

# **REPORT ON GREENHOUSE GAS EMISSION REDUCTION**

**Project Reference Number: 1636**

**Project Title: Alto-Tietê landfill gas capture project**

**Monitoring period: September 25<sup>th</sup> 2008 – March 04<sup>th</sup> 2009**

Alto Tietê Biogás, Redução de Emissões e Geração de Energia Ltda.

Itaquaquecetuba/SP

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# **1 INTRODUCTION**

A gas collection and flaring system was built in the Itaquaquecetuba landfill operated by Empreiteira Pajoan Ltda.

This project was registered under the Clean Development Mechanism at the UNFCCC, according to the Project Design Document Version 06 of December 13<sup>th</sup>, 2007, using the approved methodology ACM0001 Version 5.

The Project Design Document was validated by TÜV NORD CERT GmbH in December 13<sup>th</sup> 2007, approved by the Brazilian Government in February 26<sup>th</sup> 2008 and registered at the Executive Board in May 29<sup>th</sup> 2008.

# **2 OBJECTIVE**

This report aims at quantifying the Greenhouse Gas Emission Reductions obtained by the project from September 25<sup>th</sup> 2008 to March 04<sup>th</sup> 2009.

The Emission Reductions (ER) are calculated in tones of carbon dioxide equivalent (tCO<sub>2</sub>e) and shall be certified by the Designated Operational Entity, according to the Kyoto Protocol and CDM Modalities Procedures.

### **3 GENERAL DESCRIPTION OF THE PROJECT**

The project activity is located in the municipality of Itaquaquecetuba, 40 km from the State Capital, São Paulo, Brazil, in the landfill operated by the private company Empreiteira Pajoan Ltda.. It consists of capturing and flaring the landfill gas which is generated by the decomposition of the waste accepted in the landfill.

The landfill was opened on March 2000 to receive non-hazardous wastes generated in the metropolitan area of São Paulo. The landfill currently receives approximately 2,000 tons/day of wastes.

The project design included an active gas recovery system composed by a collection and transportation pipeline network and a gas flaring system.

The project participants are the project developer, Alto-Tietê Biogás, Redução de Emissões e Geração de Energia Ltda. and Carbon Capital Markets Ltd.

## 4 TECHNICAL INFORMATION

### 4.1 Operation history

The first operation tests were performed in September 22<sup>nd</sup> 2008. The flaring system started to operate continuously in September 25<sup>th</sup> 2008.

The following table summarizes the availability of the flaring system:

Month	Availability	
	Hours	%
September 2008 (*)	139.6	97%
October 2008	663.6	89%
November 2008	701.3	97%
December 2008	728.8	98%
January 2009	705.9	95%
February 2009	655.9	98%
March 2009 (**)	88.7	92%
<b>Total:</b>	<b>3683.8</b>	<b>95%</b>

(\*) Operation started in September 25<sup>th</sup> 2008

(\*\*) Until March 04<sup>th</sup> 2009

During the monitoring period covered by this report, the system went out of operation a few times due to the following reasons (decreasing order of significance):

- Electricity supply failure;
- Corrective and preventive maintenance (blowers, flare, general);
- Process alarms;
- Calibration of instruments.

All operations are registered in forms and in electronic spreadsheets. All maintenance procedures in the critical pieces of equipment (flare, blowers, gas analyzer, air compressor) are also registered. Instrumentation calibration records are registered in a workbook and the certificates of calibration are kept in files.

## 4.2 Monitoring and Data Acquisition

### Monitored parameters

As described in the revised Monitoring Plan of the PDD<sup>1</sup> and in compliance with ACM0001 Version 05, the following parameters were monitored:

- Total amount of landfill gas captured from project wells = Total amount of landfill gas flared ( $\text{Nm}^3$ ); Instantaneous flow rate is measured and read continuously by a flow meter (FIT-01). Flow rates are recorded every minute. Totalized flow is calculated every minute. Data is aggregated monthly and yearly;
- Project emissions from flaring of the residual gas stream ( $\text{tCO}_2\text{e}$ ); As per EB 28 Annex 13, this parameter is calculated on an hourly basis. Actually, it is calculated every minute and the daily totals are displayed in the calculation spreadsheets;
- Methane fraction in the landfill gas ( $\text{m}^3\text{CH}_4/\text{m}^3\text{LFG}$ ); Instantaneous methane fraction in the landfill gas is measured and read continuously by a gas analyzer (AG-01). Values are recorded every minute;
- Total amount of electricity imported to meet project requirement (MWh/year); Electricity consumption is measured and read continuously. The utility company verifies the readings once per month and the electricity consumption is recorded in the monthly bills that the Project Participant receives from the utility company;
- $\text{CO}_2\text{e}$  emissions conversion factor for electricity ( $\text{tCO}_2\text{e}/\text{MWh}$ ); Emission factor was provided by the Brazilian DNA;
- Landfill Waste (ton); Each load of waste entering the landfill is measured at a weight bridge and is recorded. Data is archived daily in paper and monthly in electronic format;

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<sup>1</sup> <http://cdm.unfccc.int/UserManagement/FileStorage/HRPAMQ9CV7IWBYZ638D21OEULXKFNS>

- Regulatory requirements relating to landfill gas projects; Data is aggregated yearly and archived in electronic format;
- Combustion efficiency (%); As per EB 28 Annex 13, this parameter is calculated on an hourly basis. Actually, it is calculated every minute and the daily totals are displayed in the calculation spreadsheets.
- Temperature in the exhaust gas of the flare ( $^{\circ}\text{C}$ ); Measures are performed continuously by two thermocouples (TT-04 and TT-05). Records are kept electronically, minute by minute.
- Flare working hours (h); Operation of the system is recorded minute by minute in the data register;
- Volumetric fraction of component  $i$  in the residual gas ( $i=\text{CH}_4, \text{CO}_2, \text{O}_2$ ); Measures are performed continuously by the gas analyzer (AG-01), in wet basis. Records are kept electronically, minute by minute;
- Volumetric flow rate of residual gas ( $\text{Nm}^3/\text{h}$  and  $\text{m}^3/\text{h}$ ); Measures are performed continuously by a flow meter (FIT-01). Records are kept electronically, minute by minute;
- Volumetric fraction of oxygen in the exhaust gas; Measures are performed continuously by a gas analyzer (AG-02). Records are kept electronically, minute by minute;
- Concentration of methane in the exhaust gas ( $\text{mg}/\text{m}^3$ ); Measures are performed continuously by a gas analyzer (AG-02), in wet basis. Records are kept electronically, minute by minute;
- Consumption of LPG by the project activity (kg); The mass of LPG purchased by the project participant is stated in the invoices issued by the LPG supplier, which are kept in files.

The instruments used to monitor the project activity were kept calibrated, according to the established monitoring plan, manufacturers' recommendations and to internal QA/QC procedures. A summary of the calibration control is shown in **Annex A**. Calibration certificates are kept in files and are available for the verification process.

Landfill gas flow is automatically measured and registered on a continuous basis and converted automatically to norm cubic meters ( $\text{Nm}^3$ ) by the flow meter, using continuous internal measurements of pressure and temperature. Therefore, the independent measurements of pressure and temperature, performed by other instruments, are not presented in the ER totalization spreadsheets in **Annex B**.

The following parameters were also automatically measured and registered: CH<sub>4</sub>, CO<sub>2</sub> and O<sub>2</sub> content in the residual gas; CH<sub>4</sub> and O<sub>2</sub> content in the exhaust gas; landfill gas pressure (after compression), landfill gas temperature (after compression), and exhaust gas temperature. The exhaust gas temperature is measured by two thermocouples, installed in the flare.

All the above mentioned parameters and the following additional parameters are also manually registered by the operators: gas analyzer readings (landfill and exhaust gas contents), pressure indicator readings, temperature indicator readings. These registers are kept in files.

The amount of electricity imported to meet project requirement is measured monthly by the utility company BANDEIRANTE ENERGIA S.A. An energy meter was installed at ATB in October 15<sup>th</sup>, 2008, after the operation started (in September 25<sup>th</sup>, 2008).

The amount of waste received in the landfill was informed by Empreiteira Pajoan Ltda. as shown in the table below:

Month	Amount of waste (ton)
September 2008 (*)	11,318.12
October 2008	59,676.27
November 2008	54,633.62
December 2008	64,019.11
January 2009	59,743.12
February 2009	58,703.06
March 2009 (**)	7,562.80
<b>Total:</b>	<b>315,656.10</b>

(\*) Accepted waste since the monitoring period started, in September 25<sup>th</sup> 2008

(\*\*) Until March 04<sup>th</sup> 2009

An internal audit was performed in January and February 2009, as part of the monitoring plan and of the QA/QC internal procedures. A regulatory review was performed, based on the most recent Temporary Operation Permit nr. 26001234 issued by the State Environmental Agency (CETESB) and valid until March 25<sup>th</sup> 2009. No



changes to the adjustment factor or to the amount of methane that would have been destroyed/combusted during the monitoring period in the absence of the project, in tones of methane (MDreg,y) were identified. Regulatory reviews will be performed at least yearly and will be used to correct the adjustment factor at the renewal of the crediting period, if necessary.

The flaring efficiency, calculated and monitored continuously by the supervisory system, was also measured by an independent laboratory. BIOAGRI Ambiental Ltda. collected samples of the exhaust gas of the flare in January 12<sup>th</sup> 2009 and after analyzing its methane content, determined a 99.997%<sup>2</sup> combustion efficiency, which is even greater than the average continuously monitored flare efficiency values.

The temperature of the exhaust gas of the flare is typically greater than 700°C, because of the design of the equipment, which is classified as a low height insulated flare. According to the guidance provided by AM\_CLA\_0047<sup>3</sup>, it can be verified that the flare has been operated within the temperature and flow rate ranges established by the manufacturer, during the period covered by this monitoring report.

In fact, the flare has been operated with LFG flow rates significantly lower than its full capacity and no visible flames have ever been observed at the top of the equipment. The sound operation of the equipment, with no visible flames was observed during the verification site visit conducted by the DOE.

Despite of the fact that the monitoring performed by BIOAGRI Ambiental Ltda. was not fully in accordance with the monitoring guidance provided by AM\_CLA\_0047 (three samples were collected at one single point, at a distance of 0.5m-1,5m to the side of the flare, the collection of each sample lasted 20 minutes), the obtained results showed that the average value of the methane concentration in the exhaust gas, 0.84 ppmv, was even lower than those obtained with the single point measurement of the flaring system (refer to monthly averages in **Annex B**).

From 05/jan/2010 on, the project participant will measure the methane composition profile once a year using the traversing measuring procedure. The measurement will be used to calculate the flare efficiency, which will be compared to the calculations resulting from the single point measurement.

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<sup>2</sup> BIOAGRI Ambiental Ltda., Boletim de Análise N° 3677/09 – Óxidos de Nitrogênio (NO<sub>x</sub>), Monóxido de Carbono, Compostos Orgânicos Gasosos da Chaminé do Flare – 06-feb-2009, revised in 11-jan-2010

<sup>3</sup> [http://cdm.unfccc.int/UserManagement/FileStorage/AM\\_CLAR\\_UFB1W5K30GAIEYJ75TECK9VGQVHN8B](http://cdm.unfccc.int/UserManagement/FileStorage/AM_CLAR_UFB1W5K30GAIEYJ75TECK9VGQVHN8B)

## Monitoring Procedures and Documentation

The operation and monitoring procedures are described in the operation manual (“Manual de Partida e Operação” prepared by Arquipélago Engenharia Ambiental Ltda., ref.# P459/R03/V01/08).

Relevant procedures are also described in the maintenance manual (“Manual de Manutenção” prepared by Arquipélago Engenharia Ambiental Ltda., ref.# P459/R04/V01/08) and monitoring manual (“Manual de Monitoramento” prepared by Arquipélago Engenharia Ambiental Ltda., ref# P459/R05/V01/08).

Safety procedures are described in the risk management plan (“Programa de Gerenciamento de Riscos” prepared by Arquipélago Engenharia Ambiental Ltda., ref.# P459/R01/V01/08) and in the emergency plan (“Plano de Ação de Emergência” prepared by Arquipélago Engenharia Ambiental Ltda., ref.# P459/R02/V01/08). A quantitative risk assessment was also performed for the system (“Estudo de Análise de Risco” prepared by Arquipélago Engenharia Ambiental Ltda. ref# P459/R06/V00/08).

The project design and a data book containing detailed technical information are also available.

All operators were trained for operation, maintenance and safety procedures and were granted certificates. The gas analyzer manufacturer SIMENS also trained all operators to handle and calibrate the equipments AG-01 (residual gas analyzer) and AG-02 (exhaust gas analyzer).

The following additional internal procedures and instructions were prepared by ATB to assure satisfactory monitoring of the project activity, compliant with the PDD:

- Data download and backup
- Instrument maintenance and calibration
- Quality assurance and quality control

QA/QC procedures are detailed in the Instruction 04 (Internal Audits Procedures) and include: verification of the operation of the instruments used to quantify and qualify the LFG, verification of the validity and schedule of preventive maintenance of the equipment and calibration of the instruments; verification of the certificates of the gas cylinders used to calibrate the gas analyzers; verification of electricity and LPG consumption; verification of electronic and manual records of operation.

Monthly operation reports are also prepared by the plant supervisor and submitted to the directors. These reports are also employed by the management team as a QA/QC tool, since they include: key performance parameters (flow rate, content of the LFG, operating hours, number of wells connected to the LFG capturing and flaring system, waste acceptance and emission reductions), description of down time; records of maintenance, records of calibration, calibration schedule, monitoring abnormalities, electricity and LPG consumption and records of training.

## 5 CER VOLUME CLAIMED

The CER required for the period from September 25<sup>th</sup> 2008 to March 04<sup>th</sup> 2009 is **67,295.49 t CO<sub>2</sub>e**.

The calculation is as follows, according to ACM0001 Version 5:

$$ER_y = (MD_{project,y} - MD_{reg,y}) * GWP_{CH_4} + (EL_{EX, LGFG} - EL_{IMP}) * CEF_{electricity,y} - ET_y * CEF_{thermal,y} \quad \text{(Equation 1)}$$

$$MD_{reg,y} = MD_{project,y} * AF$$

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

$$MD_{project,y} = MD_{flared,y} = (LFG_{flared,y} * w_{CH_4,y} * D_{CH_4}) - (PE_{flare,y} / GWP_{CH_4})$$

$$AF = 20\%^4$$

$$GWP_{CH_4} = 21^5$$

$$D_{CH_4} = 0.0007168 \text{ tCH}_4/\text{m}^3_{CH_4}^2$$

PE<sub>flare,y</sub> is calculated according to the methodological “Tool to determine project emissions from flaring gases containing methane” – Annex 13 – EB28”.

The control system of the flaring unit automatically records the parameters described in Section 4.2.

ER<sub>y</sub> is obtained using the recorded data, Equation 1 (above) and the methodological “Tool to determine project emissions from flaring gases containing methane” – Annex 13 – EB28”.

Monthly ER totalization spreadsheets are shown in **Annex B**.

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<sup>4</sup> Source: Approved PDD Version 06 December 13<sup>th</sup> 2007

<sup>5</sup> ACM0001 Version 05

The flare efficiency is measured continuously, as described in the methodology ACM0001 Version 05 and the “Tool to determine project emissions from flaring gases containing methane” by measuring methane and oxygen content in the exhaust gas. During the monitoring period, the gas analyzer AG-02 went out of work, as registered in the operation workbook. In periods when all other monitored parameters were registered and the flaring system operated according to manufacturer’s specifications, a flare efficiency of 90% was assumed, according to STEP 6 of the “Tool to determine project emissions from flaring gases containing methane”.

The sum of  $ER_y$ , without discounting electricity and LPG consumption is **67,324.80 tCO<sub>2</sub>e**.

#### Electricity consumption

The instrumentation to measure electricity consumption was installed by the utility company BANDEIRANTE ENERGIA S.A. in October 15<sup>th</sup> 2008, after the plant start-up in September 25<sup>th</sup>, 2008. For the period between September 25<sup>th</sup>, 2008 and October 14<sup>th</sup> 2008, a conservative calculation was performed, assuming that all the existing devices of the landfill gas capturing and flaring system (total power of 160 kW, as shown in **Annex C**) worked 100% of the time. From this day on, the energy consumption was monitored by the energy bills, until March 04<sup>th</sup>, 2009.

Period	Energy Consumption (MWh)
September 25 <sup>th</sup> to October 14 <sup>th</sup> , 2008 (*)	76.800
October 15 <sup>th</sup> to November 05 <sup>th</sup> , 2008	6.731
November 06 <sup>th</sup> to December 03 <sup>rd</sup> , 2008	14.653
December 04 <sup>th</sup> , 2008 to January 05 <sup>th</sup> , 2009	18.043
January 06 <sup>th</sup> to February 04 <sup>th</sup> , 2009	19.991
February 05 <sup>th</sup> to March 04 <sup>th</sup> , 2009	21.481
<b>Total</b>	<b>157.699</b>

(\*) Conservative calculation

The emission factor is 0.1842 tCO<sub>2</sub>e/MWh <sup>6</sup>.

Hence:

$$EL_{IMP} \times CEF_{electricity} = 0.1842 * 157.699 = \mathbf{29.05 \text{ tCO}_2e}$$

### LPG consumption

LPG is used for the flare ignition. Two cylinders of 45kg of LPG are kept in the flaring plant in a specific storage area. The volume of consumed LPG is controlled by the invoices from the suppliers. From the first operation tests performed in September 25<sup>th</sup>, 2008 to the end of the monitored period March 4<sup>th</sup> 2009, 2 cylinders of 45kg of LPG were used, totalizing 90 kg.

The discount for LPG consumption is calculated:

$$LPG \text{ emission} = ET_y * CEF_{thermal,y}$$

$$ET_y = Mass_{LPG} * PCI_{LPG}$$

Where:

$$CEF_{thermal,y} = 63.1 \text{ tCO}_2e/TJ^7$$

$$\text{Lower Heating Value (LHV)}_{LPG} = 10,990 \text{ kcal/kg}^8$$

$$LPG \text{ emission} = 90 \text{ kg} * 10,990 \text{ kcal/kg} * 4186.8 \times 10^{-12} \text{ TJ/kcal} * 63.1 \text{ tCO}_2e/TJ = \mathbf{0.26 \text{ tCO}_2e}$$

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<sup>6</sup> <http://www.mct.gov.br/index.php/content/view/303073.html> , emission factors 2007

<sup>7</sup> 2006 IPCC Guidelines for national Greenhouse Gas Inventories, Volume 2, section 2, P16

<sup>8</sup> [http://www.cetesb.sp.gov.br/Emergencia/produtos/ficha\\_completa1.asp?consulta=GÁS%20\(ES\)%20DE%20PETRÓLEO,%20LIQUÉFEITO%20\(S\)](http://www.cetesb.sp.gov.br/Emergencia/produtos/ficha_completa1.asp?consulta=GÁS%20(ES)%20DE%20PETRÓLEO,%20LIQUÉFEITO%20(S))

The CER is finally calculated:

$$ER_y = (MD_{\text{project},y} - MD_{\text{reg},y}) \times GWP_{\text{CH}_4} + (EL_{\text{EX,LGFG}} - EL_{\text{IMP}}) \times CEF_{\text{electricity},y} - ET_y \times CEF_{\text{thermal},y}$$

Hence:

$$ER_y = 67,324.80 \text{ tCO}_2\text{e} - 29.05 \text{ tCO}_2\text{e} - 0.26 \text{ tCO}_2\text{e} = 67,295.49 \text{ tCO}_2\text{e}$$

Therefore, the net ERs are **67,295.49 tCO<sub>2</sub>e**.

The PDD forecasted ERs were 354,776 tCO<sub>2</sub>e for 2008 and 396,399 tCO<sub>2</sub>e for 2009. The ERs accrued in 161 days, from September 25<sup>th</sup>, 2008 to March 04<sup>th</sup>, 2009 were 67,295.49 tCO<sub>2</sub>e, which represent approximately 40% of the expected ERs. This underperformance is mainly justified by: i) an initial lower LFG flowrate during the start-up of the LFG capturing and flaring system, ii) downtime due to electricity supply failure and initial corrective and preventive maintenance of the system.

São Paulo, June 16<sup>th</sup>, 2011.

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## **ANNEX A**

### **CALIBRATION CONTROL**



Item	Equipment/Instrument	Manufacturer/Serial number	Monitored Parameter	Certificate number	Certificate issued by	Calibration frequency (*)	Certificate date (DD/MM/YYYY)	Certificate due in (DD/MM/YYYY)
1	Flow meter FIT-01	HIRSA - 288577	Volumetric flow rate of residual gas (FVRG,h)	C040066	Fluid components intl - FCI	Annual (#)	26/2/2008	26/2/2009
				RCBG 001/2009	GDD Montengel		18/2/2009	18/2/2010
2	Thermocouple TT-05	ECIL - X-X-X-	Temperature of the exhaust gas (T flare)	6075/08	ECIL	Annual	3/9/2008	3/9/2009
		n/i		ATBG 007/09	GDD Montengel		18/2/2009	18/2/2010
3	Thermocouple TT-04	ECIL - X-X-X-	Temperature in the exhaust gas of the flare (T flare)	6074/08	ECIL	Annual	3/9/2008	3/9/2009
		n/i		ATBG 008/09	GDD Montengel		18/2/2009	18/2/2010
4	Weight bridge	19964	Landfill waste	819693	INMETRO	(+)	28/5/2008	31/12/2009
5	Gas analyzer AG-01	Siemens - N1-W1-961	Volumetric fraction of component "i" in the residual gas (fvi,h), where "i" = CO2, O2 and CH4	368/2008	Siemens	Bi-annual	20/4/2008	20/10/2008
				010/2008	Arquipélago		22/9/2008	22/3/2009
				012/2008	Arquipélago		24/9/2008	24/3/2009
				n/i	Siemens		24/11/2008	24/5/2009
6	Gas analyzer AG-02	Siemens - N1-W1-027	Volumetric fraction of O2 in the exhaust gas of the flare (tO2,h), and concentration of methane in the exhaust gas of the flare (fvCH4,FG,h)	368/2008	Siemens	Bi-annual	20/4/2008	20/10/2008
				011/2008	Arquipélago		22/9/2008	22/3/2008
				013/2008	Arquipélago		24/9/2008	24/3/2009
				n/i	Siemens		24/11/2008	24/5/2009

(\*) As specified by the monitoring plan and/or by the monitoring methodology

(#) The annual calibration frequency established by ATB is more conservative than the manufacturer's recommended calibration frequency, which is defined as 1 calibration at every 18 months.

(+) A regular inspection visit is performed by INMETRO. The date of the visit is not pre-scheduled. After the visit, INMETRO issues a Certificate, which is valid until the end of the next year.

Example: if INMETRO visits the facility on 03/02/2011, the certificate will be valid until 31/12/2012.

## **ANNEX B**

### **MONTHLY ER TOTALIZATION SPREADSHEETS**

Monitored Parameter	LFG Total,y = LFG flared,y		FV RG,h		wCH4,y = fv CH4,h	wCO2,y	wO2,y	fv CH4,FG, h	t O2,h	T flare = T flaring		FE	PE flare,y	ERy	Flare h	
Date	Total captured landfill gas		Average gas flow to flare		Average methane content in the landfill gas (%)	Average carbon dioxide content in the landfill gas (%)	Average oxygen content in the landfill gas (%)	Average methane content in the exhaust gas (ppm)	Average oxygen content in the exhaust gas (%)	Average exhaust gas temperature (°C)		Average flare efficiency (%)	PEflare (tCO <sub>2</sub> e)	Total ERy (tCO <sub>2</sub> e)	Availability	
	(Nm <sup>3</sup> )	(m <sup>3</sup> )	(Nm <sup>3</sup> /h)	(m <sup>3</sup> /h)						TT-04	TT-05				Hr	%
25/09/2008	48,048	57,786	2,030	2,442	37.8	27.7	6.4	30.9	13.5	853.5	864.5	99.9%	0.23	218.53	23.7	99%
26/09/2008	53,610	63,939	2,234	2,664	39.8	28.7	5.8	54.3	12.6	884.9	909.3	99.9%	0.40	257.48	24.0	100%
27/09/2008	52,157	62,777	2,426	2,920	38.9	28.5	5.9	37.6	13.4	843.9	871.7	99.9%	0.16	244.65	21.5	90%
28/09/2008	47,410	56,527	1,975	2,355	39.4	28.7	5.8	27.0	14.2	779.0	804.9	99.9%	0.25	224.51	24.0	100%
29/09/2008	54,582	65,985	2,310	2,792	40.5	29.1	5.6	57.6	13.9	812.9	839.4	99.8%	0.97	266.07	23.6	98%
30/09/2008	62,618	75,457	2,748	3,312	40.9	28.9	5.6	84.7	13.2	830.4	860.7	99.7%	0.83	307.35	22.8	95%
Average:	53,071	63,745	2,287	2,747	39.6	28.6	5.9	48.7	13.5	834.1	858.4	99.9%	0.47	253.10		
Total:	318,425	382,470											2.84	1,518.60	139.6	97%

Monitored Parameter	LFG Total,y = LFG flared,y		FV RG,h		wCH <sub>4</sub> ,y = fv CH <sub>4</sub> ,h	wCO <sub>2</sub> ,y	wO <sub>2</sub> ,y	fv CH <sub>4</sub> ,FG, h	t O <sub>2</sub> ,h	T flare = T flaring		FE	PE flare,y	ERy	Flare h	
Date	Total captured landfill gas		Average gas flow to flare		Average methane content in the landfill gas (%)	Average carbon dioxide content in the landfill gas (%)	Average oxygen content in the landfill gas (%)	Average methane content in the exhaust gas (ppm)	Average oxygen content in the exhaust gas (%)	Average exhaust gas temperature (°C)		Average flare efficiency (%)	PEflare (tCO <sub>2</sub> e)	Total ERy (tCO <sub>2</sub> e)	Availability	
	(Nm <sup>3</sup> )	(m <sup>3</sup> )	(Nm <sup>3</sup> /h)	(m <sup>3</sup> /h)						TT-04	TT-05				Hr	%
01/10/2008	74,690	91,303	3,112	3,804	40.3	27.9	6.1	111.6	12.2	879.4	913.0	99.8%	1.12	360.69	24.0	100%
02/10/2008	81,887	98,662	3,458	4,166	41.9	28.6	5.7	141.9	12.7	909.1	936.7	99.7%	1.67	412.79	23.7	99%
03/10/2008	64,000	77,643	3,285	3,985	42.0	29.3	5.4	111.3	13.0	916.8	944.5	99.7%	1.14	322.57	19.5	81%
04/10/2008	59,375	72,485	2,474	3,020	43.5	31.6	4.4	38.7	12.6	891.0	917.9	99.9%	0.34	310.63	24.0	100%
05/10/2008	60,080	72,566	2,503	3,024	43.4	31.1	4.6	71.2	12.5	879.8	905.8	99.8%	0.00	313.61	24.0	100%
06/10/2008	63,724	75,280	2,655	3,137	42.8	30.3	5.0	108.3	12.5	886.7	917.0	99.8%	0.99	328.23	24.0	100%
07/10/2008	64,663	76,054	2,694	3,205	43.8	30.4	4.9	141.8	12.6	884.5	916.3	99.0%	4.57	340.64	24.0	100%
08/10/2008	70,070	82,410	2,920	3,434	43.6	29.9	5.1	157.7	12.3	881.6	907.8	99.7%	1.58	367.20	24.0	100%
09/10/2008	64,120	75,686	2,776	3,276	43.9	31.0	4.5	123.8	12.8	874.6	903.8	99.7%	1.28	338.70	23.1	96%
10/10/2008	68,061	82,021	2,868	3,456	40.3	31.0	4.5	20.9	12.4	873.3	890.8	100.0%	0.19	329.61	23.7	99%
11/10/2008	68,265	82,582	2,844	3,441	40.8	31.0	4.5	48.2	12.3	883.1	901.8	99.9%	0.45	334.92	24.0	100%
12/10/2008	65,275	79,070	2,720	3,295	42.2	31.6	4.2	79.5	12.7	878.3	902.1	99.8%	0.77	331.40	24.0	100%
13/10/2008	51,132	63,309	2,867	3,550	40.1	31.2	4.5	21.2	12.7	869.4	890.9	98.9%	3.19	245.65	17.8	74%
14/10/2008	49,436	59,945	2,584	3,133	42.3	32.7	3.7	41.4	12.6	864.6	891.2	99.2%	3.03	251.82	19.1	80%
15/10/2008	52,890	65,219	2,537	3,128	42.8	32.9	3.7	38.6	12.1	873.7	900.3	99.9%	0.29	272.28	20.9	87%
16/10/2008	49,714	60,039	2,697	3,257	43.9	32.8	3.8	47.5	12.6	873.1	900.8	99.9%	0.37	263.24	18.4	77%
17/10/2008	65,441	78,983	2,727	3,291	44.1	31.8	4.2	38.1	12.7	864.6	897.8	99.9%	0.38	347.25	24.0	100%
18/10/2008	64,074	76,846	2,670	3,202	44.9	32.0	4.1	70.3	12.6	864.1	896.4	99.8%	0.70	345.88	24.0	100%
19/10/2008	50,753	60,272	2,548	3,026	47.2	33.5	3.4	99.1	12.6	869.1	904.5	98.4%	5.80	288.31	19.9	83%
20/10/2008	62,737	76,025	2,614	3,168	43.0	31.3	-	-	12.9	858.2	889.5	91.2%	35.79	324.06	24.0	100%
21/10/2008	63,238	77,030	2,635	3,210	43.2	30.9	4.5	13.1	13.0	861.9	892.1	98.9%	4.16	327.94	24.0	100%
22/10/2008	17,295	20,413	2,386	2,816	46.6	33.0	3.6	37.4	12.8	851.2	883.5	99.9%	0.11	96.92	7.3	30%
23/10/2008	24,841	30,435	3,609	4,422	50.2	35.8	2.5	13.5	14.0	822.0	841.4	97.9%	4.21	149.83	6.9	29%
24/10/2008	74,780	91,961	3,544	4,358	49.2	35.2	2.6	22.1	13.9	846.7	872.9	94.2%	31.64	441.85	21.1	88%
25/10/2008	70,744	86,222	3,025	3,658	50.2	35.5	2.5	22.5	13.7	859.0	897.0	99.9%	18.96	428.95	23.6	98%
26/10/2008	54,362	66,289	2,583	3,149	52.7	36.7	1.9	30.2	12.9	860.8	894.7	96.9%	13.59	344.64	21.1	88%
27/10/2008	53,518	65,510	3,085	3,776	49.0	34.3	3.1	84.3	14.0	852.4	875.8	90.1%	39.16	315.09	17.4	72%
28/10/2008	76,397	91,960	3,194	3,845	50.1	35.4	2.4	2.5	13.7	860.4	881.8	96.3%	20.56	460.04	23.9	100%
29/10/2008	67,516	81,797	3,131	3,793	51.0	35.9	2.3	8.3	13.4	856.9	879.1	98.6%	7.16	414.46	21.6	90%
30/10/2008	73,207	88,675	3,216	3,895	51.3	36.3	2.1	23.6	13.8	871.1	897.2	94.7%	31.31	450.35	22.8	95%
31/10/2008	80,766	96,712	3,365	4,030	49.8	35.2	2.6	6.1	13.2	878.3	901.2	99.3%	4.34	483.70	24.0	100%
Average:	61,518	74,303	2,881	3,482	45.2	32.5	3.9	59.2	12.9	870.8	898.3	98.4%	7.71	333.65		
Total:	1,907,052	2,303,406											238.87	10,343.25	663.6	89%



Monitored Parameter	LFG Total,y = LFG flared,y		FV RG,h		wCH <sub>4</sub> ,y = fv CH <sub>4</sub> ,h	wCO <sub>2</sub> ,y	wO <sub>2</sub> ,y	fv CH <sub>4</sub> ,FG, h	t O <sub>2</sub> ,h	T flare = T flaring		FE	PE flare,y	ERy	Flare h	
Date	Total captured landfill gas		Average gas flow to flare		Average methane content in the landfill gas (%)	Average carbon dioxide content in the landfill gas (%)	Average oxygen content in the landfill gas (%)	Average methane content in the exhaust gas (ppm)	Average oxygen content in the exhaust gas (%)	Average exhaust gas temperature (°C)		Average flare efficiency (%)	PEflare (tCO <sub>2</sub> e)	Total ERy (tCO <sub>2</sub> e)	Availability	
	(Nm <sup>3</sup> )	(m <sup>3</sup> )	(Nm <sup>3</sup> /h)	(m <sup>3</sup> /h)						TT-04	TT-05				Hr	%
01/11/2008	74,304	90,567	3,096	3,774	50.7	35.4	2.5	18.5	13.8	840.4	869.6	99.9%	0.29	451.89	24.0	100%
02/11/2008	74,070	89,710	3,086	3,738	50.7	35.1	2.7	45.1	13.6	841.2	867.2	99.9%	0.66	451.38	24.0	100%
03/11/2008	74,720	91,317	3,113	3,805	51.2	35.1	2.7	72.3	13.2	869.8	895.0	99.8%	1.02	459.85	24.0	100%
04/11/2008	73,268	90,180	3,053	3,758	51.7	35.2	2.7	99.8	12.3	869.5	894.6	99.8%	1.25	456.00	24.0	100%
05/11/2008	74,359	91,040	3,098	3,793	52.2	35.3	2.6	126.2	12.2	875.7	900.7	99.7%	1.60	465.67	24.0	100%
06/11/2008	72,576	87,188	3,024	3,633	53.3	35.8	2.4	151.9	12.3	870.8	896.5	99.7%	1.96	465.42	24.0	100%
07/11/2008	81,064	98,352	3,378	4,098	52.4	34.9	2.7	176.5	12.5	884.5	906.1	99.6%	2.53	510.49	24.0	100%
08/11/2008	82,190	100,521	3,425	4,188	53.3	35.3	2.6	202.0	12.4	887.2	905.9	99.5%	2.96	526.89	24.0	100%
09/11/2008	84,625	104,299	3,526	4,346	54.0	35.5	2.4	224.0	12.4	888.0	907.8	99.5%	3.44	549.75	24.0	100%
10/11/2008	71,349	86,797	3,288	4,000	52.0	35.5	2.6	148.5	12.8	866.4	886.4	99.5%	2.83	447.22	21.7	90%
11/11/2008	65,657	78,734	2,736	3,281	50.4	36.3	2.7	29.2	13.5	831.1	859.6	99.9%	0.37	398.27	24.0	100%
12/11/2008	64,177	77,402	2,674	3,225	50.4	36.1	2.7	43.8	12.4	850.5	876.6	99.9%	0.48	389.51	24.0	100%
13/11/2008	59,745	72,120	2,707	3,268	49.8	36.0	2.7	34.0	12.8	847.4	880.3	99.9%	0.72	357.54	22.1	92%
14/11/2008	68,691	82,983	2,862	3,458	49.7	36.1	2.7	19.7	13.3	823.1	851.6	99.9%	0.26	410.75	24.0	100%
15/11/2008	58,243	70,386	2,841	3,433	50.2	36.2	2.6	27.7	13.6	801.9	825.4	99.9%	0.31	351.81	20.5	85%
16/11/2008	55,438	66,929	2,458	2,968	49.5	35.6	2.8	19.8	13.3	800.0	827.8	100.0%	0.20	330.50	22.6	94%
17/11/2008	62,097	73,798	2,587	3,075	50.7	36.2	2.5	28.8	13.1	841.3	873.6	99.9%	0.34	379.27	24.0	100%
18/11/2008	71,152	86,005	2,965	3,584	50.6	36.1	2.5	51.5	12.9	885.0	908.5	99.9%	0.66	433.32	24.0	100%
19/11/2008	59,171	70,974	2,465	2,957	50.3	35.6	2.8	70.2	13.3	837.6	868.4	99.8%	0.78	358.63	24.0	100%
20/11/2008	65,396	79,006	2,725	3,292	50.6	35.7	2.7	88.1	12.6	842.6	879.7	99.8%	0.99	398.22	24.0	100%
21/11/2008	76,087	92,229	3,170	3,843	51.5	36.0	2.5	104.1	12.2	892.2	927.5	99.8%	1.34	471.45	24.0	100%
22/11/2008	70,044	83,690	3,299	3,941	51.2	36.5	2.4	86.6	13.5	884.2	909.7	98.0%	10.97	431.52	21.2	88%
23/11/2008	79,493	96,551	3,312	4,023	49.9	36.3	2.5	18.9	13.7	887.2	910.2	99.0%	6.15	476.87	24.0	100%
24/11/2008	57,392	69,175	2,877	3,467	50.3	36.3	2.6	32.2	13.1	866.8	896.8	97.1%	12.03	346.93	20.0	83%
25/11/2008	78,074	94,802	3,253	3,950	49.8	35.8	2.6	-	-	889.2	917.0	90.0%	58.36	466.80	24.0	100%
26/11/2008	87,794	107,131	3,702	4,517	49.6	35.7	2.6	-	-	916.7	940.0	90.0%	65.47	523.70	23.7	99%
27/11/2008	94,018	115,102	3,917	4,796	49.5	35.5	2.6	-	-	926.6	949.5	90.0%	69.88	558.97	24.0	100%
28/11/2008	83,750	102,218	3,883	4,740	49.8	35.8	2.6	-	-	922.9	945.8	90.0%	62.58	500.97	21.6	90%
29/11/2008	90,360	111,190	3,765	4,633	48.9	35.7	2.7	-	-	923.8	945.9	90.0%	66.41	531.22	24.0	100%
30/11/2008	93,290	115,163	3,887	4,798	49.0	35.7	2.7	-	-	924.9	946.0	90.0%	68.68	549.40	24.0	100%
Average:	73,420	89,185	3,139	3,813	50.8	35.7	2.6	80.0	12.9	869.6	895.7	97.7%	14.85	448.34		
Total:	2,202,593	2,675,561											445.49	13,450.19	701.3	97%

Monitored Parameter	LFG Total,y = LFG flared,y		FV RG,h		wCH <sub>4</sub> ,y = fv CH <sub>4</sub> ,h	wCO <sub>2</sub> ,y	wO <sub>2</sub> ,y	fv CH <sub>4</sub> ,FG, h	t O <sub>2</sub> ,h	T flare = T flaring		FE	PE flare,y	ERy	Flare h	
Date	Total captured landfill gas		Average gas flow to flare		Average methane content in the landfill gas (%)	Average carbon dioxide content in the landfill gas (%)	Average oxygen content in the landfill gas (%)	Average methane content in the exhaust gas (ppm)	Average oxygen content in the exhaust gas (%)	Average exhaust gas temperature (°C)		Average flare efficiency (%)	PEflare (tCO <sub>2</sub> e)	Total ERy (tCO <sub>2</sub> e)	Availability	
	(Nm <sup>3</sup> )	(m <sup>3</sup> )	(Nm <sup>3</sup> /h)	(m <sup>3</sup> /h)						TT-04	TT-05				Hr	%
01/12/2008	93,222	115,638	3,884	4,818	48.72	35.27	2.88	-	-	918.8	936.3	90.0%	68.22	545.71	24.0	100%
02/12/2008	92,411	113,261	3,850	4,719	49.79	35.94	2.65	-	-	935.0	955.4	90.0%	69.11	552.84	24.0	100%
03/12/2008	91,751	111,015	3,823	4,626	50.24	36.07	2.55	3.7	9.1	922.1	946.8	94.2%	41.03	554.29	24.0	100%
04/12/2008	84,566	103,058	3,524	4,294	49.55	35.14	3.00	6.0	13.3	923.9	954.2	99.3%	4.83	503.83	24.0	100%
05/12/2008	80,124	97,513	3,339	4,063	50.36	35.47	2.83	20.9	12.6	919.1	949.7	99.4%	3.92	485.35	24.0	100%
06/12/2008	73,956	90,052	3,081	3,752	51.18	35.79	2.70	39.3	12.3	900.4	929.1	94.9%	32.21	456.04	24.0	100%
07/12/2008	85,672	105,291	3,570	4,387	51.09	35.81	2.65	59.5	13.4	917.9	943.9	99.2%	5.41	526.09	24.0	100%
08/12/2008	86,285	106,487	3,595	4,437	51.01	35.60	2.70	80.3	13.2	922.0	950.7	99.7%	2.09	529.13	24.0	100%
09/12/2008	69,271	85,617	3,592	4,440	50.06	35.69	2.64	97.7	13.2	916.8	949.1	97.3%	14.07	416.67	19.3	80%
10/12/2008	82,096	99,937	3,421	4,164	47.90	36.00	2.51	4.1	8.5	922.2	942.6	93.4%	37.04	473.03	24.0	100%
11/12/2008	90,048	109,848	3,752	4,577	48.01	36.19	2.43	15.9	13.9	923.3	952.8	100.0%	0.29	519.86	24.0	100%
12/12/2008	86,033	103,698	3,585	4,321	48.26	36.14	2.38	34.1	13.6	924.5	960.2	99.9%	0.56	499.23	24.0	100%
13/12/2008	82,017	99,842	3,417	4,160	47.94	35.53	2.67	52.9	13.5	904.6	942.3	99.9%	0.83	472.54	24.0	100%
14/12/2008	73,414	89,113	3,059	3,713	48.54	35.61	2.65	67.6	12.6	894.8	934.0	99.5%	2.61	428.65	24.0	100%
15/12/2008	64,754	78,404	2,698	3,267	48.59	35.42	2.78	84.7	13.2	900.3	930.7	99.8%	0.99	378.15	24.0	100%
16/12/2008	74,744	89,920	3,154	3,794	50.85	37.13	2.05	105.9	12.9	923.4	955.6	99.5%	2.50	456.86	23.7	99%
17/12/2008	90,909	111,449	3,788	4,644	49.34	36.15	2.38	118.8	12.7	923.1	965.1	99.6%	2.74	539.24	24.0	100%
18/12/2008	84,039	102,392	3,502	4,266	49.86	36.29	2.33	137.0	12.8	918.9	962.0	99.7%	2.04	503.74	24.0	100%
19/12/2008	64,504	77,495	3,129	3,759	50.32	36.31	2.42	147.4	13.4	899.4	937.7	95.7%	20.80	390.41	20.6	86%
20/12/2008	71,179	86,248	2,966	3,594	50.72	36.44	2.39	166.0	13.2	906.2	940.2	97.8%	11.89	434.09	24.0	100%
21/12/2008	64,161	77,466	2,673	3,228	49.83	35.58	2.79	178.6	13.5	914.0	935.7	99.4%	2.81	384.46	24.0	100%
22/12/2008	69,240	84,148	2,885	3,506	50.49	36.03	2.50	189.3	13.6	921.0	941.7	98.7%	6.92	420.37	24.0	100%
23/12/2008	78,770	96,070	3,354	4,091	49.54	35.56	2.69	204.7	13.0	923.8	946.1	92.6%	44.09	468.39	23.5	98%
24/12/2008	71,882	89,518	3,643	4,536	47.98	34.87	2.94	-	-	932.3	954.3	90.0%	51.75	413.97	19.7	82%
25/12/2008	73,430	89,163	3,340	4,056	46.07	35.22	2.89	-	-	904.1	948.9	90.0%	50.88	407.01	22.0	92%
26/12/2008	64,641	77,689	2,693	3,237	46.73	35.30	2.89	-	-	905.7	941.6	90.0%	45.38	363.03	24.0	100%
27/12/2008	61,033	73,321	2,543	3,055	47.68	35.91	2.65	-	-	908.6	937.3	90.0%	43.76	350.02	24.0	100%
28/12/2008	62,067	76,358	2,586	3,182	47.64	35.83	2.65	-	-	910.9	935.5	90.0%	44.43	355.38	24.0	100%
29/12/2008	63,875	78,302	2,661	3,263	46.77	35.06	2.96	-	-	913.2	932.9	90.0%	44.84	358.71	24.0	100%
30/12/2008	62,593	76,722	2,608	3,197	47.58	35.48	2.72	-	-	908.5	931.6	90.0%	44.77	358.16	24.0	100%
31/12/2008	63,153	77,038	2,631	3,210	47.86	35.65	2.66	-	-	911.4	930.1	90.0%	45.41	363.24	24.0	100%
Average:	75,995	92,648	3,237	3,947	49.05	35.76	2.64	86.4	12.7	915.2	944.3	95.5%	24.14	448.66		
Total:	2,355,838	2,872,074											748.20	13,908.48	728.8	98%





Monitored Parameter	LFG Total,y = LFG flared,y		FV RG,h		wCH <sub>4</sub> ,y = fv CH <sub>4</sub> ,h	wCO <sub>2</sub> ,y	wO <sub>2</sub> ,y	fv CH <sub>4</sub> ,FG, h	t O <sub>2</sub> ,h	T flare = T flaring		FE	PE flare,y	ERy	Flare h	
Date	Total captured landfill gas		Average gas flow to flare		Average methane content in the landfill gas (%)	Average carbon dioxide content in the landfill gas (%)	Average oxygen content in the landfill gas (%)	Average methane content in the exhaust gas (ppm)	Average oxygen content in the exhaust gas (%)	Average exhaust gas temperature (°C)		Average flare efficiency (%)	PEflare (tCO <sub>2</sub> e)	Total ERy (tCO <sub>2</sub> e)	Availability	
	(Nm <sup>3</sup> )	(m <sup>3</sup> )	(Nm <sup>3</sup> /h)	(m <sup>3</sup> /h)						TT-04	TT-05				Hr	%
01/01/2009	59,452	72,995	2,652	3,256	48.7	36.1	2.5	-	-	907.0	931.7	90.0%	43.53	348.23	22.4	93%
02/01/2009	71,188	87,413	3,051	3,746	49.0	36.3	2.4	-	-	917.7	944.2	90.0%	52.38	419.02	23.3	97%
03/01/2009	75,367	93,232	3,140	3,885	48.3	35.7	2.7	-	-	909.1	942.0	90.0%	54.68	437.41	24.0	100%
04/01/2009	66,915	80,871	2,788	3,370	48.7	35.7	2.7	-	-	896.0	930.9	90.0%	49.01	392.07	24.0	100%
05/01/2009	70,953	86,421	2,956	3,601	48.5	35.5	2.7	-	-	915.3	939.0	90.0%	51.78	414.23	24.0	100%
06/01/2009	74,364	92,090	3,099	3,837	48.3	35.3	2.8	-	-	908.2	938.4	90.0%	53.98	431.81	24.0	100%
07/01/2009	76,070	94,146	3,228	3,995	48.7	35.7	2.6	-	-	920.3	950.1	90.0%	55.66	445.24	23.6	98%
08/01/2009	77,287	97,036	3,286	4,126	47.3	34.4	2.9	-	-	911.8	941.4	90.0%	54.92	439.35	23.5	98%
09/01/2009	66,815	82,555	2,784	3,440	47.4	34.2	3.1	-	-	904.6	940.7	90.0%	47.59	380.67	24.0	100%
10/01/2009	62,841	77,562	2,684	3,312	47.8	34.4	3.0	-	-	911.7	938.4	90.0%	45.20	361.55	23.4	98%
11/01/2009	55,972	69,043	2,355	2,905	47.2	33.8	3.2	-	-	879.0	911.5	90.0%	39.69	317.51	23.8	99%
12/01/2009	58,493	72,617	2,437	3,026	47.5	34.2	3.1	-	-	880.7	913.1	90.0%	41.76	334.05	24.0	100%
13/01/2009	43,245	54,254	2,972	3,729	48.9	35.2	2.6	-	-	923.5	945.7	90.0%	31.83	254.62	14.6	61%
14/01/2009	43,018	53,774	3,419	4,273	49.7	35.6	2.4	71.9	15.6	900.3	932.6	91.1%	29.30	257.50	12.6	52%
15/01/2009	84,318	105,246	3,548	4,428	49.9	35.8	2.3	7.9	12.8	921.6	955.7	95.5%	28.31	505.98	23.8	99%
16/01/2009	84,410	105,590	3,594	4,496	49.5	35.7	2.4	15.4	12.6	923.3	954.9	100.0%	0.22	502.12	23.5	98%
17/01/2009	82,074	102,133	3,566	4,437	50.6	36.4	2.1	34.2	12.7	914.5	944.1	99.9%	0.50	499.73	23.0	96%
18/01/2009	82,932	104,089	3,456	4,337	50.2	36.0	2.2	44.3	12.8	917.7	949.5	99.9%	0.00	500.61	24.0	100%
19/01/2009	79,844	100,741	3,364	4,245	48.9	35.3	2.6	55.1	12.9	910.3	944.0	99.6%	2.15	469.33	23.7	99%
20/01/2009	72,444	90,441	3,187	3,978	49.3	35.3	2.6	66.6	13.1	894.4	928.3	99.7%	1.18	429.93	22.7	95%
21/01/2009	70,732	86,507	3,023	3,697	48.7	35.0	2.7	73.3	13.0	898.6	933.6	96.6%	17.41	414.84	23.4	98%
22/01/2009	68,260	83,128	2,844	3,464	48.2	35.3	2.6	-	-	906.6	939.4	90.0%	49.43	395.42	24.0	100%
23/01/2009	71,795	88,228	2,991	3,676	47.4	34.9	2.8	2.3	12.9	912.7	941.0	95.2%	23.61	409.32	24.0	100%
24/01/2009	70,308	86,800	2,960	3,655	47.3	34.6	2.9	9.5	12.7	910.6	940.0	100.0%	0.11	399.96	23.8	99%
25/01/2009	72,964	91,325	3,076	3,851	48.7	35.6	2.5	18.2	12.6	917.5	942.4	100.0%	0.23	427.44	23.7	99%
26/01/2009	53,193	65,632	3,321	4,098	48.6	35.7	2.5	33.9	12.4	919.4	939.0	96.3%	14.17	311.32	16.0	67%
27/01/2009	79,478	98,725	3,354	4,166	48.6	35.7	2.5	51.0	12.4	921.6	944.3	94.0%	34.56	464.73	23.7	99%
28/01/2009	81,808	101,399	3,409	4,225	49.2	35.8	2.4	54.0	12.7	923.2	941.7	99.9%	0.77	483.94	24.0	100%
29/01/2009	80,484	100,143	3,391	4,220	48.7	35.2	2.6	60.9	12.7	922.0	944.0	99.8%	0.83	471.12	23.7	99%
30/01/2009	81,294	100,572	3,425	4,238	48.4	35.1	2.7	72.2	12.8	923.5	945.1	99.7%	0.00	473.59	23.7	99%
31/01/2009	83,312	102,904	3,471	4,288	48.2	34.8	2.8	82.5	13.0	921.0	948.4	99.8%	1.20	482.72	24.0	100%
Average:	71,020	87,988	3,124	3,871	48.6	35.3	2.6	44.3	12.9	911.1	939.8	94.4%	26.65	415.33		
Total:	2,201,630	2,727,614											826.02	12,875.34	705.9	95%



Monitored Parameter	LFG Total,y = LFG flared,y		FV RG,h		wCH4,y = fv CH4,h	wCO2,y	wO2,y	fv CH4,FG, h	t O2,h	T flare = T flaring		FE	PE flare,y	ERy	Flare h	
Date	Total captured landfill gas		Average gas flow to flare		Average methane content in the landfill gas (%)	Average carbon dioxide content in the landfill gas (%)	Average oxygen content in the landfill gas (%)	Average methane content in the exhaust gas (ppm)	Average oxygen content in the exhaust gas (%)	Average exhaust gas temperature (°C)		Average flare efficiency (%)	PEflare (tCO <sub>2</sub> e)	Total ERy (tCO <sub>2</sub> e)	Availability	
	(Nm <sup>3</sup> )	(m <sup>3</sup> )	(Nm <sup>3</sup> /h)	(m <sup>3</sup> /h)						TT-04	TT-05				Hr	%
01/02/2009	81,102	100,394	3,379	4,183	48.7	35.1	2.7	93.4	12.8	918.0	949.2	99.8%	1.31	474.70	24.0	100%
02/02/2009	78,198	96,127	3,258	4,005	48.0	34.3	3.0	106.9	12.7	918.2	951.6	99.8%	1.39	451.05	24.0	100%
03/02/2009	75,617	92,729	3,151	3,864	47.7	34.0	3.2	118.5	12.8	910.1	943.3	99.7%	1.52	433.59	24.0	100%
04/02/2009	73,967	90,166	3,082	3,757	48.3	34.1	3.2	127.7	12.9	907.7	939.9	99.7%	1.62	429.73	24.0	100%
05/02/2009	76,670	93,637	3,242	3,959	47.7	34.5	2.8	77.4	12.8	910.1	942.0	99.8%	0.93	438.79	23.7	99%
06/02/2009	80,184	99,352	3,341	4,140	45.5	33.5	2.9	10.5	12.8	912.2	942.0	100.0%	0.13	438.54	24.0	100%
07/02/2009	87,583	108,816	3,751	4,660	44.9	33.1	3.1	16.8	12.9	923.7	948.7	100.0%	0.24	471.48	23.4	97%
08/02/2009	94,732	117,113	3,947	4,880	45.2	33.2	3.1	16.0	13.3	920.9	942.4	100.0%	0.26	514.78	24.0	100%
09/02/2009	94,126	117,020	3,922	4,876	43.4	31.7	3.7	21.4	13.0	922.3	951.1	99.9%	0.32	491.11	24.0	100%
10/02/2009	86,459	107,832	3,602	4,493	43.6	31.6	3.7	27.0	12.9	916.2	951.1	99.9%	0.37	453.82	24.0	100%
11/02/2009	87,566	108,643	3,649	4,527	44.2	32.0	3.6	32.9	13.1	915.4	943.5	99.9%	0.47	465.25	24.0	100%
12/02/2009	90,284	109,693	3,762	4,571	44.3	32.1	3.6	38.4	13.0	920.8	948.7	99.9%	0.57	480.62	24.0	100%
13/02/2009	90,076	109,120	3,753	4,547	44.4	32.0	3.6	43.0	12.9	915.5	940.8	99.9%	0.63	480.94	24.0	100%
14/02/2009	92,430	112,743	3,851	4,698	44.6	32.1	3.6	46.8	13.1	930.2	948.9	99.9%	0.71	496.04	24.0	100%
15/02/2009	88,149	107,396	3,673	4,475	47.4	33.9	2.9	50.3	13.0	925.5	943.4	99.9%	0.78	502.45	24.0	100%
16/02/2009	92,224	114,555	3,843	4,773	45.4	32.4	3.5	54.8	13.5	918.9	940.2	99.9%	0.90	503.37	24.0	100%
17/02/2009	90,706	113,476	3,779	4,728	45.1	32.1	3.6	59.0	13.6	919.5	945.7	99.8%	0.95	491.19	24.0	100%
18/02/2009	48,068	58,246	3,693	4,475	47.6	33.8	2.9	45.8	13.4	909.0	933.9	99.9%	0.39	275.06	13.0	54%
19/02/2009	88,876	110,337	3,703	4,597	45.9	32.5	3.6	10.1	12.9	918.6	945.1	100.0%	0.15	490.42	24.0	100%
20/02/2009	84,155	103,699	3,546	4,369	46.6	32.8	3.5	15.0	12.4	918.4	947.0	100.0%	0.20	472.02	23.7	99%
21/02/2009	90,771	112,396	3,782	4,683	45.9	32.5	3.6	18.9	12.8	911.9	937.9	100.0%	0.28	501.11	24.0	100%
22/02/2009	91,928	114,973	3,830	4,791	45.6	32.2	3.7	23.2	12.3	922.8	948.8	99.9%	0.32	504.18	24.0	100%
23/02/2009	88,312	109,560	3,745	4,646	46.2	32.6	3.5	28.3	12.5	918.3	945.1	99.9%	0.40	490.59	23.6	98%
24/02/2009	87,028	106,931	3,626	4,455	45.8	32.2	3.7	32.9	12.7	913.9	944.5	99.9%	0.46	479.55	24.0	100%
25/02/2009	75,428	93,078	3,566	4,401	47.9	33.6	3.2	37.7	13.0	909.9	940.5	99.9%	0.50	434.97	21.2	88%
26/02/2009	92,147	112,858	3,839	4,702	46.5	32.5	3.7	40.7	12.9	915.8	939.3	99.9%	0.62	514.72	24.0	100%
27/02/2009	89,879	111,100	3,841	4,748	47.1	32.9	3.5	45.3	12.8	923.5	949.3	99.9%	0.68	509.14	23.4	98%
28/02/2009	93,720	117,183	3,905	4,883	46.5	32.5	3.7	47.6	13.2	925.3	949.9	99.7%	2.28	524.28	24.0	100%
<b>Average:</b>	<b>85,371</b>	<b>105,328</b>	<b>3,645</b>	<b>4,496</b>	<b>46.1</b>	<b>32.9</b>	<b>3.4</b>	<b>45.9</b>	<b>12.9</b>	<b>917.6</b>	<b>944.8</b>	<b>99.9%</b>	<b>0.69</b>	<b>471.91</b>		
<b>Total:</b>	<b>2,390,387</b>	<b>2,949,173</b>											<b>19.37</b>	<b>13,213.48</b>	<b>655.9</b>	<b>98%</b>

Monitored Parameter	LFG Total,y = LFG flared,y		FV RG,h		wCH <sub>4</sub> ,y = fv CH <sub>4</sub> ,h	wCO <sub>2</sub> ,y	wO <sub>2</sub> ,y	fv CH <sub>4</sub> ,FG, h	t O <sub>2</sub> ,h	T flare = T flaring		FE	PE flare,y	ERy	Flare h	
Date	Total captured landfill gas		Average gas flow to flare		Average methane content in the landfill gas (%)	Average carbon dioxide content in the landfill gas (%)	Average oxygen content in the landfill gas (%)	Average methane content in the exhaust gas (ppm)	Average oxygen content in the exhaust gas (%)	Average exhaust gas temperature (°C)		Average flare efficiency (%)	PE <sub>flare</sub> (tCO <sub>2</sub> e)	Total ER <sub>y</sub> (tCO <sub>2</sub> e)	Availability	
	(Nm <sup>3</sup> )	(m <sup>3</sup> )	(Nm <sup>3</sup> /h)	(m <sup>3</sup> /h)						TT-04	TT-05				Hr	%
01/03/2009	91,197	113,975	3,800	4,749	46.9	32.6	3.7	51.3	12.8	928.5	954.8	99.9%	0.78	513.85	24.0	100%
02/03/2009	65,584	81,052	3,854	4,763	47.6	33.2	3.4	57.2	13.3	917.1	947.2	99.9%	0.68	375.56	17.0	71%
03/03/2009	97,261	120,218	4,110	5,080	47.6	33.3	3.3	62.7	13.4	925.4	955.5	99.8%	1.11	556.61	23.7	99%
04/03/2009	102,513	128,636	4,271	5,360	46.2	32.1	3.8	66.2	13.0	922.0	945.9	99.8%	1.13	569.43	24.0	100%
Average:	89,139	110,970	4,009	4,988	47.1	32.8	3.6	59.3	13.1	923.3	950.9	99.9%	0.93	503.86		
Total:	356,555	443,882											3.71	2,015.45	88.7	92%

Volume of CERs required		
Monthly calculation		Discounts
September 2008 (*)	1,518.60 tCO <sub>2</sub> e	Electricity consumption
October 2008	10,343.25 tCO <sub>2</sub> e	29.05 tCO <sub>2</sub> e
November 2008	13,450.19 tCO <sub>2</sub> e	
December 2008	13,908.48 tCO <sub>2</sub> e	
January 2009	12,875.34 tCO <sub>2</sub> e	LGP consumption
February 2009	13,213.48 tCO <sub>2</sub> e	0.26 tCO <sub>2</sub> e
March 2009 (**)	2,015.45 tCO <sub>2</sub> e	
<b>TOTAL:</b>	<b>67,324.80 tCO<sub>2</sub>e</b>	
ER <sub>total</sub> = 67,324.80 – 29.05 – 0.26		
<b>ER<sub>total</sub> = 67,295.49 tCO<sub>2</sub>e</b>		

(\*) Operation started in September 25<sup>th</sup> 2008

(\*\*) Until March 04<sup>th</sup> 2009

## **ANNEX C**

### **LIST OF INSTALLED EQUIPMENT**

Main installed equipment:

Item	Power	Unit
Blower 01	75	cv
Blower 02	75	cv
Leachate pump	2	cv
Compressor	5	cv
Total	157	cv
<b>Total</b>	<b>117</b>	<b>kW</b>

There are two electric panels which supply electricity for all devices of the system. The total power of the 220V panel is 40kW and the total power of the 440V panel is 120kW. Thus, the total installed power is 160 kW.