MONITORING REPORT FORM (F-CDM-MR)
Version 02.0

MONITORING REPORT

Title of the project activity	São João Landfill Gas to Energy Project (SJ)
Reference number of the project activity	0373
Version number of the monitoring report	Version 01
Completion date of the monitoring report	25/06/2012
Registration date of the project activity	02/07/2006
Monitoring period number and duration of this monitoring period	18th Monitoring Report - From 01/02/2012 to 15/05/2012.
Project participant(s)	▪ Prefeitura Municipal de São Paulo – Municipality of São Paulo - Brazil ▪ Biogás Energia Ambiental S.A. - Brazil ▪ KfW Bankegruppe - Germany ▪ Mercuria Energy Trading SA – Switzerland
Host Party(ies)	Brazil
Sectoral scope(s) and applied methodology(ies)	**Sectoral Scope 13** – Waste Handling and Disposal. **Scope 1** – Energy Industries (renewable/non-renewable sources). Applied Methodology: **ACM 0001 Version 02** Consolidated baseline and monitoring methodology for landfill gas project activities.
Estimated amount of GHG emission reductions or net anthropogenic GHG removals by sinks for this monitoring period in the registered PDD	186,094 tCO_2
Actual GHG emission reductions or net anthropogenic GHG removals by sinks achieved in this monitoring period	65,893 tCO2

SECTION A. Description of project activity

A.1. Purpose and general description of project activity

São João Landfill Gas to Energy is a project designed to explore the landfill gas produced in São João landfill, one of the biggest landfills in Brazil. This landfill is located in the metropolitan region of São Paulo, Brazil's biggest city and financial center of the country. With an estimated population of around 10 million citizens in 2000, São Paulo generates nearly 15,000 tons of waste daily. São João Landfill Gas to Energy's goal is to explore the gas produced in São João landfill, using it to generate electricity and flaring.

São João landfill was designed according to the best practices at the time of its conception, applying modern engineering and environmental sound technology in order to avoid environmental hazards, such as underground water contamination. Regarding landfill gas emissions, the project contemplated only passive venting, intending to solely let the gas escape. Eventually, the gas was flared in the past at the top of well's heads, in a very inefficient combustion mechanism. It is estimated that only around 20% of the gas was flared through such system.

With the implementation of São João Landfill Gas to Energy Project, the above situation has been terminated. Sealing properly the well's heads, the project has ensured that methane previously released to the atmosphere is extracted either to the flares or to the powerhouse, where the gas will be ultimately used to generate energy. São João Landfill Gas to Energy Project's implementation will therefore reduce greenhouse gas emissions.

São João Landfill Gas to Energy Project also avoids greenhouse gas emissions through grid electricity displacement. The methane extracted from the landfill is combusted to generate electricity which is going to feed the Brazilian grid. With that, emission reductions occur due to fossil-fueled energy generation displacement at the margin of the electric system.

The installation of the SJ Project was executed in the period 2007/2008. Firstly, the LFG collecting system was implemented independently to start up flaring LFG as soon as possible. The CH_4 flaring would be enough to avoid GHG emission as prescribed by the UNFCCC. As a result, the Biogas Plant operation was started on June 1st, 2007. From that date up to March 2008, the SJ Project activity was limited exclusively to the LFG flaring, as properly verified by the monitoring and verification reports issued for that period particularly.

The second implementation phase of the São João LFGE Project was the startup of the power plant in the beginning of 2008. The power plant began to work with 14 engines, model CAT3520. Finally, on October 23rd, 2008, once the Power Plant was already operational, the PP invested in the acquisition of two additional engines, the same model than the others already installed, completing so the current existent power capacity of 24.64 MW which is given by the installation of 16 engines model CAT3520. The CERs due to electricity generation have been claimed only from April 01st, 2008. The final configuration became effective only by the end of October 2008 and since then the output of the São João LFGE project is the following:

- Model CAT3520 Capacity at SJ site conditions: 1.54 MWe
- Number of Engine Units: 16
- Installed Capacity: 16 X 1.54 MWe: 24.64 MWe
- Final Energy Output delivered to the grid: 21.89 – 0.99 = 20.90 MWe[1]

[1] The Caterpillar dealer (SOTREQ) assumes 88% of the installed capacity of 24.64 MW or 21.70 MW as the average energy output of the Power Plant before discounting the losses in the transmission system. However, assuming the 93% of the Expected Plant Operation Efficiency as mentioned in the revised PDD, the Maximum Power Plant Capacity Available for Export is 21.89MW and the final energy output delivered to the grid (i.e. after discounting transmission losses) is 20.90 MWe. For sake of conservatism the value 21.70MW was adopted in the investment analysis as described in PDD - Section B.3- step 2.

The LFG degassing system includes more than 30 Km of high density polyethylene pipes connected to the about 160 landfill wells; 4 blowers to provide suction for extracting the gas from the landfill; facilities for gas treatment, such as heat exchangers, chillers; and 3 flares with capacity to destroy up to 15,000 Nm3 per hour of LFG that is not used to generate electricity.

This Monitoring Report refers to the 18th Monitoring Period that contemplates the period from February 1st 2012 until May 15th 2012. The total emission reductions achieved in this Monitoring Period is given on the table below:

Total tCO_2e from methane destroyed	61,639
Total tCO_2e from electricity dispatched	4,272
Total tCO2e from electricity consumed	18
TOTAL tCO_2e	**65,893**

A.2. Location of project activity
The São João project is located at Av. Sapopemba, km 33, Bairro Jardim Rodolfo Pirane, São Paulo - Brazil. GPS coordinates from the location of the power house are the followings: Latitude -23.6362°, Longitude -46.4141°.

A.3. Parties and project participant(s)

Party involved ((host) indicates a host Party)	Private and/or public entity(ies) project participants (as applicable)	Indicate if the Party involved wishes to be considered as project participant (Yes/No)
Brazil	Biogás Energia Ambiental S.A	No
Brazil	Municipality of Sao Paulo	No
Switzerland	Mercuria Energy Trading SA	No
Germany	KfW Bankengruppe	No

A.4. Reference of applied methodology
The methodology applied to SJ is ACM0001 – version 02, called “Consolidated baseline methodology for landfill gas project activities”. The applicability conditions for ACM0001 have already been considered under the baseline section of the PDD. In fact, SJ is a project activity undertaken with the purpose of capturing and flaring methane from landfill operations, and also using this methane as fuel for a power plant, generating electricity that will avoid fossil fuelled plants at the margin of the Brazilian electricity system, therefore causing a reduction in GHG emissions. ACM0001 is therefore fully applicable to São João Landfill Gas to Energy Project.

The Monitoring Plan was developed based on **ACM0001 - version 02** of the “Consolidated monitoring methodology for landfill gas project activities”.

A.5. Crediting period of project activity
SJ is in the first crediting period that had started on 22/05/2007. This period will finish on 21/05/2014, because the project proponent has chosen a renewable crediting period of 7 years. The crediting period was changed from 30/06/2006-29/06/2013.

SECTION B. Implementation of project activity

B.1. Description of implemented registered project activity

1) The starting date of operation of the project activity: the degassing station had started on 01/06/2007 and the power plant had started on 01/04/2008.

2) There were seven special events registered during this monitoring period, described below:

Event	Description	How the event was considered
1	On February 21st, the PP could generate almost no electricity because AES had problems in their system.	AES Eletropaulo had some problems in their system and the power plant couldn't export the generated electricity (TRIP [2] Eletropaulo). There was a considerable impact on FIR800, however a big part of the gas was flared. AES Eletropaulo realized a corrective maintenance in their system.
2	On March 14th, and 15th the PP could generate almost no electricity because AES had problems in their system.	AES Eletropaulo had some problems in their system and the power plant couldn't export the generated electricity. AES Eletropaulo realized a corrective maintenance in their system. There was a considerable impact on FIR800, however a big part of the gas was flared. AES Eletropaulo realized a corrective maintenance in their system.
3	On April 18th and 19th, the PP could generate almost no electricity because AES had problems in their system.	AES Eletropaulo had some problems in their system and the power plant couldn't export the generated electricity It wasn't observed any impact related to the total gas flow during the maintenance period, because the gas was burned on the flares; AES Eletropaulo realized a corrective maintenance in their system.
4	On April 29th, the PP could generate less electricity than the normal because AES had problems in their system.	AES Eletropaulo had some problems in their system and the power plant couldn't export the generated electricity (TRIP Eletropaulo). It was observed an impact related to the engine gas flow (FIR800) and in the electricity generation. AES Eletropaulo realized a corrective maintenance in their system.
5	On May 02th, the PP could generate less electricity than the normal because AES had problems in their system.	AES Eletropaulo had some problems in their system and the power plant couldn't export the generated electricity (TRIP Eletropaulo). It was observed an impact related to the engine gas flow (FIR800) and in the electricity generation. AES Eletropaulo realized a corrective maintenance in their system.
6	On May 13th, the PP could generate less electricity than the normal because AES Eletropaulo had problems in their system.	AES Eletropaulo had some problems in their system and the power plant couldn't export the generated electricity (TRIP Eletropaulo). It was observed an impact related to the engine gas flow and in the electricity generation. AES Eletropaulo realized a corrective maintenance in their system.
7	On May 14th and 15th, the PP could generate less electricity than the normal because AES had problems in their system.	AES Eletropaulo had some problems in their system and the power plant couldn't export the generated electricity (TRIP Eletropaulo). It was observed a small impact related to the engine gas flow and in the electricity generation. AES Eletropaulo realized a corrective maintenance in their system.

[2] The TRIP is a shutdown request from AES Eletropaulo due transmission problems on the network.

3) During this monitoring period, 01/02/2012 to 15/05/2012, an average of 4 Caterpillar engines worked in the power plant. This happens because the gas production in the landfill is lower than the estimated in the PDD. The 3 flares installed in the degassing plant were in operation during the monitoring period however usually did not operate at the same time or were on standby when all gas was combusted in the generators.

No other events or rule/policy changes have taken place that could have affected the normal operation of the project and the applicability of the methodology.

B.2. Post registration changes

B.2.1. Temporary deviations from registered monitoring plan or applied methodology

During this monitoring period, no request for deviation has taken place.

B.2.2. Corrections

Not applicable.

B.2.3. Permanent changes from registered monitoring plan or applied methodology

The application of a new monitoring plan, as approved by the EB in 18/02/2008, including, among others:

- The use of a diesel generator to supply the project's electric needs from the beginning of the project's operation until January/2008, when the power house entered into operation. This source of project emission was considered in the calculation of emission reduction. However, this project emission source is in stand-by now as the electricity generated in the power house is used to supply the project's internal needs – the diesel generator is only turned on during black-outs of electricity generation. The diesel generator CO2 emission factor was adopted based on a conservative value (1.3 tCO2/MWh), according with the "Tool to calculate project emissions from electricity consumption (version 1)"
- Differently from Annex 4 – Monitoring Plan, 3 (three) flow-meters were installed instead of the 2 (two) mentioned: the first to measure the total flow, the second to measure the gas sent to the flares and the third to measure the methane sent to the power house, according with the revised Monitoring Plan approved by the EB;
- "The net quantity of electricity displaced" will be measured by an electricity meter. São João Landfill Gas to Energy Project will measure the total electricity fed into the grid (via an electricity-meter).

A new revision of the Monitoring Plan was requested by UNFCCC on February 15th, 2011, in order to include the recording frequency for the parameter "Regulatory requirements relating to landfill gas projects". The recording frequency adopted by the PP is monthly, which is more conservative that the annually frequency mentioned in the methodology applied in the São João Landfill Gas to Energy Project. On February 24th, 2011, PP/DOE uploaded through the UNFCCC CDM interface a request for revision of the monitoring plan for the CDM project activity "São João Landfill Gas to Energy Project (SJ)". The new revision of the monitoring plan was approved by EB in 09/04/2011.

B.2.4. Changes to project design of registered project activity

A.2., A.4.3. and E.4. of the registered PDD mentioned an installed capacity of 20 MW for renewable electricity generation. As during the 5th and 6th verification period (period from 01/04/2008 to 30/06/2008 and 01/07/2008 to 30/09/2008, respectively) the installed capacity was of 21.56 MW (14 engines of each 1.54 MW) and later on (from the 7th verification period (01/10/2008 to 30/11/2008) on), the installed capacity increased to 24.64 MW (16 engines of each 1.54 MW), what is equivalent to the nominal installed capacity today, the DOE together with the PPs submitted on January 28, 2010 a "Request for approval of changes from project activity as described in the registered PDD" to UNFCCC.

From the registered PDD, the following main changes were presented:

- The application of a revised monitoring plan, as approved by the EB in 18/02/2008, as mentioned above, in B.2.

- The SJ Project was implemented, according to PDD revised, in three phases: Degassing Stations, Power Plant (with 14 engines) and acquisition of 2 new engines (the same model and capacity);

- The project was implemented with a total installed capacity of 24.64MW for electricity generation (16 engines of 1.54 MW each). This was equivalent to the total installed capacity for the Monitoring Period under consideration and two transmissions lines of around 14 and 16 km length respectively, however the latter one is not operational yet.

São João Project had its PDD revised according to the EB48, Annex 66/67. The changes do neither affect the additionality nor scale of the project nor applicability of neither the methodology nor its contribution to the Brazilian sustainable development as described further on in the revised PDD. The SJ PDD version 03, dated on December, 29th, 2009, was approved on 28/05/2010.

B.2.5. Changes to start date of crediting period
SJ is in the first crediting period that had started on 22/05/2007. This period will finish on 21/05/2014, because the project proponent has chosen a renewable crediting period of 7 years. The crediting period was changed from 30/06/2006-29/06/2013.

B.2.6. Types of changes specific to afforestation or reforestation project activity
Not applicable.

SECTION C. Description of monitoring system

Monitoring Instruments:

The following instruments were installed in the Degassing Station, as per the revised Monitoring Plan:

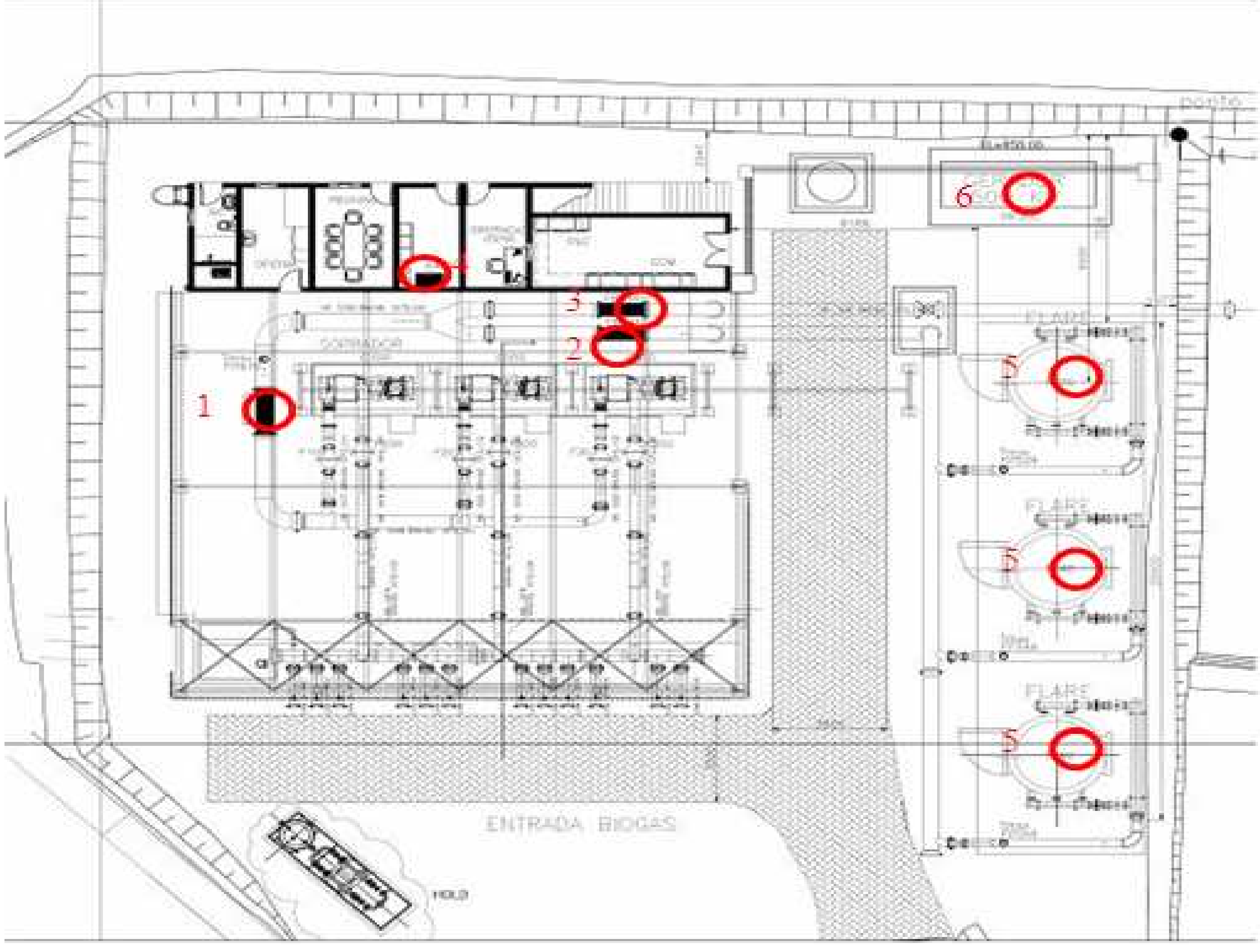

Figure -1.Lay-out of the Degassing Station

Figure -2.Lay-out of the Power Plant

1 – FIR600: Flow meter - Register the total amount of landfill gas captured;
2 – FIR500: Flow meter - Register the total amount of landfill gas flared;
3 – FIR800: Flow meter - Registered the total amount of landfill gas combusted in the Power plant
4 – Gas Analyzer: Measure the Methane fraction in the landfill;
5 – Temperature meters of the exhaust gas - Flares: F520, F540 and F560, respectively
6 – Electricity meter - Diesel generator
7 - Electricity meter - Substation

Methodology ID	Equipment Number	Equipment	Location	TAG	Manufacturer	Model	Range	Serial Number	Error (%)
$LFG_{Total, y}$	1	Turbine Flow-meter [3]	Main Line	FIR600	Instromet	SM-RI-X-K	1,300–25,000 m^3/h	10508423	0.4800
$LFG_{Flare, y}$	2	Turbine Flow-meters[4]	Line to Flares	FIR500	Instromet	SM-RI-X-K	800–16,000 m^3/h	10508421	0.9800
$LFG_{Electricity, y}$	3	Turbine Flow-meter [4]	Line to the Power House	FIR800	Instromet	SM-RI-X-K	800–16,000 m^3/h	10508422	1.2800
FE	5	(1) Temperature transmitters (thermocouples) (2) Chromatographer – analysis made by a Third Party	Flares F520, F540 and F560	(1) TAC520, TAC540 and TAC560 (2) N/A	(1) Jumo (all thermocouples) (2) N/A	(1) type "S" L750 (all thermocouples) (2) N/A	(1) 0-1500°C (all thermocouples) (2) N/A	N/A	N/A
$w_{CH4, y}$	4	Methane Analyzer	Analysis Room	A100	NUK-Emerson-Rosemount	Binos 100	0-100%	120171639018	1.0000
EG_y [4]	7	Electricity Meters	Substation	N/A	Merlin Gerin	Power Logic -	240V/300V -	32004234	1.0000

[3] The Turbine flow-meters installed are connected to a pressure and temperature transmitters, which allows the device to use those variables to make the conversion automatically to Nm^3. Thus, readings from pressure and temperature were not monitored; however the errors from the transmitters were discounted from the final calculation (refer to E.1).
[4] There are two electricity-meters installed at SJ – one in each bar. The electricity-meters are from the same manufacturer and are the same model.

Methodology ID	Equipment Number	Equipment	Location	TAG	Manufacturer	Model	Range	Serial Number	Error (%)
						CM 4000	96mA MAX.	32004233	
EC_y	6	Electricity Meter[5*]	Diesel Generator	N/A	ABB	MGE 144	0-100 MWh	11020304	0.5000

Depending on the parameter the, the frequency of the PLC's routine may vary, as presented in the table below:

Methodology ID	Equipment TAG	Reading Frequency	Transmition Frequency	Registration Frequency	Comments
$LFG_{Total, y}$	FIR600	Continuously	Continuously	Every 5 minutes (instant gas-flow) Every 1 hour (accumulated gas-flow)	– Data of instant gas-flow is registered every 5 minutes in the Supervisory System's hard disk, in Nm^3/h, using the readings from the pressure and temperature transmitters; – Data accumulated every 1 hour is registered in the Supervisory System's hard disk, in Nm^3, using the readings from the pressure and temperature transmitters; – Every 00:00, the PLC's counter is reseted; – The flow-computer installed in the flow-meter keeps registering the accumulated flow; – Every 3 hours, the accumulated flow (in Nm^3) is manually registered by the operators; – Every 1 hour, the operators perform a "Print-Screen" of the PLC Controlling System Panel, which presents the operational variables. – Responsibilities of the routine: PLC (continuously) and plant supervisor (monthly)
$LFG_{Flare, y}$	FIR500	Continuously	Continuously	Every 5 minutes (instant gas-flow) Every 1 hour (accumulated gas-flow)	
$LFG_{Electricity, y}$	FIR800	Continuously	Continuously	Every 5 minutes (instant gas-flow) Every 1 hour (accumulated gas-flow)	
FE	(1) TAC520, TAC540 and TAC560 (2) N/A	(1) Continuously (2) Every 3 months, by a specialized company on gas	(1) Continuously (2) Every 3 months, by a specialized	(1) Every 5 minutes (2) Every 3 months, by a specialized	– Temperatures below 900°C indicates that the flare is running out of the specified combustion temperature range; – A sudden decrease of temperature indicates that the main valve of the flare is closed and no gas is being sent to the flare (please, refer to

[5] The Electricity Meter was replaced on May 14th, 2012.

Methodology ID	Equipment TAG	Reading Frequency	Transmition Frequency	Registration Frequency	Comments
		analysis	company on gas analysis	company on gas analysis	item 3.1.1) – The flare efficiency analysis is made according with internal procedures from the hired company
$w_{CH4, y}$	A100	Continuously	Continuously	Every 5 minutes	– By the end of the day, an average of CH_4 concentration (registered every 5 minutes) is calculated. – Responsibilities of the routine: PLC (continuously) and plant supervisor (monthly)
Regulatory requirements relating to landfill gas projects	Green Solutions Database	Monthly	N/A	N/A	– Biogás has a data base named “Green Solutions” which contains all the National Environmental Legislation applicable to the Project. The Green Solutions was developed and updated by a consultancy specialized in Environmental Legislation.
EG_y	EM100	Continuously	Continuously	Every 1 hour	– Data accumulated every 1 hour in the Power House’s Supervisory System’s hard disk, in MWh; – Every 00:00, the PLC’s counter is reseted; – Responsibilities of the routine: PLC (continuously) and power plant supervisor (monthly)
EC_y	N/A	Continuously	Continuously	Every 1 hour (accumulated electricity consumption)	– The electricity-meter keeps accumulating the electricity consumed; – When the meter reaches 100 MWh, the count is reseted. – Responsibilities of the routine: PLC (continuously) and plant supervisor (monthly)

Involvement of Third Parties

SJ has three third parties involved (directly and indirectly):

- Specialized company on gas analysis, to perform the analysis of methane concentration in the exhaust gas. For this monitoring period, Biogás hired CORPLAB, a national certified laboratory.

- NEXT Automation, the company responsible for the automation of the system;

- ARCADIS Logos S.A - Operational Environment Unit is the company responsible for verifying the Monitoring Report; verifying the data; accomplish the verification and process related to the CDM Project and is part of the quality assurance/quality control procedures.

Quality assurance and quality control measures

Internal Procedures

Biogás counts with the internal procedure PO-005 which objective is to specify the monitoring procedures made inside the Degassing Station, as gas flows, temperature, pressure, electricity generation and methane concentration.

As presented above all parameters monitored inside the Degassing Station has the same reading / transmitting / registration routine and all routines have one person responsible: the plant supervisor.

Every week, the plant supervisor downloads all data registered from the PLC and makes a complete check to identify unconformities, such as unread registrations or troubles with the PLC (this unconformities happens mainly due to electricity black-outs). All unconformities raised are promptly compared with operational events, registered by the operators in the Operation Diary. The event is informed to the Production Manager of Biogás, which is responsible for taking the necessary actions to avoid it to happen again.

In order to avoid data loss, the operators are oriented to register all gas flow data manually in proper sheets every 3 hours, which are verified by the production manager weekly for legibility. Manual records are transferred to an Excel sheet (which is double-checked with a sheet developed by ARCADIS Logos S.A - Operational Environment Unit). Additionally, the operators are oriented to perform a “Print-Screen” of the PLC Controlling System Panel every hour. The picture printed presents all monitoring parameters and is saved in the computer’s hard disk.

Also, the SJ count with a third-party, non-responsible for the project’s monitoring: ARCADIS Logos S.A - Operational Environment Unit, which is the responsible for the development of the Monitoring Report. ARCADIS Logos S.A - Operational Environment Unit’s role in the Project is to assure the quality of the registered data, through a double-check process, and to assure the quality of the calculation of ERs and is in constant contact with the Production Manager of Biogás.

Biogás has, until now, no intention to implement EMS such as ISO 14001 in SJ.

Other procedures developed at SJ are:

PO-001: Procedure about re-starting the plant after an electricity breakdown

PO-002: Calibration of methane analyzer

PO-003: Calibration of valve (flare)

PO-004: Service orders and maintenance

PO-005: Procedure of monitoring parameters (including calibration plan)

PO-006: Procedure about internal monitoring of São João

PO-007: Procedure about workers control

PO-008: Procedure for the elaboration of the monthly operational report

PO-009: Procedure in emergency situations

PO-010: Procedure for data back-up of the supervisory system

PO-011: Procedure for manual data collection

PO-012: Instruction for Refueling the Diesel Device

PO-013: Identification of legal and other requirements

PO-014: Administrative Procedure

Organizational Structure, responsibilities and competencies

Positions and roles for this CDM project activity are well defined. From the point of view of the plant operation, positions and roles are defined. Duties, personnel replacement in the case of non-availability of the supervisor of monitoring and/or the electrical supervisor and hiring requirements for job positions are determined in documented procedures, as presented in the figures below:

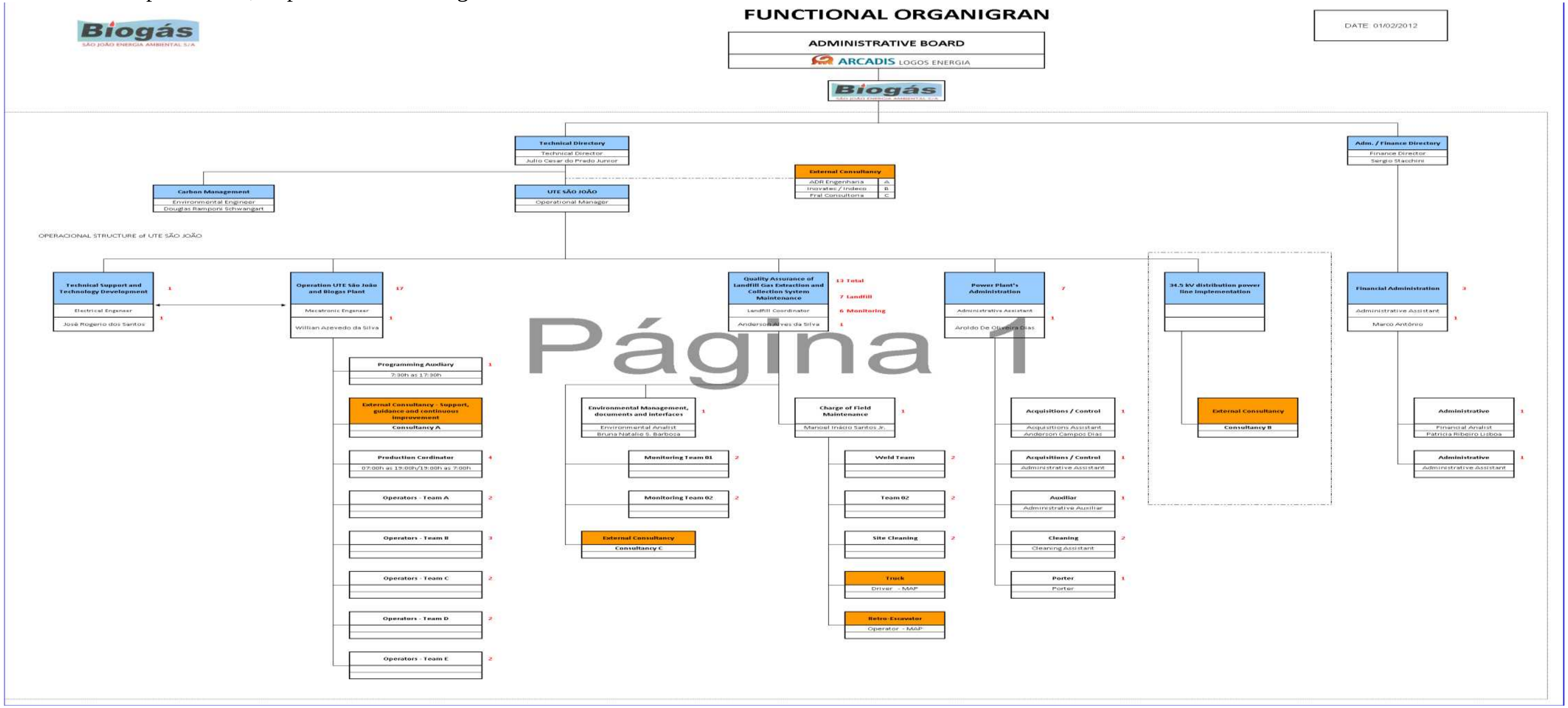

Figure -3. General Organogram of SJ

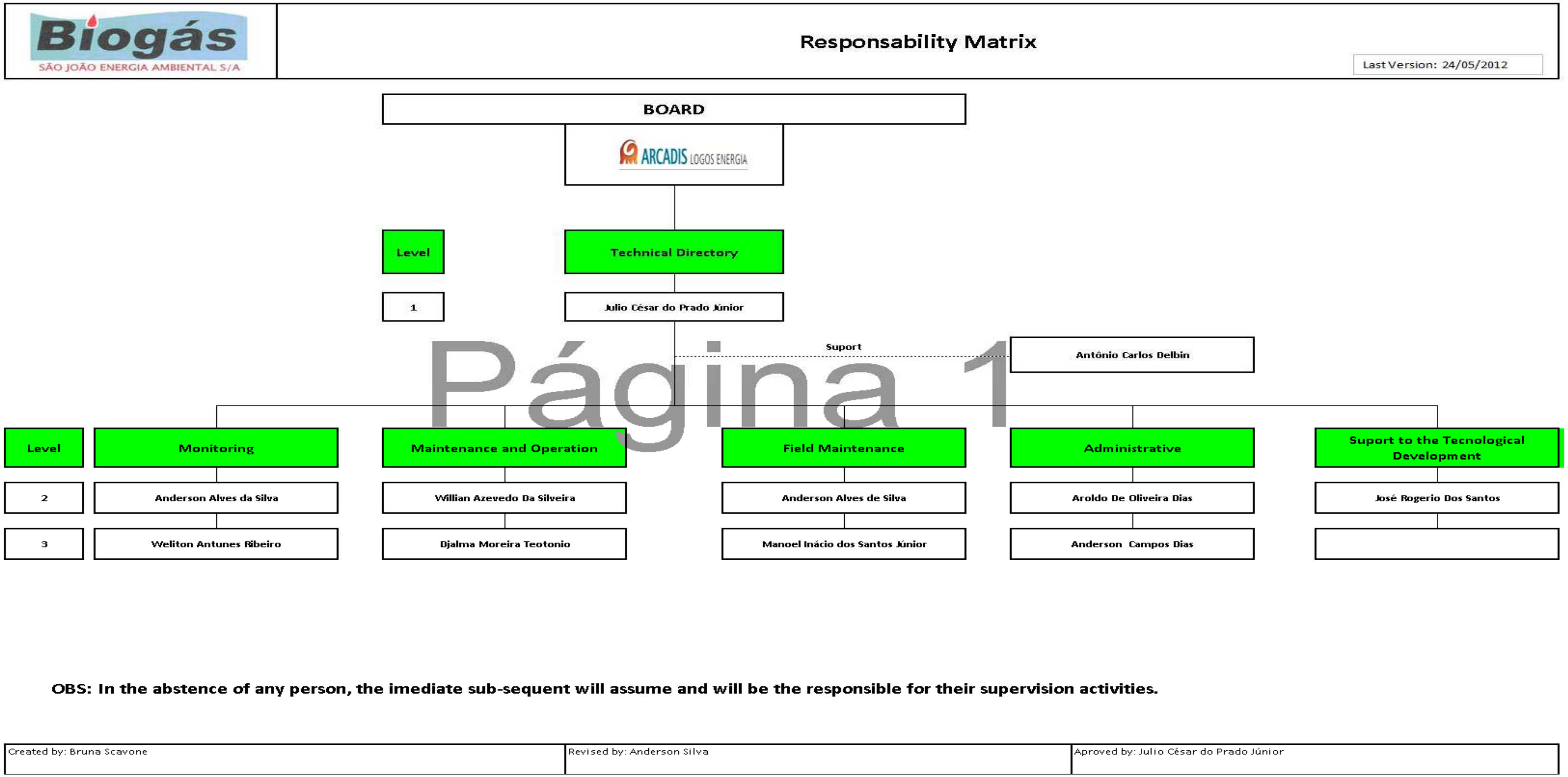

Figure -4. Responsibility Matrix of SJ

Trainings

All training was supplied to operators and technical assistants before the project's implementation. The training certificates were presented to the Verification Team.

For this monitoring period no new employee was hired.

The new operators before starts the job, realized the training, composed by:
- How to operate and start the plant;
- Reading instruments and recording of reports;
- Verification and calibration of gas analyzer;
- Maintenance of equipment.
- Data Protection Measures.

As all data registered in the Supervisory System's hard disk is subjected to sabotage and technical failure, Biogás developed the following actions to protect the monitoring system:

- The PLC is not connected to the Internet, thus the risk of virus is minimized;
- Only defined persons have access to the data base of the system;
- Antivirus programs are installed at the system;
- Data backup:
  - A weekly CD backup of the Supervisory System's hard disk;
  - A weekly backup of the Supervisory System's hard disk is made by the server of Arcadis LOGOS (Biogás shareholders);
  - ARCADIS Logos S.A - Operational Environment Unit downloads regularly the primary data for the elaboration of the monitoring report.

SECTION D. Data and parameters
D.1. Data and parameters fixed ex ante or at renewal of crediting period

Data / Parameter:	$\mathbf{GWP_{CH4}}$
Data unit:	tCO_2e/tCH_4
Description:	Global Warming Potential value for methane
Source of data used:	1996 IPCC Guideline for National Greenhouse Gas Inventory
Value(s) :	21
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Baseline calculation
Additional comment:	N/A

Data / Parameter:	$\rho_{CH4,n,h}$
Data unit:	tCH_4/m^3CH_4
Description:	Density of methane gas at standard temperature and pressure
Source of data used:	1996 IPCC Guideline for National Greenhouse Gas Inventory
Value(s) :	0.0007168
Indicate what the data are used for (Baseline/ Project/ Leakage emission	Baseline calculation

calculations)	
Additional comment:	N/A

Data / Parameter:	**(ID - 10) EF_y**
Data unit:	**tCO2e/MWh**
Description:	Emission Factor of Diesel Engines
Source of data used:	Project participant
Value(s) :	1.3 tCO_2e/MWh
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Baseline calculation
Additional comment:	N/A

Data / Parameter:	**(ID – 8) CEF_y**
Data unit:	**tCO2e/MWh**
Description:	CO_2 emission intensity of the electricity
Source of data used:	Brazilian Grid
Value(s) :	0.2677 tCO_2e/MWh
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Baseline calculation
Additional comment:	N/A

Data / Parameter:	**AF**
Data unit:	**%**
Description:	Adjustment Factor
Source of data used:	PDD registered
Value(s) :	20%
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Baseline calculation
Additional comment:	N/A

D.2. Data and parameters monitored

Data / Parameter:	**(ID – 1) $LFG_{Total, y}$**
Data unit:	Nm^3
Description:	Total amount of landfill gas captured from the landfill site in normal cubic meters at standard temperature and pressure
Measured /Calculated /Default:	Measured
Source of data:	PLC data records
Value(s) of monitored parameter:	These values are indicated in table E.1.
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	The data flow generated from FIR600 is actually used to realize the cross-checking of the other flow meters. These values of the total gas flow are not used to calculate the amount of CERs.
Monitoring equipment (type,	Equipment | TAG | Manufacturer | Model | Serial | Error | Date of the | Date of the

<table>
<tr><td>accuracy class, serial number, calibration frequency, date of last calibration, validity)</td><td>
<table>
<tr><th></th><th></th><th></th><th></th><th>Number</th><th>(%)</th><th>last calibration</th><th>next calibration</th></tr>
<tr><td>Turbine Flow-meters</td><td>FIR600</td><td>Instromet</td><td>SM-RI-X-K</td><td>10508423</td><td>0.480</td><td>23/05/2007</td><td>23/05/2012</td></tr>
<tr><td>Pressure Transmitter</td><td>FIR.600</td><td>Yokogawa</td><td>91G216023 – 2007</td><td>91G216023</td><td>0.030</td><td>15/05/2007</td><td>15/05/2012</td></tr>
<tr><td>Temperature Transmitter</td><td>FIR600</td><td>Yokogawa</td><td>C2F622018 – 2007</td><td>C2F6018</td><td>0.020</td><td>15/05/2007</td><td>15/05/2012</td></tr>
</table>
</td></tr>
<tr><td>Measuring/ Reading/ Recording frequency:</td><td>Data is continuously measured by a flow meter. Measurements of the flow are recorded electronically by PLC at least each five minutes and the hourly value is accumulated. The data is archived electronically. The reading frequency is continuously and registered by the PLC.</td></tr>
<tr><td>Calculation method (if applicable):</td><td>N/A</td></tr>
<tr><td>QA/QC procedures applied:</td><td>The procedure PO – 005: Procedure of monitoring parameters (including calibration plan) explains how the maintenance and testing are realized and also explains that the operator must check the operational conditions for all the equipment/instruments, at least once a day. In the flow meters case if the operator identifies some problem, the instrument must be replaced or calibrated. If the operator doesn’t find any abnormality, the instrument will be calibrated or replaced by another one already calibrated every five years.</td></tr>
</table>

<table>
<tr><th>Data / Parameter:</th><th>(ID – 2) $LFG_{Flare, y}$</th></tr>
<tr><td>Data unit:</td><td>Nm³</td></tr>
<tr><td>Description:</td><td>Amount of landfill gas to flares from the landfill site in normal cubic meters at standard temperature and pressure</td></tr>
<tr><td>Measured /Calculated /Default:</td><td>Measured</td></tr>
<tr><td>Source of data:</td><td>PLC data records</td></tr>
<tr><td>Value(s) of monitored parameter:</td><td>These values are indicated in table E.1.</td></tr>
<tr><td>Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)</td><td>Baseline emission calculation</td></tr>
<tr><td>Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)</td><td>
<table>
<tr><th>Equipment</th><th>TAG</th><th>Manufacturer</th><th>Model</th><th>Serial Number</th><th>Error (%)</th><th>Date of the last calibration</th><th>Date of the next calibration</th></tr>
<tr><td>Turbine Flow-meters</td><td>FIR500</td><td>Instromet</td><td>SM-RI-X-K</td><td>10508421</td><td>0.980</td><td>23/05/2007</td><td>23/05/2012</td></tr>
<tr><td>Pressure Transmitter</td><td>FIR500</td><td>Yokogawa</td><td>EJA - 510A</td><td>91G216021 - 2007</td><td>0.010</td><td>15/05/2007</td><td>15/05/2012</td></tr>
<tr><td>Temperature Transmitter</td><td>FIR500</td><td>Yokogawa</td><td>YTA-110</td><td>C2G311000-2007</td><td>0.030</td><td>15/05/2007</td><td>15/05/2012</td></tr>
</table>
</td></tr>
<tr><td>Measuring/ Reading/ Recording frequency:</td><td>Data is continuously measured by a flow meter. Measurements of the flow are recorded electronically by PLC at least each five minutes and the hourly value is accumulated. The data is archived electronically. The reading frequency is continuously and registered by the PLC.</td></tr>
<tr><td>Calculation method (if applicable):</td><td>N/A</td></tr>
<tr><td>QA/QC procedures applied:</td><td>The procedure PO – 005: Procedure of monitoring parameters</td></tr>
</table>

	(including calibration plan). This procedure explains how the maintenance and testing are realized and also explains that the operator must check the operational conditions for all the equipment/instruments, at least once a day. In the flow meters case if the operator identifies some problem, the instrument must be replaced or calibrated. If the operator doesn't find any abnormality, the instrument will be calibrated or replaced by another one already calibrated every five years.

Data / Parameter:	**(ID – 3) $LFG_{Electricity, y}$**
Data unit:	Nm^3
Description:	Amount of landfill gas to power house from the landfill site in normal cubic meters at standard temperature and pressure
Measured /Calculated /Default:	Measured
Source of data:	PLC data records
Value(s) of monitored parameter:	These values are indicated in table E.1.
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Baseline emission calculation
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	see table below
Measuring/ Reading/ Recording frequency:	Data is continuously measured by a flow meter. Measurements of the flow are recorded electronically by PLC at least each five minutes and the hourly value is accumulated. The data is archived electronically. The reading frequency is continuously and registered by the PLC.
Calculation method (if applicable):	N/A
QA/QC procedures applied:	The procedure PO – 005: Procedure of monitoring parameters (including calibration plan). This procedure explains how the maintenance and testing are realized and also explains that the operator must check the operational conditions for all the equipment/instruments, at least once a day. In the flow meters case if the operator identifies some problem, the instrument must be replaced or calibrated. If the operator doesn't find any abnormality, the instrument will be calibrated or replaced by another one already calibrated every five years.

Equipment	TAG	Manufacturer	Model	Serial Number	Error (%)	Date of the last calibration	Date of the next calibration
Turbine Flow-meters	FIR800	Instromet	SM-RI-X-K	10508422	1.280	23/05/2007	23/05/2012
Pressure Transmitter	FIR800	Yokogawa	EJA - 510A	91G216022 - 2007	0.010	15/05/2007	15/05/2012
Temperature Transmitter	FIR800	Yokogawa	YTA-110	C2G311001 – 2007	0.100	15/05/2007	15/05/2012

Data / Parameter:	**(ID – 4) $FE_{F520/F540/F560}$**
Data unit:	**(1)** **°C** **(2)** mg/Nm^3
Description:	(1) Temperature of the exhaust gas in the flares F520/F540/F560 (2) Methane content of flare exhausts gas.
Measured /Calculated	(1) Measured

/Default:	(2) Measured and Calculated
Source of data:	(1) PLC data records (2) Analyses made by a third party.
Value(s) of monitored parameter:	These values are indicated in table E.1.
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Baseline emission calculation
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	(see table below)

Equipment	TAG	Manufacturer	Model	Serial Number	Error (%)	Date of the last calibration	Date of the next calibration
(1) Thermocouple	(1) TAC520 TAC540 TAC560	(1) Jumo	(1) type "S" L750	(1)1534-00 (1)3562-00 (1)4404-00	N/A	N/A	N/A
(2) Chromatographer – analysis made by a Third Party	(2)N/A	(2) N/A	(2) N/A				

Measuring/ Reading/ Recording frequency:	(1) Data is measured by thermocouples installed in the flares and the reading frequency is continuously. Measurements of the temperature of the exhaust gas are recorded electronically by PLC at least each five minutes and once per hour. The data is archived electronically. (2) The data is measured with a chromatographer each three months by a specialized lab – CORPLAB, as explained on item E.1.
Calculation method (if applicable):	(1) N/A (2) Flare Efficiency Spreadsheet.
QA/QC procedures applied:	Regular maintenance will ensure optimal operation of flares. Flare efficiency should be checked quarterly, with monthly checks if the efficiency shows significant deviations from previous values. This is mentioned in the procedure PO – 005: Procedure of monitoring parameters (including calibration plan) that explains how the maintenance and testing are realized and also explains that the operator must check the operational conditions for all the equipment/instruments, at least once a day. The calibration is not applicable; however the thermocouple respects the demands from Standard EN 60584.

Data / Parameter:	**(ID – 5) $W_{CH4,y}$**
Data unit:	**m^3CH4/m^3LFG**
Description:	Methane fraction in the landfill gas.
Measured /Calculated /Default:	Measured
Source of data:	PLC data records.
Value(s) of monitored parameter:	These values are indicated in table E.1.
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Baseline emission calculation
Monitoring equipment (type, accuracy class, serial	Manufacturer: Rosemount - NUK Type: Binos 100

number, calibration frequency, date of last calibration, validity)	TAG: A400 Accuracy class: 1.0000% (error) Serial number: 120171639018 Calibration frequency: weekly calibration throughout the monitoring period with a standard gas Date of last calibration which affected this Monitoring Period: 15/05/2012. Validity: Each calibration is valid for one week.
Measuring/ Reading/ Recording frequency:	The data is continuously measured by the gas analyzer and recorded electronically by PLC at least each five minutes and once per hour, instantaneously. The reading frequency is continuously and registered by the PLC.
Calculation method (if applicable):	N/A
QA/QC procedures applied:	The gas analyzer will be subject to a regular maintenance and testing regime to ensure accuracy. This is mentioned in the procedure PO – 005: Procedure of monitoring parameters (including calibration plan) that explains how the maintenance and testing are realized and also explains that the operator must check the operational conditions for all the equipment/instruments, at least once a day. The operation team performs a daily check list of the instrument to detect leaks and other defects. The filter replacement is performed when the team deems necessary. The calibration is also performed to detect possible flaws in the gas analyzer.

Data / Parameter:	**(ID - 6) Regulatory requirements**
Data unit:	Test
Description:	Regulatory requirements relating to landfill gas projects
Measured /Calculated /Default:	N/A
Source of data:	National environmental legislation and data base “Green Solution”
Value(s) of monitored parameter:	Required for any changes to the adjustment factor (AF) or directly MDreg,y
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Baseline emission calculation
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	N/A
Measuring/ Reading/ Recording frequency:	The recording frequency is yearly.[6]
Calculation method (if applicable):	N/A
QA/QC procedures applied:	Required for any changes to the adjustment factor (AF) or directly $MD_{reg,y}$

Data / Parameter:	**(ID – 7) EG_y**
Data unit:	**MWh**

[6] Even though the revised monitoring plan/methodology mention as “Recording Frequency” yearly period, actually the database named Green Solutions is updated monthly by a consultancy specialized in Environmental Legislation.

Description:	Net quantity of electricity delivered to the grid which is produced by using LFG under the project activity.
Measured /Calculated /Default:	Measured
Source of data:	PLC data records
Value(s) of monitored parameter:	See section E.1.
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Baseline emission calculation
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	Manufacturer: Merlin Gerin Type: Power Logic – CM4000 TAG: Not applicable Accuracy class: 1.0000% Serial number: 32004234 / 32004233 Calibration frequency: 2 years Date of last calibration: 03/08/2010 Validity: 03/08/2012
Measuring/ Reading/ Recording frequency:	The data is measured by electricity meter installed at the project site and the connected substation. The reading frequency from the electricity meter is continuously and the recording frequency is hourly. AES Eletropaulo sends the registered data for Biogás. Double-check by electricity generated is realized and the lower values between SJ PLC data records and AES Eletropaulo sales receipt data are used for the CER calculation.
Calculation method (if applicable):	N/A
QA/QC procedures applied:	If Biogas operator identifies some problem, the instrument must be replaced or calibrated. If the operator doesn't find any abnormality, the instrument will be calibrated or replaced by another one already calibrated each 2 years. According to Biogas is very easy to identify if the instrument is not working because it can be checked by the daily registered data and the monthly production sheet.

Data / Parameter:	**(ID – 9) EC_y**
Data unit:	**MWh**
Description:	Electricity consumed from the diesel generator
Measured /Calculated /Default:	Measured
Source of data:	PLC data records
Value(s) of monitored parameter:	See section E.1.
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Project emission calculation
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	Manufacturer: ABB Type: MGE 144 TAG: Not applicable Accuracy class: 0.5000% Serial number: 11020304 Calibration frequency: 5 years

	Date of last calibration: 28/02/2012 Validity: 28/02/2017
Measuring/ Reading/ Recording frequency:	Directly measured by electricity meter installed at the project site and the connected to the PLC. The data is registered every minute in the PLC's database. The data is monitored and archived electronically. The reading frequency from the electricity meter is continuously and the recording frequency is hourly.
Calculation method (if applicable):	N/A
QA/QC procedures applied:	If Biogas operator identifies some problem, the instrument must be replaced or calibrated. If the operator doesn't find any abnormality, the instrument will be calibrated or replaced by another one already calibrated each five years. According to Biogas is very easy to identify if the instrument is not working because it can be checked by the daily registered data and the monthly production sheet.

D.3. Implementation of sampling plan
Not applicable.

SECTION E. Calculation of emission reductions or GHG removals by sinks
E.1. Calculation of baseline emissions or baseline net GHG removals by sinks
According with baseline methodology ACM0001 – version 02, Emission Reductions are calculated as follows:

$$ER_y = (MD_{project,\,y} - MD_{reg,\,y}) \times GWP_{CH4} + EG_y \times CEF + ET_y \times CEF_{thermal,\,y} \qquad (1)$$

Where:
ER_y = Emission reduction achieved by the project activity during a given year *y* (tCO_2e);
$MD_{project,\,y}$ = Amount of methane actually destroyed/combusted during the year *y* (tCH_4);
$MD_{reg,\,y}$ = Amount of methane that would have been destroyed/combusted during the year *y* in the absence of the project activity (tCH_4);
GWP_{CH4} = Global Warming Potential value for methane (tCO_2e/tCH_4);
EG_y = Net quantity of electricity displaced during the year *y* (MWh)
$CEF_{electricity,\,y}$ = CO_2 emissions intensity of the electricity displaced (tCO_2e/MWh)
ET_y = Quantity of thermal energy displaced during the year *y* (TJ)
$CEF_{thermal,\,y}$ = CO_2 emissions intensity of the thermal energy displaced (tCO_2e/TJ).

$MD_{project,\,y}$ is calculated as the sum of methane flow destroyed in the flares, in the power house and in the heat generation, as follows:

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

Where:

$MD_{flared,\,y}$ = quantity of methane destroyed in the flares in year *y* (tCH_4)
$MD_{electricity,\,y}$ = quantity of methane destroyed by the generation of electricity *y* (tCH_4);
$MD_{thermal,\,y}$ = quantity of methane destroyed for the generation of thermal energy in year *y* (tCH_4)

As São João Landfill Gas to Energy Project does not use the methane to generate thermal energy, $MD_{thermal,\,y}$ = 0.

$MD_{flared,\,y}$ is calculated as follows:

$$MD_{flared,\,y} = LFG_{flared,\,y} \times w_{CH4} \times D_{CH4} \times FE \qquad (3)$$

Where:

$MD_{flared,y}$ = Quantity of methane destroyed by flaring (tCH_4);
$LFG_{flare,y}$ = Quantity of landfill gas flared during the year measured in cubic meters (Nm^3);
$w_{CH4,y}$ = Average methane fraction of the landfill gas as measured during the year and expressed as a fraction (m^3_{CH4}/m^3LFG)
FE = Flare efficiency (%);
D_{CH4} = Methane density expressed in tones of methane per cubic meter of methane (tCH_4/m^3_{CH4});

$MD_{electricity, y}$ is calculated as follows:

$$MD_{electricity,\ y} = LFG_{electricity,\ y} \times w_{CH4} \times D_{CH4} \quad (4)$$

Where:

$MD_{electricity,y}$ = Quantity of methane destroyed by generation of electricity (tCH_4);
$LFG_{electricity\ ,y}$ = quantity of landfill gas fed into electricity generator (Nm^3);
$w_{CH4,y}$ = Average methane fraction of the landfill gas as measured during the year and expressed as a fraction (m^3_{CH4}/m^3LFG)
D_{CH4} = Methane density expressed in tones of methane per cubic meter of methane (tCH_4/m^3_{CH4});

Thus, $MD_{project, y}$ is equal to:

$$MD_{project,\ y} = \left(LFG_{flared,\ y} \times w_{CH4} \times D_{CH4} \times FE\right) + \left(LFG_{electricity,\ y} \times w_{CH4} \times D_{CH4}\right) \quad (5.1)$$

$$MD_{project,\ y} = w_{CH4} \times D_{CH4} \times \left(LFG_{flared,\ y} \times FE + LFG_{electricity,\ y}\right) \quad (5.2)$$

The amount of methane that would have been destroyed/combusted during the year *y* in the absence of the project activity ($MD_{reg, y}$) is calculated adopting an “Adjustment Factor” (AF), as no regulatory or contractual requirements specifying a quantity of methane destruction exists. As will be presented below, the *AF* adopted for the 1st Crediting Period is equal to 20% of total gas collected. Thus, equation (1) is updated to:

$$ER_y = \left(MD_{project,\ y} - 0.2 \times MD_{project,\ y}\right) \times GWP_{CH4} + EG_y \times CEF + ET_y \times CEF_{thermal,\ y} \quad (6.1)$$

As São João Landfill Gas to Energy Project does not displace thermal energy, $ET_y = 0$ and equation 6.1 is updated to:

$$ER_y = \left(0.8 \times MD_{project,\ y}\right) \times GWP_{CH4} + EG_y \times CEF \quad (6.2)$$

Additionally, electricity consumption from the diesel generator times a conservative diesel CO_2 emission factor was subtracted from equation 6.2, resulting in:

$$ER_y = \left(0.8 \times MD_{project,\ y}\right) \times GWP_{CH4} + EG_y \times CEF - EC_y \times EF \quad (6.3)$$

Where:

EC_y = Electricity consumed from the diesel generator (MWh);
EF = Diesel CO_2 emission factor, based on a conservative value (tCO_2/MWh);

A description and consideration of measurement uncertainties and error propagation will be presented and detailed along this item.

Calculation of FE – Flare Efficiency

To calculate the Flare Efficiency, the following formulae were applied, based on the mass-balance (an Excel spreadsheet was evidenced to the Verification Team):

Calculate the volume of CH_4 sent to flares F_i ($Flow_{methane}$), measured by FIR500:

$$Flow_{methane} = Flow_{FIR500} \times \frac{\%_{methane}}{100}$$

Where:

- Flowmethane = methane flow sent to the flare Fi (Nm3/h);
- FlowFIRi = total flow measured by the flow-meter FIR500 sent to the flare Fi (Nm3/h);
- % methane = methane measured by the gas analyzer (%);

Calculate the volume of other gases (residual gases) sent to flares (Flowremaining):

$$Flow_{remaining} = Flow_{FIR500} - Flow_{methane}$$

Where:

- Flow remaining = flow of residual gases sent to the flare Fi (Nm3/h);

Calculate the total flow entering the flare Fi (FlowTotal):

$$Flow_{Total} = Flow_{methane} + (Flow_{methane} \times air_{ratio}) + Flow_{remaining}$$

Where:

- Flowtotal = total gas sent to the flare Fi (Nm3/h);
- air_{ratio} = theoretical air ratio[7];

Calculate the mass of methane in the exhaust gas (Mmethane):

$$M_{methane} = Flow_{Total} \times \frac{CH_{4,eg}}{1000}$$

Where:

- $M_{methane}$ = amount of methane remaining in the exhaust gas (g), calculated using the result of the analysis;
- $CH_{4,eg}$ = methane concentration in the exhaust gas (mg/Nm^3) – data acquired from the analysis form the specialized company;

Calculate the Flare Efficiency (FE):

$$FE = \frac{(Flow_{methane} \times 0.7168) - \frac{M_{methane}}{1000}}{(Flow_{methane} \times 0.7168)} \times 100$$

, where:

- FE = Flare Efficiency (%);
- 0.7168 = density of methane, at STP (kg/Nm^3).

[7] Air_{ratio} is equal to 5, as recommended by Hoffstetter, the flare manufacturer.

During this monitoring period, CORPLAB/ESAAT[8] performed one analysis of the methane content in the exhaust gas of the flares F520, F540 and F560 on: 03/04/2012.The table below presents the methane concentration results.

Flare	January/2012	April/2012
F520	0.43 mg/Nm3	0.79 mg/Nm^3
F540	1.36 mg/Nm3	2.21 mg/Nm^3
F560	0.71 mg/Nm3	2.71 mg/Nm^3

Other parameters used to calculate the flare efficiency were:

Measurement	$Flow_{FIR500}$			$\%_{methane}$		
	F520	F540	F560	F520	F540	F560
January/2012	3,142.9385 Nm3/h	2,679.7077 Nm3/h	2,712.0769 Nm3/h	45.5738%	45.2815%	43.9077%
April/2012	1994.2923 Nm^3/h	2,110.5231 Nm^3/h	2,339.3846 Nm^3/h	48.8969%	49.6231%	48.7092%

The results were:

Measurement	Flare Efficiency Calculated		
	F520	F540	F560
January/2012	99.9996%	99.9986%	99.9993%
April/2012	99.9992%	99.9978%	99.9973%

In order to adopt a conservative approach, the lowest efficiency calculated through the methane content among the three flares was adopted. The table below resumes the period and the flare efficiency considered.

Period		Flare Efficiency Adopted
From	To	
01/02/2012	02/04/2012	99.9986%
03/04/2012	15/05/2012	99.9973%

The flare efficiency assumed from 01/02/2012 to 02/04/2012 was 99.9986%; the flare efficiency from 03/04/2012 to 15/05/2012 was 99.9973% (the lowest efficiencies calculated).

Monitoring of the operation time of the flares is made continuously by the PLC and every 5 minutes the instantaneously flare temperature is registered by the supervisory system. In order to guarantee the real destruction of the gas, the flares are equipped with an automatic system which can detect the existence of flame. The following operational procedure is applied:

- a signal of gas being collected is sent to the PLC, which sends a signal to a solenoid valve;
- the valve is opened and a small amount of gas is delivered to an ignition burner;
- the ignition burner ignites the gas;

[8] Since January/2011 Corplab has a new name: Corplab/ESAAT.

- an UV-sond (part of the ignition burner) verifies the existence of an stable flame – if not, the flare is stopped;
- if the stable flame detection is successful, the UV-sond sends a signal to the PLC, which then opens the main valve, located in the entrance of the flare;
- the main burner is ignited and gas begins to be destroyed;
- after a few seconds, the ignition burner is switched off and UV-sond begins to monitor the existence of flame in the flare – if no flame is detected, the flare will be automatically stopped by a signal sent from the UV-sond to the PLC;

According with the manufacturer, if the temperature of the flare is higher than 1,350^{o}C, the flare will be stopped automatically and if the temperature is below 900^{o}C an alarm indicates to the operator that the flare is running out of the specified combustion temperature range.

If temperature decreases significantly from one registration to another (5 minutes interval), it means that the main valve is closed – the flare is stopped and no gas is being burned. It can be confirmed that no gas is being burned by the instant reading of gas flow from the flow-meter FIR500, installed right before the flares entrances.

However, in some readings it was detected that the flare accepted gas, but with a combustion chamber temperature below 900^{o}C. It happened because between a 5 minutes interval the flare might have stopped and turned on again (e.g. the flare was stopped at 10:01 and turned on 10:04, not remaining enough time to register a temperature above 900^{o}C). To discount the values below 900^{o}C, the following procedure was applied:

- An hourly average of flares temperature was calculated, considering the temperature registers when the instant gas-flow was above 0 Nm^3/h (flares are accepting gas);
- Gas flow (FIR 500) is considered for the CER calculation only in the case when:
  a) all three flares´ temperature is above 900°C; or
  b) one flare´s temperature is above 900°C and the other two flares indicate temperature of 0°C;

Proper Excel sheets applying the above mentioned procedure were presented to the Verification Team.

Moreover, the flares are equipped with an hour-meter, which measures the accumulated operating hours of the flares. Despite of not being registered by SJ's computer supervisory system, Van der Wiel, one of Biogás shareholders, makes the registration of these accumulated operating hours of the flares every 00:01 via CARS, a system which allows Van der Wiel to have total access to the PLC of SJ.

PP has monthly worksheets to calculate the hourly average of the flares temperature (as detailed above) and for this monitoring period the worksheets were named "São João – PLC_2012.02", "São João – PLC_2012.03" "São João – PLC_2012.04" and "São João - PLC_2012.05[9]". These monthly worksheets files are very large because contains data registered by PLC every 5 minutes.

For this reason and in order to maintain transparency and to comply with the reporting requirements, PP decided to include in the CER calculation spreadsheet only the values related to the hourly data of flow and the temperature of the flares. It was created one new worksheet for each month verified; named DATA_FEB_2012, DATA_MAR_2012, DATA_APR_2012 and DATA_MAY_2012[11] which were included into the CER excel calculation spreadsheet (tool). In order to clarify the process these data were pasted as a link from the monthly worksheets to the CER Calculation spreadsheet.

[9] Until May 15th, 2012.

For the whole monitoring period, the following table presents all measured data and the calculation of methane destroyed.

DATE	COLLECTING SYSTEM				FLARING SYSTEM			ELECTRICITY GENERATION			
	LFG measured FIR600 (Nm^3)	Methane (%)	*Methane measured FIR600 (Nm³)*	Flares Efficiency (%)	LFG measured FIR500 (Nm³)	*Methane measured FIR500 (Nm³)*	*Methne Destroyed in Flares (Nm³)*	LFG measured FIR800 (Nm³)	*Methane measured FIR800 (Nm³)*	Eletricity Exported SJ (MWh)	Electricity Consumed from Diesel generator (MWh)
	A	B	*C = A . B*	D	E	*F = E . B*	*G = F . D*	H	*I = H . B*	J	L
01/02/2012	104,458	47.4563	*49,571.9018*	643	*305.1440*	99.9986%	*305.1397*	102,969	*48,865.2775*	166.50	0.0000
02/02/2012	112,478	47.0088	*52,874.5580*	0	*0.0000*	99.9986%	*0.0000*	111,838	*52,573.7017*	179.14	0.0000
03/02/2012	115,607	46.0212	*53,203.7286*	0	*0.0000*	99.9986%	*0.0000*	114,961	*52,906.4317*	182.41	0.0000
04/02/2012	117,322	45.9359	*53,892.9165*	0	*0.0000*	99.9986%	*0.0000*	116,694	*53,604.4391*	185.94	0.0000
05/02/2012	115,905	45.6890	*52,955.8354*	0	*0.0000*	99.9986%	*0.0000*	115,289	*52,674.3912*	183.21	0.0000
06/02/2012	112,213	46.3463	*52,006.5736*	0	*0.0000*	99.9986%	*0.0000*	111,460	*51,657.5859*	178.46	0.0000
07/02/2012	115,482	46.7389	*53,975.0164*	0	*0.0000*	99.9986%	*0.0000*	114,822	*53,666.5397*	184.27	0.0000
08/02/2012	117,934	45.9990	*54,248.4606*	0	*0.0000*	99.9986%	*0.0000*	117,244	*53,931.0675*	183.29	0.0000
09/02/2012	119,016	45.5409	*54,200.9575*	0	*0.0000*	99.9986%	*0.0000*	118,338	*53,892.1902*	183.49	0.0000
10/02/2012	116,441	46.5106	*54,157.4077*	0	*0.0000*	99.9986%	*0.0000*	115,763	*53,842.0658*	182.85	0.0000
11/02/2012	115,331	47.9497	*55,300.8685*	0	*0.0000*	99.9986%	*0.0000*	114,664	*54,981.0440*	187.90	0.0000
12/02/2012	116,161	47.1686	*54,791.5174*	0	*0.0000*	99.9986%	*0.0000*	115,453	*54,457.5637*	186.74	0.0000
13/02/2012	115,391	47.5788	*54,901.6531*	0	*0.0000*	99.9986%	*0.0000*	114,707	*54,576.2141*	183.70	0.0000
14/02/2012	115,265	46.5740	*53,683.5211*	0	*0.0000*	99.9986%	*0.0000*	114,625	*53,385.4475*	182.05	0.0000
15/02/2012	116,055	45.9237	*53,296.7500*	0	*0.0000*	99.9986%	*0.0000*	115,390	*52,991.3574*	180.18	0.0000
16/02/2012	120,093	46.3793	*55,698.2927*	0	*0.0000*	99.9986%	*0.0000*	119,349	*55,353.2307*	183.58	0.0000
17/02/2012	118,815	46.4750	*55,219.2712*	0	*0.0000*	99.9986%	*0.0000*	118,112	*54,892.5520*	181.70	0.0000
18/02/2012	117,973	46.4838	*54,838.3333*	0	*0.0000*	99.9986%	*0.0000*	117,334	*54,541.3018*	179.63	0.0000
19/02/2012	115,198	46.8094	*53,923.4926*	0	*0.0000*	99.9986%	*0.0000*	114,577	*53,632.8062*	175.78	0.0000
20/02/2012	117,929	46.3686	*54,682.0262*	0	*0.0000*	99.9986%	*0.0000*	117,279	*54,380.6303*	179.81	0.0000
21/02/2012	109,238	46.7800	*51,101.5364*	39,430	*18,445.3540*	99.9986%	*18,445.0957*	63,204	*29,566.8312*	96.76	1.0751

DATE	COLLECTING SYSTEM				FLARING SYSTEM			ELECTRICITY GENERATION			
	LFG measured FIR600 (Nm^3)	Methane (%)	*Methane measured FIR600 (Nm^3)*	Flares Efficiency (%)	LFG measured FIR500 (Nm^3)	*Methane measured FIR500 (Nm^3)*	*Methne Destroyed in Flares (Nm^3)*	LFG measured FIR800 (Nm^3)	*Methane measured FIR800 (Nm^3)*	Eletricity Exported SJ (MWh)	Electricity Consumed from Diesel generator (MWh)
	A	B	*C = A . B*	D	E	*F = E . B*	*G = F . D*	H	*I = H . B*	J	L
22/02/2012	121,856	44.7950	*54,585.3952*	0	*0.0000*	99.9986%	*0.0000*	121,147	*54,267.7986*	178.76	0.0000
23/02/2012	123,389	43.7127	*53,936.6634*	0	*0.0000*	99.9986%	*0.0000*	122,720	*53,644.2254*	180.42	0.0000
24/02/2012	122,081	44.0635	*53,793.1614*	0	*0.0000*	99.9986%	*0.0000*	121,415	*53,499.6985*	188.46	0.0000
25/02/2012	122,876	45.1854	*55,522.0121*	0	*0.0000*	99.9986%	*0.0000*	122,132	*55,185.8327*	187.54	0.0000
26/02/2012	116,084	46.0625	*53,471.1925*	0	*0.0000*	99.9986%	*0.0000*	115,372	*53,143.2275*	176.53	0.0000
27/02/2012	116,255	46.3011	*53,827.3438*	0	*0.0000*	99.9986%	*0.0000*	115,491	*53,473.6034*	178.23	0.0000
28/02/2012	116,951	46.0449	*53,849.9709*	0	*0.0000*	99.9986%	*0.0000*	116,170	*53,490.3603*	179.20	0.0000
29/02/2012	116,349	45.7200	*53,194.7628*	0	*0.0000*	99.9986%	*0.0000*	115,587	*52,846.3764*	176.86	0.0000
01/03/2012	115,427	45.9917	*53,086.8395*	0	*0.0000*	99.9986%	*0.0000*	114,720	*52,761.6782*	174.31	0.0000
02/03/2012	118,197	45.2546	*53,489.5795*	0	*0.0000*	99.9986%	*0.0000*	117,525	*53,185.4686*	176.89	0.0000
03/03/2012	121,492	44.0885	*53,564.0004*	0	*0.0000*	99.9986%	*0.0000*	120,760	*53,241.2726*	176.07	0.0000
04/03/2012	121,760	44.3171	*53,960.5009*	0	*0.0000*	99.9986%	*0.0000*	120,982	*53,615.7139*	175.13	0.0000
05/03/2012	118,306	44.6219	*52,790.3850*	0	*0.0000*	99.9986%	*0.0000*	117,553	*52,454.3821*	171.54	0.0000
06/03/2012	116,853	45.2438	*52,868.7376*	0	*0.0000*	99.9986%	*0.0000*	116,111	*52,533.0286*	173.50	0.0000
07/03/2012	115,716	45.4658	*52,611.2051*	14,125	*6,422.0442*	99.9986%	*6,421.9542*	97,677	*44,409.6294*	145.48	0.5266
08/03/2012	116,904	44.4877	*52,007.9008*	0	*0.0000*	99.9986%	*0.0000*	116,238	*51,711.6127*	170.74	0.0000
09/03/2012	116,544	44.2717	*51,596.0100*	0	*0.0000*	99.9986%	*0.0000*	115,827	*51,278.5819*	170.30	0.0000
10/03/2012	114,356	44.7019	*51,119.3047*	0	*0.0000*	99.9986%	*0.0000*	113,396	*50,690.1665*	166.56	0.0000
11/03/2012	115,830	45.3586	*52,538.8663*	0	*0.0000*	99.9986%	*0.0000*	114,712	*52,031.7572*	170.98	0.0000
12/03/2012	110,326	46.6462	*51,462.8866*	0	*0.0000*	99.9986%	*0.0000*	109,294	*50,981.4978*	167.62	0.0000
13/03/2012	110,733	45.6198	*50,516.1731*	0	*0.0000*	99.9986%	*0.0000*	109,788	*50,085.0660*	169.26	0.0000

DATE	COLLECTING SYSTEM				FLARING SYSTEM			ELECTRICITY GENERATION			
	LFG measured FIR600 (Nm³)	Methane (%)	*Methane measured FIR600 (Nm³)*	Flares Efficiency (%)	LFG measured FIR500 (Nm³)	*Methane measured FIR500 (Nm³)*	*Methne Destroyed in Flares (Nm³)*	LFG measured FIR800 (Nm³)	*Methane measured FIR800 (Nm³)*	Eletricity Exported SJ (MWh)	Electricity Consumed from Diesel generator (MWh)
	A	B	*C = A . B*	D	E	*F = E . B*	*G = F . D*	H	*I = H . B*	J	L
14/03/2012	108,413	45.5191	*49,348.6218*	28,484	*12,965.6604*	99.9986%	*12,965.4788*	74,967	*34,124.3036*	114.77	0.6308
15/03/2012	111,294	44.8763	*49,944.6293*	85,489	*38,364.3001*	99.9986%	*38,363.7629*	25,018	*11,227.1527*	38.28	1.5288
16/03/2012	110,438	45.4750	*50,221.6805*	194	*88.2215*	99.9986%	*88.2202*	109,487	*49,789.2132*	166.31	0.0000
17/03/2012	110,900	45.4977	*50,456.9493*	0	*0.0000*	99.9986%	*0.0000*	110,252	*50,162.1242*	167.28	0.0000
18/03/2012	107,375	44.9636	*48,279.6655*	0	*0.0000*	99.9986%	*0.0000*	105,430	*47,405.1234*	157.86	0.0100
19/03/2012	111,442	44.5547	*49,652.6487*	0	*0.0000*	99.9986%	*0.0000*	109,314	*48,704.5247*	161.06	0.0913
20/03/2012	111,980	45.0483	*50,445.0863*	0	*0.0000*	99.9986%	*0.0000*	111,295	*50,136.5054*	165.20	0.0000
21/03/2012	109,545	45.5795	*49,930.0632*	18,543	*8,451.8066*	99.9986%	*8,451.6882*	88,081	*40,146.8793*	133.22	0.4240
22/03/2012	113,993	44.7353	*50,995.1105*	0	*0.0000*	99.9986%	*0.0000*	113,186	*50,634.0966*	168.44	0.0000
23/03/2012	111,759	44.8889	*50,167.3857*	0	*0.0000*	99.9986%	*0.0000*	110,874	*49,770.1189*	166.35	0.0000
24/03/2012	112,209	45.5352	*51,094.5925*	0	*0.0000*	99.9986%	*0.0000*	111,294	*50,677.9454*	171.25	0.0000
25/03/2012	111,216	45.4839	*50,585.3742*	0	*0.0000*	99.9986%	*0.0000*	110,262	*50,151.4578*	169.09	0.0000
26/03/2012	107,858	46.4625	*50,113.5232*	0	*0.0000*	99.9986%	*0.0000*	106,964	*49,698.1485*	167.34	0.0000
27/03/2012	107,922	46.7363	*50,438.7496*	0	*0.0000*	99.9986%	*0.0000*	107,053	*50,032.6112*	167.89	0.0000
28/03/2012	109,618	46.5332	*51,008.7631*	0	*0.0000*	99.9986%	*0.0000*	108,690	*50,576.9350*	166.97	0.0000
29/03/2012	107,908	46.6078	*50,293.5448*	1,494	*696.3205*	99.9986%	*696.3107*	105,538	*49,188.9399*	158.60	0.1468
30/03/2012	116,746	45.5856	*53,219.3645*	0	*0.0000*	99.9986%	*0.0000*	113,772	*51,863.6488*	166.51	0.0000
31/03/2012	123,571	43.6860	*53,983.2270*	0	*0.0000*	99.9986%	*0.0000*	122,607	*53,562.0940*	173.39	0.0000
01/04/2012	117,159	45.2768	*53,045.8461*	0	*0.0000*	99.9986%	*0.0000*	116,247	*52,632.9216*	171.33	0.0000
02/04/2012	115,157	45.8181	*52,762.7494*	0	*0.0000*	99.9986%	*0.0000*	114,273	*52,357.7174*	170.74	0.0000
03/04/2012	104,717	44.7672	*46,878.8688*	13,718	*6,141.1644*	99.9973%	*6,140.9985*	84,018	*37,612.5060*	126.71	0.2087

DATE	COLLECTING SYSTEM				FLARING SYSTEM			ELECTRICITY GENERATION			
	LFG measured FIR600 (Nm³)	Methane (%)	*Methane measured FIR600 (Nm³)*	Flares Efficiency (%)	LFG measured FIR500 (Nm³)	*Methane measured FIR500 (Nm³)*	*Methne Destroyed in Flares (Nm³)*	LFG measured FIR800 (Nm³)	*Methane measured FIR800 (Nm³)*	Eletricity Exported SJ (MWh)	Electricity Consumed from Diesel generator (MWh)
	A	B	*C = A . B*	D	E	*F = E . B*	*G = F . D*	H	*I = H . B*	J	L
04/04/2012	111,463	45.0148	*50,174.8465*	5,709	*2,569.8949*	99.9973%	*2,569.8255*	103,916	*46,777.5795*	157.65	0.1713
05/04/2012	113,497	45.1761	*51,273.5182*	0	*0.0000*	99.9973%	*0.0000*	112,565	*50,852.4769*	171.10	0.0000
06/04/2012	113,620	44.8064	*50,909.0316*	0	*0.0000*	99.9973%	*0.0000*	112,642	*50,470.8250*	169.30	0.0000
07/04/2012	113,052	44.6522	*50,480.2051*	0	*0.0000*	99.9973%	*0.0000*	112,131	*50,068.9583*	165.00	0.0000
08/04/2012	114,470	43.9720	*50,334.7484*	0	*0.0000*	99.9973%	*0.0000*	113,703	*49,997.4831*	165.85	0.0000
09/04/2012	112,340	44.1961	*49,649.8987*	0	*0.0000*	99.9973%	*0.0000*	111,648	*49,344.0617*	164.70	0.0000
10/04/2012	106,249	44.6895	*47,482.1468*	0	*0.0000*	99.9973%	*0.0000*	105,674	*47,225.1822*	163.50	0.0000
11/04/2012	105,252	45.3824	*47,765.8836*	0	*0.0000*	99.9973%	*0.0000*	104,665	*47,499.4889*	163.78	0.0000
12/04/2012	106,746	45.2645	*48,318.0431*	0	*0.0000*	99.9973%	*0.0000*	106,158	*48,051.8879*	163.67	0.0000
13/04/2012	106,435	45.9535	*48,910.6077*	0	*0.0000*	99.9973%	*0.0000*	105,878	*48,654.6467*	165.21	0.0000
14/04/2012	105,308	46.6588	*49,135.4491*	0	*0.0000*	99.9973%	*0.0000*	104,821	*48,908.2207*	166.10	0.0000
15/04/2012	105,249	45.8610	*48,268.2438*	0	*0.0000*	99.9973%	*0.0000*	104,724	*48,027.4736*	164.51	0.0000
16/04/2012	106,107	45.2816	*48,046.9473*	0	*0.0000*	99.9973%	*0.0000*	105,557	*47,797.8985*	161.05	0.0000
17/04/2012	105,647	45.5451	*48,117.0317*	0	*0.0000*	99.9973%	*0.0000*	105,053	*47,846.4939*	161.34	0.0000
18/04/2012	105,134	45.6869	*48,032.4654*	23,045	*10,528.5461*	99.9973%	*10,528.2618*	81,232	*37,112.3826*	125.59	0.6200
19/04/2012	105,385	45.5245	*47,975.9943*	51,614	*23,497.0154*	99.9973%	*23,496.3809*	51,495	*23,442.8412*	79.82	1.0877
20/04/2012	103,415	46.0379	*47,610.0942*	0	*0.0000*	99.9973%	*0.0000*	102,689	*47,275.8591*	160.70	0.0000
21/04/2012	104,036	46.1127	*47,973.8085*	0	*0.0000*	99.9973%	*0.0000*	103,236	*47,604.9069*	161.54	0.0000
22/04/2012	104,455	45.5088	*47,536.2170*	0	*0.0000*	99.9973%	*0.0000*	103,570	*47,133.4641*	159.90	0.0000
23/04/2012	100,644	46.8885	*47,190.4619*	0	*0.0000*	99.9973%	*0.0000*	99,778	*46,784.4075*	155.99	0.0000
24/04/2012	99,010	46.7430	*46,280.2443*	0	*0.0000*	99.9973%	*0.0000*	98,141	*45,874.0476*	155.35	0.0000

DATE	COLLECTING SYSTEM				FLARING SYSTEM			ELECTRICITY GENERATION			
	LFG measured FIR600 (Nm^3)	Methane (%)	*Methane measured FIR600 (Nm^3)*	Flares Efficiency (%)	LFG measured FIR500 (Nm^3)	*Methane measured FIR500 (Nm^3)*	*Methne Destroyed in Flares (Nm^3)*	LFG measured FIR800 (Nm^3)	*Methane measured FIR800 (Nm^3)*	Eletricity Exported SJ (MWh)	Electricity Consumed from Diesel generator (MWh)
DATE	A	B	*C = A . B*	D	E	*F = E . B*	*G = F . D*	H	*I = H . B*	J	L
25/04/2012	96,912	47.3027	*45,841.9926*	0	*0.0000*	99.9973%	*0.0000*	95,518	*45,182.5929*	153.21	0.0000
26/04/2012	97,204	47.9004	*46,561.1048*	0	*0.0000*	99.9973%	*0.0000*	96,370	*46,161.6154*	157.46	0.0000
27/04/2012	92,633	49.6850	*46,024.7060*	0	*0.0000*	99.9973%	*0.0000*	91,506	*45,464.7561*	156.02	0.0000
28/04/2012	91,749	50.1902	*46,049.0065*	0	*0.0000*	99.9973%	*0.0000*	91,009	*45,677.5991*	155.26	0.0000
29/04/2012	94,514	49.2663	*46,563.5507*	57,881	*28,515.8271*	99.9973%	*28,515.0571*	33,571	*16,539.1895*	56.58	1.6883
30/04/2012	87,603	51.6876	*45,279.8882*	0	*0.0000*	99.9973%	*0.0000*	86,819	*44,874.6574*	150.73	0.0000
01/05/2012	89,205	51.1765	*45,651.9968*	0	*0.0000*	99.9973%	*0.0000*	88,576	*45,330.0966*	152.41	0.0000
02/05/2012	71,678	45.5690	*32,662.9478*	3,075	*1,401.2467*	99.9973%	*1,401.2088*	67,240	*30,640.5956*	111.94	0.2345
03/05/2012	90,219	48.9588	*44,170.1397*	0	*0.0000*	99.9973%	*0.0000*	89,484	*43,810.2925*	149.74	0.0000
04/05/2012	91,327	48.2879	*44,099.8904*	0	*0.0000*	99.9973%	*0.0000*	90,461	*43,681.7172*	150.46	0.0000
05/05/2012	91,202	48.1463	*43,910.3885*	0	*0.0000*	99.9973%	*0.0000*	90,330	*43,490.5527*	150.92	0.0000
06/05/2012	94,098	46.6231	*43,871.4046*	0	*0.0000*	99.9973%	*0.0000*	93,148	*43,428.4851*	151.13	0.0000
07/05/2012	94,645	45.7273	*43,278.6030*	0	*0.0000*	99.9973%	*0.0000*	93,778	*42,882.1473*	149.09	0.0000
08/05/2012	90,819	46.7344	*42,443.7147*	4,233	*1,978.2671*	99.9973%	*1,978.2136*	85,737	*40,068.6725*	138.72	0.1922
09/05/2012	85,361	50.6767	*43,258.1378*	0	*0.0000*	99.9973%	*0.0000*	84,479	*42,811.1693*	137.30	0.0000
10/05/2012	85,271	51.9164	*44,269.6334*	0	*0.0000*	99.9973%	*0.0000*	84,423	*43,829.3823*	141.03	0.0000
11/05/2012	88,082	51.2681	*45,157.9678*	0	*0.0000*	99.9973%	*0.0000*	87,290	*44,751.9244*	146.58	0.0000
12/05/2012	90,978	50.2820	*45,745.5579*	0	*0.0000*	99.9973%	*0.0000*	90,169	*45,338.7765*	150.00	0.0000
13/05/2012	92,321	48.5763	*44,846.1259*	51,027	*24,787.0286*	99.9973%	*24,786.3593*	39,599	*19,235.7290*	62.04	1.0611
14/05/2012	93,657	47.9702	*44,927.4502*	53,673	*25,747.0454*	99.9973%	*25,746.3502*	38,965	*18,691.5884*	59.72	1.8084
15/05/2012	94,526	47.3876	*44,793.6027*	61,509	*29,147.6388*	99.9973%	*29,146.8518*	32,087	*15,205.2592*	48.64	2.2131

Obs.: the calculation of methane measured and methane destroyed was conservatively made, using Excel tool “ROUND DOWN” with four decimal rounds.

A consolidation of methane destroyed and electricity consumed/exported is presented in the table below:

Total Methane Destroyed in Flares (Nm^3), measured by FIR500	**240,047.1579**
Total Methane destroyed in the Power House (Nm^3), measured by FIR800	**4,963,206.0000**
Total electricity consumed from the diesel generator (MWh)	**13.7187**
Total Electricity Exported, measured at São João Landfill's substation (MWh)	**16,660.9963**

ERs from the electricity indeed exported are measured at Eletropaulo substation (based on monthly electricity transaction notes), located around 14 km from São João Landfill. The values measured are lower than the one in the landfill's substation due to losses in the transmission line. The table below presents the electricity measured during the Monitoring Period and the comparison between the one measured in the landfill:

MONTH	Electricity Measured at São João Landfill (MWh)	Electricity Measured at Eletropaulo Substation (MWh)[10]
February/2012	5,173.3820	4,975.7190
March/2012	4,988.1783	4,840.1060
April/2012	4,599.7160	4,461.2499
May/2012[11]	**1,899.7200**	1,844.6274
TOTAL	**116,660.9963**	**16,121.7023**

As mentioned above, follows the description and consideration of measurement uncertainties and error propagation of the equipment. The readings from all equipment are subjected to internal errors from a standard value. These errors are measured and described in the Calibration Certificates, in terms of ± % from the standard adopted.

All calibrations usually have an expiration date, however the manufacturers of the flow-meters and pressure-temperature transmitters are Europeans and there are no rule in Europe specifying the calibration periodicity. Biogás decided to adopt a 2 years calibration frequency for the electricity meter of the grid, 5 years calibration frequency for the electricity meter of the diesel generator and 5 years for the others instruments. Regarding electricity meter, the manufacturer does not mention a specific calibration frequency of the meter. Besides, does not exist any standard or norm in Brazil indicating a specific calibration frequency.

The errors for each instrument will be presented in the formulae below.

Adopting a conservative approach on Emission Reduction calculation, the equivalent error calculated was discounted from the amount of methane calculated for each flow-meter, according to the equations below:

$$\varepsilon_{FIR500} = \sqrt{\left(\varepsilon_{\text{Gas Flow}_{FIR500}}\right)^2 + \left(\varepsilon_{\text{Temperature}_{FIR500}}\right)^2 + \left(\varepsilon_{\text{Pressure}_{FIR500}}\right)^2 + \left(\varepsilon_{\text{Methane Analysis}}\right)^2}$$

$$\varepsilon_{FIR600} = \sqrt{\left(\varepsilon_{\text{Gas Flow}_{FIR600}}\right)^2 + \left(\varepsilon_{\text{Temperature}_{FIR600}}\right)^2 + \left(\varepsilon_{\text{Pressure}_{FIR600}}\right)^2 + \left(\varepsilon_{\text{Methane Analysis}}\right)^2}$$

$$\varepsilon_{FIR800} = \sqrt{\left(\varepsilon_{\text{Gas Flow}_{FIR800}}\right)^2 + \left(\varepsilon_{\text{Temperature}_{FIR800}}\right)^2 + \left(\varepsilon_{\text{Pressure}_{FIR800}}\right)^2 + \left(\varepsilon_{\text{Methane Analysis}}\right)^2}$$

[10] Electricity measured based on monthly transaction notes.
[11] Until May 15th, 2012.

Calculation of $LFG_{flared, y}$

The calculation of $LFG_{flared, y}$ is the measurement from FIR500 made during the monitoring period, minus the uncertainties of the flow-meters, as follows:

$$LFG_{\text{flared, y, corrected}} = FIR_{500} \times \left(1 - \frac{\varepsilon_{FIR500}}{100}\right)$$

Applying the errors from the table below in the equations previously presented:

$$\varepsilon_{FIR500} = \sqrt{0.980^2 + 0.030^2 + 0.010^2 + 1.000^2} = 1.4005\%$$

Calculation of $LFG_{electricity, y}$

The calculation of $LFG_{electricity, y}$ is measurement from FIR800 made during the monitoring period, minus the uncertainties of the flow-meter, as follows:

$$LFG_{\text{electricity, y, corrected}} = FIR_{800} \times \left(1 - \frac{\varepsilon_{FIR800}}{100}\right)$$

Applying the errors from the table below in the equations previously presented:

$$\varepsilon_{FIR800} = \sqrt{1.280^2 + 0.100^2 + 0.010^2 + 1.000^2} = 1.6275\%$$

Calculation of $EG_{y, corrected}$

The calculation of EG_y is the sum of all measurements from the electricity-meter made during the monitoring period, minus the uncertainties of the electricity-meter due to conservativeness, as follows:

$$EG_{\text{y, corrected}} = \sum EG_y \times \left(1 - \frac{\varepsilon_{EG}}{100}\right)$$

$$\varepsilon_{EG} = 1.0000\%$$

Calculation of $EC_{y, corrected}$

The calculation of EC_y is the sum of all measurements from the electricity-meter made during the monitoring period, plus the uncertainties of the electricity-meter due to conservativeness, as follows:

$$EC_{\text{y, corrected}} = \sum EC_y \times \left(1 + \frac{\varepsilon_{EC}}{100}\right)$$

$\varepsilon_{EC} = 0.5000\%$

Table providing the formulae used

	Variable	Description
Flaring System	A_{FIR500} (see the table of consolidated methane destroyed and electricity consumed/exported – last table from item 4.1)	Total methane destroyed in flares, measured by FIR500 (Nm^3)
	B_{FIR500}	Total error from FIR500 (%) – see item 4.4
	$C_{FIR500} = A_{FIR500} \cdot (1 - B_{FIR500}/100)$	**Total methane corrected destroyed at the flare (Nm^3)**
Power House	A_{FIR800} (see the table of consolidated methane destroyed and electricity consumed/exported – last table from item 4.1)	Methane flow to the power house measured by FIR800 (Nm^3)
	B_{FIR800}	Total measuring error from FIR800 (%) – see item 4.5
	$C_{FIR800} = A_{FIR800} \cdot (1 - B_{FIR800}/100)$	**Total methane corrected destroyed at the power house (Nm^3)**
CO_2e Methane	$A = C_{FIR500} + C_{FIR800}$	Total methane destroyed in the period (Nm^3)
	B = 0.0007168	Density of Methane at the STPC (tCH_4/Nm^3)
	C = A . B	Total weight of methane destroyed (tCH_4)
	D = 21	CO_2 equivalency (tCO_2e/tCH_4)
	E = C . D	Total equivalent carbon (tCO_2e)
	F = 20%	Adjustment Factor (%)
	G = E . (1-F)	**Total equivalent carbon after consideration of Adjustment Factor (tCO_2e)**
CO_2e Electricity Exported	H (see the table of consolidated methane destroyed and electricity consumed/exported – last table from item 4.1)	Total electricity exported (MWh)
	I	Electricity-meter error (%)
	J = H . (1 – I/100)	Total electricity corrected (MWh)
	K = 0.2677	Emission Factor (tCO_2e/MWh)
	L = J . K	**Total CO_2e from the electricity exported (tCO_2e)**
CO_2e Electricity Consumed	M (see the table of consolidated methane destroyed and electricity consumed/exported – last table from item 4.1)	Total Electricity Consumed from the Diesel Generator (MWh)
	N	Electricity-meter error (%)
	O = M . (1 + N/100)	Total electricity corrected (MWh)
	P = 1.3	Conservative Diesel CO_2 Emission Factor (tCO_2e/MWh)
	Q = O . P	**Total CO_2e from the electricity consumed (tCO_2e)**
TOTAL	**R = G + L – Q**	**TOTAL CREDITS DURING THE PERIOD (tCO_2e)**

E.2. Calculation of project emissions or actual net GHG removals by sinks
SJ have project emissions from the consumption of electricity from an emergency diesel generator during energy supply black-outs, as per stated in the revised monitoring plan. This source of emission will only be accounted during emergency situations and the electricity consumed by SJ will be from the Power Plant. Project emissions due to electricity consumption from the diesel generator are discounted of the total CERs generated.

E.3. Calculation of leakage
No leakages under **ACM0001 – version 02.**

E.4. Summary of calculation of emission reductions or net anthropogenic GHG removals by sinks
In accordance with the ACM0001 (version 2) and the registered PDD, emission reductions (ERy, expressed in tCO2) are calculated according to the following formula:

$ER_y = BE_y - PE_y - L_y$

Where:
ER_y = Emission reductions in year $_y$
BE_y = Baseline emissions in year $_y$
PE_y = Project emissions in year $_y$
L_y = Leakage in year $_y$

In SJ Project, there is no leakage calculation. For this reason we considered that:

$ER_y = BE_y - PE_y$

According to the above calculation of baseline emissions and project emissions, the project emission reductions are calculated as shown in the table below. The project totally generated 65,893 tCO2e during this monitoring period.

Period	Baseline Emissions	Project Emissions	Leakage	Emission Reductions
	tCO_2e	tCO_2e	tCO_2e	tCO_2e
01/02/2012 to 15/05/2012	65,911	18	-	65,893

E.5. Comparison of actual emission reductions or net anthropogenic GHG removals by sinks with estimates in registered PDD
The actual emission reductions during the monitoring period are: 65,893 tCO_2.

According to the registered PDD, the estimated value of emission reduction is averagely 653,212 tCO_2e/year for 2012, that is 54,427 tCO_2e per month on average in 2012, while the project activity actually generates totally 65,893tCO2e emission reductions during the three months and a half of this monitoring period – from 01/02/2012 to 15/05/2012 – with 104 days when the plants are in operation. That is about 19,007 tCO2e per month; which is about 65% lower than the estimated average value per month in 2012.

Therefore, the emission reductions in this monitoring period are not higher than the estimation in the PDD even when bearing in mind the monitoring period does not cover a full calendar year. The difference between the PDD estimate and the gas flow monitored is mainly due for the landfill´s poor final layer cover, which increases the gas leakage through the landfill´s surface.

Item	Values applied in ex-ante calculation of the registered CDM-PDD	Actual values reached during the monitoring period
Emission reductions (tCO_2e)	**186,094 (value in this monitoring period) 653,121 (value in year 2012)**	**65,893**

E.6. Remarks on difference from estimated value in registered PDD
Not applicable to this monitoring period.

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History of the document

Version	Date	Nature of revision
02.0	EB 66 13 March 2012	Revision required to ensure consistency with the "Guidelines for completing the monitoring report form" (EB 66, Annex 20).
01	EB 54, Annex 34 28 May 2010	Initial adoption.
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