



**Verified Carbon
Standard**

VERIFICATION REPORT TITLE

JOBURG LANDFILL GAS TO ENERGY PROJECT

AENOR
Confía

Document Prepared by AENOR INTERNACIONAL S.A.U

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Summary:

AENOR Internacional SAU, hereinafter AENOR, has made the verification for the monitoring period 12-11-2019 to 26-05-2021 of the Joburg Landfill Gas to Energy Project located in Johannesburg, in the Gauteng Province of South Africa.

The objective of the project is to collect and destroy/utilise the LFG generated at the three operating Johannesburg landfill sites: Robinson Deep, Marie Louise and Goudkoppies. The project consists of two stages: first LFG is captured and destroyed using an LFG flare, and then the captured LFG is fed to the LFG flare and modular electricity generation plants. 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. Prior to implementation of the project activity, the LFG was being freely emitted into the atmosphere resulting in GHG emissions, and electricity would have been produced in the fossil fuel based South African grid resulting in CO2 emissions.

The Robinson Deep flare was commissioned on 27 May 2011 and electricity generation was commissioned on 26 November 2016. The Marie Louise landfill site flare was commissioned on 04 May 2012 and electricity generation was commissioned on 25 January 2018. The Goudkoppies flare and electricity generation components were commissioned on 25 April 2017. There are two additional sites contemplated on the project: Linbro Park and Ennerdale, which are currently not constructed.

The project has been verified on the basis of UNFCCC criteria for the CDM methodology (ACM0001 version 19.0), Verified Carbon Standard (VCS) version 4.2, as well as criteria given to provide for consistent project operations, monitoring and reporting. UNFCCC criteria refer to Article 12 of the Kyoto Protocol, the CDM rules and modalities and the subsequent decisions by the CDM Executive Board, as well as the host country criteria. The field visit did not take place, instead remote interviews with key stakeholders and staff were held on 11 January 2022. Besides the MR /1/ /2/, registered PD /3/ and supporting documents were reviewed.

The purpose of the verification was to determine the conformance of the project with respect to the VCS Standard. The scope of the verification was to assess the conformance of validated project, once implemented,

with the VCS requirements and requirements in the validated PD. The process was performed through a combination of desk review, interviews, and communications with relevant personnel.

This is the fifth verification event, corresponding to the monitoring period from 12 November 2019 to 26 May 2021.

During the verification, 2 CLs and 4 CARs were reported. All these issues raised during the verification process were appropriately closed by means of corrections, more clear explanations and other supported documents.

Once all issues detected were appropriately resolved, AENOR carried out this final verification report and deems with reasonable level of assurance that the project complies with all the verification criteria. The assessment team has no restrictions or uncertainties with respect to the compliance of the project with the verification criteria, hence, the audit team concludes that the cumulative net GHG emissions reductions of 275,155 tCO₂e over the monitoring period has been quantified in accordance with VCS rules.

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1 INTRODUCTION

1.1 Objective

The objective of the verification audit was to conduct an independent third-party assessment of the project to determine:

The extent to which methods and procedures, including monitoring procedures, have been implemented in accordance with the project description (PD), including the monitoring plan.

The extent to which GHG emission reductions reported in the monitoring report are materially accurate.

1.2 Scope and Criteria

The scope of the verification audit is to verify the emissions reductions of the project, against the Verified Carbon Standard, the identified methodology and the validated PD throughout the monitoring period from 12/11/2019 to 26/05/2021.

The objectives of this audit included a verification of the Project's calculated reductions with the Verified Carbon Standard requirements and any additional requirements. In addition, the audit assessed the project with respect to the validated baseline scenarios presented in the PD.

In accordance with VCS Standard, the criterion for validation and verification was the VCS Version 4, including the following documents:

- VCS Program Guide v.4.1
- VCS Standard v.4.2

Unless otherwise indicated, the assessment was performed against the most recent version of the relevant VCS guidance document.

1.3 Level of Assurance

The assessment was conducted to provide a reasonable level of assurance of conformance against the defined audit criteria and materiality thresholds within the audit scope. Based on the audit findings, a positive evaluation statement reasonably assures that the project GHG assertion is materially correct and is a fair representation of the GHG data and information.

All the revisions of the verification report before being submitted to the client were subjected to an independent internal technical review to confirm that all verification activities had been completed according to the pertinent AENOR instructions required. The technical review was performed by a

technical reviewer qualified in accordance with AENOR's qualification scheme for VCS validation and verification.

1.4 Summary Description of the Project

The "Joburg Landfill Gas to Energy Project" is a landfill gas project located in the Johannesburg landfill sites in Johannesburg, South Africa.

The project consists of two stages: first LFG is captured and destroyed using an LFG flare, and then the captured LFG is fed to the LFG flare and modular electricity generation plants. 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 CO₂e emissions. Prior to implementation of the project activity, the LFG was being freely emitted into the atmosphere resulting in GHG emissions, and electricity would have been produced in the fossil fuel based South African grid resulting in CO₂ emissions.

The Robinson Deep flare was commissioned on 27 May 2011 and electricity generation was commissioned on 26 November 2016. The Marie Louise landfill site flare was commissioned on 04 May 2012 and electricity generation was commissioned on 25 January 2018. The Goudkoppies flare and electricity generation components were commissioned on 25 April 2017.

The first crediting period will last for 10 years and it is planned to be renewed a second time from 27/05/2021 to 26/05/2031.

The emissions reduction for the current monitoring period is 275,155 tCO₂e.

2 VERIFICATION PROCESS

2.1 Method and Criteria

The verification was performed through a combination of document review and communications, as discussed in Sections 2.2 through 2.4 of this report. At all times, the project was assessed for conformance to the criteria described in Section 1.2 of this report. As discussed in Section 2.5, findings were issued to ensure that the project was in full conformance to all requirements.

A project specific Verification Plan was developed to guide the verification auditing process to ensure efficiency and effectiveness. The purpose of the Verification Plan was to present a risk assessment for determining the nature and extent of verification procedures necessary to ensure the risk of auditing error was reduced to a reasonable level. The Verification Plan methodology was derived from all items in our verification process stated above. Any modifications applied to the Verification plan were made based upon the conditions observed for monitoring in order to detect the processes with highest risk of material discrepancy.

The verification activities in which risks were assessed, were the evaluations of the monitoring system (data flow, data control procedures, etc.), but mainly the quality of raw data as well as sources and the spreadsheet calculations. AENOR reproduced and verified 100% of data in the “Consolidated ER Sheet 12 Nove 2019 to May 2021” /4/ for the monitoring period. The project boundary and project area for the monitoring period were checked using the evidence provided by the PP and the communications carried out with staff who showed the main facilities of the project through videos /11/ and photos /12/.

AENOR carried out a deep and meticulous review of the spreadsheet in order to verify the correct application of the methodology (formulae, equations) and checked that data required calculating the GHG emission reductions were appropriately provided. Based on the assessment carried out, AENOR confirms with a reasonable level of assurance that the claimed emission reductions are free from material errors, omissions, or misstatements.

AENOR confirms that sufficient evidence was presented for the reported net anthropogenic GHG emission reductions and that there is a clear audit trail that contains the evidence and records that validate the stated figure in this verification report since:

- Sufficient evidence available: The project participant has provided the 100% of data used in the calculations to achieve the final amount of GHG emission reductions reported, or the source of data in case of default values, or conservative approaches in case of estimated values.
- Nature of evidence: The raw data were collected from reliable sources. They are detailed in the project documents and have been provided to the verification team and were checked.
- Cross-checked evidence: AENOR cross-checked the collected information through communications with stakeholders and reproducing calculations.

Hence, AENOR confirms that the stated figures in the monitoring report are correct and confirms that is able to certify net anthropogenic GHG removals based on verifiable and reliable evidence.

2.2 Document Review

A detailed review of all project documentation was conducted to ensure consistency with, and identify any deviation from, the VCS program requirements, the methodology applied (CDM Methodology ACM0001 Version 19 Large-scale Consolidated Methodology Flaring or use of landfill gas, and the validated PD. The initial review focused on the Monitoring Report (MR) and included an examination of the project details, implementation status, data and parameters, and quantification of GHG emission reductions. Documents reviewed included data from monitoring, calculation spreadsheets, and responses to Corrective Action Requests (CARs) and Clarifications (CLs).

The verification included a review of the validated PD and the MR, relative to the field conditions and communications with project management staff and stakeholders.

For a listing of all documents received from the client for this verification, please see Appendix 1.

2.3 Interviews

Interviews were performed through videocalls and written testimonies as part of the overall verification process which was additional to that provided in the project description, monitoring report and any supporting documents. The following table summarizes the interviewees that took part in the different communications during the process.

Name	Title/Organization/Community
David Cornish	General Manager ENERGY Systems SA (PTY) LTD
Pexie Jafta	Teacher at Turffontein Primary school (near Robinson Deep plant)

Due to the COVID-19 pandemic situation, all interviews were carried out through videoconference or email /13/, as explained in Section 2.4.

2.4 Site Inspections

Due to the exceptional situation caused by the COVID-19 crisis and the travel restrictions established by governments for safety reasons, it was not possible to carry out a site visit as part of the verification process of the project.

In accordance with VERRA's COVID-19 Travel Guidance for Projects (dated 18 March 2020) and since the VCS Programs does not explicitly mandate site visits, considering that a reasonable level of assurance was achievable by other means. AENOR as VVB proposed to carry out a remote verification audit on January 11th 2022, that ensured the achievement of the assurance level required by VCS program.

The remote audit was based on the following auditing techniques:

- Document review and cross checks between the information provided in the MR, the PD and supporting information and evidence provided by the PP, emissions calculations and supporting information and evidence provided.
- Review, based on the selected methodology, tools and the other applied methodological regulatory documents, of the appropriateness of formulae and accuracy of calculations.
- Telephone, teleconference and/or e-mail interviews for the implementation of project activities and the elaboration of project's documents.
- Cross checks between information provided by interviewees to ensure that not relevant information has been omitted.

2.5 Resolution of Findings

All documentation provided by the PP was assessed against the applicable version of the relevant VCS guidance document. Several Corrective Action Requests (CAR) and Clarifications (CL) were raised and submitted to the PP, which addressed them either by providing to the audit team the requested information or by making the appropriate corrections. Updated versions of the documentation were submitted by the PP and the audit team reassessed them against the guidance documentation. This process was repeated iteratively until all findings were fully closed. Specifically, 4 CARs and 2 CLs were raised.

All findings issued by the AENOR audit team during the verification process have been closed. In accordance with Section 4.1.13 of the VCS Standard, all findings issued during the verification process, and the inputs for their closure, are described in Appendix 2 of this report.

2.5.1 Forward Action Requests

No FARs were raised to the PP during the verification process.

2.6 Eligibility for Validation Activities

N/A

3 VALIDATION FINDINGS

3.1 Participation under Other GHG Programs

The Joburg landfill gas to energy project was registered with Verra on May 27th 2011 in order to be able to apply for pre-CDM registration. From that point on, the project with CDM registration number 6797 continued with the UNFCCC issuance cycle including the renewal of the crediting period in 2020. Since the UNFCCC is not able to issue CERs under the CDM mechanism after December 31st 2020, the PP enquired to move the project back to Verra for issuance and undertook a gap validation to effect this transfer of the renewed PD and crediting period. However, since Verra uses a 10-year term and the original registration for the project was on May 2011, this crediting period still applies for the current monitoring period. Thus, the verification considers the PD approved by the UNFCCC on February 23rd 2021, as confirmed by Verra per e-mail to the PP on October 15th 2021 /13/.

AENOR checked the documentation from the CDM Registry, VCS Registry and e-mails from Verra, and concluded that the project is eligible to participate under the VCS Program for the abovementioned reasons.

3.2 Methodology deviations

Not applicable, as there has not been any methodology deviation.

3.3 Project Description Deviations

As explained on previous sections, the project was originally registered with Verra then transferred to CDM, and once again to Verra. Since the latest available version of the approved PD was renewed with the CDM, the PP used the latest version of the methodology. For this reason, the methodology ACM0001 was updated from version 11 to version 19 on the current monitoring period, and ASB0040-2018 Standardized baseline: Grid emission factor for Southern African Power Pool, version 1 was used, as it is valid from 07/10/2018 to 06/10/2021, which comprises the entire current monitoring period.

The project deviation does not impact on the applicability of the methodology, other than using a more recent version as per the latest approved PDD, the additionality nor the appropriateness of the baseline scenario, as it refers only to a change of voluntary scheme.

AENOR has checked the PD /3/, new version of the methodology and e-mails exchanged with Verra /13/ to analyze the deviation and information compiled on the MR /2/, and concludes that the deviation is appropriately described and justified, and that the project remains in compliance with the VCS rules. Thus, it is considered valid.

There was a second project deviation as there was a delay in calibration of instrument that affected parameter FCI,j,y and parameter Mt,wb. For this reason, the values were adjusted by the greater of the actual deviation and or the error, whichever is the lesser or greater value, in order to be conservative. The information on the dates and exact values affected is compiled in section 4.2 of the MR for the applicable parameters.

AENOR checked the calculations along the calibration certificates and instrument specifications, and concludes that the deviation is appropriately described and justified. It has been performed using conservative approach and there is no impact on the applicability of the methodology, additionality nor the appropriateness of the baseline scenario. Thus, it is considered valid.

3.4 Grouped Project

N/A. The project is not a grouped project.

4 VERIFICATION FINDINGS

4.1 Project Implementation Status

The Robinson Deep flare was commissioned on 27 May 2011 and electricity generation was commissioned on 26 November 2016. The Marie Louise landfill site flare was commissioned on 04 May 2012 and electricity generation was commissioned on 25 January 2018. The Goudkoppies flare and electricity generation components were commissioned on 25 April 2017. There are two additional sites contemplated on the project: Linbro Park and Ennerdale, which are currently not constructed.

The MR provides in its Section 3.1 a description of the operation of the project activity during this monitoring period. AENOR has not detected project changes in regards of the project title, its purposes and objectives. As such, the project activity accurately reflects the proposed project which reduces the GHG emissions by the combustion of methane contained in landfill gas that would otherwise be emitted to the atmosphere through flaring.

As explained throughout the MR, the project was pre-registered under VCS, renewed under CDM, and is currently seeking renovation under VCS. As such, the project participated under the CDM for the previous verifications. Nonetheless, the project has not sought any form of environmental credit for the current monitoring period, nor the emissions reductions achieved for the current monitoring period have been included in any other trading program. AENOR has checked this information with the CDM registry and mails from the PP to Verra.

During the verification process, the audit team checked the actual implementation of project activities through the analysis of evidence provided by the PP and through interviews to project staff. No discrepancies have been found between the gathered evidence and the implemented activities reported in the MR, as well between the MR and the planned activities in the PD, except for the project deviations reported.

After the review of the MR, spreadsheet calculation and the other document to support calculations, AENOR deems that project status is in compliance with applicable methodology and implementation is in support of the VCS principles of Conservativeness and Accuracy, since conservative assumptions were applied for this monitoring period.

Related to the compliance with the Monitoring Plan, section 4.3 of the MR provides information about the monitoring plan and actions carried out for the current monitoring period. AENOR reviewed the procedures put in place to perform the different parameters and data monitored and deems that they are in accordance with the procedures described in the validated monitoring plan and no different were found. AENOR checked the monitoring plan contained in the validated PD and compared it with the MR. AENOR has confirmed that no discrepancy between the actual monitoring system and the monitoring plan set out in the project description and the applied methodology has been

described, except for the methodology deviation reported, and no impact to the applicability of the methodology and the conservativeness of the quantification of GHG emission reductions have occurred.

Due to the activities of the project, sustainable development contributions have been achieved, specifically for SDG 13 and 7 by reducing emission of GHG and increasing renewable energy in South Africa's energy mix.

AENOR has checked the MR and spreadsheet with the PD and evidences, and deems that the project has been implemented as described in the project description except for the deviations aforementioned.

4.2 Safeguards

4.2.1 No Net Harm

The project does not have any potential negative environmental and socio-economic impacts as it is installed on already existing operational landfill sites that are far from population.

4.2.2 Local Stakeholder Consultation

The Joburg landfill gas to energy project is operated by the PP under contract with the City of Joburg, and as such it participates in steering committee meetings in which the performance of the project is monitored /10/. In addition, the PP engages in several social economic development programme with the local community, as compiled on the Economic Development plan and the PP's SED projects /9/ reports which show pictures of the various projects undertaken to give back into the communities in which these projects operate. In this sense, the PP undertakes a needs assessment every three months in which it identifies local underprivileged schools and assesses their need in order to provide resources. This was also evidenced by interview with one of the teachers at Turffontein Primary school, a school near the Robinson Deep landfill site.

No comments were received relating to the project's reduction in greenhouse gas emissions. Therefore, no updates have been considered with respect to the project design, because there have been no requests or complaints in this regard, received during the monitoring period.

4.3 AFOLU-Specific Safeguards

Not applicable since the project is not an AFOLU project.

4.4 Accuracy of GHG Emission Reduction and Removal Calculation

The following formulas were followed by the PP as per methodology ACM0001 Version 19 Large-scale Consolidated Methodology Flaring or use of landfill gas.

Baseline Emissions

Baseline emissions are determined according to ACM0001 - equation (1):

$$BE_y = BE_{CH,y} + BE_{EC,y} + BE_{HG,y} + BE_{NG,y}$$

Where:

$BE_{CH,y}$ Baseline emissions of methane from the SWDS ($BE_{CH4,y}$) value from below calculation
237 069 tCO₂e

$BE_{EC,y}$ baseline emissions associated with electricity generation value from below calculation
38 867 tCO₂e

$BE_{HG,y}$ there was no use of methane for heating Value is 0 tCO₂e

$BE_{NG,y}$ there was no upgrading and use of methane for natural gas Value is 0 tCO₂e

$$BE_y = 275\,936$$

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

$$BE_{CH4} = \left((1 - OX_{toplayer}) \times F_{CH4,PJ,y} - F_{CH,BL,y} \right) \times GWP_{CH4}$$

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

$F_{CH4,PJ,y}$ Amount of methane in the LFG which is flared and/or used in the project activity in year y (t CH₄/yr). Values used 7322.6 up to 31 December 2020 and 2869.5 from 1 January 2021 to 26 May 2021.

$F_{CH,BL,y}$ 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_{CH4} Global warming potential of CH₄ (t CO₂e/t CH₄) 25 for the period up to 31 December 2020 and 28 for the period from 1 January 2021 to end of monitoring period

$F_{CH4,PJ,y}$ 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:

$$F_{CH4,PJ,y} = F_{CH4,flared,y} + F_{CH4,EL,y} + F_{CH4,HG,y} + F_{CH4,NG,y}$$

Where:

$F_{CH4,flared,y}$	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 CH4/yr)
$F_{CH4,HG,y}$	Amount of methane in the LFG which is used for heat generation in year y (t CH4/yr) 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 CH4/yr) 0 as no methane was upgraded and supplied as natural gas.

The above calculation is contained in the individual site monthly workbooks /5/ and then consolidated workbook titled “Consolidated ER Sheet 12 Nove 2019 to May 2021” 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”.

$$BE_{EC,y} = \sum_k EC_{BL,k,y} \times EF_{EF,k,y} \times (1 + TDL_{k,y})$$

Where:

$EC_{BL,k,y}$	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 $EGPJ,y$. In this case electricity generated is 3961 MWh for 2019, 23959 MWh for 2020 and 10806 MWh for 2021.
$EF_{EF,k,y}$	Emission factor for electricity generation for source k in year y (t CO2/MWh) value 0.9091 t/MWh.
$TDL_{k,y}$	Average technical transmission and distribution losses for providing electricity to source j in year y 9.71 in 2019, 9.89 in 2020 and 11.78 in 2021
k	Sources of electricity consumption in the baseline

Project Emissions

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

$$PE_y = PE_{EC,y} + PE_{FC,y} + PE_{DY,y}$$

Where:

$PE_{EC,y}$ Emissions from consumption of electricity due to the project activity in year y (tCO₂/y) value from below calculation 779

$PE_{FC,y}$ 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

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

Project emissions from electricity consumption **$PE_{EC,y}$** are 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:

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

Where:

$EC_{PJ,j,y}$ Total electricity consumed 25 MWh in 2019, 273 MWh in 2020 and 474 MWh in 2021.

$EF_{EF,j,y}$ Emission Factor for electricity consumed, 0.9091 tCO₂/MWh for all periods

$TDL_{j,y}$ Transmission and Distribution losses 9.71 in 2019, 9.89 in 2020 and 11.78 in 2021

$$PE_{EC,y} = 779$$

Project emissions from fossil fuel consumption **$PE_{FC,y}$** are calculated as follows:

$$PE_{FC,j,y} = FCI_{i,j,y} \times COEF_{i,y}$$

Where:

$FCI_{i,j,y}$ Quantity of fuel type i combusted in process j during year y 0.35t

$COEF_{i,y}$ CO₂ emission coefficient of fuel type i in year y 3.24/t;|

There was a delay in calibration of the ruler for the tank level between 7/03/2019 and 22/04/2020, as well as between 22/04/2020 and 28/04/2021 /6/. For this reason, the maximum permitted error was applied to the values as a conservative measure.

$$PE_{FC,j,y} = 2$$

$$COEF_{i,y} = NCV_{i,y} \times EFCO_{2,i,y}$$

Where:

$NCV_{i,y}$ Weighted average net calorific value of the fuel type i year y 0,0433 TJ/t

$EFCO2, i, y$ Weighted average CO2 emission factor of fuel type i in year y 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 “Consolodated CDM ER Sheet 12 Nove 2019 to May 2021”.

As explained in section 5.3 of the MR, there are no leakage emissions associated with this project.

The verification activities in which risks were assessed, were the evaluations of the monitoring system (data flow, data control procedures, etc.) but mainly the quality of raw data as well as sources and the spreadsheet calculations. AENOR reproduced and verified 100% of data in the “Consolodated ER Sheet 12 Nove 2019 to May 2021” for the monitoring period, and checked all calibration certificates /6/ /7/ /8/.

AENOR carried out a deep and meticulous review of the spreadsheets in order to verify the correct application of the methodology (formulae, equations) and checked that data required calculating the GHG removals were appropriately provided. Based on the assessment carried out, AENOR confirms with a reasonable level of assurance:

- The accuracy of GHG emission reductions, including accuracy of spreadsheet formulae, conversions and aggregations, and consistent use of the data and parameters.
- The methods and formulae set out in the project description for calculating baseline emissions, project emissions and leakage have been followed.
- The appropriateness of any default values used in the monitoring report.
- The claimed emission reductions are free from material errors, omissions, or misstatements.

Hence, AENOR confirms that GHG emission reductions have been quantified correctly in accordance with the project description and applied methodology and the stated figures in the monitoring report are correct.

4.5 Quality of Evidence to Determine GHG Emission Reductions and Removals

AENOR did not find inconsistencies between the PD, monitoring report and spreadsheet calculation.

After a deep and thorough review and reproduction of calculations and the corresponding tracks to the other spreadsheets, AENOR deems the parameters monitored and available at validation are correct, reliable, and consistent. Information in the monitoring report is in compliance with the PD, the calculations provided and the applicable methodology. Then, the results showed in the monitoring report are reliable, consistent, and accurate.

AENOR confirms that sufficient evidence was presented for the reported net anthropogenic GHG emission reductions and that there is a clear audit trail that contains the evidence and records that validate the stated figure in this verification report since:

- Sufficient evidence available: The project participant has provided the 100% of data used in the calculations to achieve the final amount of GHG emission reductions reported, or the source of data in case of default values, or conservative approaches in case of estimated values.
- Nature of evidence: The raw data were collected from reliable sources. They are detailed in the project document and have been provided to the verification team and were checked during the interviews.
- All documents received from the client for this verification have been listed in the Appendix 1.

Hence, AENOR confirms that is able to certify net anthropogenic GHG reductions based on verifiable and reliable evidence.

4.6 Non-Permanence Risk Analysis

Since this project activity is not an AFOLU project and its emission reductions do not have risk of reversibility, it is not necessary to perform a non-permanence risk analysis.

5 VERIFICATION CONCLUSION

AENOR has verified that the “Joburg Landfill Gas to Energy Project” is in compliance with the VCS Standard v4.2 and has been implemented in accordance with the validated PD.

The verification assessment covers the monitoring period from 12/11/2019 to 26/05/2021, and verifies that calculated emission reductions were achieved during the monitoring period with a reasonable level of assurance and confirms that the project has reduced and not emitted GHG emissions for the period between 12/11/2019 to 26/05/2021. Therefore, AENOR is able to issue a positive verification opinion for the 275,155 tCO₂e, as reported in the Monitoring Report version 1.6 dated on 03/05/2022, for the current monitoring period (12/11/2019 to 26/05/2021) corresponds to the emission reductions achieved during the monitoring period, as the following table:

Verification period: From 12/11/2019 to 26/05/2021.

Verified GHG emission reductions in the above verification period: 275,155 tCO₂e.

Year	Baseline emissions or removals (tCO ₂ e)	Project emissions or removals (tCO ₂ e)	Leakage emissions (tCO ₂ e)	Net GHG emission reductions or removals (tCO ₂ e)
2019 (from 12 Nov)	24,296	24	0	24,272
2020	168,349	273	0	168,076
2021 (up to 26 May)	83 291	483	0	82 808
Total	275 936	780	0	275 155

AENOR is able to confirm that this verification event complies with all validation criteria for projects set out in VCS Version 4.2 without any qualifications or limitations.

Date: 14 June 2022



Lead Auditor

Elena Llorente Pérez

APPENDIX 1: LIST OF EVIDENCE PROVIDED

General documents
Monitoring report: - Initial version: MR - VCS-MR-Template-v4.0 ENERGY Joburg V1.0 17-12-2021 /1/ - Final version: VCS-MR-Template-v4.1 ENERGY Joburg V1.6 /2/ Project description: - PD v12 on 26/09/2020 /3/
Carbon Accounting
Spreadsheets: - Consolodated ER Sheet 12 Nove 2019 to May 2021 v4 /4/ - Monthly spreadsheets /5/
Supporting documents
Calibration certificates: - Diesel tank ruler /6/ - Gas monitor /7/ - Flow meters /8/ Energy Joburg SED Projects /9/ Steering Committee Minutes September 2020 /10/ Historic information of Robinson Deep, Marie Louise, Goudkoppies plants
Remote Audit Evidences
- Video testimonies /11/ - Pictures of the main equipment of the project, such as the landfill plants, flare, sensors, meters, etc. /12/ - Emails with relevant information regarding to the implementation of the project /13/

APPENDIX 2: CORRECTIVE ACTION REQUESTS AND CLARIFICATIONS

Corrective Action Requests (CAR)

CAR	01	Date: 14/01/2022
Description of CAR		
The following sections of the MR have not been completed in accordance with the VCS template: 1. Summary table does not include dates in format DD-Month-YY 2. Section 1.1 does not include the total GHG emission reductions or removals generated in this monitoring period 3. Section 2.2 does not include details on the following: • The procedures or methods used for engaging local stakeholders (e.g., dates of announcements or meetings, periods during which input was sought). • The procedures or methods used for documenting the outcomes of the local stakeholder communication. • The mechanism for on-going communication with local stakeholders. • How due account of all and any input received during ongoing communication has been taken. Include details on any updates to the project design or justify why updates are not appropriate. 4. Section 4.3 does not include the procedures used for handling any internal auditing performed and any non-conformities identified. 5. Sections 5.1 and 5.2 should be further explained as to allow the reader to reproduce the calculation. 6. Appendix should be removed if it does not have any information.		
Project participant response		Date: 18/01/2022
1. The date format has been corrected in the MR. 2. Total GHG emission reduction has been included in section 1.1 3. Section 2.2 updated to include stakeholder consultation process used. 4. Section 4.3 has been updated to outline our internal review process for workbooks and site data. 5. Section 5.1 and 5.2 updated to provide a more detailed step by step explanation of the calculations applied in the ER calculation sheets and workbooks 6. The Appendix page has been deleted.		
Documentation provided by the Project Participant		

<i>File provided containing the Stakeholder consultation process used for the project with supporting evidence, titled "04. PPP Report"</i> <i>Updated monitoring report V1.1TC and consolidated ER calculation sheets provided.</i>	
VVB Assessment	Date: 26/01/2022
1. MR has been updated accordingly 2. Section 1.1 has been updated accordingly 3. Section 2.2 is missing information on stakeholder communication during the current monitoring period 4. Section 4.3 has been updated accordingly 5. Some formulas are missing explanation and some numbers incorrect according to the spreadsheet. 6. MR has been updated accordingly	
Project participant response	Date: 02/02/2022
3. We have included additional information on the social responsibility program we run and that engagement with the community and we included details of engagement with the municipality as the owner of the site and attached copies of minutes of meeting and also copies of community engagement through our Social Development programme. 5. Additional explanations provided and numbers checked against the spreadsheet.	
VVB Assessment	Date: 09/02/2022
3. Section 2.2 is missing information on "How due account of all and any input received during ongoing communication has been taken. <u>Include details on any updates to the project design or justify why updates are not appropriate.</u>" 5. Section 5.4 is not in accordance with spreadsheet 7. Section 1.11 does not include any provisions for monitoring and reporting the SD contributions	
Project participant response	Date: 11/02/2022
3. We have provided clear outline on how input is received and taken into account and justified why no project design was required. 5. this section has been updated and the Excell sheet has been amended to make easier to compare the annual values and the totals. 7. We have added what is meter and who it is reported to in line with the guidance.	
VVB Assessment	Date: 17/02/2022
MR has been updated and deemed correct. Therefore CAR 1 is closed.	

CAR	02	Date: 14/01/2022
Description of CAR		
The following information is not in accordance with the PD: 1. Section 1.1 states “The estimated annual average and total GHG emission reductions for the second crediting period is 498 521 tCO₂e and total of 3 489 649 tCO₂e respectively” whereas on the PD it’s 480,155 tCO₂e and 3,361,087 respectively. 2. Section 1.5 states “The project start date is the 27 May 2011” whereas on the PD it states 29/05/2009. 3. Section 1.8 references to methodology is not in accordance with PD. 4. Section 4.1 parameter MMi values do not match with the ones on the PD.		
Project participant response		Date: 18/01/2022
1. <i>Corrected to match the PD.</i> 2. <i>The project start date in the PD uses the CDM set of criteria which is different to that used by VERRA. As such we have used the VERRA criteria for the MR and start date and that is why the dates differ. This has been clarified by VERRA.</i> 3. <i>This has been corrected.</i> 4. <i>Corrected in the MR</i>		
Documentation provided by the Project Participant		
<i>Updated monitoring report V1.1TC and consolidated ER calculation sheets provided.</i>		
VVB Assessment		Date: 26/01/2022
MR has been updated and evidence has been provided accordingly. Therefore, CAR 2 is closed.		

CAR	03	Date: 14/01/2022
Description of CAR		
The following errors or misstatements have been found on the MR: 1. Section 1.2 UNFCCC CERs requested do not match those from the CDM register. 2. Section 1.6 crediting period start date is incorrect. 3. Parameter GWPCH4 has not been updated in accordance with EB 108 from 1 January 2021 onwards.		
Project participant response		Date: 18/01/2022
1. <i>Corrected to match UNFCCC values.</i> 2. <i>The Start period is as per VERRA criteria which has been check and advised by VERRA directly.</i> 3. <i>This has been corrected in the MR and the workbooks and pulled through to the ER calculation sheet.</i>		
Documentation provided by the Project Participant		
<i>Updated monitoring report V1.1TC and consolidated ER calculation sheets provided.</i>		
VVB Assessment		Date: 26/01/2022
1. Section 1.2 has been updated and deemed correct 2. Evidence has been provided and deemed correct 3. The parameter has been updated on the MR but not on the spreadsheet. Please review BEch4 formula cell B78 tab "Base line LFG fl and LFG el"		
Project participant response		Date: 02/02/2022
3. This value has been corrected in cell B78 and values updated in MR.		
VVB Assessment		Date: 09/02/2022
MR and spreadsheet have been updated and deemed correct. Therefore CAR 3 is closed.		

CAR	04	Date: 14/01/2022
Description of CAR		
The following errors or misstatements have been found on the spreadsheets: 1. Parameter EFEL is not in accordance with information from the MR nor the PD. 2. Tab "Base line LFG fl and LFG el" on spreadsheet "Consolodated ER Sheet 12 Nove 2019 to May 2021 v1" does not reference the latest spreadsheets ending on "V2". 3. Diesel consumption for Robinson Deep dic-20 does not match with its certificate. 4. TDLJ,y values do not match with information stated on MR. 5. PEECy formula for Goudkoppies links values for Marie Louise. 6. PEy formula is not correctly applied as it only considers the value PEEC.		
Project participant response		Date: 18/01/2022
1. <i>Corrected to the correct value of 0.9091.</i> 2. <i>Corrected in ER calculation to refer to V2 spreadsheets between Nov 2019 and April 2020. From May 2020 onwards there is only one spreadsheet.</i> 3. <i>Checked the value in the calculation sheet and it states 75LT and the Check sheet also says 75lt. I cannot find an error here. Please advise?</i> 4. <i>These have been corrected in the ER sheet.</i> 5. <i>These are only the TDLJ,y values and EFEL values which apply to all the sites.</i> 6. <i>This has been corrected to add both PEEC and PEFC.</i>		
Documentation provided by the Project Participant		
Updated monitoring report V1.1TC and consolidated ER calculation sheets provided.		
VVB Assessment		Date: 26/01/2022
1. MR has been updated accordingly 2. Spreadsheet has been updated accordingly 3. According to evidence "RD Diesel slip Dec 2020" the receipts state 47.235L + 40L and evidence "RD 2020-12" states 75L 4. Spreadsheet has been updated accordingly 5. PEECy considers mwh values which are different for each plant 6. Spreadsheet has been updated accordingly 7. Please clarify formula PEFC,y cell C231, H231 and M231 as it appears that NCVi,y has been multiplied twice.		
Project participant response		Date: 02/02/2022

3. The slip with 47.237LT is for petrol and is used for soothing else and not the generator. The diesel slip is below that one and is for 40LT. You will see that this falls into the RD 2020-11 November check sheet for the standby generators and the 40lt is allocated to November as the system uses full weeks and not calendar months. The December check sheets start on the 6 December and the last November check sheet covers some of the first week in December. Also there are two PDF documents for December one for the slip as evidence and the other for the check sheet. The RD 2020-12 shows the 75lt that was put into the generator. 5. This is copy past error and has been corrected to reference the actual MWh values for this site. The PE value in the MR has also been corrected. 7. The COef formula use the NCV to establish a “Coefficient” of the CO2 emissions for diesel per GJ using the emission factor per Tj. This provides an emissions factor based on energy units. We then use the formula in C231, H231 and M231 to multiply the number of Lt of fuel by the energy content per Lt and then multiply this by the Coefficient (COef) to establish the emission from Diesel fuel use.	
VVB Assessment	Date: 09/02/2022
3. Please clarify the use of the 47.237 L and justify why it is not included. 5. Excel spreadsheet and MR have been updated and deemed correct. 7. Please review calculations as NCV_{i,y} is expressed in TJ/t and FC_{i,j,y} is expressed in l, thus calculation of PEFC_y is not correct.	
Project participant response	Date: 15/02/2022
3. This was fuel for mobile plant that is used to undertake repairs on and the landfill collection system and is not used for standby power production for the equipment compound and is not note linked to the ruler and standby generator as outlined in the methodology applied. The methodology is specific to the fuel used to the standby generator. 7. the calculation is correct however the units next NCV should be TJ/t and not GJ/l and the calculation was corrected to use the number of tons of diesel	
VVB Assessment	Date: 17/02/2022
Data has been clarified and corrected. Therefore CAR 4 is closed.	

Clarifications (CL)

CL ID	01	Date: 14/01/2022
Description of CL		
Please provide evidence of the following: - Emergency procedures. - Calibration certificate 12/06/2018 for Flare ID: 11104 Marie Louise - Calibration certificate 11/02/2020 for Flare ID: 10931 Robinson Deep - Goudkoppies lack of electricity consumption. - Diesel consumption certificates: - Robinson Deep: mar-20, may-20, mar-21. - Marie Louise: dic-19. - Goudkoppies: mar-21, may-21. - Robinson Deep and Marie Louise transformers. - Robinson Deep and Goudkoppies flare ID.		
Project participant response		Date: 18/01/2022
<i>Emergency procedure document provided in Training folder titled "WI-ES-ROB-24 Rev 00 Emergency PProcedure".</i> <i>Certificate uploaded in to calibraton folder titled "Marie Louise-Guardian Calibration Certificate-CH4-Serial No.10733-Installed 230618"</i> <i>Certificate uploaded into calibration folder titled "Robinson Deep-Guardian Calibration Certificate-CH4-Serial No.17270-Installed 240821".</i> <i>Goudkoppies site does not have a serperate site supply like the other two landfill sites as the landfill site does not have three phase power on site. The Goudkoppies facility uses the High Voltage export connection to pull power in reverse to power up the site and once running uses its own power to run the site and then exports the balance. This is effective net Metering and the site produces a lot more than it consumes.</i> <i>All the outstanding diésel Check sheets have been added to the respective folders.</i> <i>I have removed the reference to Type: Transformers as the these are meters this only surves to confuse the reader.</i> <i>These can be found on the front page of the flare manual contained in folder 3 Flare Operations Manuals.</i>		
Documentation provided by the Project Participant		
- Emergency procedure document provided in Training folder titled "WI-ES-ROB-24 Rev 00 Emergency PProcedure". - Certificate uploaded in to calibration folder titled "Marie Louise-Guardian Calibration Certificate-CH4-Serial No.10733-Installed 230618"		

3. Certificate uploaded into calibration folder titled "Robinson Deep-Guardian Calibration Certificate-CH4-Serial No.17270-Installed 240821". 5. Uploaded the missing data sheets to the respective site folder.	
VVB assessment	Date: 26/01/2022
1. Evidence has been provided and deemed correct 2. The serial number on the certificate is 10733 while the flare ID is 11104, please clarify 3. The serial number on the certificate is 14406, 17270 while the flare ID is 10931, please clarify 4. Please provide evidence of net metering and consumption 5. Evidence has been provided and deemed correct 6. Please clarify the difference between the instrument of Groudkoppies and those of Robinson Deep and Marie Louise and provide evidence of the Part No of the latter 2 7. Please provide picture evidence of the flare ID from Robinson Deep and Goudkoppies	
Project participant response	Date: 02/02/2022
2. The flare has an ID no and this is for the whole plant and not each instrument. We use the individual instrument serial numbers for calibration certificates and the certificates have been provided. 3. The same as above the certificates are for the instruments and contains the correct serial number for the instrument and reference to flare ID is for the overall plant and does not appear on the certificates. 4. Please find a copy of the metering data for the site which shows both imports and exports. Under Goudkoppies/Electrical meter Certs/2022-01 Goudkoppies meter readings. 6. The first two plants were bought a number of years prior to the Goudkoppies plant being purchased and in that time the manufacturer changes the instrument supplier that they used. They both use infrared benches to detect methane concentrations and are all reliable instruments. The part used in Robinson Deep and Marie Louise is the Edinburgh Instruments Guardian Natural Gas Units and the as supplied calibration certificates can be found in the relevant site folder under calibration data and the O&M manual can be found in the Gas Analyzer manuals folder. 7. The flare ID is only evident in the O&M manual and the flare themselves don't have a number displayed on them. This is so the manufacturer can supply spares and know the design and configuration set up that particular flare. The flare manuals can be found in folder 3 in dropbox.	
VVB Assessment	Date: 09/02/2022
Clarification has been provided and deemed correct. Therefore CL 1 is closed.	

CL ID	02	Date: 14/01/2022
Description of CL		
Please clarify the following: 1. Name of the PP is referenced as “Energy Joburg (Pty) Ltd”, “ENERGY Joburg RF (PTY) Limited”, “Ener-G Systems Joburg (Pty) Ltd.” Please clarify which is the correct name and use it consistently in the MR. 2. Value applied to parameter Wx. 3. Values applied to delayed calibration on parameter Fci,j, y. 4. Thermocouple serial number same for all plants.		
Project participant response		Date: 18/01/2022
1. <i>The names changed a number of years ago from ENER-G Systems Joburg to ENERGY Joburg RF (PTY) LTD. I have corrected the referneces through the MR.</i> 2. <i>Corrected the value applied note to refernce exante calculation only use at validation and note refernced in an annexure.</i> 3. <i>We took the uncertainty of measurement value on the last page of the calibration certificate and divided it by the total specified volume of the tank to establish the % of uncertainty for the calibration. We then rounded this up to one decimal place. EI for Robinson Deep the uncertainty was 3LT/ 105lt tank =0.0285714. We increased the actual values of diésel for this period by this factor even though we use reciepts to validate the volumes and we believe that this is a conservitive apporoach.</i> 4. <i>The Thermocouples are not supplied with a serial number. We therefore use the part number as serial number to demonstrate that we have procude the correct probe for that application that is why they all have the same number. The Wika data sheet on the Thermocouples is provided as reference.</i>		
Documentation provided by the Project Participant		
1. Name change certificate provided as reference. 2. Corrected MR provided with the correction		
VVB assessment		Date: 26/01/2022
1. Please clarify in which folder is the evidence 2. MR has been updated accordingly 3. Diesel values have not been increased due to uncertainty on Consolidated spreadsheet. Please review 4. Clarification has been provided and deemed correct		
Project participant response		Date: 02/02/2022

1. Please find the certificate in VERRA MR folder 3. The two diesels values effected by this have been increased the by the percentage inaccuracy of the latest calibration certificate for each site. This only affected two items which are highlighted in yellow in the consolidated sheet.	
VVB Assessment	Date: 09/02/2022
Clarification has been provided and the excel has been updated and deemed correct. Therefore CL 2 is closed.	