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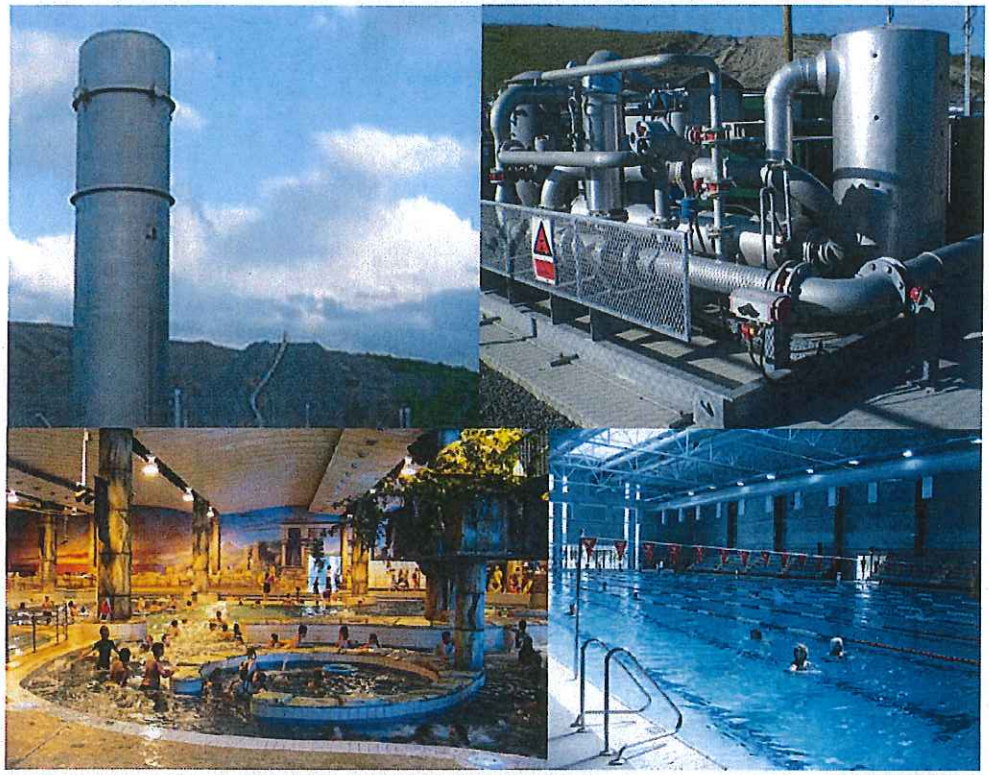
# BURWOOD LANDFILL GAS UTILISATION PROJECT

## KYOTO PROTOCOL JOINT IMPLEMENTATION PROJECT (TRACK 1)



# ANNUAL EMISSION REDUCTION REPORT
# 2012 CALENDAR YEAR

# CHRISTCHURCH CITY COUNCIL
# NEW ZEALAND

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*Front page photos from top left to bottom right: Flare at Burwood Gas Treatment Plant; Burwood Gas Treatment Plant; Pools at QEII Leisure Park.*

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# DOCUMENT CONTROL REGISTER

| Document Version | Date Version Created | Last Edited By | Final Version Quality Checked By | Final Version Approved By | Date Final Version Approved |
|---|---|---|---|---|---|
| 1 | 22-01-2013 | DH | LC | MC | 24/1/13 |
| 2 | 15-03-2013 | DH | LC | MC | 15/3/13 |
| 3 | | | | | |
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# SECTION 1: PROJECT INFORMATION

## 1.1 Introduction

Christchurch City Council (CCC), New Zealand, is pleased to submit the fifth of five annual reports regarding Emission Reduction Units (ERU's) for the Burwood Landfill Gas Utilisation Project, for the 2012 calendar year.

Burwood Landfill opened in 1984 for the disposal of municipal waste generated from Christchurch, accepting waste from both domestic and commercial sources. Approximately half of this waste is organic matter. In 2005, Burwood Landfill closed and a new landfill opened in Kate Valley, north of Christchurch. Since its closure, capping and planting have been carried out at Burwood Landfill as part of a rehabilitation programme before the site is vested as a reserve for recreational purposes.

The Burwood Landfill Gas Utilisation Project (also known as the Burwood Landfill Gas to QEII Park Project) is a Track 1 Joint Implementation Project (JI) under the Kyoto Protocol and an approved emission reduction project under the New Zealand Government's Ministry for the Environment "Projects to Reduce Emissions" (PRE) programme. Gas extracted from the landfill was originally used to replace Liquefied Petroleum Gas (LPG) used in boilers to heat swimming pools at the QEII Leisure Park, and flared at the Burwood Landfill Gas Treatment Plant. It was this use and destruction of landfill gas from which ERU's for the Burwood Landfill Gas Utilisation Project were generated. Following earthquakes in September 2010 and February 2011 the QEII facilities were damaged and in 2012 the QEII facilities were demolished as it was not practical to repair them. Since 22 February 2011 no landfill gas had been used at the facility.

An Amendment to the Project Agreement between Christchurch City Council and the New Zealand Government's Ministry for the Environment was signed by both parties in October 2009. This Amendment now allows CCC to attain ERU's associated with new gas usage plant being commissioned in 2010, which includes;

1. the co-generator gas engine located at QEII Leisure Park (already commissioned). As set out above this plant has not operated since 22 February 2011.

2. gas boilers located at the Christchurch Art Gallery

3. a tri-generator gas engine and a gas boiler located in the new central city CCC Civic Offices

4. a gas boiler located at the Christchurch Wastewater Treatment Plant Biosolids Drying Facility

The construction of the facilities at the Art Gallery, Civic Offices and Wastewater Treatment Plant was completed in 2009 and construction emissions were be reported within the 2009 calendar year. The commissioning of these facilities was commenced in 2010 and completed in 2011.

As a result of earthquake damage there were difficulties in operating the Building Management System, which was used to collect data for the annual report, and a SCADA system for system monitoring and data collection was commissioned at the end of 2010. Since 2011 all data for the annual reports has been obtained using the SCADA system.

Carbon reductions equivalent to 38,362 ERU's were achieved by the Burwood Landfill Gas Utilisation Project for the 2012 calendar year. However only 15,804 ERU's are being claimed which is the remaining number of units available for transfer by the Crown under the PRE agreement. Details regarding data and calculations for these ERU's can be found in Section 2 and Appendix A.1.

For further details regarding the Burwood Landfill Gas Utilisation Project, refer to the Project Design Document.

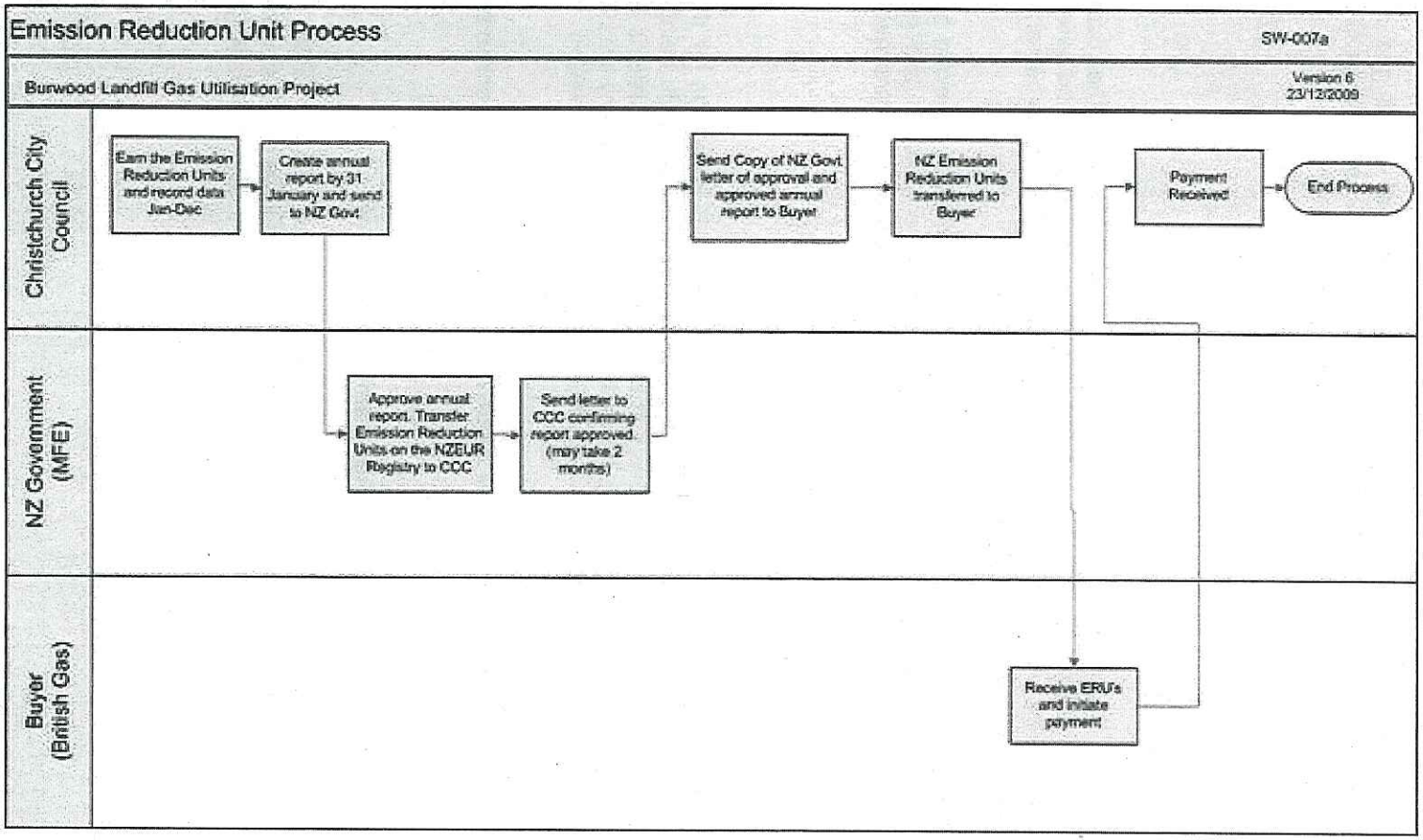
## 1.2 Project Team

The following CCC personnel have been directly involved with the Burwood Landfill Gas Utilisation Project for 2011 (note details differ slightly to those presented within the Project Design Document):

| | |
|---|---|
| **Name:** | **Mark Christison, City Water & Waste Unit Manager** |
| Project Role: | Project Sponsor |
| Project Responsibilities: | Approve annual ERU report |
| Brief Background: | Mark heads up CCC's City Water & Waste Unit and is ultimately responsible for the operation and maintenance of the city's water supply & wastewater infrastructure, and the provision of solid waste & recycling services to the community. |
| **Name:** | **Dave Harris, Landfill Aftercare Officer** |
| Project Role: | Burwood Landfill Site Manager |
| Project Responsibilities: | Management of Burwood Landfill Gas Treatment Plant and associated equipment (including calibrations).<br>Management of emission reduction data collection.<br>Quality Assurance of emission reduction data. |
| Brief Background: | Dave is the Landfill Aftercare Officer for CCC and manages the Gas Treatment Plant at the Burwood Landfill. Dave is responsible for collecting, analysing and performing quality checks on data gathered for the Burwood Landfill Gas Utilisation Project. |
| **Name:** | **Louisa Collis, Consent Compliance Officer** |
| Project Role: | Resouce Consent Compliance Officer |
| Project Responsibilities: | Provide checking of data and calculations plus monitoring of consent conditions related to the project. |
| Brief Background: | Louisa has recently been appointed to the Council and will be assisting in the data collection, verification and report preparation. |

## 1.3 Project Process Map

The process map below is an internal CCC document that demonstrates the flow of key tasks undertaken for the annual reporting of ERU's to the New Zealand Government's Ministry for the Environment and British Gas (ERU buyer):



## 1.4 Methodology

Methodology adopted for the capture and burning of landfill gas by the Burwood Landfill Gas Utilisation Project (from which consequent ERU calculations have been developed) follows that of ACM0001 (Consolidated Baseline Methodology for Landfill Gas Project Activities) and AMS-III.B (Approved Small Scale Methodology - Switching Fossil Fuels). Both of these methodologies have been approved by the CDM Executive Board for JI projects.

Further to the above, the measurement and recording of landfill gas and ERU calculations have also been undertaken as per Schedule 2 and 4 of CCC's Project Agreement with the New Zealand Ministry for the Environment.

## 1.5 Quality Assurance

### 1.5.1 Annual Report

The Project Team have made best endeavours to ensure the quality and completeness of this report and supporting data & documentation, and believe these documents meet the reporting requirements under CCC's Project Agreement with the New Zealand Ministry for the Environment.

This report has a Document Control Register, has been peer reviewed by Louisa Collis (Water & Waste Resource Consent Compliance Officer), and has been approved for release by Mark Christison (City Water & Waste Unit Manager) as part of the project's quality control process.

### 1.5.2 Data for Annual Report

Following the Christchurch earthquakes in 2010 and 2011 data was for this report was collected using the Council's SCADA systems with totalised data being used to provide the raw data used for the basis of emission reduction calculations – refer to the worksheets within Appendix A.1 for further details. Note that any data identified or deemed to contain anomalies has not been included in emission reduction calculations.

Data and calculations for this annual report have also been cross-checked by Project Team members.

### 1.5.3 Gas Treatment Plant & Landfill Site Management

Weekly visits to Burwood Landfill and the associated Gas Treatment Plant continue to be undertaken by Dave Harris (Landfill Aftercare Officer). These visits are primarily for gas monitoring purposes and to ensure the Plant is operating satisfactorily.

### 1.5.4 Project Audits

Previous audits have been undertaken on the Burwood Landfill Gas Utilisation Project by external organisations, including a verification audit conducted by GHD in 2006, the project's determination audit conducted by DNV in 2007, and a verification audit conducted by SGS in 2008. These audits have confirmed CCC's confidence in the quality and accuracy of data, information, and methodology used for the project.

# SECTION 2: EMISSION REDUCTION REPORT

## ANNUAL REPORT FOR LANDFILL GAS PROJECTS (PRE 2)

**Project Title:** **Burwood Landfill Gas Utilisation Project**

**Description of Project:** **To capture and burn landfill gas for heating swimming pools at the QEII Leisure Park and flaring at the Burwood Landfill Gas Treatment Plant**

**Company:** **Christchurch City Council**

**Year Reported on:** **2012 Calendar Year**

**(1) Break down and total of emissions generated during construction using the emission factors listed in Schedule 2** *(if applicable to the year being reported on).*

| **CONSTRUCTION EMISSIONS** | | | |
|---|---|---|---|
| **Element** | **Usage** | **Embodied emission factors** | **$tCO_2$-e** |
| Diesel | 0 litres | 0.00271 tonnes $CO_2$-e per litre | 0.00 |
| Petrol | 0 litres | 0.00232 tonnes per $CO_2$-e per litre | 0.00 |
| Electricity purchased | 0 GW hours | 625 tonnes $CO_2$-e per GWh | 0.00 |
| Iron/Steel – produced in New Zealand | 0 tonnes | 2.01 tonnes $CO_2$-e per litre | 0.00 |
| Aluminium – produced in New Zealand | 0 tonnes | 1.62 tonnes $CO_2$-e per tonne | 0.00 |
| Cement | 0 tonnes | 0.46 tonnes $CO_2$-e per tonne | 0.00 |
| | | | **Total: 0.00** |

**(2) Once abatement commences the following to be recorded if used in the operation of this project** *(if applicable):*

| **Element** | **Annual Usage** | **Factor** | **$tCO_2$-e** |
|---|---|---|---|
| Diesel | 0 litres | 0.00271 tonnes CO2-e per litre | 0 |
| Petrol | 240 litres | 0.00232 tonnes CO2-e per litre | 0.56 |
| Electricity purchased | 0.41475 GW hours | 625 tonnes CO2-e per GWh | 259.22 |
| Iron/Steel - produced in New Zealand | 0 tonnes | 2.01 tonnes CO2-e per tonne | 0 |
| Aluminium - produced in New Zealand | 0 tonnes | 1.62 tonnes CO2-e tonne | 0 |
| Cement | 0 tonnes | 0.46 tonnes CO2-e tonne | 0 |
| | | | **Total: 259.78** |

*Reminder: Emission Reductions cannot exist until after the requirements of 4.4 of the Project Agreement have been met.*

**(3) (a) If the project produces electricity, a record of the quantity of electricity exported by the Project during the year.**

**(b) If the project produces steam/hot water, a record of the quantity and energy content of the steam/hot water generated by the Project during the year[1].**

**A statement of the heat plant efficiency and the equivalent quantity of fuel displaced**

| Element and Measure | Total |
|---|---|
| (i) Electricity (GWh) | 0 |
| OR | |
| (ii) Steam (tonnes) | 0 |
| (iii) Steam (energy content) | 0 |
| (iv) Hot water (tonnes) | 0 |
| (v) Hot water (energy content) | 0 GJ |
| (vi) Heat Plant efficiency | Boiler 1:<br>Boiler 2: |
| (vii) Equivalent quantity of fuel displaced[2] | 0 litres LPG |

*NB: Emission factor to convert heat output to LPG displaced is 0.06537 tCO2-e per GJ's of heat output.*
*Earthquake damage to QEII required refurbishment of the boilers and before efficiencies could be recalculated an additional earthquake resulted in the closing down of the QEII facility. Therefore no claim has been made for LPG displaced.*

**(4) (a) If the project produces electricity, identify and measure any other generation that is <u>not</u> part of the project that flows through the above meters.** *(This generation to be subtracted from the metered electricity generation to determine the electricity output of the project).*

| Measure | Total |
|---|---|
| Electricity (GWh) | 0 |

**(b) If the project produces steam/hot water, identify and measure any other steam or hot water generation that is <u>not</u> part of the project that flows through the above meters.** *(This generation to be subtracted from the metered steam/hot water generation to determine the heat output of the project).*

| Measure | Total |
|---|---|
| (i) Steam (tonnes) | 0 |
| (ii) Steam (energy content) | 0 |
| (iii) Hot Water (tonnes) | 0 |
| (iv) Water (energy content) | 0 |

[1] Need to take account of any condensate return

[2] Calculated after subtracting any figures recorded in 4 (b)

[3] Corrected for temperature, pressure and water content

**(5) Tonnes of methane combusted. This will be calculated from the weekly methane content measurements in accordance with the methodology set out in Schedule 2 of the Project Agreement. Please append the raw data, calculations and explanatory notes.**

| Measure | Total (Tonnes) |
|---|---|
| Methane combusted in landfill flare, gas treatment plant & other CCC facilities excluding QEII | 2,159.17 |
| Methane combusted in QEII Boiler 1 | 0.00 |
| Methane combusted in QEII Boiler 2 | 0.00 |
| Methane combusted in co-generator | 0.00 |
| Total Methane combusted[3] | **2,159.17***(Please refer to Appendix A.1 for further details)* |

**Proxy Method**

Throughout 2010 and 2011 additional equipment to utilise landfill gas has been commissioned at the Christchurch Wastewater Treatment Works Biosolids Drying Plant, the Christchurch City Councils Civic Offices and the Christchurch Art Gallery. Delays and problems with commissioning plant, particularly the Biosolids Drying Facility and instrumentation for recording gas flows at the individual sites, together with further delays in commissioning as a result of repairs following the 4 September 2010 and subsequent earthquakes, have resulted in changes in the data recording and calculations for the 2010 and 2011 report. To improve accuracy of gas usage, the total flow from the gas field measured by a new RMG turbine flow meter, was used to calculate the total gas burnt through the various plant items. No gas was used in the QE II complex in 2012. Gas usage at the flare and other facilities was then calculated by subtracting the gas usage at QE2 from the total gas flow to the gas treatment plant. Problems with the Council's Building Management System (BMS) as a result of earthquake damage to QE II resulted in changing to a SCADA system to record and report gas quantities, heat generation and gas composition. A new inline gas analyser system was also installed to overcome problems with condensates affecting the metres and provide continuous data to the SCADA system.

**(6) A calculation showing tonnes of $CO_2$ emitted by the project as a result of methane combusted. (Tonnes of methane combusted; multiplied by 44/16).**

| Measure | Total $CH_4$ | Total t $CO_2$-e |
|---|---|---|
| Tonnes $CO_2$ emitted | 2,159.17 | **5,937.73** |

[3] Corrected for temperature, pressure and water content

**(7) A record of the amount of $tCO_2$-e Emission Reductions resulting from the Project during the year determined by the relevant emission factors as per Schedule 2 of the Project Agreement.[4] The construction emissions should be subtracted from this total for each of the years that are reported on when construction takes place. Once abatement commences the total of any emissions recorded in (2) above should be subtracted from the total.**

| Element | Annual Production | Factor | T $CO_2$-e |
|---|---|---|---|
| Electricity generated (GWh) (3)(a)(i) | 0 | 625 tonnes per GWh | 0 |
| OR | 0 | | 0 |
| Steam/hot water generated (tonnes) (3)(b)(ii)/(3)(b)(iv) | 0 | As per schedule | 0 |
| Steam/hot water Energy content generated (heat output) (3)(b)(iii)/(3)(b)(v) | 0 GJ | 0.06537 tonnes CO2-e per GJ's of heat output | 0 |
| Methane Combusted (6) | 2,159.17 tonnes | 21 t $CO_2$-e per tonne methane | 45,342.63 |
| | | **Total** | **45,343** |
| | | Less construction emissions and/or other project emissions (1),(2) | 260 |
| | | Less tonnes of $CO_2$ emitted by the project as a result of methane combusted (6) | 5,938 |
| | | Less other generation not part of the project, recorded by the meters (625 tonnes per GWh) (4)(a) | 0 |
| | | Less steam/hot water energy content (heat output) not part of the project (4)(b) | 0 |
| | | **Net Emission Reductions for the Year** | **39,145** |

[4] Conversion into $tCO_2$-e
The $tCO_2$-e in respect of each of the quantities used in, purchased by or introduced into the project, the electricity or steam/hot water generated and the methane combusted in the project will be calculated according to the conditions and emission factors set out in Schedule 2 of the project agreement.

**(8) Emission Units claimed for the year using the emission ratio "C" set out in Clause 5.1 of the Project Agreement.**

**Total ERU's achieved for 2012:**
**39,145** (Table 7 total) x **0.98** (contract emission ratio) = **38,362 ERU's**

**Total ERU's Claimed, the balance of units available under the PRE agreement:**
**15,804 ERU's**

*(Please refer to Appendix A.1 for data and formula used to calculate the above Emission Reduction Units)*

**(9) Evidence that the metering and recording equipment has been certified by a reputable, independent quality assurance service provider.**

Please refer to Appendices A.5a & A.5b for certification data.

*Note the "GA2000" gas sensor/analyser that measures the composition of gas flow into the Burwood Landfill Gas Treatment Plant is calibrated on average every 6 months. Readings are taken weekly apart from times when meter is being recalibrated off site in Auckland.*
*From September 2011 a new GasData Click inline analyer was commissioned to provide continuous gas composition data which is recorded using the SCADA system. This data was used for the report from September. Details of the inline analyser system are shown in Appendix A.9.*
*A RMG turbine flow meter is used to measure gas flow through the flare and treatment plant.*

**(10) A statement detailing anything that has, or has the potential, to be an impediment to achieving the agreed emission reductions during commitment period one.**

The Project Team of CCC are not aware of any issues that will impede our ability to achieve the emission reductions set out in our Project Agreement with the New Zealand Government's Ministry for the Environment.

**(11) A statement identifying that this report:**

- **has been prepared using the methodology of Schedule 2 – Measurement of Emission Reductions**
- **meets all other requirements of Schedule 4 - Contents for Annual Reports of the Project Agreement.**

The Project Team of CCC confirm that to the best of our knowledge, this annual report for the 2012 calendar year meets requirements of Schedule 2 and Schedule 4 of the Project Agreement with the New Zealand Government's Ministry for the Environment.

**Signature:** 

**Position:** **City Water & Waste Manager, Christchurch City Council**

**Date:** 15/3/2013

## Unit Transfer Details

**Please Note: To obtain the emission reduction units you will need a NZEUR account to transfer the agreed/allowed Emission Units.**

| | | |
|---|---|---|
| 1 | Project name: | Burwood Landfill Gas Utilisation Project |
| 2 | Date of project agreement: | 29 March 2005 |
| 3 | Name of the project developer: | Christchurch City Council |
| 4 | Project ID: | NZ-1000030 |
| 5 | Calendar year for which units are being transferred: | 2012 |
| 6 | Account identifier: | NZ-1149 |
| 7 | Project Participant (investor) | British Gas Ltd<br>(owned by Centrica Energy)<br>Account: GB1781 |
| 8 | Quantity of units (8):<br>2012 Calendar Year | 15,804 |
| 9 | Type of units: | Emission Reduction Units (ERU's) |

Note: Units can only be awarded for Emission Reductions during CP1, i.e. from 2008 to 2012.