Verification and Certification Report

of

Caieiras landfill gas emission reduction

GLC Report No: 258, Rev. 03

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Organisational Unit	
Germanischer Lloyd Certification GmbH (GLC), Greenhouse Gas Services	
Client Essencis Soluções Ambientais S.A.	Client reference person Mr. Fernando Freitas

Summary:

UNFCCC Ref.	0171	
Project Name:	Caieiras landfill gas emission reduction	
Project Country:	Brazil	
Sectoral Scope, Technical Area	CDM Sectoral Scope 13 – Waste handling and disposal Technical Area 13.1 - Waste handling and disposal	
Methodology(ies) / Version(s):	ACM0001 version 2	
Project Size:	☒ Large Scale	☐ Small Scale
Number of verification:	6th verification.	
Dates of monitoring period (incl. both days)	2011-09-01 to 2012-03-31	
Verified emission reductions	520,295 tCO_2e	
Included post registration changes	☐ yes ☒ no	

Project Assessment Team:	**Technical Review Team:**	**Approval by:**
Marco A. Ratton	Fernando Rangel Villasana	Markus Weber

Date of this revision:	Revision No.	Number of pages
2013-04-11	03	110

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History of report revisions:

Rev.	Date	**Person** (short sign or name)	**Function**	**Action**
01	2013-03-15	Marco A. Ratton	Assessment Team Leader (ATL) + Technical Expert	1st Review of report
02	2013-04-05	Fernando Rangel Villasana	Reviewer	Review with minor corrections. No comments were raised.
03	2013-04-11	Markus Weber	Final reviewer+Approver	Final reviewed and approved

Abbreviations

ANP	Brazilian National Agency of Petroleum, Natural Gas and Biofuels (*Agência Nacional do Petróleo, Gás Natural e Biocombustíveis)*
CAR	Corrective Action Request
CDM	Clean Development Mechanism
CDM-EB	CDM Executive Board
CER	Certified Emission Reduction
CETESB	Companhia Ambiental do Estado de São Paulo (Environmental Agency for São Paulo State in Brazil)
CH_4	Methane
CL	Clarification Request
CMP	Conference of the Parties Serving as the Meeting of the Parties to the Kyoto Protocol
CO_2	Carbon dioxide
CO_2e	Carbon dioxide equivalent
CTR	Central de Tratamento de Resíduos ("*Waste Treatment Facility*" when translated into English language)
DNA	Designated National Authority
DOE	Designated Operational Entity
ER	Emission Reductions
FAR	Forward Action Request
LFG	Landfill gas
LPG	Liquefied Petroleum Gas
GHG	Greenhouse gas(es)
GLC	Germanischer Lloyd Certification GmbH
GWP	Global Warming Potential
HDPE	High density polyethylene
INMETRO	Instituto Nacional de Metrologia, Normalização e Qualidade Industrial (Brazilian "Institute for Metrology, Standardization and Industrial quality" when translated into English language)
LFG	Landfill Gas
LPG	Liquefied Petroleum Gas
LPNRS	See PNRS
MR	Monitoring Report
MSW	Municipal Solid Waste
NOS	Operador Nacional do Sistema (Brazilian entity responsible for the coordination of the dispatch of power plants connected to the National Electricity Grid of Brazil)
PNRS	Política Nacional de Resíduos Sólidos (Brazilian National Policy on Waste Management as established by Federal Law No. 12,305/10 (the LPNRS).
PC	Personal computer
PDD	Project Design Document
PLC	Programmable logic controller
QA/QC	Quality Assurance / Quality Control

RMSP	Região Metropolitana de São Paulo (São Paulo's Metropolitan Region).
SQL	Structured Query Language
UNFCCC	United Nations Framework Convention on Climate Change

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1 INTRODUCTION

Essencis Soluções Ambientais S.A. has commissioned the Germanischer Lloyd Certification GmbH (GLC) to carry out the 6th verification of the project, Caieiras landfill gas emission reduction, registered by the UNFCCC as CDM project 0171 with regard to the relevant requirements for CDM project activities. This verification encompasses the period from 2011-09-01 to 2012-03-31 (including both days). During this verification period, the operation of the project activity resulted in mitigation of methane (CH_4) emissions by collecting and combusting landfill gas (LFG) in 3 (three) high temperature enclosed flares. LFG is rich in CH_4.
Achieved GHG emission reductions were calculated based on the consolidated CDM baseline and monitoring methodology ACM0001 (version 2) /11/ and the monitoring plan included in the Project Design Document (PDD version 4 /2/, dated 2013-01-10) for the project activity[1].
GLC has designated a verification team to review the implementation of the monitoring plan (MP). GHG data for the encompassed verification period was verified in a detailed manner applying set of requirements, auditing practices and principles as established in the latest version of the CDM´s Validation and Verification Standard (VVS) /1/ of UNFCCC.
This Verification Report summarizes the findings and conclusions of this 6th verification of the above-mentioned UNFCCC registered CDM project activity.

1.1 Objective

The objective of the verification is the review by a Designated Operational Entity (DOE) of *ex-post* determination of GHG emission reductions that have occurred as result of the operation of the project activity during a defined verification period.

Certification is the written assurance (declaration) by the DOE that, during the considered verification period, the project activity in question achieved the emission reductions as verified.

The objective of this verification was to verify and certify emission reductions reported for the project activity "Caieiras landfill gas emission reduction" for the verification period from 2011-09-01 to 2012-03-31 (including both days). It includes the verification:

- that the CDM project activity has been implemented and operated as per the PDD /2/ and that all physical features (technology, project equipment, and monitoring and metering equipment) of the project are in place;

[1] It is noteworthy that, as part of the previous 5th verification for the project activity (monitoring period from 2010-10-01 to 2011-08-31), a revised version of the PDD was included in the context of a request of approval of permanent post-registration changes which was submitted to UNFCCC in March 2013 under the "issuance" process track.
The revised version of the PDD (version 4, dated 2013-01-10 /2/) includes the following post-registration changes of which represent changes under the category "Corrections" (in information that do not affect the project design):
- Revised quantitative information about occurred and forecasted disposal of municipal solid waste (MSW) at the CTR Caieiras landfill from the period from year 2007 onwards;
- Revised ex-ante estimations of emission reductions (due to revision of the amount of MSW historically disposed in the landfill as well as revised MSW disposal forecasts from year 2007 onwards);
- Corrections of minor typo errors/mistakes and general text improvements.

While the revised version of the PDD (version 4, dated 2013-01-10 /2/) addresses minor changes (which do not affect the project design), as a result of the submitted request of approval of post registration changes (under "issuance" process track), this updated version of the PDD is expected to be finally registered by May/June 2013.

- that the Monitoring Report /3/ and other supporting documents provided are complete and verifiable and in accordance with all applicable CDM requirements;
- that actual monitoring systems as well as monitoring and management procedures comply with the description of the monitoring system and related procedures as per:
    - the monitoring plan of the PDD /2/;
    - Consolidated CDM baseline and monitoring methodology ACM0001 - "Consolidated monitoring methodology for landfill gas project activities" (version 2) /11/ and adopted calculation tools;
- that all monitoring data is measured, recorded and stored as per the adopted CDM monitoring methodology.
- that reported GHG emission data is sufficiently supported by evidences.

1.2 Scope

The verification shall ensure that reported emission reductions are complete and accurate in order to be certified. The verification of the registered CDM project activity is based on the Project Design Document (PDD) /2/, the Monitoring Report /3/, summarized emission reduction calculation spreadsheet /5/, supporting documents made available to the verification team and information collected through performing interviews and during the on-site assessments. Furthermore, publicly available information was considered as far as available and required.

The verification assessment was carried out on the basis of the following requirements, applicable for this project activity:

- Article 12 of the Kyoto Protocol /8/,
- guidelines for the implementation of Article 12 of the Kyoto Protocol as presented in the Marrakech Accords under decision 3/CMP.1 /9/ and subsequent decisions made by the Executive Board and COP/MOP,
- other relevant rules, including the host country legislation,
- CDM Validation and Verification Standard (VVS) /1/,
- monitoring plan of the PDD /2//,
- Consolidated CDM baseline and monitoring methodology ACM0001 "Consolidated monitoring methodology for landfill gas project activities" (version 2) /11/.
- Monitoring Report (all versions) /3/ /4/
- Latest version of the following tools, which are referred in the Monitoring Report /3/:
    - "Tool to calculate baseline, project and/or leakage emissions from electricity consumption" (version 01) /13/
    - "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion" (version 02) /35/
    - "Tool to calculate the emission factor for an electricity system" (version 01.1) /41/

1.3 GHG Project Description

1.3.1 Project Characteristics

Essential information of the project is presented in Table 1.

Table 1:: Project Characteristics

Item	Description
Title of the CDM project activity	"Caieiras landfill gas emission reduction"
Project Description	In accordance with the conceived project design, during the whole verification period the project activity has collected and combusted (in 3 (three) high temperature enclosed flares[2]) landfill gas (LFG) generated at the CTR Caieiras landfill with the unique goal of avoiding emissions of methane (CH_4) into the atmosphere. The CTR Caieiras landfill is located in municipality of Caieiras in the suburban area of the city of São Paulo in Brazil. LFG (which is rich in CH_4) has been historically generated at the CTR Caieiras landfill as result of the anaerobic decomposition of municipal solid waste (MSW) disposed in the site. As described in the PDD /2/, apart of destroying LFG in an enclosed flare, possible use for captured LFG includes (i) electricity generation for use at the landfill site as well as (ii) supply of collected LFG as a fuel to be used for thermal and energy application in an industrial facility outside of the landfill.
Project size	☒ Large Scale ☐ Small Scale
CDM Reference No.	0171
Date of registration as a CDM project activity by UNFCCC	2006-03-09
Project Scope (according to UNFCCC Sectoral Scope and Technical Area numbers for CDM)	CDM Sectoral Scope 13 – Waste handling and disposal Technical Area 13.1 - Waste handling and disposal
Applied Methodology	ACM0001 "Consolidated monitoring methodology for landfill gas project activities" (version 2) /11/
CDM crediting period	Renewable Crediting Period (7 years) (from 2006-03-31 to

[2] It is important to note that, as described in the PDD, a 4th high temperature enclosed flare was installed at the project site in year 2012, but it only started its continuous operations on 30 April 2012 (thus after the end of the present verification period). This was confirmed by the GLC's verification team though assessment of a service and maintenance log book /42/ (with historical of interventions in the project).

	2013-03-30).
Project's actual starting date	The project activity was implemented on 2007-02-01 and it has been operating in the CTR Caieiras landfill since this date.

1.3.2 Involved Parties and Project Participants

The following parties to the Kyoto Protocol and project participants are involved in this project activity (Table 2).

Table 2: Project Parties and project participants (as informed by the project participants and as per the latest version of the completed Modalities of Communication (MoC) form /26/)

Party(ies)		Project Participant(s)
Host party	Brazil	Essencis Soluções Ambientais S.A.
Other involved party/ies	Japan	Electric Power Development Co., Ltd.

1.3.3 Project Location

Project location details are given in Table 3:

Table 3: Project Location

Project Location Details	
Host Country	Brazil
Region:	Metropolitan Region of São Paulo (RMSP)
Project location address:	The project site is located in the extreme Northeast region of Caieiras municipality at the Bandeirantes highway, km 33. Caieiras is one of the municipalities which encompass the Metropolitan Region of São Paulo (RMSP).
Latitude:	23°20'40"S (-23.3444)
Longitude:	46°46'20"W (-46.7722)

1.3.4 Technical Project Description

The registered CDM project activity "Caieiras landfill gas emission reduction" was designed and was implemented and operated along the verification period from 2011-09-01 to 2012-03-31 with the objective to collect and combust (in three (3) high temperature enclosed flares) LFG generated at the "CTR Caieiras" landfill with the goal to avoid emissions of LFG into the atmosphere.

LFG (which is rich in CH_4) has been historically generated at the "CTR Caieiras" landfill as a result of the anaerobic decomposition of municipal solid waste (MSW) disposed in the site.

As per the project design details available in the PDD /2/, fractions of collected LFG could be eventually utilized as fuel for electricity generation (for meeting the electricity demand of both the CTR Caieiras landfill and the project activity) and/or could also eventually be used as gaseous fuel for thermal application in an external industrial facility not located in the project site. If these two alternative utilizations of collected LFG were implemented, associated emission reductions due to methane emission abatement or use of renewable fuel (displacing fossil fuel) would not be being claimed as emission reductions in the context of the project activity.

In accordance to the project design, all electricity consumed by the project activity was sourced by the National Electricity Grid of Brazil. As confirmed by the GLC's verification team, no captive off-grid electricity generator has ever been used to meet the project's electricity demand under circumstances of interruption of the supply of grid electricity to the project.

During the monitoring period from 2011-09-01 to 2012-03-31, the CDM project activity "Caieiras landfill gas emission reduction" encompassed the installation and operation of:

- Two LFG condensation traps to separate liquids in the collected LFG (leachate and condensate);
- One LFG blower, manufactured by Anton Blaselbauer Artécnica Ltda. with nameplate installed power of 125 HP (93 kW) and nominal LFG pumping capacity for 4,000 Nm^3/h.
- Two LFG blowers also manufactured by Anton Blaselbauer Artécnica Ltda. with nameplate installed power of 100 HP (75 kW) and nominal LFG pumping capacity for 4,000 Nm^3/h of LFG
- Two[3] LFG blowers also manufactured by Anton Blaselbauer Artécnica Ltda. with nameplate installed power of 200 HP (149 kW) and nominal LFG pumping capacity for 7,000 Nm^3/h of LFG.
- LFG Monitoring equipment/instruments:
    - One LFG flow meter (the installed LFG flow meter includes two main components: an annubar element (differential pressure measurement principle) and a data processing and transmitter unit which is coupled to the annubar element of the flow meter.),
    - One LFG temperature sensor and data transmitter,
    - One LFG pressure sensor and data transmitter,
    - One $CH_4/CO_2/O_2$ content gas analyzer unit,
    - Three[4] thermocouples (to measure temperature in the exhaust gases of the flares).

[3] The second LFG blower with pumping capacity for 7,000 Nm^3/h of LFG started its operation on 2011-09-05 (the same day the third high temperature enclosed flare started its continuous operations). This was confirmed by the GLC's verification team through assessment of a service and maintenance log book /42/ (with historical of interventions in the project). It is also important to note that the electricity consumption of this LFG blower is measured by the electricity meter 1 (with internal ID "ME plant").

- Three[5] enclosed high temperature flares,
- Two electricity meters (to measure the consumption of electricity by the project activity related equipments).

As confirmed by the GLC's verification team through assessment of a service and maintenance log book /42/ (with historical of interventions in the project) and through visual inspection during the conducted on-site visit, in May 2012, as part of the operation of the project activity, one additional flare was installed in the project's LFG destruction station. However, it is noteworthy that this additional flare only started its operations in 2012-04-30, thus after the verification period from 2011-09-01 to 2012-03-31. As justified by the project participants, the introduction of the additional flare aimed to improve the LFG collection and destruction efficiency of the project activity.

During the verification period from 2011-09-01 to 2012-03-31, the project's LFG collection system encompassed about 190 operational vertical LFG collecting wells connected through a high density polyethylene (HDPE) pipeline network. As the part of the typical operation of the CTR Caieiras landfill, some of the LFG extracting wells are normally temporarily disconnected from the LFG collection system in order to allow MSW disposal, compacting and movement of equipments (wheel loaders and excavators) and trucks.

As confirmed by the project participant Essencis Soluções Ambientais S.A. (which is the operator of the CTR Caieiras landfill), the project's LFG extracting system (LFG wells and LFG pipeline network) is increased or even modified as a result of the dynamics of the landfill (opening of new cells, closure of working fronts (MSW disposal areas), etc.).

The occurred, on-going and future planned expansions in the project's LFG collection and destruction system (e.g. inclusion of additional new blowers, additional new enclosed high temperature flares, additional new LFG collecting wells, etc.) do not represent modifications in the project design of which are required to be assessed and approved as per the "Clean development mechanism project cycle procedure" /67/.

No references to number and/or specific location of the LFG extracting wells neither references to phases for the gradual introduction of new LFG collecting wells and/or new enclosed flares are included in the PDD /2/.

According to the Monitoring Report, the MSW disposal capacity of the CTR Caieiras landfill is about 60,000,000 ton and the project activity is currently not expected to close before year 2030. By the end of the verification period, an accumulated quantity of 17,500,000 ton of MSW has been disposed in the site. From March 2007, as a result of unexpected problems in two other landfills, the amount of MSW actually disposed in the CTR Caieiras landfill has increased significantly. It is important to note that such significant increase in the MSW disposal rate at CTR Caieiras landfill would also occur in the absence of the project activity as indicated in the PDD.

[4] It is noteworthy that the thermocouple used to measure temperature in the exhaust gases of the Flare 2 was replaced on 2012-03-12.

[5] It is noteworthy that the third high temperature enclosed flare only started its continuous operations on 5 September 2011. This was confirmed by the GLC's verification team through assessment of a service and maintenance log book /42/ (with historical of interventions in the project). The GLC's verification team was also able to confirm, through assessment of the monthly emission reduction calculation spreadsheets, that all measurements of temperature of the exhaust gases of the Flare 3 were recorded and reported as zero (null) before this date.

The project activity was implemented and remains being operated without having any collected LFG being sold to a local industry or being internally used as gaseous fuel for electricity generation.

2 VERIFICATION TEAM

2.1 Assessment Team

A competent team with relevant knowledge and experience in the specific sectoral scopes and project activity was appointed by GLC. Furthermore the appointment of the team takes into account the required knowledge of the host country and general project activity knowledge requirements for validating the project activity design and the relevant CERs will be achieved. The assessment team can be composed of an Assessment Team Leader (ATL), auditors (A) and host country or technical expert (E). Table 4 below shows the composition of the assessment team, the qualification of the team members and their functions.

Table 4: Verification team

Name	Function [1)]	Sectoral scope specific knowledge	Technical area specific knowledge	Local knowledge	Type of involvement				
					Desk review	On-site visit / interviews	Reporting	Supervision of work	Expert input
Marco A. Ratton	ATL	X	X	X	X	X	X	X	X

A	Auditor	FE	Financial expert	T-ATL	Trainee ATL
ATL	Assessment team leader	LE	Local expert	T-A	Trainee auditor
				TE	Technical expert

2.2 Technical Review Team and Approval

Before submission of the final verification report to the CDM EB of the UNFCCC, a technical review of the whole verification and the draft report was carried out by an appointed technical review (TR) team. The TR team is composed of persons competent to the technical area this project activity falls under. Each person involved in the reviewer is independent to the verification assessment.

The complete assessment prepared by the verification team is checked, if required adjusted and finally confirmed by the TR process.
The TR team and the person responsible for approval of the report are found in the table below:

Table 5: Technical review team and approval

Name	Function [2)]	Technical area specific knowledge	Sectoral scope specific knowledge	Supervision of work
Fernando Rangel Villasana	R			X
Markus Weber	FR / AP	X	X	

AP Approver
FR Final reviewer
TE Technical expert
T-R Trainee reviewer
R Reviewer

3 METHODOLOGY

3.1 Verification Process

The verification process is based on the guidelines described in the latest version of the Validation and Verification Standard (VVS) /1/. In addition to that, standard auditing techniques have been applied by the GLC's verification team. As part of the verification assessment, the verification team initially performed a desk review on all verification related documents, followed by an on-site visit to the project site to review the project implementation and its operation. The verification findings and observations from these two initial phases are collected and are described in a Verification Questionnaire /37/. For all identified inconsistencies and lack of clarity, related findings were raised. The next steps were to close out the findings through direct communication with the project participants and finally prepare the final verification report. This verification report and other supporting documents underwent a technical review by GLC prior to its submission to the CDM-EB as a CER issuance request.

3.2 Desk review

The GLC's verification team conducted a desk review of all documents initially provided by Essencis Soluções Ambientais S.A. and publicly available documents relevant for the verification assessment. The main documents are listed below:

- The earlier registered PDD /22/ (version 3) for the "Caieiras landfill gas emission reduction" including the Monitoring Plan and the corresponding Validation Report /10/;
- The revised PDD /2/ for the "Caieiras landfill gas emission reduction" including the Monitoring Plan and the corresponding Validation Opinion on Post-registration Changes of Registered CDM Project Activity /77/;
- The initial version of the Monitoring Report for the 6th verification of the "Caieiras landfill gas emission reduction" /4/;
- The applied approved baseline and monitoring methodology ACM0001 – "Consolidated monitoring methodology for landfill gas project activities" (version 2) /11/.
- The Verification Reports for the previous 1st verification /27/, 2nd verification, /69/, 3rd verification /70/, 4th verification /71/ and 5th verification (draft version) /49/ for the "Caieiras landfill gas emission reduction".
- Relevant decisions, clarifications and guidance from the CMP of the Kyoto Protocol and the CDM Executive Board;
- Any other information and references relevant to the project activity's resulting emission reductions (e.g., IPCC reports, data on electricity generation in the national grid or laboratory analysis and national regulations).

Besides the above-mentioned documents, the GLC's verification team also assessed other additional documents that were required to assess the accuracy of the emission reduction calculations presented in the Monitoring Report. A list of key documents is given in Section 6 (References) of this Verification Report.

3.3 On-site assessment

On 2012-05-24 and 2012-05-25, Mr. Marco A. Ratton from GLC's verification team performed an on-site visit to the project site (CTR Caieiras landfill) in the municipality of Caieiras, São Paulo State in Brazil.

The performed on-site inspection also included further review of all project related monitoring data and records as well as a set of interviews with project operational staff in order to confirm of the correctness and suitability of all data sources, constants and assumptions used in the Monitoring Report.

The main tasks covered during the on-site visit include, but are not limited to the following:

- Confirmation that all project equipment have been installed and operated as per the monitoring plan of the PDD /2/.
- Interviews with the project activity's operational staff and observations of the operation of the project activity in order to check the risks of inappropriate operation and data collection procedures.
- Review of information processes for generating, aggregating, processing, recording and reporting related monitored parameters.
- Auditing of the monitoring processes, routines and documentations to check their proper application.
- Complete checking of the monitored data (figures quoted in the Monitoring Report were checked by reviewing operation records).
- Checking of data aggregation trail procedure

Representatives of Essencis Soluções Ambientais S.A. (project operational staff) were interviewed to confirm selected information and to resolve issues identified in the document review.
The main topics of the interviews are summarized in Table 6.

Table 6: Interviewed persons

Name	Organization/Function	Interview Topics
Mr. Fernando Freitas	Essencis Soluções Ambientais S.A.: operation manager	- General aspects of the project - Technical equipment and operation - Changes since validation - Monitoring and measurement equipment - Remaining issues from validation and previous verifications - Calibration procedures - Quality management system - Involved personnel and responsibilities - Training and practice of the operational personnel - Implementation of the monitoring plan - Monitoring data management - Data uncertainty and residual risks - Emission reduction calculations
Mr. Mark Zulauf	Essencis Soluções Ambientais S.A.: CDM principal consultant	
Mr. Fabrício Luis Ventura	Essencis Soluções Ambientais S.A.: operational engineer	
Mr. Marcus Roberto Morais da Silva	Essencis Soluções Ambientais S.A.: operational engineer	

		- Procedural aspects of the verification - Maintenance - Environmental aspects
Mr. Nuno Barbosa	Unicarbo Ltda. (CDM consultancy service company / not a project participant)	

3.4 Resolution of Findings and Reporting

Based on the performed document desk review, performed on-site visit, conducted follow-up interviews and further investigations; the verification questionnaire was completed as part of the GLC verification assessment. As per the GLC verification procedure, in case any inconsistencies or lacks of clarity are identified during the verification, the verification team raises:

Corrective Action Requests (CARs), if:

- non-conformities with the application of the monitoring plan or monitoring methodology are found in monitoring and reporting process, or if the evidence provided to prove conformity is insufficient;
- mistakes have been made in applying assumptions, data or calculations of emission reductions which will impair the estimate of emission reductions;
- issues identified in a FAR during the validation or previous verification to be verified during the current verification which have not been properly addressed by the project participants.

Clarification Request (CL), if:

- provided information is insufficient or not clear enough to determine whether the applicable CDM requirements have been met.

In case the verification team identifies essential risks for further verifications or the actual status requires a special focus on this item for the next consecutive verification, a Forward Action Request (FAR) is raised.

While aiming to resolve any outstanding issues which needed to be clarified or resolved, a detailed list of verification findings was sent to the project proponents for resolution of raised CARs and CLs. Only after the findings are answered by the client in an appropriate manner, the CARs and CLs were closed out [6].

The Verification Protocol applied for the 6th verification of the "Caieiras landfill gas emission reduction" consists of the Verification Questionnaire /37/ and List of findings /36/ (set of tables where the raised Corrective action request (CAR), Request for clarification (CL) and Forward Action Request (FAR) are listed). To guarantee the required transparency and objectiveness of the verification process, the outstanding issues raised by the GLC's verification team are all identified in a detailed in tables which includes all raised CARs and CLs (and also includes the related summary of responses of the raised CARs and CLs which were provided by the project participants). These tables are presented in Annex 1 of this Verification Report (Verification Protocol - Resolution of Corrective Action and Clarification Requests).

[6] The identified preliminary outstanding issues / findings raised by the GLC's verification team (list of CARs, CLs and FAR) (dated 2012-06-15) were only considered and completely answered by the project participant Essencis Soluções Ambientais S.A. on 2013-01-24. That resulted in a significant delay in the completion of the verification assessment as per the earlier set assessment.

The different columns of the tables of the List of Findings are explained in Table 7.

Table 7: Structure of the Table for Resolution of Corrective Action and Clarification Requests (Findings List)

Description of the finding (CAR, CL, FAR)	**Date** *(dd/mm/yyyy)*	**Summary of the Project Participant(s) Responses**	**Date** *(dd/mm/yyyy)*	**GLC Assessment of the Response Provide by the Project Participant(s)**	**Date** *(dd/mm/yyyy)*
In this column each identified finding (CAR and/or CL) is described in a clear and transparent manner. It also shall be described which further information is needed or which correction must be applied.	Date of raising of the finding by the GLC's verification team.	In this column it is provided a summary of the of the response to the raised finding and/or further action from the project participant(s) in order to close the identified finding (CAR / CL). This statement shall be sustained with suitable arguments and evidence (if applicable).	Date response provided by the project participant(s)	In this column the GLC's verification team shall provide the conclusion of the assessment. In case the finding (CAR / CL) is closed, it shall be clearly indicated how it is found that the provided response / action is considered to be appropriate and / or meeting the specific requirement of the finding. In case the response is not satisfactory, additio-nal response / action and subsequent assessment(s) by the verifcation team (#2, #3, etc.) shall be sought. If the provided argumentation and/or evidence are not suitable a new line below with the continuation of the finding will be opened.	*Date of GLC Assessment of the project participant(s) response*

3.5 Technical Review

Prior to the submission of the final Verification Report to UNFCCC, a technical review was carried out by GLC for the whole verification assessment as per information included in the draft version of this Verification Report.

The technical review was carried out during the period from 2013-03-21 to 2013-04-11. For performing the technical review team includes at least one competent GHG auditor appointed for the scope and technical area the project activity falls under. More than one GHG auditor can eventually be appointed for performing the technical review. A Technical Expert may also be appointed as part of the technical review team

As a result of the internal technical review process, the GLC verification opinion and specific topics and elements of the assessments (as earlier prepared by the Assessment Team Leader (ATL) of the GLC's verification team) may be confirmed or revised. Furthermore reporting improvements might be achieved as result of the performed technical review.

4 VERIFICATION REPORTING

4.1 Verification of Compliance

4.1.1 Compliance of the Project implementation in Accordance with the Registered Project Design Document

As a result of the performed on-site visit and the performed review of project documentation as well as historical monitoring records, the GLC's verification team was able to confirm that adopted technology, the project equipment, as well as the monitoring and metering equipment were implemented and operated during the verification period from 2011-09-01 to 2012-03-31 in accordance with the project design and monitoring details as described in the PDD /2/. Furthermore, as assessed in Section 4.1.3 additional parameters were also monitored for sake of conservativeness.

Moreover, as part of conducted interviews with operational staff of Essencis Soluções Ambientais S.A., the verification team was informed in further details about the whole progress of the project activity during the latest 6 years.

During the whole verification period from 2011-09-01 to 2012-03-31 the project activity operated as a LFG collection and destruction initiative by following the project technical description as per the PDD /2/. As indicated in the Monitoring Report, during the considered verification period, the project activity was out of operation for a total of 166 hours and 3 minutes due to different reasons (this was verified by the GLC's verification team through assessment of a service and maintenance log book /42/ (with historical of interventions in the project)).

As also established by the PDD /2/, the project activity's electricity demand has been entirely met by imports of grid electricity (without any captive electricity generator fuelled by fossil fuel being used) during the whole verification period.

It is crucial to note that while the project activity has operated with three high temperature enclosed flares during the verification period from 2011-09-01 to 2012-03-31, at the time of the performed on-site assessment (2012-05-24 and 2012-05-25) there were four enclosed flares installed at the project site [7].

4.1.2 Compliance of the Monitoring Plan with the Monitoring Methodology Including Applicable Tools

During the document review and the on-site visit, the GLC's verification team has reviewed the application of the implemented monitoring plan vis-à-vis the monitoring requirements of the PDD /2/ along the verification period from 2011-09-01 to 2012-03-31.

Moreover the application of the monitoring plan during the verification period was also compared against the applicable requirements of the monitoring methodology ACM0001 (version 2) /11/ in order to verify its compliance.

Based on this review, the verification team confirms that the monitoring plan was applied during the period from 2011-09-01 to 2012-03-31 in conformance with the provisions of the PDD /2/. Moreover the applied monitoring plan also sufficiently meets the requirements of the baseline and monitoring methodology ACM0001 (version 2) /11/ and applicable tools /13/ /35/.

[7] On 2012-05-25, there were four (4) installed enclosed high temperature flares of which only three (3) were under operational status.

4.1.3 Compliance of Monitoring Activities with the Registered Monitoring Plan

The application of the monitoring plan during the verification period from 2011-09-01 to 2012-03-31 is summarized in this section.

Monitored Parameters

By taking into account the project operational status (without any utilization of LFG as fuel for electricity generation and/or being sold to an external industrial facility), the GLC's verification team was able to confirm that all monitoring parameters of which monitoring is required by the monitoring plan of the PDD /2/ were monitored during the verification period from 2011-09-01 to 2012-03-31. Table 8 presents the parameters monitored during the considered verification period.

Table 8: Monitored Parameters

Monitored parameters
Amount of landfill gas flared ($LFG_{flare,y}$)
Flare combustion/ efficiency determined by the operation hours (1) and the methane content in the exhaust gas (2) (FE)
Methane fraction in the landfill gas ($w_{CH4,y}$)
Temperature of the landfill gas (T)
Pressure of the landfill gas (P)
Total amount of electricity and/or other energy carriers used in the project for gas pumping and heat transport (not derived from the gas) (Energy) This parameter is associated with two sub-parameters[8]: - Amount of consumed grid electricity ($EC_{PJ,grid,y}$) - Amount of consumed LPG ($FC_{LPG,y}$)
CO2 emission intensity of the electricity and/or other energy carriers (CO_2 emission) This parameter is associated with two sub-parameters[9]: - Combined margin emission factor for consumed grid electricity ($EF_{grid,CM,y}$) - Emission factor for consumed LPG ($COEF_{LPG,y}$) (in mass basis)
Regulatory requirements relating to landfill gas projects (HE)

[8] The sub-parameters Amount of consumed grid electricity ($EC_{PJ,grid,y}$) and Amount of consumed LPG ($FC_{LPG,y}$) are not explicitly identified in the monitoring plan of the PDD. However, by taking in account monitoring details for the parameter "Total amount of electricity and/or other energy carriers used in the project for gas pumping and heat transport (not derived from the gas)" (Energy) as per the monitoring plan of the PDD, it is deemed reasonable and acceptable to assume that the consideration of $EC_{PJ,grid,y}$ and $FC_{LPG,y}$ in the Monitoring Report do not represent a deviation of application of the monitoring plan of the PDD.

[9] The sub-parameters Combined margin emission factor for consumed grid electricity ($EF_{grid,CM,y}$) and Emission factor for consumed LPG ($COEF_{LPG,y}$) (in mass basis) are not explicitly identified in the monitoring plan of the PDD. However, by taking in account monitoring details for the parameter "CO_2 emission intensity of the electricity and/or other energy carriers" (CO_2 emission) as per the monitoring plan of the PDD, it is deemed reasonable and acceptable to assume that the consideration of $EF_{grid,CM,y}$ and $COEF_{LPG,y}$ in the Monitoring Report do not represent a deviation of application of the monitoring plan of the PDD.

Not monitored parameters:
The monitoring plan of the PDD /2/ also includes monitoring parameter of which monitoring is only required in case collected LFG is utilized as fuel for electricity generation or is sold as a gaseous fuel for an external industrial facility to be combusted in a boiler. As there was not commercial utilization of collected LFG within the verification period, the monitoring parameters listed in the table below were thus not monitored during the verification period from2011-09-01 to 2012-03-31.

Table 9: Not monitored Parameters

Not monitored parameters
Total amount of landfill gas captured ($LFG_{total,y}$) [10]
Amount of landfill gas going into electricity generator ($LFG_{electricity,y}$)
Amount of methane combusted in boiler ($LFG_{thermal,y}$)
Amount of methane sold to industry, $MD_{industry,y}$

Additional monitoring:
Apart of the monitoring parameters presented in Table 8, values for the following additional parameter was also defined for during the considered verification period:

Table 10: Additional parameters (in addition to the requirements of the Monitoring Plan of the PDD /2/)

Monitored Parameters (in addition to the requirements of the monitoring plan of the PDD /2/)
Transmission and Distribution Losses ($TDL_{grid,y}$)
Temperature of the exhaust gas in the flares (T_{flare}) [11]

Assessment of the provided justification for the decision of the project participant Essencis Soluções Ambientais S.A. to also consider the parameter "Transmission and Distribution Losses" ($TDL_{grid,y}$) in the context of determination of project emissions due to the consumption of grid electricity by the project activity (regardless it is not required as per the monitoring plan of the PDD):

As indicated in the Monitoring Report /3/, defining a value for the parameter Transmission and Distribution Losses ($TDL_{grid,y}$) is required when determining project emissions due to grid electricity consumption by the project activity when following the applicable guidance of the "Tool to calculate baseline, project and/or leakage emissions from electricity consumption" /13/.
It is however noteworthy that, while as per the PDD /2/, the use of this tool is not required for the determination of related project emissions, this tool was used for the determination of project emissions due to consumption of grid electricity by the project activity.

[10] While no LFG was utilized for purpose other than combustion in high temperature enclosed flares (flaring), there was no need to install a dedicated LFG flow meter to measure the total amount of LFG directed to flaring, electricity generation and export to an external industrial facility. Under the current project configuration (without any utilization of LFG as fuel for electricity generation and/or being sold to an external industrial facility), the parameter "Total amount of landfill gas captured" ($LFG_{total,y}$) is equal to the parameter $LFG_{flare,y}$.as all collected LFG has been directed to the flare during the whole verification period..
[11] The assessment of the reasons for including the parameter T_{flare} are detailed in Table 12.

As justified by the project participant Essencis Soluções Ambientais S.A., the only reason for adopting this tool for calculating project emissions due to consumption of grid electricity is the current situation regarding the impossibility of validation of the official CO_2 emission factor for the National Electricity Grid of Brazil.

As also opportunely outlined in the Monitoring Report /3/, the GLC's verification team is aware about the following facts related to this issue involving the official value for the CO_2 emission factor for the national electricity grid of Brazil:

Since year 2008 the Designated National Authority (DNA) of Brazil has published the official value for the CO_2 combined margin emission factor of the electricity grid of Brazil on the basis of confidential data and calculation using dispatch analysis calculation method as per the "Tool to calculate the emission factor for an electricity system" /41/.

While, due to proven lack of data, detailed calculation for the *ex-post* monitored parameter Grid CO_2 emission factor ($EF_{grid,CM,y}$) is thus not possible to be enclosed to the Monitoring Report /3/ and emission reduction spreadsheets /5/, it is thus not possible to GLC to confirm whether the determination of the value for the CO_2 emission factor for the National Electricity Grid of Brazil is in full compliance with the requirements of the "Tool to calculate the emission factor for an electricity system" /41/.

While the DNA of Brazil has chosen an approach to calculate and publish their official CO_2 emission factor for the National Electricity Grid of Brazil on the basis of confidential and/or proprietary data, it is thus not possible for Essencis Soluções Ambientais S.A. or any other project participant of any grid-connected CDM project activity hosted in Brazil to make related calculation details publicly available as required by applicable CDM rules.

As outlined in the Monitoring Report /3/, the applicable conservative default value for the combined margin emission factor of the applicable electricity system as established by the "Tool to calculate baseline, project and/or leakage emissions from electricity consumption" /13/ (1.3 tCO_2/MWh) was adopted. Moreover, in order to fully follow the provisions of the "Tool to calculate baseline, project and/or leakage emissions from electricity consumption" /13/, the parameter Transmission and Distribution losses ($TDL_{grid,y}$) was also considered (adoption of the applicable default value of 20%). As also indicated in the Monitoring Report /3/, when the issue of involving lack of publicly available data which is required for calculating $EF_{grid,CM,y}$ be finally solved or addressed by the approval of an alternative assessment procedure by the CDM-EB, there will be no need to use the default conservative value for grid emission factor as per the applicable guidance of the "Tool to calculate baseline, project and/or leakage emissions from electricity consumption". Under this circumstance, project emissions due to the consumption of grid electricity will not be any longer determined as per the "Tool to calculate baseline, project and/or leakage emissions from electricity consumption" and no value for the parameter $TDL_{grid,y}$ will have to be selected and considered in the context of the determination of related project emissions.

The GLC's verification team thus confirms that the parameter $TDL_{grid,y}$ was correctly selected by following the applicable guidance of the "Tool to calculate baseline, project and/or leakage emissions

from electricity consumption" /13/ and that the application of this parameter is deemed acceptable and conservative.
Further assessment for the use of this parameter is not included in the assessment details for the monitored parameters under tables 11 to 18 due to the following reasons:
- $TDL_{grid,y}$ is not a monitoring parameter as per the latest version of the PDD /2/.
- Since the conservative default value as per the "Tool to calculate baseline, project and/or leakage emissions from electricity consumption" was selected, no further assessment is required.

Monitoring details for the monitored parameters:

Tables 11 to 18 presents assessment for monitoring details of all parameters monitored during the verification period from2011-09-01 to 2012-03-31.

Table 11: Amount of landfill gas flared

Assessment	
Data / Parameter: (as in monitoring plan of PDD):	Amount of landfill gas flared ($LFG_{flare,y}$)
Measuring, recording and reporting frequencies:	During the verification period from 2011-09-01 to 2012-03-31, continuously measurements of Amount of landfill gas flared ($LFG_{flare,y}$) were recorded/reported with an every minute frequency. While the installed LFG flow meter does not automatically convert and express the measurement of LFG flow in normalized cubic meters per hour (Nm^3/h), monitoring of LFG pressure and LFG temperature were thus also performed during the verification period as established in the PDD/2/.
Are measuring, recording and reporting frequencies in accordance with the monitoring plan and monitoring methodology? (Yes / No)	The PDD /2/ and ACM0001 (version 2) /11/ do not clearly specify any measuring, recording and reporting frequency for Amount of landfill gas flared ($LFG_{flare,y}$): "*continuous*" is indicated in the column "Recording Frequency" of the applicable tables in both the monitoring plan of the PDD /2/ and ACM0001 (version 2) /11/. Thus, the adopted measuring, recording and reporting frequencies are assumed as in accordance with the monitoring plan of the PDD /2/ and monitoring methodology ACM0001 (version 2) /11/.
Type of monitoring equipment/instrument:	The installed LFG flow meter has differential pressure measurement principle and it includes two main components: - an annubar element - a data converter/transmitter unit (which is coupled to the annubar element). This type flow meter sensor measures the average velocity of the

<table>
<tr><td></td><td>LFG passing through the pipeline by considering the differential pressure between a high-pressure point and a low-pressure point (Bernoulli's Principle). The specifications of the installed LFG flow meter (data converter/transmitters and annubar element) are presented below:

<table>
<tr><th colspan="2">Specifications of the data converter/transmitter</th></tr>
<tr><td>Manufacturer</td><td>Yokogawa Electric Corporation</td></tr>
<tr><td>Model</td><td>EJA 110A</td></tr>
<tr><td>Serial Number</td><td>27A26928</td></tr>
<tr><td>Accuracy:</td><td>±0.065%</td></tr>
</table>
Source: /47/

<table>
<tr><th colspan="2">Specifications of the annubar element</th></tr>
<tr><td>Manufacturer</td><td>Digimat Montagem e Instrumentação Ltda.</td></tr>
<tr><td>Model</td><td>Sonda 6</td></tr>
<tr><td>Serial Number</td><td>There is no Serial Number for the installed annubar element.</td></tr>
<tr><td>Measuring principle</td><td>Differential pressure transmitter</td></tr>
<tr><td>Maximum gas flow measurement error as per manufacturer generic information</td><td>± 2%</td></tr>
</table>
Source: /7/</td></tr>
<tr><td>Is the accuracy of the monitoring equipment/instrument as stated in the PDD? If the PDD does not specify the accuracy of the monitoring equipment/instrument, does the utilization of the monitoring equipment/instrument represent good monitoring practice?</td><td>The PDD /2/ and ACM0001 (version 2) /11/ do not specify any accuracy requirement for the LFG flow meter installed at the project site. The accuracy range for the installed instrument is assumed ±2.065% (± 2% for the annubar element plus ±0.065% for the data converter/transmitter). It is GLC's contention that the use of the installed instrument represents good practice for monitoring of LFG flow.</td></tr>
<tr><td>Calibration frequency /interval for the monitoring equipment/instrument:</td><td>Data converter/transmitter:
As per the implemented monitoring procedure at Essencis Soluções Ambientais S.A., the data converter/transmitter component of the</td></tr>
</table>

	flow meter is to be calibrated yearly (every 12 months). As confirmed by the GLC's verification team through assessment of the specification sheet /47/ for the data converter/transmitter, the selected calibration frequency is as per the recommendations of the instrument manufacturer. A calibration event was performed on 2011-05-18 (Certificate of Calibration No. E1192/11 /14/ issued by Elus Serviços de Instrumentação Ltda.), which is valid for the whole monitoring period. It is noteworthy that the installed data converter/transmitter of the flow meter set was replaced on 2012-04-05. This was confirmed by the GLC's verification team through assessment of a service and maintenance log book /42/ (with historical of interventions in the project). The Calibration Certificate was made available and assessed by the GLC's verification team. *Annubar element:* As per the implemented monitoring procedure at Essencis Soluções Ambientais S.A., the data annubar element of the LFG flow meter is to be calibrated every 5 years. As confirmed by the GLC's verification team through assessment of the specification sheet /7/ for the installed annubar element, the selected calibration frequency is as per the recommendations of the instrument manufacturer. A calibration event was performed on 2011-05-18 (Certificate of Calibration No. E1194/11 /45/ issued by Elus Serviços de Instrumentação Ltda.), which is valid for the whole monitoring period. It is important to note that as also indicated specification sheet /7/ for the installed annubar element, the instrument was supplied by the manufacturer already calibrated prior to be installed in the project site. The Calibration Certificate /45/ was made available and assessed by the GLC's verification team.
Is the calibration interval in line with the monitoring plan of the PDD? If the PDD does not specify the frequency of calibration, does the selected frequency represent good monitoring practice?	Neither the PDD /2/ nor ACM0001 (version 2) /11/ specify any calibration frequency requirement for the LFG flow meter. As per the monitoring plan of the PDD /2/, *"(…) all the equipment must be calibrated periodically*". Therefore, the calibration frequencies considered for the two LFG flow meter components (data converter/transmitter and annubar element) were as per recommendations from the component manufacturers. It is the opinion of the GLC's verification team that the adopted calibration frequencies for the related components represent good practices.
Company which has performed the applicable calibration events:	The related instrument/equipment calibration events were performed by the following companies/entities:

	Data converter/transmitter component: - Elus Serviços de Instrumentação Ltda. *Annubar element component:* - Elus Serviços de Instrumentação Ltda. Both companies are based in Brazil.
Did the performed calibration(s) confirm proper functioning of monitoring equipment/instrument? (Yes / No):	The calibration events performed in the annubar element and in the data converter/transmitter component of the flow meter confirmed proper functioning of this component of the LFG flow meter.
Is(are) the performed calibration(s) valid for the whole reporting period?	Yes. The performed calibration events for the data converter/transmitter and annubar element which are referred in the Monitoring Report /3/ are valid for the whole verification period from 2011-09-01 to 2012-03-31.
If applicable, has the reported monitoring data been cross-checked with other available data or source?	Not applicable.
How were the values in the Monitoring Report (and/or supporting documents, i.e emission reduction calculation spreadsheet) verified and/or compared?	Figures of LFG flow as visualized by the GLC's verification team in the screen of the data supervisory system model E3 (in the project activity's control room) were compared with figures displayed by the data converter/transmitter of the LFG flow meter (for the same time instant) at the time of the on-site visit. Such data checking/comparison confirmed correct data processing and recording by the project's PLC unit and monitoring parameter data base respectively (at the time of the performed on-site visit to the project site). For further details about recording of values measured at the project site, see section 4.1.4.2. A *data authenticity checking* was performed for all every minute basis measurement records of the following monitoring parameters in order to demonstrate and ensure that only authentic/not modified monitoring data was used for the emission reduction calculations for the verification period of 2011-09-01 to 2012-03-31: - Amount of landfill gas flared ($LFG_{flare,y}$) - Flare combustion/ efficiency determined by the operation hours (1) and the methane content in the exhaust gas (2) (FE) - Methane fraction in the landfill gas ($w_{CH4,y}$) - Temperature of the landfill gas (T) - Pressure of the landfill gas (P) - Temperature of the exhaust gas in the flares (T_{flare})

	The performed checking aimed to ensure that monitoring data were not intentionally or unintentionally edited/modified by anyone prior to be used as primary data input for the processing of emission reduction calculations. Details about the performed *data authenticity checking* (which is valid for all LFG related monitoring data) are included in Section 4.1.4.4.
Does the applied monitoring data management process (from monitoring equipment/instrument to emission reduction calculation) ensure correct recording, transfer and reporting of data to be used for the emission reductions calculations? Are necessary/applicable QA/QC processes in place?	See Section 4.1.4.7.

Table 12: Flare combustion/ efficiency determined by the operation hours (1) and the methane content in the exhaust gas (2) (and Temperature of the exhaust gas in the flares (T_{flare})) [12]

Assessment	
Data / Parameter: (as in monitoring plan of PDD):	Flare combustion/ efficiency determined by the operation hours (1) and the methane content in the exhaust gas (2) (FE) and Temperature of the exhaust gas in the flares (T_{flare})
Measuring, recording and reporting frequencies:	*Determination of Flare combustion/ efficiency determined* by the operation hours (1) and the methane content in the exhaust gas (2) *(FE):* During the verification period from 2011-09-01 to 2012-03-31, the adopted values of Flare combustion/ efficiency determined by the operation hours (1) and the methane content in the exhaust gas (2) (FE) were based on determination based on measurements of the amount of residual methane in the exhaust gas of the flare which are performed quarterly (4 times per year). As per the adopted

[12] Reason for aggregating FE and T_{flare} under the same monitoring details table in Seciton 4.1.3: Temperature of the exhaust gas of the flare (T_{flare}) is not explicitly listed as a monitoring parameter as per the monitoring plan of the PDD. In the PDD, monitoring details for the parameter Flare combustion/efficiency (FE) include "*Continuous measurement of operation time of flare (e.g. with temperature)"* as complementary monitoring information. As outlined in the Monitoring Report /3/, the temperature of the exhaust gas of the flare (T_{flare}) was thus also monitored in order to meet the monitoring requirements for FE. It is also important to note that as per the adopted emission reduction calculation procedure, no emission reduction is claimed during time instants the flare operated with T_{flare} < 500°C. As per the monitoring plan of the PDD /2/ and ACM0001 (version 2) /11/, temperature of the exhaust gas of the flare (T_{flare}) is thus not assumed as a monitoring parameter. T_{flare} > 500°C is a prerequisite for determining FE based inter-alia on quarterly measurements of amount of residual methane in the exhaust gas of the flare. No monitoring details or requirements (e.g. measuring, recording and reporting frequencies) are specified in the PDD for T_{flare}.

	monitoring procedure, these measurements are performed by a third party independent inspection service company. The independent inspection service company Ecosampling Ambiental Ltda. was selected by Essencis Soluções Ambientais S.A. for performing all measurements and calculations related to the determination of Flare combustion/ efficiency determined by the operation hours (1) and the methane content in the exhaust gas (2) (FE). As outlined in the test/evaluation technical reports /48/ issued by Ecosampling Ambiental Ltda., performance of measurements and calculations for the determination of values for Flare combustion/ efficiency determined by the operation hours (1) and the methane content in the exhaust gas (2) (FE) valid for the verification period from 2011-09-01 to 2012-03-31 occurred in the following dates: - 2011-06-01 - 2011-09-05 - 2011-12-07 *Measurements of Temperature of the exhaust gas in the flares (T_{flare}):* While, as also established by the monitoring plan of the PDD /2/ and ACM0001 (version 2) /11/ Flare temperature (T_{flare}) is also considered in the context of the determination of the amount of methane destroyed in the flares, continuously measurements of T_{flare} were recorded/reported with an every minute frequency.
Are measuring, recording and reporting frequencies in accordance with the monitoring plan (as per the registered PDD) and monitoring methodology? (Yes / No)	*Determination of Flare combustion/ efficiency determined* by the operation hours (1) and the methane content in the exhaust gas (2) *(FE):* The PDD /2/ and ACM0001 (version 2) /11/ do not clearly specify any frequency for the determination of Flare combustion/ efficiency determined by the operation hours (1) and the methane content in the exhaust gas (2) (FE): "*Quarterly and continually*" is paradoxically indicated in the column "Recording Frequency" of the applicable tables in both the monitoring plan of the PDD /2/ and ACM0001 (version 2) /11/. Anyhow, Section D.3 of the PDD /2/ clearly states: *"(…) Flare efficiency should be checked quarterly, with monthly checks if the efficiency shows significant deviations from previous values.*" The adopted quarterly frequency for the determination of FE is thus in accordance with the monitoring plan of the PDD /2/. *Measurements of Temperature of the exhaust gas in the flares (T_{flare}):* The PDD /2/ and ACM0001 (version 2) /11/ do not clearly specify any measuring, recording and reporting frequency for Temperature of the

	exhaust gas in the flares: "*Continuous measurement of operation time of flare (e.g. with temperature)*" (as indicated in the column "Comments" for parameter FE in the applicable tables in both the monitoring plan of the PDD /2/ and ACM0001 (version 2) /11/). The adopted measuring, recording and reporting frequencies represents good monitoring practice.
Type of monitoring equipment/instrument:	*Determination of Flare combustion/ efficiency determined* by the operation hours (1) and the methane content in the exhaust gas (2) *(FE):* As outlined in the Monitoring Report /3/ and in the test/evaluation reports issued for the valid performed measurements and calculations for the regular determination of the values of FE, for performing the measurements of amount of residual methane in the exhaust gas of the flare an analyzer FID / California Analytical Instruments (CAI) model 300 HFID was utilized. As determining the speed of exhaust gas in the flare (in order to calculate the flow of exhaust gas of the flare), a Pitot tube was used. As also per information made available in the technical evaluation/testing reports /48/, applicable measurement and test methodologies of U.S.A. Environmental Protection Agency (US-EPA) were applied as follows: • Method 3 – "Gas Analysis for Carbon Dioxide, Oxygen, Excess Air and Dry Molecular Weight" • Method 4 – "Determination of Moisture in Stack Gases" • Method 25A – "Determination of Total Gaseous Organic Concentration Using a Flame Ionization Analyzer" *Measurements of Temperature of the exhaust gas in the flares (T_{flare}):* For measurements of Temperature of the exhaust gas in the flares (T_{flare}), four thermocouples located in the upper section of the enclosed high temperature flares were used as the thermocouple installed on the Flare 2 was replaced during the verification period.. The specifications of the thermocouples utilized during the verification period from 2011-09-01 to 2012-03-31 are presented below:

Specifications of the thermocouple installed on Flare 1	
Manufacturer	Naka Instrumentação Industrial Ltda.
Model	NKTC-3000, type K
Serial Number	51748
Accuracy	±0.75%

Period of use in the project activity within the verification period from 2011-09-01 to 2012-03-31	From 2011-09-01 to 2012-03-31

Source: /50/ /42/

Specifications of the first thermocouple installed on Flare 2	
Manufacturer	Naka Instrumentação Industrial Ltda.
Model	NKTC-3000, type S
Serial Number	51856
Accuracy	±0.5%
Period of use in the project activity within the verification period from 2011-09-01 to 2012-03-31	From 2011-09-01 to 2012-03-12

Source: /50/ /42/

Specifications of the second thermocouple installed on Flare 2	
Manufacturer	Naka Instrumentação Industrial Ltda.
Model	NKTC-3000, type S
Serial Number	79656
Accuracy	±0.5%
Period of use in the project activity within the verification period from 2011-09-01 to 2012-03-31	From 2012-03-12 to 2012-03-31

Source: /50/ /42/

Specifications of the thermocouple installed on Flare 3	
Manufacturer	Naka Instrumentação Industrial Ltda.
Model	NKTC-3000, type K
Serial Number	51747
Accuracy	±0.75%
Period of use in the project activity within the verification period from 2011-09-01 to 2012-03-31	From 2011-09-01 to 2012-03-31

	Source: /50/ /42/
Is the accuracy of the monitoring equipment/instrument as stated in the PDD? If the PDD does not specify the accuracy of the monitoring equipment/instrument, does the utilization of the monitoring equipment/instrument represent good monitoring practice?	*Determination of Flare combustion/ efficiency determined* by the operation hours (1) and the methane content in the exhaust gas (2) *(FE):* The PDD /2/ and ACM0001 (version 2) /11/ do not specify any equipment or procedural requirement for performing the related measurements and calculations for the determination of flare combustion efficiency (FE). It is the opinion of GLC that performing related measurements with the analyzer FID / California Analytical Instruments (CAI) model 300 HFID and following the applicable measurement and test methodologies of the US-EPA represent a good practice for the determination of flare combustion efficiency (FE). The GLC's verification team has assessed the operation and maintenance manual /51/ for the gas analyzer 300 HFID California Analytical Instruments (CAI) and was able to confirm this type of gas analyzer is appropriate for performing gas related analysis and measurements in enclosed high temperature flares. *Measurements of Temperature of the exhaust gas in the flares (T_{flare}):* The PDD /2/ and ACM0001 (version 2) /11/ do not specify any accuracy requirement for the thermocouples installed at the upper section of the flare. The accuracy ranges for the utilized instruments are ±0.75% and ±0.5%. It is GLC's contention that the adopted thermocouples represent good practice for monitoring of exhaust temperature of the flare.
Calibration frequency /interval for the monitoring equipment/instrument:	*Determination of Flare combustion/ efficiency determined* by the operation hours (1) and the methane content in the exhaust gas (2) *(FE):* As per the implemented monitoring procedure at Essencis Soluções Ambientais S.A., the determination of Flare combustion/ efficiency determined by the operation hours (1) and the methane content in the exhaust gas (2) (FE) is based *inter-alia* on regular measurements of the amount of residual methane in the flare and related calculations which are performed by a third party independent inspection service company at a quarterly frequency (4 times per year). The technical test/evaluation reports /48/ issued by the third party independent inspection service company Ecosampling Ambiental Ltda. highlight that both the utilized gas analyzer FID / California Analytical Instruments (CAI) model 300 HFID and Pitot tube were in conformance with calibration requirements applicable for these instruments.

	Measurements of Temperature of the exhaust gas in the flares (T_{flare}): As per the implemented monitoring procedure at Essencis Soluções Ambientais S.A., the utilized thermocouples are to be calibrated yearly (every 12 months). As confirmed by the GLC's verification team through assessment of the specification sheet for the installed thermocouples /50/, the selected calibration frequencies are as per the recommendations of the instrument manufacturers. In the case of the thermocouple with Serial Number 51748, model NKTC-3000, type K (manufactured by Naka Instrumentação Ltda.) (utilized on Flare 1 during the whole monitoring period), an initial calibration event was performed on 2011-05-02 (Certificate No. 7416-11 /21/ issued by Contemp Laboratório de metrologia). A second calibration event was later performed on 2012-03-12 (Certificate No. 3901-12 /21/ issued by Contemp Laboratório de metrologia). The Calibration Certificates /21/ were made available and assessed by the GLC's verification team. In the case of the thermocouple with Serial Number 51856, model NKTC-3000, type S (manufactured by Naka Instrumentação Ltda.) (utilized on Flare 2 during the period from 2011-08-11 to 2012-03-12), a calibration event was performed on 2011-05-03 (Certificate No. 7495-11 /32/ issued by Contemp Laboratório de Metrologia). The Calibration Certificate /32/ was made available and assessed by the GLC's verification team. In the case of the thermocouple with Serial Number 79656, model NKTC-3000, type S (manufactured by Naka Instrumentação Ltda.) (utilized on Flare 2 during the period from 2012-03-12 until the end of the monitoring period), a calibration event was performed on 2012-03-12 (Certificate No. 3911-12 /19/ issued by Contemp Laboratório de metrologia). The Calibration Certificate /19/ was made available and assessed by the GLC's verification team. In the case of the thermocouple with Serial Number 51747, model NKTC-3000, type K (manufactured by Naka Instrumentação Ltda.) (utilized on Flare 3 during the whole monitoring period), an initial calibration event was performed on 2011-05-02 (Certificate No. 7417-11 /20/ issued by Contemp Laboratório de metrologia). A second calibration event was later performed on 2012-03-12 (Certificate No. 3902-12 /20/ issued by Contemp Laboratório de metrologia). The Calibration Certificates /20/ were made available and assessed by the GLC's verification team.
Is the calibration interval in line with the monitoring plan of the	*Determination of Flare combustion/ efficiency determined* by the operation hours (1) and the methane content in the exhaust gas (2)

PDD? If the PDD does not specify the frequency of calibration, does the selected frequency represent good monitoring practice?	*(FE):* The PDD /2/ and ACM0001 (version 2) /11/ do not specify any equipment or procedural requirement for performing the related measurements and calculations for the determination of flare combustion efficiency (FE). Thus no calibration frequency requirement for related instruments/equipment is specified either. It was not made available to the GLC's verification team any evidence/proof (e.g. Certificates of Calibration, description of applied calibration procedures, etc.) outlining the adopted calibration intervals for the equipment/instruments utilized by the inspection service company Ecosampling Ambiental Ltda. The technical valid test/evaluation reports /48/ issued by the third party independent inspection service company Ecosampling Ambiental Ltda. highlight that both the utilized gas analyzer FID / California Analytical Instruments (CAI) model 300 HFID and the Pitot tube were in conformance with calibration requirements applicable for these instruments. *Measurements of Temperature of the exhaust gas in the flares (T_{flare}):* Neither the PDD /2/ nor ACM0001 (version 2) /11/ specify any calibration frequency requirement for the thermocouple. As per the monitoring plan of the PDD /2/, *"(…) all the equipment must be calibrated periodically*". Therefore, the calibration frequency considered for the thermocouples was as per recommendations from the instrument manufacturer. It is the opinion of the GLC's verification team that the adopted calibration frequency for related instrument/equipment represents good practice.
Company which has performed the applicable calibration events:	*Determination of Flare combustion/ efficiency determined* by the operation hours (1) and the methane content in the exhaust gas (2) *(FE):* No information, evidences/proof for performed calibration events in equipment/instruments utilized by the inspection service company Ecosampling Ambiental Ltda. were made available to the GLC's verification team. *Measurements of Temperature of the exhaust gas in the flares (T_{flare}):* The calibration events in the thermocouples were performed by CONTEMP Indústria Comércio e Serviços Ltda. and Calibratec – Comércio e Assistência Técnica de Instrumentos de Medição Ltda., both companies established in Brazil.
Did the performed calibration(s) confirm proper functioning of monitoring	*Determination of Flare combustion/ efficiency determined* by the operation hours (1) and the methane content in the exhaust gas (2) *(FE):*

equipment/instrument? (Yes / No):	No information, evidences/proof for performed calibration events in equipment/instruments utilized by the inspection service company Ecosampling Ambiental Ltda. were made available to the GLC's verification team. *Measurements of Temperature of the exhaust gas in the flares (T_{flare}):* Yes. The performed calibration events in the thermocouple confirm proper functioning of these measurement instruments.
Is(are) the performed calibration(s) valid for the whole reporting period?	*Determination of Flare combustion/ efficiency determined* by the operation hours (1) and the methane content in the exhaust gas (2) *(FE):* No information, evidences/proof for performed calibration events in equipment/instruments utilized by the inspection service company Ecosampling Ambiental Ltda. were made available to the GLC's verification team. *Measurements of Temperature of the exhaust gas in the flares (T_{flare}):* Yes. By considering the time period each one of the thermocouples was in operation within the verification period from 2011-09-01 to 2012-03-31, the performed calibration events cover the whole verification period.
If applicable, has the reported monitoring data been cross-checked with other available data or source?	*Determination of Flare combustion/ efficiency determined* by the operation hours (1) and the methane content in the exhaust gas (2) *(FE):* The related technical test/evaluation reports /48/ for the determination of Flare combustion/ efficiency determined by the operation hours (1) and the methane content in the exhaust gas (2) (FE) (which were issued by the inspection service company Ecosampling Ambiental Ltda.) were made available and assessed by the GLC's verification team. Information made available in the Monitoring Report is in line with measurement and calculation details outlined in these technical reports /48/. *Measurements of Temperature of the exhaust gas in the flares (T_{flare}):* Not applicable.
How were the values in the Monitoring Report (and/or supporting documents, i.e emission reduction calculation spreadsheet) verified and/or compared?	*Determination of Flare combustion/ efficiency determined* by the operation hours (1) and the methane content in the exhaust gas (2) *(FE):* The GLC's verification team compared the results of all measurements and calculations as outlined in the test/evaluation technical reports /48/ issued by Ecosampling Ambiental Ltda. against

	description of measurements and calculations as presented in the latest version of the Monitoring Report /3/ and summarized emission reduction calculation spreadsheet/5/. *Measurements of Temperature of the exhaust gas in the flares (T_{flare}):* Figures of Temperature of the exhaust gas in the flares (T_{flare}) as visualized by the GLC's verification team in the screen of the data supervisory system model E3 (in the project activity's control room) were compared with figures displayed by a display existent in the flare control panel (which are located next to the flare) (for the same time instant) at the time of the on-site visit. Such data checking/comparison confirmed correct data processing and recording by the project's PLC unit and monitoring parameter data base respectively (at the time of the performed on-site visit to the project site). For further details about recording of values measured at the project site, see section 4.1.4.2. A *data authenticity checking* was performed for all every minute basis measurement records of the following monitoring parameters in order to demonstrate and ensure that only authentic/not modified monitoring data was used for the emission reduction calculations for the verification period from 2011-09-01 to 2012-03-31: - Amount of landfill gas flared ($LFG_{flare,y}$) - Flare combustion/ efficiency determined by the operation hours (1) and the methane content in the exhaust gas (2) (FE) - Methane fraction in the landfill gas ($w_{CH4,y}$) - Temperature of the landfill gas (T) - Pressure of the landfill gas (P) - Temperature of the exhaust gas in the flares (T_{flare}) The performed checking aimed to ensure that monitoring data were not intentionally or unintentionally edited/modified by anyone prior to be used as primary data input for the processing of emission reduction calculations. Details about the performed *data authenticity checking* (which is valid for all LFG related monitoring data) is included in Section 4.1.4.4.
Does the applied monitoring data management process (from monitoring equipment/instrument to emission reduction calculation) ensure correct recording,	See Section 4.1.4.7.

transfer and reporting of data to be used for the emission reductions calculations? Are necessary/applicable QA/QC processes in place?	

Table 13: Methane fraction in the landfill gas

Assessment	
Data / Parameter: (as in monitoring plan of PDD):	Methane fraction in the landfill gas ($w_{CH4,y}$)
Measuring, recording and reporting frequencies:	During the verification period from 2011-09-01 to 2012-03-31, continuously measurements of Methane fraction in the landfill gas ($w_{CH4,y}$) were recorded/reported with an every minute frequency. As part of the measurement, samples of collected LFG continuously pass through the infrared cell of the $CH_4/CO_2/O_2$ content gas analyzer unit as a stream. Each reported value of $w_{CH4,y}$ corresponds to measurement at the last time instant the minute in question. While it takes about 5 seconds for the collected gas to go through the filtering / cooling process before reaching the infra-red cell (according to information provided by the equipment manufacturer), every minute measurement which is recorded/reported for a specific time instant (for example, 12:03:00) is actually the concentration of the gas that entered the gas analyzer pump five seconds before (e.g. at 12:02:55).
Are measuring, recording and reporting frequencies in accordance with the monitoring plan (as per the registered PDD) and monitoring methodology? (Yes / No)	The PDD /2/ and ACM0001 (version 2) /11/ do not clearly specify any measuring, recording and reporting frequency for Methane fraction in the landfill gas ($w_{CH4,y}$): "*continuous*" is indicated in the column "Recording Frequency" of the applicable tables in both the monitoring plan of the PDD /2/ and ACM0001 (version 2) /11/. Thus, the adopted measuring, recording and reporting frequencies are correctly assumed as in accordance with the monitoring plan of the PDD /2/ and monitoring methodology ACM0001 (version 2) /11/.
Type of monitoring equipment/instrument:	Methane fraction in the landfill gas ($w_{CH4,y}$) has been measured by a $CH_4/CO_2/O_2$ content gas analyzer unit of which main specifications are presented below:

Specifications of installed $CH_4/CO_2/O_2$ content gas analyzer unit	
Manufacturer	Yokogawa Electric Corporation
Model	IR200
Serial Number	6EG5195

	<table><tr><td>Accuracy</td><td>±2.0% (from full scale)</td></tr><tr><td>Operating pressure</td><td>10 kPa or less</td></tr><tr><td>Repeatability</td><td>±0.5% of full scale</td></tr></table> Source: /54/ It is important to note that GLC was able to confirm during the conducted on-site visit that the implemented LFG collection process ensures that the humidity of the collected LFG is removed by condensation before the LFG passes through the flow meter and through a $CH_4/CO_2/O_2$ content gas analyzer unit. It is thus correctly assumed that LFG flow and CH_4 content of collected LFG are measured on the same basis/conditions [13].
Is accuracy of the adopted monitoring equipment/instrument as stated in the PDD? If the PDD does not specify the accuracy of the monitoring equipment, does the monitoring equipment represent good monitoring practice?	The PDD /2/ and ACM0001 (version 2) /11/ do not specify any accuracy requirement for the $CH_4/CO_2/O_2$ content analyzer installed at the project site. The accuracy range for the installed unit is ±2%. It is GLC's contention that the use of the installed unit represents good practice for monitoring of CH_4 content of LFG.
Calibration frequency /interval for the monitoring equipment/instrument:	As per the implemented monitoring procedure at Essencis Soluções Ambientais S.A., the $CH_4/CO_2/O_2$ content analyzer unit is to be calibrated every 15 days by trained project activity's operational staff of project activity. Related Certificates of staff training /55/ were made available to the GLC's verification team. The performed 20 calibration events which are valid for the verification period from 2011-09-01 to 2012-03-31 were correctly performed by comparison with canisters of calibrated pattern gases purchased from a certified gas supplier. Two of the valid calibrations were performed on 2011-08-23 and on 2012-04-02 which are dates

[13] While under the CDM it is assumed that moisture is not relevant when gas temperature is below 60°C, thus the considerations of alternatives for the correction of measured flow rate of the residual gas from wet basis to dry basis included in the CDM Requests of Clarification AM_CLA 0092 and AM_CLA116 /67/ were considered in the context of the emission reduction calculations. These requests for clarification were raised in the context of verifications of other LFG collection and destruction/utilization CDM project activities:

- AM_CLA_0116: Further clarification on AM_ CLA_ 0092 – Alternatives for the correction of measured flow rate of the residual gas from wet basis to dry basis
- AM_CLA_0092: Clarification on a conflict between ACM0001 and the 'Tool to determine project emissions from flaring gases containing methane' relating to the measurement of methane fraction and flow rate of landfill gas (wet or dry basis).

It should be noted that, as per such Requests for clarification/67/ "(…) *for temperatures below 60°C, moisture could be neglected due to its very low influence on final results. In such cases, the basis adopted for measurements is not important. The rationale for adopting dry basis is linked to the fact that most gas analyzers operate in dry basis and thus no corrections would be necessary*".

prior and post the verification period. The certified pattern gases used for the calibration of the gas analyzer unit during the verification period are summarized below:

Set of certificates for the cylinder of pattern gases used for the calibration of the $CH_4/CO_2/O_2$ content gas analyzer unit:

- Gas cylinders with 60% CH_4 pattern gas: cylinder n° 11916 /25/ (supplied by White Martins Gases Industriais Ltda.)
- Gas cylinders with 60% CH_4 pattern gas: cylinder n° 13874F /25/ (supplied by White Martins Gases Industriais Ltda.)
- Gas cylinders with 60% CH_4 pattern gas: cylinder n° 14028D /25/ (supplied by White Martins Gases Industriais Ltda.)

As part of the performed calibrations, the relationship between the measuring instrument and the value obtained with a standard gas was established. Through this procedure, the error/deviation expressed as a percentage is obtained and expressed in the calibration notes. Information available in the calibration notes /23/ were assessed by GLC. As per the calibration notes /23/, the calibration events were performed in the dates indicated in the table below. Moreover, for each individual calibration event, measurement deviation/error for CH_4 content was identified as also indicated below.

$CH_4/CO_2/O_2$ content gas analyzer unit	
	Calibration Results/findings:
Date of calibration events	Max. deviation error for CH_4 content measurement- Span - %)
2011-08-23	+2.2%[14]
2011-09-06	-1.1%
2011-09-16	+2.1%
2011-09-26	+0.5%
2011-10-06	+1.6%
2011-10-17	+0.9%
2011-10-25	-0.8%
2011-11-16	-2.2%
2011-11-25	+1.2%
2011-12-12	-2.3%
2011-12-26	+0.1%
2012-01-03	-1.0%
2012-01-13	-0.1%
2012-01-30	+2.0%

[14] It is noteworthy that the identified positive deviation/error of +2.2% in the readings of the $CH_4/CO_2/O_2$ content gas analyzer unit during the calibration event performed on 2011-08-23 was addressed in the previous 5th periodid verification (a conservative deduction factor of -2.2% was applied in the calculated values for the calculation parameter $MD_{project,y}$ during the period of 2011-08-18 to 2011-08-23)

	<table><tr><td>2012-02-07</td><td>+0.2%</td></tr><tr><td>2012-02-21</td><td>-0.2%</td></tr><tr><td>2012-02-27</td><td>+0.1%</td></tr><tr><td>2012-03-12</td><td>+0.2%</td></tr><tr><td>2012-03-22</td><td>-1.2%</td></tr><tr><td>2012-04-02</td><td>+1.9%</td></tr></table> Source: /23/ The GLC's verification team has assessed the certificates /25/ of the calibrated pattern gas cylinders in order to confirm the correctness of information provided above. Moreover, by assessing the reported details for the 20 valid calibration events, the GLC's verification team was able to confirm that the composition of the utilized pattern gases were properly considered in the context of the determination of the maximum measurement deviations/errors for CH4 content measurements (Span).
Is the calibration interval in line with the monitoring plan of the PDD? If the PDD does not specify the frequency of calibration, does the selected frequency represent good monitoring practice?	Neither the PDD /2/ nor ACM0001 (version 2) /11/ specify any calibration frequency requirement for $CH_4/CO_2/O_2$ content gas analyzer unit. As per the monitoring plan of the PDD /2/, *"(…) all the equipment must be calibrated periodically*". Based on approval from the manufacturer of $CH_4/CO_2/O_2$ content gas analyzer unit, every 15 days calibration frequency was adopted by Essencis Soluções Ambientais S.A. Thus, the calibration adopted frequency is in accordance with recommendations from the instrument manufacturers. A communication issued by Yokogawa Service Ltda. (service representative of the equipment manufacturer in Brazil) confirms their approval for the internal working procedure PRO 405 of Essencis Soluções Ambientais S.A. As assessed by the GLC's verification team, the internal working procedure "PRO 405 – Calibração do Analisador de Gases" (Gas analyzer calibration) details the procedure to be adopted for calibrating the installed $CH_4/CO_2/O_2$ content gas analyzer unit and specifies a calibration frequency of every 15 days. It is the opinion of the GLC's verification team that the adopted calibration frequency represents good practice.
Company which has performed the applicable calibration events:	All the 20 calibrations valid for the verification period from 2011-09-01 to 2012-03-31 were performed by the own staff of Essencis Soluções Ambientais S.A.. The staff responsible for the calibrations received previous training following the applicable procedure "*PRO 405 – Calibração do Analisador de Gases"* (Gas analyzer calibration). Moreover, related Certificates of training /55/ were made

<table>
<tr><td></td><td>available to the GLC's verification team.

Moreover, the GLC's verification team was also able to verify that the work procedure PRO 405 was approved by equipment manufacturer in and it is available in the project site.

As informed by the project participants, the main reason for performing the calibrations internally is the relatively remote location of the project site.</td></tr>
<tr><td>Did the performed calibration(s) confirm proper functioning of monitoring equipment/instrument? (Yes / No):</td><td>Not completely.
<u>(i) Result of performed calibration: error/deviation beyond the maximum permissible error of the measuring instrument:</u>
GLC has also assessed that two[15] of the results of the calibration events performed in the $CH_4/CO_2/O_2$ content gas analyzer unit revealed positive deviations/errors in the readings of the $CH_4/CO_2/O_2$ content gas analyzer unit as follows:

<table>
<tr><th rowspan="2">Date of the calibration event in the $CH_4/CO_2/O_2$ content gas analyzer unit</th><th rowspan="2">Identified measurement deviation/error</th><th colspan="2">Application of conservative deduction factor in selected calculated values for the calculation parameter $MD_{project,y}$</th></tr>
<tr><th>Value</th><th>Period</th></tr>
<tr><td>2011-09-16</td><td>+2.1%</td><td>-2.1%</td><td>2011-09-06 to 2011-09-16</td></tr>
<tr><td>2012-01-30</td><td>+2.0%</td><td>-2.0%</td><td>2012-01-13 to 2012-01-30</td></tr>
</table>

While the identified error/deviations are beyond the maximum permissible error of this measuring instrument (established as the ±2.0% equipment accuracy), the project participant Essencis Soluções Ambientais S.A. acknowledges that the identified positive measurement deviations/errors potentially negatively affects the level of assurance of calculated baseline emissions.

In order to address this uncertainty in a conservative approach, conservative deduction factors were applied for the periods from 2011-09-06 to 2011-09-16 and from 2012-01-13 to 2012-01-30.

The applied deduction factors were defined as equal to the nominal value of the related identified positive measurement error/deviations.

GLC has also assessed that as two (2) of the results of calibrations performed in the $CH_4/CO_2/O_2$ content gas analyzer unit revealed</td></tr>
</table>

[15] It is noteworthy that the identified positive deviation/error of +2.2% in the readings of the $CH_4/CO_2/O_2$ content gas analyzer unit during the calibration event performed on 2011-08-23 was addressed in the previous 5th periodid verification (a conservative deduction factor of -2.2% was applied in the calculated values for the calculation parameter $MD_{project,y}$ during the period of 2011-08-18 to 2011-08-23)

	negative deviations/errors beyond the maximum permissible error of the measuring instrument (±2.0%) in the readings of the $CH_4/CO_2/O_2$ content gas analyzer unit of -2.2% and -2.3% (deviations/errors identified during the calibration events performed on 2011-11-16 and 2011-12-12 respectively). No deduction or even increment factor in values of parameter $MD_{project,y}$ were applied due to these negative measurement deviations/errors which were identified in the calibration events. Moreover, no conservative deduction factor was applied as a result of the also identified positive deviations/errors of +1.6%, +0.9%, +1.2%, +0.1%, +0.2%, +0.1%, +0.2% and +1.9% during the calibration events performed on 2011-10-06, 2011-10-17, 2011-11-25, 2011-12-26, 2012-02-07,,2012-02-27, 2012-03-12 and 2012-04-02, respectively. Such potential measurement errors/deviations can be reasonably regarded as negligible (below the maximum permissible error of the instrument: ±2.0%) as reasonably argued by the project participants. *(ii) Selected calibration events in the $CH_4/CO_2/O_2$ content gas analyzer unit were not conducted not in compliance with the calibration frequency earlier approved by the equipment manufacturer:* As outlined in the Monitoring Report /3/, relative delays on performing some of the calibration events for $CH_4/CO_2/O_2$ content gas analyzer unit occurred. - While a calibration event was performed on 2011-10-25, the next sequential calibration event was supposed to be performed on 2011-11-09. Since such sequential calibration event was performed in 2011-11-16, a non-compliance with the applicable every 15 days calibration frequency thus occurred. - While a calibration event was performed on 2011-11-25, the next sequential calibration event was supposed to be performed on 2011-12-10. Since such sequential calibration event was performed in 2011-12-12, a non-compliance with the applicable every 15 days calibration frequency thus occurred. - While a calibration event was performed on 2012-01-13, the next sequential calibration event was supposed to be performed on 2012-01-28. Since such sequential calibration event was performed in 2012-01-30, a non-compliance with the applicable every 15 days calibration frequency thus occurred. As argued by the project participants, the reason for not performing

<table>
<tr><td></td><td>
such regular calibration events as per the defined calibration frequency was difficulties in scheduling the calibration events.

By following applicable guidance of the VVS /1/, conservative deduction factors were applied in every minute calculated values for $MD_{project,y}$ for selected periods as assessed below:

<table>
<tr><th rowspan="2">Date of the delayed calibration event in the $CH_4/CO_2/O_2$ content gas analyzer unit</th><th colspan="2">Application of conservative deduction factor in selected hourly calculated values for the calculation parameter $MD_{project,y}$</th></tr>
<tr><th>Value</th><th>Period</th></tr>
<tr><td>2011-11-16</td><td>-2.0%</td><td>From 2011-11-09 to 2011-11-16</td></tr>
<tr><td>2011-12-12</td><td>-2.0%</td><td>From 2011-12-10 to 2011-12-12</td></tr>
<tr><td>2012-01-30</td><td>-2.0%</td><td>From 2012-01-28 to 2012-01-30</td></tr>
</table>

The values of the conservative deduction factors for the occurred relative delays in performing calibration events were determined as the higher value between the measurement deviation/error (which was identified during for the performance of the delayed calibration event in question (only for cases a positive measurement deviation/error was indentified)) and the accuracy (assumed as maximum permissible measurement error) of the equipment.

As a conclusion, the GLC's verification team confirmed that the conservative deduction factors were consistently applied and in accordance with the VVS /1/.
</td></tr>
<tr><td>Is(are) the performed calibration(s) valid for the whole reporting period?</td><td>Yes. The performed 20 calibration events are valid for the whole verification period from 2011-09-01 to 2012-03-31.</td></tr>
<tr><td>If applicable, has the reported monitoring data been cross-checked with other available data or source?</td><td>Not applicable.</td></tr>
<tr><td>How were the values in the Monitoring Report (and/or supporting documents, i.e emission reduction calculation spreadsheet) verified and/or compared?</td><td>Figures of CH_4 content in the collected LFG as visualized by the GLC's verification team in the screen of the data supervisory system model E3 (in the project activity's control room) were compared with figures displayed in the display of the installed $CH_4/CO_2/O_2$ content gas analyzer unit (for the same time instant) at the time of the on-site visit. As further assessed in Section 4.1.4.2, this data supervisory system (as per the project configuration since 2008-02-08) retrieves data from the SQL based data base where LFG related monitoring</td></tr>
</table>

	data is recorded. Such data checking/comparison confirmed correct data processing and recording by the project's PLC unit and monitoring parameter data base respectively (at the time of the performed on-site visit to the project site). For further details about recording of values measured at the project site, see section 4.1.4.2. A *data authenticity checking* was performed for all every minute basis measurement records of the following monitoring parameters in order to demonstrate and ensure that only authentic/not modified monitoring data was used for the emission reduction calculations for the verification period from 2011-09-01 to 2012-03-31. - Amount of landfill gas flared ($LFG_{flare,y}$) - Flare combustion/ efficiency determined by the operation hours (1) and the methane content in the exhaust gas (2) (FE) - Methane fraction in the landfill gas ($w_{CH4,y}$) - Temperature of the landfill gas (T) - Pressure of the landfill gas (P) - Temperature of the exhaust gas in the flares (T_{flare}) The performed checking aimed to ensure that monitoring data were not intentionally or unintentionally edited/modified by anyone prior to be used as primary data input for the processing of emission reduction calculations. Details about the performed *data authenticity checking* (which is valid for all LFG related monitoring data) is included in Section 4.1.4.4.
Does the applied monitoring data management process (from monitoring equipment/instrument to emission reduction calculation) ensure correct recording, transfer and reporting of data to be used for the emission reductions calculations? Are necessary/applicable QA/QC processes in place?	See Section 4.1.4.7.

Table 14: Temperature of the landfill gas

Assessment	
Data / Parameters:	Temperature of the landfill gas (T)

(as in monitoring plan of PDD):	
Measuring, recording and reporting frequencies:	During the verification period from 2011-09-01 to 2012-03-31, continuously measurements of Temperature of the landfill gas (T) were recorded/reported with an every minute frequency. While the installed LFG flow meter does not automatically convert and express the measurement of LFG flow in normalized cubic meters per hour (Nm^3/h), monitoring of LFG pressure and LFG temperature were thus also performed during the verification period as established in the PDD /2/.
Are measuring, recording and reporting frequencies in accordance with the monitoring plan (as per the registered PDD) and monitoring methodology? (Yes / No)	The PDD /2/ and ACM0001 (version 2) /11/ do not clearly specify any measuring, recording and reporting frequency for Temperature of the landfill gas (T): "*continuous/periodic*" is indicated in the column "Recording Frequency" of the applicable tables in both the monitoring plan of the PDD /2/ and ACM0001 (version 2) /11/. Thus, the adopted measuring, recording and reporting frequencies are assumed as in accordance with the monitoring plan of the PDD /2/ and monitoring methodology ACM0001 (version 2) /11/.
Type of monitoring equipment/instrument:	The specifications of the installed LFG temperature sensor is presented below: Specifications of the sensor elements for the LFG temperature sensor sets Manufacturer: Pressgage instrumentos de Medição e Controle. Model: PT-100 (MRT 0403L) Serial Numbers: No. 32057 Accuracy: ±1.0% Source: /46/
Is the accuracy of the monitoring equipment/instrument as stated in the PDD? If the PDD does not specify the accuracy of the monitoring equipment/instrument, does the utilization of the monitoring equipment/instrument represent good monitoring practice?	The PDD /2/ and ACM0001 (version 2) /11/ do not specify any accuracy requirement for the LFG temperature sensor installed at the project site. The accuracy range for the installed instrument is ±1.0%. It is GLC's contention that the use of the installed instrument represents good practice for monitoring of LFG temperature.

Calibration frequency /interval for the monitoring equipment/instrument:	As per the implemented monitoring procedure at Essencis Soluções Ambientais S.A., the LFG temperature sensor is to be calibrated yearly (every 12 months). As confirmed by the GLC's verification team through assessment of the specification sheet for the installed LFG temperature sensor, the selected calibration frequency is as per the recommendations of the instrument manufacturer. An initial calibration event was performed on 2011-01-25 (Certificate No. 1522-12 /18/ issued by Contemp Laboratório de Metrologia). A second calibration event was performed on 2012-03-13 (Certificate No. 3913-12 /17/ also issued by Contemp Laboratório de Metrologia). The Calibration Certificates were made available and assessed by the GLC's verification team.
Is the calibration interval in line with the monitoring plan of the PDD? If the PDD does not specify the frequency of calibration, does the selected frequency represent good monitoring practice?	Neither the PDD /2/ nor ACM0001 (version 2) /11/ specify any calibration frequency requirement for the LFG temperature sensor. As per the monitoring plan of the PDD /2/, *"(…) all the equipment must be calibrated periodically*". Therefore, the calibration frequency considered for the LFG temperature sensor was as per recommendations from the instrument manufacturer. It is the opinion of the GLC's verification team that the adopted calibration frequency for related instrument/equipment represents good practice.
Company which has performed the applicable calibration events:	The valid calibration events for the LFG temperature sensor were performed by Contemp Laboratório de Metrologia (which is a company established in Brazil).
Did the performed calibration(s) confirm proper functioning of monitoring equipment/instrument? (Yes / No):	Yes. The performed calibration events for the LFG temperature sensor confirm proper functioning of the measurement instrument.
Is(are) the performed calibration(s) valid for the whole reporting period?	*Selected calibration event for the LFG temperature sensor was not conducted not in compliance with the calibration frequency recommended by the instrument manufacturer:* As outlined in the Monitoring Report, a relative delay occurred in performing the calibration event dated 2012-03-12 for the LFG temperature sensor. While an earlier calibration event was performed on 2011-01-25, the next sequential calibration event was supposed to be performed on 2012-01-25. Since such sequential calibration event was performed in 2012-03-12, a non-compliance with the applicable 12 month calibration frequency thus occurred. As argued by the project participants, the reason for not performing such calibration event as per the defined calibration frequency was difficulties in scheduling the calibration event.

	By following applicable guidance of the VVS /1/, a correction factor of +1.0% was applied in the values of LFG temperature valid for the period from 2012-01-25 to 2012-03-12. Corrected values of LFG temperature were considered for the determination of value $MD_{project,y}$ valid for this period. While the correction factor was applied for both values of LFG temperature and LFG pressure during the verification period from 2011-09-01 to 2012-03-31 (due to the occurred relative delay on performing calibration events in both the LFG temperature sensor and LFG pressure sensor), the total impact of the application of such correction factors over the calculated value of $MD_{project,y}$ is 20.7781 tCH_4. The value of the conservative correction factor was determined by considering the absolute value of the permissible error for the utilized LFG temperature sensor (±1.0%) It is the opinion of the GLC's verification team that the adopted approach for this issue is acceptable. Related calculations are presented in the emission reductions calculation spreadsheets /5/. It is also noteworthy that, as also established by the VVS /1/, the higher value between (i) the measurement deviation/error (which was identified during for the performance of the delayed calibration event in question) and (ii) the accuracy of the instrument (assumed maximum permissible measurement error) were considered in the context of the definition of the conservative deduction factor. The GLC's verification team confirmed that the conservative deduction factor was consistently applied and it is in accordance with the VVS /1/.
If applicable, has the reported monitoring data been cross-checked with other available data or source?	Not applicable.
How were the values in the Monitoring Report (and/or supporting documents, i.e emission reduction calculation spreadsheet) verified and/or compared?	Figures of LFG temperature as visualized by the GLC's verification team in the screen of the data supervisory system model E3 (in the project activity's control room) were compared with figures displayed by LFG temperature indicators (which are located next to the LFG temperature sensor) (for the same time instant) at the time of the on-site visit. Such data checking/comparison confirmed correct data processing and recording by the project's PLC unit and monitoring parameter data base respectively (at the time of the performed on-site visit to the project site). For further details about recording of values measured at the project site, see section 4.1.4.2.

	A *data authenticity checking* was performed for all every minute basis measurement records of the following monitoring parameters in order to demonstrate and ensure that only authentic/not modified monitoring data was used for the emission reduction calculations for the verification period from 2011-09-01 to 2012-03-31: - Amount of landfill gas flared ($LFG_{flare,y}$) - Flare combustion/ efficiency determined by the operation hours (1) and the methane content in the exhaust gas (2) (FE) - Methane fraction in the landfill gas ($w_{CH4,y}$) - Temperature of the landfill gas (T) - Pressure of the landfill gas (P) - Temperature of the exhaust gas in the flares (T_{flare}) The performed checking aimed to ensure that monitoring data were not intentionally or unintentionally edited/modified by anyone prior to be used as primary data input for the processing of emission reduction calculations. Details about the performed *data authenticity checking* (which is valid for all LFG related monitoring data) is included in Section 4.1.4.4.
Does the applied monitoring data management process (from monitoring equipment/instrument to emission reduction calculation) ensure correct recording, transfer and reporting of data to be used for the emission reductions calculations? Are necessary/applicable QA/QC processes in place?	See Section 4.1.4.7.

Table 15: Pressure of the landfill gas

Assessment	
Data / Parameters: (as in monitoring plan of PDD):	Pressure of the landfill gas (P)
Measuring, recording and reporting frequencies:	During the verification period from 2011-09-01 to 2012-03-31, continuously measurements of Pressure of the landfill gas (P) were recorded/reported with an every minute frequency. While the installed LFG flow meter does not automatically convert and express the measurement of LFG flow in normalized cubic meters per hour (Nm^3/h), monitoring of LFG pressure and LFG temperature were thus also performed during the verification period

<table>
<tr><td></td><td>as established in the PDD/2/.</td></tr>
<tr><td>Are measuring, recording and reporting frequencies in accordance with the monitoring plan (as per the registered PDD) and monitoring methodology? (Yes / No)</td><td>The PDD /2/ and ACM0001 (version 2) /11/ do not clearly specify any measuring, recording and reporting frequency for Pressure of the landfill gas (P): “continuous/periodic” is indicated in the column “Recording Frequency” of the applicable tables in both the monitoring plan of the PDD /2/ and ACM0001 (version 2) /11/.
Thus, the adopted measuring, recording and reporting frequencies are assumed as in accordance with the monitoring plan of the PDD /2/ and monitoring methodology ACM0001 (version 2) /11/.</td></tr>
<tr><td>Type of monitoring equipment/instrument:</td><td>The specifications of the installed LFG pressure sensor is presented below:

<table><tr><th colspan="2">Specifications of the installed LFG pressure sensor</th></tr><tr><td>Manufacturer</td><td>Pressage Instrumentos de Medição e Controle</td></tr><tr><td>Model</td><td>TPI-PRESS</td></tr><tr><td>Serial/batch number</td><td>43608</td></tr><tr><td>Accuracy</td><td>± 1.5%</td></tr></table>Source: /44/</td></tr>
<tr><td>Is the accuracy of the monitoring equipment/instrument as stated in the PDD? If the PDD does not specify the accuracy of the monitoring equipment/instrument, does the utilization of the monitoring equipment/instrument represent good monitoring practice?</td><td>The PDD /2/ and ACM0001 (version 2) /11/ do not specify any accuracy requirement for the LFG pressure sensor installed at the project site. The accuracy range for the installed instrument is ±1.5%. It is GLC’s contention that the use of the installed instrument represents good practice for monitoring of LFG pressure.</td></tr>
</table>

Calibration frequency /interval for the monitoring equipment/instrument:	As per the implemented monitoring procedure at Essencis Soluções Ambientais S.A., the LFG pressure sensor is to be calibrated yearly (every 12 months). As confirmed by the GLC's verification team through assessment of the specification sheet for the installed LFG pressure sensor, the selected calibration frequency is as per the recommendations of the instrument manufacturer. An initial calibration event was performed on 2011-01-25 (Certificate No. 1523-11 /16/, issued by Contemp Laboratório de Metrologia). A second calibration event was performed on 2012-03-12 (Certificate No. 3917-12 /15/, also issued by Contemp Laboratório de Metrologia). The Calibration Certificates were made available and assessed by the GLC's verification team.
Is the calibration interval in line with the monitoring plan of the PDD? If the PDD does not specify the frequency of calibration, does the selected frequency represent good monitoring practice?	Neither the PDD /2/ nor ACM0001 (version 2) /11/ specify any calibration frequency requirement for the LFG pressure sensor. As per the monitoring plan of the PDD /2/, *"(…) all the equipment must be calibrated periodically*". Therefore, the calibration frequency considered for the LFG pressure sensor was as per recommendations from the instrument manufacturer. It is the opinion of the GLC's verification team that the adopted calibration frequency for related instrument/equipment represents good practice.
Company which has performed the applicable calibration events:	The valid calibration events for the LFG pressure sensor were performed by Contemp Laboratório de Metrologia (which is a company established in Brazil).
Did the performed calibration(s) confirm proper functioning of monitoring equipment/instrument? (Yes / No):	Yes. The performed calibration events for the pressure sensor confirm proper functioning of the measurement instrument.
Is(are) the performed calibration(s) valid for the whole reporting period?	*Selected calibration event for the LFG pressure sensor was not conducted not in compliance with the calibration frequency recommended by the instrument manufacturer:* As outlined in the Monitoring Report, a relative delay occurred in performing the calibration event dated 2012-03-12 for the LFG pressure sensor. While an earlier calibration event was performed on 2011-01-25, the next sequential calibration event was supposed to be performed on 2012-01-25. Since such sequential calibration event was performed in 2012-03-12, a non-compliance with the applicable 12 month calibration frequency thus occurred. As argued by the project participants, the reason for not performing such calibration event as per the defined calibration frequency was

	difficulties in scheduling the calibration event. By following applicable guidance of the VVS /1/, a correction factor of -1.5% was applied in the values of LFG pressure valid for the period from 2012-01-25 to 2012-03-12. Corrected values of LFG pressure were considered for the determination of value $MD_{project,y}$ valid for this period. While the correction factor was applied for both values of LFG temperature and LFG pressure during the verification period from 2011-09-01 to 2012-03-31 (due to the occurred relative delay on performing calibration events in both the LFG temperature sensor and LFG pressure sensor), the total impact of the application of such correction factors over the calculated value of $MD_{project,y}$ is 20.7781 tCH_4. The value of the conservative correction factor was determined by considering the absolute value of the permissible error for the utilized LFG pressure sensor (-1.5%) It is the opinion of the GLC's verification team that the adopted approach for this issue is acceptable. Related calculations are presented in the emission reductions calculation spreadsheets /5/. It is also noteworthy that, as also established by the VVS /1/, the higher value between (i) the measurement deviation/error (which was identified during for the performance of the delayed calibration event in question) and (ii) the accuracy of the instrument (assumed maximum permissible measurement error) were considered in the context of the definition of the conservative deduction factor. The GLC's verification team confirmed that the conservative deduction factor was consistently applied and it is in accordance with the VVS /1/.
If applicable, has the reported monitoring data been cross-checked with other available data or source?	Not applicable.
How were the values in the Monitoring Report (and/or supporting documents, i.e emission reduction calculation spreadsheet) verified and/or compared?	Figures of LFG pressure as visualized by the GLC's verification team in the screen of the data supervisory system model E3 (in the project activity's control room) were compared with figures displayed by LFG temperature indicators (which are located next to the LFG pressure sensor) (for the same time instant) at the time of the on-site visit. Such data checking/comparison confirmed correct data processing and recording by the project's PLC unit and data base respectively (at the time of the performed on-site visit to the project site). For further details about recording of values measured at the project site, see section 4.1.4.2.

	A *data authenticity checking* was performed for all every minute basis measurement records of the following monitoring parameters in order to demonstrate and ensure that only authentic/not modified monitoring data was used for the emission reduction calculations for the verification period from 2011-09-01 to 2012-03-31: - Amount of landfill gas flared ($LFG_{flare,y}$) - Flare combustion/ efficiency determined by the operation hours (1) and the methane content in the exhaust gas (2) (FE) - Methane fraction in the landfill gas ($w_{CH4,y}$) - Temperature of the landfill gas (T) - Pressure of the landfill gas (P) - Temperature of the exhaust gas in the flares (T_{flare}) The performed checking aimed to ensure that monitoring data were not intentionally or unintentionally edited/modified by anyone prior to be used as primary data input for the processing of emission reduction calculations. Details about the performed *data authenticity checking* (which is valid for all LFG related monitoring data) is included in Section 4.1.4.4.
Does the applied monitoring data management process (from monitoring equipment/instrument to emission reduction calculation) ensure correct recording, transfer and reporting of data to be used for the emission reductions calculations? Are necessary/applicable QA/QC processes in place?	See Section 4.1.4.7.

Table 16: Total amount of electricity and/or other energy carriers used in the project for gas pumping and heat transport (not derived from the gas)

Assessment	
Data / Parameters: (as in monitoring plan of PDD):	Total amount of electricity and/or other energy carriers used in the project for gas pumping and heat transport (not derived from the gas) (Energy) This parameter is associated with two parameters: - Amount of consumed grid electricity ($EC_{PJ,grid,y}$) - Amount of consumed LPG ($FC_{LPG,y}$)

Measuring, recording and reporting frequencies:	Amount of consumed grid electricity ($EC_{PJ,grid,y}$) is determined on the basis of continuous measurements made by the company Elektro Eletricidade e Serviços S.A. (a Brazilian power distribution company) through electricity meters installed at the project site. Accumulated values of the continuous measurements of grid electricity consumed are aggregated and recorded/reported monthly. Amount of consumed LPG ($FC_{LPG,y}$) is determined based on measurements performed by the local LPG distribution company Cia Ultragaz S.A. as part of LPG delivery events. As confirmed by the GLC's verification through assessment of a clarification communication /28/ issued by Cia Ultragaz S.A., the adopted weight measurement procedure for LPG is as per the working procedure IT-CO.61.0008 /62/ of the ISO9001 certified QA/QC management system of Cia Ultragaz S.A. Amount of consumed LPG was thus measured by the LPG supplying company in each delivery event of cylinders of LPG with 45 kg capacity each to the project site. All events of delivery of LPG from the supplier Cia Ultragaz S.A. are registered at Essencis Soluções Ambientais S.A. as confirmed by the GLC's verification team through assessment of records as per the financial/accounting management system of Essencis Soluções Ambientais S.A. /52/. The GLC's verification team has also assessed a declaration of amount of LPG sold to Essencis Soluções Ambientais S.A. /28/ (issued by Cia Ultragaz S.A.) during the period from 2011-09-01 to 2012-03-31.
Are measuring, recording and reporting frequencies in accordance with the monitoring plan (as per the registered PDD) and monitoring methodology? (Yes / No)	The PDD /2/ and ACM0001 (version 2) /11/ do not clearly specify any measuring, recording and reporting frequency for Total amount of electricity and/or other energy carriers used in the project for gas pumping and heat transport (not derived from the gas) (Energy): "*continuous*" is indicated in the column "Recording Frequency" of the applicable tables in both the monitoring plan of the PDD /2/ and ACM0001 (version 2) /11/. Thus, the adopted measuring, recording and reporting frequencies are assumed as in accordance with the monitoring plan of the PDD /2/ and monitoring methodology ACM0001 (version 2) /11/.
Type of monitoring equipment/instrument:	Monitoring records for $EC_{PJ,grid,y}$ were measured by two electricity meters (the second meter was installed on April 2009 for measuring the electricity consumption of the 4th blower, which was also installed on April 2009) as per specifications provided below. Specifications of the electricity meters

Manufacturer	KRON Instrumentos Elétricos Ltda.
Model	MULT-K
Serial Numbers	234215 (electricity meter with internal ID "ME plant") and 465025 (electricity meter with internal ID "ME Blower 4")
Accuracy	± 0.2% (Class 2)

Source: /29/

Monitoring records for $FC_{LPG,y}$ were measured by a weight scale as per specifications provided below.

Specifications of the weight scale used for measuring LPG mass	
Manufacturer	Mettler-Toledo Inc.
Model	2180
Serial Numbers	10423008
Capacity	Max. 250 kg
Accuracy	± 50 grams

Source: /31/

As confirmed by the GLC's verification team, as per the project design, LPG was consumed for lighting/igniting the flare (flare pilot). However, the monitored value actually corresponds to the total amount of LPG consumed at the CTR Caieiras landfill. While a relatively low share of LPG consumption corresponds to LPG consumed at the employees' kitchen facility of the CTR Caieiras landfill, as a conservative measure, it is assumed that all monitored amount of LPG was consumed by the project activity. This is deemed conservative and acceptable.

Is the accuracy of the monitoring equipment/instrument as stated in the PDD? If the PDD does not specify the accuracy of the monitoring equipment/instrument, does the utilization of the monitoring	Both ACM0001 (version 2) /11/ and the monitoring plan of the PDD /2/ do not specify any accuracy for the electricity meters. The accuracy for the installed meter is ± 0.2%. The use of this kind of electricity meter represents good practice for measuring consumption of grid electricity. Both ACM0001 (version 2) /11/ and the monitoring plan of the PDD /2/ do not specify any measurement requirement for monitoring

equipment/instrument represent good monitoring practice?	consumption of LPG. The accuracy for the installed scale is ± 50 grams. The use of this kind of weight scale represents good practice for measuring consumption of grid electricity.
Calibration frequency /interval for the monitoring equipment/instrument:	*Electricity meters:* As confirmed by the GLC's verification team through assessment of the specification sheet for the installed electricity meters /29/ and a declaration/communication issued by the meters manufacturer /30/, as per recommendation of the meter manufacturer, the meters are to be calibrated every 5 years. For the 234215 meter, an initial calibration event was performed on 2007-03-02 (Calibration Certificate 518/07 /73/, issued by KRON Instrumentos Elétricos Ltda.), prior the installation of the meter at the project site. A second calibration event was later performed on 2012-03-19 (Calibration Certificate R-0701/12 /24/, issued by Naka Instrumentação Industrial Ltda.). For the 465025 meter, an initial calibration event was performed on 2008-10-03 (Calibration Certificate 2600/08 /74/, issued by KRON Instrumentos Elétricos Ltda.), prior the installation of the meter at the project site. A second calibration event was later performed on 2012-03-19 (Calibration Certificate R-0702/12 /72/, issued by Naka Instrumentação Industrial Ltda.). *Weight scale:* The GLC's verification team was able to confirm that the Brazilian National Agency of Petroleum, Natural Gas and Biofuels (*Agência Nacional do Petróleo, Gás Natural e Biocombustíveis - ANP*), as the federal government agency responsible for the regulation of the oil sector (including production and distribution of petroleum fuels) defines in its Resolution 15 (dated 2005-05-18) /57/ that any LPG distributor operating in Brazil should have a functioning weight scale for checking the weight of LPG commercialized in 45 kg cylinders. As also established by the Resolution 15, related weight scales should be regularly calibrated by a certification/calibration company with accreditation from the Brazilian national authority for metrology and standardization issues (INMETRO). Moreover, it was made available to the GLC's verification team a declaration/communication issued by the local LPG distribution company Cia Ultragaz S.A. (dated 2012-05-11) /28/ confirming that: - Cia Ultragaz S.A. has historically calibrated weight scales as per the Internal working procedure "Monitoramento dos

	equipamentos de envazamento e controle" (*Monitoring of measurement/control and bottling equipment*). Doc. Code: IT-CO-61.0008; Rev. 4 /62/. - The weight scale Mettler-Toledo - model 2180 – S/N 10423008 has been regularly calibrated as per internal working procedure IT-CO-61.0008 /62/. A copy of the working procedure IT-CO-61.0008 /62/ was also made available and was assessed by the GLC's verification team. Moreover, Certifications of Calibration /61/ for the pattern standard weights internally used by Cia Ultragaz S.A. (used for the performance of regular calibration events of weight scales) and a Calibration Ceritifcate for the weight scale 10423008 (Certificate No. 905/10 /60/, dated 2010-11-10 and issued by Caieiras Balanças Comércio e Serviços Ltda.) were also made available and assessed by the verification team.
Is the calibration interval in line with the monitoring plan of the PDD? If the PDD does not specify the frequency of calibration, does the selected frequency represent good monitoring practice?	*Electricity meters:* Both the monitoring plan of the PDD /3/ and ACM0001 (version 2) /11/ do not specify any calibration frequency requirements for the electricity meters. The PDD merely states that "*(...) all equipment must be calibrated periodically*". As per the "Tool to calculate baseline, project and/or leakage emissions from electricity consumption" /13/, the following requirement is established regarding maintenance and calibration for electricity meters: "*(...) meters should be installed, maintained and calibrated according to equipment manufacturer instructions and be in line with national standards, or, if these are not available, international standards (e.g. IEC, ISO)*". It is important to note that the installed electricity meters are approved/certified by the Brazilian national authority for metrology and standardization issues (INMETRO). The meters are thus in conformance with INMETRO's requirements for maintenance and testing of electricity meters. Furthemore, the adopted calibration frequency is also in accordance with related requirements/recommendations as established by the meters manufacturer. *Weight scale:* Both the monitoring plan of the PDD /3/ and ACM0001 (version 2) /11/ do not specify any calibration frequency requirements for the weight scale. The PDD merely states that "*(...) all equipment must be calibrated periodically*". As per the more recently issued "Tool to calculate project or

	leakage CO_2 emissions from fossil fuel combustion" /35/ (more recently issued CDM guidance for monitoring project emissions due to fossil fuel consumption), "*(…) meters should be installed, maintained and calibrated according to equipment manufacturer instructions and be in line with national standards, or, if these are not available, international standards (e.g. IEC, ISO)*." As per Resolution 15 /57/ of ANP, any LPG distributor operating in Brazil should have a functioning weight scale for checking the weight of LPG commercialized in 45 kg cylinders. As also established by the Resolution 15, related weight scales should be regularly calibrated by a certification/calibration company with accreditation from the Brazilian national authority for metrology and standardization issues (INMETRO). The adopted calibration frequency is in accordance with national requirements and also with related requirements/recommendations as established by the weight scale manufacturer.
Company which has performed the applicable calibration events:	*Electricity meters:* The electricity meters were initially calibrated by KRON Instrumentos Elétricos Ltda. (prior to be delivered to commercialization). The second calibration event for both electricity meters was performed by Naka Instrumentação Industrial Ltda. Both companies are based in Brazil. *Weight scale:* The weight scale used by the local LPG distribution company Cia Ultragaz S.A. was calibrated by Caieiras Balanças Comércio e Serviços Ltda.
Did the performed calibration(s) confirm proper functioning of monitoring equipment/instrument? (Yes / No):	*Electricity meters:* Yes. As confirmed by the GLC's verification team through assessment of declaration /30/ issued by the manufacturer of the electricity meters (KRON Instrumentos Elétricos Ltda.), the electricity meters model MULT K are calibrated at the production facility prior to be delivered for commercialization. Moreover, as also confirmed by the instrument manufacturer in the same declaration /30/, the electricity meters installed in the project site were calibrated by KRON Instrumentos Elétricos Ltda. on 2007-03-02 (electricity meter 234215 "ME Plant", test report No. 518-07 /73/) and on 2008-10-03 (electricity meter 465025 "ME Blower 4", test report No. 2600-08 /74/) (both performed prior the delivery of the instruments to commercialization). A second calibration event was performed on both electricity meters on 2012-03-19 (Certificates No. R-0701/12 /24/ (electricity meter 234215 "ME Plant") and R-0702/12 /72/ (electricity meter 465025 "ME Blower 4"), both issued

	by Naka Instrumentação Industrial Ltda.). It is thus reasonable to assume that the performed calibration events confirm proper functioning of the electricity meters (at the time the calibration events were performed). *Weight scale:* Yes. The calibration event performed on 2010-05-06 (Certificate No. 905/10 /60/, dated 2010-11-10 and issued by Caieiras Balanças Comércio e Serviços Ltda.) for the weight scale confirm proper functioning of the measurement instrument.
Is(are) the performed calibration(s) valid for the whole reporting period?	*Electricity meters:* Yes. The calibration events dated 2007-03-02 (Electricity meter 01 /73/), 2008-10-03 (electricity meter 02 (Blower 4) /74/) and 2012-03-19 (for both meters /24/ /72/) are valid for the whole verification period from 2011-09-01 to 2012-03-31. *Weight scale:* Yes. The calibration event dated 2010-05-06 /60/ is valid for the whole verification period from 2011-09-01 to 2012-03-31.
If applicable, has the reported monitoring data been cross-checked with other available data or source?	*Electricity meters:* Not applicable *Weight scale:* The GLC's verification team has assessed a declaration/communication /28/ issued by the local LPG distribution company Cia. Ultragaz S.A. confirming the quantities of LPG supplied to Essencis Soluções Ambientais S.A. during the periods from 2011-09-01 to 2012-03-31 and from 2011-09-01 to 2012-03-31. Declared values valid for the verification period from 2011-09-01 to 2012-03-31 were compared against values for LPG cost expenditures and notes of delivery events of LPG in the project site as per available records in the financial/accounting management system of Essencis Soluções Ambientais S.A. /52/.
How were the values in the Monitoring Report (and/or supporting documents, i.e emission reduction calculation spreadsheet) verified and/or compared?	The GLC's verification team has confirmed that values for Amount of consumed grid electricity ($EC_{PJ,grid,y}$) and Amount of consumed LPG ($FC_{LPG,y}$) as reported in the summarized emission reduction calculation spreadsheet are as per the primary monitoring records.
Does the applied monitoring data management process (from monitoring equipment/instrument to emission reduction calculation)	See Section 4.1.4.7.

ensure correct recording, transfer and reporting of data to be used for the emission reductions calculations? Are necessary/applicable QA/QC processes in place?	

Table 17: CO_2 emission intensity of the electricity and/or other energy carriers

Assessment	
Data / Parameters: (as in monitoring plan of PDD):	CO2 emission intensity of the electricity and/or other energy carriers (CO_2 emission) This parameter is associated with two parameters: - Combined margin emission factor for consumed grid electricity ($EF_{grid,CM,y}$) - Emission factor for consumed LPG ($COEF_{LPG,y}$) (in mass basis)
Measuring, recording and reporting frequencies:	*Combined margin emission factor for consumed grid electricity ($EF_{grid,CM,y}$):* Not applicable. The value for the parameter $EF_{grid,CM,y}$ was determined as the applicable default value established by the "Tool to calculate baseline, project and/or leakage emissions from electricity consumption" /13/ (which is equal to per the 1.3 tCO_2-/MWh). No measurement or calculation was performed in the context of the determination of thus performed and no monitoring equipment/instrument was used either. As outlined in the latest version of the Monitoring Report, the reason for adopting the applicable conservative default value as established by Tool to calculate baseline, project and/or leakage emissions from electricity consumption" /13/ (instead of determining the combined margin emission factor as per the "Tool to calculate the emission factor for an electricity system" /41/), is the impossibility of reporting and validating the calculation of the CO_2 emission factor for the national electricity grid of Brazil (due to lack of publicly available data. As acknowledged by the GLC's verification team, Designated National Authority (DNA) of Brazil has published only results of the calculated value for the so called official combined margin CO_2 emission factor for the national electricity grid of Brazil. Due to confidentiality reasons detailed input data and related calculations (using the dispatch analysis calculation method as per the "Tool to calculate the emission factor for an electricity system") are not made publicly available.

	Moreover, the Brazilian entity Operador Nacional do Sistema (ONS) does not make any power dispatch data publicly available either. ONS is the entity who coordinates the dispatch of electricity by the power generation sources (power plants) connected to the electricity grid of Brazil. *Emission factor for consumed LPG ($COEF_{LPG,y}$):* The value for the parameter $COEF_{LPG,y}$ was determined as the product between Net Calorific Value (NCV) for consumed LPG ($NCV_{LPG,y}$) and CO_2 emission factor for consumed LPG (in energy basis) ($EF_{CO2,LPG,y}$). As further assessed in Section 4.1.4.3, default values $NCV_{LPG,y}$ and $EF_{CO2,LPG,y}$ are used. Thus no measurement was performed in the context of the determination of value for $COEF_{LPG,y}$ and no monitoring equipment/instrument was used either.
Are measuring, recording and reporting frequencies in accordance with the monitoring plan (as per the registered PDD) and monitoring methodology? (Yes / No)	Not applicable. There are no measurements or measurement instruments involved for the definition of Emission Factor for consumed grid electricity ($EF_{grid,CM,y}$) and Emission factor for consumed LPG ($COEF_{LPG,y}$) (in mass basis).
Type of monitoring equipment/instrument:	Not applicable. There are no measurements or measurement instruments involved for the definition of Emission Factor for consumed grid electricity ($EF_{grid,CM,y}$) and Emission factor for consumed LPG ($COEF_{LPG,y}$) (in mass basis).
Is the accuracy of the monitoring equipment/instrument as stated in the PDD? If the PDD does not specify the accuracy of the monitoring equipment/instrument, does the utilization of the monitoring equipment/instrument represent good monitoring practice?	Not applicable. There are no measurements or measurement instruments involved for the definition of Emission Factor for consumed grid electricity ($EF_{grid,CM,y}$) and Emission factor for consumed LPG ($COEF_{LPG,y}$) (in mass basis).
Calibration frequency /interval for the monitoring equipment/instrument:	Not applicable. There are no measurements or measurement instruments involved for the definition of Emission Factor for consumed grid electricity ($EF_{grid,CM,y}$) and Emission factor for consumed LPG ($COEF_{LPG,y}$) (in mass basis).
Is the calibration interval in line with the monitoring plan of the PDD? If the PDD does not specify the frequency of	Not applicable. There are no measurements or measurement instruments involved for the definition of Emission Factor for consumed grid electricity ($EF_{grid,CM,y}$) and Emission factor for consumed LPG ($COEF_{LPG,y}$) (in mass basis).

calibration, does the selected frequency represent good monitoring practice?	
Company which has performed the applicable calibration events:	Not applicable. There are no measurements or measurement instruments involved for the definition of Emission Factor for consumed grid electricity ($EF_{grid,CM,y}$) and Emission factor for consumed LPG ($COEF_{LPG,y}$) (in mass basis).
Did the performed calibration(s) confirm proper functioning of monitoring equipment/instrument? (Yes / No):	Not applicable. There are no measurements or measurement instruments involved for the definition of Emission Factor for consumed grid electricity ($EF_{grid,CM,y}$) and Emission factor for consumed LPG ($COEF_{LPG,y}$) (in mass basis).
Is(are) the performed calibration(s) valid for the whole reporting period?	Not applicable. There are no measurements or measurement instruments involved for the definition of Emission Factor for consumed grid electricity ($EF_{grid,CM,y}$) and Emission factor for consumed LPG ($COEF_{LPG,y}$) (in mass basis).
If applicable, has the reported monitoring data been cross-checked with other available data or source?	Not applicable. There are no measurements or measurement instruments involved for the definition of Emission Factor for consumed grid electricity ($EF_{grid,CM,y}$) and Emission factor for consumed LPG ($COEF_{LPG,y}$) (in mass basis).
How were the values in the Monitoring Report (and/or supporting documents, i.e emission reduction calculation spreadsheet) verified and/or compared?	The GLC's verification team verified that the selected value for $EF_{grid,CM,y}$ is indeed the applicable default value as per the Tool to calculate baseline, project and/or leakage emissions from electricity consumption /13/. Moreover, the adopted default values for Net Calorific Value (NCV) for consumed LPG ($NCV_{LPG,y}$) and and CO_2 emission factor for consumed LPG ($EF_{CO2,LPG,y}$) (in energy basis) were also checked about its sources: Brazilian Energetic Balance Report year 2011 (base year 2010) /53/ and IPCC 2006 /12/.
Does the applied monitoring data management process (from monitoring equipment/instrument to emission reduction calculation) ensure correct recording, transfer and reporting of data to be used for the emission reductions calculations? Are necessary/applicable QA/QC processes in place?	Not applicable. There are no measurements or measurement instruments involved for the definition of Emission Factor for consumed grid electricity ($EF_{grid,CM,y}$) and Emission factor for consumed LPG ($COEF_{LPG,y}$) (in mass basis).

Table 18: Regulatory requirements relating to landfill gas projects

Assessment	
Data / Parameters: (as in monitoring plan of PDD):	Regulatory requirements relating to landfill gas projects (HE)
Measuring, recording and reporting frequencies:	Not applicable. The determination of the parameter Regulatory requirements relating to landfill gas projects (HE) is not based on measurements. In accordance with the requirement of the monitoring plan of the PDD, as correctly indicated in Section D.2 of the Monitoring Report /3/, so far there are no new regulatory requirements relating to LFG projects, which went into force during the first 7-year renewable crediting period for the project activity. As established by ACM0001 (version 2) /11/, eventual changes in the current status for regulatory requirements relating to LFG managements in landfills will be considered in the context of the definition of the parameter adjustment factor (AF) at renewal of the credit period. For sake of completeness and transparency the following clarification about a more recently passed regulations about waste management in Brazil was provided by Essencis Soluções Ambientais S.A.: *The Brazilian Regulation of the National Policy on Waste Management, established by Decree No. 7,404/10 (the Decree), was published on 23 December 2010. In force since its publication, this decree regulates the National Policy on Waste Management (PNRS), established by Federal Law No. 12,305/10 (the LPNRS), and creates the Steering Committee for the Implementation of Reverse Logistics Systems (Steering Committee) and the PNRS Interministerial Committee. This new Brazilian Regulation of the National Policy on Waste Management does not establish any requirement, obligation or recommendation related to LFG management at landfills in Brazil.* As outlined by the law firm "Tauil & Chequer Advogados" /59/: *"The Regulation of the National Policy on Waste Management, established by Decree No. 7,404/10 (the Decree), was published on December 23, 2010. In force since its publication, the Decree regulates the National Policy on Waste Management (PNRS), established by Federal Law No. 12,305/10 (the LPNRS), and creates the Steering Committee for the Implementation of Reverse Logistics Systems (Steering Committee) and the PNRS Interministerial Committee.*

	The main purpose of the PNRS Interministerial Committee is to support the PNRS structuring and implementation, in order to enable the accomplishment of the provisions and goals set forth by the LPNRS. The Steering Committee has the basic function of guiding the implementation of reverse logistics. *Among the instruments regulated by the Decree are the Reverse Logistics Systems, the Waste Management Plans (PGRS) and the National Registry for Hazardous Waste Operators.* *The Decree lists three specific instruments for the implementation and operation of the reverse logistic systems: (i) sectorial agreements, executed between public authorities and the industry; (ii) regulations, issued by the executive branch; and (iii) commitment agreements—which are to be adopted in the absence of sectorial agreements and regulations and when specific circumstances require more restrictive obligations—to be approved by the competent environmental agency.* *Regarding the obligation to prepare a PGRS, which should be required within environmental permitting proceedings, the Decree mentions the possibility of jointly submitting the PGRS under specific conditions and in cases where activities are conducted in the same condominium, municipality, micro-region or metropolitan/urban areas. Additionally, the Decree establishes that small companies that generate household waste, as provided for by article 30 of the LPNRS, are not required to submit a PGRS.* *Regarding the National Registry for Hazardous Waste Operators, which must be integrated to the already existing Federal Technical Registry of IBAMA, the Decree establishes a registration obligation for companies that manipulate or operate hazardous waste. The Decree also describes those who are considered generators or operators of hazardous waste, establishing several requirements for their authorization or permitting. These include the preparation of hazardous waste management plan, the demonstration of technical and economic capacity and the obtaining of civil liability insurance for environmental damages."* Also based on the revision of the new Brazilian Regulation of the National Policy on Waste Management and its legal interpretation /59/ quoted above (which is also quoted in the Monitoring Report /3/), the GLC's verification team was able to confirm that there is still no regulatory requirement, obligation or recommendation related to LFG management at landfills in Brazil.

Are measuring, recording and reporting frequencies in accordance with the monitoring plan (as per the registered PDD) and monitoring methodology? (Yes / No)	Not applicable.
Type of monitoring equipment/instrument:	Not applicable.
Is the accuracy of the monitoring equipment/instrument as stated in the PDD? If the PDD does not specify the accuracy of the monitoring equipment/instrument, does the utilization of the monitoring equipment/instrument represent good monitoring practice?	Not applicable.
Calibration frequency /interval for the monitoring equipment/instrument:	Not applicable.
Is the calibration interval in line with the monitoring plan of the PDD? If the PDD does not specify the frequency of calibration, does the selected frequency represent good monitoring practice?	Not applicable.
Company which has performed the applicable calibration events:	Not applicable.
Did the performed calibration(s) confirm proper functioning of monitoring equipment/instrument? (Yes / No):	Not applicable.
Is(are) the performed calibration(s) valid for the whole reporting period?	Not applicable.
If applicable, has the reported monitoring data been cross-checked with other available data or source?	Based on its sectoral and country knowledge, the GLC's verification team was able to confirm that that there is still no regulatory requirement, obligation or recommendation related to LFG management at landfills in Brazil. Moreover, information /59/ quoted in the Monitoring Report was also assessed by the GLC's verification team in it s original source and language (Brazilian

	Portuguese).
How were the values in the Monitoring Report (and/or supporting documents, i.e emission reduction calculation spreadsheet) verified and/or compared?	Not applicable.
Does the applied monitoring data management process (from monitoring equipment/instrument to emission reduction calculation) ensure correct recording, transfer and reporting of data to be used for the emission reductions calculations? Are necessary/applicable QA/QC processes in place?	Not applicable. There are no measurements or measurement instruments involved for the definition of Regulatory requirements relating to landfill gas projects (HE).

4.1.4 Assessment of Data and Calculation of GHG Emission Reductions

4.1.4.1 Handling of monitoring records and *ex-ante* determined parameters for emission reduction calculations

As part of the adopted monitoring procedure, measurements for the LFG related monitoring parameters Amount of landfill gas flared ($LFG_{flare,y}$), Methane fraction in the landfill gas ($w_{CH4,y}$), Temperature of the landfill gas (T), Pressure of the landfill gas (P) and Temperature of the exhaust gas in the flares (T_{flare}) were automatically processed by the project's PLC unit and recorded in a customized SQL based data base with a data recording/reporting frequency of every one minute.

The customized SQL based data-server is directly connected to a data supervisor system model E3. The system was designed by the IT solution company Elipse Software Ltda.

As per the use of the E3 data supervisor platform, two data files are generated every week as follows:

- a MS-Excel spreadsheet file with every one minute values of $LFG_{flare,y}$, $w_{CH4,y}$, T, P and T_{flare} are generated.
- a PDF format file with the same monitoring recording details made available at the MS-Excel spreadsheet.

It is GLC's opinion that the use of the E3 data supervisor system and the customized SQL[16] based data base for recording monitoring details for the project activity represents good practice in terms of data acquisition and data archiving.

It is important to note that, as detailed in Section 4.1.4.3, the GLC's verification team was able to confirm that the monitoring parameter Amount of landfill gas flared ($LFG_{flare,y}$) was recorded in the SQL based data base (and displayed in the E3 data supervisor system) in cubic meters per hour (m^3/h). As part of the emission reduction calculations, the parameter $LFG_{flare,y}$ is converted in normalized cubic meters per hour (Nm^3/h) (conversion performed automatically after exporting the generated MS-Excel format "raw-data" files /6/ to the *blank* version of the spreadsheet template for monthly emission reduction calculation.

4.1.4.2 Data transmission, data export/conversion and creation of "raw data" input files for the emission reduction calculations

SQL-format data with values of the measured records at the LFG extracting and flaring station has been regularly retrieved from the data base through the available interface in the data supervisor system model E3.

As per the implemented monitoring procedure, at regular time intervals, the monitoring manager for the project activity exports/converts data from SQL-format into an MS-Excel-format (.xls files) by using the data supervisor system model E3. Data is also exported/converted into a PDF-format to ensure a backup file in the data base. These data exports/conversions into PDF and MS-Excel formats are performed by selecting the related functions (buttons) in the user graphical interface of the data supervisor system model E3.

Also as part of the implemented project's monitoring procedure, monthly generated MS-Excel format "raw-data" files /6/ resulted from regular data exports were thus used as primary monitoring input data for the emission reduction calculations (as established in the applicable work procedure of Essencis Soluções Ambientais S.A.).

For the verification period from 2011-09-01 to 2012-03-31, as per the adopted work procedures, a set of seven monthly "raw-data" MS-Excel-format files were generated. Moreover a set of seven "PDF-format" files were also generated. As outlined in the Monitoring Report, the "raw-data" files /6/ in PDF format were generated for checking purposes. The set of 7 MS-Excel "raw-data" files /6/ were used as primary monitoring data input for the compilation of the monthly emission reduction calculations as follows:

Table 19: Generated files with monitoring input data for the emission reduction calculations

[16] SQL (sometimes also referred to as Structured Query Language) is a programming language designed for managing data in relational database management systems. SQL is currently the most widely used database language /68/.

Period	File Names
September 2011	*"Set-2011.xls"*
October 2011	*"Out-2011.xls"*
November 2011	*"Nov-2011.xls"*
December 2011	*"Dez-11.xls"*
January 2012	*"Jan-12.xls"*
February 2012	*"Fev-12.xls"*
March 2012	*"Mar-12.xls"*

The set of 7 generated MS-Excel-format "raw-data" files /6/ and the set of generated 7 PDF-format "raw data" files were made available and assessed by GLC's verification team. All raw data files contains for every minute, historical monitoring records for LFG flow, LFG pressure, LFG temperature, Flare temperature, CH_4 content of LFG as well as temperature of exhaust gas of the flare which are used for the calculation of GHG emission reductions. As verified by GLC, while for each individual MS-Excel-format "raw-data" spreadsheet file, the number of records exceeds 42,000 rows. It is crucial to note that when generating such files in MS-Excel and PDF formats, data could be eventually intentionally or unintentionally edited/modified. Thus, in order to ensure that only authentic (not edited /not modified) "raw data" were used as a basis for the emission reduction calculations, a systematic *data authenticity checking* was performed by the GLC's verification team for all the monitored data as described and assessed in Section 4.1.4.4.

As part of the adopted project's monitoring procedure, in order to compile the set of monthly emission reduction spreadsheets valid for the verification period from 2011-09-01 to 2012-03-31, all every minute measurement records of LFG related parameter as presented in the raw-data files were used as input data for the compilation of monthly MS-Excel format emission reduction calculation spreadsheets.

As per the adopted monitoring procedure and in accordance with the requirements of ACM0001 (version 2) and related provisions of the PDD, GHG emission reductions are calculated based on measurement records and selected default values of the *ex-post* monitored parameters (of which monitoring details are presented in Tables 11 to 18) and also using the values for the ex-ante determined parameter as presented below[17]:

Table 20: Parameters determined ex-ante which are used in the context of emission reduction calculations

Parameter	Value
Global Warming Potential of Methane (GWP_{CH4})	21
CH_4 Density (D_{CH4})	0.0007168 t_{CH4}/m^3_{CH4}
Ajustment Factor (AF)	20%

[17] It is also important to note that as further assessed in Section 4.1.4.3, values for Flare temperature (T_{flare}) and Transmission and Distribution Losses ($TDL_{grid,y}$) were also considered in the context of the determination baseline and project emissions respectively.

It is noteworthy that values of the fixed parameters indicated in Table 20 were selected *ex-ante* in the PDD and were thus not verified as part of this verification assessment.

The GHG emission reductions for each month of the verification period were directly calculated by the *blank* version of the spreadsheet template for emission reduction calculation /65/, this spreadsheet template uses the following data/information as input data:

- monitoring records included in the 7 MS-Excel format "raw-data" spreadsheet files /6/ valid for the verification period
- the *ex-ante* determined parameters presented in the Table 20.

For the verification period from 2011-09-01 to 2012-03-31,7 monthly emission reduction calculation spreadsheets /5/ were thus generated as a result of the use of the spreadsheet template for every month of the verification period. Each one of the 7 monthly emission reduction calculation spreadsheets files /5/ aggregates the following recorded data on a 1-minute basis (folder "Output"):

- LFG flow (data records on a 1-minute basis);
- Methane fraction in the LFG for every hour (data records on a 1-minute basis);
- Temperature of landfill gas (data records on a 1-minute basis);
- Pressure of the landfill gas (measured in mbar and Pa)
- Flare temperature (data records on a 1-minute basis);

An additional summarized emission reduction calculation spreadsheet /5/ correctly summarizes the emission reductions for the whole verification period (by using the accumulated monthly values for the calculation parameter $MD_{flared,y}$ from each one of the 7 monthly emission reduction spreadsheets + *ex-ante* determined parameters as input data).

Moreover, the summarized emission reduction calculation spreadsheet /5/ also applies a conservative deduction factor in calculated accumulated values of parameter $MD_{project,y}$ (for a selected time period) as a result of identified inconsistency in calibration events of the $CH_4/CO_2/O_2$ content gas analyzer unit, LFG temperature sensor and LFG pressure sensor..

Table 21: Deduction in the calculated value of parameter $MD_{Project}$ due to identified measurement deviation/errors and/or delays in the $CH_4/CO_2/O_2$ content gas analyzer unit and LFG temperature and pressure sensor (identified during a calibration events)

Applied conservative deduction in the calculated value of parameter $MD_{project,y}$ for selected time periods due to identified measurement deviation/errors and/or relative delays on the calibration of the $CH_4/CO_2/O_2$ content gas analyzer unit, LFG temperature sensor and LFG pressure sensor			
Period	Instruments/ equipment.	Conservative deduction factor proposed by the project participants	Impact of the applied deductions in the quantity of methane captured and destroyed by flaring ($MD_{project,y}$)
2011-09-06 to 2011-09-16	$CH_4/CO_2/O_2$ content gas analyzer unit	-2.1%	29.86 tCH_4
2011-11-09 to 2011-11-16		-2.0%	22.16 tCH_4
2011-12-10 to 2011-12-12		-2.0%	9.12 tCH_4

2012-01-13 to 2012-01-30		-2.0%	52.09 tCH_4
2012-01-25 to 2012-03-12	LFG temperature sensor	+1.0% (Applied in the reported values of the parameter T)	20.78 tCH_4
2012-01-25 to 2012-03-12	LFG pressure sensor	-1.5% (Applied in the reported values of the parameter P)	

As established by the VVS /1/, the performed calculation of emissions reductions also incorporates the application of a set of conservative correction factors for measured values of Methane fraction in the landfill gas, Temperature of the landfill gas and Pressure of the landfill gas ($w_{CH4,y}$, T and P, respectively) for selected time periods. The application of such correction factors aims to address in a conservative manner the identified measurement deviations/errors and/or delays in calibration events for the LFG temperature sensor, LFG pressure sensor and $CH_4/CO_2/O_2$ content gas analyser unit. It is however noteworthy that the application of all conservative deduction factors reduces the claimed total achieved emission reductions in 2,814 tCO_2e.

All the 7 MS-Excel-format monthly emission reduction calculation spreadsheets files /5/ as well as the summarized emission reduction calculation spreadsheet /5/ were made available and assessed by GLC. While GLC was able to verify that such 7 monthly emission reduction spreadsheets /5/ correctly calculate and present the accumulated values of the calculation parameter "amount of methane actually destroyed/combusted during a given year" ($MD_{project,y}$) for the related months of the verification period, the summarized emission reduction calculation spreadsheet correctly summarizes the emission reductions for the whole verification period (by correctly considering selected data from the monthly emission reduction spreadsheets /5/ + *ex-ante* determined parameters as input data + applied deduction factors in the parameter $MD_{project,y}$). Calculations of baseline emissions and project emissions were correctly performed as per the formulae and methods stated in the PDD /2/, monitoring methodology and applicable tools /13/ /35/ as described and assessed in Section 4.1.4.3. All calculations are thus in accordance with the requirements of:

- Consolidated CDM baseline and monitoring methodology ACM0001–"Consolidated monitoring methodology for landfill gas project activities" (version 2) /11/,
- "Tool to calculate baseline, project and/or leakage CO_2 emissions from fossil fuel combustion" (version 02) /35/
- "Tool to calculate baseline, project and/or leakage emissions from electricity consumption" (version 01) /13/.
- Monitoring plan of the PDD /2/.

Table 22: Reported results of the generated monthly emission reduction spreadsheets and the summarized emission reduction calculation spreadsheet

File name for the monthly emission reduction calculation spreadsheets	Period	Reported amount of methane destroyed ($MD_{project,y}$)
"IMP 403 – Dados Registrador Isodoc Setembro-11.xls"	Sep,. 2011	3,954.67 tCH_4 (3,924.80 tCH_4)

"IMP 403 – Dados Registrador Isodoc Outubro-11.xls"	Oct. 2011	4,435.91 tCH_4
"IMP 403 – Dados Registrador Isodoc Novembro-11.xls"	Nov. 2011	4,094.43 tCH_4 (4,072.27 tCH_4)
"IMP 403 – Dados Registrador Isodoc Dezembro-11.xls"	Dec. 2011	4,699.81 tCH_4 (4,690.69 tCH_4f
"IMP 403 – Dados Registrador Isodoc Janeiro-12.xls"	Jan. 2012	4,482.00 tCH_4 (4,426.67 tCH_4
"IMP 403 – Dados Registrador Isodoc Fevereiro-12.xls"	Feb. 2012	4,539.06 tCH_4 (4,526.73 tCH_4
"IMP 403 – Dados Registrador Isodoc Março-12.xls"	Mar. 2012	5,073.53 tCH_4 (5,068.31 tCH_4)
"Resumo final CO2e 6a auditoria.xls" (Summarized emission reduction calculation spreadsheet for the whole verification period)	From 2011-09-01 to 2012-03-31	31,279 tCH_4 (31,145 tCH_4[1])

1) Calculated by taking into account the conservative deduction factor applied in the value of the calculation parameter $MD_{project,y}$ for selected time periods of the verification period (as presented in Table 21) due to identified measurement deviation/errors and relative delays in the $CH_4/CO_2/O_2$ content gas analyzer unit, LFG temperature sensor and LFG pressure sensor calibration events. Quantitative impact of over the total achieved emission reductions: 2,814. tCO_2e

As verified by the GLC's verification team, while the number of records exceeds 42 000 rows in for each individual MS-Excel format monthly emission reduction spreadsheets /5/, these files are saved in a way that they are protected against intentional or unintentional post editing or modifications. However, it is crucial to note that, as earlier highlighted in this section, when generating the "raw-data" spreadsheet files (which are used as primary input data for each one of the monthly emission reduction spreadsheets), data could be eventually intentionally or unintentionally edited/modified (by using MS-Excel application). Thus, in order to ensure that only authentic (not edited /not modified) data were used as a basis for the emission reduction calculations, a systematic *data authenticity checking* was performed by the GLC's verification team for all the monitored data as detailed in Section 4.1.4.4.

4.1.4.3 GHG calculation approach

Although the baseline methodology ACM0001 (version 2) /11/ and the PDD /2/ do not offer any provisions for calculating emissions associated with the consumption of electricity and LPG by the project activity, for sake of completeness these emissions were correctly calculated and accounted as project emissions. Thus, total GHG emission reductions are calculated as:

Total emission reductions = Baseline emissions (BE) - Project emissions (PE)

Baseline emissions

As established by ACM0001 /11/ and the PDD /2/ , GHG emissions reductions (ER_y) are calculated (in tCO_2e) as follows:

$$ER_y = (MD_{project,y} - MD_{reg,y}) * GWP_{CH4}$$

Where:

$MD_{project,y}$	Quantity of methane captured and destroyed by flaring (in tCO_2) which is calculated as indicated below.
$MD_{reg,y}$	Amount of methane that would have been destroyed/combusted in the absence of the project (in tCO_2),
GWP_{CH4}	Global Warming Potential value for methane, for the first commitment period is 21 tCO_2e/tCH_4

It is important to note that in this formulae project emissions from the consumption of electricity and LPG by the project activity are not accounted. Thus, ER_y is actually equivalent to baseline emissions (BE).

Assessment of the calculation of $MD_{project,y}$: The quantity of methane captured and destroyed by flaring (in tCH_4) which was calculated as follows:

The methane destroyed by the project activity ($MD_{project,y}$) during a year is determinate by monitoring the quantity of methane actually flared and gas used to generate electricity and/or produce thermal energy, if applicable.

$$MD_{project,y} = MD_{flared,y} + MD_{electricity,y} + MD_{thermal,y}$$

As per the implemented design of the project activity, the terms $MD_{electricity,y}$ and $MD_{thermal,y}$ are not considered as the electricity generation using LFG as fuel is not available. All project's electricity demand is met by imports of grid electricity.

Moreover, there is no use of collected LFG for any thermal energy application.

The final equation for $MD_{project,y}$ calculation results:

$$MD_{project,y} = MD_{flared,y}$$

GLC was able to verify that, as per the latest version of the Monitoring Report /3/, the accumulated value for the calculation parameter $MD_{project,y}$ for the period from 2011-09-01 to 2012-03-31 is 31,145 tCH_4 (including the application of a set of conservative deduction factors in the accumulated value for $MD_{project,y}$).

So, the $MD_{flared,y}$ is correctly expressed as:

$$MD_{project,y} = LFG_{flare,y} * w_{CH4,y} * D_{CH4} * FE$$

Where:

$LFG_{flared,y}$ Quantity of landfill gas fed to the flare during the verification period (determined on the basis of measured LFG flow (in normalized cubic meters per hour (Nm^3/h)). The records of the monitoring parameter LFG flow have been recorded and then converted in normalized cubic meters per hour (Nm^3/h).

$w_{CH4,y}$ Average methane content of the collected LFG (in m^3CH_4/m^3LFG). GLC's assessment revealed measurement deviations/errors identified during one of the performed calibrations in the $CH_4/CO_2/O_2$ content gas analyzer unit negatively affects the level of assurance of emission reductions associated with measured values for the period covered by this particular calibration. In order to address this aspect in a conservative manner, the determined accumulated value of the parameter $MD_{project,y}$ for the period potentially affected by such measurement deviations/errors was adjusted by the adoption of a conservative deduction factors which were proposed by the project participants. For further details, see section 4.1.4.2.

D_{CH4} Methane density. *Ex-ante* determined as 0.0007168 t_{CH4}/m^3_{CH4}.

FE Flare efficiency. For the determination of flare combustion/efficiency, the measurements were made on a sampling basis by a third party company, in a quarterly frequency.
As per the test reports issued by Ecosampling Ambiental Ltda, /48/ the calculation of destruction efficiency of methane was carried out by the following formula:

Determination of FE values:

In order to determined FE values, as part of the operation of the monitoring process for the project actvity, Essencis Soluções Ambientais S.A. has hired the third part company "Ecosampling Ambiental Ltda." (which is an inspection company specialized in emission measurements and air pollution inspections) to periodically perform measurements of residual concentration of methane in sample the exhaust gas of the flares (parameter $wCH4_{residual,n,f}$); perform the determination of flow of exhaust gas in the flares(parameter $Flow\_Exhaust\_Gas\_flare_{,n,f}$) and perform the calculations of values for parameter FE based on records for "$w_{CH4residual,n,f}$", "$Flow\_Exhaust\_Gas\_flare_{,n,f}$" and also using monitoring data of inflow of methane to the flare
As outlined in the latest version of the Monitoring Report /3/, the monitoring plan of the PDD does not include any reference about how to perform the related measurements and how to actually calculate the values of FE.
In accordance with ACM0001 version 2 /11/ requirement, the tests/evaluations were performed quarterly by " Ecosampling Ambiental Ltda.".

The verification team assessed the three flare efficiency analysis reports issued by the inspection services company " Ecosampling Ambiental Ltda." and was able to confirm that, for each flare evaluation/test, minimum and maximum values of Methane combustion efficiency (Min._$FE_{n,f}$ and Max._$FE_{n,f}$) were determined/calculated as follows:

- Min._$FE_{n,f}$ = 1- (Max._$CH4_{residual,n,f}$ / Average-$CH4_{Flared,n,f}$)
- Max._$FE_{n,f}$ = 1- (Min._$CH4_{residual,n,f}$ / Average-$CH4_{Flared,n,f}$)

Where:

Min._$FE_{n,f}$ — The lowest calculated value for $FE_{n,f}$

Max._$FE_{n,f}$ — The highest calculated value for $FE_{n,f}$

n — Number of the test/evaluation. Four test/evaluations events were performed during the considered verification period (n = 1, 2 and 3).

f — Flare number identification (f = 1, 2 and 3).

Average-$CH4_{Flared,n,f}$ — Average flow of methane sent to the flare under testing/evaluation during a selected period (in kg CH_4/h). The analysis period is the same time period of which measurements of $wCH4_{residual,n,f}$ were performed. Within the calculation method adopted by "Ecosampling Ambiental Ltda.", records for the monitoring parameter $MD_{project,y}$ (methane destroyed by flaring) were taken into account as follows:

Average-$CH4_{Flared,n,f}$ = $MD_{project,y\text{-}accumulated}$

Where:

$MD_{project,y\text{-}accumulated}$ — Accumulated value of the parameter $MD_{project,y}$ during the analysis period within which measurements of minimum and maximum residual CH_4 concentration in the exhaust gas of the flare (Min._$CH4_{residual,n,f}$ and Max._$CH4_{residual,n,f}$) were measured.

Min._$CH4_{residual,n,f}$ — Minimum of residual flow of methane in the exhaust gas of the flare under evaluation during the selected test/evaluation period (in kg CH_4/h).

Max._$CH4_{residual,n,f}$ — Maximum of residual flow of methane in the exhaust gas of the flare under evaluation during the selected test/evaluation period (in kg CH_4/h).

As per the calculation procedure adopted by "Ecosampling Ambiental Ltda.", Min._$CH4_{residual,n,f}$ and Max._$CH4_{residual,n,f}$ are determined as follows:

Min._$CH4_{residual,n,f}$ = $Flow\_Exhaust\_Gas\_flare_{n,f}$ * Min._$wCH4_{residual,n,f}$ * CF

$$Max.\_CH4_{residual,n,f} = Flow\_Exhaust\_Gas\_flare_{n,f} * Max.\_wCH4_{residual,n,f} * CF$$

Where:

CF	Density of CH_4. As indicated in the flare efficiency analysis reports issued by the third party independent inspection service company "Ecosampling Ambiental Ltda.", the assumed value for density of methane is 0.7168 kg/m^3, which is equal to the value selected in the PDD for the ex-ante determined parameter Density of Methane (D_{CH4}).
$Flow\_Exhaust\_Gas\_flare_{n,f}$	Determined accumulated flow of exhaust gas of the flare (in Nm^3 exhaust gas/h).
$Min.\_wCH4_{residual,n,f}$	Minimum measurement of residual CH_4 concentration in the exhaust gas of the flare (in ppm CH_4)
$Max.\_wCH4_{residual,n,f}$	Maximum measurement of residual CH_4 concentration in the exhaust gas of the flare (in ppm CH_4)

As indicated in the testing/evaluation reports /48/, the measurements of minimum and maximum residual CH_4 concentration in collected sample of exhaust gas of the flares were performed using a gas analyzer FID / California Analytical Instruments (CAI), model 300 M.

The resulted calculated values for FE ($Min.\_FE_{n,f}$ and $Max.\_FE_{n,f}$) for each one of the four valid third party evaluations are indicated in the table below:

Table 23: Calculated values for FE ($Min.\_FE_{n,f}$ and $Max.\_FE_{n,f}$)

n	f	Date of the evaluation/testing	$Min.\_FE_{n,f}$	$Max.\_FE_{n,f}$

1	1	2011-06-01	99.9957%	99.9984%
1	2	2011-06-01	99.9977%	99.9987%
2	1	2011-09-05	99.9946%	99.9984%
2	2	2011-09-05	99.9952%	99.9989%
2	3	2011-09-05	99.9974%	99.9991%
3	1	2011-12-07	99.9963%	99.9990%
3	2	2011-12-07	99.9947%	99.9986%
3	3	2011-12-07	99.9957%	99.9981%

As a conservative approach, the lowest between the calculated values of Min._$FE_{n,f}$ for both flares were considered for application of values of FE for the determination of the calculation parameter $MD_{project,y}$ as follows:

Table 24: Adopted values for FE along the verification period

Period	Adopted value for the monitoring parameter FE
From 2011-09-01 to 2011-09-05	99.9957%
From 2011-09-06 to 2011-12-07	99.9946%
From 2011-12-08 to 2012-03-31	99.9947%

Project emissions

As indicated in the latest version of the Monitoring Report /3/, while neither the PDD /2/ nor ACM0001 (version 2) do not refer to the methodological tools "Tool to calculated project or leakage CO_2 emissions from fossil fuel combustion" /35/ and "Tool to calculate baseline, project and/or leakage emissions from electricity consumption" (version 01) /13/, the project participants assume as appropriate the use of such tools as their application is currently assumed as the correct approach to determine related project emissions due to consumption of LPG and grid electricity by a CDM project activity respectively.
Although the baseline and monitoring methodology ACM0001 (version 2) /11/ and the PDD /2/ do not provide any approach for calculating project emissions from grid electricity consumption and LPG consumption by the project activity, it is GLC's opinion that the use of the methodological tools "Tool to calculate baseline, project and/or leakage emissions from electricity consumption" (version 01) /13/ and "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion" (version 02) /35/ for calculating project emissions is deemed acceptable and correct. More detailed rationale for the application of the "Tool to calculate baseline, project and/or leakage emissions from electricity consumption" (version 01) /13/ is presented in Section 4.1.3.

Project emissions due to the consumption of grid electricity by the project activity:
Project emissions due to the consumption of grid electricity (LE_{EC}) are correctly calculated by following the applicable guidance of the "Tool to calculate baseline, project and/or leakage emissions from electricity consumption" (version 01) /13/ as follows:

$$PE_{EC,y} = EC_{PJ,grid,y} * EF_{grid,CM,y} * (1 + TDL_{grid,y})$$

Where:

$EC_{PJ,grid,y}$ Total amount of grid electricity consumed by the project activity. $EC_{PJ,grid,y}$ is monitored as 1 527.50 MWh during the verification period from 2011-09-01 to 2012-03-31.
The following monthly values for consumption of grid electricity ($EC_{PJ,grid,y}$) are correctly reported:
Sep. 2011: 204.514 MWh
Oct. 2011: 232.210 MWh
Nov. 2011: 205.472 MWh
Dec. 2011: 204.488 MWh
Jan. 2012: 224.868 MWh
Feb. 2012: 237.933 MWh
Mar. 2012: 218.018 MWh

Detailed assessment for monitoring of $EC_{PJ,grid,y}$ is presented in Section 4.1.3.

$TDL_{grid,y}$ Transmission and Distribution losses. The applicable default value of 20% as per the "Tool to calculate baseline, project and/or leakage emissions from electricity consumption" /13/ is selected. Further information about the parameter $TDL_{grid,y}$ is included in a text box in Section 4.1.3.

$EF_{grid,CM,y}$ Combined margin emission factor for consumed grid electricity. As further assessed in Section 4.1.3, the applicable default value of 1.3 tCO_2/MWh as per the "Tool to calculate baseline, project and/or leakage emissions from electricity consumption" /13/ is selected as a conservative measure.

The calculated value for $PE_{EC,y}$ for the verification period from 2011-09-01 to 2012-03-31 is correctly determined as 2,383 tCO_2 (rounded value). All related calculations are provided in the summarized emission reduction calculation spreadsheet /5/. It is the opinion of the GLC's verification team that the decision of the project participants to determine project emissions due to consumption of grid electricity by following the applicable guidance of the "Tool to calculate baseline, project and/or leakage emissions from electricity consumption" (version 01) /13/ is deemed correct and acceptable. All adopted calculations, as reported in the latest version of the Monitoring Report /3/ and emission reduction calculations spreadsheets /5/, are correctly performed and are in accordance with applicable guidance of the related provisions of the "Tool to calculate baseline, project and/or leakage emissions from electricity consumption" (version 01) /13/.

Project emissions due to the consumption of LPG by the project activity:

Project emissions due to the consumption of LPG by the project activity ($PE_{FC,y}$) are correctly determined by following the applicable guidance of the "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion" (version 02) /35/ as follows:

$PE_{FC,y} = FC_{LPG,y} * COEF_{LPG,y}$
Where:

$FC_{LPG,y}$ Quantity of fossil fuel (LPG) consumed by the project activity which is correctly reported as 0.225 ton. Detailed assessment for monitoring of $FC_{LPG,y}$ is presented in Section 4.1.3.

$COEF_{LPG,y}$ Conversion emission factor for fossil fuel (LPG). The Emission factor for LPG ($COEF_{LPG,y}$) is correctly calculated as 3.23 tCO_2e/ton LPG. The calculated value $COEF_{LPG,y}$ corresponds to the product between selected value of Net Calorific Value (NCV) for consumed LPG ($NCV_{LPG,y}$) and selected value of CO_2 emission factor for consumed LPG (in energy basis) ($EF_{CO2,LPG,y}$) as follows:

$NCV_{LPG,y}$ = 0.0492 TJ/ton (value sourced by the Brazilian Energetic Balance Report, year 2011 /53/).

$EF_{CO2,LPG,y}$ = 65.6 tCO_2/TJ (value sourced by IPCC Guidelines for National Greenhouse Gas Inventories, 2006 /12/, Chapter 1, Volume 2, Table 1.4).

The calculated value for $PE_{FC,y}$ is correctly performed in the emission reduction calculations spreadsheet /5/. The rounded value for $PE_{FC,y}$ is 1 tCO_2 (rounded value). It is the opinion of the GLC's verification team that the decision of the project participants to determine project emissions due to consumption of LPG by following the applicable guidance of the "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion" (version 02) /35/ is deemed correct and acceptable. All adopted calculations, as reported in the latest version of the Monitoring Report /3/ and emission reduction calculations spreadsheets /5/, are correctly performed and are in accordance with applicable guidance of the related provisions of "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion" (version 02) /35/.

Total project emissions are correctly reported as 2,384 tCO_2 (rounded value) and are correctly considered in the context of the emission reduction calculations.

Leakage emissions

As per ACM0001 (version 2) /11/, no leakage emissions are to be considered in the context of emission reduction calculations.

4.1.4.4 Checking of data authenticity

As part of the verification assessment, the GLC's verification team was able to confirm that the related emission reduction calculation spreadsheets are basically MS-Excel spreadsheets which, in theory, could have recorded data easily edited/modified (intentionally or unintentionally). Thus, these spreadsheets could potentially tamper reported monitoring records, thus resulting in unreal reported emission reductions. In order to ensure that all calculations are completely based on authentic and real monitoring records the *data authentic check* was performed:

As part of the verification assessment, a *data authenticity check* was performed for monitored data. Such checking aimed to ensure that only authentic/not-modified monitoring records data were used for the emission reduction calculation (thus ensuring that the measurement records made available in the MS-Excel format "raw data" input files /6/ and measurement records reported in the monthly emission reduction spreadsheets were not intentionally or unintentionally edited/modified during the generation of these files). The *data authenticity check* involved the following steps:

STEP 1: Assessment and handling of the measurement data in PDF-format: Since the "raw data" input files available for the checking of data authenticity, are the back-up files in PDF format (MS-Excel files are regularly copied and pasted into a customized MS-Excel based emission reduction calculation spreadsheet (designed by Essencis Soluções Ambientais S.A.), internally denominated as "IMP 403 – Dados Registrador Isodoc" as input data to calculate*),* GLC's verification team has assessed these PDF files, which were retrieved from data supervisor system model E3 unit of the LFG extracting and flaring station during the conducted on-site visit, and converted in a format appropriate for editing (.txt.). *O*nce again these files are converted in MS-Excel format for re-calculation purposes. The result of this step was the "generation" of a set of comparative MS-Excel format "*raw-data for checking*" files (of which the number of records exceeds 44,000 rows in each one).

STEP 2: Re-calculation of emission reductions: By using the set of new MS-Excel format "*raw-data for checking*" files (generated under STEP 1) as input data, the emission reductions were re-calculated on a monthly basis using the *blank* version of the spreadsheet template for emission reduction calculation (also in ".xls" format). Moreover, correct values for the *ex-ante* determined parameters and monitored data for electricity consumption for the project activity were also inserted in the spreadsheet template for emission reduction calculation by as input data. As a result of this step, a set of comparative emission reduction spreadsheet /63/ were thus created. This step was performed by the GLC's verification team by using the *blank* version of the spreadsheet template for emission reduction calculation and by following the available written guidance (internal work procedure) of Essencis Soluções Ambientais S.A. for calculating the emission reductions.

STEP 3 – Comparison of emission reduction calculation spreadsheets and analysis of the results: The calculated accumulated monthly values of the parameter $MD_{project,y}$ in each one of the comparative monthly emission reduction spreadsheets /63/ (files generated under STEP 2) were compared against the corresponding accumulated values for the parameter $MD_{project,y}$ in each one of the emission reduction spreadsheets previously generated by the project participants as part of the monitoring/reporting process.

As a result of STEP 3, by comparing files previously generated by the project participants against the files generated under STEP 2, the GLC's verification team was able to confirm that the generated monthly checking spreadsheets /63/ are identical to the monthly emission reduction calculation spreadsheets previously generated by the project participants as part of the monitoring/reporting process. While no deviations or differences were found when comparing the files, and by assuming that PDF-format data is a reliable, un-editable and authentic monitoring data (by taking for grant that data earlier recorded in the data supervisor system model E3 unit cannot be edited or modified), the performed *data authenticity check* has thus successfully and sufficiently confirmed that only authentic and not-modified monitored measurement data (from the installed data supervisor system model E3)

were previously used by the project participants for the calculation of emission reductions reported in the Monitoring Report.

4.1.4.5 Correctness, consistency and summary of reported emission reductions

As a result of the performed verification assessment, the GLC's verification team was able to confirm that the determination of achieved GHG emission reductions are performed and reported in a correct, objective and transparent manner.
Determination of baseline and project emissions are thus in accordance with the requirements of:

- Monitoring plan and other related provisions of the PDD /2/.
- Approved baseline and monitoring methodology ACM0001 – 'Consolidated monitoring methodology for landfill gas project activities" (version 2) /11/,
- Tool to calculate baseline, project and/or leakage emissions from electricity consumption (version 01) /13/.
- Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion" (version 02) /35/

All figures and input data as well as all performed calculations were checked and were found to be reported in a deemed correct, appropriate and transparent manner in the latest versions of the Monitoring Report /3/ and emission reduction calculation spreadsheets /5/.

Furthermore, GLC was able to confirm that the emission reductions reported for the verification period from 2011-09-01 to 2012-03-31 are based on authentic measurements of LFG related monitoring data and are based on the application of a semi-automatic and systematic data monitoring procedure for LFG related monitoring data. All *ex-post* monitoring data (with exception of (i) monitoring of the consumed amount of grid electricity; (ii) consumed amount of fossil fuel (LPG); (iii) determined values for flare efficiency; (iv) adopted emission factors for LPG; (v) adopted emission factors for grid electricity and (vi) assumed value for transmission and distribution losses of grid electricity ($TDL_{grid,y}$)) are based on semi-automatic measurements performed at the project site. Moreover, as also assessed by the GLC's verification team, LFG related monitoring data records were correctly retrieved and utilized in the emission reduction calculation spreadsheets /5/ for performing related calculation and reporting of achieved emission reductions for the period from 2011-09-01 to 2012-03-31.

GLC was thus able to verify that in general all calculation and reporting procedures were adopted in a deemed transparent, correct and reliable manner.

As a conclusion, GLC thus confirms that the reported achieved emission reductions for verification period from 2011-09-01 to 2012-03-31 are in accordance with all measurement, reporting and calculation requirements of the monitoring plan of the PDD /2/, monitoring and baseline methodology ACM0001 (version 2) /11/ and adopted CDM tools /13/ /35/.

GLC thus confirms that, as presented in the latest version of emission reduction spreadsheets /5/ and Monitoring Report /3/, the project has achieved GHG emission reductions as follows:

Emission reductions for the verification period from 2011-09-01 to 2012-03-31:	520,295 tCO_2e

4.1.4.6 Comparison of verified emission reductions against *ex-ante* emission reduction estimation indicated in the PDD

As part of the verification assessment, total emission reductions achieved and reported for the verification period from 2011-09-01 to 2012-03-31 were compared against the related *ex-ante* estimation of emission reductions as per the PDD /2/. The results of such comparisons are presented and assessed below:

Table 25: Comparison of achieved emission reductions against *ex-ante* estimation of emission reductions in the PDD

Period	Ex-ante estimation of emission reductions as per the PDD (tCO_2e)	Achieved emission reductions (tCO_2e)[18]
From 2011-09-01 to 2012-03-31	-	520,295
ER year 2011	1,161,016	-
ER 1 from 2011-09-01 to 2011-12-31	387,005 (calculated share of ex-ante estimation of emission reductions assumed as valid for the 4-month period within year 2011 = 4 months/12 months * ER year 2011).	297,311 (calculated share of achieved emission reductions assumed as valid for the 4-month period within year 2011 = 4 months/7 months * Achieved emission reductions).
ER year 2012	1,382,469	-
ER 2 from 2012-01-01 to 2012-03-31	345,617 (calculated share of ex-ante estimation of emission reductions assumed as valid for the 3-month period within year 2012= 3 months/12 months * ER year 2012).	222,984 (calculated share of achieved emission reductions assumed as valid for the 3-month period within year 2012 = 3 months/7 months * Achieved emission reductions).

For the 4-month period within year 2011 (from 2011-09-01 to 2011-12-31), the achieved emission reductions for the project activity are about ~ 33% lower than the assumed 4-month period comparable value for the *ex-ante* estimation of emission reductions as per the PDD /2/.

[18] The calculated shares of achieved emission reductions assumed as valid for the 4-month period within year 2011 and valid for the 3 month period within year 2012 were determined in this section by applying the same approach/rationale as for related ex-ante estimations of emission reductions in the PDD for sake of simplification.

For the 3-month period within year 2012 (from 2012-01-01 to 2011-03-31), the achieved emission reductions for the project activity are about ~ 45% lower than the assumed 3-month period comparable value for the *ex-ante* estimation of emission reductions as per the PDD /2/.

As assessed below, Section E.6 of the latest version of the Monitoring Report /3/ presents a set of factors and aspects which sufficiently explains the occurred differences between achieved/verified emission reductions and the *ex-ante* estimation of emission reductions as per the PDD /2/.

Aspects/conditions which represent increment factors of reported emission reductions for the considered verification period when compared against the ex-ante estimation of emission reduction for the same period in the PDD:

No use of any share of collected LFG as fuel by a local industry:
As opportunely highlighted in Section E.6 of the Monitoring Report /3/ a total of 15,698 tCH_4 would be sold as gaseous fuel to a local industry per year during years 2011 and 2012 without having associated methane emission reductions being claimed as CERs.(parameter $MD_{industry}$). That was considered in the context of the earlier determination of the *ex-ante* estimation of emission reduction in the PDD (where the value of the parameter MD_{reg} was assumed as equal to $MD_{industry}$). During the verification period, MD_{reg} was correctly calculated as $MD_{project}$ * 20% (where 20% is the ex-ante determined value for parameter AF in cases $MD_{industry,y}$ = zero). As the determined value for "$MD_{project,y}$ * 20%" within the 7-month length monitoring period (= 6,255 tCH_4) is indeed lower than 9,157 tCH_4 (equivalent amount for the considered verification period encompassing 7 months, calculated as 15,698 tCH_4, * 7/12 months), that represents a relative increase of reported emission reductions when compared to earlier related estimations in the PDD.

Aspects/conditions which represent a decrease factor of reported emission reductions for the considered verification period when compared against the ex-ante estimation of emission reduction for the same period in the PDD:

Uncertainties associated with the application of First Order Decay (FOD) multi-phased model for estimating the emission reductions in the PDD:
Like any other CDM project activity encompassing LFG collection and destruction/utilization, all potential uncertainties associated with the application of the First Order Decay (FOD) multi-phased model in the context of the *ex-ante* estimation of emission reductions in the PDD /2/ are applicable for the *ex-ante* estimation of emission reductions for the "Caieiras landfill gas emission reduction.

The GLC's verification team acknowledges that the LFG collection efficiency also plays an important role in differences between the achieved emission reductions and related ex-ante estimations of emission reductions as per the PDD. Recently published literature on the topic /38/ /39/ /40/ has shown that LFG collection efficiency for well-engineered landfills with forced LFG extracting systems ranges from 50% up to 90% (depending on the design and operation of the LFG extracting system). While the GLC's verification team also acknowledges that there are indeed several operational and performance aspects for a typical LFG collection and destruction project activity that negatively influences the potentially achieved average LFG collection and destruction efficiency, in the particular context of the "Caieiras landfill gas emission reduction", it is reasonable to assume that the average achieved LFG collection efficiency during the considered verification period was lower than the one earlier assumed in the context of the ex-ante estimation of emission reductions.

Accounting of project emissions:
Ex-ante estimation of emission reductions in the PDD do not account project emissions due to grid electricity and LPG consumption.

As a conclusion, by taking into account all the aspects listed above, it is the opinion of the GLC's verification team that the occurred relative differences between the achieved emission reductions and the PDD's ex-ante estimation of emission reductions for the period from 2011-09-01 to 2012-03-31 is deemed acceptable, plausible and reasonable.

4.1.4.7 Monitoring Management and quality assurance

As verified by the GLC's verification team, competent and trained employees are recruited for operating the project activity and handling related monitoring data. Such employees are found with knowledge not only about the operation of the project activity but also with sufficient knowledge and competence to ensure the application of all related QA/QC procedures for data recording and storage.

As assessed by the GLC's verification team, the project activity is operated by following guidance and instructions of internal documented working procedures.

Sections 4.1.4.1 and 4.1.4.2 include detailed descriptions and assessments of procedures for data collection, data reporting, QA/QC, calibration and other aspects related to the adopted procedures for determining the emission reductions for the verification period from 2011-09-01 to 2012-03-31. These procedures are systematically implemented by Essencis Soluções Ambientais S.A..

During the conducted on-site visit to the project site, the verification team was thus able to verify that the operational structure of the project activity is also in line with the information made available in the PDD /2/ and in the Monitoring Report /3/. GLC was also able to verify that detailed management and operational work procedures are in place. An operational structure for the project activity is established with responsibilities clearly identified. Moreover trained staff is employed to ensure the data quality. As a conclusion, GLC was thus able to verify that a reliable monitoring mechanism was established and systematically implemented by Essencis Soluções Ambientais S.A..

The GLC's verification team was thus able to conclude that evidences, data and calculations are sufficiently and correctly provided for the achieved emission reductions reported for the verification period from 2011-09-01 to 2012-03-31.

By verifying the application of the monitoring plan, GLC was able to confirm that the project was implemented and operated as described in the PDD /2/ during the period from 2011-09-01 to 2012-03-31.

Section 4.1.3 includes detailed descriptions and assessments of procedures for data collection, data reporting, QA/QC, calibration and other aspects related to the adopted procedures for determining the emission reductions for the verification period from 2011-09-01 to 2012-03-31. These procedures are systematically implemented by Essencis Soluções Ambientais S.A..

During the conducted on-site visit to the project site, the verification team was thus able to verify that the operational structure of the project activity is also in line with the information made available in the PDD /2/ and in the Monitoring Report /3/. GLC was also able to verify that detailed management and operational work procedures are in place. An operational structure for the project activity is established with responsibilities clearly identified. Moreover trained staff is employed to ensure the data quality. As a conclusion, GLC was thus able to verify that a reliable monitoring mechanism was established and systematically implemented by Essencis Soluções Ambientais S.A..

The verification team concludes that evidences, data and calculations are sufficiently and correctly provided for the emission reductions reported for the verification period from 2011-09-01 to 2012-03-31.

By verifying the application of the monitoring plan, GLC was able to confirm that the project was implemented and operated as described in the PDD /2/ during the period from 2011-09-01 to 2012-03-31.

4.2 Remaining issues, FARs from previous validation or verification

By assessing the earlier issued Validation Report /10/ for the project activity, the GLC's verification team identified no missing steps or open issues from the validation phase of the project activity, which are to be addressed in the context of the verifications. Thus, there were no pending issues from the validation phase of the project activity. Furthermore, by assessing the verification reports for previous verifications, the GLC's verification team identified no FARs to be considered/addressed in the context of the 6th and future verifications.

4.3 Identified correction and improvement needs during the verification assessment and differences between the initial and final version of the Monitoring Report

The performed document review and the conducted on-site visit revealed that a set of corrections were needed to be implemented in the latest version of the Monitoring Report /3/ and supporting documents in order to make such documents fully in accordance with applicable CDM requirements and criteria. In order to have all identified inconsistencies addressed by the project participants, the GLC's verification team raised 10 (ten) CARs and no (zero) CL.

The raised 10 CARs were sufficiently addressed by Essencis Soluções Ambientais S.A.. In order to address the raised CARs and CLs reported emission reduction calculations were corrected and improved. Moreover information made available in the Monitoring Report /3/ was also corrected and improved. GLC considers actions taken by Essencis Soluções Ambientais S.A. to be appropriate and has thus successfully closed all these 10 CARs.

Upon successful closure of the raised CARs and based on the on-site findings and the reviewed project documentation; the verification team confirms that there are no remaining non-conformities related to the application of the monitoring plan and no further improvements in terms of monitoring or reporting are needed. Moreover, GLC also confirms that as per the latest version of the Monitoring Report /3/, no mistakes or mismatches have been made in applying assumptions, data or performing the calculations of emission reductions which would impair the determination of emission reductions.

As a conclusion, GLC thus confirms that the application of the CDM baseline and monitoring methodology ACM0001 (version 2) /11/ , as per the monitoring plan of the PDD /2/ is correct and transparent during the verification period from 2011-09-01 to 2012-03-31.

As a result of the GLC's verification assessment, corrections and significant improvements in the Monitoring Report were implemented by Essencis Soluções Ambientais S.A.. The differences between the initial /4/ and final version of the Monitoring Report (version 2 dated 2013-01-25) /3/ are summarized in Table 8:

Table 26: Summary of differences/changes between the first version of the Monitoring Report made available for the verification assessment (Monitoring Report version 1 dated 2012-05-08 /4/) and the latest version of the Monitoring Report (Monitoring Report(version 2 dated 2013-01-25 /3/)

Summarized description of the changes in the Monitoring Report (and supporting documents, i.e emission reduction calculation spreadsheet(s).	CAR/CL triggering the change in the document
Values of accumulated quantity of MSW disposed at the end of the monitoring period and the average rate of disposal of MSW at the CTR Caieiras landfill were corrected in the Monitoring Report. A revised version of the PDD was submitted in the context of a request of approval of post-registration changes (as part of the previous 5th verification). The revised PDD (version 4) included the following corrections (in information that do not affect the project design): - Revised quantitative information about occurred and forecasted disposal of municipal solid waste (MSW) at the CTR Caieiras landfill from the period from year 2007 onwards; - Revised ex-ante estimations of emission reductions (due to revision of the amount of MSW historically disposed in the landfill as well as revised MSW disposal forecasts from year 2007 onwards); - Corrections of minor typo errors/mistakes and general text improvements.	CAR 1
A clarification that the project activity was implemented and remain being operated without any commercial utilization of collected LFG (LFG being sold to a local industry or LFG being internally used a fuel to power a thermal desorption unit) was added. Moreover, an explanative box with details about the occurred field research work involving electricity generation with LFG (which was performed in the project site during the period from April 2009 to June 2009 and in the framework of a technical cooperation agreement between Biomass Center Institute (CENBIO) of University of São Paulo and Essencis) was added in the Monitoring Report. As indicated in the explanative box, no amount of measured LFG was used/consumed for electricity generation and no generated electricity was actually internally used or exported to the grid.	CAR 2
Values for the parameters $NCV_{LPG,y}$ and $EF_{CO2,LPG,y}$ were corrected as per the applicable guidance of the "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion". Moreover, the symbol of all parameters related to the calculation of project emissions were corrected as per the respective methodological tools.	CAR 3

A description of the relevant abnormal events which occurred during the considered monitoring period (including the total time the project activity was out of operation due to different reasons as power outage, equipment maintenance, calibration events, pipe drainage, problems in the PLC panel, etc.) was included in the Monitoring Report.	CAR 4
Several terminology, grammar and typo mistakes/inconsistencies were corrected in the Monitoring Report.	CAR 5
Details about the calibration event performed on the weight scale used by the local LPG supplier to measure LPG delivered to the project activity were included and texts referring to the lack of calibration evidences for the weight scale were removed from the Monitoring Report. Moreover, project emissions due to the consumption of LPG by the project activity were re-calculated by considering the corrected value of $FC_{LPG,y.}$	CAR 6
Emission reductions were re-calculated by considering the application of conservative deduction factors in order to address the identified non-compliance of the calibration frequency requirement for the LFG temperature sensor, LFG pressure sensor and the $CH_4/CO_2/O_2$ content gas analyzer unit as well as measurement deviation/errors identified during selected calibration events performed in the $CH_4/CO_2/O_2$ content gas analyzer unit.	CAR 7
Values of grid electricity consumed by the project activity were corrected in the Monitoring Report. Moreover, project emissions were re-calculated by taking into account the corrected values of grid electricity consumed by the project activity.	CAR 8
Details about the period in use of each thermocouple installed to measure temperature of the exhaust gas of the flares were revised.	CAR 9
Details about the second calibration event performed on both electricity meters installed at the project site were added.	CAR 10

4.4 Post Registration Changes

This assessment:

☒ Does not include any post registration changes and therefore this section is not applicable to this project activity.

☐ Includes changes as part of the request for issuance. The assessment of the changes is done in a separated document.

☐ Includes changes that required prior approval of the Board. The assessment of the changes was done in a separated document.

It is noteworthy that, as earlier assess in Section 1, as part of the previous 5th verification for the project activity (monitoring period from 2010-10-01 to 2011-08-31), a revised version of the PDD was included in the context of a request of approval of permanent post-registration changes which was submitted to UNFCCC in March 2013 under the "issuance" process track.

The revised version of the PDD (version 4, dated 2013-01-10 /2/) includes the following post-registration changes of which represent changes under the category "Corrections" (in information that do not affect the project design):

- Revised quantitative information about occurred and forecasted disposal of municipal solid waste (MSW) at the CTR Caieiras landfill from the period from year 2007 onwards;
- Revised ex-ante estimations of emission reductions (due to revision of the amount of MSW historically disposed in the landfill as well as revised MSW disposal forecasts from year 2007 onwards);
- Corrections of minor typo errors/mistakes and general text improvements.

While the revised version of the PDD (version 4, dated 2013-01-10 /2/) addresses changes (which do not affect the project design), such changes were regarded as deemed correct and acceptable by GLC in the context of its earlier assessment.

5 VERIFICATION STATEMENT

Germanischer Lloyd Certification GmbH (GLC) has performed the 6th verification assessment for the CDM project activity "Caieiras landfill gas emission reduction" (UNFCCC CDM project number 0171), with regards to the relevant requirements for verification of a registered CDM project activity.

The performed CDM verification assessment covered the verification period from 2011-09-01 to 2012-03-31 (including both days).

It is GLC's responsibility to express an independent verification statement and opinion for the reported GHG emission reductions from the considered CDM project activity.

The project activity is implemented and has operated at the CTR Caieiras landfill, which is located in the Municipality of Caieiras, Brazil. As also confirmed by GLC, in accordance with related project design information (as per the revised version of the Project Design Document (PDD) for the project activity), the operation of the project activity resulted in mitigation of methane (CH_4) and carbon dioxide (CO_2) emissions during the monitoring period from 2011-09-01 to 2012-03-31. As per the project design, CH_4 emissions are mitigated through collection and combustion of landfill gas (LFG) in high temperature enclosed flares. LFG is rich in CH_4.

The project participant Essencis Soluções Ambientais S.A. has been responsible for the collection of monitoring data in accordance with the monitoring plan of the PDD. Essencis Soluções Ambientais S.A. has also been responsible for all calculations and reporting of GHG emissions reductions achieved by the project activity during the considered monitoring period.

The GLC's verification team performed its verification assessment and provided its verification opinion on the basis of the provisions and requirements of the consolidated baseline and monitoring methodology ACM0001 – "Consolidated monitoring methodology for landfill gas project activities" (version 2). The monitoring plan of the PDD and the latest version of Monitoring Report (version 2 dated 2013-01-25) are also considered in the context of the verification opinion provide by GLC.

The performed verification assessment included:

checking whether the design of the project is implemented and installed as planned and described in the project design document;

i) checking whether the project activity was implemented and has operated in accordance with related project design details as described in the revised version of the PDD for the project activity;
ii) checking whether the provisions of the monitoring methodologies and the monitoring plan (as per the revised PDD) were consistently and appropriately considered and applied;
iii) assessment of all documented evidences which supports the reported data and achieved emission reductions during the considered monitoring period;
iv) checking whether the installed monitoring equipment/instruments required for measuring ex-post determined parameters (of which monitoring records are required for calculating emission reductions) were calibrated and have operated appropriately.

The GLC's verification approach draws on an understanding of the risks associated with reporting of GHG emission data and the controls in place to mitigate these. GLC planned and performed the verification assessment by obtaining evidence, information and explanations that GLC considered necessary to be able to provide, with reasonable level of assurance that reported GHG emission reductions are real and are fairly stated. It is the opinion of GLC that GHG emission reductions for the

project " Caieiras landfill gas emission reduction" for the monitoring period from 2011-09-01 to 2012-03-31 as reported in the latest version of the Monitoring Report issued on 2013-01-24 (version 2) are calculated without material misstatements in a conservative and appropriate manner.

Germanischer Lloyd Certification GmbH (GLC) herewith confirms that emission reductions achieved by the CDM project activity Caieiras landfill gas emission reduction during the monitoring period from 2011-09-01 to 2012-03-31 are free from material errors, omissions or misstatements. Thus, GLC confirms, with a reasonable level of assurance, that the project activity achieved during the considered monitoring period emission reductions as follows:

Emission reductions for the verification period from 2011-09-01 to 2012-03-31:	520,295 tCO_2e.

Hamburg, 2013-04-11

Markus Weber

Germanischer Lloyd
Certification

6 REFERENCES

Reference	Author: Title, version, date of issue
/1/	UNFCCC/CDM-EB: Clean Development Mechanism Validation and Verification Standard (VVS), version 03.0 as per EB70.
/2/	Essencis Soluções Ambientais S.A.: Revised Project Design Document (PDD) for the CDM project activity: "Caieiras landfill gas emission reduction" Version 4, dated 2013-01-10.
/3/	Essencis Soluções Ambientais S.A.: Monitoring Report for the CDM project activity "Caieiras landfill gas emission reduction" – verification period from 2011-09-01 to 2012-03-31, version 2, dated 2013-01-25
/4/	Essencis Soluções Ambientais S.A.: Monitoring Report for the CDM project activity "Caieiras landfill gas emission reduction" – verification period from 2011-09-01 to 2012-03-31, version 1, dated 2012-05-08.
/5/	Essencis Soluções Ambientais S.A.: Emission reduction calculation spreadsheets for the CDM project activity "Caieiras landfill gas emission reduction" for the verification period from 2011-09-01 to 2012-03-31. Set of 7 monthly emission reduction spreadsheets (one for each month of the verification period) + summarized emission reduction spreadsheet. File names: "IMP 403 - Dados Registrador Isodoc Setembro-11.xls" "IMP 403 - Dados Registrador Isodoc Outubro-11.xls" "IMP 403 - Dados Registrador Isodoc Novembro-11.xls" "IMP 403 - Dados Registrador Isodoc Dezembro-11.xls" "IMP 403 - Dados Registrador Isodoc Janeiro-12.xls" "IMP 403 - Dados Registrador Isodoc Fevereiro-12.xls" "IMP 403 - Dados Registrador Isodoc Março-12.xls" "Resumo final CO2e 6a auditoria.xls"
/6/	Essencis Soluções Ambientais S.A.: Input data for the emission reduction calculation spreadsheets for the project activity "Caieiras landfill gas emission reduction" valid for the verification period from 2011-09-01 to 2012-03-31. File names: "*Set-2011.xls"* *"Out-2011.xls"* *"Nov-2011.xls"* *"Dez-2011.xls"*

Reference	Author: Title, version, date of issue
	"Jan-2012.xls" *"Fev-2012.xls"* *"Mar-2012.xls"*
/7/	Digimat Montagem e Instrumentação Ltda.: Operation and Installation Manual for the Annubar element Sonda 6 (differential pressure type flow meter).
/8/	UNFCCC: Kyoto Protocol to the United Nations Framework Convention on Climate Change (1998)
/9/	UNFCCC: Decision 3/CMP. 1 (Marrakesh – Accords)
/10/	Det Norske Veritas Certification A/S: Validation Report for the CDM project activity "Caieiras landfill gas emission reduction", Report No. 2005-0458, Revision No. 04, dated 2005-12-12.
/11/	UNFCCC/ CDM-EB: Consolidated baseline and monitoring methodology ACM0001 - "Consolidated monitoring methodology for landfill gas project activities, version 2.
/12/	IPCC: 1996 IPCC Guidelines for National Greenhouse Gas Inventories: work book IPCC: 2006 IPCC Guidelines for National Greenhouse Gas Inventories: work book
/13/	CDM-EB: "Tool to calculate baseline, project and/or leakage emissions from electricity consumption", version 01
/14/	Elus Serviços de Instrumentação Ltda.: Certificate of Calibration for the data converter/transmitter unit model EJA 110A, S/N 27EA26928, manufactured by Yokogawa Electric Corporation. Certificate No. E1192/11. Calibration event performed on 2011-05-18. Issuance date 2011-05-18.
/15/	Contemp Laboratório de Metrologia: Calibration certificate for Pressgage pressure sensor (Serial No. 12016707067). Certificate No. 3917-12. Calibration event date: 2012-03-12. Certificate issuance date: 2012-03-14.
/16/	Contemp Laboratório de Metrologia: Calibration certificate for Pressgage pressure sensor (Serial No. 43608). Certificate No. 1523-11. Calibration event date: 2011-01-25. Certificate issuance date: 2011-02-04.
/17/	Contemp Laboratório de Metrologia: Calibration certificate for Pressgage STP 100

Reference	Author: Title, version, date of issue
	temperature sensor. Certificate No. 3913-12. Calibration event date: 2012-03-13. Certificate issuance date: 2012-03-14.
/18/	Contemp Laboratório de Metrologia: Calibration certificate for Pressgage STP 100 temperature sensor. Certificate No. 1522-12. Calibration event date: 2011-01-25. Certificate issuance date: 2011-02-03.
/19/	Contemp Laboratório de Metrologia: Calibration certificate for Thermocouple NKTC-3000, type S, manufactured by Naka Instrumentação Industrial Ltda. (Serial No. 79656). Certificate No. 3911-12. Calibration event date: 2012-03-12. Certificate issuance date: 2012-03-14.
/20/	Contemp Laboratório de Metrologia: Calibration certificate for Thermocouple NKTC-3000, type K, manufactured by Naka Instrumentação Industrial Ltda. (Serial No. 51747). Certificate No. 7417-11. Calibration event date: 2011-05-02. Certificate issuance date: 2011-05-13. Contemp Laboratório de Metrologia: Calibration certificate for Thermocouple NKTC-3000, type K, manufactured by Naka Instrumentação Industrial Ltda. (Serial No. 51747). Certificate No. 3902-12. Calibration event date: 2012-03-12. Certificate issuance date: 2012-03-14.
/21/	Contemp Laboratório de Metrologia: Calibration certificate for Thermocouple NKTC-3000, type K, manufactured by Naka Instrumentação Industrial Ltda. (Serial No. 51748). Certificate No. 7416-11. Calibration event date: 2011-05-02. Certificate issuance date: 2011-05-13. Contemp Laboratório de Metrologia: Calibration certificate for Thermocouple NKTC-3000, type K, manufactured by Naka Instrumentação Industrial Ltda. (Serial No. 51748). Certificate No. 3901-12. Calibration event date: 2012-03-12. Certificate issuance date: 2012-03-14.
/22/	Essencis Soluções Ambientais S.A.: Registered Project Design Document (PDD) for the CDM project activity: “Caieiras landfill gas emission reduction” Version 3, dated 2005-09-12.
/23/	Essencis Soluções Ambientais S.A.: Set of 20 internal calibration notes for the Infrared CH_4 content gas analyzer unit Yokogawa IR 200 with serial number 6EG5195. Dates of the performed calibration events: - 2011-08-23 - 2011-09-06 - 2011-09-16

Reference	Author: Title, version, date of issue
	- 2011-09-26 - 2011-10-06 - 2011-10-17 - 2011-10-25 - 2011-11-16 - 2011-11-25 - 2011-12-12 - 2011-12-26 - 2012-01-03 - 2012-01-13 - 2012-01-30 - 2012-02-07 - 2012-02-21 - 2012-02-27 - 2012-03-12 - 2012-03-22 - 2012-04-02
/24/	Naka Instrumentação Industrial Ltda.: Calibration certificate for electricity meter model MULT K (Serial No. 234215) "ME Plant", manufactured by KRON Instrumentos Elétricos Ltda. Certificate No. R-0701/12. Calibration event date: 2012-03-19. Certificate issuance date: 2012-04-03.
/25/	White Martins Gases Industriais Ltda.: Set of certificates for the cylinder of pattern gases used for the calibration of the $CH_4/CO_2/O_2$ content gas analyzer unit: - Gas cylinders with 60% CH_4 pattern gas: cylinder n° 11916 (supplied by White Martins Gases Industriais Ltda.). Dated 2011-06-22. - Gas cylinders with 60% CH_4 pattern gas: cylinder n° 13874F (supplied by White Martins Gases Industriais Ltda.). Dated 2011-08-11. - Gas cylinders with 60% CH_4 pattern gas: cylinder n° 14028D (supplied by White Martins Gases Industriais Ltda.). Dated 2011-02-17.
/26/	Essencis Soluções Ambientais S.A.: Completed Modalities of Communication (MoC) form for the CDM project activity "Caieiras landfill gas emission reduction" Latest version dated 2011-01-12.
/27/	SGS United Kingdom Ltd: CDM Verification and Certification Report for the CDM project activity "Caieiras landfill gas emission reduction". 1st verification (verification period from 2006-03-31 to 2007-10-31; UK AR6 CDM Verification; Issue 3; CDM.VER0241. Dated 2011-01-18.

Reference	Author: Title, version, date of issue
/28/	Cia Ultragaz S.A.: Communication explaining the adopted procedure at Cia Ultragaz S.A. for measuring quantity of LPG regularly delivered to Essencis Soluções Ambientais S.A. including confirmation of supplied amount of LPG during the periods October 2010 to August 2011 and from September 2011 to March 2012. Dated November 2012-05-11.
/29/	KRON Instrumentos Elétricos Ltda.: Technical Specification sheet for the electricity meters MULT K. "Multimedidor Mult-K / Ficha técnica – K0001", rev. 6, dated 17 February 2009. Available online: http://www.bagarel.com.br/coel/boletins%20tecnicos/Boletim_MICO.pdf
/30/	KRON Instrumentos Elétricos Ltda.: Communication confirming that: - electricity meters model MULT K are calibrated at the production facility prior to be delivered for commercialization. - The electricity meters MULT K with S/Ns 234215 and 465025 were calibrated by KRON Instrumentos Elétricos Ltda. on 2007-03-05. Communication dated 2007-11-20.
/31/	Mettler-Toledo Inc.: User manual for the weight scale 2180. Available online: http://www.toledobrasil.com.br/suporte/manuais/mu2180piso140404.pdf
/32/	Contemp Laboratório de Metrologia: Calibration certificate for Thermocouple NKTC-3000, type K, manufactured by Naka Instrumentação Industrial Ltda. (Serial No. 51856). Certificate No. 7495-11. Calibration event date: 2011-05-03. Certificate issuance date: 2011-05-13.
/33/	CDM-EB: "Guidelines on assessment of different types of changes from the project activity as described in the PDD". EB48/Annex 67.
/34/	GLC: Germanischer Lloyd CDM Procedures.
/35/	CDM-EB: "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion" (Version 02). EB41/Annex 11.
/36/	GLC: List of Findings for the 6th verification of the CDM project activity "Caieiras landfill gas emission reduction". Dated 2012-06-15 (initial version)

Reference	Author: Title, version, date of issue
/37/	GLC: Verification Questionnaire for the 6th verification of the CDM project activity "Caieiras landfill gas emission reduction". Dated 2013-01-30 (latest version)
/38/	Designing a Landfill Gas to Energy Project: Rules of Thumb and Questions to Ask. Intermountain CHP Application Center Workshop - Intermountain Workshop. CHP Bioenergy for Landfills and for and Wastewater Treatment Plants. SCS Engineers. Dated 2005-08-11. Available online: http://www.intermountaincleanenergy.org/events/landfills/050811/presentations/pierce-designing.pdf
/39/	Landfill Gas Collection System Efficiencies (2007). Solid Waste Association of North America (SWANA). Report dated 2007.
/40/	California Environmental Protection Agency. Evaluation of Landfill Gas Collection Efficiency. Appendix D. Dated year 2009. Available online: http://www.arb.ca.gov/regact/2009/landfills09/appd.pdf
/41/	UNFCCC / CDM-EB: "Tool to calculate the emission factor for an electricity system". Version 01.1 as per EB35
/42/	Essencis Soluções Ambientais S.A.: Internal service and maintenance log book (with details about historical of interventions, service and instrument/equipment calibration and replacement in the project activity "Caieiras landfill gas emission reduction").
/43/	UNFCCC / CMP.7: Materiality standard under the clean development mechanism" Advance unedited version. Available online: (http://unfccc.int/files/meetings/durban_nov_2011/decisions/application/pdf/cmp7_cdm_.pdf)
/44/	Pressgage instrumentos de Medição e Controle: Specification details for the pressure sensor model TPI-PRESS. Available online: http://www.pressgage.com.br/25.pdf
/45/	Elus Serviços de Instrumentação Ltda.: Calibration Certificate for the annubar element Digimat Sonda 6. Certificate No. E1194/11. Calibration date: 2011-05-18. Certificate issuance date: 2011-05-18
/46/	Pressgage instrumentos de Medição e Controle: Specification details for the temperature sensor model PT-100 (MRT 0403L). Available online: http://www.pressgage.com.br/stp_100.pdf

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/47/	Yokogawa Electric Corporation: General Specifications, Differential Pressure Transmitter, Model EJA110A. Publication code GS 01C21B01-00E. 27thEdition. Dated July 2011. Available online: http://www.yokogawa.com/fld/pdf/eja/GS01C21B01-00E.pdf
/48/	Ecosampling Ambiental Ltda.: Set of 8 Technical Reports for determination of methane destruction efficiency in the flares of the project activity "Caieiras landfill gas emission reduction". Report titles: - *"Eficiência de queima Junho-11 Flare 1.pdf".* Dated June 2011 - *"Eficiência de queima junho 11 Flare 2.pdf".* Dated June 2011 - *"Eficiência de queima setembro-11 Flare 1.pdf".* Dated September 2011 - *"Eficiência de queima setembro-11 Flare 2.pdf".* Dated September 2011 - *"Eficiência de queima setembro-11 Flare 3.pdf".* Dated September 2011 - *"Eficiência de queima dezembro-11 Flare 1.pdf".* Dated December 2011 - *"Eficiência de queima dezembro-11 Flare 2.pdf".* Dated December 2011 - *"Eficiência de queima dezembro-11 Flare 3.pdf*". Dated December 2011
/49/	GLC: CDM Verification and Certification Report for the CDM project activity "Caieiras landfill gas emission reduction". 5th verification (verification period from 2010-10-01 to 2011-08-31; Issue 5; CDM.253. Dated 2013-03-18.
/50/	Naka Instrumentação Industrial Ltda.: Specification sheet for the thermocouple NKTC-3000. Available online: http://www.naka.com.br/pdf/03122009_101608_pdfProduto_.pdf
/51/	California Analytical Instruments, Inc.: Operation and Maintenance Manual for the gas analyzer 300 HFID/MHFID. Version B.031. Dated June 2003. Available online: http://secure.snapcms.net/userfolder/39/file/300_HFID_Manual.pdf
/52/	Essencis Soluções Ambientais S.A.: Internal records of expenditures with fuel type LPG during the period from October 2010 to March 2012 + dates of delivery of fuel LPG at the project site (data retrieved from the financial/accounting management financial system of Essencis Soluções Ambientais S.A on 2012-05-24).
/53/	Empresa Brasileira de Pesquisa Energética (EPE): Balanço Energético Nacional 2011 | Ano base 2010. Brazilian Energetic Balance Report year 2011 (base year 2010). Available online: https://ben.epe.gov.br/downloads/Relatorio_Final_BEN_2011.pdf

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/54/	Yokogawa Electric Corporation: IR200 Infrared Gas Analyzer, User Manual version 03. Dated July 2007. Yokogawa América do Sul Ltda.: Email communication submitted to Essencis Soluções Ambientais S.A. confirming the measurement accuracy for the IR200 Infrared $CH_4/CO_2/O_2$ content gas analyzer unit. Dated 2009-12-17. .
/55/	Essencis Soluções Ambientais S.A.: Internal Certificates of Training for performance of calibration events in the $CH_4/CO_2/O_2$ content gas analyzer model IR200 and manufactured by Yokogawa Instrument South America. Years 2011 and 2012.
/56/	UNFCCC / CDM-EB: Clean development mechanism project cycle procedure. Version 03.1, EB70
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/58/	Yokogawa Service Ltda.: Communication with ref.: "*PRO 405 – Calibração do Analisador de Gases*" Submitted to Essencis Soluções Ambientais S.A.. Dated 2008-06-27.
/59/	Mayer-Brown / Tauil & Chequer: Legal update / interpretation: Regulation of Brazil's National Policy on Waste Management Available online: http://www.tauilchequer.com.br/publications/article.asp?id=10261&nid=13012
/60/	Caieiras Balanças Comércio e Serviços Ltda.: Certificate of Calibration No. 905/10 valid for weight scale used by Cia Ultragaz S.A. for measuring mass of delievered LPG cylinders in years 2010, 2011 and 2012 (as per communication/clarification issued by Cia Ultragaz S.A.) Dated 2010-05-06.
/61/	CETEC – Centro Tecnológico do Instituto de Pesos e Medidas do Estado de São Paulo: Certifications of calibrations for the pattern standard weights internally used by Cia Ultragaz S.A. for the performance of regular calibration events of weight scales. Certificate No. MA092/2010. Dated 2010-06-29.

Reference	Author: Title, version, date of issue
/62/	Cia Ultragaz S.A.: Internal working procedure ”Monitoramento dos equipamentos de envazamento e controle” (*Monitoring of measurement/control and bottleing equipment*). Doc. Code: IT-CO-61.0008; Rev. 4
/63/	GLC / Essencis Soluções Ambientais S.A.: Comparative emission reduction calculation spreadsheets for the project activity “Caieiras landfill gas emission reduction” – verification period from 2011-09-01 to 2012-03-31. Created as part of the *Data authenticity checking* procedure performed during the verification. *File names:* “*IMP 403 - Dados Registrador Isodoc Setembro-11 - for checking.xls”* *“IMP 403 - Dados Registrador Isodoc Outubro-11 - for checking.xls”* *“IMP 403 - Dados Registrador Isodoc Novembro-11 - for checking.xls”* *“IMP 403 - Dados Registrador Isodoc Dezembro-11 - for checking.xls”* *“IMP 403 - Dados Registrador Isodoc Janeiro-12 - for checking.xls”* *“IMP 403 - Dados Registrador Isodoc Fevereiro-12 - for checking.xls”* *“IMP 403 - Dados Registrador Isodoc Março-12 - for checking.xls”* “Resumo final CO2e 6a auditoria - for checking.xls”
/64/	Essencis Soluções Ambientais S.A.: Comparative spreadsheets with monitoring records for the project activity “Caieiras landfill gas emission reduction” – verification period from 2011-09-01 to 2012-03-31 .Created as part of the *Data authenticity checking* procedure performed during the verification, *“Set-2011 - for checking.xls”* *“Out-2011 - for checking.xls”* *“Nov-2011 - for checking.xls”* *“Dez-2011 - for checking.xls”* *“Jan-2012 - for checking.xls”* *“Fev-2012 - for checking.xls”* *“Mar-2012 - for checking.xls”*
/65/	Essencis Soluções Ambientais S.A. Blank version of the emission reduction calculation spreadsheets for the project activity “Caieiras landfill gas emission reduction” – verification period from 2011-09-01 to 2012-03-31. Created as part of the *Data authenticity checking* procedure performed during the verification. File names: “IMP 403 - Dados Registrador Isodoc - blank.xls ” and “Resumo final CO2e 6a auditoria - blank.xls”
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Reference	Author: Title, version, date of issue
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/67/	UNFCCC / CDM-EB: Clean development mechanism project cycle procedure, version 03.1. EB 70 / Annex 4.
/68/	Chapple, Mike. "SQL Fundamentals". *Data bases*. About.com. Available online: http://data bases.about.com/od/sql/a/sqlfundamentals.htm
/69/	GLC: CDM Verification and Certification Report for the CDM project activity "Caieiras landfill gas emission reduction". 2nd verification (verification period from 2007-11-01 to 2008-06-30; Issue 15; CDM. 081. Dated 2012-07-10.
/70/	GLC: CDM Verification and Certification Report for the CDM project activity "Caieiras landfill gas emission reduction". 3rd verification (verification period from 2008-07-01 to 2009-12-31; Issue 10; CDM.066. Dated 2012-07-10.
/71/	GLC: CDM Verification and Certification Report for the CDM project activity "Caieiras landfill gas emission reduction". 4th verification (verification period from 2010-01-01 to 2010-09-30; Issue 12; CDM.071. Dated 2012-07-10.
/72/	Naka Instrumentação Industrial Ltda.: Calibration certificate for electricity meter model MULT K (Serial No. 465025) "ME Blower 4", manufactured by KRON Instrumentos Elétricos Ltda. Certificate No. R-0702/12. Calibration event date: 2012-03-19. Certificate issuance date: 2012-04-03.
/73/	KRON Instrumentos Elétricos Ltda.: Test report for electricity meter model MULT K (Serial No. 234215) "ME Plant", manufactured by KRON Instrumentos Elétricos Ltda. Test No. 518/07, Certificate No. 70204-101/7. Test date: 2007-03-02. Issuance date: 2007-03-20.
/74/	KRON Instrumentos Elétricos Ltda.: Test report for electricity meter model MULT K (Serial No. 465025) "ME Blower 4", manufactured by KRON Instrumentos Elétricos Ltda. Test No. 2600/08, Certificate No. 88466-01/8. Test date: 2008-10-03. Issuance date: 2008-10-03.

Reference	Author: Title, version, date of issue
/75/	UNFCCC / CDM-EB: Clean Development Mechanism Project Standard. Version 02.1, EB70.
/76/	UNFCCC / CDM-EB: Guidelines for completing the Monitoring Report Form. Version 02.0, EB66.
/77/	GLC: "Validation Opinion on Post-registration Changes of Registered CDM Project Activity". Assessment and opinion about performed corrections in information made available in the PDD for the registered CDM project activity "Caieiras landfill gas emission reduction".

ANNEX A: RESOLUTION OF CORRECTIVE ACTION AND CLARIFICATION REQUESTS (LIST OF FINDINGS)

Resolution of Corrective Action and Clarification Requests including list of Forward Action Requests

Description of Finding (CAR, CL, FAR) *Describe the finding in a transparent manner i.e. state clearly what is required and why; address the context (e.g. section)*	**Project Participants Response** *This section shall be filled by the PP. The finding shall be addressed with suitable arguments and evidence*	**GLC's Assessment** *The assessment shall include how the finding is closed i.e. how it is found that the response is assessed to be appropriate and meeting the specific requirement of the finding. In case the response is not satisfactory, additional response and DOE assessments (#2, #3, etc.) shall be sought.*	**Final Conclusion (OK or OPEN)**
CAR 01 (2012-06-15): The accumulated quantity and the average rate of disposal of MSW in the CTR Caieiras landfill as indicated in Section B.1 of the Monitoring Report, are not consistent with documented evidences. The related values indicated in the registered PDD do not match with provided evidences either.	**2013-01-24:** As a response to the raised CAR, the values of accumulated quantity of MSW disposed at the end of the monitoring period and the average rate of disposal of MSW the CTR Caieiras landfill were corrected in the updated version of the Monitoring Report. A revised version of the PDD was submitted in the context of a request of approval of post-registration changes (as part of the previous 5th verification). The revised PDD (version 4) includes the following corrections (in information that do not affect the project design): - Revised quantitative information about occurred and forecasted disposal of municipal solid waste (MSW) at the CTR Caieiras landfill from the period from year 2007 onwards; - Revised ex-ante estimations of emission reductions (due to revision of the amount of	**2013-01-28:** The GLC's verification team verified that related modifications in the Monitoring Report are reasonable and correct. Assessment of the revised version of the PDD (version 4) is included in a Validation Opinion Report for Post-registration Changes which was submitted to UNFCCC as part of the CER issuance request for the previous 5th verification	CAR is closed.

	MSW historically disposed in the landfill as well as revised MSW disposal forecasts from year 2007 onwards); - Corrections of minor typo errors/mistakes and general text improvements.		
CAR 02 (2012-06-15): The GLC verification team has observed during the conducted on-site visit to the project site that a non-operative small-scale electricity generation facility (powered by LFG) is still available in the project site (next to the LFG destruction facility). Clarification and background information about such equipment is missing in the Monitoring Report (including justification why such not in use generator is still located in the project site).	**2013-01-24:** As a response to the raised CAR, an explanative box with details about the field research work involving electricity generation with LFG which was performed in the project site during the period from April 2009 to June 2009 (in the framework of a technical cooperation agreement between Biomass Center Institute (CENBIO) of University of São Paulo and Essencis) was added in the revised version of the Monitoring Report. As indicated in the explanative box, no amount of LFG measured by the project's LFG flow meter was used for electricity generation and no generated electricity was actually internally consumed or exported to the grid.	**2013-01-28:** OK. The GLC's verification team verified that related explanations and modifications in the Monitoring Report are reasonable and correct. This CAR is closed.	CAR is closed.
CAR 03 (2012-06-15): The monitored parameters related to the calculation of project emissions from electricity consumption and LPG consumption are not correctly indicated in the Monitoring Report as per the "Tool to calculate baseline, project and/or leakage emissions from electricity consumption" and the "Tool to calculate project or leakage CO_2 emissions from fossil fuel	**2013-01-24:** As a response to the raised CAR, the symbol of all parameters related to the calculation of project emissions were corrected as per the respective methodological tools. By following the applicable guidance of the methodological " Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion", the values of the parameters $NCV_{LPG,y}$ and $EF_{CO2,LPG,y}$ were corrected in the updated version of the	**2013-01-28:** OK. The GLC's verification team verified that related modifications in the Monitoring Report are reasonable and correct. This CAR is closed.	CAR is closed.

combustion", respectively. Moreover, the values for the parameters $NCV_{LPG,y}$ and $EF_{CO2,LPG,y}$ were not correctly selected as per the "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion"., and the source for these parameters is not correct as per documented evidences.	Monitoring Report by using valid sources as indicated in the methodological tool.		
CAR 04 (2012-06-15): While the Monitoring Report does not refer to the apparently abnormal project operational conditions, the project participants are requested to explain all apparently abnormal events / project operation working conditions identified for the considered verification period.	**2013-01-24:** As a response to the raised CAR, a description of the abnormal events that occurred during the considered monitoring period was added in Section B.1 of the updated version of the Monitoring Report. This description includes the total time the project was out of operation during the considered monitoring period.	**2013-01-28:** OK. The GLC's verification team verified that related explanations and modifications in the Monitoring Report are reasonable and correct. This CAR is closed.	CAR is closed.
CAR 05 (2012-06-15): The Monitoring Report includes several terminology, grammar and typo mistakes/inconsistencies of which some are listed below. - Inconsistencies in the symbol "$LFG_{flare,y}$" - The name of the company which performed the calibration on the annubar element of the flow meter is not as per documented evidences - The date of the performed	**2013-01-24:** As a response to the raised CAR, all existent typo mistakes/inconsistencies were corrected in the updated version of the Monitoring Report.	**2013-01-28:** OK. The GLC's verification team verified that related modifications in the Monitoring Report are reasonable and correct. This CAR is closed.	CAR is closed.

calibration event on the annubar element of the flow meter is incorrect as per documented evidences - The number of the Calibration Certificate for the calibration event performed on the first thermocouple installed on Flare 1 is incorrect as per documented evidences - Inconsistencies in the name of the CTR Caieiras landfill - Inconsistencies in the symbol of the parameter ¨$EC_{PJ,grid,y}$¨			
CAR 06 (2012-06-15): The monitoring Report states "*(...) In order to address the lack of calibration evidences for the measuring equipment (weight scale used by the LPG supplier to measure the amount of LPG delivered to the project site), it is assumed that the amount of LPG consumed was 100% higher as a conservative measure*" However, as confirmed by the GLC's verification through checking of documented evidences, a calibration event was performed on the weight scale used by the local LPG supplier to measure the amount of LPG delivered to the project site (the calibration certificate	**2013-01-24:** As a response to the raised CAR, project emissions due to the consumption of LPG by the project activity were re-calculated using the corrected value of $FC_{LPG,y}$ (amount of consumed LPG). Moreover, texts referring to the lack of calibration evidences for the weight scale were removed from the updated version of the Monitoring Report.	**2013-01-28:** OK. The GLC's verification team verified that related explanations and modifications in the Monitoring Report as well as the corrections in the emission reductions calculation spreadsheets are reasonable and correct. This CAR is closed.	CAR is closed.

was made available to the GLC's verification team). Thus, the application of such discount (amount of LPG consumed by the project activity assumed as 100% higher) is not applicable for the considered monitoring period.			
CAR 07 (2012-06-15): The GLC's verification team was able to identify relative delays in the performance of calibration events for monitoring instruments as well as measurement deviation/errors in the monitoring instruments (as an outcome of selected performed calibration events). The identified relative delays in the performance of calibration events are not addressed as per the "VVS. Moreover, no justification whether the identified measurement deviation/errors are material or relevant in the context of the emission reduction calculations is provided.	**2013-01-24:** As a response to the raised CAR, the emission reduction calculation spreadsheets were revised. As per the revised spreadsheets, the values of $MD_{flared,y}$ were conservatively adjusted to take into account the results of the calibration events in the monitoring instruments which were not conducted at the frequency specified by the methodology/monitoring plan and also to take into account the identified positive measurement deviation/errors beyond the maximum permissible error for the installed $CH_4/CO_2/O_2$ content gas analyzer unit. A deduction factor of 2.0% is applied for the periods from 2011-11-09 to 2011-11-16 and from 2011-12-10 to 2011-12-12 (due to the identified delays in the calibration events for the $CH_4/CO_2/O_2$ content gas analyzer unit). A deduction factor of 2.1% is applied for the period from 2010-09-06 to 2010-09-16 (due to the identified measurement deviation/error in the readings of the $CH_4/CO_2/O_2$ content gas analyzer unit).	**2013-01-28:** OK. The GLC's verification team verified that related explanations and modifications in the Monitoring Report as well as the corrections in the emission reductions calculation spreadsheets are reasonable and correct. This CAR is closed.	CAR is closed.

	A deduction factor of 2.0% is applied for the period from 2012-01-13 to 2012-01-30 (due to the identified measurement deviation/error in the readings of the $CH_4/CO_2/O_2$ content gas analyzer unit). By following applicable guidance of the VVS , a correction factor of +1.0% was applied in the values of LFG temperature valid for the period from 2012-01-25 to 2012-03-12. Corrected values of LFG temperature were considered for the determination of value $MD_{project,y}$ valid for this period. While correction factors were applied for both values of LFG temperature and LFG pressure during the considered verification period (due to the occurred relative delay on performing calibration events in both the LFG temperature sensor and LFG pressure sensor), the total impact of the application of such correction factors over the calculated value of $MD_{project,y}$ is 20.7781 tCH4. By following applicable guidance of the VVS, correction factor of -1.5% was applied in the values of LFG pressure valid for the period from 2012-01-25 to 2012-03-12. Corrected values of LFG pressure were considered for the determination of value $MD_{project,y}$ valid for this period. While correction factor were applied for both values of LFG temperature and LFG pressure during the considered verification period (due to the occurred relative delay on performing calibration events in both the LFG temperature		

	sensor and LFG pressure sensor), the total impact of the application of such correction factors over the calculated value of $MD_{project,y}$ is 20.7781 tCH4.		
CAR 08 (2012-06-15): The values of the amount of grid electricity consumed by the project activity as presented in the Monitoring Report are not consistent with related documented evidences.	**2013-01-24:** As a response to the raised CAR, the monthly values of grid electricity consumed by the project activity were corrected in the monitoring report. Moreover, project emissions due to the consumption of grid electricity were re-calculated by taking into account the corrected values of grid electricity consumed by the project activity.	**2013-01-28:** OK. The GLC's verification team verified that related modifications in the Monitoring Report as well as the corrections in the emission reductions calculation spreadsheets are reasonable and correct. This CAR is closed.	CAR is closed.
CAR 09 (2012-06-15): The GLC's verification team was able to identify that the periods in use of each thermocouple installed to measure temperature of the exhaust gas of the flares as indicated in the Monitoring Report are not correct as per documented evidences.	**2013-01-24:** As a response to the raised CAR, the period in use for each thermocouple installed to measure temperature of the exhaust gas of the flares was revised in the updated version of the Monitoring Report. Moreover, information about the third thermocouple used to measure temperature of the exhaust gas of the Flare 1 during a 2-months period within the monitoring period were added.	**2013-01-28:** OK. The GLC's verification team verified that related modifications and corrections in the Monitoring Report as well as the corrections in the emission reductions calculation spreadsheets are reasonable and correct. This CAR is closed.	CAR is closed.
CAR 10 (2012-06-15): The GLC's verification team was able to identify that, while the installed electricity meters were calibrated prior to be installed at the project site, the Monitoring Report does not present any information about further calibration events performed on the electricity meters.	**2013-01-24:** As a response to the raised CAR, information about the second calibration event performed in both installed electricity meters were added to the updated version of the MonitoringReport.	**2013-01-28:** OK. The GLC's verification team verified that related modifications and corrections in the Monitoring Report as well as the corrections in the emission reductions calculation spreadsheets are reasonable and correct. This CAR is closed.	CAR is closed.
