

# **Verification of Greenhouse Gas Emission Reductions for Egyptian Brick Factory Fuel-Switch Project**

## **Final Verification Report**

*Submitted to:  
Landfill Gas Canada Ltd.  
Oakville, ON*

*Submitted by:  
AMEC Americas Limited  
Earth & Environmental  
Mississauga, ON*

*1 June 2010*

1 June 2010

Landfill Gas Canada Ltd.  
200 North Service Road West  
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Oakville, ON L6M 2Y1

Attention: Gerald Hamaliuk

Re: Final Report for Verification of Greenhouse Gas Emission Reductions for Egyptian  
Brick Factory Fuel-Switch Project

Dear Mr Hamaliuk,

AMEC is pleased to submit this Final Report for the Verification of Emission Reductions for the Egyptian Brick Factory Fuel-Switch Project (the Project).

Please contact Dr. Steve Lamming (O: 905 568 2929/X4159; C: 289 242 4159; E: [steve.lamming@amec.com](mailto:steve.lamming@amec.com)) or Dr. Andrew Gillam (O: 604 473 5310; C: 604 649 1904; E: [andy.gillam@amec.com](mailto:andy.gillam@amec.com)) if you require any additional information.

Respectfully submitted,

**AMEC Americas Limited**  
**Earth & Environmental**

A handwritten signature in black ink that reads "AGillam".

Andrew Gillam, PhD, PGeo, CEA  
*Lead Verifier*

A handwritten signature in black ink that reads "M. Hahn".

Michael Hahn, MSc  
*Senior Review*

## Report Material

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## About AMEC

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For further information please see [www.amec.com](http://www.amec.com).



Throughout this report, AMEC is used to refer to the parent company (AMEC plc); AMEC Americas Limited, a wholly-owned subsidiary of AMEC plc; and to AMEC Earth & Environmental, a division of AMEC Americas Limited, as the context requires.

## TABLE OF CONTENTS

		Page
1.0	INTRODUCTION .....	1
2.0	REPORT FORMAT .....	1
3.0	PROJECT DETAILS .....	1
4.0	VERIFICATION SCOPE AND OBJECTIVES .....	8
5.0	VERIFICATION CRITERIA AND STANDARDS .....	10
6.0	RISK ASSESSMENT AND MATERIALITY LEVEL .....	12
7.0	VERIFICATION METHODOLOGY .....	14
8.0	VERIFICATION FINDINGS .....	19
9.0	VERIFICATION CONCLUSIONS .....	21
10.0	CLOSURE .....	21

### List of Tables

Table 3-1:	Brick Kiln Stack Locations and Commencement Dates .....	3
Table 4-1:	Summary of GHG Emissions and Reductions .....	9
Table 6-1:	Initial Risk Assessment .....	13
Table 7-1:	Guidance for Determining Sample Size Selection .....	17
Table 7-2:	Verification Team .....	19

### List of Figures

Figure 6-1:	Materiality Thresholds .....	14
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### Appendices

Appendix A	Data Sampling Plan
Appendix B	Assurance Statement

## **1.0 INTRODUCTION**

Landfill Gas Canada Ltd. (LFGC, the Proponent) retained AMEC Americas Limited (AMEC) to complete the verification of greenhouse gas (GHG) emission reductions for the Egyptian Brick Factory Fuel-Switch Project (the Project), including a review of the validation report prepared in accordance with ISO 14064-2 for the Project.

The Project Report is “The Egyptian Brick Factory Fuel-Switch Project, Version 1, March 9, 2010” prepared by LFGC (the Report). The Project is included in the Canadian Standards Association’s GHG CleanProjects™ Registry (Ref. No. 0561-8286).

The Project includes 50 Egyptian brick factories located at Arab Abu Saed, Halewan Governorate, Egypt. The brick factories are privately owned by individual families in the area. PEI-Europe Limited (PEI) facilitated the conversion of the kilns used to dry the bricks from heavy oil to natural gas and has contracted with the individual owners of the brick factories to transfer ownership of any emission reductions resulting from the conversion to PEI. PEI has subsequently transferred ownership of the emission reductions to LFGC.

## **2.0 REPORT FORMAT**

AMEC has prepared this Final Report in accordance with the requirements of ISO 14064-3 @ 4. The Final Report includes the following sections:

- Introduction;
- Report Format;
- Project Details;
- Audit Scope and Objectives;
- Audit Criteria and Standards;
- Risk Assessment and Materiality Level;
- Audit Methodology;
- Audit Findings;
- Audit Conclusions; and
- Closure.

## **3.0 PROJECT DETAILS**

### **3.1 Project Title**

The Egyptian Brick Factory Fuel-Switch Project.

### **3.2 Project Type**

The project is a fuel switch from heavy oil (mazut) to natural gas. AMEC’s verification team has the necessary combination of education, experience, training and skills to complete the verification.

### 3.3 Project Start Date

April 1, 2005

### 3.4 Date of Site Visit

April 26-29, 2010

### 3.5 Expected Lifetime of Project

The Proponent has identified the facility lifetime as 21 years. AMEC has confirmed that this estimation is accurate. A review of the project baseline should be completed twice during the lifetime of the project; 7 years and 14 years after project start-up.

### 3.6 Appropriateness of Quantification Methodology

The project activity is a fuel switch from heavy oil (mazut) to natural gas. The baseline and monitoring methodology used for the project is the United Nations Framework Convention on Climate Change (UNFCCC) Clean Development Mechanism (CDM) Methodology *ACM 0009 Consolidated baseline methodology for fuel switching from coal or petroleum fuel to natural gas, version 03 (28 July 2006)* (ACM0009).

This methodology is appropriate and applicable to the project as the following conditions apply:

- All brick factories involved in the Project are operating only on heavy oil;
- There are no regulations that constrain the use of heavy oil or other fossil fuels at the brick kilns;
- There are no regulations requiring the use of natural gas or any other fuels in the process;
- The Project does not increase the thermal output or lifetime of the process, nor is there any thermal capacity expansion planned for the brick kilns during the crediting period; and
- The Project does not result in integrated process change.

The project proponent has provided an analysis of the additionality of the project using ACM0009 and the UNFCCC CDM Methodological Tool *Tool for the demonstration and assessment of additionality, version 03 (25 November 2005)* (the Additionality Tool).

### 3.7 Legal Description of Project

The project is described as The Egyptian Brick Factory Fuel-Switch Project. The locations of the stacks for the brick kilns are shown in **Table 3-1**.

**Table 3-1: Brick Kiln Stack Locations and Commencement Dates**

	Brick kiln	Stack Location			Elevation (m)	Commissioning Date
		Accuracy (m)	Location (UTM) Grid 36 R			
			Easting	Northing		
1	Awlad El Arab 1	4	0349879	3293282	67	14-May-05
2	Awlad El Arab 2	5	0340084	3293299	71	4-Jun-05
3	M. Helmy	4	0340091	3293496	60	18-Aug-05
4	Al Areesh	5	0339561	3292587	49	26-Jul-05
5	Al Islah 96	5	0338944	3293111	47	18-Sep-05
6	Jeddah 1	4	0339832	3293598	57	30-Sep-05
7	Jeddah 2	6	03340123	3293790	58	2-May-05
8	El Kambashawy 1	6	0339058	3293355	50	7-Jun-05
9	El Kambashawy 2	6	0339172	32933427	48	26-Dec-05
10*	Al Amar 1	6	0339392	3293350	60	1-Apr-05
		4	0339446	3293317	61	
11	Al Amar 2	5	0339276	3293190	59	9-Jun-05
12	Al Amar 3	5	0339540	3293420	54	9-Jun-05
*13	Helwan	4	0339786	3293389	55	25-Jul-05
14	Al Amana	5	0339577	3293239	56	1-Jul-05
15	Reedy	5	0339283	3293499	61	4-Jul-05
16	Al Gayar	5	0339248	3292692	48	19-Feb-06
17	Al Masreya	5	0339022	3293466	47	9-Apr-06
18	Al Madina	5	0338933	3292518	52	24-May-05
19	Al Islam 2000	6	0339605	3293870	54	7-Feb-06
20	Al Salaam	5	0339543	3293120	60	24-Jul-05
21	Al Badr	4	0339687	3293535	55	28-May-06
22	El Wesam	4	0339843	3291641	51	23-May-06
23	Al Zaeem 1	5	0339215	3293963	49	12-Mar-06
24	Al Zaeem 2	5	0339405	3293936	51	30-Mar-06
25	Al Ahram	5	0339598	3293045	62	12-Apr-06
26	Mecca	5	0340089	3292523	56	15-May-06
27	Al Ta'awoun 5	6	0340231	3292835	58	23-Apr-06
28	Toshka	5	0340117	3292236	51	15-May-06
29	Singer1	5	0337918	3292288	35	21-Dec-05
30	Singer2	5	0337879	3292294	35	18-May-06
31	Al Baraka	4	0337864	3292456	37	9-Mar-06
32	Al Arabi	5	0337653	3292380	36	16-Feb-06
33	Al Zohour	6	0337669	3292215	35	20-Jan-06

	Brick kiln	Stack Location			Commissioning Date	
		Accuracy (m)	Location (UTM) Grid 36 R			Elevation (m)
			Easting	Northing		
34	Al Safa	6	0337877	3292069	35	21-Jan-06
35	Al Mouttaheda	6	0338158	3292493	41	19-Feb-06
36	Al Mahabba 2000	4	0340731	3290217	64	18-May-06
37	Al Yamama	5	0346957	3290937	62	11-May-06
38	Abnaa Sol	4	0339538	3292393	48	3-May-06
39	Al Qawmeya	6	0338634	3293251	42	16-Feb-06
40	Hammad	5	0338332	3292570	46	27-Jan-06
41	Al Orouba	5	0339986	3291866	54	23-May-06
42	Al Ekhlas	4	0338759	3292672	51	10-Apr-06
43	Al Ta'awoun Lux	6	0340871	3292875	64	15-May-06
44	Al Riad	5	0338206	3292690	39	26-Dec-05
*45	El Mohandes	5	0340880	3291955	63	15-May-06
*46	Al Amal 98	4	0340881	3292354	64	29-Apr-06
47	Al Radwan 1	5	0337612	3292492	36	8-Dec-05
48	Al Radwan 2	5	0337711	3292531	36	8-Dec-05
49	Al Amal 1	6	0339577	3291535	47	24-May-06
50	Al Amal 2	5	0339617	3291625	48	24-May-06

**Notes:** Al Amar #1 has two stacks; the data of kilns 13, 45 and 46 are not applicable.

The locations of the kilns selected for the verification were confirmed by use of Google Maps ([www.google.com](http://www.google.com)).

### 3.8 Ownership of Emission Reductions

The emission reductions are owned by Landfill Gas Canada Ltd. AMEC has reviewed:

- The Emissions Reduction Purchase Agreement (ERPA) between PEI-Europe Limited and LFGC; and
- The purchase agreements between the owners of the brick kilns included in the audit sample and PEI-Europe Limited.

### 3.9 Project Reporting, Monitoring and Audit Details

Landfill Gas Canada Ltd. will update the Project documentation and report to the GHG Clean Projects™ Registry on an annual basis.

The CDM Project Design Document, Version 03, 22 December 2006 (the PDD) for the Project includes a monitoring plan and supporting quality management procedures. AMEC reviewed this plan and procedures during the on-site visit. The project developer (IDEA–Egypt Inc.) (IDEA) is responsible for overall management of the monitoring program for the



Project and ensuring that data are collected and archived appropriately and that calculations are completed and archived appropriately.

Each month, the brick kiln owner will fill in a form identifying the brick factory name and UTM coordinates, the type of brick produced in that month, the quantity of each brick (units of 1000 red bricks (RB)), the hours of operation and down time for the month and comments on any operational problems for that month. Forms are completed in Arabic and signed by both parties; one copy is retained by the brick factory owner and one copy by IDEA. Data will be transferred to electronic forms in English and maintained by IDEA. Paper forms will be archived in the IDEA office in Cairo.

Gas consumption data is provided by Egypt Town Gas (ETG) in Arabic, including the brick factory name and UTM coordinates. The gas usage forms will be archived in the IDEA office in Cairo and transferred to forms in English that will be stored electronically in the IDEA office in Cairo.

Monthly analysis of the natural gas composition and calorific value will be stored in paper format at the IDEA office in Cairo. IDEA will calculate the natural gas emission factor based on carbon content and density of the natural gas and will calculate annual averages for both parameters and store them electronically.

Gas meters will be calibrated in accordance with the manufacturer's recommendations; calibrations records will be maintained in the IDEA office in Cairo.

There are three levels of internal auditing that will be carried out. The first is an arms-length Internal Audit of the quality management system (QMS), which will be conducted annually. These QMS audits will involve the following:

- Check of completeness of files in IDEA office;
- Review of brick factory files;
- Check of random sample of calculations;
- Review of previously identified corrective action requests (CARs); and
- Issuance of report to Project Manager with recommendations and corrective actions.

The second level is random checks by field staff. Field auditing will consist of:

- Periodic parallel brick counts, to compare the IDEA counts with the brick kiln counts; and
- Periodic meter readings to check gas company records.

The third level is brick kiln performance audits carried out by field staff in cooperation with outside technical assistance. These audits will consist of:

- Qualitative assessment of gas burner systems; i.e., visual check of system components and their condition;
- Check of operating training status; and
- Review of annual efficiency results.

All audits will be fully documented and will identify deficiencies and corrective actions.

AMEC will also complete an annual surveillance audit of the project, including a site visit to a sample of the brick factories and review of project files maintained in the IDEA office in Cairo.

AMEC understands the following will be publicly posted on the GHG Clean Projects™ Registry:

- This report entitled Verification of Greenhouse Gas Emission Reductions for Egyptian Brick Factory Fuel-Switch Project, 1 June 2010, including AMEC's assurance statement; and
- The report entitled *The Egyptian Brick Factory Fuel-Switch Project, Version 1, March 9, 2010* prepared by LFGC, including the emission reductions claimed.

### 3.10 Summary Assurance Statement

Based on our review, nothing has come to our attention which causes us to believe that the emission reductions presented in the report entitled *The Egyptian Brick Factory Fuel-Switch Project, Version 1, March 9, 2010* prepared by Landfill Gas Canada Ltd. for 206,884 tonnes CO<sub>2</sub>e (carbon dioxide equivalent) for the period April 1, 2005 to August 31, 2009 are not presented fairly, in all material respects, in accordance with *ISO 14064-2:2006 Greenhouse gases – Part 2: Specification with guidance at the project level for quantification, monitoring and reporting of greenhouse gas emissions reductions or removal enhancements*.

### 3.11 Roles and Responsibilities

**Dr. Andrew Gillam, PGeo, CEA** served as AMEC's Lead Verifier for this work. Dr. Gillam has more than 25 years experience with large-scale project management, environmental data collection and analysis, non-financial auditing and management information systems in the Americas, Europe and the Pacific Rim. He is based in AMEC's office in Burnaby, BC.

Prior to joining AMEC, Andrew spent 10 years with non-financial risk management groups within two Big 4 firms (KPMG and PwC) in Canada. Prior to 1998, he served in senior management roles in the environmental engineering and management services sector in Canada and the UK for 15 years.

Dr. Gillam was approved as member of PwC's staff working on Natural Resources Canada TEAM (Technology Early Action Measures) projects in 2005. Dr. Gillam has successfully completed the Canadian Standards Association's 3-day Training Course GHG Verification Using ISO 14064 and the 2-day Training Course ISO 14064-2 Essentials – GHG Projects.

Dr. Gillam holds a BSc (Chemistry), MBA (Strategic Management) and PhD (Organic Geochemistry). He is registered as a Professional Geoscientist (PGeo) and a Certified Environmental Auditor (CEA).

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**Andrea Baldin, MSc** served as Site Verifier for this work. Andrea is a Program Manager with over 18 years of consulting experience, including extensive EHS, carbon and energy advisory management, training, auditing, EIA & social assessment and communication. Mr. Baldin is qualified as a EMS/ETS Lead Auditor by BSI and CEPAS, operates as a third party auditor for three certification bodies (DGQ, LRQA and ICIM), and has joined several technical group and panel experts at UNI, ANPA and ASSORECA.

Mr. Baldin managed several projects dealing with ETS & CDM management, accounting and registration, energy efficiency procedures and plans, EMS and health & safety (EMAS, ISO 14001, OHSAS 18001) management and lead auditing, EHS management and lead auditing, risk management, EIA and social assessment, sustainability plan development, communication and reporting process, conflict management, environmental strategic plans and program assessment for the Public Administration, Agenda 21 actions design and implementations, green marketing and green purchasing systems procedures design and implementation.

Mr. Baldin has worked in the following industrial and services sectors: energy production (both fossils and renewable) and delivering; oil & gas production and distribution (refinery, depots, logistic plants, pipeline network etc.); pulp & paper plants; cement and lime production; chemical production; pharmaceutical plants; waste & waste-to-energy management and production; airport operation; automotive; steel and aluminium manufacturing; electronics and household appliance; and financial institutions.

**Michael Hahn, MSc** served as Senior Review for this work. Michael is an environmental scientist with more than 16 years of professional experience, with more than 10 years experience with climate change related projects. He has in-depth knowledge of climate change related aspects and is familiar with regulations of the UN Framework Convention for Climate Change (UNFCCC) with regard to the project based mechanisms. With this background he successfully supported clients through a broad variety of services such as Clean Development Mechanism (CDM) feasibility studies, carbon due diligence assessments, corporate climate change programs and greenhouse gas emissions monitoring plans for complex industrial facilities.

Through his education in environmental sciences, ecosystem and climate change research and his experience in the field of environmental policy and legislation he has developed a strong analytical and holistic expertise.

**Richard Szudy** is a Director with PEI-Europe Limited, the Project Developer, and with IDEA-Egypt Inc.

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## 4.0 VERIFICATION SCOPE AND OBJECTIVES

### 4.1 Activity Scope

The scope of the verification includes the 50 brick factories identified in the Report and data, processes and controls used to generate the Report.

The project boundary for each brick factory includes the kilns only, consisting of:

- The green brick area;
- Brick charging area;
- Air heating and brick cooling area;
- Burner racks;
- Drying area;
- Underground flues; and
- Emissions stack.

### 4.2 Quantification Methodology

The GHG quantification methodology includes measurement of all relevant parameters; no estimations are included. The proponent used a disaggregated method of calculating and reporting individual direct and indirect GHG emission sources. The GHG sources for the Project are based on carbon dioxide (CO<sub>2</sub>) emissions from heavy oil and natural gas

combustion and methane (CH<sub>4</sub>) leakage associated with natural gas pipelining. Other GHG emissions in the baseline, project activity and leakage elements are considered minor.

The baseline scenario is using heavy oil (mazut) for heating the kilns. The project activity is using natural gas for heating, taking into account leakage from natural gas pipelining.

The quantification methodology used was the UNFCCC CDM's *ACM 0009 Consolidated baseline methodology for fuel switching from coal or petroleum fuel to natural gas, version 03 (28 July 2006)* (ACM0009). The baseline scenario was continuation of the operations using heavy oil (business as usual). The project scenario is a switch from heavy oil to natural gas.

### 4.3 Physical Infrastructure

The Project converted 50 independent brick kilns from burning heavy oil to natural gas. The Project involves replacement of heavy oil burners with natural gas burners and control systems, installation of connecting gas piping and pressure reducing stations, and upgrades to electrical systems. The gas, which is supplied by a local gas distribution company, Egypt Towns Gas (ETG), was already in the area and required a pressure reducing station to step down from high pressure to lower pressure, and then a low-pressure distribution network from the main pressure reducing station to each factory.

### 4.4 GHG Sources and Sinks

Greenhouse gas sources and reductions are identified in **Table 4-1**.

GHG sources relevant for the Project are all based on carbon dioxide equivalent emissions only, as detailed in the Table below. The GHG emissions associated with the heavy fuel oil (baseline scenario) and natural gas (project activity) are corrected for the leakage of natural gas from pipelining.

**Table 4-1: Summary of GHG Emissions and Reductions**

	SOURCE	GAS	INCLUDED?	JUSTIFICATION
<b>BASELINE</b>	Heavy oil combustion	CO <sub>2</sub>	Yes	Main emission source
		CH <sub>4</sub>	No	Minor source
		N <sub>2</sub> O	No	Minor source
<b>PROJECT ACTIVITY</b>	Natural gas combustion	CO <sub>2</sub>	Yes	Main emission source
		CH <sub>4</sub>	No	Minor source
		N <sub>2</sub> O	No	Minor source
<b>LEAKAGE</b>	Natural gas pipelining	CO <sub>2</sub>	No	Minor source
		CH <sub>4</sub>	Yes	Significant source; converted to CO <sub>2</sub> e
		N <sub>2</sub> O	No	Minor sources

#### **4.5 Activity Scope Exclusions**

LFGC has identified the following emissions as being excluded from the scope of the GHG assertion:

- Emissions from raw material transportation to the site (considered to be the same for business as usual and alternative scenarios);
- Emissions for reduced road transportation of fuel oil to the site (for conservativeness; fuel is no longer trucked to the Project);
- Emissions associated with fuel oil pumping on-site (for conservativeness; fuel pumping is no longer required for the Project);
- Emissions associated with additional energy use for natural gas compression (additional compression is not required for delivery of natural gas to the Project);
- Emissions from the generation of electricity for site lighting and any other electrical equipment on site (considered to be the same for business as usual and alternative scenarios); and
- Emissions from any mobile on-site equipment (considered to be the same for business as usual and alternative scenarios).

AMEC confirmed the validity of these assumptions during the on-site visit. Individual emissions from these sources of less than 500 tonnes CO<sub>2</sub>e were considered de-minimis.

#### **4.6 Temporal Scope**

The temporal scope of the verification includes project activities from 1 April 2005 to 31 August 2009, the time period included in the Report.

#### **4.7 Verification Objectives**

The objectives of the verification, using a risk-based approach, were to:

- Confirm the data, controls and processes supporting the emission reduction calculations as presented in the Report and the corresponding GHG assertions, in accordance with the requirements of *ISO 14064-3*;
- Confirm that the Report and corresponding GHG assertions conform to the requirements and principles of *ISO 14064-2* and are without material discrepancies; and
- Provide a statement of reasonable assurance for the emission reductions.

### **5.0 VERIFICATION CRITERIA AND STANDARDS**

#### **5.1 Verification Criteria**

AMEC collected evidence from document reviews, interviews and physical observation of activities to confirm that the Report had been prepared in conformance with the following verification criteria:

- *ISO 14064-2:2006 Greenhouse gases – Part 2: Specification with guidance at the project level for quantification, monitoring and reporting of greenhouse gas emission reductions or removal enhancements;*

In addition, AMEC designed the verification to confirm that:

- The data supporting the GHG calculations have sufficient controls to be considered fair and accurate and without material discrepancy;
- The calculations supporting the GHG assertions are sufficiently accurate to be considered fair and accurate and without material discrepancy; and
- There are no competing claims to the ownership of the emission reductions.

## **5.2 Verification and Assurance Standards**

AMEC's verification methodology is in conformance with the following verification and assurance standards:

- *ISO 14064-3:2006 Greenhouse gases – Part 3: Specification with Guidance for the Validation and Verification of Greenhouse Gas Assertions;* and
- *ISAE 3000 Assurance Engagements Other than Audits or Reviews of Historical Financial Information.*

## **5.3 Level of Assurance**

The term “assurance” encompasses a range of different levels of assurance, where an auditor is engaged to issue a written communication (an “assurance statement” or “assurance report”) to a client expressing a conclusion concerning subject matter (GHG data, for example) for which they are responsible.

Reasonable assurance, sometimes referred to as positive assurance, is less than absolute assurance. The conclusion reached is structured as a direct factual statement expressing the opinion of the auditor. Reducing assurance risk to zero is very rarely attainable or cost beneficial as a result of factors such as: the characteristics of the subject matter; sampling considerations; application of professional judgment; and the inherent limitations of internal controls, among others.

The audit procedures used to generate a reasonable assurance statement are more rigorous than those used to generate a limited assurance statement (see below) and would include: direct inspection of measurement devices/meters; physical observation of activities; extensive enquiry/interviews; detailed recalculation of GHG data; and analytical procedures such as trending of data, reverse data mining, etc.

Limited, or negative, assurance is based on the identification of anomalies in the assertion (nonconformities). Limited assurance for GHG data is obtained through enquiry/interviews, data systems evaluation and application of a smaller set of analytical procedures such as recalculation of emissions data, observation of information management system controls, confirmation of delivery of product, data inspection and data analysis.

The wording used in a limited assurance statement is less positive than it would be for a reasonable assurance statement. The level of effort and cost required to complete an assurance engagement increases with the level of assurance.

Both reasonable assurance and limited assurance engagements require the application of assurance skills and techniques and the gathering of sufficient, appropriate audit evidence as part of an iterative, systematic process that includes obtaining an understanding of the subject matter and other engagement circumstances. The nature, timing and extent of procedures for gathering sufficient appropriate evidence in a limited assurance engagement are, however, deliberately limited relative to a reasonable assurance engagement.

The verification was designed to provide a statement of reasonable assurance in accordance with the requirements of the GHG CleanProjects™ Registry.

#### **5.4 Conflict of Interest**

AMEC is not aware of a possible conflict of interest, or what could be perceived as a possible conflict of interest, with Landfill Gas Corporation Ltd. in the two years prior to completing this verification.

All members of the AMEC verification team have signed individual conflict of interest statements for this work.

### **6.0 RISK ASSESSMENT AND MATERIALITY LEVEL**

#### **6.1 Risk Assessment**

Risks to the successful completion of the verification included:

- Inherent risk: the lack of historical data records and the dated validation of the baseline studies;
- Control risk: the use of metering devices that were not under the proponent's direct management, therefore their calibration and the measurement uncertainty level could not be confirmed. Alternative procedures, in case of deficiency with the metering devices deficiency, were not defined; and
- Detection risk, limitations of the sampling plan; the compressed verification schedule and the language of the verification (English).

The results of the initial risk assessment are shown in **Table 6-1**.



**Table 6-1: Initial Risk Assessment**

Source Stream	Size (Major-Minor)	Data Management	Measurement Equipment	People	Total
Baseline emissions- Combustion of heavy oil	Major for CO <sub>2</sub> emissions Minor for CH <sub>4</sub> , N <sub>2</sub> O emissions	<b>High</b> – The validation of the process efficiency data studies conducted is not recent (2003).	<b>High</b> – The raw original records of the data, i.e., mazut usage; consumption in kWh of the kiln equipment (pumps, air blowers, and heaters),; green bricks (GB) input and red bricks (RB) output collected in 2003 and 2004 are not available for review, but are declared by the proponent.	<b>Low</b> – very skilled and trained field engineers.	<b>High</b>
Project emissions - natural gas emissions	Major for CO <sub>2</sub> emissions Minor for CH <sub>4</sub> , N <sub>2</sub> O emissions	<b>Low</b> – Raw data coming from gas bills and gas analysis. Brick production is recorded in field. The data are periodically checked and transferred into spreadsheets.	<b>Medium</b> - Uncertainty assessment of the gas meter not available, meter devices maintenance and calibration plan is not under proponent's control. No emergency procedure defined.	<b>Low</b> – very skilled and trained field engineers	<b>Low</b>
Leakage emissions - natural gas pipelining	Major for CH <sub>4</sub> , converted to CO <sub>2</sub> e Minor for CO <sub>2</sub> and N <sub>2</sub> O emissions	<b>Low</b> – UNFCCC procedure followed.	<b>Low</b> - Egyptian Environmental Affairs Agency initial communication report June 1999 utilised.	<b>Low</b> – very skilled and trained field engineers.	<b>Low</b>

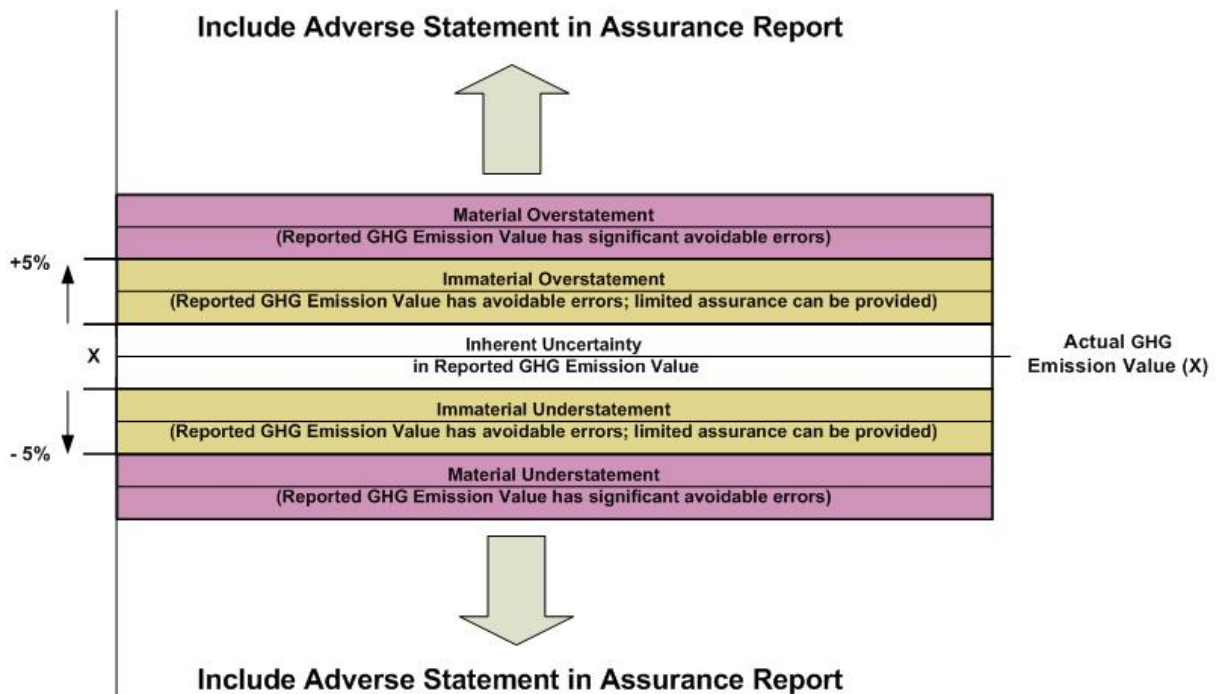
## 6.2 Materiality Level

The concept of materiality is used to determine if omitted or misstated GHG or other information will lead to a significant misstatement or misrepresentation of a GHG assertion included in the Report, thereby influencing conclusions or decisions made on the basis of those assertions by users of the Report.

A material misstatement is the aggregate of errors, omissions, non-compliance with the requirements of *ISO 14064-2* and/or misrepresentations that could affect the decisions of intended users of the Report.

There were no material quantitative misstatements (greater than 5% under- or over-statement, see **Figure 6-1**) identified during the verification.

**Figure 6-1: Materiality Thresholds**



Any immaterial quantitative misstatements (less than 5% under- or over-statement) are noted in this Final Report.

## 7.0 VERIFICATION METHODOLOGY

AMEC's verification approach was to divide the project work into three phases, each with a set of work tasks and deliverables.

The three phases included:

- Phase 1 – Verification Planning;
- Phase 2 – Verification Implementation (On-Site); and
- Phase 3 – Verification Reporting.

The Planning Phase included:

- Conflict-of-interest (COI) checks for the verification team members;
- Project initiation meeting;
- Initial review of available documentation from LFGC;
- Verification documentation preparation (verification plan, sampling plan, verification protocol and checklist, spreadsheets, verification report, etc.);
- Preliminary risk analysis (confirmed in phase 2 on site: size, number and types of GHG sources, control on the monitoring/measurement, gathering and calculation of the data, attitude and commitment of the personnel who are involved in the management of data):
- Preliminary assurance level and materiality definition (confirmed in phase 2 on site), verification criteria, scope and objectives confirmation, assumptions and exclusions definition;
- The procedures for acquiring and maintaining (hard/electronic copies) verification records, i.e., data, gas invoices, gas meter calibration tests and certificates, etc., for possible future reviews by competent authorities; and
- Liability limitations for AMEC.

The Implementation Phase included:

- Opening meeting with confirmation of all data and information collected in planning phase, i.e., organizational and physical project boundaries and baseline scenarios validation, emissions sources and streams verification, maps and natural gas streams examination, exclusions and assumptions validation, project authorizations and permits, and metering devices uncertainty definition);
- Finalizing the risk analysis: data management procedures, spreadsheets, personnel evaluation and metering devices adequacy assessment;
- Selection/confirmation of sampling plan and of subsamples of data, controls and processes used to create the report;
- Detailed verification testing by site and gas meters visits, interviews, documentation reviews and checks of:
  - emissions sources and streams;
  - meter devices functioning, calibration and operation;
  - raw data collecting, normalizing and inputting in spreadsheets;
  - calculation procedures, parameters and factors utilized;
  - operational and control procedures implemented to ensure the quality assurance and quality control integrity of the GHG system;

- GHG information management system processes;
- GHG system personnel training and awareness;
- Closing meeting to present draft verification findings.

Reporting, the final phase of work, included preparation of draft and final verification reports, including an assurance statement, and review of these by LFGC prior to submission to the GHG CleanProjects™ Registry.

AMEC will retain all project documentation for a minimum of seven (7) years at the Burnaby, BC office or in offsite storage.

### 7.1 Data Sampling Plan

AMEC used a risk-based approach to selecting the verification sample that focuses on emissions and other reported data sources, information management systems and data management processes that pose the greatest risk as sources of material misstatements.

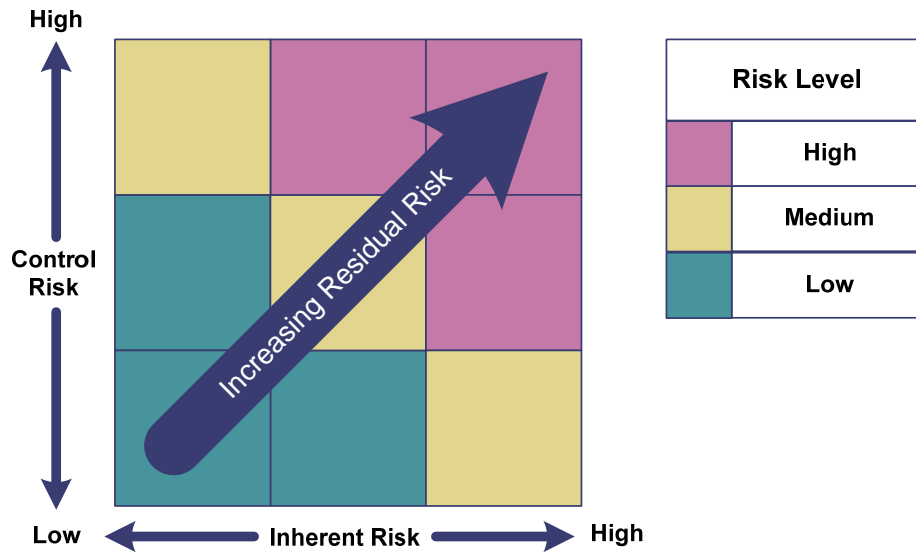
AMEC utilised the guidance provided in *ISO 14064-3:2006 @ A.2.4.6 Sampling Plan* to develop the sampling plan for this verification, including the following activities:

- Review and assessment of the scale, complexity and nature of the systems and processes used to generate the selected data included in the Report;
- Identification of key inherent risks, including incompleteness, inaccuracy, inconsistency and data control weaknesses;
- Review of internal control environment and its level of risk;
- Identification of levels of residual risk; and
- Inclusion of residual risks in the sampling plan.

Based on this review, sampling focused on those areas of the GHG information management system and data subject to the greatest residual risk (see **Figure 7-1**). Residual risk is the combination of the inherent risk in the source data and the level of risk associated with the internal control environment for the GHG data management system.

Based on the risk assessment, AMEC selected subsamples of the datasets with the highest risk profile for more detailed testing. **Table 7-1**, included in the *General Verification Protocol, Version 1.0 (May 2008)* produced by The Climate Registry, was used as guidance for determining the number of data sources for more detailed testing.

**Figure 7-1: Risk Matrix**



**Table 7-1: Guidance for Determining Sample Size Selection**

Total Input Data Sources	Approximate Sample Size
1-3	1
4-10	2
11-25	3
26-50	6
51-100	8
101-250	12
251-500	15
501-1,000	20
More than 1,000	2 percent (2%)

AMEC visited the following facilities and reviewed data for 2005-2009 for each of these sites:

- Singer 1 and Singer 2;
- Toshka;

- Al Amar 1 and Al Amar 2; and
- Al Zaeem 1 and Al Zaeem 2.

AMEC also reviewed the following documents at the Cairo office of IDEA prior to the site visit:

- Baseline mazut consumption study;
- Elemental analysis (carbon content) of mazut;
- Natural gas consumption for each kiln (from ETG);
- Meter calibration records (from ETG);
- Net calorific value and carbon content of local natural gas calculation (2006 data);
- Study on efficiency of element process (2003 and 2004 data);
- CO<sub>2</sub>e emission factor report for upstream CH<sub>4</sub> emissions (1999 data); and
- Copy of ERPA between PEI and LFGC.

Other data sampling criteria utilised in creating the final sampling plan were:

- Number, size and type of natural gas/oil flows/streams;
- Type of meters, the loading of meters related to their design capacity, the state of maintenance and calibration of meters, and the functioning period of each meter; and
- Entity/contribution of each source to be sample to the total emissions.

The final sampling plan (**Appendix A**) was created during the on-site verification work, following completion of the process mapping and assessment of the levels of inherent risk and risk associated with the internal control environment.

The initial verification planning work took place from April 12 to April 25. AMEC reviewed and analyzed the available data and created a set of interview questions (verification checklist). On-site visits in the week of April 26-30 focused on clarifying issues identified during the initial data review.

The on-site verification work started on Monday April 26 and the closing meeting was held on Wednesday April 28. Initial and desk verification activities, i.e., opening meeting, documentation reviews, completion of sampling plan, etc., were completed in the project office in Cairo on Monday April 26. Site visits were completed on Tuesday April 27. Additional document review, interviews and initial verification reporting were completed on Wednesday April 28 in the IDEA office in Cairo.

## 7.2 Verification Team

Verification team information is included in **Table 7-2** below.

**Table 7-2: Verification Team**

Name	Title	Office Phone Number	Cell Phone Number
<b>AMEC</b>			
Dr Andrew Gillam	Lead Verifier	+1 604 473 5310	+1 604 649 1904
Andrea Baldin	Site Verifier	+39 2 3270871	+39 347 7078763
Michael Hahn	Senior Review	+49 (0) 711 67400/X228	+49 (0) 173 3529575

### 7.3 Verification Limitations

There were no limitations that impacted the ability of AMEC to complete the verification.

## 8.0 VERIFICATION FINDINGS

### 8.1 ISO 14064-2 @ 5.2 Describing the project

- More information on the brick manufacturing process (starting from raw material delivery through to product shipment), including figures and photographs could be added to the project report.
- A map of the project location with the identification of the kilns included in the project could be added to the project report.
- Differences between the baseline technological, environmental and social conditions and the project conditions could be emphasized and included in the project report, e.g., describing the meaning of the difference in the global warming potential (GWP) potential of the two fuels, and defining the burner types and their thermal capacity data compared with the previous burners.
- A risk assessment could be included in the project report, including mapping and grading the detection risks for the emission procedure and data, i.e., preventing damage to project records and off-site back-up; the inherent risk and control risk associated with owners with limited data management systems; and the calibration of the gas meters.
- A project organizational chart would help in clearly defining the project roles and responsibilities.
- Some consideration should be given to updating the process description for the data management for the project. Natural gas consumption data are recorded semi-monthly by ETG, rather than monthly as stated in the project report. ETG issues an invoice semi-monthly to each kiln operator. These invoices are then collected by IDEA-Egypt Inc. and a hard copy is retained by IDEA-Egypt Inc. and the data are transferred to an electronic spread sheet. Monthly data sheets with all the data are signed by the owners and the other interested persons.
- The emission factor (EF) used is based on the EF provided monthly by the Quality Control Department of the Rashid Petroleum Company, not the ETG, as stated in the Project Report.

## **8.2 ISO 14064-2 @ 5.4 Determining the baseline scenario**

- Some consideration should be given to better illustrate the additionality of the project, i.e., provide further justification that the project results in emission reductions that would not occur in the baseline scenario and that the project itself is not the baseline, for example:
  - Barrier analysis, i.e., investment barriers;
  - Technological barriers, especially dealing with the maintenance of the gas systems;
  - Other local barriers, such as the limited size of the individual brick factories, which makes it difficult for the owners to merge and build up a critical mass;
  - More information about the project history and timing.
- A more recent validation of the efficiency calculations, originally performed in 2004, could be completed by repeating the statistical analysis and the studies conducted in 2003.

## **8.3 ISO 14064-2:2006 @ 5.6 Selecting relevant GHG sources, sinks and reservoirs for monitoring or estimating GHG emissions and removals**

- More details on the reasons why some sources have been defined as minor should be provided.
- Some consideration should be given to issuing the GHG monitoring procedure as a specific internal GHG management system procedure within a GHG management system.

## **8.4 ISO 14064-2:2006 @ 5.9 Managing data quality**

- Some consideration should be given to including the uncertainty assessments for the project and baseline scenario in the project report.
- Some consideration should be given to providing additional details for the uncertainty assessment of the gas meter.
- Some consideration should be given to requesting ETG to provide assurance for the calibration and maintenance plan for the gas metering devices.
- Some consideration should be given to preparing a maintenance plan, including maintenance records, for the burners and installations and providing a copy to the kiln owners.
- Some consideration should be given to preparing an emergency response procedure for failure of the gas measurement systems to be included in the monitoring plan, to ensure that there is an alternative means available to collect the natural gas consumption data.



## 9.0 VERIFICATION CONCLUSIONS

Based on our review, nothing has come to our attention which causes us to believe that the emission reductions presented in the report entitled *The Egyptian Brick Factory Fuel-Switch Project, Version 1, March 9, 2010* prepared by Landfill Gas Canada Ltd. for 206,884 tonnes CO<sub>2</sub>e (carbon dioxide equivalent) for the period April 1, 2005 to August 31, 2009 are not presented fairly, in all material respects, in accordance with *ISO 14064-2:2006 Greenhouse gases – Part 2: Specification with guidance at the project level for quantification, monitoring and reporting of greenhouse gas emissions reductions or removal enhancements*.

AMEC's Assurance Statement is Included in **Appendix B**.

## 10.0 CLOSURE

### 10.1 Report Limitations

The findings and conclusions presented in this report are based, in part, on interviews conducted and records reviewed by AMEC. Our conclusions cannot, and are not extended to, include those portions of the records or personnel which were not reasonably available, in AMEC's opinion, for review or interview.

It should be noted that AMEC is an engineering and environmental consulting organization and, therefore, the contents of this report should not be interpreted as providing legal advice, opinions or interpretations. No other warranties or representations, either expressed or implied, are made as to the professional services provided under the terms of our contract, or the conclusions presented.

This report is for the sole use of Landfill Gas Canada Ltd., unless expressly stated otherwise in the report or contract. Any use which any third party makes of the report, in whole or the part, or any reliance thereon or decisions made based on any information or conclusions in the report is the sole responsibility of such third party.

AMEC accepts no responsibility whatsoever for damages or loss of any nature or kind suffered by any such third party as a result of actions taken or not taken or decisions made in reliance on the report or anything set out therein.

### 10.2 Verification Confidentiality

AMEC has had access to confidential business information. AMEC will maintain the confidentiality of confidential information in its possession by exercising the same security measures it normally exercises with respect to its own confidential information.

AMEC will treat all such information as confidential during the term of the contract and for a period of seven (7) years following expiration or termination of the contract.

AMEC will not disclose any confidential information to any third party, except to those of its employees, agents or subcontractors who have a need to know such information for purposes directly related to the engagement, unless required by law.

### **10.3 Report Distribution**

- Gerald Hamaliuk, Landfill Gas Canada Ltd., Oakville, Ontario, Canada.

### **10.4 Verification Follow-up Activities**

Any recommendations for follow-up actions to address material discrepancies identified in the verification report are the responsibility of LFGC, PEI-Europe Limited and the individual owners of the brick factories.

Monitoring of completion of these actions is not included within the scope of this work. The completeness and effectiveness of any corrective actions taken by LFGC, PEI-Europe Limited and the individual owners of the brick factories should be confirmed as part of a subsequent verification.

Follow-up actions by members of the AMEC verification team, based on their specific expertise, will not be completed without prior approval from LFGC, in order to maintain verifier independence.

### **10.5 Material Discrepancies Identified After Completion of the Verification**

AMEC has not identified any material discrepancies since completion of the closing meeting for the verification on 28 April 2010.

**Appendix A**  
Data Sampling Plan

Source Stream and/or Emission sources	Raw Data Checks	Transposition Checks	Aggregation & Assumption Checks	Calculation Checks	Materiality Level
Baseline emissions- Combustion of heavy oil	Baseline mazut consumption study verified Baseline Information And Emission Calculation	4/12 months spreadsheet for 2005-2007-2009 year verified, for the selected kilns (Kiln Singer (n. 29), Kilns Singer 2 (n. 30), Kiln Al Amar (n. 10) 1, Kiln Al Amar 2 (n.11), Kiln Tashka (n. 28), Kiln El Zaeem (n. 23 & 24)	4/12 months spreadsheet for 2005-2007-2009 year verified, for the selected kilns 4/12 months NCV, Ef	Total CO <sub>2</sub> calculation for 4/12 months spreadsheet for 2005-2007-2009 year verified, for the selected kilns	✓ 5%
Baseline emissions- Combustion of heavy oil	Baseline mazut consumption study verified Baseline Information And Emission Calculation	4/12 months spreadsheet for 2005-2007-2009 year verified, for the selected kilns (Kiln Singer (n. 29), Kilns Singer 2 (n. 30), Kiln Al Amar (n. 10) 1, Kiln Al Amar 2 (n.11), Kiln Tashka (n. 28), Kiln El Zaeem (n. 23 & 24)	4/12 months spreadsheet for 2005-2007-2009 year verified, for the selected kilns 4/12 months NCV, Ef	Total CO <sub>2</sub> calculation for 4/12 months spreadsheet for 2005-2007-2009 year verified, for the selected kilns	✓ 5%
Source Stream and/or Emission sources	Raw Data Checks	Transposition Checks	Aggregation Checks & Assumption Checks	Calculation Checks	Materiality Level
Project emissions - Natural Gas emissions	Raw data natural gas collecting procedure and monthly data sheets report checked for Singer Kilns (Dec 2005 and 2007: 8/12 months, 2009 6/8 months) Ala Amara 10 & 11 (Apr,Jun, Sept, Dec 2005, 2007: 8/12 months, 2009 6/8 months). For Tashka n. 28 (2006: 5/8 month, 2007: 8/12 months, 2009 6/8 months), El Zaeem n. 23 & 24 (2006:	4/12 months spreadsheet for 2005-2007-2009 year verified, for the selected kilns (Kiln Singer (n. 29), Kilns Singer 2 (n. 30), Kiln Al Amar (n. 10) 1, Kiln Al Amar 2 (n.11), Kiln Tashka (n. 28), Kiln El Zaeem (n. 23 & 24)	Transfer from the Gas Analysis report to the spreadsheet for methane % mole for: 2005: 4/12 months, 2007: 4/12 months, 2009 El Teebena HP: 4/12 months	Total CO <sub>2</sub> calculation for 4/12 months spreadsheet for 2005-2007-2009 year verified, for the selected kilns	✓ 5%

Source Stream and/or Emission sources	Raw Data Checks	Transposition Checks	Aggregation & Assumption Checks	Calculation Checks	Materiality Level
	<p>6/10 months, 2007: 8/12 months, 2009 6/8 months).</p> <p>Raw data monthly brick production checked for kilns: Singer 1 (Dec 2005, May 06, 4/12 months 2007 and 2009), for Singer 2 ( Apr 2007, Jul-Nov 2009, Feb-Jun 2009); for Al Amara 10 &amp; 11 (8/12 months 2007 and Jun-Jul-Ago 2009); For Kilns Tashka n. 28 (2006: 5/8 months, 2007: 8/12 months, 2009 6/8 months); For El Zaeem n. 23 &amp; 24 (2006: 6/10 months, 2007: 8/12 months, 2009 6/8 months).</p> <p>Calibration test declaration and data sheets and technical description for: Schlumberger Fluxi 2000 TX model, Actaris SEVC-D electronic Volume converter, PRS certificate (meter no. 6528901003 G 160 Actaris for factory Alamana, meter no. 652899010141 G 160 Actaris for factory Al Areesh, meter no. 6528901035/A G 160 Actaris for ToshKa factory and other). Commission certificate in Arabic signed by brick factory owners, component supplier and Town Gas Company (Toshka facility) recording also the Volume converter no. SC 04000001724</p>		<p>Correct transfer from the Gas Analysis NCV (Egyptian Nat Gas Co report) to the spreadsheet for: 2005: 4/12 months, 2007: 4/12 months, 2009 El Teebena HP:</p>		



**Appendix B**  
Assurance Statement



## Independent Reviewer's Report

### To Landfill Gas Canada Ltd.

Landfill Gas Canada Ltd. ("LFGC") retained AMEC Americas Limited ("AMEC") to provide an independent review and assurance for the emission reductions of 206,884 tonnes CO<sub>2</sub>e (carbon dioxide equivalent) claimed in the report entitled *The Egyptian Brick Factory Fuel Switch Project Version 1, March 9, 2010 (GHG CleanProjects™ Registry Ref. No, 0561-8286)* (the "Report") for the period April 1, 2005 to August 31, 2009. LFGC's management is responsible for the collection and presentation of the information included in the Report. AMEC's responsibility is to provide a conclusion as to whether anything has come to our attention to suggest that the emission reductions claimed in the Report are not presented fairly, in all material respects, in accordance with *ISO 14064-2:2006 Greenhouse gases – Part 2: Specification with guidance at the project level for quantification, monitoring and reporting of greenhouse gas emissions reductions or removal enhancements* (the "Criteria").

AMEC's review was completed in accordance with *ISO 14064-3:2006 Greenhouse gases – Part 3: Specification with guidance for the validation and verification of greenhouse gas assertions* and the *International Standard on Assurance Engagements (ISAE) 3000 – Assurance Engagements Other Than Audits or Reviews of Historical Financial Information* (the "Standards"). As such, we planned and performed the review in order to provide reasonable assurance that the emission reductions claimed are presented fairly in accordance with the Criteria. Our review criteria were based on the requirements described in the Standards and associated guidance documents. We believe our work provides a reasonable basis for our conclusion. A review does not constitute an audit and, consequently, we do not express an audit opinion.

Based on our review, nothing has come to our attention which causes us to believe that the emission reductions presented in the Report, and shown in the Table immediately below, for the period April 1, 2005 to August 31, 2009 are not presented fairly, in all material respects, in accordance with the Criteria.

Year	Period	Emission Reduction Credit/tonnes CO <sub>2</sub> e
2005	Apr 1 to Dec 31	11,704
2006	Jan 1 to Dec 31	50,435
2007	Jan 1 to Dec 31	53,263
2008	Jan 1 to Dec 31	55,506
2009	Jan 1 to Aug 31	35,975
<b>Total</b>		<b>206,884</b>

This Independent Reviewer's Report was prepared by AMEC at the request of LFGC and is intended for the sole use of LFGC. Any use which any third party makes of this report, in whole or the part, or any reliance thereon or decisions made based on any information or conclusions in this report is the sole responsibility of such third party. AMEC accepts no responsibility whatsoever for damages or loss of any nature or kind suffered by any such third party as a result of actions taken or not taken or decisions made in reliance on this report or anything set out herein.

Andrew Gillam, PGeo, CEA  
AMEC Americas Limited  
Burnaby, British Columbia, Canada  
1 June 2010