584 Serial Number: 23380033 Generator 1590 Serial Number: 2338000D
QA/QC procedures to be applied	The values are recoded monthly and included in the monthly returns for the generators. The metering is done digitally so no calibration is undertaken, however the values are reviewed on a monthly basis to detect any manifest error of failure of the devise.
Purpose of the data	Calculation of baseline emissions
Calculation method	Calculated in the workbook using a formula that checks the flow from the flow meters against the flare temperature and UV sensor and or electricity flow meter.
Comments	None

Data / Parameter	$EG_{PJ,y} = EC_{BL,k,y}$	
Data unit	MWh	
Description	Amount of electricity generated using LFG by the project activity in year y	
Source of data	Electricity meter	
Description of measurement methods and procedures to be applied	Monitor net electricity generation by the project activity using LFG	
Frequency of monitoring/recording	Continuous	
Value monitored	Robinson Deep	12,533.5MWh
	Marie Louise	5,532.5 MWh
	Goudkoppies	6,067.4MWh
	Total	24,133.3MWh
Monitoring equipment	Robinson Deep	

	Name/description: Main Meter
	Manufacturer: Elster
	Device type: A1700
	Serial/model number: 351421105891
	Class: 0.20
	Validity:01-March-2016 to 28-February-2026
	Marie Louise
	Name/description: Main Meter
	Manufacturer: Elster
	Device type: A1700
	Serial/model number: 3514 21100020
	Class: 0.50
	Validity: 25-January-2016 to 24-Janury-2026
	Goudkoppies
	New Meter replaced on 01-February-2019
	Name/description: Main Meter
	Manufacturer: Elster
	Device type: A1700
	Serial/model number: 3514 41128474
	Class: 0.50
	Original Validity: 12-June-2018 to 11-June-2028
	Removed for Calibration 18-August-2022
	New Validity 18-August-2022 to 18-August-2032
QA/QC procedures to be applied	The meter is a sealed non serviceable item.

	In terms of SANS 474 digital meters are only required to be calibrated every ten years after installation. See page 22 and table 5.
Purpose of the data	Calculation of baseline emissions
Calculation method	Not applicable
Comments	None

Data / Parameter	TDL _y
Data unit	%
Description	Average technical transmission and distribution losses for providing electricity
Source of data	Eskom Annual Reports 2024 Page 78 and 2025 report page 106
Description of measurement methods and procedures to be applied	Monitored annually. In the absence of data from the relevant year, most recent figures should be used, but not older than 5 years.
Frequency of monitoring/recording	<i>Annual</i>
Value monitored	Insert TDL from 2024 and 2025 report 2024 11.94% 2025 12.34%
Monitoring equipment	N/A: Third party information source
QA/QC procedures to be applied	N/A: Third party information source
Purpose of the data	Calculate baseline emissions
Calculation method	Not Applicable
Comments	None

Data / Parameter	TEG _m
Data unit	°C

Description	Temperature in the exhaust gas of the enclosed flare in minute <i>m</i>
Source of data	Project participants
Description of measurement methods and procedures to be applied	Continuous monitoring of the temperature in the exhaust gas with a type N thermocouple. Accuracy of applied thermocouples: +/-0.75% (for 333 °C to 1,200 °C).
Frequency of monitoring/recording	Once per minute
Value monitored	Average Temperature Flare Robinson Deep 961.71 °C Average Temperature Flare Goudkoppies 752.01 °C Average Temperature Flare Marie Louise 923.97 °C
Monitoring equipment	Robinson Deep Type N thermocouple Serial No: Part Number T1TECNSX60 Accuracy: Class 1 +/- 5 °C (-200 °C-1300 °C) Calibration: Functionality test every three months Marie Louise Type N thermocouple Serial No: Part Number T1TECNSX60 Accuracy: Class 1 +/- 5 °C (-200 °C-1300 °C) Calibration: Functionality test every three months Goudkoppies Type N thermocouple Serial No: Part Number T1TECNSX60 Accuracy: Class 1 +/- 5 °C (-200 °C-1300 °C) Calibration: Functionality test every three months

	For all instruments: Accuracy: Class 1 +/- 5 °C (-200 °C-1300 °C) Calibration: Functionality test every three months
QA/QC procedures to be applied	The thermocouple will be subject to a functionality test which establishes if the units are operating correctly and this is done by comparing them against a separate handheld calibrated instrument to compare the results of the two. This is done every three months to ensure accuracy. The functionality tests were conducted on the following dates for each site Marie Louise T/C TEST 29-October-2024 06-February-2025 15-May-2025 17-September-2025 Goudkoppies T/C TEST 30-August-2024 27-November-2024 17-March-2025 02-July-2025 02-October-2025 Robinson Deep T/C TEST 14-October-2024 20-January-2025 25-March-2025 15-July-2025

	16-October-2025
Purpose of the data	Calculate project emissions
Calculation method	Not Applicable
Comments	None

Data / Parameter	$EC_{pjj,k,y}$
Data unit	MWh/y
Description	Quantity of electricity consumed by the project electricity consumption source in year y
Source of data	Electricity meter
Description of measurement methods and procedures to be applied	Monitor net electricity generation by the project activity using LFG The electricity meters at Robinson Deep, Marie Louise and Goudkoppies landfill sites have an accuracy class of Class 0.5. The accuracy of the meters at Ennerdale and Linbro Park will be determined once equipment has been finalised.
Frequency of monitoring/recording	Continuous monitoring
Value monitored	Robinson Deep 224.22 MWh/y Goudkoppies 0 MWh/y Marie Louise 15.44 MWh/y Total 239.66 MWh/y
Monitoring equipment	Robinson Deep Part No: CBI- EC330CM Serial No: 11 1060 2482 6 Accuracy: class 1 Calibration: Calibration not required Solid state instrument Marie Louise

	Serial No: 3107150104818 Accuracy: class B Calibration: Calibration not required solid state instrument Goudkoppies New Meter replaced on 01-February-2019 Name/description: Main Meter Manufacturer: Elster Device type: A1700 Serial/model number: 3514 41128474 Class: 0.50 Original Validity: 12-June-2018 to 11-June-2028 Removed for calibration 18-August-2022 New Validity 18-August-2022 to 18-August-2032
QA/QC procedures to be applied	Electricity meter(s) will be subject to regular maintenance and testing in accordance with stipulation of the meter supplier, to ensure accuracy. In accordance with the equipment manufacturer specifications, the meters are guaranteed for 10 years which is in line with the national standard, SANS474: 2009, which specifies a calibration frequency of 10 years.
Purpose of the data	Calculation of baseline emissions
Calculation method	Not Applicable
Comments	Required to calculate the emission reductions from electricity generation from LFG. Will only be used if and when the project produces electricity. The equation to be used is in B.6.1. Therefore, $EGP_{J,y}$ is equivalent to $EC_{BL,k,y}$. Note that The Goudkoppies site was not able to secure site supply as there was no three phase power supply at this site. As a result, when developing this site, we needed to use the high voltage power line which was needed to export power as our incoming power supply. So when we are not exporting power the system works in revers and site have power through the export cable to start up the plant. Once the plant is running, we then export power through the same connection. With this being the design requirement, the export meter is a net meter that measures the

	power used and exported and provided a net value for power used and exported. So the site basically runs on own generation without the need to any external power except for when it trips and needs to restart and this power consumption is then netted off against export power within the same period
--	---

Data / Parameter	$FC_{i,j,y}$
Data unit	Mass or volume unit per year (e.g. ton/yr or m3/yr)
Description	Quantity of fuel type i combusted in process j during the year y
Source of data	Onsite measurements
Description of measurement methods and procedures to be applied	Each fuel tank is fitted with a calibrated ruler used to measure the volume of fuel used. This is cross referenced with fuel procured to put into the tank.
Frequency of monitoring/recording	Continuously
Value monitored	Robinson Deep 1,110.23 Lt Marie Louise 1,050.00 Lt Goudkoppies 1,470.00 Lt Total 3,630.23 Lt Diesel density : 0.84kg/Lt taken from European Union Standards EN 590 diesel fuel is defined as 0.820 to 0.845 kg/L and 0.0433 TJ/t. IPCC default values as provided in Table 1.2 of Chapter 1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories.
Monitoring equipment	The ruler does not state class or accuracy as the tanks and rulers were calibrated to stipulate the volumes from empty to full and provided a calibrated value for the ruler over the range of the ruler for the tank in question. The rulers are calibrated annually. Robinson Deep: - Type: Volvo 105I (Diesel Tank level indicator) - Sl. No.: FE3095S Marie Louise: - Type: Volvo 105I (Diesel Tank level indicator) - Sl. No.: FE0686S

	Goudkoppies: - Type: Cummins 175l (Diesel Tank level indicator) - Sl. No.: AK16080689-A Calibration undertaken on 14-May-2024 Robinson Deep 105lt tank / +/- 3lt accuracy = 2.9% (rounded up) Marie Louise 105lt tank +/- 3lt accuracy = 2.9% (rounded up) Goudkoppies 175lt tank / +/-3lt accuracy = 1.8% (rounded up) Calibration undertaken on 13-May-2025 Robinson Deep 105lt tank / +/- 3lt accuracy = 2.9% (rounded up) Marie Louise 105lt tank +/- 3lt accuracy = 2.9% (rounded up) Goudkoppies 175lt tank / +/-3lt accuracy = 1.8% (rounded up)) The calibration reports note a 95.45% confidence level for the accuracy of the rulers.
QA/QC procedures to be applied	Diesel will be supplied from tanks and ruler gauges will be used to determine volume of diesel consumed. The ruler gauges will be part of the tank and calibrated at least once a year. The measurements will be recorded in a book (on a daily basis or per shift). The volume is obtained by multiplying the tank level by the tank cross-sectional area. Calibration is undertaken once per year and have been provided.
Purpose of the data	Calculate project emissions
Calculation method	Not Applicable
Comments	None

Data / Parameter	$V_{i,t,wb}$
Data unit	m ³ gas i/m ³ wet gas
Description	Volumetric fraction of greenhouse gas i in a time interval t on a wet basis
Source of data	Measurement
Description of measurement methods and procedures to be applied	Continuous in-situ analysers

Frequency of monitoring/recording	Measurements are logged once every minute
Value monitored	Robinson Deep 54.0 % Marie Louise 55.0% Goudkoppies 56.6% Average 55.19 %
Monitoring equipment	Robinson Deep Flare ID: 10931 Edinburgh Instruments-Guardian NG Infrared Gas Monitor CH₄ 0-100% Replaced CH₄ Sensor on 09-May-2023 CH₄ 0-100% Accuracy: < 2% of full scale Serial no: 22970 Calibration frequency: Yearly Replaced CH₄ Sensor on 04-December-2024 CH₄ 0-100% Accuracy: < 2% of full scale Serial no: 27926 Calibration frequency: Yearly Replaced CH₄ Sensor on 26-March2025 CH₄ 0-100% Accuracy: < 2% of full scale Serial no: 28695 Calibration frequency: Yearly The instrument is calibrated regularly utilizing a certified span gas on site until the unit is no longer able to be calibrated on site. Should the instrument not be able to be calibrated then the instrument sensor is replaced. Calibration gas used: Span Gas Traceability Cert/Can.541911 Valid from 01-April-2024 to 30-April-2025 Span Gas Traceability Cert/Can.623374

Valid from 01-January-2025 to 31-January-2026

Marie Louise

Flare ID: 11104

Edinburgh Instruments-Guardian NG Infrared Gas Monitor

CH₄ 0-100%

Accuracy: < 2% of full scale

Replaced CH₄ Sensor on 04-October-2022

CH₄ 0-100%

Accuracy: < 2% of full scale

Serial no: 17269

Replaced CH₄ Sensor on 13-January-2025

CH₄ 0-100%

Accuracy: < 2% of full scale

Serial no: 21824

Calibration frequency: Yearly

The instrument is calibrated regularly utilizing a certified span gas on site until the unit is no longer able to be calibrated on site.

Should the instrument not be able to be calibrated then the instrument sensor is replaced.

(Despite the OEM calibration frequency being yearly we calibrate the units on a weekly bases as operational time allows but never less than yearly.)

Calibration gas used:

Span Gas Traceability Cert.541824

Valid from 01-April-2024 to 30-April-2025

Span Gas Traceability Cert.687501

Valid from 01-May-2025 to 31-August-2026

Goudkoppies

Edinburgh Instruments-Guardian NG Infrared Gas Monitor

Fitted with CH₄ Sensor on 08-May-2024

CH₄ 0-100%

Accuracy: < 2% of full scale
Serial no: 25482
Calibration frequency: Yearly

Replaced with CH₄ Sensor on 04-December-2024
CH₄ 0-100%
Accuracy: < 2% of full scale
Serial no: 27927
Calibration frequency: Yearly

Replaced with CH₄ Sensor on 07-January-2025
CH₄ 0-100%
Accuracy: < 2% of full scale
Serial no: 21825
Calibration frequency: Yearly

Replaced with CH₄ Sensor on 18-February-2025
CH₄ 0-100%
Accuracy: < 2% of full scale
Serial no: 10733
Calibration frequency: Yearly

Replaced with CH₄ Sensor on 29-April-2025
CH₄ 0-100%
Accuracy: < 2% of full scale
Serial no: 27187
Calibration frequency: Yearly

Replaced with CH₄ Sensor on 29-July-2025
CH₄ 0-100%
Accuracy: < 2% of full scale
Serial no: 200950
Calibration frequency: Yearly

The instrument is calibrated regularly utilizing a certified span gas on site until the unit is no longer able to be calibrated on site.

	Should the instrument not be able to be calibrated then the instrument sensor is replaced. Calibration gas used: Span Gas Traceability Cert.541918 Valid from 01-April-2024 to 30-April-2025 Span Gas Traceability Cert.687625 Valid from 01-May-2025 to 31-August-2026
QA/QC procedures to be applied	Calibration includes zero verification with an inert gas (e.g. O ₂ /N ₂) and at least one reading verification with a standard gas (single calibration gas or mixture calibration gas CH ₄ and CO ₂). All calibration gases have a certificate provided by the manufacturer and must be under their validity period.
Purpose of the data	Calculation of Baseline Emissions
Calculation method	Not Applicable
Comments	None

Data / Parameter	M _{t,wb}
Data unit	kg/h
Description	Mass flow of the gaseous stream in time interval t on a wet basis
Source of data	Flow meter
Description of measurement methods and procedures to be applied	Continuous monitoring using the flow meter Instruments with recordable electronic signal (analog or digital).
Frequency of monitoring/recording	Monitored continuously and recorded every one minute
Value monitored	Robinson Deep Average 1,073.2 Kg/h Marie Louise Average 500.8 Kg/h Goudkoppies Average 657.7 Kg/h

Monitoring equipment

Total flow Meter

For Robinson Deep

Thermal Mass flow meters

Type: E&H Proline T mass 65I

Accuracy:<3%

Calibration frequency: every three years as per manufacturer's specifications

Installed 05-December-2023

Serial No: 99047502000

1st calibration date 18-August-2022

Valid from 05-December-2023 to 04-December-2026 as per manufacturer's specifications

Total flow Meter

For Marie Louise

Thermal Mass flow meters

Type: E&H Proline T mass 65I

Accuracy:<3%

Calibration frequency: every three years as per manufacturer's specifications

Installed 06-February-2024

Serial No: A309FA02000

1st calibration date 02-January-2024

Valid from 06-February-2024 to 05-February-2027 as per manufacturer's specifications

Total flow Meter

For Goudkoppies

Thermal Mass flow meters

Type: E&H Proline T mass 65I

Accuracy:<3%

Calibration frequency: every three years as per manufacturer's specifications

Serial No: 99047602000

1st calibration date 29July-2022

Valid from 06-October-2022 to 05-October-2025 as per manufacturer's specifications

Replaced 02-October-2025

Serial No: W9004C02000

1st calibration date 03-September-2024

Valid from 02-October-2025 to 01-October-2028 as per manufacturer's specifications

Flare flow meter

For Robinson Deep

Thermal Mass flow meters

Type: E&H Proline T mass 65I

Accuracy:<3%

Calibration frequency: every three years as per manufacturer's specifications

Serial No: A309F902000

1st calibration date 03-March-2023

Valid from 09-October-2023 to 08-October-2026 as per manufacturer's specifications

Flare flow meter

For Marie Louise

Thermal Mass flow meters

Type: E&H Proline T mass 65I

Accuracy:<3%

Calibration frequency: every three years as per manufacturer's specifications

Serial No: N8103702000

1st calibration date 05-December-2022

Valid from 27-Janury-2023 to 26-January-2026 as per manufacturer's specifications

Flare flow meter

For Goudkoppies

Thermal Mass flow meters

Type: E&H Proline T mass 65I

Accuracy:<3%

Calibration frequency: every three years as per manufacturer's specifications

Installed 08-May-2024

Serial No: L5003702000

1st calibration date 15-April-2024

Valid from 08-May-2024 to 07-May-2027 as per manufacturer's specifications

Electricity Flow Meter

For Robinson Deep

Thermal Mass flow meters

Type: E&H Proline T mass 65I

Accuracy:<3%

Calibration frequency: every three years as per manufacturer's specifications

Installed on 09-October-2023

Serial No: N8103802000

1st calibration date 15/12/2022

Valid from 09-October-2023 to 08-October-2026 as per manufacturer's specifications

Electricity Flow Meter

For Marie Louise

Thermal Mass flow meters

Type: E&H Proline T mass 65I

Accuracy:<3%

Calibration frequency: every three years as per manufacturer's specifications

Serial No: 99047702000

1st calibration date 08-June-2022

Valid from 30-June-2022 to 29-June-2025 as per manufacturer's specifications

Installed on 27-June-2025

Serial No: X30C1E02000

1st calibration date 14-March-2025

Valid from 27-June-2025 to 27-June-2028 as per manufacturer's specifications

Electricity Flow Meter

For Goudkoppies

Thermal Mass flow meters

Type: E&H Proline T mass 65I

Accuracy:<3%

Calibration frequency: every three years as per manufacturer's specifications

Installed in 02-May-2024

Serial No: E2110D02000

1st calibration date 02-January-2024

	Valid from 02-May-2024 to 01-May-2027 as per manufacturer's specifications
	Please note that manufacturer stipulates that although the instrument was calibrated on a certain date the validity of the calibration remains valid for the first three years of operation from the date of use and not the date of calibration.
QA/QC procedures to be applied	Periodic calibration against a primary device provided by an independent accredited
Purpose of the data	Calculation of baseline emissions
Calculation method	This parameter will be monitored in Option F as per the applied "Tool to determine the mass flow of a greenhouse gas in a gaseous stream" (Version 02.0.0).
Comments	None

Data / Parameter	Flame _m
Data unit	Flame on or Flame off
Description	Flame detection of flare in the minute m
Source of data	Flare program logic controller
Description of measurement methods and procedures to be applied	Measure using a fixed installation optical flame detector: Ultra Violet detector
Frequency of monitoring/recording	Continuous and recorded once every minute
Value monitored	Detection of flame recorded as a minute that the flame was on, otherwise recorded as a minute that the flame was off
Monitoring equipment	UV sensor replacement as per OEM Specifications: Replaced on : Robinson Deep 08-March-2024 25-April-2025

	Marie Louise
	23-April-2024
	29-October-2024
	17-September-2025
	Goudkoppies
	01-March-2024
	17-March-2025
QA/QC procedures to be applied	Equipment shall be maintained in accordance with manufacturer's recommendations
Purpose of the data	Calculation of Project Emissions
Calculation method	-
Comments	None

4.3 Monitoring Plan

The Monitoring Plan for this project has been developed to ensure that from the start, the project is well organised in terms of the collection and archiving of complete and reliable data.

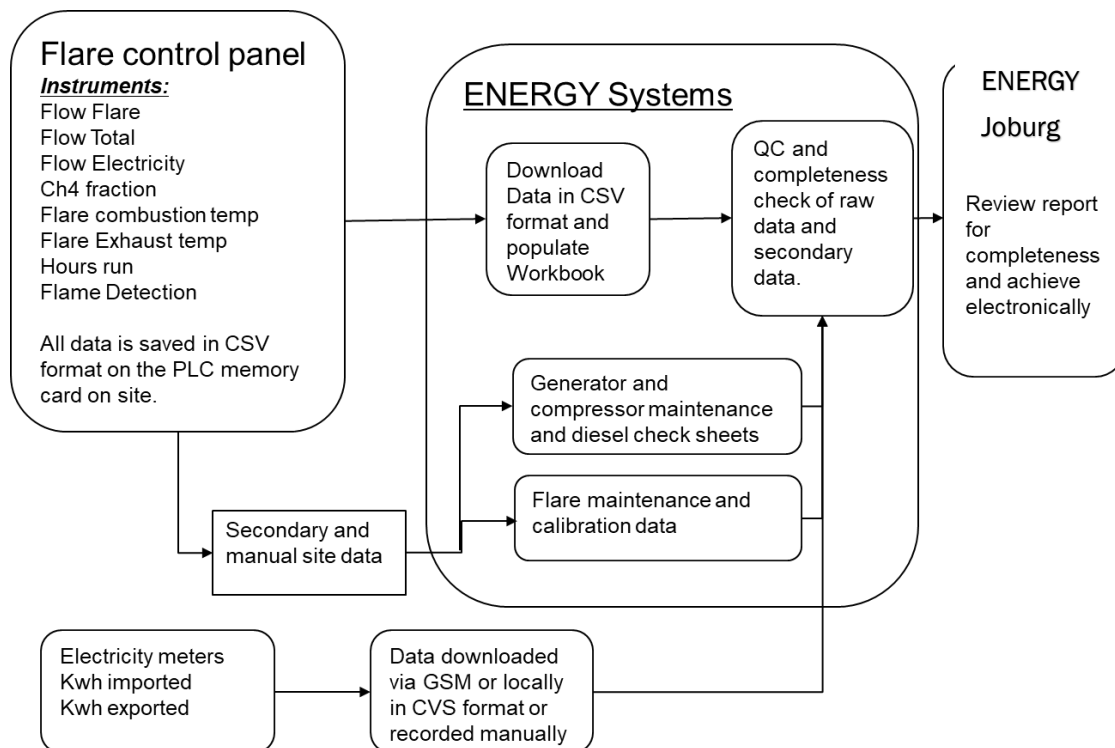
The monitoring system consists of total flow, flare flow and electricity flow meters that record the flow of landfill gas extracted from the site and conveyed to the flare and generators in Nm³/h. The landfill gas is then analysed by a fixed gas analyser that measures the concentration of methane in the landfill gas. The gas is then either combusted in a high temperature enclosed flare and the combustion temperature is monitored to ensure that the methane gas is combusted at a suitable temperature or the gas is used for power generation in the generators. All of the above measurements are recorded and stored in CSV (comma separated Values) format available for down load.

The data is downloaded monthly and compiled into a workbook where the raw data is used to calculate the number of emission reductions achieved by applying the approved calculations as detailed in the PDD.

The monthly reports are then reviewed and checked for inconsistencies by comparing the data and the site trip sheets to establish if there are any mismatches in the data with that of the site records. This review and check is done every month and any queries regarding the quality of the data or outages are resolved through this check process and closed out before the report is finalised. This report and the final workbook is then stored electronically by the operations manager and or the general manager.

The workbooks only provide the electronic data for the methane destroyed by the projects activities. Other parameters are also recorded but are documented manually such as the projects emissions from fuel consumed or electricity consumed. This data is then included in the monitoring periods consolidated workbook that takes into account both emission reductions from the project activity and the project emissions and established the net reduction in tCO₂e.

Below is a diagrammatic flow chart showing the flow of data from each site for the project.



Quality assurance

The data is compiled into a monthly workbook which takes the collected data and calculates the volume of CERs produced from the project activity. This data is reviewed for consistency and details of the plants' operations over the month. This data and the trip sheets are used to compile a brief monthly report that documents the sites performance and plant availability but also highlights any challenges being faced by the project and or corrective action needed. Non-conformances are limited to delayed calibrations as the system is largely driven by electronic data capture. These are noted in the monitoring reports and instrument change out sheets and replacement calibration sheets.

Staff Training

ENERGY Joburg RF (PTY) Ltd embarks on continuous site based training that included induction training and CDM training when a new staff member joins the team and hands on technical training on a regular basis to enhance site based skills and knowledge. Training is very targeted and focussed on the individual

areas of involvement, typically termed “On the Job Training” and is recorded in a sheet titled “Competency Records”, and this is signed off by the trainer and trainee.

Position and Respective Person	Responsibilities	Authorities
ENERGY Systems Process Operations Manager (Tony Cummings – TC or other)	Overall responsibility for the landfill gas system. Overall responsibility for the Quality Management System for the landfill gas data collection system. Reviews performance data on landfill gas system Stores and archives data received for ENERGY Joburg RF (PTY) Ltd Robinson Deep, Goudkoppies and Marie Louise CDM projects.	Manages resources for operation of the landfill gas system
ENERGY Systems General Manager (David Cornish)	Overall responsibility for managing the projects and implementing the systems.	Manages resources for the system.
ENERGY Joburg Site Technician (Elleck Mkhari – EM) (Erick Ramalebane _ER) and or other	Day-to-day operation of the landfill gas system and flare maintenance and calibration of site instruments.	Controls the landfill gas system and flare
Data Controller – David Cornish and or Tony Cummings	Reviews and compares primary data and secondary data from flare system.	Compile data into the monthly workbook.

Position and Respective Person	Responsibilities	Authorities
	Prepares monthly workbook and submits to ENERGY Systems General Manager. Reviews comments.	
PLC data logging	Responsible for data collection. Allows ENERGY Systems and access to down load the raw data collected from the sites.	Management and archiving of the raw data.

Emergency Procedures

A copy of our emergency procedures document for each of the sites has been provided which cover the procedure for shutting down the plant in the event of an emergency and reporting to an emergency evacuation point located on the site. The procedure further outlines the procedure for notifying the relevant line managers and site operators of the event and refers to the relevant incident report documents to be completed.

Sampling: Not applicable – sampling approach is not used.

5 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS

5.1 Baseline Emissions

The baseline emissions are determined according to equation (1) of the applied methodology:

$$BE_y = BE_{CH_4,y} + BE_{EC,y} + BE_{HG,y} + BE_{NG,y} \quad (\text{Equation 1 of ACM0001, v19})$$

Where

$BE_{CH_4,y}$ Baseline emissions of methane from the SWDS ($BE_{CH_4,y}$): value from below calculation 201,967 ,

$BE_{EC,y}$ baseline emissions associated with electricity generation: value from below calculation
26,137

$BE_{HG,y}$ there was no use of methane for heating: Value is 0.

$BE_{NG,y}$ there was no upgrading and use of methane for natural gas: Value is 0.

BE_y = 228,104 rounded down

Baseline emissions of methane from the SWDS (**$BE_{CH_4,y}$**)

Baseline emissions of methane from the SWDS are determined according to equation (2) of the applied methodology:

$$BE_{CH_4} = \left((1 - OX_{toplayer}) \times F_{CH_4,PJ,y} - F_{CH_4,BL,y} \right) \times GWP_{CH_4} \quad (\text{Equation 2 of ACM0001, v19})$$

Where:

$OX_{toplayer}$ Fraction of methane in the LFG that would be oxidized in the top layer of the SWDS in the baseline (dimensionless), value 0.1

$F_{CH_4,PJ,y}$ Amount of methane in the LFG which is flared and/or used in the project activity in year y (t CH₄/yr). Values used 8,014.6 t CH₄ for the monitoring period.

$F_{CH_4,BL,y}$ Amount of methane in the LFG that would be flared in the baseline in year y (t CH₄/yr), the baseline value is 0.

GWP_{CH_4} Global warming potential of CH₄ (t CO₂e/t CH₄) value used 28.

$F_{CH_4,PJ,y}$ is determined as the sum of the quantities of methane flared and used in power plant(s), boiler(s), air heater(s), glass melting furnace(s), kiln(s) and natural gas distribution, as follows:

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

(Equation 3 of ACM0001, v19)

Where:

$F_{CH_4,PJ,y}$ Amount of methane in the LFG which is flared and/or used in the project activity in year y (t CH₄/yr) value 8,014.6.

$F_{CH_4,flared,y}$ Amount of methane in the LFG which is destroyed by flaring in year y (t CH₄/yr)

$F_{CH4,EL,y}$	Amount of methane in the LFG which is used for electricity generation in year y (t CH ₄ /yr)
$F_{CH4,HG,y}$	Amount of methane in the LFG which is used for heat generation in year y (t CH ₄ /yr) this value is 0 as no methane was used for heating.
$F_{CH4,NG,y}$	Amount of methane in the LFG which is sent to the natural gas distribution network and/or dedicated pipeline and/or to the trucks in year y (t CH ₄ /yr) this value is 0 as no methane was upgraded and supplied as natural gas.

For:

$F_{CH4,flared,y}$ in the workbooks take the flow to the flare per minute and adjusts it for the methane concentration and then multiplies it by the density for methane. This is then adjusted for the actual mass for that time interval to provide an actual unit and not a flow rate.

$$F_{CH4,flared,y} = F_{CH4,sent_{flare,y}} - \frac{PE_{flare,y}}{GWP_{CH4}}$$

(Equation 4 of ACM0001, v19)

Where:

$F_{CH4,flared,y}$	=	Amount of methane in the LFG which is destroyed by flaring in year y (t CH ₄ /yr)
$F_{CH4,sent_{flare,y}}$	=	Amount of methane in the LFG which is sent to the flare in year y (t CH ₄ /yr)
$PE_{flare,y}$	=	Project emissions from flaring of the residual gas stream in year y (t CO ₂ e/yr)
GWP_{CH4}	=	Global warming potential of CH ₄ (t CO ₂ e/t CH ₄)

$F_{CH4,EL,y}$ in the workbooks take the flow to the generators per minute and adjusts it for the methane concentration and then multiplies it by the density for methane. This is then adjusted for the actual mass for that time interval to provide an actual unit and not a flow rate.

$F_{CH4,EL,y}$ is determined using the “Tool to determine the mass flow of a greenhouse gas in a gaseous stream Version 03.0.0” and monitoring the working hours of the power plant(s), so that no emission reduction is claimed for methane destruction during non-working hours. This is taken into

account by monitoring the hours that the equipment utilizing the LFG is operating in year y (Opj,h,y) and is applied to determine the parameter of $FCH_4,EL,y = F_{i,t} \times Opj,h,y$.

Option F of the “Tool to determine the mass flow of a greenhouse gas in a gaseous stream” (Version 03.0.0)

The mass flow of greenhouse gas i ($F_{i,t}$) is determined using the equations below as stipulated in the “Tool to determine the mass flow of a greenhouse gas in a gaseous stream” (Version 03.0.0):

$$F_{i,t} = V_{t,wb,n} \times v_{i,t,wb} \times \rho_{i,n} \quad \text{Mass Flow Tool Equation (9)}$$

$$\rho_{i,n} = \frac{P_n \times MM_i}{R_u \times T_n} \quad \text{Mass Flow Tool Equation (10)}$$

$$V_{t,wb,n} = M_{t,wb} / \rho_{t,wb,n} \quad \text{Mass Flow Tool Equation (15)}$$

$$\rho_{t,wb,n} = \frac{P_n \times MM_{t,wb}}{R_u \times T_n} \quad \text{Mass Flow Tool Equation (16)}$$

Where:

$F_{i,t}$ Mass flow of greenhouse gas i in the gaseous stream in time interval t (kg gas/h)

$V_{t,wb,n}$ Volumetric flow of the gaseous stream in the time interval t at normal conditions on a wet basis (m³ wet gas/h)

$v_{i,t,wb}$ Volumetric fraction of greenhouse gas i in the gaseous stream in a time interval t on a wet basis (m³ gas i/m³ wet gas)

$\rho_{i,n}$ Density of greenhouse gas i in the gaseous stream normal conditions (kg gas/m³ wet gas i)

P_n Absolute pressure of the gaseous stream in time interval t at normal conditions (Pa)

MM_i Molecular mass of greenhouse gas i (kg/kmol)

R_u Universal ideal gases constant (Pa.m³/kmol.K)

T_n Temperature of the gaseous stream at normal conditions (K)

$M_{t,wb}$ Mass flow of the gaseous stream in time interval t on wet basis (kg/h)

$\rho_{t,wb,n}$ Density of greenhouse gas i in the gaseous stream in interval t on a wet basis at normal conditions (kg wet gas/m³ wet gas)

$MM_{t,wb}$ Molecular mass of greenhouse gas i in time in time interval t on a wet basis (kg/kmol wet)

The molecular mass of the gaseous stream ($MM_{t,wb}$) is determined according to equation (17) below, as stipulated in the “Tool to determine the mass flow of a greenhouse gas in a gaseous stream” (Version 03.0.0):

$$MM_{t,wb} = \sum_k (V_{k,t,wb} \times MM_k) \quad \text{Mass Flow Tool Equation (17)}$$

Where:

$MM_{t,wb}$ Molecular mass of gaseous stream in time interval t on a wet basis (kg wet gas/kmol wet gas)

$V_{k,t,wb}$ Volumetric fraction of gas k in the gaseous stream in time interval t on a wet basis (m³ gas k / m³ wet gas)

MM_k Molecular mass of gas k (kg/kmol)

k All gases contained in the gaseous stream (e.g. N₂, CO₂, O₂, CO, H₂, CH₄, N₂O, NO, NO₂, SO₂, SF₆ and PFCs and H₂O in vapor phase).

The determination of the molecular mass of the gaseous stream ($MM_{t,wb}$) requires measuring the volumetric fraction of all gases (k) in the gaseous stream. However, as a simplification, the volumetric fraction of only the gases k that are greenhouse gases and are considered in the emission reduction calculation in the underlying methodology must be monitored and the difference to 100% may be considered as pure nitrogen. As per ACM0001 the only GHG to be considered is methane, therefore only the volumetric fraction of the methane will be monitored.

The above calculation is contained in the individual site monthly workbooks and then consolidated workbook titled “Consolidated ER Sheet 01-November-2024 to 31-October-2025 V3” under the Baseline Emissions sheet.

The baseline emissions associated with electricity generation in year y ($BE_{EC,y}$) are calculated using the “Tool to calculate baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation, Version 3”.

$BE_{EC,y} = \sum_k EC_{BL,k,y} \times EF_{EF,k,y} \times (1 + TDL_{k,y})$ (Equation 2 of Electricity Consumption and Generation Tool, v3). This case we are doing the calculation for Electricity generation:

Where:

$BE_{EC,y}$	Baseline emissions from electricity consumption in year y (t CO ₂ / yr)
$EC_{BL,k,y}$	Quantity of electricity that would be consumed by the baseline electricity consumer k in year y (MWh/yr). $EC_{BL,k,y}$ is equivalent to $EG_{PJ,y}$. In this case electricity generated is 26,137MWh.
$EF_{EF,k,y}$	Emission factor for electricity generation for source k in year y (t CO ₂ /MWh) value 0.9647t/MWh .
$TDL_{k,y}$	Average technical transmission and distribution losses for providing electricity to source j in year y is 11.98%in 2024 and 12.34% for 2025.
k	Sources of electricity consumption in the baseline

The above calculation is contained in the consolidated workbook titled “Consolidated ER Sheet 01-November-2024 to 31-October-2025 V3” under the Baseline Emissions sheet.

5.2 Project Emissions

The project emissions are calculated in accordance with equation (22) of the applied methodology:

$$PE_y = PE_{EC,y} + PE_{FC,y} + PE_{DY,y} \quad (\text{Equation 22 of ACM0001, v19})$$

Where:

PE_y = Project emissions in year y (tCO₂/y)

$PE_{EC,y}$ = Emissions from consumption of electricity due to the project activity in year y (tCO₂/y); value from below calculation 260 tCO₂.

$PE_{FC,y}$ = Emissions from consumption of fossil fuels due to the project activity, for purpose other than electricity generation, year y (tCO₂/y); value from below calculation 2 is 10 tCO₂.

$PE_{DY,y}$ = Emissions from distribution of compressed/liquefied LFG using trucks in year y (tCO₂/y); this is 0 as no distribution of the gas took place in this monitoring period.

$$PE_y = 270 \text{ tCO}_2$$

Project emissions from electricity consumption:

$PE_{EC,y}$ is calculated according to the “Tool to calculate baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation, Version 3” using the following equation:

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

(Equation 1 of Electricity Consumption Tool and Generation, v3)

Where:

$EF_{EF,j,y}$ = Emission Factor for electricity consumed value applied is 0,9647tCO₂/MWh for all periods

$EC_{PJ,j,y}$ = Total electricity consumed 41 MWh consumed in 2024 and 199MWh consumed in 2025.

$TDL_{j,y}$ = Transmission and Distribution losses; 11.94 in 2024 and 12.34 in 2025

$$PE_{EC,y} = 259,57 \text{ tCO}_2$$

All of the above calculations are contained in the consolidated workbook titled “Consolidated ER Sheet 01-November-2024 to 31-October-2025 V3” under the Project Emissions sheet.

Project emissions from fossil fuel consumption:

$$PE_{FCi,j,y} = FCI_{j,y} \times COEF_{i,y} \quad (\text{Equation 1 of Fossil Fuel Combustion Tool, v3})$$

Where

$PE_{FCi,j,y}$ CO₂ emissions from fossil fuel combustion in process j during year

$FCI_{j,y}$ Quantity of fuel type i combusted in process j during year y [Mass or volume unit/yr] is 3.05t;

$COEF_{i,y}$ CO₂ emission coefficient of fuel type i in year y [tCO₂/mass or volume unit] is 3.24/t;

$$PE_{FC,j,y} = 10 \text{ tCO}_2$$

$$COEF_{i,y} = NCV_{i,y} \times EF_{CO2,i,y} \quad (\text{Equation 4 of Fossil Fuel Combustion Tool, v3})$$

Where

$COEF_{i,y}$ CO₂ emission coefficient of fuel type i in year y [tCO₂/mass or volume unit];

$NCV_{i,y}$ Weighted average net calorific value of the fuel type i year y [GJ/mass or volume unit] is 0.0433 TJ/t;

$EF_{CO_2,i,y}$ Weighted average CO₂ emission factor of fuel type i in year y [tCO₂/TJ] 74.8tCO₂/TJ;

i Fuel types combusted in process j during year y is standard diesel.

All of the above calculations are contained in the consolidated workbook titled “Consolidated ER Sheet 01-November-2024 to 31-October-2025 V3”.

5.3 Leakage Emissions

There are no leakage emissions associated with this project.

5.4 GHG Emission Reductions and Carbon Dioxide Removals

Vintage period	Baseline emissions (tCO ₂ e)	Project emissions (tCO ₂ e)	Leakage emissions (tCO ₂ e)	Reduction VCUs (tCO ₂ e)	Removal VCUs (tCO ₂ e)	Total VCUs (tCO ₂ e)
Year 2024 01-Nov-2024 to 31-Dec-2024	43,839	44	0	43,795	0	43,795
Year 2025 01-Jan-2025 to 31-Oct-2025	163,020	226	0	184,039	0	184,039
Total	228,104	270	0	227,834	0	227,834

Vintage period	Ex-ante estimated reductions/removals	Achieved reductions/removals	Percent difference	Explanation for the difference
01-Nov-2024 to 31-Dec-2024	102,945 The value for 1-November-2024 to 31-December-2024 =616,038/365 *61 =102,954	43,795	42.53%	This is due to low collection efficiency due to landfill tipping practice. We are also not able to access all the waste for each site and not all sites are fully operational. This impacts bulk ga

				and collection efficiencies and access to newer waste.
01-Jan-2025 to 31-Oct-2025	524,287 The value for 1-January-2025 to 31-October-2025 = 629,490/365 *304 = 524,287	184,039	35,10%	Also this is due to low collection efficiency due to landfill tipping practice. We are also not able to access all the waste for each site and not all sites are operational. This impacts bulk ga and collection efficiencies and access to newer waste.

APPENDIX 1: COMMERCIALLY SENSITIVE INFORMATION

None.