ANNUAL ENVIRONMENTAL REPORT

FOR

ARTHURSTOWN LANDFILL
KILL, CO. KILDARE

FOR THE PERIOD

1ST JANUARY 2009 – 31ST DECEMBER 2009

WASTE LICENCE NO. W0004-003

Prepared by:

Facility Management,
Arthurstown Landfill,
Kill,
Co. Kildare.

31st March 2010

AER 11

TABLE OF CONTENTS

PAGE

TABLE OF FIGURES

PAGE

LIST OF TABLES

PAGE

LIST OF APPENDICES

1. INTRODUCTION

1.1. Site Location

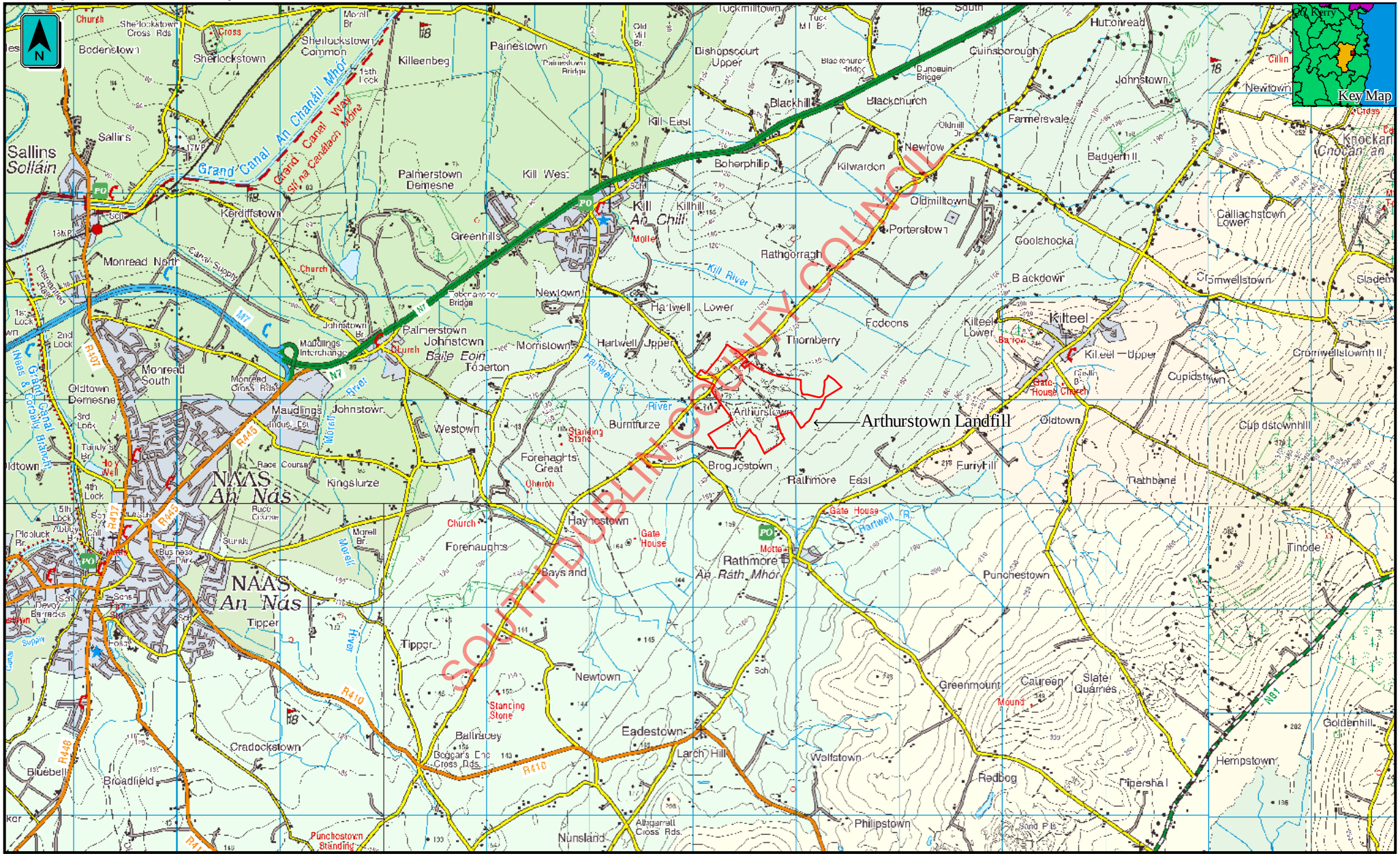
Arthurstown landfill, Kill, Co. Kildare is owned and operated by South Dublin County Council (SDCC). SDCC was granted a waste licence to operate the site by the Environmental Protection Agency. Land-filling commenced in October 1997. The current waste licence register number is W004-003 and was issued on *11th March 2005.* The facility is located approximately 25 km south-west of Dublin City and caters for the Greater Dublin Region.

The national grid coordinates for the facility are E 295691 N 220936. Figure 1.1 is a site location map.

The prevailing land use in the area is the bloodstock industry and agriculture. The site was a disused quarry when purchased by SDCC in 1992. It had been a sand and gravel quarry. Some unauthorised dumping took place in the 1970's. SDCC carried out remediation and restoration works on the unauthorised "dump" known locally as "Gavin's Dump".

Groundwater generally flows in a north-westerly direction. There are two rivers in the area, the Hartwell River and the Kill River. Surface water run-off from the site is first collected and stored in the on-site surface water storage lagoon before being discharged to the Hartwell River along with pumped groundwater. Groundwater levels beneath the landfill were artificially reduced during cell construction using a cut-off pipe system so that the water table is maintained below the landfill lining system base level.

The prevailing winds are south to south westerly. The annual rainfall for the area is approximately 1,000 mm.



Fehily Timoney & Company

1: 50,000 Site Location Map

Figure 2.2

1.2. Purpose

This Annual Environmental Report (AER) has been prepared in compliance with Condition 11.5 of the waste licence. It is the 11th AER for the facility.

Condition 11.5.1 states that:

"Annual Environmental Report"

The licensee shall submit to the Agency for its agreement, by 31st March each year, an Annual Environmental Report (AER).

The AER shall include as a minimum the information specified in *Schedule F: Content of Annual Environmental Report*, of this licence and shall be reported in accordance with any relevant written guidance issued by the Agency".

The AER includes all of the items that are required by Schedule F of the current waste licence for the facility.

This AER covers the operational period of the landfill from 1st January 2009 to 31st December 2009.

2. SITE DESCRIPTION AND ACTIVITIES

2.1. Waste Activities

Waste activities carried out at Arthurstown Landfill are in accordance with the licence as follows:

Licensed Waste Disposal Activities,
in accordance with the Third Schedule of the Waste Management Acts 1996-2003

Class 1 **Deposit on, in or under land (including landfill):**

This activity is limited to the deposit of baled municipal waste at the facility.

Class 4 **Surface impoundment, including placement of liquid or sludge discards into pits, ponds or lagoons:**

This activity is limited to the storage of leachate in the storage and treatment tank and lagoons and the storage of surface water and groundwater at the facility.

Class 5 **Specially engineered landfill, including placement into lined discrete cells which are capped and isolated from one another and the environment:**

This activity is limited to the deposit of baled municipal waste into lined cells at the facility.

Class 6 **Biological treatment not referred to elsewhere in this Schedule which results in final compounds or mixtures which are disposed of by means of any activity referred to in paragraphs 1. to 10. of this Schedule:**

This activity is limited to the biological treatment of leachate arising from the waste disposed of on-site.

Class 7 **Physico-chemical treatment not referred to elsewhere in this Schedule (including evaporation, drying and calcination) which results in final compounds or mixtures which are disposed of by means of any activity referred to in Paragraphs 1. to 10. of this Schedule:**

This activity is limited to the physico-chemical treatment of leachate arising from the waste disposed of on-site.

Municipal waste that has been baled prior to acceptance at Arthurstown Landfill, is land-filled in 15 no. lined discrete cells which are subsequently capped. Leachate is collected from the breakdown of waste and is stored on site and treated in a Sequencing Batch Reactor (SBR) prior to transfer off-site for disposal at a wastewater treatment plant or discharged to the local foul sewer network.

Surface water is collected from rainwater run-off and is stored in a surface water lagoon on site. (The lagoon is maintained for a fire-fighting water source if the need arose. Additional volumes of surface water, not required for this purpose are discharged to the Hartwell River in accordance with the licence.)

2.2. Waste quantities

Table 2.1 is a list of waste material received at the facility for land-filling since operations commenced in 1997 to the end of this reporting period 2009.

Table 2.1 Waste Intake (Tonnes)

Year	Waste Materials (Tonnes)			
	Cumulative Waste Inputs	Annual Waste Inputs	Month 2009	Tonnages 2009
2009	4,587,468	214,560		
2008	4,372,908	301,828	Jan	22,508.10
2007	4,071,077	480,529	Feb	15,664.84
2006	3,590,548	591,755	Mar	17,411.06
2005	2,998,793	497,400	Apr	18,293.92
2004	2,501,393	423,626	May	18,518.50
2003	2,077,767	483,582	June	19,355.84
2002	1,594,185	463,436	July	19,206.94
2001	1,130,749	334,333	Aug	16,445.41
2000	796,416	274,642	Sept	17,024.24
1999	521,774	271,079	Oct	16,013.84
1998	250,695	216,284	Nov	16,238.94
1997	34,411	34,411	Dec	17,878.44

2.3. Remaining Capacity

2.3.1. Current Filling Rates

Figure 2.1 illustrates the layout of Arthurstown Landfill. The intake of waste into Cell 1 of Stage 1 at the facility began in October 1997. Substantial filling of Stage 1 (Cells 1 to 4) was completed in 2000. Filling of Stage 2 began with Cells 5 - 10 in 2000 and this stage was completed in 2003.

In 2004, SDCC commenced the placement of waste in cell 11 of stage 3 and 4. Since then, SDCC is currently landfilling cells 12 -15. The final cell (Cell 15) accepted waste during November 2007.

To date SDCC has placed a final cap over 65% of this area (150,000 m^2). Waste intake figures show that between October 1997 and December 2009 more than 4.5 million tonnes of waste has been landfilled at the facility.

Table 2.2 details the remaining void space at Arthurstown landfill, which was calculated by Facility Management using a topographical survey taken in January 2010.

The facility is to close on 21st December 2010 as the planning permission from Kildare County Council expires on this date.

Table 2.2 Void Capacity

Air space from January 2010 Site Survey	357,208 m^3		
Using 0.8 t/m3 =	357,208	X 0.8	285,766 tonnes
Plus 20 % Settlement	285,766	Plus 20%	342,919 tonnes
Less Daily Cover, Temp Cap & Final Cap	342,919	Less 20%	274,335 tonnes
Remaining Tonnage			**274,335 tonnes**
Predicted Tonnage for 2010			200,000 tonnes
Spare Capacity	274,335	- 200,000	74,335 tonnes

As can be seen from Table 2.2, the estimated remaining capacity at the landfill at the end of 2009 is 274, 335 tonnes.
Based on these figures and with spare capacity, the closure of Arthurstown will take place as planned during December 2010.

N

LEGEND

- REMEDIATED SITE
- STAGE 1
- STAGE 2
- STAGES 3 AND 4
- LEACHATE LAGOON
- RETENTION POND
- LAND OWNERSHIP BOUNDARY
- SITE BOUNDARY
- WASTE PERMITTED FACILITY (T. GAVIN)
- SURFACE WATER SWALE

ARTHURSTOWN ROAD

LOCATION OF SITE NOTICE

HARTWELL UPPER

BROUGHSTOWN

Rev.	Drawn	Chkd	Appd	Date	Description
B	CH	BR	CC	16/4/04	ISSUE FOR WASTE LICENCE REVIEW
A	CH	BR	CC	16/4/04	ISSUE FOR APPROVAL

Name of Client:
SOUTH DUBLIN COUNTY COUNCIL

Name of Job
ARTHURSTOWN WASTE LICENCE
4-2 REVIEW

Title of Drawing
SITE PLAN

Scales Used
1:2500

Dwg. No. 2004-054-02-001

Rev. B

FEHILY TIMONEY & COMPANY
CONSULTANTS IN ENGINEERING & ENVIRONMENTAL SCIENCES
CORE HOUSE, POULADUFF RD, CORK, IRELAND.
Phone: +353-21-4961733 Fax: +353-21-4964484 Email: info@fehily.ie
Web Site: www.fehilytimoney.ie

ORIGINAL DRAWING SIZE A1 - (841 x 594)

NATURAL SCALE

2.4. Future Trends in Filling Rates

The Arthurstown landfill has almost reached capacity. As highlighted on the previous pages the approximate time left is 9 months.
Waste License W0004-003 was granted on 11th March 2005 and increased the allowable annual tonnage input to 600,000 tonnes per annum.

A reduced rate of intake was introduced at Arthurstown to prolong the life of the landfill until the date outlined in the planning permission (December 2010).

During 2006 the highest amount of waste was accepted. (591,755 tonnes)
A reduction in waste intake was recorded during 2007. (480,529 tonnes)
A further reduction was implemented at the start of 2008 and waste intake for this period was only 301,828.92 tonnes.
The tonnage received for 2009 was less than expected at 214,560 tonnes.

It is envisaged that the tonnage for the coming year 2010 will be similar to that of 2009. (200,000 tonnes approx)

The landfill at Arthurstown is due to close on December 21st 2010 as the planning permission from Kildare County Council expires on this date.

2.5. Waste Deposition

Waste may be accepted at the facility from Monday to Saturday inclusive between the hours of 08.00 to 18.30. Security staff are on-site outside the opening hours of the facility. Facility Management staff are on 24 hour call 7 days a week

The facility is used solely for the land-filling of non-hazardous baled municipal waste. Baled waste is accepted from pre-approved baling centres only, which are also licensed by the EPA. Arthurstown landfill currently receives waste from the facilities outlined in Table 2.3.

Baled waste is transported to the site in fully enclosed containers, via a specified route, which prevents trucks passing through Kill village as well as the preventing a need to cross the traffic flow on the N7 southbound carriageway. The enclosed containers are deposited in a dedicated marshalling yard and onto hydraulic stillages, which is not open to deliveries before 08:00 each morning. The use of a marshalling yard ensures that the road going fleet does not access the actual landfill cell area and minimises to the greatest possible degree the potential for transfer of dirt onto local and site access roads. Site vehicles are regularly cleaned using the vehicle wash facilities installed on site.

Refer to Figure 2.3; Loaded containers are taken to the working landfill face by specially adapted rough terrain vehicles and emptied using a hydraulic ram and an excavator with a grab attachment. The bales are stacked in horizontal rows, like buildings blocks, and covered as the working face travels horizontally along the cell, being sheltered insofar as is possible from the prevailing winds. As the waste generally gives rise to odours, the site management employs techniques to eliminate where possible, or at least minimise, the potential for these odours to be carried off site at all times. Techniques currently employed include use of clay cover material and spraying with odour control mixtures, application of a double layer of Heavy duty Plastic Covering on the vertical face. (See Section 3.9 on Odour Management during 2009).
Currently there are 4 no. Enclosed landfill gas flares at Arthurstown.

The first 2 enclosed landfill gas flares operate in conjunction with the 11 no. landfill gas engines producing 13 MW of electricity. The second 2 enclosed flares are at opposite ends of the temporary capped areas. (Cells 11-15)
Waste is not re-excavated once it is land-filled. A schematic of the waste handling operation is shown below. Site activities are carried out under the supervision of the Facility Manager (J. Smith).

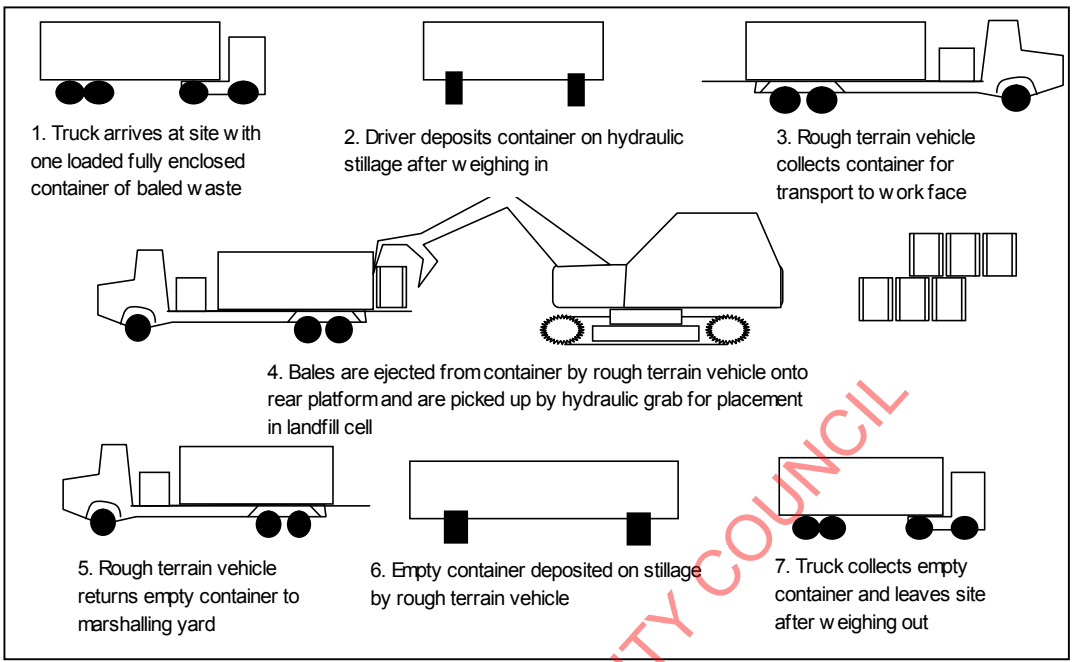
Table 2.3 Baling Stations Supplying Arthurstown Landfill

Facility	Waste Licence No.	Licensee	Operator
Ballymount Baling Station	3-3	SDCC	Veolia (formerly Onyx Ireland)
Thorntons Recycling Centre	44-2	Pardraig Thornton Waste Disposal Limited	Pardraig Thornton Waste Disposal Limited
Ballyogan Recycling Park	15-1	Dun Laoghaire Rathdown County Council	Greenstar
Oxygen Environmental Ltd. Integrated Waste Management Facility	208-1	Oxygen	Oxygen

The principal activity as licensed by the EPA at Arthurstown landfill site is the land-filling of baled municipal waste into pre-constructed fully lined cells.

1. Waste delivered to Arthurstown is handled as follows: Waste is visually inspected at each of the baling stations prior to baling to ensure it is suitable for land-filling at Arthurstown.
1. On arrival at Arthurstown landfill, waste is weighed at the onsite weighbridge. Details of all wastes accepted (type, nature, weight, origin etc) at the site is recorded by the weighbridge operator.
2. Waste containers are set down on hydraulic stillage units in the marshalling yard.
3. The containers are picked up and transported to the active area of the landfill by dedicated on-site vehicles only, known as slave vehicles.
4. At the active waste area, the bales are removed from the site vehicles. An excavator with a grab attachment stacks them in close formation, normally 4 bales high. At the end of each working day, the top horizontal face of the bales is covered with a minimum of 300 mm of clay cover material or greater if deemed necessary by the Facility Manager. The vertical face of the bales is covered with a double layer of plastic sheeting or with clay if the vertical face is to be left unattended for 3 days or more.

Figure 2.3 Illustration of Waste Deposition Method



Continuous intermediate capping is carried out at the landfill. The EPA Landfill Design Manual states that waste material settles by approximately 25% of the depth of waste mass.

Phases 1 and 2 have been fully capped and restored.

Containment Principle

Arthurstown landfill comprises 15 discrete cells occupying at total area of approximately 230,000 m^2. The lining system in these cells comprises of a 2.5 mm thick fully welded high density polyethylene (HDPE) flexible membrane liner underlain by a minimum of 1 m of engineered clay. The clay liner underlying the HDPE flexible membrane liner has a permeability of 1 x 10^{-9} m/sec or lower. This lining system minimises leakage of leachate and migration of landfill gas through the base and side walls of the filling cells and is installed progressively during the development of each phase. All liner placement is carried out under strict quality assurance procedures that are documented and sent to the EPA for their approval. No waste is deposited within a cell without approval from the EPA.

The landfill has been constructed on a phased basis:

- Phase 1 - Cells 1 to 4 are filled and capped
- Phase 2 – Cells 5 to10 are filled and capped
- Phase 3 and 4 - Cells 11 to 15. Cells 12 – 15 are currently being filled.

2.6. Resource and Energy Consumption

The principal resources consumed at the landfill facility are diesel oil and electricity. Site vehicles are fuelled by diesel oil.

Table 2.4 Resource Use and Energy Consumption

Resource/Energy	Units	Quantity Used in 2009.
Diesel Oil	(Litres)	614,000 (Approx)
Electricity (As per SCADA)	(kWh)	865,813

2.7. Leachate Generation

In 2009 leachate was collected from the waste cells and pumped to the leachate treatment plant. It was subsequently removed from site to a wastewater treatment plant by road tanker. SDCC has received permission from the local authority Kildare County Council to commence discharge via the rising main during 2008. Table 2.5 lists the quantities of leachate tankered off site and discharged to sewer in 2009 and Table 2.6 shows the quantities of leachate treated in the leachate treatment plant prior to disposal off-site since 2002. During 2009 an additional 18,998 tonnes of treated leachate was discharged to the sewer. The total quantity of leachate tankered off-site and discharged to sewer for 2009 is 115,427 tonnes.

Table 2.5 Leachate Removal Off-Site

Month	Tonnes leachate tankered off site 2009	Tonnes Leachate Discharged to Sewer 2009
January	11,339.62	1,730.03
February	10,366.98	1,816.37
March	10,260.00	1,581.37
April	6,939.04	1,310.45
May	3,493.22	1,564.93
June	6,072.80	1,340.61
July	7,631.85	801.40
August	7,187.50	1,418.82
September	7,297.14	2,095.06
October	4,532.62	1,352.15
November	10,442.64	1,800.61
December	10,865.06	2,186.11
Total	**96,428.47**	**18,997.91**

Table 2.6 Leachate Treatment

	2002	2003	2004	2005	2006	2007	2008	2009
Treated in SBR m^3	12,407	10,922	4,178	10,777	12,210	14,853	5,638	18,998
Tankered off-site m^3	39,035	32,599	55,072	63,279	80,270	101,732	104,184	96,429

3. ENVIRONMENTAL MONITORING

This is a summary of results and interpretation of environmental monitoring carried out in the period 1st January 2009 to 31st December 2009.

Environmental monitoring of the following is carried out in compliance with Condition 8 and Schedule D of the licence. (W0004-003)

- Landfill Gas
- Landfill Gas Utilisation Plant
- Dust Deposition
- Noise
- Surface Water including Biological Assessment
- Groundwater
- Private Wells (Groundwater)
- Leachate (including discharges to sewer)
- Nuisance
- Meteorological

Environmental monitoring is carried out on a weekly, monthly, quarterly, bi-annual and annual basis for various parameters of the various media. The AER presents the results of annual monitoring with interpretation. A review of the other results collected during the year is included.

3.1. Monitoring Locations

The environmental monitoring points are shown on Drawing Number AWL03 – 14. All samples were collected at the sampling points listed in Table D.1.1 of the licence unless specified otherwise in the following sections.

N

LEGEND

- LAND OWNERSHIP BOUNDARY
- SITE BOUNDARY
- LG_5 — LANDFILL GAS MONITORING POINT
- MW_3 — GROUNDWATER MONITORING WELL
- N1 — NOISE MONITORING LOCATION
- D4 — DUST MONITORING LOCATION
- SW_2 — SURFACE WATER MONITORING LOCATION
- PW1 — PRIVATE WELL LOCATIONS

STAGE 1

STAGE 2

STAGE 3 & 4

REMEDIATED SITE

Gravel Pit

Quarry

Pond

Rev.	Drawn	Chkd	Apprvd	Date	Description
A	CH	BR	CC	15.03.04	ISSUE FOR APPROVAL

Name of Client
SOUTH DUBLIN COUNTY COUNCIL

Name of Job
ARTHURSTOWN WASTE LICENCE
4-2 REVIEW

Title of Drawing
ENVIRONMENTAL MONITORING LOCATIONS

Scales Used
1:2500

Dwg. No. 2004-054-02-002 — Rev. A

FEHILY TIMONEY & COMPANY
CONSULTANTS IN ENGINEERING & ENVIRONMENTAL SCIENCES
CORE HOUSE, POULADUFF Rd, CORK, IRELAND.
Phone: +353-21-4964133. Fax: +353-21-4964464. Email: info@ftco.ie
WEB SITE: www.fehilytimoney.com

ORIGINAL DRAWING SIZE A1 - 1841 x 594

10 0 10 20 50 100mm NATURAL SCALE

3.2. Landfill Gas

Perimeter Monitoring Wells

There are 23 no. perimeter gas monitoring wells at the facility. In accordance with Schedule D.2.1 of the licence, monitoring of the wells is carried out on a monthly basis. An investigation was carried out in 2005 into elevated levels of carbon dioxide and methane at a number of perimeter wells. The investigation concluded that the elevated levels of CH_4 and $C0_2$ were due to incidences of rotting vegetation, proximity to old percolation areas etc. and was not due to landfill gas migration.

Appendix 3.2 shows methane and carbon dioxide levels measured in perimeter wells in 2009. The levels are comparable to levels recorded in 2006,2007 & 2008.

Gas Extraction Wells

The fully capped areas have a gas extraction system. This system is controlled and monitored by landfill gas field balancing. A gas balancing model is used by the staff at Arthurstown. A recent audit of the system is included in Appendix 3.2.

Experience to date at the facility shows that vents do not produce viable landfill gas until they are approximately 9 - 12 months old. The connection of vents is carried out if waste deposition in the area of the vent has either reached final levels or is to cease for 6 months or more. Temporary connections are also made on the instruction of the Facility Manager. Some of these vents are also located along the temporary landfill access roads.

Site Buildings

There are four permanent gas monitors, one in each building on site:

- Administration building
- Staff services building
- Leachate plant building
- Maintenance building

The following is the report of monitoring for 2009.

- Quarter 1 – no exceedences
- Quarter 2 - no exceedences
- Quarter 3 - no exceedences
- Quarter 4 - no exceedences

3.2.1. Landfill Gas Results

Appendix 3.2 has a series of tables and charts that show landfill gas levels at perimeter monitoring wells. They include:

Table or Figure number	Table or Figure Name
Table A. 3.2.1.	Landfill Gas Perimeter Monthly 2009

3.2.2. Interpretation of Landfill Gas Results

Landfill gas results are typical for Arthurstown landfill.
Certain wells as indicated in the Table are above the limit for CH4 and CO2. The Facility Management staff already engaged Odour Monitoring Ireland on 17th June 2005 to investigate these levels of methane in some of the perimeter wells.
The report concluded that due to the high sulphuric content of the gas in the perimeter wells that the gas was not migrating from the landfill and that this was occurring naturally due to decaying vegetation in certain areas and as a result of an old percolation area in another location. Before land-filling took place there was also background monitoring carried out. Levels of methane were also detected at that stage also.
Please refer to the consultants report reference 090905A. This report was again submitted to the Agency during 2009.

Landfill Gas Utilisation Plant Emissions

In accordance with Schedule D.7.1of the licence annual monitoring of the landfill gas utilisation plant was carried out.

The Landfill Gas Utilisation Plant commenced operations April 2004 with three no. Jensbaucher landfill gas engines from Austria extracting gas at a rate of approximately 3,000 m^3/hr. The Council requested that the enclosed flare operate in conjunction with the engines. This was carried out and the extraction rate increased to 4,900 m^3 per hour. During December 2004 a fourth engine was installed and the rate further increased to approximately 5,700 m^3 per hour. In 2005 an additional enclosed flare unit was installed. The extraction rate in the utilisation plant is currently approx. 11,000 m^3/hour, this is generated by 11 no. engines and 2 no. enclosed flares. Currently both 2,500m3 per hour enclosed flares are on stand-by as all landfill gas is now being diverted to the utilisation plant for electricity production. These flare units replace all open flare units on site.

Annual monitoring of the landfill gas utilisation plant emissions is a requirement of the licence. Monitoring was carried out for the period 2009 and the results are contained in Tables 3.1 to 3.11 and also on the following pages. The results show that all engines and flares are in full compliance with Waste License W0004-003.

Table 3.4. Emission value results from landfill gas flare 1.

Flare 1	Conc.	Units[1]	Adjusted units (mg/m^3)	Volumetric flow rate (Nm^3/hr)	Emission conc (mg/Nm^3)	Oxygen corrected emission conc to 3% (mg/Nm^3)[2]	Emission limit Values
TOC	1.60	ppm	2.56	2,869.95	2.56	4.02	<10 mg/Nm^3
Hydrogen chloride	4.12	mg/m3	4.12	2,869.95	5.63	8.85	<50 mg/Nm^3
Hydrogen fluoride	0.25	mg/m3	0.25	2,869.95	0.34	0.54	<5 mg/Nm^3
Temperature	1,053	degrees	1326K	2,869.95	-	-	-
CO	2	ppm	2.50	2,869.95	2.50	3.93	<50 mg/Nm^3
O_2	9.51	%	9.51	2,869.95	-	-	-
Total NOx [as NO_2]	28	ppm	57.50	2,869.95	57.50	90.36	<150 mg/Nm^3
SO_2	15	ppm	42.86	2,869.95	42.86	67.35	-
CO_2	6.12	%	6.12	2,869.95	-	-	-

Notes: [1] denotes units as measured.
[2] denotes refer to *Appendix II* for Oxygen correction calculations

Table 3.5. Emission value results from landfill gas flare 2.

Flare 2	Conc.	Units[1]	Adjusted units (mg/m^3)	Volumetric flow rate (Nm^3/hr)	Emission conc (mg/Nm^3)	Oxygen corrected emission conc to 3% (mg/Nm^3)[2]	Emission limit Values
TOC	1.40	ppm	2.24	2,930.70	2.24	3.41	<10 mg/Nm^3
Hydrogen chloride	3.56	mg/m^3	3.56	2,930.70	4.86	7.40	<50 mg/Nm^3
Hydrogen fluoride	0.21	mg/m^3	0.21	2,930.70	0.29	0.44	<5 mg/Nm^3
Temperature	1072	degrees	1345K	2,930.70	-	-	-
CO	2.00	ppm	2.50	2,930.70	2.50	3.81	<50 mg/Nm^3
O_2	9.14	%	9.14	2,930.70		0.00	-
Total NOx [as NO_2]	32	ppm	65.71	2,930.70	65.71	100.02	<150 mg/Nm^3
SO_2	53	ppm	151.43	2,930.70	151.43	230.49	-
CO_2	9.33	%	9.33	2,930.70	-	-	-

Notes: [1] denotes units as measured.
[2] denotes refer to *Appendix II* for Oxygen correction calculations

Table 3.6. Emission value results from landfill gas flare 3.

Flare 3	Conc.	Units[1]	Adjusted units (mg/m^3)	Volumetric flow rate (Nm^3/hr)	Emission conc (mg/Nm^3)	Oxygen corrected emission conc to 3% (mg/Nm^3)[2]	Emission limit Values
TOC	1.72	ppm	2.75	1,666.21	2.75	4.26	<10 mg/Nm^3
Hydrogen chloride	4.67	mg/m^3	4.67	1,666.21	6.38	9.88	<50 mg/Nm^3
Hydrogen fluoride	0.18	mg/m^3	0.18	1,666.21	0.25	0.38	<5 mg/Nm^3
Temperature	1060	degrees	1333K	1,666.21	-	-	-
CO	3.0	ppm	3.75	1,666.21	3.75	5.81	<50 mg/Nm^3
O_2	9.34	%	9.34	1,666.21	-	-	-
Total NOx [as NO_2]	38	ppm	78.04	1,666.21	78.04	120.83	<150 mg/Nm^3
SO_2	61	ppm	174.29	1,666.21	174.29	269.87	-
CO_2	9.45	%	9.45	1,666.21	-	-	-

Notes: [1] denotes units as measured.
[2] denotes refer to *Appendix II* for Oxygen correction calculations

Table 3.7. Emission value results from landfill gas flare 4.

Flare 4	Conc.	Units[1]	Adjusted units (mg/m^3)	Volumetric flow rate (Nm^3/hr)	Emission conc (mg/Nm^3)	Oxygen corrected emission conc to 3% (mg/Nm^3)[2]	Emission limit Values
TOC	2.34	ppm	3.74	1,738.64	3.74	6.04	<10 mg/Nm^3
Hydrogen chloride	5.44	mg/m3	5.44	1,738.64	7.43	12.00	<50 mg/Nm^3
Hydrogen fluoride	0.34	mg/m3	0.34	1,738.64	0.46	0.75	<5 mg/Nm^3
Temperature	1090	degrees	1363K	1,738.64	-	-	-
CO	2.00	ppm	2.50	1,738.64	2.50	4.04	<50 mg/Nm^3
O_2	9.81	%	9.81	1,738.64	-	-	-
Total NOx [as NO_2]	31	ppm	63.66	1,738.64	63.66	102.75	<150 mg/Nm^3
SO_2	45	ppm	128.57	1,738.64	128.57	207.52	-
CO_2	9.88	%	9.88	1,738.64	-	-	-

Notes: [1] denotes units as measured.
[2] denotes refer to *Appendix II* for Oxygen correction calculations

Table 3.8. Emission value results from gas utilisation engine AR01.

Gas Utilisation engine AR01	Conc.	Units[1]	Adjusted units (mg/m^3)	Volumetric flow rate (Nm^3/hr)	Emission conc (mg/Nm^3)	Oxygen corrected emission conc to 5% (mg/Nm^3)[2]	Emission limit Values
TNMVOC	4.12	mg/m^3	6.59	2,263.11	6.59	7.10	<75 mg/Nm^3
Average THC	405	mg/m^3 [propane]	648	2,263.11	648.00	697.58	<1,000 mg/Nm^3
Hydrogen chloride	5.23	mg/m^3	5.23	2,263.11	7.14	7.69	<50 mg/Nm^3 (at mass flows >0.30 kg/h)
Hydrogen fluoride	0.78	mg/m^3	0.78	2,263.11	1.07	1.15	<5 mg/Nm^3 (at mass flows >0.05 kg/h)
Temperature	455	degrees	728.15 K	2,263.11	-	-	-
CO	705	ppm	881.25	2,263.11	881.25	948.67	<1,400 mg/Nm^3
O_2	6.13	%	6.13	2,263.11	-	-	-
Total NOx [as NO_2]	216	ppm	443.57	2,263.11	443.57	477.51	<500 mg/Nm^3
SO_2	31	ppm	88.57	2,263.11	88.57	95.35	-
CO_2	9.17	%	9.17	2,263.11	-	-	-
Particulates	35.11	mg/m^3	35.11	2,263.11	113.27	121.94	<130 mg/Nm^3

Notes: [1] denotes units as measured.
[2] denotes refer to *Appendix II* for Oxygen correction calculations

Table 3.9. Emission value results from gas utilisation engine AR02.

Gas Utilisation engine AR02	Conc.	Units[1]	Adjusted units (mg/m^3)	Volumetric flow rate (Nm^3/hr)	Emission conc (mg/Nm^3)	Oxygen corrected emission conc to 5% (mg/Nm^3)[2]	Emission limit Values
TNMVOC	2.11	mg/m^3	3.38	2,294.62	3.38	3.74	<75 mg/Nm^3
Average THC	491	mg/m^3 [propane]	785.60	2,294.62	785.60	870.46	<1,000 mg/Nm^3
Hydrogen chloride	3.12	mg/m^3	3.12	2,294.62	4.26	4.72	<50 mg/Nm^3 (at mass flows >0.30 kg/h)
Hydrogen fluoride	0.15	mg/m^3	0.15	2,294.62	0.20	0.23	<5 mg/Nm^3 (at mass flows >0.05 kg/h)
Temperature	445	degrees	718K	2,294.62	-	-	-
CO	704	ppm	880	2,294.62	880	975.05	<1,400 mg/Nm^3
O_2	6.55	%	6.55	2,294.62	-	-	-
Total NOx [as NO_2]	198	ppm	406.61	2,294.62	406.61	450.53	<500 mg/Nm^3
SO_2	14.00	ppm	40.00	2,294.62	40.00	44.32	-
CO_2	9.31	%	9.31	2,294.62	-	-	-
Particulates	24.67	mg/m^3	24.67	2,294.62	64.86	71.87	<130 mg/Nm^3

Notes: [1] denotes units as measured [2] denotes refer to *Appendix II* for Oxygen correction calculations

Table 3.10. Emission value results from gas utilisation engine AR03.

Gas Utilisation engine AR03	Conc.	Units[1]	Adjusted units (mg/m^3)	Volumetric flow rate (Nm^3/hr)	Emission conc (mg/Nm^3)	Oxygen corrected emission conc to 5% (mg/Nm^3)[2]	Emission limit Values
TNMVOC	4.16	mg/m^3	6.66	2,549.36	6.66	7.32	<75 mg/Nm^3
Average THC	387	mg/m^3 [propane]	619.20	2,549.36	619.20	681.33	<1,000 mg/Nm^3
Hydrogen chloride	3.13	mg/m^3	3.13	2,549.36	4.28	4.70	<50 mg/Nm^3 (at mass flows >0.30 kg/h)
Hydrogen fluoride	0.56	mg/m^3	0.56	2,549.36	0.77	0.84	<5 mg/Nm^3 (at mass flows >0.05 kg/h)
Temperature	453	degrees	726.15K	2,549.36	-	-	-
CO	732	ppm	915	2,549.36	915	1,006.82	<1,400 mg/Nm^3
O_2	6.45	%	6.45	2,549.36	-	-	-
Total NOx [as NO_2]	213	ppm	437.41	2,549.36	437.41	481.30	<500 mg/Nm^3
SO_2	24.00	ppm	68.57	2,549.36	68.57	75.45	-
CO_2	10.13	%	10.13	2,549.36	-	-	-
Particulates	31.45	mg/m^3	31.45	2,549.36	83.61	92	<130 mg/Nm^3

Notes: [1] denotes units as measured. [2] denotes refer to *Appendix II* for Oxygen correction calculations

Table 3.11. Emission value results from gas utilisation engine AR04.

Gas Utilisation engine AR04	Conc.	Units[1]	Adjusted units (mg/m^3)	Volumetric flow rate (Nm^3/hr)	Emission conc (mg/Nm^3)	Oxygen corrected emission conc to 5% (mg/Nm^3)[2]	Emission limit Values
TNMVOC	4.56	mg/m^3	7.30	2,752	7.30	7.85	<75 mg/Nm^3
Average THC	467	mg/m^3 [propane]	747.20	2,752	747.20	803.82	<1,000 mg/Nm^3
Hydrogen chloride	5.34	mg/m^3	5.34	2,752	7.29	7.85	<50 mg/Nm^3 (at mass flows >0.30 kg/h)
Hydrogen fluoride	0.67	mg/m^3	0.67	2,752	0.92	0.98	<5 mg/Nm^3 (at mass flows >0.05 kg/h)
Temperature	461	degrees	734.15K	2,752	-	-	-
CO	783	ppm	978.75	2,752	978.75	1052.92	<1,400 mg/Nm^3
O_2	6.12	%	6.12	2,752	-	-	-
Total NOx [as NO_2]	213	ppm	437.41	2,752	437.41	470.56	<500 mg/Nm^3
SO_2	26	ppm	74.29	2,752	74.29	79.91	-
CO_2	10.12	%	10.12	2,752	-	-	-
Particulates	36.77	mg/m^3	36.77	2,752	97.75	105.16	<130 mg/Nm^3

Notes: [1] denotes units as measured.[2] denotes refer to *Appendix II* for Oxygen correction calculations

Table 3.12. Emission value results from gas utilisation engine AR05.

Gas Utilisation engine AR05	Conc.	Units[1]	Adjusted units (mg/m^3)	Volumetric flow rate (Nm^3/hr)	Emission conc (mg/Nm^3)	Oxygen corrected emission conc to 5% (mg/Nm^3)[2]	Emission limit Values
TNMVOC	8.43	mg/m^3	13.49	2265	13.49	14.51	<75 mg/Nm^3
Average THC	562	mg/m^3 [propane]	899.20	2265	899.20	967.34	<1,000 mg/Nm^3
Hydrogen chloride	6.11	mg/m^3	6.11	2265	8.35	8.98	<50 mg/Nm^3 (at mass flows >0.30 kg/h)
Hydrogen fluoride	0.45	mg/m^3	0.45	2265	0.61	0.66	<5 mg/Nm^3 (at mass flows >0.05 kg/h)
Temperature	445	degrees	718.15 K	2265	-	-	-
CO	899	ppm	1123.75	2265	1,123.75	1,208.91	<1,400 mg/Nm^3
O_2	6.12	%	6.12	2265	-	-	-
Total NOx [as NO_2]	225	ppm	462.05	2265	462.05	497.07	<500 mg/Nm^3
SO_2	15	ppm	42.86	2265	42.86	46.10	-
CO_2	11.32	%	11.32	2265	-	-	-
Particulates	37.23	mg/m^3	37.23	2265	97.88	105.30	<130 mg/Nm^3

Notes: [1] denotes units as measured. [2] denotes refer to *Appendix II* for Oxygen correction calculations

Table 3.13. Emission value results from gas utilisation engine AR06.

Gas Utilisation engine AR06	Conc.	Units[1]	Adjusted units (mg/m^3)	Volumetric flow rate (Nm^3/hr)	Emission conc (mg/Nm^3)	Oxygen corrected emission conc to 5% (mg/Nm^3)[2]	Emission limit Values
TNMVOC	5.34	mg/m^3	8.54	2,278	8.54	9.15	<75 mg/Nm^3
Average THC	478	mg/m^3 [propane]	764.80	2,278	764.80	818.88	<1000 mg/Nm^3
Hydrogen chloride	5.78	mg/m^3	5.78	2,278	7.90	8.45	<50 mg/Nm^3 (at mass flows >0.30 kg/h)
Hydrogen fluoride	0.13	mg/m^3	0.13	2,278	0.18	0.19	<5 mg/Nm^3 (at mass flows >0.05 kg/h)
Temperature	451	degrees	724.15K	2,278	-	-	-
CO	948	ppm	1185	2,278	1,185	1,268.79	<1400 mg/Nm^3
O_2	6.05	%	6.05	2,278	-	-	-
Total NOx [as NO_2]	205	ppm	420.98	2,278	420.98	450.75	<500 mg/Nm^3
SO_2	18.13	ppm	51.80	2,278	51.80	55.46	-
CO_2	9.13	%	9.13	2,278	-	-	-
Particulates	41.21	mg/m^3	41.21	2,278	108.35	116.01	<130 mg/Nm^3

Notes: [1] denotes units as measured. [2] denotes refer to *Appendix II* for Oxygen correction calculations

Table 3.14. Emission value results from gas utilisation engine AR07.

Gas Utilisation engine AR07	Conc.	Units[1]	Adjusted units (mg/m^3)	Volumetric flow rate (Nm^3/hr)	Emission conc (mg/Nm^3)	Oxygen corrected emission conc to 5% (mg/Nm^3)[2]	Emission limit Values
TNMVOC	7.13	mg/m^3	11.41	2,405	11.41	12.55	<75 mg/Nm^3
Average THC	561	mg/m^3 [propane]	897.60	2,405	897.60	987.67	<1,000 mg/Nm^3
Hydrogen chloride	8.56	mg/m^3	8.56	2,405	11.69	12.87	<50 mg/Nm^3 (at mass flows >0.30 kg/h)
Hydrogen fluoride	2.13	mg/m^3	2.13	2,405	2.91	3.20	<5 mg/Nm^3 (at mass flows >0.05 kg/h)
Temperature	453	degrees	726.15 K	2,405	-	-	-
CO	733	ppm	916.25	2,405	916.25	1,008.19	<1,400 mg/Nm^3
O_2	6.45	%	6.45	2,405	-	-	-
Total NOx [as NO_2]	216	ppm	443.57	2,405	443.57	488.08	<500 mg/Nm^3
SO_2	16	ppm	45.71	2,405	45.71	50.30	-
CO_2	9.58	%	9.58	2,405	-	-	-
Particulates	34.55	mg/m^3	34.55	2,405	90.84	99.95	<130 mg/Nm^3

Notes: [1] denotes units as measured. [2] denotes refer to *Appendix II* for Oxygen correction calculations

Table 3.15. Emission value results from gas utilisation engine AR08.

Gas Utilisation engine AR08	Conc.	Units[1]	Adjusted units (mg/m^3)	Volumetric flow rate (Nm^3/hr)	Emission conc (mg/Nm^3)	Oxygen corrected emission conc to 5% (mg/Nm^3)[2]	Emission limit Values
TNMVOC	5.36	mg/m^3	8.58	2,339	8.58	10.15	<75 mg/Nm^3
Average THC	513	mg/m^3 [propane]	820.80	2,339	820.80	971.04	<1,000 mg/Nm^3
Hydrogen chloride	7.13	mg/m^3	7.13	2,339	9.74	11.52	<50 mg/Nm^3 (at mass flows >0.30 kg/h)
Hydrogen fluoride	1.45	mg/m^3	1.45	2,339	1.98	2.34	<5 mg/Nm^3 (at mass flows >0.05 kg/h)
Temperature	450	degrees	723.15 K	2,339	-	-	-
CO	931	ppm	1,163.75	2,339	1,163.75	1,376.76	<1,400 mg/Nm^3
O_2	7.46	%	7.46	2,339	-	-	-
Total NOx [as NO_2]	194.00	ppm	398.39	2,339	398.39	471.31	<500 mg/Nm^3
SO_2	9	ppm	25.71	2,339	25.71	30.42	-
CO_2	9.32	%	9.32	2,339	-	-	-
Particulates	35	mg/m^3	35.00	2,339	92.02	108.86	<130 mg/Nm^3

Notes: [1] denotes units as measured. [2] denotes refer to *Appendix II* for Oxygen correction calculations

Table 3.16. Emission value results from gas utilisation engine AR09.

Gas Utilisation engine AR09	Conc.	Units[1]	Adjusted units (mg/m^3)	Volumetric flow rate (Nm^3/hr)	Emission conc (mg/Nm^3)	Oxygen corrected emission conc to 5% (mg/Nm^3)[2]	Emission limit Values
TNMVOC	4.45	mg/m^3	7.12	2,791	7.12	7.43	<75 mg/Nm^3
Average THC	435	mg/m^3 [propane]	696	2,791	696	726.14	<1000 mg/Nm^3
Hydrogen chloride	7.13	mg/m^3	7.13	2,791	9.74	10.16	<50 mg/Nm^3 (at mass flows >0.30 kg/h)
Hydrogen fluoride	0.67	mg/m^3	0.67	2,791	0.92	0.95	<5 mg/Nm^3 (at mass flows >0.05 kg/h)
Temperature	451	degrees	724.15 K	2,791	-	-	-
CO	487	ppm	608.75	2,791	608.75	635.11	<1400 mg/Nm^3
O_2	5.66	%	5.66	2,791	-	-	-
Total NOx [as NO_2]	226	ppm	464.11	2,791	464.11	484.21	<500 mg/Nm^3
SO_2	7	ppm	20	2,791	20.00	20.87	-
CO_2	9.34	%	9.34	2,791	-	-	-
Particulates	38.32	mg/m^3	38.32	2,791	100.75	105.11	<130 mg/Nm^3

Notes: [1] denotes units as measured. [2] denotes refer to *Appendix II* for Oxygen correction calculations

Table 3.17. Emission value results from gas utilisation engine AR10.

Gas Utilisation engine AR10	Conc.	Units[1]	Adjusted units (mg/m^3)	Volumetric flow rate (Nm^3/hr)	Emission conc (mg/Nm^3)	Oxygen corrected emission conc to 5% (mg/Nm^3)[2]	Emission limit Values
TNMVOC	5.45	mg/m^3	8.72	2,815	8.72	9.70	<75 mg/Nm^3
Average THC	467	mg/m^3 [propane]	747.20	2,815	747.20	830.80	<1,000 mg/Nm^3
Hydrogen chloride	7.34	mg/m^3	7.34	2,815	10.03	11.15	<50 mg/Nm^3 (at mass flows >0.30 kg/h)
Hydrogen fluoride	0.12	mg/m^3	0.12	2,815	0.16	0.18	<5 mg/Nm^3 (at mass flows >0.05 kg/h)
Temperature	453	degrees	726.15K	2,815	-	-	-
CO	718	ppm	897.50	2,815	897.50	997.92	<1,400 mg/Nm^3
O_2	6.60	%	6.60	2,815	-	-	-
Total NOx [as NO_2]	209	ppm	429.20	2,815	429.20	477.22	<500 mg/Nm^3
SO_2	6	ppm	17.14	2,815	17.14	19.06	-
CO_2	10.77	%	10.77	2,815	-	-	-
Particulates	24.77	mg/m^3	24.77	2,815	65.12	72.41	<130 mg/Nm^3

Notes: [1] denotes units as measured.
[2] denotes refer to *Appendix II* for Oxygen correction calculations

Table 3.18. Emission value results from gas utilisation engine AR11.

Gas Utilisation engine AR11	Conc.	Units[1]	Adjusted units (mg/m^3)	Volumetric flow rate (Nm^3/hr)	Emission conc (mg/Nm^3)	Oxygen corrected emission conc to 5% (mg/Nm^3)[2]	Emission limit Values
TNMVOC	5.99	mg/m^3	9.58	2,950	9.58	10.30	<75 mg/Nm^3
Average THC	573.00	mg/m^3 [propane]	916.80	2,950	916.80	985.61	<1000 mg/Nm^3
Hydrogen chloride	7.34	mg/m^3	7.34	2,950	10.03	10.78	<50 mg/Nm^3 (at mass flows >0.30 kg/h)
Hydrogen fluoride	0.88	mg/m^3	0.88	2,950	1.20	1.29	<5 mg/Nm^3 (at mass flows >0.05 kg/h)
Temperature	452	degrees	725.15K	2,950	-	-	-
CO	487	ppm	608.75	2,950	608.75	654.44	<1400 mg/Nm^3
O_2	6.11	%	6.11	2,950	-	-	-
Total NOx [as NO_2]	215	ppm	441.52	2,950	441.52	474.65	<500 mg/Nm^3
SO_2	8	ppm	22.86	2,950	22.86	24.57	-
CO_2	10.91	%	10.91	2,950	-	-	-
Particulates	34.21	mg/m^3	34.21	2,950	89.94	96.69	<130 mg/Nm^3

Notes: [1] denotes units as measured. [2] denotes refer to *Appendix II* for Oxygen correction calculations.

3.2.3. Interpretation of Utilisation Emissions

The annual report on emissions monitoring of flares and engine stacks shows all readings are in compliance with waste license W0004-003 for 2009.

3.3. Dust Deposition

Dust monitoring was carried out in accordance with the licence at 6 monitoring locations, three times in the year.

Dust monitoring was carried out over a 30 day period +/- 2 days. The periods were as follows:

- ___13th March 2009
- ___22nd May 2009
- ___08th July 2009

3.3.1. Dust Deposition

Dust deposition results for 2009 are shown in Figure 3.3.1.x Dust Monitoring 2009.

3.3.2. Interpretation of Dust Deposition Results

The license limit for dust at the facility is 350 mg/m2/day. This was not exceeded during 2009. The highest level recorded was in Q1 was 344 mg/m2/day at location D5.

3.4. Noise

In compliance with Schedule D (D.4) of the waste licence, noise monitoring was carried out twice during 2009.

The noise monitoring events took place as follows:

Day time monitoring – 10th November 2009
Night time monitoring – 10th November 2009
Day time monitoring – 17th December 2009
Night time monitoring – 17th December 2009

Noise Results

The results of noise monitoring events are shown in the following tables and charts in Appendix 3.4:

Table or Figure number	Table or Figure Name
Table A.3.4.1.a	Noise Day-time Monitoring 2009
Table A.3.4.2.b	Noise Night-time Monitoring 2009
Figure A.3.4.1.a	Noise Day-time Monitoring (5 Years)
Figure A.3.4.2.b	Noise Night-time Monitoring (5 Years)

3.4.1. Interpretation of Noise Results

Event 1
Daytime Event – 10th November 2009
Night-time Event – 10th November 2009

Exceedences = Day 5 Night 4
A total of seven locations were monitored during the day time period. Five out of the seven were slightly over the day time limit for noise. (55 db)
These were mainly due to the close proximity of the monitoring point to moving traffic on site. The highest reading during this daytime round was 64 dB L_{Aeq} at N3.
The same seven locations were monitored at night and four locations were above the licensed limit of 45 dB L_{Aeq}. The highest reading during this night time round was 56 dB L_{Aeq} at N5 & N6. This was a direct result of night time operations at the adjacent BALCAS facility.

Event 2
Day time monitoring – 17th December 2009
Night time monitoring – 17th December 2009.

Exceedences = Day 7 Night 4
A total of seven locations out of the seven were slightly over the day time limit for noise. (55 db) These were mainly due to the close proximity of the monitoring point to moving traffic on site. The highest reading during this daytime round was 63 L_{aeq} dB at N4.
The highest reading during this night time round was 56 dB L_{Aeq} at N5. This was a direct result of night time operations at the adjacent BALCAS facility.

Noise levels are consistent with previous years monitoring.

3.5. Surface Water

The following is a summary of surface water quality findings in 2009. More detailed information has been submitted in each of the quarterly reports from Bord Na Mona.

There are 5 no. surface water monitoring points. Chemical analyses are carried out at all 5 of the monitoring locations and a biological assessment was carried out at SW1, SW3 (Hartwell River) and at SW4 (Kill River). The 5 no. surface water monitoring points are located as follows:

- SW1 upstream of the outfall from the stormwater lagoon in the Hartwell River
- SW2 outlet for the on site stormwater pond
- SW3 downstream of the outfall from the stormwater lagoon in the Hartwell River
- SW4 downstream of Arthurstown Road in the Kill River
- SW5 inlet to the stormwater pond (storm and groundwaters)

3.5.1. Surface Water Results

Chemical Analysis

The results of surface water analysis are shown in the following tables and charts in Appendix 3.5: (The Reporting Application has information on the 4 elements of the licence with regard to surface water monitoring). A visual and odour inspection of all surface water points is carried out on a weekly basis. Chemical analysis of SW2 is carried out weekly. All surface water monitoring points are monitored on a quarterly basis for a list of parameters and on an annual basis for a more comprehensive list.)

The tables and figures relating to annual monitoring (Table/Figure 3.5.4.a) are discussed here in greatest detail as the quarterly reports submitted to the Agency will have included details of the previous events.

Table or Figure number	Table or Figure Name
Table A. 3.5.2.a	Surface Water SW2 Weekly 2009
Table A. 3.5.3.b	Surface Water Quarterly 2009
Table A.3.5.4.c	Surface Water Annually 2009

3.5.2. Interpretation of Surface Water Results

During 2009 the surface water quality has remained consistent with previous years as can be seen with the Q rating in table 3.1 below.
Quarterly monitoring is carried out by Bord na Mona at all monitoring points for surface water.
Monitoring points SW2 and SW5 are within the surface water storage pond. During 2009 there were elevated levels of NH_4 Ammonia. This was as a direct result of the large amounts of rainfall eroding parts of the temporary cap area which may lead to small amounts of “breakout leachate” entering the surface water swale. These areas are remediated as soon as they occur on the instruction of the Facility Manager.

On examining the results of the monitoring points in the Hartwell River (SW1 & SW3) there was no effect as a result of these ammonia levels and therefore no pollution caused. This proves that the surface water retention pond is working effectively.
The Agency was already informed of these incidents during 2009.

Biological Sampling

Biological sampling was carried out in the Hartwell and Kill Rivers. The Hartwell received a Q rating of 4 and the Kill river a Q rating of 4 quality. This is consistent with 2008 figures and an improvement of the Q rating figures compared to 2007.

Biological sampling is carried out annually in accordance with the licence. It was carried out during the second quarter of 2009. The Q rating system was used. This rating system recognises five macro-invertebrate communities/faunal groups ranging from A to E (i.e. most sensitive to most tolerant of pollution) and relates to their relative abundance, from a standard 2 minute kick sample, to a quality rating –the Q Index. The area surveyed is then assigned a Q rating from 5 to 1, 5 being pristine unpolluted waters to 1 gross polluted. Results of biological sampling are shown in Table 3.12.

Table 3.12 Q Rating of Surface Waters 2009.

Biological Q Rating for Surface Waters (within rivers)			
Location	SW-1	SW-3	SW-4
Q-Rating	4	4	4

Interpretation of Results

Quality at point SW1 is consistent with last years results. This point is upstream of the Arthurstown surface water discharge point. (note: discharge from ALCRETE Ltd is within 5m upstream of the discharge from Arthurstown Landfill)
Quality at point SW3 is consistent with previous years which indicate that discharges from the landfill are actually improving the surface water quality at point SW3.
Quality at point SW4 is also consistent with last years results. This point is on the Kill River which is approximately 500m northeast of the site. No discharges are taking place to the Kill River from Arthurstown landfill.

The overall bio-diversity noted for the Hartwell River was very good. The results of the biological survey indicate that the quality of water in the Hartwell River is good (using the Q-value system) / excellent (using the LQI interpretation of water quality) upstream and downstream of the landfill.

Groundwater

There were 22 no. groundwater monitoring wells and 5. no. private wells. Table 3.13 shows the locations of the wells in relation to the facility and in relation to groundwater flow in the area. Table 3.14 shows the depths of groundwater wells. Private Wells are discussed in Section 3.7.

Table 3.2 Location of groundwater monitoring boreholes relevant to the facility and the groundwater flow in the area

Well	**Direction with respect to the facility**	**Location with respect to groundwater flow***
MW3	**260 M NE**	**US**
MW4	400 m E	US
MW5	400 m E	US
MW6	100 m ESE	US
MW7	80 m SE	US
MW8	**240 m ESE**	**US**
MW20	**150 m S**	**US**
MW21	140 m SSE	US
MW22	400 m E	US
MW2	**260 m NE**	**CG**
MW17	100 m WSW	CG
MW19	20 m WSW	CG
MW1	140 m NE	DS
MW9	**50 m W**	**DS**
MW10	50 m W	DS
MW11	50 m W	DS
MW12	50 m NW	DS
MW13	100 m N	DS
MW14	**200 m NNE**	**DS**
MW15	200 m NNE	DS
MW16	**90 m NNW**	**DS**
MW18	170 m N	DS

*Note: US upstream
DS downstream
CS cross gradient
Wells highlighted in bold font are those that are required to be monitored by the waste licence.

The waste licence (W004-003), Schedule D.1 Table D.1.states that groundwater levels should be recorded for all wells on a monthly basis and that sampling for chemical parameters should be carried out in 7 no. wells. These 7 wells (as selected by the Agency) are highlighted in bold in Table 3.13.

In order to reduce the quantity of data displayed in the Reporting Application, the selected wells have been labelled as active and the others as inactive. Sampling data for all wells is stored in the database, but only active well results are shown in the charts and tables unless the user specifically changes the status of a well to active in Lab Info.

Table 3.3 Depths of Groundwater Monitoring Wells

Wells	Base of wells m O.D (2006)*	Well height at ground level m O.D	Depth of Borehole (m)
MW1	130.04	138.67	8.63
MW2	130.22	137.00	6.78
MW3	131.67	140.20	8.53
MW4	141.72	143.40	1.68
MW5	146.12	148.00	1.88
MW6A	144.7	150.50	5.80
MW7	147	153.60	6.60
MW8	115.19	149.20	34.01
MW9	110.01	139.50	29.49
MW10	132.19	135.10	2.91
MW11	129.28	133.75	4.47
MW12	130.83	134.74	3.91
MW13	127.28	135.60	8.32
MW14	125.13	129.40	4.27
MW15	126.61	129.42	2.81
MW16	112.84	135.54	22.70
MW17	129.05	139.40	10.35
MW18	102.16	136.68	34.52
MW19	118.72	145.30	26.58
MW20	147.51	156.50	8.99
MW21	146.83	155.00	8.17
MW22	140.64	145.00	4.36

*Note: The total depths of wells are as per measurements in 2006. Wells can silt up gradually over time, diminishing their total depth.

3.5.3. Groundwater Results

Tables and charts showing groundwater results and trends are included as follows in Appendix 3.6:

Table or Figure number	Table or Figure Name
Table/Figure 3.6.2.a	Groundwater Wells Quarterly
Table/Figure 3.6.2.b	Groundwater Wells Quarterly
Figure A.3.6.3.a	2007 Groundwater Annually

3.5.4. Interpretation of Groundwater Results

Annual Results

A total of twenty two groundwater monitoring boreholes are located at Arthurstown Landfill. During the annual sampling event a total number of 10 boreholes were sampled.
Chemical analysis, Metals analysis, Organic analysis and Microbial Analysis were carried out as part of the annual analysis of the groundwater.

Table A.3.6.3.e. Groundwater Annual outlines all exceedances for the annual monitoring event.

Ammonia-N was above the MAC at the following points: MW2, MW3 & MW18.
Chloride levels were above the MAC at MW2, MW3 & MW14.
MW3 had also elevated levels of conductivity.

Calcium levels were only just over the MAC limit at MW2,MW3,MW17 & MW19.
Iron levels were above the MAC limit at MW3,MW6A & MW8.
MW3 had also elevated levels of Lead, Magnesium, Sodium, Zinc, Sulphate & Total Dissolved Solids.
Manganese levels were above the MAC limit at MW3, MW6A & MW18.
Potassium levels were only above the MAC at location MW2 &MW3.
Sulphate level was just above the MAC at MW7.
Cyanide Levels were slightly elevated at MW14.
Orthophosphate levels were just above the MAC at MW2 & MW 18.

Locations MW2 and MW3 are not within the boundary of the landfill and are in an agricultural location (i.e. a farm adjacent to slatted sheds) Works were carried out during 2009 at location MW3 and this had a bearing on the results at MW3 for the annual testing.

MW2 and MW3 are adjacent to the landfill and located on a cross-gradient flow in relation to the groundwater contour flow below the landfill. The elevated readings at MW2 and MW3 cannot be attributed to the landfill due to its location.
External agricultural factors are contributing at these locations.

The majority of monitoring at all other locations is consistent with previous years monitoring results apart from MW3 as mentioned above.

3.6. Private Wells (Groundwater)

There are 5 no. private groundwater monitoring wells, referred to as Private Wells. Monitoring of the wells is carried out on a quarterly and annual basis.
PW1 is sampled on a quarterly basis and wells PW2 – PW5 are sampled on an annual basis.

The location of the wells is shown on Drawing Number AWL03 – 14 inserted as Figure 3.1.

3.6.1. Private Wells Results

Tables and charts showing groundwater results and trends are included as follows in Appendix 3.7:

Table or Figure number	Table or Figure Name
Table 3.7.2.a	Private Wells Annual 2009
Figure 3.7.1.b	Private Wells Quarterly 2009

3.6.2. Interpretation of Results

Annual
All private wells (PW1 – PW5) are sampled on an annual basis.
PW2 showed slightly elevated Iron (mg/l) and Manganese (ug/l) readings.
PW5 was elevated in Sodium (mg/l).
The location of all wells are rural agricultural.

All other results for 2009 were below MAC limits.

Quarterly

PW 1 is the only private well that is sampled every quarter. See Figure 3.7.1.b Private Wells Quarterly.

3.7. Leachate

The waste licence (W004-003), Schedule D.1 Table D.1.states that leachate levels should be recorded for all sumps and collection points on a continuous basis. This continued during 2009. Towards the end of 2009 there was exceptional amounts of rainfall which contributed to high leachate levels within the landfill body. (e.g. Dec 2009- 123.0 mm , Nov 2009- 50mm and Oct 2009 – 119.2mm) During the last 10 weeks of 2009 there was a total of 292.2mm of rainfall.

SDCC carries out quarterly and annual monitoring of all leachate cells and leachate storage points on site. However the waste licence conditions sampling at 5 locations, LC1, LC3, LC11, LL (leachate lagoon) and LB (leachate balance tank).

SDCC stores and reviews the results of only the 5 leachate locations required by the waste license. This decision was made during 2009 due to budgetary contraints.

3.7.1. Leachate Results

Tables and charts showing leachate results and trends are included as follows in Appendix 3.8:

Table or Figure number	Table or Figure Name
Table A. 3.8.2.a	Leachate Annual 2009
Table 3.8.1.a	Leachate Quarterly 2009

3.7.2. Interpretation of Leachate Results

Leachate results for 2009 are typical for leachate analysis for Arthurstown Landfill depending on age of the waste in the cell being tested.
At the end of 2007 all 15 cells contained leachate.
Treated leachate was discharged to the sewer rising main connection to Kill.
Table A.3.8.2.a outlines annual leachate results in Appendix 3.8.

3.8. Meteorological Monitoring

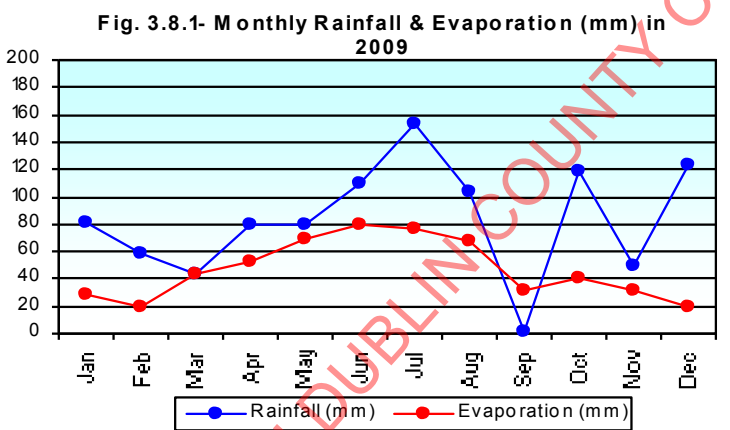
Condition 8.10.1 and schedule D.6.1. of the current Waste Licence W0004-003 requires the daily monitoring of rainfall, temperature (min/max), wind speed and direction, evaporation, humidity and atmospheric pressure at the landfill site. The data for 2009 is summarised in Figures below. All presented data has been recorded by the on site "VIASALA" Weather Station which was installed during March 2003.
The data indicates prevailing wind directions from a south to south-westerly direction.

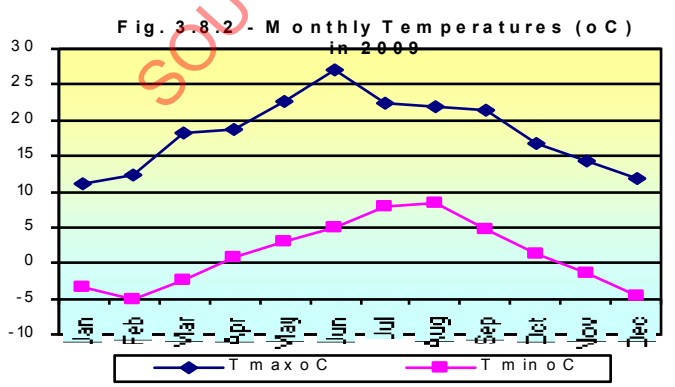
Total annual rainfall during 2009 was approximately 1004 mm, (1.00m) consistent with the annual average of 1000mm and 249mm (9.8 inches) less than the previous years total.

Monthly summaries of meteorological conditions are included in Appendix 3.9 for 2009.

Figures 3.8.1 to 3.8.6 outline the annual meteorological results for 2009.

Monthly Rainfall & Evaporation for 2009.

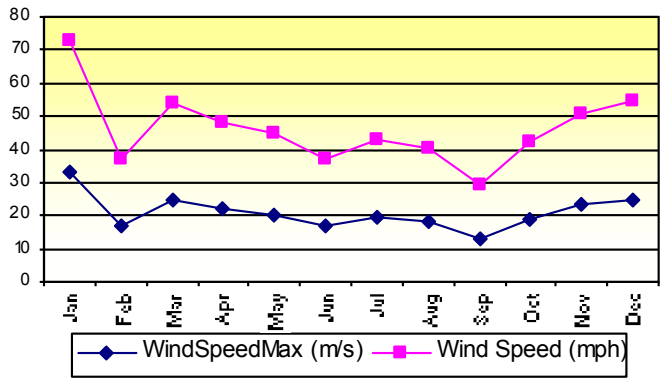




Temperatures (Max and Min) for 2009.

Monthly Max Wind Speeds for 2009.

Fig. 3.8.3 - Monthly Maximum Wind Speed in 2009



Atmospheric Pressure for 2009 (mb)

Fig.3.8.4 - Monthly Atmospheric Pressure (mb) in 2009

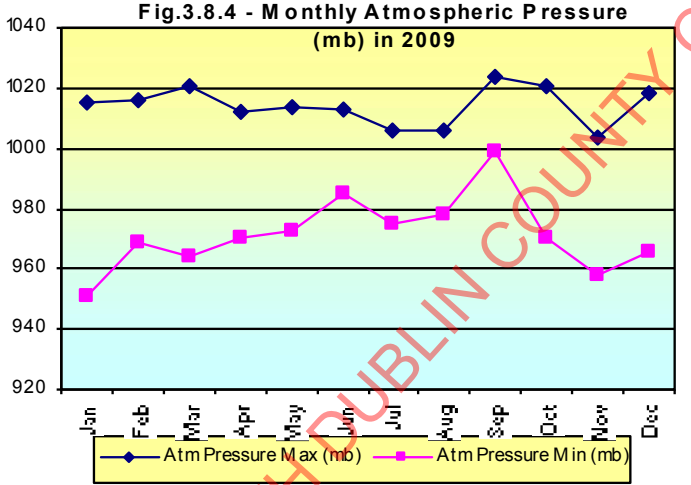
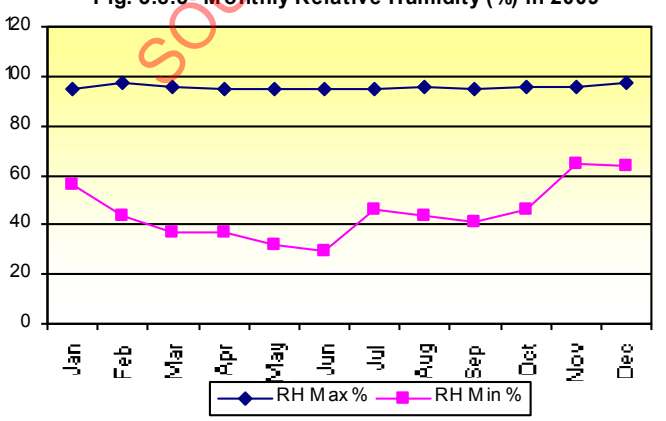
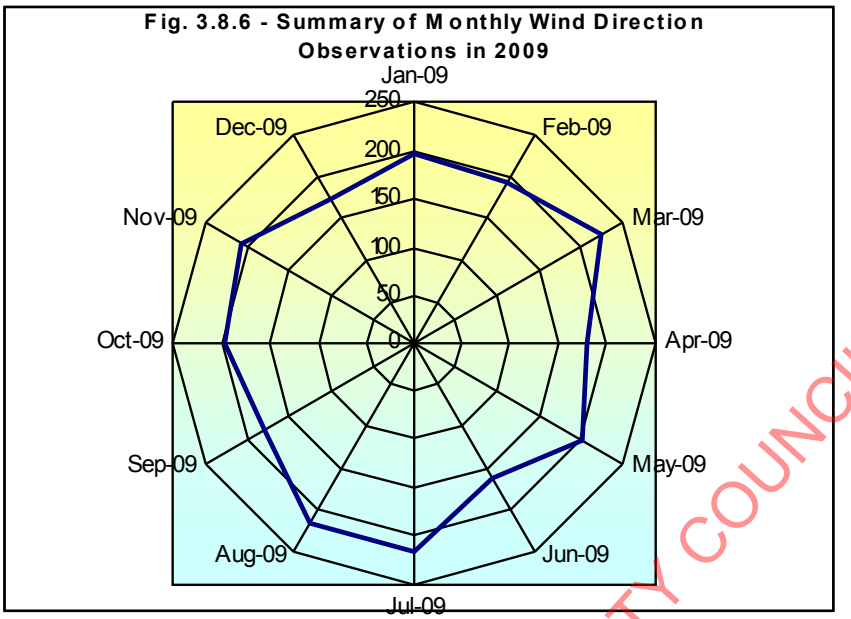


Fig. 3.8.5- Monthly Relative Humidity (%) in 2009



Relative Humidity for 2009. (%)

Wind Direction for 2009.



This radar graph displays changes in values relative to a centre point.
The data indicates prevailing wind directions from a south to south-westerly direction.
(200 degrees approximately for the entire year 2009 – Actual average for 2009 is 195 degrees)

3.9. Odour and Odour Control at Arthurstown

The facility management staff endeavour at all times to reduce odours and complaints at the facility.
The Facility Manager and Deputy Facility Manager are on emergency 24 hour call 7 days a week.
A number of odour control techniques are in operation at Arthurstown, namely:

a) Utilisation plant (11 landfill gas engines and 2 no enclosed flares) which is now operating at 11,000 m3/hour (maximum)
b) 2 no. 2,500 m3 per hour enclosed flares both of which can extract gas from the temporary capped areas in cells 11-15.(Currently on stand-by as all gas is now being utilised.)
c) Drilling of additional gas extraction wells as directed by the Facility Manager using a purpose built "DIGGA" auger attachment for a Komatsu PC290-$8_{LC.}$ (see plate 3)
d) Sacrificial horizontal gas extraction from the active cells.
e) The landfill is now 65% final capped with a total of 150,000 m2 of final cap laid. Further final capping works are due in Spring/ Summer 2010.
f) Quarterly independent odour assessments carried out by Odour Monitoring Ireland.(See note below)
g) The placing of additional clay cover and the drilling of new gas wells in areas deemed suspect by the Facility Manager. i.e. areas where gas may be leaking through the temporary cap.
h) The placement of Landfill Covertop 32 , an LDPE membrane. (See plates 4 & 5 below) Extraxction is also taking place from under the Covertop 32.
i) Partial Capping of the side slopes as per plates 1 & 2 below.

Other methods used in the past include:

j) The use of the Soil cement. Trialled in an area during the summer 2004. Very weather dependant. Must by dry on application.
k) Large plastic Hessian sheeting. Sheets were too large to manually handle. Health and Safety issues for the operatives at the workplace rendered this unusable.
l) Spraying of essential oils to mask the odour from the landfill. This method is still used at the working face only and at the discretion of the Facility Manager.

Plate 1:

Plate 1: Partial capping material placed on side slopes at rear of Cell 13.

Plate 2:

Plate 2: Partial capping material placed on side slopes at the rear of Cell 15. HDPE Liner welded to anchor trench.

Plate:3 : Auger attached to CAT Excavator. Drilling of new gas wells as deemed necessary by Facility Manager.

Plate 4: CoverTop 32 placed on side slopes of Cell 14.

Plate 5: CoverTop 32 placed on side slopes of Cell 14. (Enclosed Flare in background)

Quarterly Odour Assessments:

Waste license W0004-003 states in condition 8.14.3 that an independent odour assessment be carried out once every quarter. The quarterly odour audits are carried out by Odour Monitoring Ireland.

Landfill gas leakage is the predominant source of odour complaints in Ireland. Although the landfill site is situated in a predominantly rural area, in the past there have been a number of odour complaints from residential properties in the surrounding area. Over the years, staff at Arthurstown are endeavoring to reduce odour complaints from residents through the techniques mentioned earlier.

Quarterly monitoring audits are carried out on site by Odour Monitoring Ireland Ltd.. They took place on:

- Q1 – 26th March 2009
- Q2 – 27th May 2009
- Q3 – 11th September 2009
- Q4 – 07th December 2009

The methodologies employed include:

- Capping source monitoring using a continuous ppb PID and Jerome 631X analyser to detect areas of potential landfill gas release
- Sniff odour assessments at pre-selected resident locations in the vicinity of the landfill
- Geo-referencing of detected leakage locations for remediation.

The new methodology used in the odour audit is very useful in identifying areas of potential leakage. It is concluded that this technique is very successful in the reduction of landfill odours in order to prevent odour impact downwind of the landfill operations. Once the quarterly odour audit is carried out, the findings are brought to the attention of the Facility Manager who carries out the remediation.

3.9.1. Odour Results

The colour odour charts for the landfill that are produced for each quarter are contained in the following four pages. *(Note the deterioration due to extreme weather during 2009.)*
The colour maps of the site highlight where the most problems arise due to the concentrations measured on the temporary capped areas.
At the end of each odour audit the consultant meets with the Facility Manager to highlight the areas for remediation. These works are carried out as soon as possible.

Q1 – 2008	Total Complaints	100
Q2 – 2008	Total Complaints	40
Q3 – 2008	Total Complaints	17
Q4 – 2008	Total Complaints	17

Total Complaints for 2008 was 174.

Q1 – 2009	Total Complaints	8
Q2 – 2009	Total Complaints	1
Q3 – 2009	Total Complaints	2
Q4 – 2009	Total Complaints	15

Total Complaints for 2009 was 26.

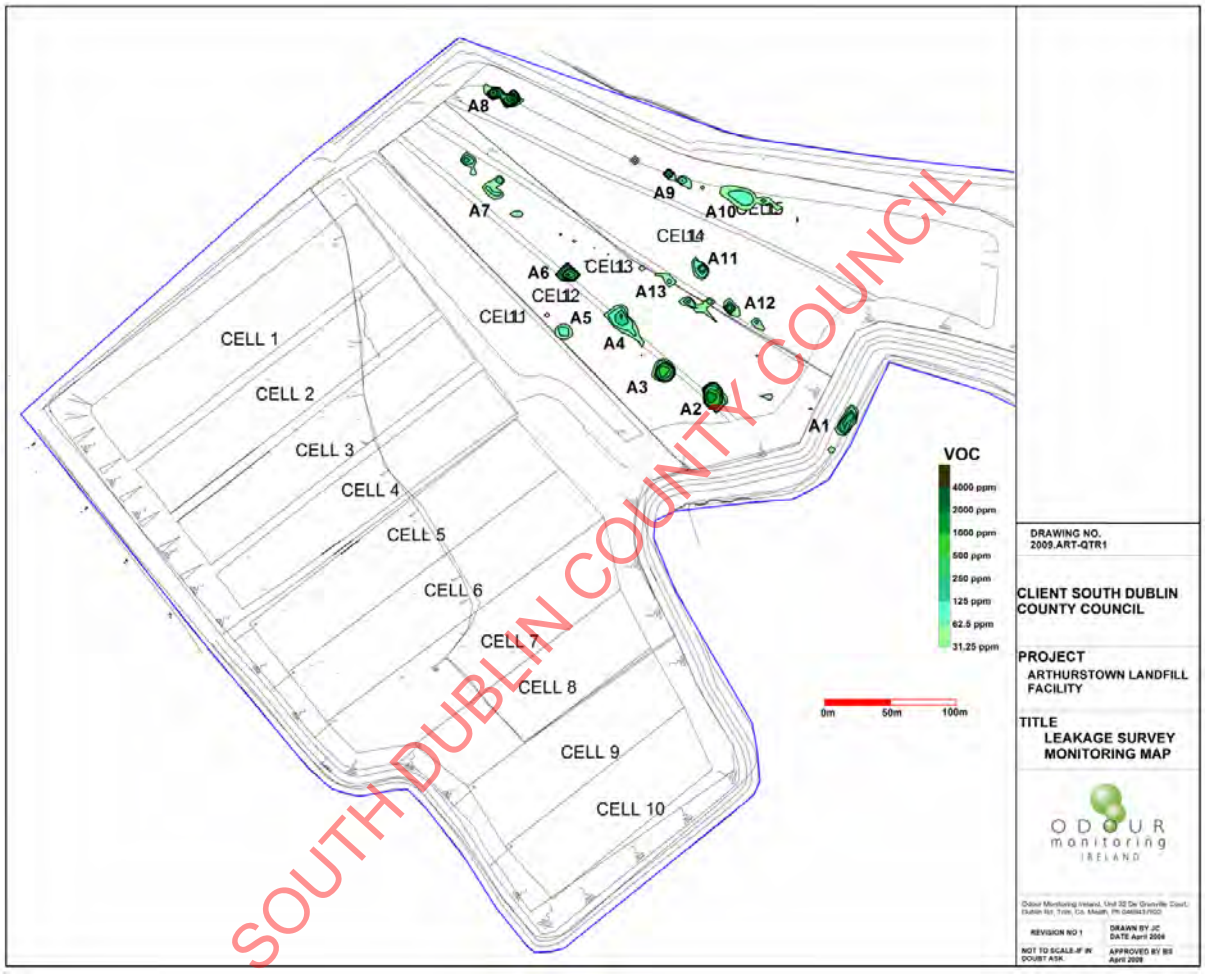


Figure 2.1. Capping source “Odour Hog” monitoring within the operating landfill facility (colour scale area indicating TVOC gas colour scale). Quarter 1 2009.

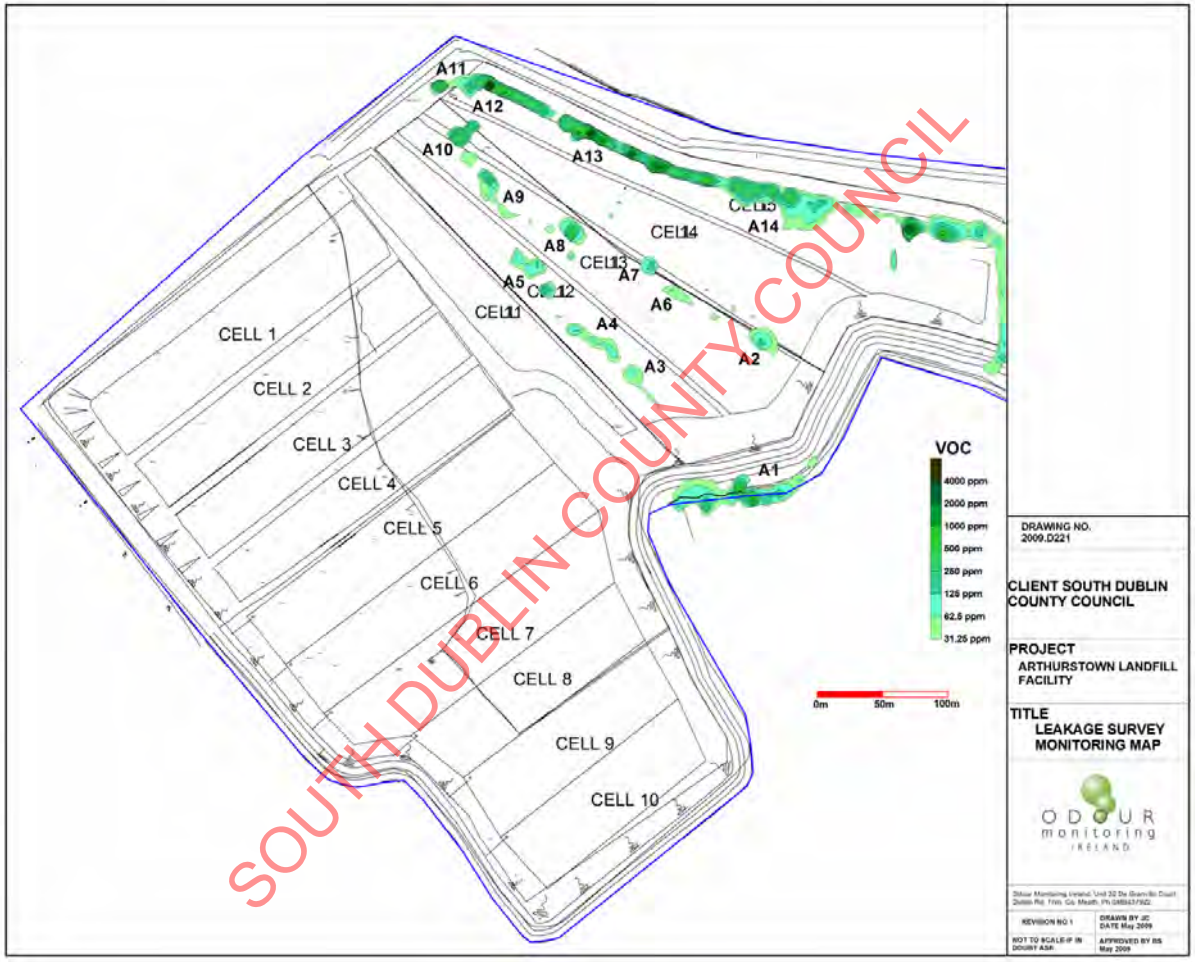


Figure 2.1. Capping source “Odour Hog” monitoring within the operating landfill facility (colour scale area indicating TVOC gas colour scale). Quarter 2 2009

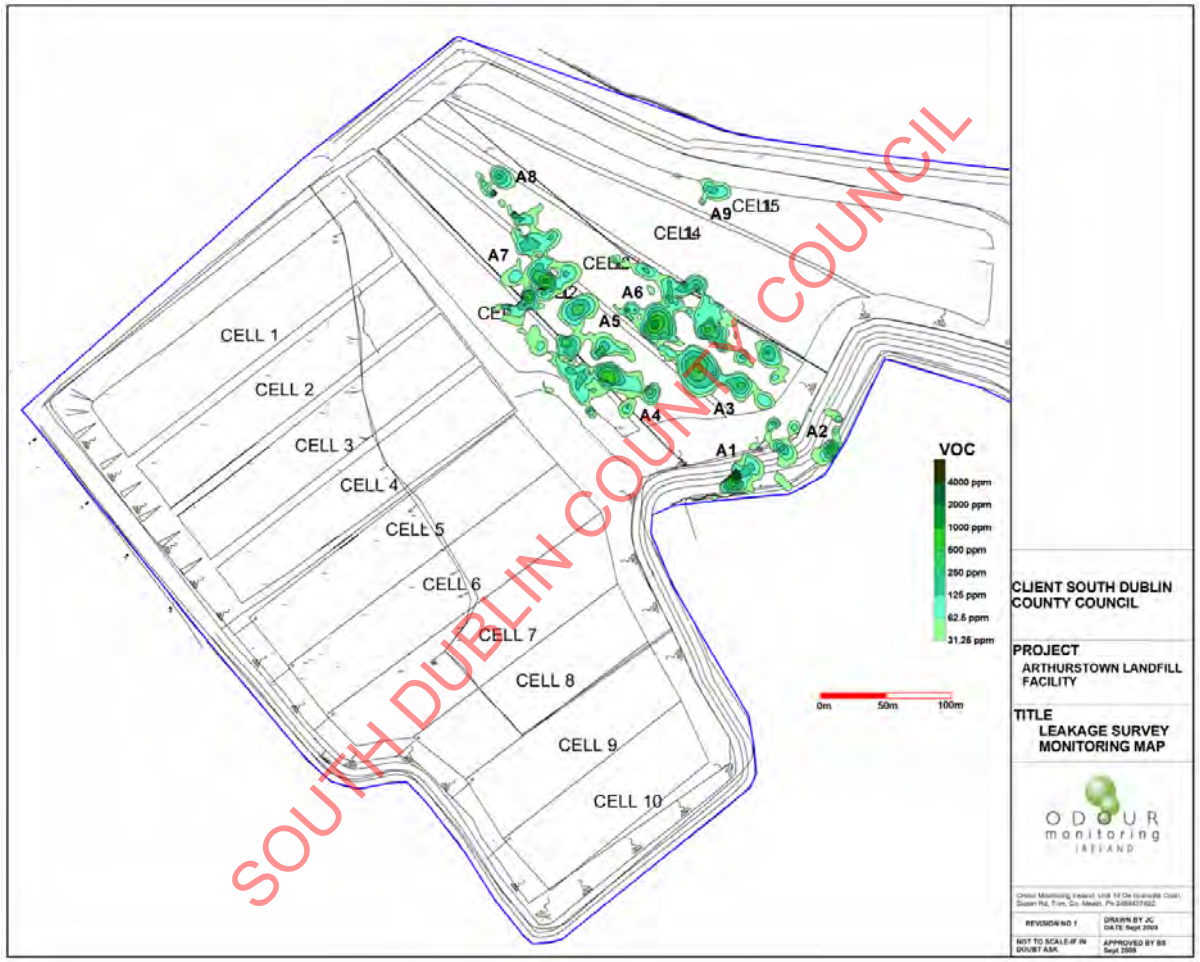


Figure 2.1. Capping source “Odour Hog” monitoring within the operating landfill facility (colour scale area indicating TVOC gas colour scale). Quarter 3 2009

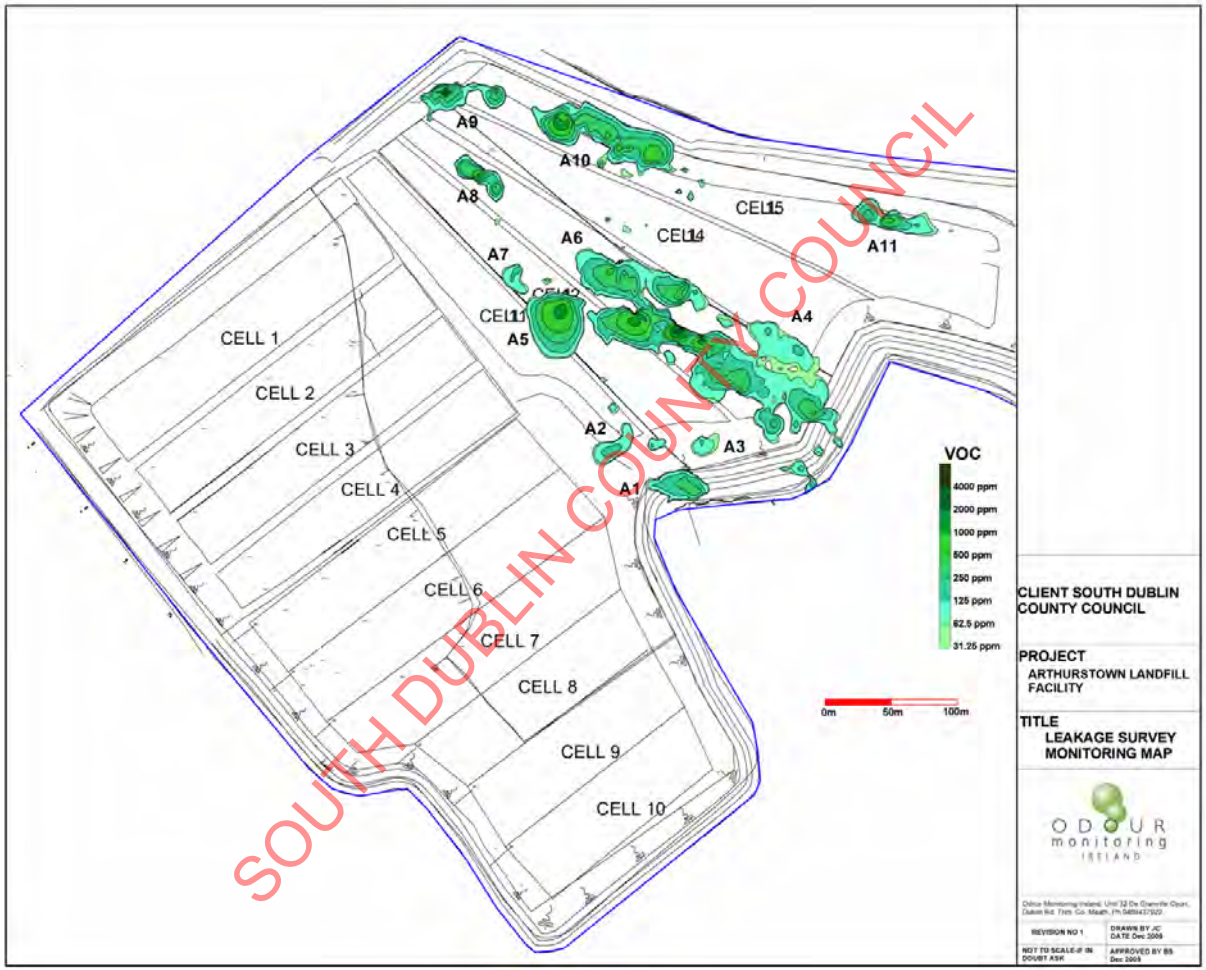


Figure 2.1. Capping source “Odour Hog” monitoring within the operating landfill facility (colour scale area indicating TVOC gas colour scale). Quarter 4 2009

3.10. Landfill Gas Emissions

Table 4.1 is a table of calculated emissions based on the quantity of landfill gas collected by the gas extraction system in 2009.

96,360,000 m^3 of landfill gas was utilised by the gas extraction system in 2009. **(based on average of 11,000 m^3 per hour)* The gas collected from the temporary capped areas by the 2 no enclosed flare units was approximately 8,688,000 m^3.*(based on average of 2,000 m3 per hour for the first 6 months of 2009.)*
From July 2009 onwards all gas captured was sent to the utilisation plant.
Total Landfill gas Collected (Captured) 2009 = 105,048,000 m^3.

Estimates vary as to the efficiency with which gas collection systems in landfills gather the methane formed in waste. Modern gas wells installed throughout a landfill site may collect between 70% – 90%. The efficiency for Arthurstown landfill is estimated here as 90% because the wells are relatively new and in good condition, capping is well progressed *(70% of Landfill Area)* and the daily cover system is good. **Based on this efficiency it is estimated that the total landfill gas generated at Arthurstown Landfill in 2009 was 116,720,000 m^3.**

Gas extracted from the landfill is managed in 3 different ways:

- Electricity production from landfill gas in 11 no. engines at the Bioverda compound (Approx. 13 MW)
- Flaring in 2 no. enclosed flares at the Bioverda compound.
- Flaring in 2 no. 2,500m3 p/hour enclosed flares on the temporary capped areas.

All of the gas collected from the capped areas and a large volume of good quality gas from the uncapped areas is directed to the Bioverda compound for generation and flaring. The generation capacity is currently at maximum at 11,000 m^3 per hour and the capacity to flare poor quality gas from the temporary gas collection system is 5,000m^3.
The maximum available extraction rate is approximately 16,000 m^3/hour.
Note: The current average extraction rate is 11,000 m3 per hour.
During 2009 a third booster station arrived for the 3 additional engines. This brought the extraction rate to 11,000 m3/hour. All gas is now being extracted by the utilisation plant. The 2 no enclosed flares on the temporary capped areas are currently on stand by.

For the purposes of this exercise it is assumed that landfill gas captured at Arthurstown is 49% methane, 42% carbon dioxide and the remainder is made up of other compounds. These figures are based on average readings at the Bioverda compound.

The table overleaf contains the results for the European PRTR in relation to the Utilisation plant and the enclosed flare units at Arthurstown Landfill.

European PRTR Table Arthurstown Landfill flares and gas utilisati on engines only.

Table 1. Table for European-PRTR requirements for Landfill flare and Gas utilisation engines only 2010.

Location	Carbon Monoxide (CO) (kg/yr)	Carbon dioxide (CO_2) (kg/yr)	Nitrogen Oxides (NO_x as NO_2) (kg/yr)	TNMVOC's (kg/yr)	Sulphur dioxide (SO_2) (kg/yr)	Total particulates (kg/yr)	Methane (kg/yr)
Flare 1[2]	310	5,484,597	7,214	781	5,377	-	321
Flare 2[2]	313	8,424,611	8,307	624	19,143	-	283
Flare 3[1]	264	4,808,025	5,558	469	12,414	-	196
Flare 4[1]	188	5,363,360	4,838	483	9,771	-	285
AR01[2]	46,094	3,461,546	23,442	348	4,681	5,986	34,246
AR02	46,028	3,514,394	21,488	178	2,114	3,428	41,517
AR03	53,765	4,295,774	25,969	395	4,071	4,964	36,761
AR04	62,759	4,683,215	28,339	473	4,813	6,333	48,409
AR05	58,022	4,218,165	24,104	704	2,236	5,106	46,910
AR06	62,054	3,450,477	22,274	452	2,741	5,733	40,465
AR07	50,783	3,832,025	24,840	639	2,560	5,087	50,266
AR08	62,472	3,610,752	21,608	465	1,395	4,991	44,519
AR09	39,057	4,324,780	30,086	462	1,297	6,531	45,118
AR10	58,222	5,042,239	28,131	572	1,124	4,269	48,975
AR11	41,337	5,346,658	30,292	658	1,568	6,171	62,901
Totals	**581,216**	**59,689,232**	**296,096**	**6,750**	**53,118**	**58,598**	**500,693**

Notes: [1] denotes the flares 3 & 4 are operated on standby when gas utilisation engine failure occurs, therefore these re not a dded to the total emission value for the combustion plant in PRTR reporting.

[2] denotes that the total values reported are based on 24 hr per day 365 days per year operation and for AR01 to AR11 only. If the hours of operation are known through site records then the total actual amount can be calculated by calculating the yearly total to an hourly figure and then multiply by the number of hours operation (e.g. Emissions (kg/yr) / 8760 hrs = kg/hr × hours operation = Total emission in kg/y r.

Estimated Landfill Gas Generation

In summary, 500,693 kg / year of methane and 581,216 kg / year were produced at Arthurstown Landfill during 2009. (as per PRTR Table produced by Odour Monitoring Ireland Ltd. (as per Table 1.)

A GASSIM model for landfill gas production at Arthurstown was produced during 2008. The findings of the model did not reflect the actual gas production on site. This report on the capacity of the utilisation plant at Arthurstown and possible future capacity issues was submitted to the Agency on 03rd December 2008.

Table 4.2 Estimated Electricity Production at Arthurstown Landfill from Landfill Gas.

During 2009 the amount of electricity produced at Arthurstown Landfill by converting the landfill gas via the 11 gas engines is outlined as follows:

Month 2009	MW output per month
January	8,567
February	7,843
March	8,641
April	8,585
May	8,335
June	7,457
July	7,776
August	7,661
September	7,472
October	7,726
November	7,997
December	7,893
Total 2009 MW produced	**95,953 MW h**

Table 4.3 Cumulative Quantities of Landfill Gas

Year	Cumulative Waste Inputs	Annual Waste Inputs	Annual Landfill Gas Generation	Rate of generation	Cumulative Landfill Gas Generation	Comparison to Landfill Prediction Model Note 1
	tonnes	tonnes	m^3/annum	m^3/tonne	m^3	m^3
2009	4,587,468	214,560	116,720,000	25.4	649,626,681	Not included
2008	4,372,908	301,828	126,533,333	28.9	532,906,681	Not included
2007	4,071,077	480,529	144,277,200	35.4	406,373,348	Not included
2006	3,590,863	591,755	87,600,000	24.4	262,096,148	86,222,204
2005	2,999,108	497,274	59,982,155	20.0	174,496,148	65,224,225
2004	2,501,834	424,067	40,029,346	16.0	114,513,993	47,434,011
2003	2,077,767	483,582	29,088,737	14.0	74,484,647	32,376,858
2002	1,594,185	463,436	19,130,220	12.0	45,395,910	20,660,181
2001	1,130,749	334,333	11,872,865	10.5	26,265,690	12,255,544
2000	796,416	274,642	7,565,952	9.5	14,392,826	6,242,246
1999	521,774	271,079	4,695,966	9.0	6,826,874	2,229,690
1998	250,695	216,284	2,130,908	8.5	2,130,908	270,387
1997	34,411	34,411	0	0.0	0	0

Note 1: Due to the discrepancies in the landfill gas prediction model results, it is not proposed to include it next year in the AER as a method to quantify landfill gas emissions from the facility.
Note 2: Figures are slightly lower than last year due to the number of open flares on site in previous years. Difficult to estimate flows through open flares. Also less waste was accepted at Facility.

3.11. Indirect Emissions to Groundwater

Estimated Annual and Cumulative Quantity of Indirect Emissions to Groundwater.

Monitoring results to date do not indicate the presence of indirect emissions to groundwaters. Considering that groundwater flow is in a generally north-westerly (NW to NNW) direction, monitoring wells can be deemed to be either upstream, downstream, or cross-gradient of the landfill area. Table 4.3 below presents a summary assessment of monitoring well locations relative to the existing waste body. Parameters selected for this assessment, because they are known to exhibit high concentrations in landfill leachate at Arthurstown, are Ammonia-N, Chloride and Electrical Conductivity.

Condition 6.4.1 states that there shall be no direct emissions to groundwater.

Table 3.4 Calculation of Direct and Indirect Emissions to Groundwater

Location	Direction	Relative Position	Summary of Results since March 1999 - Dec 2009				
			Ammonia (mg/l)		Chloride (mg/l)	Conductivity (uS/cm)	
			Max	Avg	Avg	Max	Avg
MW3	260 M NE	US	2.45 (April'04)	0.13	19.27	913 (May'07)	669
MW4 **	400 m E	US	1.2	<0.31	7.5	952 (Apr '02)	761
MW5 **	400 m E	US	<0.2	<0.2	10.6	686 (Oct '99)	481
MW6A	100 m ESE	US	5.8 (May'08)	0.35	14.4	838 (Nov'08)	717
MW7	80 m SE	US	5.7 (May'08)	1.20	16.4	987 (Nov'08)	881
MW8	240 m ESE	US	1.04 (April '05)	0.16	11.0	692 (Jul '06)	614
MW20	150 m S	US	1.7 (Feb '03)	0.10	15.7	2815 (Nov '09)	1210
MW21	140 m SSE	US	1.5 (May '01)	0.07	15.6	1568 (Apr '05)	1071
MW22	400 m E	US	0.33 (Feb ' 03)	0.07	11.3	805 (Apr '05)	540
MW2	260 m NE	CG	1.5 (May '01)	0.09	67.6	1344 (Jul '06)	1005
MW17	100 m WSW	CG	0.6 (May '01)	0.14	23.5	2097 (May'07)	1234
MW19	20 m WSW	CG	3.08 (July '07)	0.11	18.6	1204 (Jul'06)	911
MW1	140 m NE	DS	Dry	Dry	Dry	Dry	Dry
MW9	50 m W	DS	1.2 (July '01)	0.13	12.8	738 (Nov'08)	640
MW10 **	50 m W	DS	Dry	Dry	Dry	Dry	Dry
MW11	50 m W	DS	0.36 (April'04)	0.08	10.4	690 (Apr'04)	617
MW12 **	50 m NW	DS	Dry	Dry	Dry	Dry	Dry
MW13 **	100 m N	DS	0.2 (Nov '02)	<0.2	27.9	944 (Nov'02)	944
MW14	200 m NNE	DS	11.2 (Oct '01)	0.10	39.70	1042 (Feb'09)	777
MW15 *	200 m NNE	DS	1.0 (May'01	<0.28	33	900 (Feb'03)	802
MW16	90 m NNW	DS	0.7 (July '01	0.02	16.5	992 (Nov'08)	764
MW18	170 m N	DS	1.2 (May'01)	0.07	11.6	703 (May'07)	581

DS – downstream
US – upstream
CG – cross gradient

Locations upstream from the landfill are located in an agricultural area and are therefore sprayed several times a year with "slurry".
Only locations MW20 and MW14 showed an increase in conductivity levels during 2009. This can be attributed to agricultural activity on the lands adjacent.

Due to the upstream locations of the majority and cross gradient locations of other boreholes, it can be assumed that emissions to groundwater are satisfactory for the period 2009.

3.12. Water Balance

A number of assumptions were made in the calculation of the water balance.

Evaporation

Due to the nature of baled waste, rainfall tends to flow through the edges of each bale quickly and makes its way deep into the waste body or onto the cell floor quickly. Hence a nominal value of 10% of the recorded evaporation in the calculation.

Active Area

Cells 12-15 were active for all of 2009.
Uncapped Area approx: 80,000 m2
Final Capped Area approx. 150,000 m2

Absorptive Capacity of Waste

Due to the nature of baled waste, cells with new waste will have a lower absorptive capacity. This increases with the age of the waste and as the waste is in contact with moisture for longer periods. An absorptive capacity of 15% of the traditional value of 0.07 m^3/t has been assumed.

The volume of leachate tankered off-site in 2009 was 115,427 m3.Results of the water balance calculation estimate that approximately 80,304 m3 of leachate was produced during 2009.
The difference of 35,123 m^3 can be attributed to the leachate that has been produced in previous years and was not removed from the cells. Due to the volumes of leachate being produced at Arthurstown, this prevented the full volume of leachate being removed from the site each year and this back log of leachate is now being removed.
An unprecedented amount of rainfall also fell during some months of 2009, with 1 m of rainfall.
Facility management staff are endeavouring at all times to maintain the levels to the 1m limit by constant pumping of leachate.

A summary of the calculation is shown as Table 5.1.

Table 5.1 Water Balance Calculation Summary 2009.

Month	Rainfall	Evaporation	Effective Rainfall	Waste Input	Active Area	Fully Capped Area	Cumulative Predicted Leachate (Effective)	Cumulative Predicted Leachate (Rainfall)	Actual leachate off site	Actual SW/GW discharged to river
		(mm)	(mm)	(tonnes)	(m^2)	(m^2)	(m^3)		(m^3)	(m3)
Jan-09	81.6	28.1	53.5	22,508.10	80,000	150,000	4,280	6528	13,069.65	852.26
Feb-09	58.8	20.0	38.8	15,664.84	80,000	150,000	7,384	4704	12,183.35	732.06
Mar-09	43.0	43.6	-0.6	17,411.06	80,000	150,000	7,384	3440	11,841.37	2,230.28
Apr-09	79.6	53.2	26.4	18,293.92	80,000	150,000	9,496	6368	8,249.49	265.12
May-09	79.0	68.6	10.4	18,518.50	80,000	150,000	10,328	6320	5,058.15	257.43
Jun-09	109.4	80.3	29.1	19,355.84	80,000	150,000	12,656	8752	7,413.41	410.06
Jul-09	153.6	76.4	77.2	19,206.94	80,000	150,000	18,832	12288	8,433.25	214.09
Aug-09	104.4	68.0	36.4	16,445.41	80,000	150,000	21,744	8352	8,606.32	2,979.51
Sep-09	2.2	31.6	-29.4	17,024.24	80,000	150,000	21,744	176	9,392.20	7,682.25
Oct-09	119.2	39.9	79.3	16,013.84	80,000	150,000	28,088	9536	5,884.77	624.39
Nov-09	50.0	30.9	19.1	16,238.94	80,000	150,000	29,616	4000	12,243.25	8,368.21
Dec-09	123.0	18.9	104.1	17,878.44	80,000	150,000	37,944	9840	13,051.17	3,830.47
Total	**1,003.80**	**559.5**	**444.30**	**214,560**			**37,944**	**80,304**	**115,427**	**28,446.15**

Note: Approx 35,123 tonnes more than was calculated from the table was due to Leachate from previous years
And remained within the landfill body. Facility management staff are endeavouring a t all times to maintain leachate levels below the 1m limit.

4. FACILITY DEVELOPMENT

4.1. Site Survey

A topographical survey of the landfill facility was carried out by the facility management team during January 2010.
The survey is attached as Appendix 5.1.

4.2. Developments Undertaken in 2009.

4.2.1. Capping Works

Capping works were due to re-commence during 2009 but due to budgetary constraints, this phase was deferred until 2010.

It is envisaged that a further 30,000 m^2 will commence Spring/Summer 2010. *(Weather & Budget permitting)*

4.2.2. Bioverda Power Systems Utilisation Plant

Three new engines were installed towards the end of 2008. This brought the total amount of engines on site to 11.
The plant is now extracting 11,000 m3 of gas per hour.
This plant comprises of 11 no. Jensbaucher landfill gas engines and 2 no. 2,500 m3 per hour enclosed flare units manufactured by HAASE, Germany.
The works necessary for the upgrade and the installation of the 3 additional engines was carried out by the E.S.B. during 2008. This involved an extension to the switchgear room and the upgrade of the 10 kv power line to a 20 kv line.

No further works were carried out during 2009 as the plant is now operating at maximum.

4.2.3. Staff reductions during 2009

There was a reduction in the number of staff at Arthurstown during 2009.
One member of S.D.C.C. left.
3 members of Blessington Plant Staff were made redundant.
This was as result of the reduction in the annual waste intake at Arthurstown Landfill. (From 600,000 tonnes during 2006 to just over 200,000 tonnes during 2009.)

4.3. Developments Proposed for 2010.

4.3.1. Capping Works

It is proposed to continue with final capping works in Spring/Summer 2010 weather and budget permitting.
The specified engineering works for this phase will be submitted in due course.

4.4. Restoration Report

4.4.1. Completed Cells

Cells 1-10 are now fully capped and restored.

Landscaping and fencing has been placed and is now established in these areas.

4.4.2. Restoration

Further capping took place during 2008.
Additional capping is due to take place again during 2010.

Temporary capping will also be placed in Cells 11-15. This will consist of at least 1 meter of clay cover as deemed necessary by the Facility Manager.

It is envisaged that all the final capping works will be complete by end 2012.

5. ENVIRONMENTAL OBJECTIVES AND TARGETS

5.1. Objectives and Targets

The list of objectives and targets for 2010 will be submitted as part of the EMP revision which will be submitted in the coming weeks.

6. FACILITY MANAGEMENT

6.1. Summary of New Written Procedures

The revision of the EMP in the coming weeks will include an updated OMP (Odour Management Plan)

This AER (Annual Environmental Report) was submitted 31st March 2010.

6.2. Tank, Pipeline and Bund Testing

Routine inspections of tank, pipeline and bund inspections are carried out once every three years.
Inspections were completed during 2008 and the certificates for the tanks and tankers are available for inspection at the facility as is required by Waste License W0004-003 condition number 3.12.3.

6.3. Reported Incidents and Complaints

6.3.1. Reported Incidents

A summary of reported incidents during 2009 is shown in Table 7.1. Incidents are defined by Condition 1.6 of the current waste licence (W004-003).

There were 17 no. incidences reported to the EPA in 2009. These included:

- 12 no. Gas borehole trigger level incidents
- 1 no. report of noise trigger level incident
- 4 no. Elevated Levels at SW2

Table 6.1 Summary of Reported Incidences 2009.

	Incident Date	Cause	Mitigation Measure
Gas borehole trigger levels	290109	Elevated trigger levels in Perimeter Gas Boreholes	See Report dated 060209 (submitted to Agency)
	170209	Elevated trigger levels in Perimeter Gas Boreholes	See Report dated 170209 (submitted to Agency)
	100308	Elevated trigger levels in Perimeter Gas Boreholes	See Report dated 110309 (submitted to Agency)
	210409	Elevated trigger levels in Perimeter Gas Boreholes	See Report dated 130509 (submitted to Agency)
	290509	Elevated trigger levels in Perimeter Gas Boreholes	See Report dated 040609 (submitted to Agency)
	300609	Elevated trigger levels in Perimeter Gas Boreholes	See Report dated 300609 (submitted to Agency)
	280709	Elevated trigger levels in Perimeter Gas Boreholes	See Report dated 050808 (submitted to Agency)
	260809	Elevated trigger levels in Perimeter Gas Boreholes	See Report dated 260809 (submitted to Agency)
	240909	Elevated trigger levels in Perimeter Gas Boreholes	See Report dated 240909 (submitted to Agency)
	281009	Elevated trigger levels in Perimeter Gas Boreholes	See Report dated 021109 (submitted to Agency)
	271109	Elevated trigger levels in Perimeter Gas Boreholes	See Report dated 071209 (submitted to Agency)
	171209	Elevated trigger levels in Perimeter Gas Boreholes	See Report dated 110110 (submitted to Agency)

	Incident Date	Cause	Mitigation Measure
Sw2	170309	Elevated Ammonia Levels SW2	Remediate Areas on Temporary Cap. (See Report dated 090409 Submitted to Agency)
SW2	060709	Elevated Ammonia Levels SW2	Remediate Areas on Temporary Cap. (See Report dated 080709 Submitted to Agency)
SW2	151009	Elevated Ammonia Levels SW2	Remediate Areas on Temporary Cap. (See Report dated 151009 Submitted to Agency)
SW2	311209	Elevated Ammonia Levels SW2	Remediate Areas on Temporary Cap. (See Report dated 200110 Submitted to Agency)

Table 8.1: Cont'd

	Incident Date	Cause	Mitigation Measure
Noise	171209	Elevated Noise Readings	None. Causes are proximity to Meter and Adjacent Commercial Activities. (Report to Agency 150110)

6.3.2. Complaints

There were 26 no. complaints to the facility in 2009.
Figure 8.1 is a graphical summary of complaints.

This represents a massive decrease on the number of complaints made in during the previous years. There were 382 complaints in 2007 and 174 during 2008.

Some reasons for the decrease in complaints to the facility are as follows:

(a) Final capping works were ongoing during 2008. As the final cap progresses there is less area prone to fugitive landfill gas emissions.
(b) The installation of the 2 no 2,500 m3 per hour enclosed flare units which extract landfill gas from the temporary capped areas. i.e. Areas which are yet to be final capped.
(c) Facility Manager and Deputy Facility Manager are on 24 hour call 7 days a week. They also receive text messages from both enclosed flare units when there is a shut down.
(d) The placement of Covertop 32 on the side slopes of the landfill also greatly reduced fugitive emissions.
(e) The placing of additional clay material on temporary cap, especially in areas that will not be used for landfilling in the next 3 months.
(f) The use of the drilling Auger rig to place additional gas wells in areas deemed necessary by the Facility Manager.
(g) The use of the long reach excavator to compact side slopes and other areas where standard machines are not able to reach.

A combination of all of the above has dramatically reduced complaints from 174 to 26. (A further 85% reduction for 2009)
Reductions have already been observed during the first few weeks of 2010.

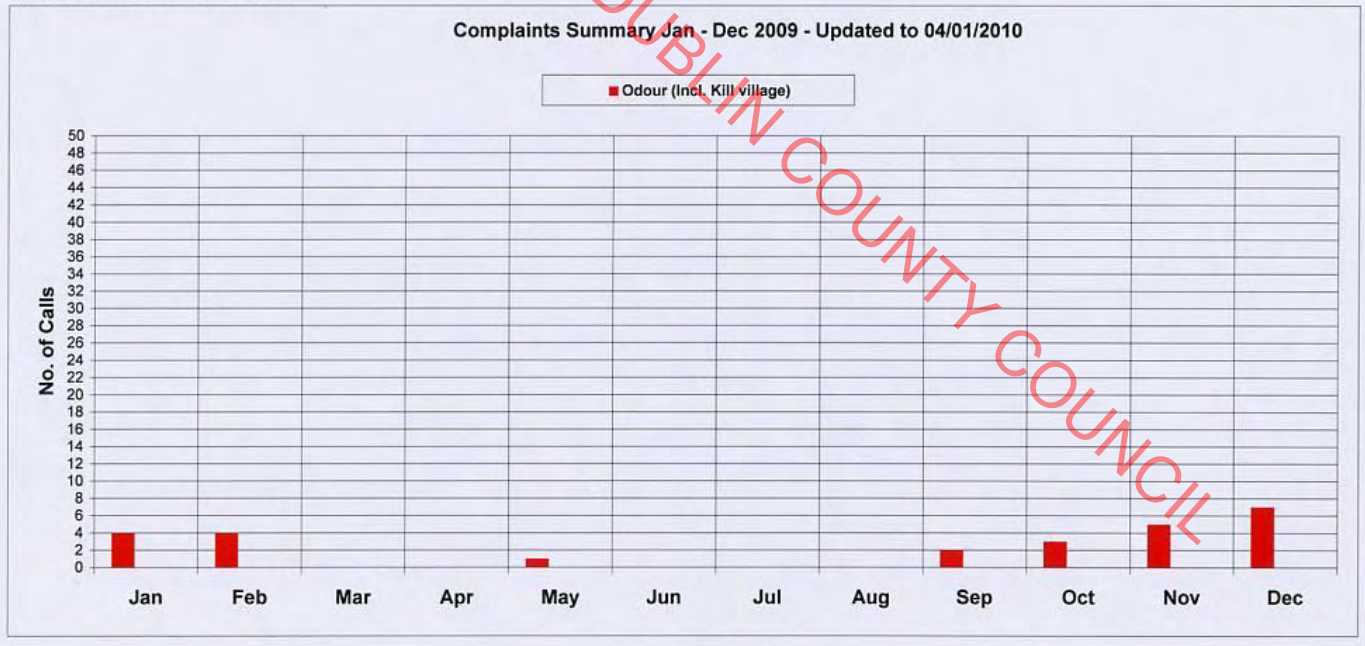
Follow up to Complaints

Complaints are followed up by the facility management team where possible i.e. the complainant has left contact details and a time and date of the odour incident.

Complaints Summary 2009

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Odour (Incl. Kill village)	4	4	0	0	1	0	0	0	2	3	5	7	**26**
Odour (Kill Village only)	1	2	0	0	0	0	0	0	0	0	2	2	**7**
Noise (Anywhere)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Traffic (Anywhere)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Callers	3	3	0	0	1	0	0	0	2	3	5	7	**24**
Max Calls from 1 Caller	2	2	0	0	1	0	0	0	1	1	1	1	
Callers on Max	1	1	0	0	1	0	0	0	2	3	5	7	
Monthly Total Calls	**4**	**4**	**0**	**0**	**1**	**0**	**0**	**0**	**2**	**3**	**5**	**7**	**26**
Most Frequent Callers	B.Gilhooley	B.Gilhooley			J.King								

Updated by M.Heffernan on 04/01/2010



6.4. Review of Nuisance Controls

Litter

Litter is not a nuisance at the Arthurstown landfill. This is mainly due to the baling of the waste. A number of portable litter fences surround the top edge of the landfill in the off chance that litter should escape from the bale face. Litter patrols take place weekly at the facility.

Birds & Vermin

Due to the excellent vector control programme, there are no nuisances caused by Birds and Vermin at this Facility. As a result of the excellent housekeeping in the Marshalling yard and again at the bale face, Vermin do not cause nuisance at this facility. There are also several different types of Birds of Prey on-site throughout the day, seven days a week. A Peregrine falcon, a Saker falcon, Harris hawks, American red-tailed Eagle and other cross breeds of falcon. All are proving effective means of deterrent for birds which otherwise could cause nuisance at the site.

Odour

Odour control mechanisms are constantly being reviewed and discussed at Arthurstown. The facility management team have also noticed a dramatic decrease in complaints during 2009 due to the 11 landfill gas engines plus 4 enclosed 2,500 m3/hour flares on site. Currently all gas is now being utilised and two of the enclosed flare units are on stand-by or are activated when deemed necessary by the Facility manager.

See section 3.9 on Odour.

6.5. Report on Staff Training

The following training courses/seminars were attended by the staff at Arthurstown Landfill during 2009.

Table 6.2 Staff Training Log 2009.

Training Course /Seminar	Staff Attendees
EPA – PCB training Course	J.Smith M.Heffernan
GIS – Arc View Training	M.Heffernan
EMS Level 1 Training	Blessington Plant Hire Staff

6.6. Non-Compliances at Arthurstown Landfill during 2009.

During 2009 Arthurstown landfill received a total of 4 Non-compliances from the Environmental Protection Agency. They were for the following reasons:

Reason for NC	Number	EPA Site Visit
Odour	1	Yes
Leachate Management	1	Yes
Daily Odour Audit sheets	1	Yes
Complaints File Log	1	Yes

Table 6.3 Non-Compliance Log for 2009.

All non compliances were responded to in writing by the facility management team and returned to the EPA.

Legal action brought by the Agency against South Dublin County Council was also concluded during February 2009. This led to a prosecution of South Dublin County Council on 2 counts of odour emissions.

During 2009 there was also a fully compliant audit carried out on 23rd July 2009.

6.7. Reports of Financial Provision

Report on Financial Provisions under Waste Licence

South Dublin County Council has taken out a bond in favour of Kildare County Council (the local authority in whose functional area the facility is located) in order to ensure satisfactory completion of Arthurstown Landfill. Significant contributions are made annually towards leachate treatment, environmental monitoring and landfill closure/aftercare. Budgetary estimates for landfilling and ancillary activities at Arthurstown during 2009 were in the region of € 3.5 m.

Report on Programme for Public Information

In accordance with Waste Licence W0004-003, information is made available on site and submitted to the EPA on a regular basis. During 2008 there were numerous visits conducted at the facility for interested parties including schools and university groups, local and other international visitors. Information about the facility is available on the website which can be accessed either directly *(www.arthurstown.com)* email address also is *arthurstownlandfill@eircom.net* or through a link on the South Dublin County Council website *(www.sdcc.ie)*. Site contact numbers are posted at the facility entrance. The website has been updated to include the final cap and the utilisation of the landfill gas.
A site DVD is now complete since March 2003. This 9 minute short film describes the site from the landfill construction and operational perspectives. It is used during site visits to present visitors with a clear understanding of the nature of the site activities. The site has also featured in televised waste management documentaries as being the most state of the art and well managed landfill to date in Ireland, as well as in landfill operative training courses.

Report on Management and Operation Structure

The site is owned and managed by South Dublin County Council, who also holds the Waste Licence and Planning Permission for the facility. Waste placement at the site is supervised by the Facility Manager (J. Smith) and Deputy Facility Manager (M.Heffernan) under the terms of a Joint Venture with Veolia Ireland Ltd., a waste management company. Veolia Ireland also operates the Council's Municipal Waste Baling and Transfer Station at Ballymount in South Dublin. Waste is also delivered to the facility from a further three baling centres, operated by Padraig Thornton Waste Disposal Ltd. located on the Kileen Road, Ballyfermot,Co.Dublin , Dun Laoghaire Rathdown County Council Baling and Recycling Park in Ballyogan,Co.Dublin operated by Greenstar Ltd and Oxygen Environmental Ltd, Ballymount.

At the end of 2009 South Dublin County Council had 7 direct employees engaged in full time management and administrative functions at the site, namely the Facility Manager (J. Smith), Deputy Facility Manager (M.Heffernan), Site Foreman (S. Finnegan), Assistant Site Foreman (S. Fitzgerald), Weighbridge Attendant (C. Cummins) and E. Comerford (GO)
The Senior Engineer for South Dublin County Council Environmental Services is Mr. Leo Magee and the Director of Services for Environment is Ms. Philomena Poole.

6.8. Local Environmental Project Funding

Contributions to the Locality

South Dublin County Council was conditioned by An Bord Pleanala to contribute the sum of € 100,000 annually to Kildare County Council.

The required committee has recently been formed and funds are currently being distributed.

There is a total of €300,000 to be distributed locally for the community.

7. ANY OTHER ITEMS

APPENDIX 3.1

Monitoring Locations Drawing

N

LEGEND

- LAND OWNERSHIP BOUNDARY
- SITE BOUNDARY
- LG_5 — LANDFILL GAS MONITORING POINT
- MW_3 — GROUNDWATER MONITORING WELL
- N1 — NOISE MONITORING LOCATION
- D4 — DUST MONITORING LOCATION
- SW_2 — SURFACE WATER MONITORING LOCATION
- PW1 — PRIVATE WELL LOCATIONS

STAGE 1

STAGE 2

STAGE 3 & 4

REMEDIATED SITE

Gravel Pit

Quarry

Pond

Rev.	Drawn	Chkd	Apprvd	Date	Description
A	CH	BR	CC	15.03.04	ISSUE FOR APPROVAL

Name of Client
SOUTH DUBLIN COUNTY COUNCIL

Name of Job
ARTHURSTOWN WASTE LICENCE
4-2 REVIEW

Title of Drawing
ENVIRONMENTAL MONITORING LOCATIONS

Scales Used
1:2500

Dwg. No. 2004-054-02-002 — Rev. A

FEHILY TIMONEY & COMPANY
CONSULTANTS IN ENGINEERING & ENVIRONMENTAL SCIENCES
CORE HOUSE, POULADUFF Rd, CORK, IRELAND.
Phone: +353-21-4964133. Fax: +353-21-4964464. Email: info@ftco.ie
WEB SITE: www.fehilytimoney.com

ORIGINAL DRAWING SIZE A1 - 1841 x 594

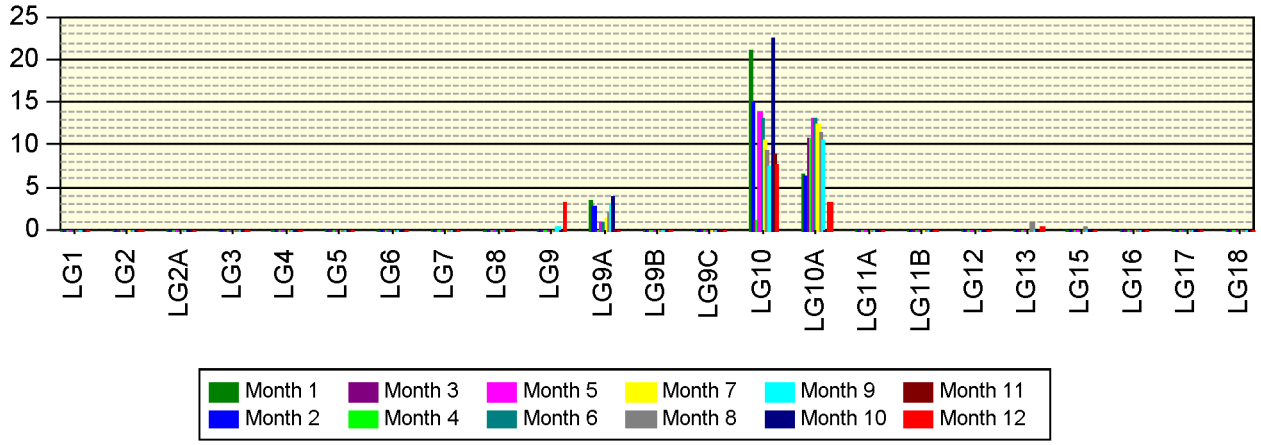
10 0 10 20 50 100mm NATURAL SCALE

APPENDIX 3.2

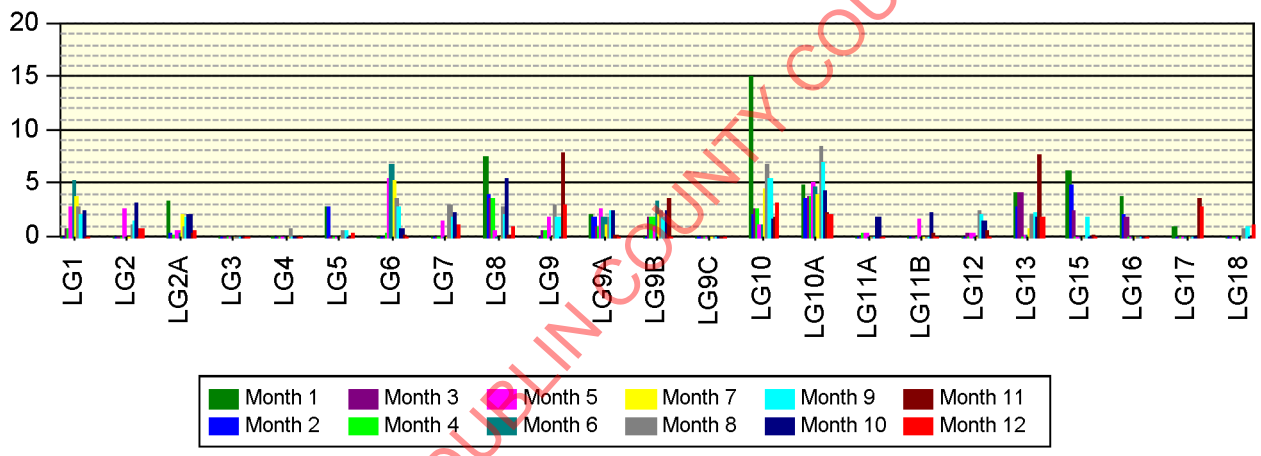
Landfill Gas Charts and Tables (perimeter monitoring wells and site buildings)

Figure A.3.2.1.x Landfill Gas Perimeter Monthly 2009

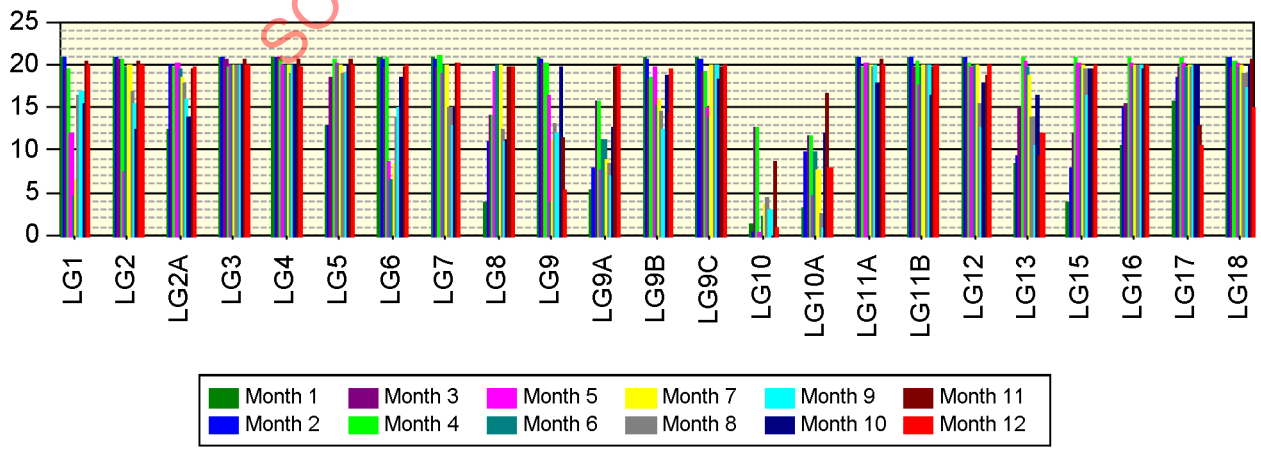
Sample Type: Landfill Gas Perimeter Monthly, Year: 2009, All Stations.
Methane (% v/v), MaxAllowedConc:1% v/v



Sample Type: Landfill Gas Perimeter Monthly, Year: 2009, All Stations.
Carbon Dioxide (% v/v), MaxAllowedConc:1.5% v/v



Sample Type: Landfill Gas Perimeter Monthly, Year: 2009, All Stations.
Oxygen (% v/v)



Note: Occasions where the sampler was unable to record a measurement are indicated in a separate comments table

Results marked with '' indicate that it is below the level of detection of the measuring instrument.*

The levels of detection used may have varied over time depending on the lab or the method of detection used.

Table A.3.2.1. Landfill Gas Perimeter Monthly (Page 1 of 5)

Sample Type: Landfill Gas Perimeter Monthly, Year: 2009, All Stations, All Parameters

Station	Parameters	MAC	Month 1 01-Jan	Month 2 01-Feb	Month 3 10-Mar	Month 4 21-Apr	Month 5 29-May	Month 6 30-Jun	Month 7 28-Jul	Month 8 26-Aug	Month 9 24-Sep	Month 10 28-Oct	Month 11 27-Nov	Month 12 17-Dec
LG1	Methane(% v/v)	1	0	0	0	0	0	0	0	0	0	0	0	0
	Carbon Dioxide(% v/v)	1.5	0	0	0.7	0.7	2.9	5.2	3.8	2.8	2	2.5	0	0
	Oxygen(% v/v)		21	20.9	19.6	19.6	12.1	4.7	6.5	16.5	17	15.5	20.5	20.1
	Atmospheric Pressure(mb)		980	1007	996	1010	1013	1003	992	980	1011	998	980	1000
LG2	Methane(% v/v)	1	0	0	0	0	0	0	0	0	0	0	0	0
	Carbon Dioxide(% v/v)	1.5	0	0	0	0	2.6	0	0	1.2	1.5	3.2	0	0.8
	Oxygen(% v/v)		21	20.9	20.8	20.8	7.5	19.8	20.1	17	15.5	12.5	20.6	20.1
	Atmospheric Pressure(mb)		980	1007	996	1010	1013	1003	992	980	1011	998	980	1000
LG2A	Methane(% v/v)	1	0	0	0	0	0	0	0	0	0	0	0	0
	Carbon Dioxide(% v/v)	1.5	3.4	0.3	0.2	0.2	0.5	0.3	2.1	1	1.8	2	0.3	0.5
	Oxygen(% v/v)		12.5	20	19.8	19.8	20.2	19.6	18.5	18	16	14	19.6	19.8
	Atmospheric Pressure(mb)		980	1007	996	1010	1013	1003	992	980	1011	998	980	1000
LG3	Methane(% v/v)	1	0	0	0	0	0	0	0	0	0	0	0	0
	Carbon Dioxide(% v/v)	1.5	0	0	0	0	0	0	0	0	0	0	0	0
	Oxygen(% v/v)		21	20.9	20.7	19.8	20.1	20.1	20.1	20.1	20	20.1	20.8	20.1
	Atmospheric Pressure(mb)		980	1007	996	1010	1013	1003	992	980	1011	998	980	1000
LG4	Methane(% v/v)	1	0	0	0	0	0	0	0	0	0	0	0	0
	Carbon Dioxide(% v/v)	1.5	0	0	0	0	0	0	0	0.8	0	0	0	0
	Oxygen(% v/v)		21	20.9	20.9	20.8	20.1	20	20.1	19.2	20	20.1	20.7	19.8
	Atmospheric Pressure(mb)		980	1007	996	1010	1013	1003	992	980	1011	998	980	1000
LG5	Methane(% v/v)	1	0	0	0	0	0	0	0	0	0	0	0	0
	Carbon Dioxide(% v/v)	1.5	2.8	2.8	0	0	0	0	0	0.5	0.5	0	0	0.3

Table A.3.2.1. Landfill Gas Perimeter Monthly (Page 2 of 5)

Station	Parameters	MAC	Month 1 01-Jan	Month 2 01-Feb	Month 3 10-Mar	Month 4 21-Apr	Month 5 29-May	Month 6 30-Jun	Month 7 28-Jul	Month 8 26-Aug	Month 9 24-Sep	Month 10 28-Oct	Month 11 27-Nov	Month 12 17-Dec
LG5	Oxygen(% v/v)		13	13	18.5	20.7	20.2	20	20.1	19	19	20.1	20.7	20.1
	Atmospheric Pressure(mb)		980	1007	996	1010	1013	1003	992	980	1011	998	980	1000
LG6	Methane(% v/v)	1	0	0	0	0	0	0	0	0	0	0	0	0
	Carbon Dioxide(% v/v)	1.5	0	0	0	0.4	5.5	6.8	5.2	3.5	2.8	0.8	0.1	0
	Oxygen(% v/v)		21	20.8	19.8	21	8.8	6.5	8.5	14	15	18.5	19.9	20.1
	Atmospheric Pressure(mb)		980	1007	996	1010	1013	1003	992	980	1011	998	980	1000
LG7	Methane(% v/v)	1	0	0	0	0	0	0	0	0	0	0	0	0
	Carbon Dioxide(% v/v)	1.5	0	0	0	0	1.5	0	0	3	1.8	2.2	0	1.2
	Oxygen(% v/v)		21	20.8	19.8	21.1	19.2	20.1	20.1	15	13	15	20.2	20.2
	Atmospheric Pressure(mb)		980	1007	996	1010	1013	1003	992	980	1011	998	980	1000
LG8	Methane(% v/v)	1	0	0	0	0	0	0	0	0	0	0	0	0
	Carbon Dioxide(% v/v)	1.5	7.5	4	3.5	3.5	0.5	0	0	2.8	2	5.5	0.2	1
	Oxygen(% v/v)		4	11	14.1	14.1	19.4	20.1	20.1	12.5	11	11.3	19.9	19.9
	Atmospheric Pressure(mb)		980	1007	996	1010	1013	1003	992	980	1011	998	980	1000
LG9	Methane(% v/v)	1	0	0	0	0	0	0	0	0	0.5	0	0	3.2
	Carbon Dioxide(% v/v)	1.5	0	0	0.5	0.5	1.9	0	0	3	1.8	0	7.9	3
	Oxygen(% v/v)		21	20.8	20.3	20.3	16.5	4.1	11.2	13.2	12	19.8	11.6	5.5
	Atmospheric Pressure(mb)		980	1007	996	1010	1013	1003	992	980	1011	998	980	1000
LG9A	Methane(% v/v)	1	3.5	2.8	0	0	1	0.8	1.5	2	3	4.1	0	0
	Carbon Dioxide(% v/v)	1.5	2	1.8	1	1	2.6	1.8	1.2	1.8	2.5	2.4	0.2	0
	Oxygen(% v/v)		5.5	8	15.8	15.8	7.8	11.4	9	8.5	7	12.8	19.9	20.1
	Atmospheric Pressure(mb)		980	1007	996	1010	1013	1003	992	980	1011	998	980	1000
LG9B	Methane(% v/v)	1	0	0	0	0	0	0	0	0	0	0	0	0

Table A.3.2.1. Landfill Gas Perimeter Monthly (Page 3 of 5)

Station	Parameters	MAC	Month 1 01-Jan	Month 2 01-Feb	Month 3 10-Mar	Month 4 21-Apr	Month 5 29-May	Month 6 30-Jun	Month 7 28-Jul	Month 8 26-Aug	Month 9 24-Sep	Month 10 28-Oct	Month 11 27-Nov	Month 12 17-Dec
LG9B	Carbon Dioxide(% v/v)	1.5	0	0	1.8	1.8	0.9	3.4	2.1	2.5	1.8	2.4	3.6	0
	Oxygen(% v/v)		21	20.8	18.3	18.5	19.8	15.4	16	14.5	12.5	18.8	14.4	19.5
	Atmospheric Pressure(mb)		980	1007	996	1010	1013	1003	992	980	1011	998	980	1000
LG9C	Methane(% v/v)	1	0	0	0	0	0	0	0	0	0	0	0	0
	Carbon Dioxide(% v/v)	1.5	0	0	0	0	0	0	0	0	0	0	0	0
	Oxygen(% v/v)		21	20.8	19.4	19.4	15.1	14	20	20.1	20	18.4	19.9	20.1
	Atmospheric Pressure(mb)		980	1007	996	1010	1013	1003	992	980	1011	998	980	1000
LG10	Methane(% v/v)	1	21.2	15.1	1.2	1.2	13.8	13.1	10.5	9.5	7.5	22.7	9	7.8
	Carbon Dioxide(% v/v)	1.5	15	2	2.7	2.7	1.2	1.2	4.5	6.8	5.5	1.7	1.8	3.2
	Oxygen(% v/v)		1.5	0.5	12.8	12.8	0.4	2.4	3.8	4.5	3	0	8.7	1
	Atmospheric Pressure(mb)		980	1007	996	1010	1013	1003	992	980	1011	998	980	1000
LG10A	Methane(% v/v)	1	6.5	6.3	10.9	10.9	13.2	13.2	12.5	11.5	10.5	0	0	3.2
	Carbon Dioxide(% v/v)	1.5	4.8	3.5	3.8	3.8	5	4.7	4	8.5	7	4.4	2.2	2
	Oxygen(% v/v)		3.2	9.8	11.8	11.8	4.7	9.8	7.8	2.5	1	12	16.8	8
	Atmospheric Pressure(mb)		980	1007	996	1010	1013	1003	992	980	1011	998	980	1000
LG11A	Methane(% v/v)	1	0	0	0	0	0	0	0	0	0	0	0	0
	Carbon Dioxide(% v/v)	1.5	0	0	0	0.4	0.3	0	0	0	0	1.8	0	0
	Oxygen(% v/v)		21	20.9	19.8	19.7	20.2	20.1	20.1	19.8	20	18	20.8	20.1
	Atmospheric Pressure(mb)		980	1007	996	1010	1013	1003	992	980	1011	998	980	1000
LG11B	Methane(% v/v)	1	0	0	0	0	0	0	0	0	0	0	0	0
	Carbon Dioxide(% v/v)	1.5	0	0	0	0	1.7	0	0	0	0	2.2	0.4	0
	Oxygen(% v/v)		21	20.9	19.8	20.6	17.6	19.8	20.1	20.1	20	16.5	19.8	20.1
	Atmospheric Pressure(mb)		980	1007	996	1010	1013	1003	992	980	1011	998	980	1000

Table A.3.2.1. Landfill Gas Perimeter Monthly (Page 4 of 5)

Station	Parameters	MAC	Month 1 01-Jan	Month 2 01-Feb	Month 3 10-Mar	Month 4 21-Apr	Month 5 29-May	Month 6 30-Jun	Month 7 28-Jul	Month 8 26-Aug	Month 9 24-Sep	Month 10 28-Oct	Month 11 27-Nov	Month 12 17-Dec
LG12	Methane(% v/v)	1	0	0	0	0	0	0	0	0	0	0	0	0
	Carbon Dioxide(% v/v)	1.5	0	0	0.3	0	0.4	0	0	2.5	2	1.4	0.5	0
	Oxygen(% v/v)		21	20.9	20.3	20.3	19.7	20	20	15.5	12.8	18	18.9	20.1
	Atmospheric Pressure(mb)		980	1007	996	1010	1013	1003	992	980	1011	998	980	1000
LG13	Methane(% v/v)	1	0	0	0	0	0	0	0	0.8	0	0	0	0.5
	Carbon Dioxide(% v/v)	1.5	4.2	2.9	4.2	0	0.1	0.1	0.8	2.1	2.2	1.8	7.8	1.8
	Oxygen(% v/v)		8.5	9.5	15.1	20.9	20.5	19.9	18.9	14	10.5	16.5	9.4	12
	Atmospheric Pressure(mb)		980	1007	996	1010	1013	1003	992	980	1011	998	980	1000
LG14	Atmospheric Pressure(mb)		980	1007	996	1010	1013	1003	992	980	1011	998	980	1000
LG15	Methane(% v/v)	1	0	0	0	0	0	0	0	0.5	0	0	0	0
	Carbon Dioxide(% v/v)	1.5	6.3	4.8	2.5	0	0	0	0	0	1.8	0	0.1	0
	Oxygen(% v/v)		4	8	12	21	20.2	19.9	20	19.5	16.5	19.5	19.6	20.1
	Atmospheric Pressure(mb)		980	1007	996	1010	1013	1003	992	980	1011	998	980	1000
LG16	Methane(% v/v)	1	0	0	0	0	0	0	0	0	0	0	0	0
	Carbon Dioxide(% v/v)	1.5	3.8	2	1.8	0	0	0	0	0	0	0	0	0
	Oxygen(% v/v)		10.5	15	15.5	21	20.2	19.8	20	20.1	20	19.5	20	20.1
	Atmospheric Pressure(mb)		980	1007	996	1010	1013	1003	992	980	1011	998	980	1000
LG17	Methane(% v/v)	1	0	0	0	0	0	0	0	0	0	0	0	0
	Carbon Dioxide(% v/v)	1.5	1	0	0	0	0	0	0	0	0	0	3.6	2.8
	Oxygen(% v/v)		15.8	18.5	19.8	21	20.2	19.8	20	19.8	20	20.1	13	10.5
	Atmospheric Pressure(mb)		980	1007	996	1010	1013	1003	992	980	1011	998	980	1000
LG18	Methane(% v/v)	1	0	0	0	0	0	0	0	0	0	0	0	0
	Carbon Dioxide(% v/v)	1.5	0	0	0	0	0	0	0	0.8	1	0	0	1.2

Table A.3.2.1. Landfill Gas Perimeter Monthly (Page 5 of 5)

Station	Parameters	MAC	Month 1 01-Jan	Month 2 01-Feb	Month 3 10-Mar	Month 4 21-Apr	Month 5 29-May	Month 6 30-Jun	Month 7 28-Jul	Month 8 26-Aug	Month 9 24-Sep	Month 10 28-Oct	Month 11 27-Nov	Month 12 17-Dec
LG18	Oxygen(% v/v)		21	20.9	19.8	20.5	20.3	19.7	20.1	19	17.5	20.1	20.7	15
	Atmospheric Pressure(mb)		980	1007	996	1010	1013	1003	992	980	1011	998	980	1000

Note: Occasions where the sampler was unable to record a measurement are indicated in a separate comments table

Occasions where the sampler was unable to record a measurement are indicated in a separate comments table

Value above MAC (maximum allowed concentration)

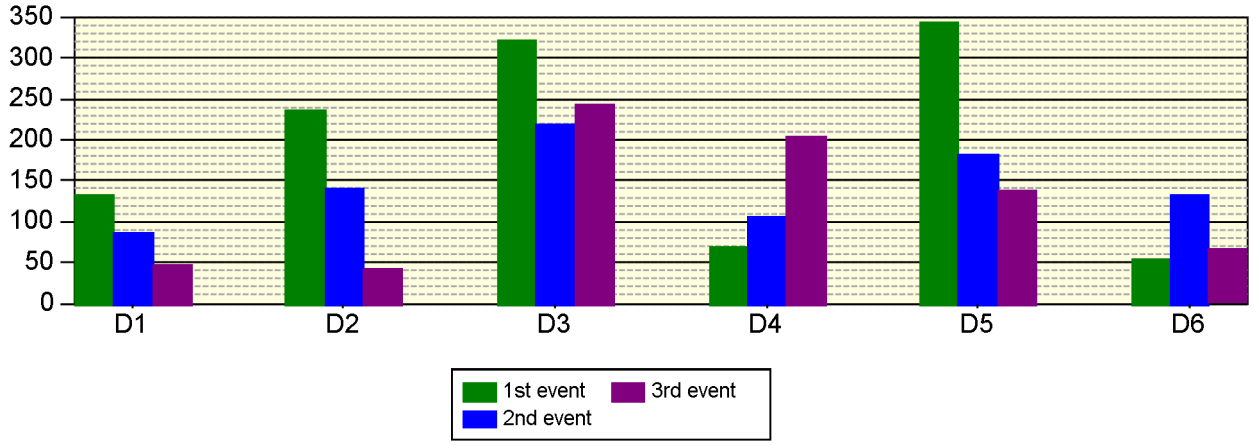
APPENDIX 3.3

Dust Charts and Tables

Figure A.3.3.1.x Dust Monitoring 2009

Sample Type: Dust, Year: 2009, All Stations.

Dust Deposition (mg/m2/day), MaxAllowedConc:350mg/m2/day



Note: Occasions where the sampler was unable to record a measurement are indicated in a separate comments table

Results marked with '' indicate that it is below the level of detection of the measuring instrument.*

The levels of detection used may have varied over time depending on the lab or the method of detection used.

Table A.3.3.1.x Dust Monitoring 2009 (Page 1 of 1)

Sample Type: Dust, Year: 2009, All Stations, All Parameters

Station	Parameters	MAC	1st event 13-Mar	2nd event 22-May	3rd event 08-Jul
D1	Dust Deposition (mg/m2/day)	350	134	88	48
D2	Dust Deposition (mg/m2/day)	350	236	140	44
D3	Dust Deposition (mg/m2/day)	350	323	219	245
D4	Dust Deposition (mg/m2/day)	350	71	108	204
D5	Dust Deposition (mg/m2/day)	350	344	182	138
D6	Dust Deposition (mg/m2/day)	350	56	133	68

2002- annual event was in accordance with W004-01

2003- biannual event was in accordance with W004-02 (issued July 2003)

2004 to date - three times per year (twice in period May to Sep) in accordance with W004-03

Note1: Occasions where the sampler was unable to record a measurement are indicated in a separate comments table

Note2: The sample date has been recorded as the date on which the sample pot was removed from site, i.e. the 30th day of sampling

Occasions where the sampler was unable to record a measurement are indicated in a separate comments table

Value above MAC (maximum allowed concentration)

APPENDIX 3.4

Noise Charts and Tables

Table A.3.4.1.x Noise Day-time Monitoring 2009 (Page 1 of 1)

Sample Type: Noise Daytime, Year: 2009, All Stations, All Parameters

Station	Parameters	MAC	1st Event	2nd Event
N1A	L(A)eq(dB) (sample time)	55	50 (10-Nov-11:30)	58 (17-Dec-09:30)
	L(A)10(dB) (sample time)		53 (10-Nov-11:30)	60 (17-Dec-09:30)
	L(A)90(dB) (sample time)		44 (10-Nov-11:30)	53 (17-Dec-09:30)
N2	L(A)eq(dB) (sample time)	55	61 (10-Nov-10:55)	60 (17-Dec-10:40)
	L(A)10(dB) (sample time)		64 (10-Nov-10:55)	62 (17-Dec-10:40)
	L(A)90(dB) (sample time)		48 (10-Nov-10:55)	52 (17-Dec-10:40)
N3	L(A)eq(dB) (sample time)	55	64 (10-Nov-09:45)	60 (17-Dec-11:50)
	L(A)10(dB) (sample time)		55 (10-Nov-09:45)	64 (17-Dec-11:50)
	L(A)90(dB) (sample time)		45 (10-Nov-09:45)	51 (17-Dec-11:50)
N4	L(A)eq(dB) (sample time)	55	48 (10-Nov-08:00)	63 (17-Dec-08:15)
	L(A)10(dB) (sample time)		49 (10-Nov-08:00)	67 (17-Dec-08:15)
	L(A)90(dB) (sample time)		46 (10-Nov-08:00)	46 (17-Dec-08:15)
N5	L(A)eq(dB) (sample time)	55	63 (10-Nov-08:35)	59 (17-Dec-10:00)
	L(A)10(dB) (sample time)		63 (10-Nov-08:35)	59 (17-Dec-10:00)
	L(A)90(dB) (sample time)		58 (10-Nov-08:35)	54 (17-Dec-10:00)
N6	L(A)eq(dB) (sample time)	55	58 (10-Nov-09:10)	58 (17-Dec-12:25)
	L(A)10(dB) (sample time)		59 (10-Nov-09:10)	61 (17-Dec-12:25)
	L(A)90(dB) (sample time)		56 (10-Nov-09:10)	56 (17-Dec-12:25)
N9	L(A)eq(dB) (sample time)	55	61 (10-Nov-10:20)	60 (17-Dec-11:10)
	L(A)10(dB) (sample time)		63 (10-Nov-10:20)	62 (17-Dec-11:10)
	L(A)90(dB) (sample time)		51 (10-Nov-10:20)	54 (17-Dec-11:10)

MAC: Maximum Allowed Concentration

A note explaining the layout of the noise tables is included in Section 3.4 of the AER.

Occasions where the sampler was unable to record a measurement are indicated in a separate comments table

Table A.3.4.2.x Noise Night-time Monitoring 2009 (Page 1 of 1)

Sample Type: Noise Night-time, Year: 2009, All Stations, All Parameters

Station	Parameters	MAC	1st Event	2nd Event
N1A	L(A)eq(dB) (sample time)	45	44 (10-Nov-05:15)	44 (17-Dec-05:15)
	L(A)10(dB) (sample time)		46 (10-Nov-05:15)	46 (17-Dec-05:15)
	L(A)90(dB) (sample time)		42 (10-Nov-05:15)	41 (17-Dec-05:15)
N2	L(A)eq(dB) (sample time)	45	51 (10-Nov-06:15)	46 (17-Dec-06:00)
	L(A)10(dB) (sample time)		51 (10-Nov-06:15)	47 (17-Dec-06:00)
	L(A)90(dB) (sample time)		50 (10-Nov-06:15)	44 (17-Dec-06:00)
N3	L(A)eq(dB) (sample time)	45	44 (10-Nov-05:40)	39 (17-Dec-06:20)
	L(A)10(dB) (sample time)		45 (10-Nov-05:40)	40 (17-Dec-06:20)
	L(A)90(dB) (sample time)		41 (10-Nov-05:40)	35 (17-Dec-06:20)
N4	L(A)eq(dB) (sample time)	45	47 (10-Nov-07:15)	48 (17-Dec-07:45)
	L(A)10(dB) (sample time)		48 (10-Nov-07:15)	48 (17-Dec-07:45)
	L(A)90(dB) (sample time)		45 (10-Nov-07:15)	45 (17-Dec-07:45)
N5	L(A)eq(dB) (sample time)	45	56 (10-Nov-06:30)	56 (17-Dec-05:40)
	L(A)10(dB) (sample time)		57 (10-Nov-06:30)	59 (17-Dec-05:40)
	L(A)90(dB) (sample time)		55 (10-Nov-06:30)	54 (17-Dec-05:40)
N6	L(A)eq(dB) (sample time)	45	56 (10-Nov-06:50)	54 (17-Dec-07:10)
	L(A)10(dB) (sample time)		56 (10-Nov-06:50)	55 (17-Dec-07:10)
	L(A)90(dB) (sample time)		55 (10-Nov-06:50)	53 (17-Dec-07:10)
N9	L(A)eq(dB) (sample time)	45	45 (10-Nov-05:55)	42 (17-Dec-06:35)
	L(A)10(dB) (sample time)		46 (10-Nov-05:55)	44 (17-Dec-06:35)
	L(A)90(dB) (sample time)		43 (10-Nov-05:55)	34 (17-Dec-06:35)

MAC: Maximum Allowed Concentration

A note explaining the layout of the noise tables is included in Section 3.4 of the AER.

Occasions where the sampler was unable to record a measurement are indicated in a separate comments table

APPENDIX 3.5

Surface Water Charts and Tables

Table A.3.5.4. Surface Water Annual 2009 (Page 1 of 2)

Sample Type: Surface Water Annual, Year: 2009, All Stations, All Parameters

Station	MAC	SW1	SW2	SW3	SW4	SW5
		05-May	05-May	05-May	05-May	05-May
Total Alkalinity CaCO3 (mg/l)		268	328	277	298	321
Ammonia-N (mg/l)	0.8	0.03	0.51	0.04	0.03	0.54
BOD (mg/l)	5	<2	<2	<2	<2	<2
COD (mg/l)		<10	<10	<10	<10	<10
Chloride (mg/l)		12	31	13	13	31
Dissolved Oxygen (mg/l)		11.15	10.3	11.05	10.55	11
Conductivity (µS/cm)		566	914	572	590	912
pH (pH units)	9	8.3	7.8	8.3	8.2	7.8
Total Suspended Solids (mg/l)	25	<5	68	<5	<5	<5
Temperature(C)		13.6	12.6	13.4	11.9	13
Boron (µg/l)		27	60	11	14	<2
Cadmium (µg/l)		<2	<2	<2	<2	<2
Calcium (mg/l)		177	126	94	100	<0.1
Chromium (µg/l)		<2	<2	<2	<2	<2
Copper (µg/l)	112	10	15	6	<2	<2
Lead (µg/l)		<2	<2	<2	<2	<2
Iron (mg/l)		<0.1	<0.1	<0.1	0.1	<0.1
Magnesium (mg/l)		6.5	17	3.5	5.4	<0.1
Manganese (µg/l)		4	32	3	21	<2
Nickel (µg/l)		<2	5	<2	<2	<2
Potassium (mg/l)		1.6	4.1	1.5	1.1	0.1
Sodium (mg/l)		7.9	34	8	7.1	0.2
Zinc (µg/l)	500	29	25	12	27	8
Mercury(µg/l)		<1	<1	<1	<1	<1
Sulphate (mg/l)		14.57	119.74	15.12	14.36	119.24
Total Phosphorus(mg/l)		<0.05	0.07	<0.05	<0.05	<0.05
TON(mg/l)		2.23	5.2	8.2	1.44	4.84
Nitrate(mg/l)		4.31	4.68	2.16	1.16	4.43
Nitrite(mg/l)	0.05	<0.02	0.08	<0.02	<0.02	0.09

Note: SW1 - Upstream, SW2 - Downstream

Occasions where the sampler was unable to record a measurement are indicated in a separate comments table

Table A.3.5.4. Surface Water Annual 2009 (Page 2 of 2)

Results are compared to the European Communities (Quality of Salmonid Waters) Regulations, 1988 (S.I. No. 293 of 1988). The EPA directed SDCC to do so as a result of the Three Rivers Project. It classified the Hartwell and Painestown rivers as a salmonid catchement area. The Kill river (SW4) is a tributary of the Painestown river. Reference EPA letter Ref.4-2/GEN/17EM. The term MAC is imposed upon this tables and graphs by the use of LabInfo in this Reporting Application. In this case the MAC should be seen as an indicator rather than a limit as all of the standards in the Regulations have attached notes. The quality standard for temperature for example is, "Temperature measured downstream of a point of thermal discharge must not a)exceed the unaffected temperature by more than 1.5C, b) exceed i) 21.5 c, ii) 10 C during the perod 1 November to 30 April where species which need cold water for production are present."

Table A.3.5.2.a Surface Water SW2 Weekly 2009 (Page 1 of 3)

Sample Type: SW2 Weekly, Year: 2009, All Stations, All Parameters

Station,Sampling Period			Ammonia-N	Conductivity	pH	Total Suspended Solids	Temperature	Cadmium	Lead	Manganese
			(mg/l)	(µS/cm)	(pH units)	(mg/l)	(C)	(µg/l)	(µg/l)	(µg/l)
			MAC:0.8mg/l		MAC:9pH units	MAC:25mg/l				
SW2	Q 1 Wk 1	02-Jan	0.65	895	7.4	5	6.8	<0.1	<2	60
	Q 1 Wk 2	06-Jan	0.75	890	7.8	2	7	<0.1	<2	60
	Q 1 Wk 3	13-Jan	3	863	7.6	40	10.2	<0.1	<2	90
	Q 1 Wk 4	20-Jan	8.9	891	7.9	73	6	0.3	<2	230
	Q 1 Wk 5	27-Jan	3.9	847	7.8	16	9	0.27	<2	130
	Q 1 Wk 6	04-Feb	2.8	1025	7.9	19	5	0.22	<2	100
	Q 1 Wk 7	10-Feb	2	809	7.6	13	9	<0.1	<2	140
	Q 1 Wk 8	17-Feb	<0.08	889	7.7	2	11	0.21	<2	70
	Q 1 Wk 9	24-Feb	0.8	880	7.4	2	11	<0.1	<2	60
	Q 1 Wk 10	03-Mar	0.7	860	8	9	5	<0.1	<2	60
	Q 1 Wk 11	10-Mar	<0.08	806	8	24	9	<0.1	2.9	90
	Q 1 Wk 12	18-Mar	0.5	837	7.8	9	12	0.14	<2	70
	Q 2 Wk 1	24-Mar	0.36	749	7.7	15	10	<0.1	<2	40
	Q 2 Wk 2	01-Apr	0.21	777	7.9	7	12	<0.1	<2	40
	Q 2 Wk 3	07-Apr	0.14	735	7.8	27	10	<0.1	<2	70
	Q 2 Wk 4	14-Apr	0.26	808	7.9	7	12	<0.1	<2	70
	Q 2 Wk 5	21-Apr	0.1	739	7.6	6	14	<0.1	<2	70
	Q 2 Wk 7	05-May	0.47	807	7.7	2	12	<0.1	<2	90
	Q 2 Wk 8	12-May	0.24	778	7.8	10	14	<0.1	<2	30
	Q 2 Wk 9	19-May	0.53	746	7.8	28	13	<0.1	<2	70
	Q 2 Wk 10	26-May	0.42	831	7.6	3	15	<0.1	<2	60

Table A.3.5.2.a Surface Water SW2 Weekly 2009 (Page 2 of 3)

Station,Sampling Period			Ammonia-N	Conductivity	pH	Total Suspended Solids	Temperature	Cadmium	Lead	Manganese
			(mg/l)	(µS/cm)	(pH units)	(mg/l)	(C)	(µg/l)	(µg/l)	(µg/l)
			MAC:0.8mg/l		MAC:9pH units	MAC:25mg/l				
SW2	Q 2 Wk 11	02-Jun	0.31	735	7.8	12	24	<0.1	<2	30
	Q 2 Wk 12	09-Jun	2.4	779	7.8	10	15	<0.1	<2	50
	Q 2 Wk 13	16-Jun	0.33	825	7.7	6	19	<0.1	<2	60
	Q 3 Wk 1	23-Jun	0.39	773	7.6	9	19	<0.1	<2	<30
	Q 3 Wk 2	30-Jun	0.09	800	6.4	15	20	<0.1	<2	<30
	Q 3 Wk 3	08-Jul	0.12	762	7.8	7	18	<0.1	<2	40
	Q 3 Wk 4	14-Jul	0.53	744	7.8	10	16.9	0.24	4.1	50
	Q 3 Wk 5	21-Jul	0.33	774	7.6	6	19	<0.1	3.9	40
	Q 3 Wk 6	28-Jul	<0.08	779	7.6	6	16	<0.1	<2	30
	Q 3 Wk 7	04-Aug	<0.08	691	7.7	3	16	0.17	5	<30
	Q 3 Wk 8	11-Aug	0.11	677	7.5	4	17.5	<0.1	<2	<30
	Q 3 Wk 9	18-Aug	<0.08	758	7.6	3	17	<0.1	<2	<30
	Q 3 Wk 10	25-Aug	0.65	772	7.6	3	15	<0.1	<2	30
	Q 3 Wk 11	01-Sep	3.3	779	7.5	23	14	<0.1	<2	60
	Q 4 Wk 1	22-Sep	<0.08	855	7.9	9	14	<0.1	<2	40
	Q 4 Wk 2	29-Sep	<0.1	855	7.7	4	15	<0.1	<2	<30
	Q 4 Wk 3	06-Oct	<0.08	652	7.8	25	14	<0.1	<2	40
	Q 4 Wk 4	13-Oct	0.22	836	7.5	3	12	<0.1	<2	<30
	Q 4 Wk 5	20-Oct	<0.08	800	7.5	23	12	<0.1	<2	30
	Q 4 Wk 6	27-Oct	0.96	852	7.5	5	13	<0.1	<2	50
	Q 4 Wk 7	03-Nov	2.3	729	7.6	86	11	<0.1	<2	150
	Q 4 Wk 8	10-Nov	1.2	714	7.7	50	9	<0.1	5	50

Table A.3.5.2.a Surface Water SW2 Weekly 2009 (Page 3 of 3)

Station,Sampling Period			Ammonia-N	Conductivity	pH	Total Suspended Solids	Temperature	Cadmium	Lead	Manganese
			(mg/l)	(µS/cm)	(pH units)	(mg/l)	(C)	(µg/l)	(µg/l)	(µg/l)
			MAC:0.8mg/l		MAC:9pH units	MAC:25mg/l				
SW2	Q 4 Wk 9	17-Nov	2.7	830	7.8	15	9	0.18	<2	90
	Q 4 Wk 10	26-Nov	4.5	802	7.8	26	8	<0.1	8	70
	Q 4 Wk 11	01-Dec	3	797	7.4	18	7	<0.1	<2	110

Occasions where the sampler was unable to record a measurement are indicated in a separate comments table

Results are compared to the European Communities (Quality of Salmonid Waters) Regulations, 1988 (S.I. No. 293 of 1988). The EPA directed SDCC to do so as a result of the Three Rivers Project. It classified the Hartwell and Painestown rivers as a salmonid catchement area. The Kill river (SW4) is a tributary of the Painestown river. Reference EPA letter Ref.4-2/GEN/17EM. The term MAC is imposed upon this tables and graphs by the use of LabInfo in this Reporting Application. In this case the MAC should be seen as an indicator rather than a limit as all of the standards in the Regulations have attached notes. The quality standard for temperature for example is, "Temperature measured downstream of a point of thermal discharge must not a)exceed the unaffected temperature by more than 1.5C, b) exceed i) 21.5 c, ii) 10 C during the perod 1 November to 30 April where species which need cold water for production are present."

APPENDIX 3.6

Groundwater Charts and Tables

Table A.3.6.3.e Groundwater Annual 2009 (Page 1 of 3)

Sample Type: Groundwater Annual, Year: 2009, All Stations, All Parameters

Station	MAC	MW2	MW3	MW6A	MW8	MW9	MW14	MW16	MW17
		06-May	06-May	06-May	06-May	06-May	06-May	06-May	06-May
Total Alkalinity CaCO3 (mg/l)		280	113	306	296	285	288	377	355
Groundwater Level(m O.D)		132.55		148.61	142.38	131.75	126.62	129.22	135.07
Ammonia-N (mg/l)	0.12	0.16	0.43	0.08	<0.02	0.04	<0.02	<0.02	0.07
Chloride (mg/l)	30	70	4234	12	6.4	13	40	16	25
Conductivity (µS/cm)	1000	866	11650	685	585	625	727	831	992
pH (pH units)	9.5	7.3	7.2	7.4	7.7	7.6	7.6	7.4	7.3
Temperature(C)	25	9.6	9.8	11.1	11	11.3	9.6	11.2	11.6
Total Organic Carbon(mg/l)		3.12	6.93	0.9	1.07	0.69	1.63	1.61	1.44
Boron (µg/l)	1000	11	13	10	8	18	20	19	11
Cadmium (µg/l)	5	<2	<2	<2	<2	<2	<2	<2	<2
Calcium (mg/l)	200	139	1281	208	124	124	145	148	238
Chromium (µg/l)	30	<2	7	<2	<2	<2	<2	<2	<2
Copper (µg/l)	30	<2	6	<2	<2	<2	<2	<2	<2
Iron (mg/l)	0.2	<0.1	2.1	0.7	1.1	<0.1	0.1	<0.1	<0.1
Lead (µg/l)	10	<2	81	<2	<2	<2	<2	<2	<2
Magnesium (mg/l)	50	9.1	77	9.3	6.6	19	12	21	18
Manganese (µg/l)	50	42	5014	192	13	9	37	1690	2
Nickel (µg/l)	20	<2	<2	<2	<2	<2	<2	<2	<2
Potassium (mg/l)	5	8	15	0.4	0.4	1.2	2.1	2.4	0.7
Sodium (mg/l)	150	27	2244	8.1	6	14	35	17	12
Zinc (µg/l)	100	79	128	3	4	7	7	<2	5
Cyanide (total)(mg/l)	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.08	<0.01	<0.01
Fluoride(mg/l)	1	<0.1	<0.1	<0.1	<0.1	0.16	0.27	<0.1	<0.1
Mercury(µg/l)	1	<1	<1	<1	<1	<1	<1	<1	<1
Sulphate (mg/l)	200	45.98	224.27	12.05	8.01	26.37	28.02	59.27	102.53
Orthophosphate(mg/l)	0.03	0.08	<0.01	<0.01	<0.01	0.02	<0.01	<0.01	<0.01
Total Oxidised Nitrogen (mg/l)		6.3	<0.2	1.13	<0.2	<0.2	0.54	<0.2	1.75
Total dissolved solids (mg/l)	1000	624	8658	416	334	364	432	522	626
Faecal Coliforms cfu/100ml (cfu/100ml)		<1	<1	<1	<1	<1	<1	<1	<1
Total Coliforms cfu/100ml (cfu/100ml)		<1	20	1	700	<1	<1	66	<1
Semi-volatile VOCs(µg/l)		<1			<1		<1		
Pesticides (µg/l)		<0.01			<0.01		<0.01		

Note: The results are compared to the Interim Guideline Values, taken from the EPA publication "Towards setting Guidelines for the Protection of Groundwater in Ireland", 2003

Please refer to Section 3.6 of the AER for further details of groundwater wells, e.g. well depths, location with respect to groundwater flow etc.

Occasions where the sampler was unable to record a measurement are indicated in a separate comments table

Table A.3.6.3.e Groundwater Annual 2009 (Page 2 of 3)

Station	MAC	MW18 06-May	MW19 06-May
Total Alkalinity CaCO3 (mg/l)		274	377
Groundwater Level(m O.D)		128.33	132
Ammonia-N (mg/l)	0.12	0.64	<0.02
Chloride (mg/l)	30	22	20
Conductivity (µS/cm)	1000	628	874
pH (pH units)	9.5	7.8	7.3
Temperature(C)	25	10.5	11.5
Total Organic Carbon(mg/l)		0.86	1.05
Boron (µg/l)	1000	13	11
Cadmium (µg/l)	5	<2	<2
Calcium (mg/l)	200	175	216
Chromium (µg/l)	30	<2	<2
Copper (µg/l)	30	<2	<2
Iron (mg/l)	0.2	<0.1	<0.1
Lead (µg/l)	10	<2	<2
Magnesium (mg/l)	50	19	16
Manganese (µg/l)	50	506	<2
Nickel (µg/l)	20	<2	<2
Potassium (mg/l)	5	1	0.6
Sodium (mg/l)	150	20	13
Zinc (µg/l)	100	13	9
Cyanide (total)(mg/l)	0.01	<0.01	<0.01
Fluoride(mg/l)	1	<0.1	<0.1
Mercury(µg/l)	1	<1	<1
Sulphate (mg/l)	200	18.52	74.42
Orthophosphate(mg/l)	0.03	0.09	<0.01
Total Oxidised Nitrogen (mg/l)		<0.2	1.53
Total dissolved solids (mg/l)	1000	406	538
Faecal Coliforms cfu/100ml (cfu/100ml)		<1	<1
Total Coliforms cfu/100ml (cfu/100ml)		<1	<1
Semi-volatile VOCs(µg/l)			
Pesticides (µg/l)			

Table A.3.6.3.e Groundwater Annual 2009 (Page 3 of 3)

Value above MAC (maximum allowed concentration)

Table A.3.6.2.Groundwater Quarterly 2009 (Page 1 of 2)

Sample Type: Groundwater Quarterly, Year: 2009, All Stations, All Parameters

Station,Sampling Period			Groundwater Level (m O.D)	Ammonia-N (mg/l) MAC:0.12mg/l	Chloride (mg/l) MAC:30mg/l	Conductivity (µS/cm) MAC:1000µS/cm	pH (pH units) MAC:9.5pH units	Temperature (C) MAC:25C	Total Organic Carbon (mg/l)
MW2	Qtr 1	11-Feb	132.7	<0.02	39	1013	7.4	10	2.84
	Qtr 3	04-Aug	132.96	0.2	126.14	1237	7.3	13	4
	Qtr 4	02-Nov	133.36	<0.02	72	955	7.1	11.9	
MW3	Qtr 3	05-Aug	132.29	2.19	1343	4920	7.4	10.1	5.7
MW5	Qtr 1	12-Feb	146.81						
MW6A	Qtr 1	12-Feb	149	<0.02	12	669	7.6	10.1	1.02
	Qtr 3	04-Aug	148.67	0.53	14.2	700	7.5	10.1	1.6
	Qtr 4	02-Nov	148.9	<0.02	15	742	7.3	11	
MW7	Qtr 1	12-Feb	148.61						
MW8	Qtr 1	12-Feb	141.29	0.06	3.27	509	8	10.8	1.11
	Qtr 3	05-Aug	142.41	0.24	14	654	7.4	11.5	1
	Qtr 4	02-Nov	141.93	0.02	12	600	7.6	10.9	
MW9	Qtr 1	11-Feb	130.11	0.04	13	703	7.8	10.3	0.77
	Qtr 3	05-Aug	132.27	0.38	12	609	7.6	12	1.1
	Qtr 4	02-Nov	132.25	<0.02	13	601	7.6	10.8	
MW14	Qtr 1	11-Feb	126.99	<0.02	112	1042	7.7	10.7	1.86
	Qtr 3	04-Aug	126.65	0.12	15.85	594	7.6	14.1	4.9
	Qtr 4	02-Nov	126.84	<0.02	7.1	644	7.4	12.5	
MW15	Qtr 1	11-Feb	126.87						
MW16	Qtr 1	12-Feb	129.68	<0.02	17	790	7.6	10.1	1.68
	Qtr 3	04-Aug	129.49	0.02	16.74	786	7.4	11.4	3

Table A.3.6.2.Groundwater Quarterly 2009 (Page 2 of 2)

Station,Sampling Period			Groundwater Level	Ammonia-N	Chloride	Conductivity	pH	Temperature	Total Organic Carbon
			(m O.D)	(mg/l)	(mg/l)	(µS/cm)	(pH units)	(C)	(mg/l)
				MAC:0.12mg/l	MAC:30mg/l	MAC:1000µS/cm	MAC:9.5pH units	MAC:25C	
MW16	Qtr 4	02-Nov	129.07	<0.02	16	745	7.4	11.1	
MW17	Qtr 1	11-Feb	135.45	0.06	23	1231	7.4	10.6	1.13
	Qtr 3	05-Aug	134.7	0.33	18	1178	7.2	13.8	1.5
MW18	Qtr 1	12-Feb	128.58	0.03	11	544	8.1	10.1	0.71
	Qtr 3	04-Aug	128.96	0.1	11.82	583	7.9	11	0.8
MW19	Qtr 1	11-Feb	132.55	<0.02	18	948	7.4	10.3	1.07
	Qtr 3	04-Aug	131.7	0.1	20.57	870	7.4	11.6	1.9
MW20	Qtr 4	02-Nov	150.49	0.08	146	2815	7.1	11.4	
MW22	Qtr 4	02-Nov	142.4	0.06	11	538	7.6	11.1	

Note: The results are compared to the Interim Guideline Values, taken from the EPA publication "Towards setting Guidelines for the Protection of Groundwater in Ireland", 2003

Please refer to Section 3.6 of the AER for further details of groundwater wells, e.g. well depths, location with respect to groundwater flow etc.

Occasions where the sampler was unable to record a measurement are indicated in a separate comments table

Value above MAC (maximum allowed concentration)

APPENDIX 3.7

Private Wells (Groundwater) Charts and Tables

Table A.3.7.2.a Private Wells Annual 2009 (Page 1 of 1)

Sample Type: Private Groundwater Wells Annual, Year: 2009, All Stations, All Parameters

Station		PW1	PW2	PW3	PW4	PW5
		06-May	06-May	06-May	06-May	06-May
Total Coliforms MPN/100ml (MPN/100ml)		14	80	31	>1000	<1
Ammonia-N (mg/l)	0.23	0.09	0.07	0.02	0.03	<0.02
Chloride (mg/l)	250	34	13	16	22	44
Conductivity (µS/cm)	2500	868	560	732	692	822
pH (pH units)	9.5	7.3	7.6	7	7.4	7.4
Total Organic Carbon(mg/l)		1.44	0.67	1.01	0.82	0.92
Boron (µg/l)	1000	28	9	11	10	13
Cadmium (µg/l)	5	<2	<2	<2	<2	<2
Calcium (mg/l)		176	94	166	159	0.9
Chromium (µg/l)	50	<2	<2	<2	<2	<2
Copper (µg/l)	2000	<2	<2	<2	<2	<2
Iron (mg/l)	0.2	<0.1	1.2	<0.1	<0.1	<0.1
Lead (µg/l)	25	<2	<2	<2	<2	<2
Magnesium (mg/l)		15	17	<2	19	0.1
Manganese (µg/l)	50	<2	81	<2	4	<2
Nickel (µg/l)	20	<2	<2	<2	<2	<2
Potassium (mg/l)		8.5	0.8	0.4	0.9	0.4
Sodium (mg/l)	200	25	16	7.9	9.1	263
Zinc (µg/l)		28	87	3	16	5
Cyanide (total)(µg/l)	50	<0.01	<0.01	<0.01	<0.01	<0.01
Fluoride(mg/l)	1.5	<0.1	0.21	<0.1	<0.1	<0.1
Mercury(µg/l)	1	<1	<1	<1	<1	<1
Sulphate (mg/l)	250	42.4	15.18	16.15	31.95	23.92
Orthophosphate(mg/l)		<0.01	0.06	<0.01	<0.01	<0.01
Total Oxidised Nitrogen (mg/l)		6.5	<0.2	0.9	4.63	3.86
Residue on Evaporation (mg/l)		514	336	460	532	550
Faecal Coliforms MPN/100ml(MPN/100ml)		11	<1	<1	<1	<1

Value above MAC (maximum allowed concentration)

Note 1: The results are compared to the limits set by the European Communities (Drinking Water) Regulations SI No.106 of 2007)

Note 2: For the purposes of this reporting system, the parametric values set in the regulations are referred to as the Maximum Allowed Concentration (MAC).

If there is no MAC limit displayed for a particular parameter, it was either not set by the regulations or is listed below:

TOC: no abnormal change, pH: >= 6.5 and <= 9.5

Occasions where the sampler was unable to record a measurement are indicated in a separate comments table

Table A.3.7.1.b Private Wells Quarterly 2009 (Page 1 of 1)

Sample Type: Private Groundwater Wells Quarterly, Year: 2009, All Stations, All Parameters

Station,Sampling Period			Ammonia-N (mg/l) MAC:0.23mg/l	Chloride (mg/l) MAC:250mg/l	Conductivity (µS/cm) MAC:2500µS/cm	pH (pH units) MAC:9.5pH units	Temperature (C)	Total Organic Carbon (mg/l)
PW1	Qtr 1	12-Feb	0.12	28	970	7.3	10.1	1.23
	Qtr 3	05-Aug	<0.02	31.45	856	7.2		1.36
	Qtr 4	02-Nov	<0.02	30	854	7.1		

Value above MAC (maximum allowed concentration)

Note 1: The results are compared to the limits set by the European Communities (Drinking Water) Regulations SI No.106 of 2007)

Note 2: For the purposes of this reporting system, the parametric values set in the regulations are referred to as the Maximum Allowed Concentration (MAC).

If there is no MAC limit displayed for a particular parameter, it was either not set by the regulations or is listed below:

TOC: no abnormal change, pH: >= 6.5 and <= 9.5

Note 3: In accordance with Waste Licence W004-03, sampling of 1 no. private well is carried out on a quarterly basis (PW1)

Occasions where the sampler was unable to record a measurement are indicated in a separate comments table

APPENDIX 3.8

Leachate Charts and Tables

Table A.3.8.2.a Leachate Annual 2009 (Page 1 of 4)

Sample Type: Leachate Annually, Year: 2009, All Stations, All Parameters

Station		LC1	LC2	LC3	LC4	LC5	LC6	LC7	LC8
		07-May	07-May	07-May	07-May	07-May	07-May	07-May	07-May
Temperature(C)		12.4	12.8	11.9	13.3	27.3	26.6	26.1	16.9
Ammonia-N (mg/l)		2109	1938	1980	2061	2386	3127	160	160
BOD (mg/l)		143	154	144	124	123	513	719	51
COD (mg/l)		4050	4230	4055	3555	4270	5325	6435	559
Chloride (mg/l)		2524	2570	2498	2748	2780	3003	2816	408
Conductivity (µS/cm)		24290	25770	25580	21250	28350	31100	3200	30200
pH (pH units)		7.9	7.7	7.7	8	7.7	7.8	7.1	7.6
Boron (µg/l)		2934	2909	2668	1871	3284	3665	3547	319
Cadmium (µg/l)		<20	<20	<20	<20	<20	<20	<20	<20
Calcium (mg/l)		50	53	56	67	57	74	87	334
Chromium (µg/l)		481	619	533	434	548	596	593	44
Copper (µg/l)		<20	<20	<20	<20	<20	<20	<20	<20
Iron (mg/l)		6	6	4	3	4	8	9	3
Lead (µg/l)		<20	<20	<20	<20	<20	18	<20	<20
Magnesium (mg/l)		55	56	54	37	62	67	55	45
Manganese (µg/l)		222	177	155	74	171	426	500	5833
Nickel (µg/l)		538	554	542	422	573	489	481	65
Potassium (mg/l)		1304	1465	1473	1239	1558	1642	1529	114
Sodium (mg/l)		1940	2194	2096	1712	2312	2342	2213	195
Zinc (µg/l)		212	224	137	349	311	361	636	361
Cyanide (total)(mg/l)		<1	<1	<1	<1	<1	<1	<1	<1
Fluoride(mg/l)		<0.5	<0.5	<0.5	0.74	<0.5	<0.1	<0.1	<0.5
Mercury(µg/l)		<10	<10	<10	<10	<10	<10	<10	<10
Sulphate (mg/l)		96.45	6.74	33.8	22.64	5.89	13.84	12.24	497.57
Total Phosphorus(mg/l)		21.7	26.2	24.95	16.65	26.3	36.3	38.8	1.05
Nitrate(mg/l)		0.24	<0.2	<0.2	21	<0.2	<0.2	<0.2	<0.2
Nitrite(mg/l)		<0.02	<0.02	<0.02	8.2	<0.02	<0.02	<0.02	<0.02
Total Oxidised Nitrogen (mg/l)		0.26	<0.2	<0.2	29	<0.2	<0.2	<0.2	<0.2

The waste licence (W004-03), Schedule D.1 Table D.1.states that leachate levels should be recorded for all sumps and collection points on a continuous basis.
SDCC carries out annual monitoring of all leachate cells and leachate storage points on site.
The waste licence conditions sampling at 5 locations, LC1, LC3, LC11, LL (leachate lagoon) and LB (leachate balance tank).
For interpretative purposes it is useful to examine the results of LT2 (leachate aeration tank).
Data for all stations as monitored on site is stored in the database. Only the stations as conditioned by the licence are displayed in this report.
Data relating to other stations can be included by changing the status of the station to Active in Lab Info".

The SBR plant was upgraded in 2006. From 2001 to end of Quarter 2, 2006 there was a storage tank named Storage Tank (LT2). This tank changed function at that point to an aeration tank and was renamed Aeration Tank (LT2).Therefore the data for Storage Tank (LT2) ceases following Q2, 2006 and the data for Aeration Tank (LT2) commences.

Table A.3.8.2.a Leachate Annual 2009 (Page 2 of 4)

Station		LC9	LC10	LC12	LC13	LC14	LC15	Leachate Lagoon (LL)	Balance Tank (LB)
		07-May	07-May	07-May	07-May	07-May	07-May	07-May	07-May
Temperature(C)		30.1	28.6	27.8	26.9	24.3	21.8	10.6	27.3
Ammonia-N (mg/l)		2717	2166	3319	3460	3431	3140	1867	24
BOD (mg/l)		196	255	675	663	445	8100	625	31
COD (mg/l)		4830	4860	7333	7730	7220	16240	3500	2086
Chloride (mg/l)		3051	2907	3257	3217	3075	2950	1986	2383
Conductivity (µS/cm)		29800	30300	33700	34400	33800	32100	22190	23490
pH (pH units)		7.8	7.8	7.8	7.8	7.8	7.5	7.6	7.7
Boron (µg/l)		3927	2188	4325	3703	4507	3878	2735	3878
Cadmium (µg/l)		<20	<20	<20	<20	<20	<20	<20	<20
Calcium (mg/l)		51	97	81	63	78	316	293	316
Chromium (µg/l)		528	459	798	842	823	439	249	439
Copper (µg/l)		<20	<20	<20	<20	<20	133	<20	133
Iron (mg/l)		6	6	6.4	4.2	3.2	38.6	5.4	3.7
Lead (µg/l)		<20	<20	<20	<20	<20	<20	<20	<20
Magnesium (mg/l)		62	53	84	64	82	190	132	190
Manganese (µg/l)		172	505	518	348	403	3544	2084	3544
Nickel (µg/l)		628	375	597	485	510	591	408	591
Potassium (mg/l)		1627	1271	1932	1694	1749	1829	1174	1829
Sodium (mg/l)		2385	1762	2797	2336	2399	2292	1560	2292
Zinc (µg/l)		407	367	695	604	709	1221	478	1221
Cyanide (total)(mg/l)		<1	<1	<1	<1	<1	<1	<1	<1
Fluoride(mg/l)		<0.5	0.94	<0.5	<0.5	0.77	<0.5	<0.5	<0.5
Mercury(µg/l)		<10	<10	<10	<10	<10	<10	<10	<10
Sulphate (mg/l)		40.77	66.69	25.04	17.87	12.21	37.22	5.55	100.23
Total Phosphorus(mg/l)		27.5	23.28	38.5	42.4	45.5	29.45	12.15	17.2
Nitrate(mg/l)		<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	0.22	2268
Nitrite(mg/l)		<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	10
Total Oxidised Nitrogen (mg/l)		<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	0.21	2275

Table A.3.8.2.a Leachate Annual 2009 (Page 3 of 4)

Station		Aeration Tank (LT1)	Storage Tank (LT2)
		07-May	07-May
Temperature(C)		31	33.6
Ammonia-N (mg/l)		9.4	60
BOD (mg/l)		44	88
COD (mg/l)		5185	6310
Chloride (mg/l)		2334	2571
Conductivity (µS/cm)		22150	24150
pH (pH units)		7.3	7.9
Boron (µg/l)		2478	3354
Cadmium (µg/l)		<20	<20
Calcium (mg/l)		127	237
Chromium (µg/l)		476	616
Copper (µg/l)		<20	<20
Iron (mg/l)		13.7	19.5
Lead (µg/l)		<20	25
Magnesium (mg/l)		72	84
Manganese (µg/l)		1065	1516
Nickel (µg/l)		379	508
Potassium (mg/l)		1032	1333
Sodium (mg/l)		1866	3847
Zinc (µg/l)		552	625
Cyanide (total)(mg/l)		<1	<1
Fluoride(mg/l)		<0.5	<0.5
Mercury(µg/l)		<10	<10
Sulphate (mg/l)		104.36	105.36
Total Phosphorus(mg/l)		69.6	66.4
Nitrate(mg/l)		4.57	2378
Nitrite(mg/l)		0.06	8
Total Oxidised Nitrogen (mg/l)		4.62	2386

Table A.3.8.2.a Leachate Annual 2009 (Page 4 of 4)

Occasions where the sampler was unable to record a measurement are indicated in a separate comments table

Table A.3.8.1.a Leachate Quarterly 2009 (Page 1 of 1)

Sample Type: Leachate Quarterly, Year: 2009, All Stations, All Parameters

Station	Temperature (C)		
	Qtr 1 : 13-Feb	Qtr 3 : 05-Aug	Qtr 4 : 03-Nov
LC1	24.6	14.6	27.5
LC2	21.8		
LC3	15.1		
LC4	15.3		
LC5	26.4		
LC6	19.9		
LC7	19.4		
LC8	18.4	18.4	24.5
LC9	20		
LC10	22.7		
LC11	24.9		
LC12	25.7	25.7	
LC13	17.6		
LC14	21.2		
LC15	20.1		
Leachate Lagoon (LL)	8.9	22.7	18.6
Balance Tank (LB)	21.7	12.9	19.1
Aeration Tank (LT1)	26.4		
Storage Tank (LT2)	25		

The waste licence (W004-03), Schedule D.1 Table D.1.states that leachate levels should be recorded for all sumps and collection points on a continuous basis.
SDCC carries out annual monitoring of all leachate cells and leachate storage points on site.
The waste licence conditions sampling at 5 locations, LC1, LC3, LC11, LL (leachate lagoon) and LB (leachate balance tank).
For interpretative purposes it is useful to examine the results of LT2 (leachate aeration tank).
Data for all stations as monitored on site is stored in the database. Only the stations as conditioned by the licence are displayed in this report.
Data relating to other stations can be included by changing the status of the station to Active in Lab Info".

The SBR plant was upgraded in 2006. From 2001 to end of Quarter 2, 2006 there was a storage tank named Storage Tank (LT2). This tank changed function at that point to an aeration tank and was renamed Aeration Tank (LT2).Therefore the data for Storage Tank (LT2) ceases following Q2, 2006 and the data for Aeration Tank (LT2) commences.

Occasions where the sampler was unable to record a measurement are indicated in a separate comments table

APPENDIX 3.9

Meteorological Monitoring

Date	Evap	Rain	Temp (0C)			RH%			Atm P (mb)			NR (W/m2)			Indoor Temp (oC)			Wind Direction			Wind Speed (m/s)		
	(mm)	(mm)	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min
01/01/2009	0.7	0.0	2.3	4.0	-0.7	85	91	78	1012	1013	1011	-44	3	-75	20.4	21.8	19.7	98	360	1	2.8	10.3	0.0
02/01/2009	0.5	0.0	2.4	4.7	0.0	78	87	66	1014	1015	1013	-28	59	-87	19.6	20.6	18.7	137	207	35	3.1	9.5	0.3
03/01/2009	0.8	0.0	2.0	3.2	0.3	67	75	58	1013	1015	1011	-11	22	-54	19.2	19.8	18.9	170	355	4	1.8	6.3	0.0
04/01/2009	0.8	2.0	0.7	2.1	-2.2	84	95	69	1007	1011	1005	-16	74	-62	18.7	19.1	18.4	205	360	1	1.8	5.4	0.0
05/01/2009	0.4	0.0	0.6	4.8	-3.0	83	94	70	1008	1013	1005	-31	57	-83	19.1	21.2	18.0	133	360	1	1.9	8.6	0.0
06/01/2009	0.5	0.0	-1.0	1.7	-3.4	72	81	61	1012	1013	1011	-39	14	-72	19.2	20.4	18.3	186	357	3	1.8	4.8	0.0
07/01/2009	0.6	0.0	-0.7	3.1	-2.9	72	81	56	1011	1012	1010	-38	3	-54	18.3	19.9	17.1	199	339	97	2.6	5.2	0.1
08/01/2009	0.9	0.0	2.1	4.6	-2.2	74	87	58	1011	1012	1010	-37	7	-63	18.7	20.7	17.8	196	285	108	3.3	7.8	0.5
09/01/2009	1.0	0.0	3.7	5.3	1.9	77	91	66	1009	1010	1007	-14	60	-66	18.8	19.8	18.1	197	308	102	3.5	13.0	0.0
10/01/2009	0.9	0.4	6.3	8.0	2.9	76	87	69	1000	1007	996	-19	15	-61	18.3	19.0	17.8	211	294	108	8.8	20.6	1.8
11/01/2009	1.5	11.8	9.3	10.8	7.7	88	91	85	990	997	984	-15	22	-48	19.0	19.4	18.5	214	306	108	10.4	25.3	3.1
12/01/2009	1.0	8.4	7.7	10.8	5.5	89	94	82	986	988	984	-21	45	-60	20.6	22.8	19.4	215	336	90	4.2	17.5	1.0
13/01/2009	0.7	3.4	4.2	6.5	1.7	89	95	79	991	995	988	-23	85	-63	21.5	23.6	20.4	217	358	1	2.8	7.1	0.0
14/01/2009	0.5	3.0	5.9	9.9	1.2	84	91	72	989	995	981	-36	-2	-66	20.8	21.3	20.4	190	267	129	6.7	22.5	1.2
15/01/2009	1.3	6.2	9.1	10.0	6.2	85	92	76	983	988	980	-25	83	-70	21.4	22.5	20.2	202	321	98	7.4	21.1	1.2
16/01/2009	1.2	0.2	6.7	8.3	4.9	85	92	75	986	989	982	-31	43	-71	21.5	22.3	20.6	205	290	108	5.7	19.1	1.3
17/01/2009	1.0	10.4	5.3	8.0	2.0	81	92	68	977	986	965	-38	28	-93	20.6	21.8	19.8	219	353	88	7.7	33.0	0.9
18/01/2009	1.3	4.0	2.1	4.3	0.4	86	92	73	972	975	969	-29	72	-171	19.2	19.8	18.7	223	329	100	6.0	18.1	0.6
19/01/2009	0.8	13.0	2.2	4.9	0.2	87	94	72	961	969	958	-23	74	-101	19.5	21.1	18.7	222	351	17	5.4	17.5	0.8
20/01/2009	0.8	0.6	1.6	2.9	0.5	86	91	77	970	979	962	-27	41	-68	19.9	23.1	18.5	226	341	99	5.0	12.1	0.8
21/01/2009	0.6	2.0	3.9	9.9	0.3	87	91	77	975	981	962	-29	17	-66	22.2	23.4	20.0	205	316	108	5.9	17.4	1.5
22/01/2009	1.0	4.4	5.8	9.9	2.1	81	93	66	963	967	959	-21	71	-69	23.9	25.7	23.3	232	360	98	5.3	15.9	1.2
23/01/2009	1.3	0.0	2.6	5.9	0.3	85	93	70	963	967	958	-32	52	-67	23.2	25.1	22.3	237	350	19	3.4	11.8	0.4
24/01/2009	0.8	0.2	2.9	6.7	0.8	83	91	71	969	973	956	-28	14	-104	21.8	22.9	20.4	201	286	108	5.2	23.3	1.4
25/01/2009	1.0	2.4	4.5	7.6	1.9	83	92	69	958	969	951	-24	101	-119	20.6	21.2	20.0	183	360	1	5.2	19.4	0.0
26/01/2009	1.1	0.4	4.5	8.6	1.5	87	94	70	982	989	969	-10	122	-79	22.3	25.7	20.6	253	360	1	2.1	10.6	0.0
27/01/2009	0.7	3.2	6.5	7.7	3.8	91	95	79	991	994	988	-8	46	-49	24.1	25.0	23.3	208	347	94	3.0	11.6	0.2
28/01/2009	0.6	0.0	5.5	10.0	2.5	79	92	62	996	997	994	-36	46	-70	23.3	25.6	21.2	194	360	1	2.8	6.6	0.0
29/01/2009	1.1	0.0	7.4	9.0	4.7	80	87	74	990	996	985	-17	73	-95	21.3	22.2	20.8	178	360	1	8.2	21.1	0.0
30/01/2009	1.4	3.0	9.3	11.2	6.3	84	88	80	985	987	983	-48	-7	113	22.6	23.5	21.5	183	244	105	9.9	21.2	2.0
31/01/2009	1.3	2.6	5.6	6.3	5.1	84	89	76	988	992	985	-18	31	-60	22.9	23.2	22.5	163	278	85	6.3	20.4	0.4
	Sum	**Sum**	**Avg**	**Max**	**Min**	**Avg**	**Max**	**Min**	**Avg**	**Max**	**Min**	**Avg**	**Max**	**Min**	**Avg**	**Max**	**Min**	**Avg**	**Max**	**Min**	**Avg**	**Max**	**Min**
Monthly	28.1	81.6	4.2	11.2	-3.4	82	95	56	989	1015	951	-26	122	-171	20.7	25.7	17.1	197	360	1	4.8	33.0	0.0

Date	Evap	Rain	Temp (oC)			RH %			Atm P (mb)			NR (W/m2)			Indoor Temp (oC)			Wind Direction			Wind Speed (m/s)		
	(mm)	(mm)	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min
01/02/2009	1.0	0.0	2.7	5.3	1.0	72	79	60	995	997	992	-19	131	-79	22.8	23.2	22.4	112	360	1	4.1	14.5	0.0
02/02/2009	1.3	2.0	-0.1	3.0	-2.4	86	96	57	990	997	980	-20	19	-110	22.2	22.9	21.8	76	360	1	3.3	12.4	0.1
03/02/2009	0.8	21.0	0.3	1.7	-1.5	94	97	86	973	980	969	-28	52	-200	22.0	22.6	21.5	103	360	1	4.1	16.9	0.0
04/02/2009	0.3	25.4	2.1	4.4	0.2	87	92	79	975	977	972	-15	36	-121	21.5	22.5	20.9	94	360	2	3.7	14.2	0.2
05/02/2009	0.6	4.8	-0.1	0.9	-1.8	93	95	89	978	981	976	-25	1	-200	20.2	20.9	19.7	74	360	1	2.3	11.2	0.0
06/02/2009	0.2	2.4	-0.9	4.1	-4.4	87	96	66	982	984	981	-36	81	-79	20.3	23.4	17.9	208	360	1	1.5	8.1	0.0
07/02/2009	0.4	0.2	-0.4	4.2	-5.2	82	94	60	987	989	984	-37	51	-75	22.1	24.4	20.9	228	360	1	2.1	10.7	0.0
08/02/2009	0.6	1.4	1.2	4.2	-4.0	84	92	69	984	989	981	-24	12	-83	21.9	23.3	21.2	195	288	99	3.3	12.8	0.1
09/02/2009	0.7	0.0	1.6	5.3	-0.5	89	96	75	979	983	975	-23	16	-56	22.3	23.8	21.3	134	360	1	2.7	8.5	0.0
10/02/2009	0.5	0.0	1.9	6.4	-0.8	89	96	71	990	998	979	-23	36	-66	23.3	25.1	22.4	233	360	1	2.5	9.8	0.1
11/02/2009	0.6	0.0	2.7	4.8	1.4	91	94	88	1003	1009	998	-13	45	-66	23.0	23.8	22.3	177	350	1	2.1	6.5	0.0
12/02/2009	0.3	0.2	4.4	7.9	1.3	82	93	44	1008	1010	1007	4	86	-40	22.0	23.5	20.6	209	351	89	3.1	10.3	0.3
13/02/2009	1.5	0.2	6.3	7.8	4.9	91	95	87	1009	1010	1008	4	89	-28	23.0	23.8	20.9	206	355	96	1.9	5.0	0.0
14/02/2009	0.3	0.0	6.9	8.4	5.5	78	89	67	1010	1012	1009	-3	38	-55	21.8	22.7	21.3	194	321	98	2.9	6.6	0.2
15/02/2009	1.0	0.0	7.6	11.3	5.5	81	90	68	1011	1012	1011	-1	125	-44	21.5	22.8	20.7	218	352	96	3.1	7.7	0.5
16/02/2009	1.2	0.0	6.9	9.6	3.9	81	89	73	1011	1012	1011	-7	77	-51	21.8	22.7	20.9	229	342	96	2.8	7.4	0.7
17/02/2009	0.9	0.0	7.9	11.4	5.9	76	84	61	1013	1014	1012	-1	83	-23	21.4	22.2	20.1	248	360	1	1.7	5.7	0.0
18/02/2009	1.1	0.0	6.7	7.5	6.0	72	80	64	1011	1014	1010	-5	23	-27	21.9	22.3	20.6	195	306	108	2.5	5.3	0.5
22/02/2009	1.1	0.4	8.0	9.5	5.8	89	95	82	1015	1016	1014	0	243	-45	20.2	20.6	19.8	282	360	1	3.1	9.6	0.3
23/02/2009	0.6	0.4	7.9	12.4	5.7	88	95	71	1012	1014	1011	9	202	-44	20.5	22.0	19.5	267	360	1	2.0	6.9	0.0
24/02/2009	0.9	0.0	7.3	8.6	6.4	89	95	79	1012	1013	1011	2	42	-15	22.6	24.2	21.6	223	360	1	1.3	8.0	0.0
25/02/2009	0.4	0.2	6.8	10.5	4.0	79	94	60	1011	1012	1010	-3	169	-57	22.7	24.0	19.9	235	357	1	3.6	13.0	0.8
26/02/2009	1.4	0.2	6.6	9.8	3.2	85	91	71	1008	1011	1005	-2	112	-45	20.2	21.1	18.9	227	347	89	3.8	12.5	0.9
27/02/2009	1.1	0.0	8.0	9.2	6.8	83	88	70	1002	1005	999	5	124	-33	20.3	21.0	19.7	223	340	94	4.0	10.7	0.9
28/02/2009	1.2	0.0	7.6	9.3	6.7	85	90	77	994	999	990	0	164	-53	20.0	20.6	19.3	204	291	108	5.1	14.5	1.4
	Sum	**Sum**	**Avg**	**Max**	**Min**	**Avg**	**Max**	**Min**	**Avg**	**Max**	**Min**	**Avg**	**Max**	**Min**	**Avg**	**Max**	**Min**	**Avg**	**Max**	**Min**	**Avg**	**Max**	**Min**
Monthly	20.0	58.8	4.4	12.4	-5.2	84	97	44	999	1016	969	-11	243	-200	21.6	25.1	17.9	192	360	1	2.9	16.9	0.0

Date	Evap	Rain	Temp (oC)			RH %			Atm P (mb)			NR (W/m2)			Inddor Temp (oC)			Wind Direction			Wind Speed (m/s)		
	(mm)	(mm)	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min
01/03/2009	1.1	3.6	5.7	9.8	3.2	84	93	65	992	999	989	-6	282	-62	19.9	21.3	18.8	250	360	1	3.1	9.2	0.4
02/03/2009	1.1	0.6	5.4	9.4	2.4	88	93	78	998	999	995	-22	171	-65	19.6	20.7	18.5	219	349	94	4.0	11.2	0.6
03/03/2009	0.8	9.0	4.1	6.3	-0.1	86	93	79	979	995	965	-20	76	-71	20.6	21.9	19.6	224	360	1	5.0	14.0	1.0
04/03/2009	0.7	0.2	0.7	4.2	-1.3	88	94	72	965	968	964	-6	243	-69	21.2	22.8	19.9	204	360	1	2.6	7.3	0.0
05/03/2009	0.6	3.4	1.9	8.9	-2.4	86	96	57	980	988	968	-2	256	-200	21.8	23.7	20.5	219	360	1	1.8	12.0	0.0
06/03/2009	0.9	0.2	5.2	10.1	1.1	85	92	73	988	992	986	4	159	-59	20.6	22.0	19.5	223	360	1	3.6	12.0	0.5
07/03/2009	1.0	2.6	8.5	13.2	5.0	85	92	75	988	993	980	0	153	-79	19.8	20.8	19.0	228	354	1	5.8	24.5	0.7
08/03/2009	1.4	8.4	2.5	5.0	0.2	86	95	71	984	989	981	-14	324	-200	18.2	19.7	17.0	243	360	1	5.0	17.3	0.8
09/03/2009	0.8	4.8	4.9	8.7	1.9	81	90	62	992	995	986	-8	208	-73	18.9	21.9	17.0	242	353	86	4.5	12.6	1.0
10/03/2009	1.4	0.8	7.5	10.4	6.4	83	92	64	994	1003	986	3	134	-75	22.9	25.7	21.2	226	360	1	2.7	10.6	0.0
11/03/2009	1.1	0.0	10.4	14.3	7.2	83	91	72	1002	1004	1000	18	167	-41	23.8	25.7	22.6	211	317	105	4.7	12.1	1.1
12/03/2009	1.5	0.2	9.3	13.1	5.6	76	92	52	1003	1004	1000	8	234	-54	24.2	25.8	23.1	250	359	1	4.2	14.4	0.7
13/03/2009	2.1	1.6	8.0	9.3	5.3	85	93	75	997	1004	989	3	103	-53	22.0	24.1	20.8	200	322	99	5.4	19.5	0.0
14/03/2009	1.1	0.8	8.3	11.5	5.5	73	90	54	1001	1010	990	6	234	-81	20.8	22.1	19.7	272	360	1	4.9	19.0	0.8
15/03/2009	2.0	0.0	8.6	12.2	5.4	74	87	59	1014	1015	1010	7	182	-54	21.3	22.6	20.2	217	344	91	3.5	8.9	0.6
16/03/2009	1.7	0.0	8.0	12.1	4.6	78	90	63	1015	1017	1014	3	163	-50	21.3	22.8	20.0	201	352	23	3.1	10.2	0.0
17/03/2009	1.4	0.0	9.8	15.1	5.5	70	90	40	1017	1018	1016	-3	141	-77	22.6	25.2	21.0	150	355	2	2.5	10.6	0.0
18/03/2009	2.2	0.0	10.2	18.1	3.7	68	88	41	1014	1017	1012	-12	127	-71	23.4	26.6	21.2	184	360	1	1.4	6.6	0.0
19/03/2009	1.7	0.0	6.9	15.8	-2.1	79	95	52	1011	1012	1010	12	214	-78	24.0	27.6	21.5	150	360	1	1.2	5.0	0.0
20/03/2009	1.1	0.0	8.8	13.0	3.5	72	90	50	1012	1014	1011	-7	128	-69	24.0	26.1	22.5	195	360	1	2.7	8.6	0.0
21/03/2009	1.8	0.0	6.4	12.6	3.1	85	95	65	1018	1021	1014	-13	100	-61	22.3	23.9	21.4	221	360	1	1.8	6.5	0.0
22/03/2009	0.9	0.0	7.1	12.1	2.0	82	93	65	1019	1021	1014	-3	153	-56	21.2	22.3	20.4	249	360	1	2.8	10.5	0.2
23/03/2009	1.2	1.6	7.0	9.6	2.7	79	92	54	1007	1014	1004	-5	189	-61	21.2	23.0	20.3	281	360	1	4.9	17.7	0.2
24/03/2009	1.7	0.2	5.6	10.9	0.8	84	92	70	1003	1008	993	-4	160	-76	20.9	22.7	19.4	239	360	1	3.7	14.7	0.0
25/03/2009	1.1	0.0	8.2	12.4	5.8	70	91	48	993	994	991	17	272	-57	22.9	24.8	21.9	296	360	1	6.0	17.2	0.9
26/03/2009	2.5	3.0	7.1	9.5	3.0	79	94	56	985	991	983	15	329	-144	22.2	24.1	21.0	272	360	1	6.3	17.8	1.0
27/03/2009	1.8	1.2	5.1	9.9	2.6	75	89	50	981	986	978	7	263	-83	22.8	26.5	21.0	278	360	1	4.8	14.9	0.9
28/03/2009	1.9	0.2	4.3	8.8	-1.2	66	85	37	992	998	982	2	229	-67	22.7	24.3	21.8	154	360	1	4.4	17.6	0.0
29/03/2009	2.2	0.4	4.7	9.7	-1.6	76	93	48	995	998	992	16	176	-57	21.4	22.7	20.2	201	313	108	4.7	14.2	0.0
30/03/2009	1.9	0.2	8.7	11.4	6.6	85	95	74	1001	1005	996	16	146	-42	22.3	23.6	21.3	219	340	88	2.5	6.9	0.4
31/03/2009	0.9	0.0	10.8	16.9	7.3	70	89	42	1006	1007	1005	19	261	-56	24.2	26.1	22.8	191	360	1	2.4	6.8	0.0
	Sum	**Sum**	**Avg**	**Max**	**Min**	**Avg**	**Max**	**Min**	**Avg**	**Max**	**Min**	**Avg**	**Max**	**Min**	**Avg**	**Max**	**Min**	**Avg**	**Max**	**Min**	**Avg**	**Max**	**Min**
Monthly	43.6	43.0	6.8	18.1	-2.4	79	96	37	998	1021	964	1	329	-200	21.8	27.6	17.0	223	360	1	3.7	24.5	0.0

Date	Evap	Rain	Temp (oC)			RH %			Atm Pressure (mb)			NR (w/m2)			Indoor Temp (oC)			W Direction			Wind Speed (m/s)		
	(mm)	(mm)	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min
01/04/2009	2.4	0.0	8.5	11.6	5.6	73	90	55	1007	1008	1006	1	247	-68	23.9	25.1	23.3	189	312	85	3.1	8.5	0.0
02/04/2009	1.6	0.0	10.8	18.1	4.6	68	86	46	1005	1007	1002	6	194	-65	23.7	28.0	21.6	187	360	1	2.4	6.7	0.0
03/04/2009	2.4	3.2	9.0	12.5	5.3	77	92	59	998	1002	994	-6	152	-74	23.3	24.8	22.2	197	324	92	4.3	13.0	0.0
04/04/2009	1.8	0.6	8.2	12.9	5.0	72	92	40	1001	1007	994	20	357	-67	22.7	25.7	21.2	254	360	1	4.0	11.6	0.2
05/04/2009	2.5	0.0	7.3	12.2	3.6	69	77	52	1003	1007	997	3	206	-62	22.0	23.6	20.8	197	356	102	4.1	10.8	0.7
06/04/2009	2.3	5.0	7.5	9.2	6.1	80	88	71	988	997	984	-10	119	-73	21.1	22.0	20.5	184	314	30	4.7	14.0	0.4
07/04/2009	1.2	5.0	7.1	11.4	4.2	79	89	59	981	985	970	-1	294	-108	20.5	22.0	19.3	204	317	106	6.9	21.8	1.5
08/04/2009	2.1	0.6	8.6	14.2	5.0	70	88	43	984	989	971	9	347	-116	20.9	24.1	19.2	237	350	5	5.1	20.9	0.7
09/04/2009	2.9	2.4	10.5	11.7	7.7	84	90	77	980	986	978	-9	122	-85	21.7	22.7	20.3	195	279	108	8.4	20.9	2.2
10/04/2009	1.4	4.0	7.5	13.0	4.4	77	94	38	983	988	978	22	392	-62	21.7	24.5	20.3	232	360	2	2.7	13.4	0.2
11/04/2009	2.1	0.0	7.6	13.1	2.9	73	87	47	992	997	988	15	275	-64	21.5	24.0	19.8	202	357	2	3.0	8.1	0.5
12/04/2009	2.1	0.0	8.8	13.9	2.9	73	90	51	997	999	995	20	268	-68	22.4	25.9	20.6	197	318	93	3.4	9.1	0.4
13/04/2009	2.1	0.2	9.1	11.1	7.4	78	86	70	990	995	988	9	260	-64	21.8	23.0	21.2	181	269	96	5.4	14.7	0.6
14/04/2009	1.6	0.0	9.2	13.0	4.7	76	89	54	991	994	989	25	420	-91	22.3	26.8	20.5	151	260	18	3.4	11.2	0.0
15/04/2009	1.9	2.4	8.6	10.0	6.4	90	94	82	992	994	990	-4	144	-66	22.6	23.6	21.6	73	360	1	4.2	15.7	0.0
16/04/2009	0.7	3.8	8.9	9.9	8.1	89	93	84	992	994	991	-11	94	-62	22.5	23.0	22.1	77	360	1	4.5	14.9	0.1
17/04/2009	0.7	1.4	8.1	9.7	6.8	89	92	83	997	1000	994	-3	105	-53	21.1	22.1	19.9	95	360	1	3.2	14.2	0.0
18/04/2009	0.7	0.0	8.9	13.3	5.6	76	92	53	1004	1007	1000	41	280	-77	22.2	27.6	20.2	86	360	1	2.9	8.5	0.0
19/04/2009	1.8	0.0	10.7	18.4	3.2	69	90	45	1008	1011	1007	21	215	-65	24.0	28.5	21.6	186	360	1	1.7	6.9	0.0
20/04/2009	2.0	0.0	12.4	18.8	6.3	69	87	37	1011	1012	1010	20	194	-62	24.9	30.0	21.9	213	360	1	2.1	7.3	0.0
21/04/2009	2.7	0.0	11.7	18.4	7.4	72	88	42	1010	1012	1009	27	350	-62	25.4	28.8	23.8	215	360	1	3.3	9.9	0.0
22/04/2009	3.1	0.0	10.6	14.0	7.2	76	90	63	1007	1011	1002	8	284	-75	23.8	26.0	22.2	191	297	9	5.8	15.7	0.1
23/04/2009	2.1	8.8	10.2	13.0	8.6	90	94	79	1001	1003	996	12	276	-45	22.3	23.3	21.6	198	353	55	3.4	13.5	0.0
24/04/2009	0.9	7.0	9.3	10.7	7.9	86	93	77	993	997	990	1	63	-44	22.0	23.4	21.0	150	360	1	3.1	11.9	0.0
25/04/2009	0.9	7.2	9.0	12.9	5.7	83	95	55	988	992	984	30	499	-66	23.3	25.7	22.3	84	360	1	3.4	12.6	0.0
26/04/2009	1.7	4.2	7.9	11.7	4.7	86	93	64	989	992	980	5	279	-57	22.8	24.2	21.6	206	347	92	3.5	13.4	0.0
27/04/2009	1.4	10.6	7.2	13.1	3.9	82	93	49	979	982	977	35	416	-195	22.8	25.3	21.5	236	360	1	2.5	10.6	0.0
28/04/2009	1.7	0.2	7.7	14.7	0.9	76	95	46	987	989	982	47	463	-59	23.6	26.4	21.8	166	360	1	1.3	5.6	0.0
29/04/2009	1.4	8.2	9.3	11.1	7.2	86	94	73	987	989	986	10	188	-52	23.7	24.9	23.1	191	360	1	3.3	14.1	0.0
30/04/2009	1.0	4.8	11.2	16.4	8.0	75	94	40	994	1002	986	29	466	-70	23.7	27.6	22.2	240	360	1	2.4	8.1	0.0
	Sum	**Sum**	**Avg**	**Max**	**Min**	**Avg**	**Max**	**Min**	**Avg**	**Max**	**Min**	**Avg**	**Max**	**Min**	**Avg**	**Max**	**Min**	**Avg**	**Max**	**Min**	**Avg**	**Max**	**Min**
Monthly	53.2	79.6	9.0	18.8	0.9	78	95	37	995	1012	970	12	499	-195	22.7	30.0	19.2	180	360	1	3.7	21.8	0.0

Date	Evap	Rain	Temp (oC)			RH %			Atm Pressure (mb)			NR (W/m2)			Indoor Temp (oC)			W Direction			Wind Speed (m/s)		
	(mm)	(mm)	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min
01/05/2009	2.4	3.8	10.8	16.0	7.1	71	92	49	1002	1009	998	27	448	-70	23.9	26.3	21.8	236	359	4	5.0	19.6	0.4
02/05/2009	2.8	4.6	9.2	14.4	5.4	75	92	48	1010	1013	1009	30	379	-134	23.3	25.2	21.8	226	359	1	3.5	11.5	0.4
03/05/2009	2.2	0.4	8.0	13.1	3.1	77	94	50	1013	1014	1010	35	410	-97	22.8	25.3	21.3	272	360	1	3.0	10.9	0.2
04/05/2009	1.9	1.0	9.5	13.0	6.7	88	93	80	1008	1013	1006	3	191	-50	21.8	23.3	21.2	249	357	6	4.9	15.9	1.2
05/05/2009	1.1	0.0	11.9	16.3	10.2	79	92	54	1003	1007	1000	40	317	-33	22.4	24.0	21.4	264	358	1	5.2	15.1	1.0
06/05/2009	2.7	3.2	11.7	15.0	7.9	82	91	63	997	1000	992	12	349	-86	22.5	23.2	22.2	247	360	16	5.2	16.6	0.9
07/05/2009	2.1	3.4	8.3	12.8	4.8	74	90	53	990	994	983	22	385	-131	21.8	23.8	20.6	230	353	90	6.4	20.4	1.1
08/05/2009	2.5	2.2	8.0	13.4	5.2	72	87	51	989	996	983	36	514	-126	21.5	25.0	19.6	246	360	7	6.0	17.1	1.1
09/05/2009	2.7	3.6	9.1	14.5	5.9	71	89	44	995	1000	992	40	492	-61	21.6	25.4	20.3	238	359	4	4.5	17.0	0.4
10/05/2009	2.8	0.0	9.6	14.8	5.1	70	89	47	1004	1007	1000	41	352	-77	22.3	26.7	20.4	116	360	1	2.3	10.0	0.0
11/05/2009	2.0	0.0	10.3	13.2	5.8	68	84	52	1008	1009	1007	42	293	-85	24.1	32.0	21.6	99	360	1	4.4	16.2	0.0
12/05/2009	2.4	0.0	9.6	13.9	5.7	67	79	51	1007	1009	1004	36	295	-78	24.0	31.6	22.1	105	358	2	4.8	12.6	0.2
13/05/2009	2.7	3.0	9.1	11.0	5.4	79	91	70	999	1005	995	-10	76	-81	22.7	24.8	21.8	109	360	3	2.9	11.4	0.0
14/05/2009	1.0	2.4	11.2	13.8	9.4	89	94	77	993	995	989	24	215	-31	21.9	23.2	20.9	99	360	1	2.1	6.3	0.0
15/05/2009	0.8	16.6	9.9	14.0	6.6	91	95	79	984	989	981	18	293	-79	22.5	23.6	20.6	176	360	1	1.9	8.0	0.0
16/05/2009	0.7	3.6	8.9	12.2	6.4	79	88	64	977	983	973	30	463	-100	20.4	22.1	19.4	183	286	73	6.9	19.4	0.8
17/05/2009	2.0	3.4	9.2	12.0	7.5	78	88	67	981	983	980	34	566	-100	20.0	23.1	19.0	170	360	1	4.6	15.2	0.0
18/05/2009	1.6	10.6	9.7	14.0	8.0	86	94	64	986	991	981	26	529	-65	20.8	23.9	19.6	222	356	1	4.6	12.1	1.1
19/05/2009	1.8	7.6	10.3	14.3	8.6	82	93	62	994	996	991	39	570	-81	21.2	23.1	19.6	211	351	21	4.7	13.5	0.4
20/05/2009	2.0	2.2	10.4	14.3	8.6	85	93	65	998	999	996	34	508	-65	21.7	22.8	20.8	215	351	89	3.3	10.1	0.4
21/05/2009	1.6	0.6	10.7	16.6	6.3	75	92	48	998	998	997	41	468	-105	21.7	31.0	20.4	246	360	1	3.0	10.0	0.5
22/05/2009	2.4	1.4	12.8	19.3	8.3	83	92	61	997	998	996	35	582	-55	22.8	25.3	21.2	214	359	89	3.3	8.6	0.3
23/05/2009	2.2	1.4	12.0	15.3	8.3	78	91	56	999	1003	996	26	395	-110	23.7	29.0	22.6	236	360	1	4.1	14.3	0.0
24/05/2009	2.3	0.0	13.2	20.1	6.9	63	85	32	1003	1004	1002	53	254	-60	24.2	36.5	22.0	204	357	4	3.4	10.9	0.1
25/05/2009	4.2	0.0	13.3	18.3	9.1	79	90	61	999	1003	997	9	342	-62	25.9	26.8	25.0	229	360	1	2.2	9.7	0.0
26/05/2009	1.7	0.2	10.0	15.6	4.7	71	90	42	1001	1004	998	46	476	-133	24.2	32.3	21.9	256	360	1	4.2	15.4	0.3
27/05/2009	3.0	3.8	12.0	15.0	8.3	89	92	78	1001	1008	995	3	112	-72	23.4	24.6	22.4	234	359	1	4.9	15.7	0.9
28/05/2009	1.3	0.0	15.5	21.8	11.7	79	93	53	1013	1014	1008	42	445	-62	24.5	31.0	22.7	216	356	5	2.8	8.6	0.4
29/05/2009	2.9	0.0	16.3	22.6	10.0	74	94	53	1012	1014	1009	52	287	-65	26.1	36.1	23.7	189	360	1	2.7	11.2	0.0
30/05/2009	2.9	0.0	17.5	21.9	11.6	61	91	40	1009	1011	1008	53	282	-64	27.2	36.0	25.5	178	355	2	3.2	10.9	0.0
31/05/2009	3.9	0.0	16.7	22.2	9.7	59	76	39	1011	1012	1011	57	311	-71	27.2	34.9	25.4	121	360	1	2.6	8.6	0.0
	Sum	**Sum**	**Avg**	**Max**	**Min**	**Avg**	**Max**	**Min**	**Avg**	**Max**	**Min**	**Avg**	**Max**	**Min**	**Avg**	**Max**	**Min**	**Avg**	**Max**	**Min**	**Avg**	**Max**	**Min**
Monthly	68.6	79.0	11.1	22.6	3.1	77	95	32	999	1014	973	32	582	-134	23.0	36.5	19.0	201	360	1	4.0	20.4	0.0

Date	Evap	Rain	Temp (oC)			RH %			Atm P (mb)			NR (W/m2)			Indoor Temp (oC)			Wind Dir			Wind Speed (m/s)		
	(mm)	(mm)	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min
01/06/2009	3.9	0.0	18.1	26.1	9.7	63	88	36	1012	1012	1011	58	320	-71	27.9	36.7	25.7	112	360	1	1.8	8.7	0.0
02/06/2009	3.8	0.0	20.3	27.0	11.9	53	75	29	1011	1012	1009	50	273	-62	28.7	37.1	26.2	134	360	1	1.4	5.7	0.0
03/06/2009	3.9	0.0	15.8	19.1	10.7	69	80	60	1008	1010	1006	57	317	-71	28.2	36.7	26.6	85	360	1	2.6	9.9	0.0
04/06/2009	2.4	0.0	15.0	22.1	6.9	66	89	37	1003	1006	999	29	278	-70	26.5	34.5	24.7	125	360	1	1.3	6.4	0.0
05/06/2009	2.4	0.0	11.2	17.3	6.1	74	92	42	995	1000	993	24	378	-68	25.4	27.6	23.8	88	360	1	2.2	11.6	0.0
06/06/2009	2.3	56.0	6.9	8.9	5.0	90	95	81	989	993	985	-12	82	-63	23.0	27.1	20.1	76	360	1	4.0	16.9	0.0
07/06/2009	0.6	4.8	10.4	14.1	7.6	77	93	53	989	991	988	62	457	-62	20.4	25.1	19.5	64	360	1	3.7	11.3	0.2
08/06/2009	2.2	1.8	10.5	13.3	8.4	80	90	63	992	993	991	19	471	-64	22.0	24.5	20.6	79	360	1	3.1	9.9	0.0
09/06/2009	1.5	0.0	11.7	14.9	7.5	68	86	47	994	996	992	40	347	-75	25.0	35.3	23.1	83	360	1	2.9	9.6	0.0
10/06/2009	2.3	4.0	11.5	17.9	5.8	73	92	43	996	998	995	37	374	-101	25.1	26.4	23.8	121	360	1	1.5	9.1	0.0
11/06/2009	1.9	0.0	12.1	18.9	6.3	68	93	38	1002	1005	998	51	431	-90	24.4	31.7	23.2	217	360	1	1.5	6.5	0.0
12/06/2009	2.2	1.8	12.7	18.0	8.7	72	86	56	1002	1005	1000	18	469	-111	23.6	32.7	22.2	174	350	5	3.3	8.5	0.0
13/06/2009	2.5	0.0	14.9	20.0	11.0	71	89	43	1000	1001	999	37	430	-197	23.7	32.6	22.1	212	360	1	3.7	10.6	0.0
14/06/2009	3.6	0.2	14.0	20.4	10.9	74	86	46	1001	1002	1001	28	320	-80	23.6	24.8	22.4	206	340	92	3.3	9.4	0.5
15/06/2009	3.4	0.0	14.1	21.1	10.0	74	88	44	1000	1002	999	27	474	-75	23.6	31.2	21.9	192	360	1	2.1	7.0	0.0
16/06/2009	2.7	0.0	15.7	21.7	9.8	71	89	48	1003	1005	1001	54	301	-86	24.9	29.0	23.1	204	351	2	3.7	12.3	0.2
17/06/2009	3.6	23.2	13.3	17.5	10.2	79	94	48	995	1001	992	14	520	-81	24.0	32.3	22.2	249	360	1	5.7	15.4	0.3
18/06/2009	3.2	2.0	11.8	17.0	8.9	75	88	49	999	1001	998	32	514	-122	23.5	29.8	22.5	245	360	1	4.8	16.4	0.4
19/06/2009	3.1	0.0	12.7	17.7	8.8	73	90	52	1006	1009	1001	25	402	-67	22.7	28.8	21.6	277	360	1	4.0	13.6	0.5
20/06/2009	2.8	0.0	13.8	19.0	11.0	74	90	54	1010	1012	1008	25	249	-51	22.6	24.7	21.7	257	360	1	3.1	11.1	0.0
21/06/2009	2.6	1.4	15.4	23.3	11.1	85	94	62	1010	1012	1010	34	413	-51	23.0	30.8	22.0	235	360	1	2.3	8.1	0.1
22/06/2009	2.2	0.2	18.7	23.9	15.1	79	92	60	1013	1013	1012	32	382	-50	25.0	26.5	23.7	235	360	1	1.0	4.7	0.0
23/06/2009	1.5	0.0	19.6	24.5	15.4	71	92	48	1012	1013	1009	60	464	-69	27.1	36.2	25.5	123	360	1	2.0	7.3	0.0
24/06/2009	3.0	0.0	18.0	21.1	12.3	59	82	33	1006	1009	1003	68	311	-78	28.1	37.1	27.1	138	360	1	3.1	9.5	0.0
25/06/2009	4.3	0.0	16.1	20.3	11.9	69	82	52	999	1003	997	64	398	-55	26.8	29.4	25.7	98	360	1	2.8	10.4	0.0
26/06/2009	3.0	11.4	16.8	20.6	13.3	82	94	68	997	998	996	32	442	-88	25.6	27.1	24.1	115	360	1	1.7	6.6	0.0
27/06/2009	1.4	0.0	17.5	25.1	13.8	77	92	50	999	1000	998	43	402	-68	26.1	34.1	24.5	187	360	1	1.8	5.5	0.0
28/06/2009	2.8	2.6	16.9	22.5	10.5	73	92	46	999	1000	998	31	323	-113	25.6	27.3	23.5	146	360	1	2.0	6.7	0.0
29/06/2009	2.8	0.0	17.8	21.4	14.1	76	86	66	1000	1002	999	17	199	-72	25.4	30.4	24.2	167	360	1	2.3	7.2	0.0
30/06/2009	2.0	0.0	18.4	23.4	12.1	71	85	54	1003	1005	1002	38	371	-58	25.5	26.9	24.3	177	358	5	3.2	9.6	0.0
	Sum	**Sum**	**Avg**	**Max**	**Min**	**Avg**	**Max**	**Min**	**Avg**	**Max**	**Min**	**Avg**	**Max**	**Min**	**Avg**	**Max**	**Min**	**Avg**	**Max**	**Min**	**Avg**	**Max**	**Min**
Monthly	80.3	109.4	14.7	27.0	5.0	73	95	29	1002	1013	985	37	520	-197	24.9	37.1	19.5	161	360	1	2.7	16.9	0.0

Date	Evap	Rain	Temp (oC)			RH (%)			Atm Pr (mb)			NR (W/m2)			Indoor Temp (oC)			Wind Dir			Wind Speed (m/s)		
	(mm)	(mm)	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min
01/07/2009	3.4	6.6	19.3	21.9	17.0	83	92	75	1005	1006	1004	27	314	-66	26.2	27.1	25.4	201	356	81	2.9	9.5	0.0
02/07/2009	1.8	23.0	18.0	22.1	15.6	86	95	67	1001	1004	997	9	213	-75	26.5	34.3	25.7	161	360	1	1.7	8.2	0.0
03/07/2009	1.5	0.0	18.0	21.5	14.5	74	90	55	995	997	994	55	348	-57	26.6	37.5	25.3	207	353	2	4.1	12.2	0.0
04/07/2009	3.4	6.6	16.2	20.4	13.2	75	93	50	992	995	990	46	539	-125	25.0	32.4	24.2	200	347	7	4.7	13.8	0.7
05/07/2009	3.5	3.4	15.1	18.5	12.6	77	86	61	988	991	985	44	497	-177	24.7	27.0	23.5	194	354	100	4.8	11.9	0.9
06/07/2009	2.8	3.2	14.6	19.5	10.2	82	93	58	986	989	985	45	550	-149	24.9	26.2	23.8	258	360	1	2.4	8.5	0.0
07/07/2009	2.1	0.2	14.9	19.3	12.0	80	93	61	992	997	989	32	425	-127	24.8	25.6	24.4	290	360	1	3.4	11.9	0.3
08/07/2009	2.3	0.0	14.3	18.8	11.7	73	88	51	1000	1003	997	31	446	-80	24.2	25.0	23.6	264	360	1	2.5	10.8	0.0
09/07/2009	2.5	0.0	14.0	19.2	9.6	71	85	51	1003	1004	1002	19	281	-64	24.3	25.5	23.3	268	360	1	1.9	8.3	0.0
10/07/2009	2.2	1.2	13.1	17.5	8.0	81	91	60	1000	1003	997	18	201	-63	24.3	25.1	23.3	197	360	1	1.9	6.5	0.0
11/07/2009	1.6	10.8	15.9	19.2	11.8	86	93	72	991	997	981	13	257	-130	23.9	24.7	23.1	159	360	1	3.4	19.3	0.0
12/07/2009	1.7	5.4	14.9	19.3	12.5	78	90	52	987	990	982	48	507	-173	23.6	26.1	22.2	220	355	1	4.1	12.6	0.5
13/07/2009	3.2	10.0	14.0	17.5	11.5	83	90	66	987	990	984	8	411	-127	23.5	24.3	22.8	193	350	7	3.9	13.7	0.3
14/07/2009	2.0	10.0	13.9	16.3	11.4	84	92	70	987	988	986	4	328	-77	23.4	24.3	22.6	176	358	2	2.6	7.7	0.0
15/07/2009	1.4	0.0	14.5	22.3	8.7	80	95	55	993	1000	986	43	566	-97	24.1	32.0	22.6	235	360	1	2.0	9.5	0.0
16/07/2009	2.3	4.2	14.2	18.6	10.9	77	92	55	1000	1001	997	18	302	-58	24.2	25.2	23.3	208	360	1	1.9	8.2	0.0
17/07/2009	1.8	0.0	14.4	20.1	10.8	76	94	54	998	999	997	49	432	-64	24.3	31.7	22.5	267	360	1	3.8	14.4	0.0
18/07/2009	2.9	4.0	13.2	17.1	9.3	82	93	63	995	998	993	10	220	-79	24.3	26.9	23.3	250	360	1	2.5	9.0	0.2
19/07/2009	1.6	9.0	13.6	20.0	11.1	85	95	54	993	996	991	50	488	-101	24.2	26.4	23.1	244	360	1	2.2	12.3	0.0
20/07/2009	2.2	0.4	14.0	18.7	9.8	78	93	54	995	996	993	39	406	-134	23.4	24.8	22.1	211	357	67	3.7	11.8	0.4
21/07/2009	2.6	6.2	15.3	19.8	10.5	78	91	60	983	993	978	52	447	-133	24.0	33.2	22.5	167	360	1	5.1	16.9	0.0
22/07/2009	3.0	16.2	15.2	19.6	12.7	85	94	62	978	981	975	59	524	-134	24.4	29.1	23.2	213	360	1	3.8	11.8	0.3
23/07/2009	2.4	3.4	14.3	19.5	12.1	82	92	56	983	988	980	38	494	-127	24.1	25.3	23.1	215	357	2	3.6	14.7	0.5
24/07/2009	2.7	6.8	14.0	19.7	11.4	84	92	62	993	1001	988	26	532	-194	23.4	27.5	22.0	216	360	1	2.4	8.6	0.0
25/07/2009	1.9	0.0	14.6	20.3	9.1	76	93	51	1002	1004	999	50	427	-71	23.1	24.8	21.5	198	344	67	3.6	12.4	0.1
26/07/2009	3.0	4.2	15.5	18.9	13.3	78	91	60	992	999	990	41	372	-121	22.6	25.0	21.5	206	339	90	6.3	16.1	1.5
27/07/2009	3.1	2.0	14.3	19.5	11.8	77	92	49	992	994	990	44	474	-114	22.9	30.4	21.4	227	360	1	3.9	13.0	0.3
28/07/2009	3.2	3.8	14.1	17.5	11.9	82	90	63	992	994	990	11	383	-63	22.9	24.0	22.0	202	352	102	5.9	15.4	1.5
29/07/2009	2.6	12.0	13.5	21.1	10.6	83	94	51	992	996	991	28	474	-111	23.0	24.9	21.7	211	360	1	2.5	12.1	0.0
30/07/2009	2.6	0.0	13.7	19.4	9.2	72	90	46	1001	1004	996	38	390	-82	23.5	32.9	22.0	233	360	1	3.2	12.7	0.5
31/07/2009	3.1	1.0	14.0	16.0	11.8	81	92	75	996	1004	989	-5	168	-68	22.7	24.7	21.9	193	282	108	6.6	19.5	1.3
	Sum	**Sum**	**Avg**	**Max**	**Min**	**Avg**	**Max**	**Min**	**Avg**	**Max**	**Min**	**Avg**	**Max**	**Min**	**Avg**	**Max**	**Min**	**Avg**	**Max**	**Min**	**Avg**	**Max**	**Min**
Monthly	76.4	153.6	14.8	22.3	8.0	79.6	95.2	46.0	993	1006	975	32	566	-194	24.1	37.5	21.4	216	360	1	3.5	19.5	0.0

Date	Evap	Rain	Temp (oC)			RH (%)			Atm Pr (mb)			NR (W/m2)			Indoor Temp (oC)			Wind Dir			Wind Speed (m/s)		
	(mm)	(mm)	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min
01/08/2009	1.7	0.4	14.0	17.5	11.2	82	93	62	990	994	988	27	448	-70	22.3	23.0	21.5	230	360	1	3.8	12.4	0.4
02/08/2009	2.1	0.0	13.4	17.4	9.4	77	93	57	994	995	992	19	308	-102	22.2	23.4	21.2	201	343	85	4.0	11.9	0.4
03/08/2009	2.4	2.4	16.0	19.3	14.1	81	91	64	990	992	989	27	430	-73	22.6	23.7	21.8	197	330	98	5.9	16.5	0.8
04/08/2009	2.8	0.0	16.6	18.9	13.8	79	90	64	991	995	989	36	366	-54	23.7	25.9	22.6	202	329	91	5.4	14.9	0.7
05/08/2009	2.7	0.0	15.8	19.9	13.0	72	84	56	997	1001	995	26	310	-60	24.6	28.9	22.7	203	318	105	5.6	13.5	1.3
06/08/2009	3.6	0.2	14.7	19.5	11.6	75	87	54	1003	1005	1001	15	351	-75	24.6	25.9	23.4	202	352	2	3.3	9.3	0.2
07/08/2009	2.8	0.0	15.1	20.0	10.8	71	90	44	1005	1006	1005	34	311	-53	24.6	26.9	23.2	211	360	3	2.3	7.5	0.2
08/08/2009	2.7	20.0	15.9	20.6	13.4	81	95	62	1004	1005	1003	38	411	-62	24.6	25.7	23.6	204	360	1	3.5	10.3	0.1
09/08/2009	2.4	4.0	15.8	19.7	13.4	86	93	65	1002	1004	997	28	362	-138	24.3	24.9	23.7	205	360	1	2.7	11.2	0.0
10/08/2009	1.9	2.6	16.4	20.6	13.4	87	94	74	997	1004	994	33	541	-104	23.6	24.9	22.5	220	360	1	3.0	10.0	0.0
11/08/2009	1.6	0.0	16.4	21.2	12.9	83	91	66	1005	1006	1004	33	313	-54	24.7	26.0	23.5	229	360	1	2.5	9.3	0.0
12/08/2009	2.0	4.8	16.9	21.9	13.7	86	95	68	1004	1005	1003	35	489	-31	25.0	26.3	23.9	240	360	1	2.2	8.6	0.0
13/08/2009	1.8	0.0	14.7	19.0	12.0	73	90	50	1004	1005	1002	14	121	-51	24.6	25.9	23.6	209	360	1	0.9	4.6	0.0
14/08/2009	1.3	0.8	16.9	20.8	13.7	83	88	72	996	1002	992	16	201	-71	23.7	24.7	22.7	200	343	88	4.8	13.8	0.4
15/08/2009	2.3	10.2	16.3	19.5	13.2	82	94	63	993	997	989	24	458	-64	23.6	25.7	22.9	227	360	2	4.6	13.2	0.7
16/08/2009	2.5	0.0	14.5	17.1	12.9	81	89	70	998	999	997	10	193	-57	22.5	23.9	22.0	226	359	2	3.9	10.8	0.7
17/08/2009	1.9	0.0	16.3	21.2	13.0	76	89	56	998	1000	997	34	390	-119	22.6	24.7	21.4	219	359	2	3.2	9.3	0.2
18/08/2009	2.9	0.4	16.7	19.3	14.2	83	89	75	997	1000	994	31	319	-62	24.1	25.0	23.3	196	293	3	5.5	14.1	1.0
19/08/2009	2.1	6.0	17.8	21.7	16.1	84	91	69	992	994	988	22	380	-71	24.3	25.4	23.5	198	291	95	6.1	15.5	1.4
20/08/2009	2.8	36.0	14.8	17.6	11.9	84	96	66	989	998	983	36	399	-114	24.4	26.4	23.8	233	360	1	3.8	13.7	0.1
21/08/2009	1.9	1.2	13.1	18.0	10.1	74	88	49	1000	1004	998	25	332	-184	23.1	26.0	21.5	229	360	1	3.8	14.3	0.5
22/08/2009	3.0	1.2	14.2	19.4	9.6	77	89	51	1002	1005	996	26	238	-77	22.3	23.5	21.1	201	320	97	4.3	12.2	0.6
23/08/2009	3.2	1.6	16.2	19.4	11.4	84	90	74	991	997	987	9	316	-72	23.0	24.1	22.3	206	358	1	6.2	18.4	0.3
24/08/2009	2.1	2.0	13.0	16.7	10.0	76	87	59	987	990	985	18	413	-182	22.4	24.7	21.3	203	357	90	4.2	12.0	0.2
25/08/2009	2.4	0.0	13.8	18.8	9.8	73	90	46	988	990	986	20	280	-78	22.1	24.1	20.7	210	359	12	3.8	10.2	0.5
26/08/2009	3.2	3.4	15.9	20.1	12.0	83	90	71	985	993	978	10	405	-104	22.7	24.6	21.2	232	360	1	4.8	17.1	0.0
27/08/2009	2.2	2.4	13.2	16.8	10.5	83	92	72	992	995	986	14	399	-94	22.6	23.6	21.8	217	359	3	4.4	18.2	0.4
28/08/2009	1.7	4.8	11.9	16.2	9.2	82	93	65	995	1004	990	14	383	-90	22.5	25.1	21.1	263	360	1	4.6	17.2	0.5
29/08/2009	2.0	0.0	12.2	16.6	8.3	80	93	58	1004	1005	1002	16	292	-67	22.2	23.8	21.1	229	360	3	3.2	10.6	0.3
30/08/2009																							
31/08/2009																							
	Sum	**Sum**	**Avg**	**Max**	**Min**	**Avg**	**Max**	**Min**	**Avg**	**Max**	**Min**	**Avg**	**Max**	**Min**	**Avg**	**Max**	**Min**	**Avg**	**Max**	**Min**	**Avg**	**Max**	**Min**
Monthly	68.0	104.4	15.1	21.9	8.3	80	96	44	996	1006	978	24	541	-184	23.4	28.9	20.7	215	360	1	4.0	18.4	0.0

Date	Evap	Rain	Temp (oC)			RH (%)			Atm Pr (mb)			NR (W/m2)			Indoor Temp (oC)			Wind Dir			Wind Speed (m/s)		
	(mm)	(mm)	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min
01/09/2009																							
02/09/2009																							
03/09/2009																							
04/09/2009																							
05/09/2009																							
06/09/2009																							
07/09/2009																							
08/09/2009																							
09/09/2009																							
10/09/2009																							
11/09/2009	1.7	0.0	13.2	20.2	6.0	74	91	50	1022	1024	1019	2	178	-123	23.7	26.1	21.2	100	360	1	1.3	5.5	0.0
12/09/2009	1.6	0.0	12.9	21.4	4.9	75	94	41	1017	1019	1015	2	166	-83	23.9	26.6	21.9	135	360	1	1.1	7.3	0.0
13/09/2009	1.7	0.0	11.9	19.2	4.8	82	95	61	1015	1016	1014	30	271	-63	23.8	26.0	22.1	117	360	1	1.8	8.9	0.0
14/09/2009	1.5	0.0	12.2	15.8	8.5	81	93	67	1015	1016	1014	12	232	-57	22.8	24.5	21.4	80	360	1	1.8	8.8	0.0
15/09/2009	1.1	0.0	11.9	16.5	8.7	83	92	63	1013	1015	1012	5	247	-58	22.9	24.7	21.5	81	360	1	1.7	8.8	0.0
16/09/2009	1.2	0.0	11.7	16.3	9.3	87	94	63	1012	1013	1011	3	157	-60	23.1	24.3	22.2	89	360	1	1.6	8.0	0.0
17/09/2009	1.1	0.0	11.2	14.2	7.6	78	94	58	1009	1012	1006	12	230	-62	22.7	23.6	21.8	101	360	1	1.7	7.0	0.0
18/09/2009	1.2	0.0	11.4	14.8	7.7	73	87	60	1003	1006	1000	-6	77	-68	21.5	22.3	20.7	181	338	81	2.2	5.7	0.0
19/09/2009	1.5	0.8	11.7	15.7	6.0	82	91	60	1001	1006	999	-5	163	-88	20.8	21.9	20.1	223	360	1	2.1	8.0	0.0
20/09/2009	1.4	0.0	10.6	15.8	5.0	78	93	57	1008	1009	1006	10	267	-52	22.5	25.5	18.8	205	351	6	2.5	8.4	0.1
21/09/2009	1.7	0.0	13.7	18.4	11.2	79	86	63	1005	1008	1002	1	200	-53	24.2	25.7	23.3	211	358	97	5.3	13.0	1.5
22/09/2009	2.7	0.2	13.7	16.9	10.8	80	92	62	1005	1008	1002	12	300	-55	25.4	26.9	24.5	232	360	1	4.3	13.3	0.6
23/09/2009	2.2	0.2	12.1	17.1	8.7	80	88	63	1009	1010	1007	2	246	-87	25.6	27.2	24.4	224	360	2	3.3	10.6	0.4
24/09/2009	2.0	0.0	11.8	15.8	8.0	78	88	62	1011	1012	1010	8	224	-58	25.5	26.7	24.3	213	360	1	2.9	9.8	0.2
25/09/2009	1.8	0.0	13.5	18.6	10.2	77	86	60	1011	1012	1010	8	244	-53	25.2	26.8	23.8	224	359	1	3.1	9.2	0.3
26/09/2009	2.3	0.0	14.1	18.8	11.7	80	91	65	1012	1013	1011	14	148	-46	25.7	26.6	24.5	232	360	1	1.4	5.3	0.0
27/09/2009	1.2	0.0	14.0	16.8	12.5	86	93	75	1013	1014	1012	6	184	-44	25.9	26.2	25.4	230	360	1	2.4	8.0	0.1
28/09/2009	1.1	0.0	13.8	17.4	12.7	86	93	67	1012	1014	1010	8	257	-28	25.8	27.0	25.1	239	360	2	2.7	9.2	0.3
29/09/2009	1.6	0.6	13.5	15.5	12.2	88	93	83	1009	1011	1008	5	103	-31	25.7	26.4	25.1	240	360	1	2.1	6.9	0.1
30/09/2009	0.7	0.4	13.7	18.8	11.3	85	93	62	1006	1008	1004	20	268	-40	25.8	27.2	24.9	231	360	1	2.1	7.6	0.0
	Sum	**Sum**	**Avg**	**Max**	**Min**	**Avg**	**Max**	**Min**	**Avg**	**Max**	**Min**	**Avg**	**Max**	**Min**	**Avg**	**Max**	**Min**	**Avg**	**Max**	**Min**	**Avg**	**Max**	**Min**
Monthly	31.6	2.2	12.6	21.4	4.8	80	95	41	1010	1024	999	7	300	-123	24.1	27.2	18.8	179	360	1	2.4	13.3	0.0

Date	Evap	Rain	Temp (oC)			RH %			Atm P (mb)			NR (W/m2)			Indoor Temp (oC)			Wind Dir			Wind Speed (m/s)		
	(mm)	(mm)	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min
01/10/2009	1.7	0.0	10.9	14.6	8.5	78	92	57	1006	1008	1004	7	214	-58	25.5	26.1	24.7	236	360	1	1.7	6.3	0.0
02/10/2009	1.3	0.2	11.5	14.7	8.3	86	91	82	1003	1007	996	0	81	-40	24.5	25.1	23.5	231	360	1	3.4	13.0	0.2
03/10/2009	0.9	2.2	11.3	15.5	8.5	80	93	53	992	996	989	3	245	-60	23.9	25.0	23.2	249	360	1	4.8	15.2	0.5
04/10/2009	2.5	0.0	9.4	13.4	6.5	80	91	61	996	996	994	-7	206	-56	23.1	23.7	22.3	211	360	2	2.1	7.2	0.2
05/10/2009	1.2	0.0	11.6	16.6	7.4	72	86	52	993	996	989	-5	116	-57	23.3	25.3	21.9	194	355	77	2.4	7.8	0.3
06/10/2009	2.0	31.4	10.8	13.8	4.2	91	96	76	987	994	984	-12	54	-69	24.1	24.7	23.4	123	360	1	1.6	8.7	0.0
07/10/2009	0.6	0.0	6.8	14.1	1.2	83	95	58	997	999	994	-10	179	-64	22.4	23.6	21.1	196	360	1	1.1	4.0	0.0
08/10/2009	0.8	0.0	9.3	14.8	5.1	75	92	46	1003	1005	999	-8	135	-67	22.9	25.5	21.3	182	360	1	1.6	6.8	0.0
09/10/2009	1.5	6.6	11.7	13.6	8.7	83	93	72	995	1004	990	-20	133	-91	22.5	23.7	21.8	184	346	82	3.8	13.6	0.2
10/10/2009	1.2	0.4	11.8	14.8	10.2	88	94	73	999	1002	994	4	146	-50	23.7	24.8	23.0	221	355	9	2.2	6.5	0.2
11/10/2009	1.0	3.2	11.4	15.7	6.3	85	95	62	1002	1010	998	6	214	-65	25.1	27.1	24.0	240	360	1	2.6	10.9	0.0
12/10/2009	1.5	0.2	9.0	15.2	3.2	81	95	53	1013	1014	1009	-13	117	-62	24.8	26.4	23.4	191	360	1	1.7	5.6	0.0
13/10/2009	1.3	0.0	11.9	14.5	8.9	88	94	81	1014	1015	1014	5	107	-49	23.8	24.5	23.0	200	358	35	2.0	5.1	0.0
14/10/2009	0.7	0.0	12.6	13.9	11.6	90	93	83	1014	1016	1013	4	161	-23	24.2	25.0	23.6	199	358	5	1.3	3.8	0.0
15/10/2009	0.5	0.0	12.4	15.1	10.1	89	94	77	1018	1019	1016	5	84	-40	24.3	25.0	23.7	191	360	1	1.0	4.1	0.0
16/10/2009	0.5	0.0	9.8	15.2	5.0	88	94	72	1020	1021	1019	-7	258	-62	24.2	25.6	23.3	125	360	1	1.1	6.5	0.0
17/10/2009	0.6	0.2	8.6	13.9	3.3	79	94	58	1016	1020	1011	-15	159	-60	23.2	24.6	21.9	178	341	5	2.0	6.9	0.0
18/10/2009	1.2	0.8	10.9	13.8	8.0	85	93	78	1005	1011	999	-2	68	-50	22.3	23.0	21.7	199	332	98	3.9	9.2	0.9
19/10/2009	1.1	0.8	11.4	12.9	10.3	83	93	70	989	999	978	-3	141	-92	22.4	23.2	21.8	190	291	106	5.4	16.8	1.4
20/10/2009	1.5	16.0	11.1	14.0	9.4	80	93	68	972	978	970	-24	206	-91	22.8	25.1	21.4	172	320	28	5.9	19.1	0.6
21/10/2009	1.7	18.6	11.4	13.6	9.1	81	90	71	972	973	971	-38	199	-114	23.5	24.0	22.9	167	243	88	5.0	12.6	1.0
22/10/2009	1.5	17.2	11.8	14.8	10.0	85	94	75	975	981	972	-12	253	-99	24.1	25.6	23.3	161	318	31	3.0	9.5	0.0
23/10/2009	1.0	0.0	11.4	13.7	9.1	86	92	74	987	989	981	-8	134	-55	24.6	25.5	23.8	185	360	1	2.6	6.7	0.0
24/10/2009	1.0	3.4	13.4	15.7	10.9	83	91	74	981	986	975	-16	172	-79	24.7	25.4	24.1	212	360	1	6.0	18.1	0.0
25/10/2009	1.7	2.2	11.3	13.8	9.9	86	92	77	991	997	986	-12	209	-76	23.7	24.2	23.3	240	360	4	5.0	16.1	0.8
26/10/2009	1.3	0.0	11.6	14.5	9.0	85	93	66	999	1001	997	1	115	-56	23.8	24.7	23.0	191	358	30	2.1	9.1	0.0
27/10/2009	1.1	2.0	14.6	15.8	11.4	82	91	64	994	999	991	-10	114	-59	24.7	25.7	24.2	194	287	108	6.6	17.5	0.0
28/10/2009	2.4	0.0	13.8	16.7	12.5	83	89	72	998	1000	993	-18	134	-61	25.1	26.1	24.5	198	288	108	4.4	11.1	0.9
29/10/2009	1.7	0.0	15.0	16.4	11.7	84	89	80	999	1000	997	-5	69	-65	24.3	24.9	23.8	187	306	27	5.3	16.6	0.0
30/10/2009	1.5	9.2	15.1	16.1	12.8	86	94	81	996	1000	994	-29	33	-79	24.7	25.1	24.3	191	313	87	6.3	18.1	0.8
31/10/2009	1.3	4.6	13.1	16.1	11.0	86	93	73	999	1001	997	-24	101	-83	24.4	25.5	23.6	206	360	1	4.5	11.5	0.0
	Sum	**Sum**	**Avg**	**Max**	**Min**	**Avg**	**Max**	**Min**	**Avg**	**Max**	**Min**	**Avg**	**Max**	**Min**	**Avg**	**Max**	**Min**	**Avg**	**Max**	**Min**	**Avg**	**Max**	**Min**
Monthly	39.9	119.2	11.5	16.7	1.2	84	96	46	998	1021	970	-9	258	-114	23.9	27.1	21.1	195	360	1	3.3	19.1	0.0

Date	Evap	Rain	Temp (oC)			RH (%)			Atm P (mb)			NR (W/m2)			Indoor Temp (oC)			Wind Dir			Wind Speed (m/s)		
	(mm)	(mm)	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min
01/11/2009	1.5	18.4	9.6	13.3	5.3	88	94	76	982	997	976	-22	89	-67	23.7	24.3	22.7	209	360	1	3.7	15.8	0.0
02/11/2009	1.0	0.0	7.1	9.5	4.9	86	93	79	981	984	975	-22	89	-66	22.1	23.4	21.0	219	348	11	3.9	10.6	0.8
03/11/2009	0.8	0.0	8.3	10.4	5.5	85	95	68	969	975	966	-16	178	-74	22.8	24.6	22.1	231	360	4	4.4	13.8	0.8
04/11/2009	1.2	0.0	7.2	11.1	5.4	86	90	70	968	974	966	-18	165	-91	22.6	24.0	21.4	242	360	1	4.7	14.3	0.7
05/11/2009	1.3	0.0	7.3	9.3	5.8	89	92	83	981	987	974	-21	69	-60	22.6	23.1	21.9	264	360	1	4.1	14.1	0.3
06/11/2009	0.7	0.0	7.1	11.1	3.9	87	93	71	981	987	977	-21	165	-70	22.4	23.3	21.4	220	352	3	4.1	14.0	0.3
07/11/2009	1.1	0.0	5.1	8.3	3.0	89	93	83	975	982	971	-23	184	-65	20.0	21.7	19.2	231	360	1	4.1	13.1	0.2
08/11/2009	0.6	0.0	5.9	11.5	2.4	88	94	69	994	1003	982	-20	63	-59	19.3	21.0	18.3	230	360	1	1.7	6.9	0.0
09/11/2009	0.7	0.0	7.1	10.0	2.2	84	93	72	1001	1004	995	-24	54	-77	19.6	21.5	18.0	184	321	91	3.5	12.7	0.1
10/11/2009	0.9	0.0	6.7	10.6	1.8	90	95	77	996	997	995	-12	175	-59	22.8	24.6	21.5	225	360	1	1.3	7.2	0.0
11/11/2009	0.4	0.0	7.3	10.5	1.9	86	95	75	986	995	975	-14	106	-67	22.7	23.6	21.9	149	360	1	3.0	11.9	0.0
12/11/2009	0.8	0.0	8.7	12.0	6.6	84	95	74	974	978	968	-42	74	-117	23.0	23.9	22.4	205	329	84	5.5	23.2	0.7
13/11/2009	1.2	0.0	7.2	9.5	5.6	80	94	66	974	980	960	-31	31	-84	22.7	23.6	21.9	158	359	8	4.1	15.0	0.5
14/11/2009	1.2	0.0	8.2	11.2	5.9	83	93	75	967	981	958	-31	86	-84	22.8	23.6	22.1	223	360	1	4.6	14.7	0.2
15/11/2009	1.1	0.0	9.6	11.9	5.8	82	88	74	981	982	979	-28	81	-104	22.9	24.0	22.2	198	318	108	5.0	12.3	1.5
16/11/2009	1.3	9.8	9.0	11.1	6.9	84	90	79	975	981	970	-35	86	-101	23.5	24.4	23.2	219	357	87	5.9	15.2	0.9
17/11/2009	1.1	3.6	7.2	10.0	5.2	83	90	73	984	985	981	-27	118	-81	23.0	23.7	22.2	219	348	2	5.3	18.4	1.0
18/11/2009	1.2	4.6	10.0	12.8	5.3	88	95	79	982	986	978	-18	44	-75	23.3	24.3	22.5	198	360	1	6.6	20.3	0.0
19/11/2009	1.1	8.8	13.2	13.6	12.7	89	91	86	978	982	976	-30	-2	-54	24.3	25.0	23.8	213	300	108	9.6	22.5	2.9
20/11/2009	1.2	0.0	9.7	12.9	7.3	82	92	67	988	998	976	-31	84	-65	24.6	25.7	23.7	218	343	83	4.7	15.9	1.0
21/11/2009	1.5	0.0	11.3	14.4	8.3	78	88	65	983	997	975	-40	56	-128	23.1	24.0	22.3	191	291	87	7.9	22.8	0.8
22/11/2009	2.3	0.0	7.6	9.0	6.2	79	87	72	973	977	970	-31	34	-91	21.0	22.4	20.1	226	351	9	7.6	19.0	1.3
23/11/2009	1.4	0.0	8.2	9.7	6.8	87	94	80	980	986	975	-14	98	-55	20.8	22.1	20.1	246	360	1	4.8	14.4	0.9
24/11/2009	0.8	0.4	9.5	12.2	5.9	88	93	80	978	986	973	-18	24	-56	21.2	21.5	20.9	221	355	84	6.8	19.7	1.0
25/11/2009	1.1	2.8	6.3	8.1	5.1	80	88	72	974	978	969	-42	143	-90	20.7	21.9	19.4	227	351	90	7.0	20.4	1.7
26/11/2009	1.3	0.0	4.9	6.9	3.1	83	89	75	978	979	977	-32	92	-69	21.8	23.0	20.9	227	348	5	5.4	12.8	1.2
27/11/2009	1.0	0.0	4.0	6.7	2.5	88	92	82	979	981	976	-33	43	-63	23.1	24.3	22.3	215	328	92	3.6	7.9	0.7
28/11/2009	0.5	1.6	1.2	3.1	-0.1	93	96	85	975	977	972	-10	36	-96	22.4	23.2	21.9	144	360	1	1.4	6.9	0.0
29/11/2009	0.2	0.0	4.1	5.3	2.1	90	96	80	974	984	969	-18	15	-117	21.6	21.9	21.5	75	360	1	4.8	19.1	0.1
30/11/2009	0.6	0.0	0.8	4.6	-1.5	86	94	74	993	998	984	-45	72	-71	22.3	24.8	20.5	179	360	1	2.0	9.0	0.0
	Sum	**Sum**	**Avg**	**Max**	**Min**	**Avg**	**Max**	**Min**	**Avg**	**Max**	**Min**	**Avg**	**Max**	**Min**	**Avg**	**Max**	**Min**	**Avg**	**Max**	**Min**	**Avg**	**Max**	**Min**
Monthly	30.9	50.0	7.3	14.4	-1.5	86	96	65	980	1004	958	-26	184	-128	22.3	25.7	18.0	207	360	1	4.7	23.2	0.0

Date	Evap	Rain	Temp (oC)			RH (%)			Atm P (mb)			NR (W/m2)			Indoor Temp (oC)			Wind Dir			Wind Speed (m/s)		
	(mm)	(mm)	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min
01/12/2009	0.4	1.6	5.2	8.3	-0.3	81	93	67	986	997	979	-30	21	-120	23.1	23.8	22.7	195	283	103	6.3	24.9	0.4
02/12/2009	1.2	0.2	7.4	10.6	5.2	85	94	74	976	980	974	-22	71	-72	24.5	26.2	23.6	185	360	1	2.9	11.2	0.0
03/12/2009	0.8	0.0	3.0	6.0	0.8	88	94	78	985	991	979	-31	39	-68	24.4	25.3	23.3	264	360	1	3.2	11.6	0.2
04/12/2009	0.5	10.2	6.1	10.0	0.9	88	94	81	986	991	976	-19	35	-59	22.8	23.5	22.2	192	336	88	3.9	12.3	0.4
05/12/2009	0.7	5.0	8.4	11.4	6.1	88	95	79	973	977	966	-28	34	-76	22.9	23.4	22.5	202	360	1	6.0	18.8	0.0
06/12/2009	1.0	0.0	6.5	9.4	4.5	78	83	71	971	977	967	-38	56	-70	22.6	23.4	21.9	215	313	96	6.4	15.9	1.8
07/12/2009	1.5	5.6	6.1	7.9	3.7	86	92	76	975	984	969	-24	95	-68	22.2	22.8	21.7	212	347	82	4.9	14.8	0.8
08/12/2009	0.9	0.8	8.2	11.8	4.2	85	91	74	985	988	982	-33	69	-72	22.7	23.7	21.8	203	333	101	6.1	18.5	1.1
09/12/2009	1.3	5.2	8.3	10.4	5.3	85	92	76	995	1002	988	-34	77	-63	23.4	24.2	22.9	210	359	1	5.0	13.4	0.5
10/12/2009	1.0	0.0	6.1	9.6	4.3	85	91	73	1010	1014	1002	-36	59	-64	23.7	25.9	22.6	189	360	7	3.0	7.4	0.0
11/12/2009	0.8	0.0	7.8	10.4	4.1	74	83	64	1014	1016	1013	-21	57	-68	24.2	25.5	23.3	152	360	1	2.8	9.0	0.0
12/12/2009	1.3	0.0	4.9	7.5	0.9	79	87	69	1017	1018	1016	-45	50	-75	22.9	23.9	22.1	146	278	50	2.8	8.8	0.0
13/12/2009	0.8	0.0	2.2	4.9	-1.3	89	94	79	1016	1018	1014	-22	84	-72	22.6	23.2	22.1	141	360	1	0.9	4.1	0.0
14/12/2009	0.2	0.2	2.0	5.5	-1.8	94	96	92	1010	1014	1005	-8	35	-68	23.1	23.9	22.4	192	360	1	0.8	5.0	0.0
15/12/2009	0.1	3.2	5.5	6.7	3.7	92	95	85	1004	1005	1003	-1	75	-47	24.4	25.1	23.9	97	360	1	1.5	8.5	0.0
16/12/2009	0.3	1.6	4.0	5.3	1.8	93	96	91	1000	1005	995	-6	83	-59	23.7	24.2	23.0	174	360	1	0.8	5.7	0.0
17/12/2009	0.1	8.6	2.4	5.2	-0.5	93	95	85	1001	1007	996	-15	85	-112	23.2	23.7	22.7	74	360	1	2.0	10.8	0.0
18/12/2009	0.3	0.2	-0.6	1.6	-2.0	82	93	73	1007	1008	1006	-31	162	-200	22.6	23.2	22.0	114	360	1	2.0	9.3	0.0
19/12/2009	0.4	0.8	0.5	3.0	-1.3	89	93	81	998	1006	990	-13	42	-71	21.7	22.4	21.3	193	360	1	2.3	9.9	0.1
20/12/2009	0.4	0.2	-0.8	1.5	-2.5	92	95	85	984	990	978	-37	46	-70	21.2	22.0	20.2	238	360	1	3.0	11.0	0.0
21/12/2009	0.3	0.0	-0.2	1.3	-1.2	92	94	89	972	978	969	-13	98	-61	19.8	20.5	19.1	203	340	91	3.5	9.0	0.3
22/12/2009	0.3	0.0	-0.3	1.9	-1.8	92	96	84	970	971	969	-22	51	-61	21.0	22.5	20.3	214	347	5	2.8	7.3	0.2
23/12/2009	0.3	0.6	1.0	4.8	-1.4	84	94	66	971	972	970	-39	49	-79	21.7	23.2	20.6	128	360	1	2.1	7.3	0.0
24/12/2009	0.6	0.2	-1.3	1.6	-3.2	94	96	91	972	977	970	-29	135	-66	22.5	24.2	21.8	181	360	1	0.8	3.8	0.0
25/12/2009	0.0	1.6	0.3	4.8	-4.6	91	97	76	979	981	977	-32	33	-66	20.1	21.6	19.4	188	359	17	2.8	10.8	0.0
26/12/2009	0.5	0.2	4.2	7.0	2.7	82	88	66	976	979	973	-35	15	-66	19.6	20.5	19.0	202	289	108	4.5	10.5	1.4
27/12/2009	1.2	0.8	2.4	4.8	-1.4	89	94	78	983	990	973	-23	110	-61	20.2	21.9	19.5	239	360	1	3.0	11.7	0.0
28/12/2009	0.5	0.2	1.4	6.0	-1.9	86	93	72	987	989	984	-33	52	-102	20.0	20.7	19.3	128	360	1	1.7	6.3	0.0
29/12/2009	0.4	15.4	3.1	4.0	2.0	85	90	79	979	984	976	-14	0	-51	20.3	20.7	20.1	93	360	1	5.8	17.3	0.7
30/12/2009	0.7	54.6	2.5	3.5	1.1	90	96	87	976	984	974	-11	33	-103	21.0	21.5	20.7	98	336	2	8.7	23.4	1.2
31/12/2009	0.4	6.0	1.3	3.6	-2.6	83	95	67	989	992	984	-29	108	-102	21.0	21.4	20.6	71	360	1	4.0	19.3	0.0
	Sum	**Sum**	**Avg**	**Max**	**Min**	**Avg**	**Max**	**Min**	**Avg**	**Max**	**Min**	**Avg**	**Max**	**Min**	**Avg**	**Max**	**Min**	**Avg**	**Max**	**Min**	**Avg**	**Max**	**Min**
Monthly	18.9	123.0	3.5	11.8	-4.6	87	97	64	989	1018	966	-25	162	-200	22.2	26.2	19.0	172	360	1	3.4	24.9	0.0

APPENDIX 4.1

Landfill Gas Emissions (gas extraction system)

Table 3.4. Emission value results from landfill gas flare 1.

Flare 1	Conc.	Units[1]	Adjusted units (mg/m^3)	Volumetric flow rate (Nm^3/hr)	Emission conc (mg/Nm^3)	Oxygen corrected emission conc to 3% (mg/Nm^3)[2]	Emission limit Values
TOC	1.60	ppm	2.56	2,869.95	2.56	4.02	<10 mg/Nm^3
Hydrogen chloride	4.12	mg/m3	4.12	2,869.95	5.63	8.85	<50 mg/Nm^3
Hydrogen fluoride	0.25	mg/m3	0.25	2,869.95	0.34	0.54	<5 mg/Nm^3
Temperature	1,053	degrees	1326K	2,869.95	-	-	-
CO	2	ppm	2.50	2,869.95	2.50	3.93	<50 mg/Nm^3
O_2	9.51	%	9.51	2,869.95	-	-	-
Total NOx [as NO_2]	28	ppm	57.50	2,869.95	57.50	90.36	<150 mg/Nm^3
SO_2	15	ppm	42.86	2,869.95	42.86	67.35	-
CO_2	6.12	%	6.12	2,869.95	-	-	-

Notes: [1] denotes units as measured.
[2] denotes refer to *Appendix II* for Oxygen correction calculations

Table 3.5. Emission value results from landfill gas flare 2.

Flare 2	Conc.	Units[1]	Adjusted units (mg/m^3)	Volumetric flow rate (Nm^3/hr)	Emission conc (mg/Nm^3)	Oxygen corrected emission conc to 3% (mg/Nm^3)[2]	Emission limit Values
TOC	1.40	ppm	2.24	2,930.70	2.24	3.41	<10 mg/Nm^3
Hydrogen chloride	3.56	mg/m^3	3.56	2,930.70	4.86	7.40	<50 mg/Nm^3
Hydrogen fluoride	0.21	mg/m^3	0.21	2,930.70	0.29	0.44	<5 mg/Nm^3
Temperature	1072	degrees	1345K	2,930.70	-	-	-
CO	2.00	ppm	2.50	2,930.70	2.50	3.81	<50 mg/Nm^3
O_2	9.14	%	9.14	2,930.70		0.00	-
Total NOx [as NO_2]	32	ppm	65.71	2,930.70	65.71	100.02	<150 mg/Nm^3
SO_2	53	ppm	151.43	2,930.70	151.43	230.49	-
CO_2	9.33	%	9.33	2,930.70	-	-	-

Notes: [1] denotes units as measured.
[2] denotes refer to *Appendix II* for Oxygen correction calculations

Table 3.6. Emission value results from landfill gas flare 3.

Flare 3	Conc.	Units[1]	Adjusted units (mg/m^3)	Volumetric flow rate (Nm^3/hr)	Emission conc (mg/Nm^3)	Oxygen corrected emission conc to 3% (mg/Nm^3)[2]	Emission limit Values
TOC	1.72	ppm	2.75	1,666.21	2.75	4.26	<10 mg/Nm^3
Hydrogen chloride	4.67	mg/m^3	4.67	1,666.21	6.38	9.88	<50 mg/Nm^3
Hydrogen fluoride	0.18	mg/m^3	0.18	1,666.21	0.25	0.38	<5 mg/Nm^3
Temperature	1060	degrees	1333K	1,666.21	-	-	-
CO	3.0	ppm	3.75	1,666.21	3.75	5.81	<50 mg/Nm^3
O_2	9.34	%	9.34	1,666.21	-	-	-
Total NOx [as NO_2]	38	ppm	78.04	1,666.21	78.04	120.83	<150 mg/Nm^3
SO_2	61	ppm	174.29	1,666.21	174.29	269.87	-
CO_2	9.45	%	9.45	1,666.21	-	-	-

Notes: [1] denotes units as measured.
[2] denotes refer to *Appendix II* for Oxygen correction calculations

Table 3.7. Emission value results from landfill gas flare 4.

Flare 4	Conc.	Units[1]	Adjusted units (mg/m^3)	Volumetric flow rate (Nm^3/hr)	Emission conc (mg/Nm^3)	Oxygen corrected emission conc to 3% (mg/Nm^3)[2]	Emission limit Values
TOC	2.34	ppm	3.74	1,738.64	3.74	6.04	<10 mg/Nm^3
Hydrogen chloride	5.44	mg/m3	5.44	1,738.64	7.43	12.00	<50 mg/Nm^3
Hydrogen fluoride	0.34	mg/m3	0.34	1,738.64	0.46	0.75	<5 mg/Nm^3
Temperature	1090	degrees	1363K	1,738.64	-	-	-
CO	2.00	ppm	2.50	1,738.64	2.50	4.04	<50 mg/Nm^3
O_2	9.81	%	9.81	1,738.64	-	-	-
Total NOx [as NO_2]	31	ppm	63.66	1,738.64	63.66	102.75	<150 mg/Nm^3
SO_2	45	ppm	128.57	1,738.64	128.57	207.52	-
CO_2	9.88	%	9.88	1,738.64	-	-	-

Notes: [1] denotes units as measured.
[2] denotes refer to *Appendix II* for Oxygen correction calculations

Table 3.8. Emission value results from gas utilisation engine AR01.

Gas Utilisation engine AR01	Conc.	Units[1]	Adjusted units (mg/m^3)	Volumetric flow rate (Nm^3/hr)	Emission conc (mg/Nm^3)	Oxygen corrected emission conc to 5% (mg/Nm^3)[2]	Emission limit Values
TNMVOC	4.12	mg/m^3	6.59	2,263.11	6.59	7.10	<75 mg/Nm^3
Average THC	405	mg/m^3 [propane]	648	2,263.11	648.00	697.58	<1,000 mg/Nm^3
Hydrogen chloride	5.23	mg/m^3	5.23	2,263.11	7.14	7.69	<50 mg/Nm^3 (at mass flows >0.30 kg/h)
Hydrogen fluoride	0.78	mg/m^3	0.78	2,263.11	1.07	1.15	<5 mg/Nm^3 (at mass flows >0.05 kg/h)
Temperature	455	degrees	728.15 K	2,263.11	-	-	-
CO	705	ppm	881.25	2,263.11	881.25	948.67	<1,400 mg/Nm^3
O_2	6.13	%	6.13	2,263.11	-	-	-
Total NOx [as NO_2]	216	ppm	443.57	2,263.11	443.57	477.51	<500 mg/Nm^3
SO_2	31	ppm	88.57	2,263.11	88.57	95.35	-
CO_2	9.17	%	9.17	2,263.11	-	-	-
Particulates	35.11	mg/m^3	35.11	2,263.11	113.27	121.94	<130 mg/Nm^3

Notes: [1] denotes units as measured.
[2] denotes refer to *Appendix II* for Oxygen correction calculations

Table 3.9. Emission value results from gas utilisation engine AR02.

Gas Utilisation engine AR02	Conc.	Units[1]	Adjusted units (mg/m^3)	Volumetric flow rate (Nm^3/hr)	Emission conc (mg/Nm^3)	Oxygen corrected emission conc to 5% (mg/Nm^3)[2]	Emission limit Values
TNMVOC	2.11	mg/m^3	3.38	2,294.62	3.38	3.74	<75 mg/Nm^3
Average THC	491	mg/m^3 [propane]	785.60	2,294.62	785.60	870.46	<1,000 mg/Nm^3
Hydrogen chloride	3.12	mg/m^3	3.12	2,294.62	4.26	4.72	<50 mg/Nm^3 (at mass flows >0.30 kg/h)
Hydrogen fluoride	0.15	mg/m^3	0.15	2,294.62	0.20	0.23	<5 mg/Nm^3 (at mass flows >0.05 kg/h)
Temperature	445	degrees	718K	2,294.62	-	-	-
CO	704	ppm	880	2,294.62	880	975.05	<1,400 mg/Nm^3
O_2	6.55	%	6.55	2,294.62	-	-	-
Total NOx [as NO_2]	198	ppm	406.61	2,294.62	406.61	450.53	<500 mg/Nm^3
SO_2	14.00	ppm	40.00	2,294.62	40.00	44.32	-
CO_2	9.31	%	9.31	2,294.62	-	-	-
Particulates	24.67	mg/m^3	24.67	2,294.62	64.86	71.87	<130 mg/Nm^3

Notes: [1] denotes units as measured.
[2] denotes refer to *Appendix II* for Oxygen correction calculations

Table 3.10. Emission value results from gas utilisation engine AR03.

Gas Utilisation engine AR03	Conc.	Units[1]	Adjusted units (mg/m^3)	Volumetric flow rate (Nm^3/hr)	Emission conc (mg/Nm^3)	Oxygen corrected emission conc to 5% (mg/Nm^3)[2]	Emission limit Values
TNMVOC	4.16	mg/m^3	6.66	2,549.36	6.66	7.32	<75 mg/Nm^3
Average THC	387	mg/m^3 [propane]	619.20	2,549.36	619.20	681.33	<1,000 mg/Nm^3
Hydrogen chloride	3.13	mg/m^3	3.13	2,549.36	4.28	4.70	<50 mg/Nm^3 (at mass flows >0.30 kg/h)
Hydrogen fluoride	0.56	mg/m^3	0.56	2,549.36	0.77	0.84	<5 mg/Nm^3 (at mass flows >0.05 kg/h)
Temperature	453	degrees	726.15K	2,549.36	-	-	-
CO	732	ppm	915	2,549.36	915	1,006.82	<1,400 mg/Nm^3
O_2	6.45	%	6.45	2,549.36	-	-	-
Total NOx [as NO_2]	213	ppm	437.41	2,549.36	437.41	481.30	<500 mg/Nm^3
SO_2	24.00	ppm	68.57	2,549.36	68.57	75.45	-
CO_2	10.13	%	10.13	2,549.36	-	-	-
Particulates	31.45	mg/m^3	31.45	2,549.36	83.61	92	<130 mg/Nm^3

Notes: [1] denotes units as measured.
[2] denotes refer to *Appendix II* for Oxygen correction calculations

Table 3.11. Emission value results from gas utilisation engine AR04.

Gas Utilisation engine AR04	Conc.	Units[1]	Adjusted units (mg/m^3)	Volumetric flow rate (Nm^3/hr)	Emission conc (mg/Nm^3)	Oxygen corrected emission conc to 5% (mg/Nm^3)[2]	Emission limit Values
TNMVOC	4.56	mg/m^3	7.30	2,752	7.30	7.85	<75 mg/Nm^3
Average THC	467	mg/m^3 [propane]	747.20	2,752	747.20	803.82	<1,000 mg/Nm^3
Hydrogen chloride	5.34	mg/m^3	5.34	2,752	7.29	7.85	<50 mg/Nm^3 (at mass flows >0.30 kg/h)
Hydrogen fluoride	0.67	mg/m^3	0.67	2,752	0.92	0.98	<5 mg/Nm^3 (at mass flows >0.05 kg/h)
Temperature	461	degrees	734.15K	2,752	-	-	-
CO	783	ppm	978.75	2,752	978.75	1052.92	<1,400 mg/Nm^3
O_2	6.12	%	6.12	2,752	-	-	-
Total NOx [as NO_2]	213	ppm	437.41	2,752	437.41	470.56	<500 mg/Nm^3
SO_2	26	ppm	74.29	2,752	74.29	79.91	-
CO_2	10.12	%	10.12	2,752	-	-	-
Particulates	36.77	mg/m^3	36.77	2,752	97.75	105.16	<130 mg/Nm^3

Notes: [1] denotes units as measured.
[2] denotes refer to *Appendix II* for Oxygen correction calculations

Table 3.12. Emission value results from gas utilisation engine AR05.

Gas Utilisation engine AR05	Conc.	Units[1]	Adjusted units (mg/m^3)	Volumetric flow rate (Nm^3/hr)	Emission conc (mg/Nm^3)	Oxygen corrected emission conc to 5% (mg/Nm^3)[2]	Emission limit Values
TNMVOC	8.43	mg/m^3	13.49	2265	13.49	14.51	<75 mg/Nm^3
Average THC	562	mg/m^3 [propane]	899.20	2265	899.20	967.34	<1,000 mg/Nm^3
Hydrogen chloride	6.11	mg/m^3	6.11	2265	8.35	8.98	<50 mg/Nm^3 (at mass flows >0.30 kg/h)
Hydrogen fluoride	0.45	mg/m^3	0.45	2265	0.61	0.66	<5 mg/Nm^3 (at mass flows >0.05 kg/h)
Temperature	445	degrees	718.15 K	2265	-	-	-
CO	899	ppm	1123.75	2265	1,123.75	1,208.91	<1,400 mg/Nm^3
O_2	6.12	%	6.12	2265	-	-	-
Total NOx [as NO_2]	225	ppm	462.05	2265	462.05	497.07	<500 mg/Nm^3
SO_2	15	ppm	42.86	2265	42.86	46.10	-
CO_2	11.32	%	11.32	2265	-	-	-
Particulates	37.23	mg/m^3	37.23	2265	97.88	105.30	<130 mg/Nm^3

Notes: [1] denotes units as measured.
[2] denotes refer to *Appendix II* for Oxygen correction calculations

Table 3.13. Emission value results from gas utilisation engine AR06.

Gas Utilisation engine AR06	Conc.	Units[1]	Adjusted units (mg/m^3)	Volumetric flow rate (Nm^3/hr)	Emission conc (mg/Nm^3)	Oxygen corrected emission conc to 5% (mg/Nm^3)[2]	Emission limit Values
TNMVOC	5.34	mg/m^3	8.54	2,278	8.54	9.15	<75 mg/Nm^3
Average THC	478	mg/m^3 [propane]	764.80	2,278	764.80	818.88	<1000 mg/Nm^3
Hydrogen chloride	5.78	mg/m^3	5.78	2,278	7.90	8.45	<50 mg/Nm^3 (at mass flows >0.30 kg/h)
Hydrogen fluoride	0.13	mg/m^3	0.13	2,278	0.18	0.19	<5 mg/Nm^3 (at mass flows >0.05 kg/h)
Temperature	451	degrees	724.15K	2,278	-	-	-
CO	948	ppm	1185	2,278	1,185	1,268.79	<1400 mg/Nm^3
O_2	6.05	%	6.05	2,278	-	-	-
Total NOx [as NO_2]	205	ppm	420.98	2,278	420.98	450.75	<500 mg/Nm^3
SO_2	18.13	ppm	51.80	2,278	51.80	55.46	-
CO_2	9.13	%	9.13	2,278	-	-	-
Particulates	41.21	mg/m^3	41.21	2,278	108.35	116.01	<130 mg/Nm^3

Notes: [1] denotes units as measured.
[2] denotes refer to *Appendix II* for Oxygen correction calculations

Table 3.14. Emission value results from gas utilisation engine AR07.

Gas Utilisation engine AR07	Conc.	Units[1]	Adjusted units (mg/m^3)	Volumetric flow rate (Nm^3/hr)	Emission conc (mg/Nm^3)	Oxygen corrected emission conc to 5% (mg/Nm^3)[2]	Emission limit Values
TNMVOC	7.13	mg/m^3	11.41	2,405	11.41	12.55	<75 mg/Nm^3
Average THC	561	mg/m^3 [propane]	897.60	2,405	897.60	987.67	<1,000 mg/Nm^3
Hydrogen chloride	8.56	mg/m^3	8.56	2,405	11.69	12.87	<50 mg/Nm^3 (at mass flows >0.30 kg/h)
Hydrogen fluoride	2.13	mg/m^3	2.13	2,405	2.91	3.20	<5 mg/Nm^3 (at mass flows >0.05 kg/h)
Temperature	453	degrees	726.15 K	2,405	-	-	-
CO	733	ppm	916.25	2,405	916.25	1,008.19	<1,400 mg/Nm^3
O_2	6.45	%	6.45	2,405	-	-	-
Total NOx [as NO_2]	216	ppm	443.57	2,405	443.57	488.08	<500 mg/Nm^3
SO_2	16	ppm	45.71	2,405	45.71	50.30	-
CO_2	9.58	%	9.58	2,405	-	-	-
Particulates	34.55	mg/m^3	34.55	2,405	90.84	99.95	<130 mg/Nm^3

Notes: [1] denotes units as measured.
[2] denotes refer to *Appendix II* for Oxygen correction calculations

Table 3.15. Emission value results from gas utilisation engine AR08.

Gas Utilisation engine AR08	Conc.	Units[1]	Adjusted units (mg/m^3)	Volumetric flow rate (Nm^3/hr)	Emission conc (mg/Nm^3)	Oxygen corrected emission conc to 5% (mg/Nm^3)[2]	Emission limit Values
TNMVOC	5.36	mg/m^3	8.58	2,339	8.58	10.15	<75 mg/Nm^3
Average THC	513	mg/m^3 [propane]	820.80	2,339	820.80	971.04	<1,000 mg/Nm^3
Hydrogen chloride	7.13	mg/m^3	7.13	2,339	9.74	11.52	<50 mg/Nm^3 (at mass flows >0.30 kg/h)
Hydrogen fluoride	1.45	mg/m^3	1.45	2,339	1.98	2.34	<5 mg/Nm^3 (at mass flows >0.05 kg/h)
Temperature	450	degrees	723.15 K	2,339	-	-	-
CO	931	ppm	1,163.75	2,339	1,163.75	1,376.76	<1,400 mg/Nm^3
O_2	7.46	%	7.46	2,339	-	-	-
Total NOx [as NO_2]	194.00	ppm	398.39	2,339	398.39	471.31	<500 mg/Nm^3
SO_2	9	ppm	25.71	2,339	25.71	30.42	-
CO_2	9.32	%	9.32	2,339	-	-	-
Particulates	35	mg/m^3	35.00	2,339	92.02	108.86	<130 mg/Nm^3

Notes: [1] denotes units as measured.
[2] denotes refer to *Appendix II* for Oxygen correction calculations

Table 3.16. Emission value results from gas utilisation engine AR09.

Gas Utilisation engine AR09	Conc.	Units[1]	Adjusted units (mg/m^3)	Volumetric flow rate (Nm^3/hr)	Emission conc (mg/Nm^3)	Oxygen corrected emission conc to 5% (mg/Nm^3)[2]	Emission limit Values
TNMVOC	4.45	mg/m^3	7.12	2,791	7.12	7.43	<75 mg/Nm^3
Average THC	435	mg/m^3 [propane]	696	2,791	696	726.14	<1000 mg/Nm^3
Hydrogen chloride	7.13	mg/m^3	7.13	2,791	9.74	10.16	<50 mg/Nm^3 (at mass flows >0.30 kg/h)
Hydrogen fluoride	0.67	mg/m^3	0.67	2,791	0.92	0.95	<5 mg/Nm^3 (at mass flows >0.05 kg/h)
Temperature	451	degrees	724.15 K	2,791	-	-	-
CO	487	ppm	608.75	2,791	608.75	635.11	<1400 mg/Nm^3
O_2	5.66	%	5.66	2,791	-	-	-
Total NOx [as NO_2]	226	ppm	464.11	2,791	464.11	484.21	<500 mg/Nm^3
SO_2	7	ppm	20	2,791	20.00	20.87	-
CO_2	9.34	%	9.34	2,791	-	-	-
Particulates	38.32	mg/m^3	38.32	2,791	100.75	105.11	<130 mg/Nm^3

Notes: [1] denotes units as measured.
[2] denotes refer to *Appendix II* for Oxygen correction calculations

Table 3.17. Emission value results from gas utilisation engine AR10.

Gas Utilisation engine AR10	Conc.	Units[1]	Adjusted units (mg/m^3)	Volumetric flow rate (Nm^3/hr)	Emission conc (mg/Nm^3)	Oxygen corrected emission conc to 5% (mg/Nm^3)[2]	Emission limit Values
TNMVOC	5.45	mg/m^3	8.72	2,815	8.72	9.70	<75 mg/Nm^3
Average THC	467	mg/m^3 [propane]	747.20	2,815	747.20	830.80	<1,000 mg/Nm^3
Hydrogen chloride	7.34	mg/m^3	7.34	2,815	10.03	11.15	<50 mg/Nm^3 (at mass flows >0.30 kg/h)
Hydrogen fluoride	0.12	mg/m^3	0.12	2,815	0.16	0.18	<5 mg/Nm^3 (at mass flows >0.05 kg/h)
Temperature	453	degrees	726.15K	2,815	-	-	-
CO	718	ppm	897.50	2,815	897.50	997.92	<1,400 mg/Nm^3
O_2	6.60	%	6.60	2,815	-	-	-
Total NOx [as NO_2]	209	ppm	429.20	2,815	429.20	477.22	<500 mg/Nm^3
SO_2	6	ppm	17.14	2,815	17.14	19.06	-
CO_2	10.77	%	10.77	2,815	-	-	-
Particulates	24.77	mg/m^3	24.77	2,815	65.12	72.41	<130 mg/Nm^3

Notes: [1] denotes units as measured.
[2] denotes refer to *Appendix II* for Oxygen correction calculations

Table 3.18. Emission value results from gas utilisation engine AR11.

Gas Utilisation engine AR11	Conc.	Units[1]	Adjusted units (mg/m^3)	Volumetric flow rate (Nm^3/hr)	Emission conc (mg/Nm^3)	Oxygen corrected emission conc to 5% (mg/Nm^3)[2]	Emission limit Values
TNMVOC	5.99	mg/m^3	9.58	2,950	9.58	10.30	<75 mg/Nm^3
Average THC	573.00	mg/m^3 [propane]	916.80	2,950	916.80	985.61	<1000 mg/Nm^3
Hydrogen chloride	7.34	mg/m^3	7.34	2,950	10.03	10.78	<50 mg/Nm^3 (at mass flows >0.30 kg/h)
Hydrogen fluoride	0.88	mg/m^3	0.88	2,950	1.20	1.29	<5 mg/Nm^3 (at mass flows >0.05 kg/h)
Temperature	452	degrees	725.15K	2,950	-	-	-
CO	487	ppm	608.75	2,950	608.75	654.44	<1400 mg/Nm^3
O_2	6.11	%	6.11	2,950	-	-	-
Total NOx [as NO_2]	215	ppm	441.52	2,950	441.52	474.65	<500 mg/Nm^3
SO_2	8	ppm	22.86	2,950	22.86	24.57	-
CO_2	10.91	%	10.91	2,950	-	-	-
Particulates	34.21	mg/m^3	34.21	2,950	89.94	96.69	<130 mg/Nm^3

Notes: [1] denotes units as measured.
[2] denotes refer to *Appendix II* for Oxygen correction calculations.

APPENDIX 5.1

Discharge to Sewer Results for 2009
Quarterly Reports

TelLab

ANALYSIS OF AQUEOUS SAMPLE.

Date Sampled: 13.01.2009
Date Received: 13.01.2009
Date Analysis Commenced:13.01.2009
Our Ref.:WS-23439, 153845, COV575734/2009
Your Ref : Arthurstown
Certificate No. L/09/0216

DETERMINAND	Sample ID Lab ID	Balance Tank 77868
Alkalinity	n/a	190
Ammonia as NH_3	n/a	1.2
Ammoniacal Nitrogen	n/a	1.0
Arsenic(ug/l)	++	99
BOD	n/a	36
Cadmium (ug/l)	n/a	0.71
Chloride	**	1851
Chromium	**	0.32
COD	n/a	1396
Copper	**	0.12
Cyanide	n/a	0.01
Fluoride	**	13
Kjeldhal Nitrogen	n/a	22
Lead (ug/l)	**	6.3
Magnesium	**	93
Manganese	**	0.57
Mercury (ug/l)	++	1.4
Nickel	**	0.38
Nitrate as N	n/a	1761
Nitrite as N	**	3.5
Organochlorine Pesticides	++	see attached
Orthophosphate as P	**	14
pH	**	6.7
Selenium(ug/l)	++	54
Semi -Voc's	++	see attached
Sulphate	**	101
Suspended Solids	n/a	195
TOC	n/a	401
VOC	++	see attached
Zinc	**	0.45
Total Coliforms(cfu/100ml)	n/a	**>100**
Faecal Coliforms(cfu/100ml)	n/a	**2**

Concentrations are expressed as mg/l (ppm)
unless otherwise specified.
Analysis of metals are performed on the filtered sample
** = INAB Accredited Tests ++ = Subcontracted Tests n/a = Non-INAB Accredited Tests

The above results relate only to the sample tested
This report should not be regenerated except in full and with the consent of T.E. Laboratories Ltd.

T.E. Laboratories

TelLab

ANALYSIS OF AQUEOUS SAMPLE.

Date Sampled: 13.01.2009
Date Received: 13.01.2009
Date Analysis Commenced:13.01.2009
Our Ref.:WS-23439, 153845, COV575734/2009
Your Ref : Arthurstown
Certificate No. L/09/0216

ORGANOCHLORINE PESTICIDES (ug/l) ++

Determinand	Sample ID Lab ID	Balance Tank 77868
1,2,3-Trichlorobenzene		<0.300
1,3,5-Trichlorobenzene		<0.300
124-Trichlorobenzene		<0.300
Aldrin		<0.300
Cis Chlordane		<0.100
DDE (op)		<0.100
DDE (pp)		<0.100
DDT (op)		<0.100
DDT (pp)		<0.100
Dichlorbenil		0.402
Dieldrin		<0.300
Endosulphan A		<0.300
Endosulphan B		<0.300
Endrin		<0.300
HCH - alpha		<0.100
HCH - beta		<0.100
HCH - gamma		<0.100
HCH - delta		<1.000
Heptachlor		<0.100
Heptachlor Epoxide		<0.100
Hexachlorobenzene		<0.100
Hexachlorobutadiene		<0.100
Isodrin		<0.300
TDE (op)		<0.100
TDE (pp)		<0.100
Tecnazene		<0.500
Trans Chlordane		<0.100
Triallate		<0.500
Trifluralin		<0.500

Concentrations expressed as ug/l
unless stated otherwise

** = INAB Accredited Tests ++ = Subcontracted Tests n/a = Non-INAB Accredited Tests
The above results relate only to the sample tested
This report should not be regenerated except in full and with the consent of T.E. Laboratories Ltd.

TelLab

ANALYSIS OF AQUEOUS SAMPLE.

Date Sampled: 13.01.2009
Date Received: 13.01.2009
Date Analysis Commenced:13.01.2009
Our Ref.:WS-23439, 153845, COV575734/2009
Your Ref.: Arthurstown
Certificate No. L/09/0216

Semi-Volatile Organic Compounds ++

Determinand	Client ID / LAB ID	Balance Tank 77868	Blank Water
1,2,4-Trichlorobenzene	ug/l	<1	<1
1,2-Dichlorobenzene	ug/l	<1	<1
1,3-Dichlorobenzene	ug/l	<1	<1
1,4-Dichlorobenzene	ug/l	14	<1
2,4,5-Trichlorophenol	ug/l	<1	<1
2,4,6-Trichlorophenol	ug/l	<1	<1
2,4-Dichlorophenol	ug/l	<1	<1
2,4-Dimethylphenol	ug/l	<1	<1
2,4-Dinitrophenol	ug/l	#<5	#<5
2,4-Dinitrotoluene	ug/l	<1	<1
2,6-Dinitrotoluene	ug/l	<1	<1
2-Chloronaphthalene	ug/l	<1	<1
2-Chlorophenol	ug/l	<1	<1
2-methyl phenol	ug/l	<1	<1
2-Methylnaphthalene	ug/l	1	<1
2-Nitroaniline	ug/l	<1	<1
2-Nitrophenol	ug/l	<1	<1
3-Nitroaniline	ug/l	<1	<1
3/4-Methylphenol	ug/l	<1	<1
4-Bromophenyl phenylether	ug/l	<1	<1
4-Chloro-3-methylphenol	ug/l	<1	<1
4-Chloroaniline	ug/l	<1	<1
4-Chlorophenyl phenylether	ug/l	<1	<1
4-Nitroaniline	ug/l	<1	<1
4-Nitrophenol	ug/l	#<5	#<5
Acenaphthene	ug/l	<1	<1
Acenaphthylene	ug/l	<1	<1
Anthracene	ug/l	<1	<1
Azobenzene	ug/l	<1	<1
Benzo(a)Anthracene	ug/l	<1	<1
Benzo(a)Pyrene	ug/l	1	<1
Benzo(b/k)Fluoranthene	ug/l	2	<1
Benzo(ghi)Perylene	ug/l	2	<1
Bis (2-chloroethoxy) methane	ug/l	<1	<1
Bis (2-chloroethyl) ether	ug/l	<1	<1
Bis (2-chloroisopropyl) ether	ug/l	<1	<1
Bis (2-ethylhexyl)phthalate	ug/l	16	2
Butyl benzylphthalate	ug/l	<1	<1
Carbazole	ug/l	<1	<1
Chrysene	ug/l	<1	<1
Di-n-butylphthalate	ug/l	2	<1
Di-n-octylphthalate	ug/l	1	<1
Dibenzo(ah)Anthracene	ug/l	<1	<1
Dibenzofuran	ug/l	<1	<1
Diethyl phthalate	ug/l	2	<1
Dimethyl phthalate	ug/l	<1	<1
Fluoranthene	ug/l	<1	<1
Fluorene	ug/l	<1	<1
Hexachlorobenzene	ug/l	<1	<1
Hexachlorobutadiene	ug/l	<1	<1
Hexachlorocyclopentadiene	ug/l	<5	<5
Hexachloroethane	ug/l	<1	<1
Indeno(123-cd)Pyrene	ug/l	1	<1
Isophorone	ug/l	<1	<1
Naphthalene	ug/l	<1	<1
Nitrobenzene	ug/l	<1	<1
Pentachlorophenol	ug/l	#<5	#<5
Phenanthrene	ug/l	<1	<1
Phenol	ug/l	18	#<5
Pyrene	ug/l	<1	<1

#LOD raised due to low matrix spike recovery

Concentrations expressed as ug/l (ppb)
unless stated otherwise
** = INAB Accredited Tests ++ = Subcontracted Tests n/a = Non-INAB Accredited Tests

The above results relate only to the sample tested
This report should not be regenerated except in full and with the consent of T.E. Laboratories Ltd.

TelLab

ANALYSIS OF AQUEOUS SAMPLE.

Date Sampled: 13.01.2009
Date Received: 13.01.2009
Date Analysis Commenced:13.01.2009
Our Ref.:WS-23439, 153845, COV575734/2009
Your Ref : Arthurstown
Certificate No. L/09/0216

Volatile Organic Compounds ++

Determinand	Client ID LAB ID	Balance Tank 77868
1,1,1,2-Tetrachloroethane	ug/l	<1
1,1,1-Trichloroethane	ug/l	<1
1,1,2,2-Tetrachloroethane	ug/l	<1
1,1,2-Trichloroethane	ug/l	<1
1,1,2-Trichloroethylene	ug/l	<1
1,1-Dichloroethane	ug/l	<1
1,1-Dichloroethylene	ug/l	<1
1,1-Dichloropropene	ug/l	<1
1,2,3-Trichloropropane	ug/l	<1
1,2,4-Trimethylbenzene	ug/l	<1
1,2-dibromoethane	ug/l	<1
1,2-Dichlorobenzene	ug/l	<1
1,2-Dichloroethane	ug/l	<1
1,2-Dichloropropane	ug/l	<1
1,3,5-Trimethylbenzene	ug/l	<1
1,3-Dichlorobenzene	ug/l	<1
1,3-Dichloropropane	ug/l	<1
1,4-Dichlorobenzene	ug/l	<1
2,2-Dichloropropane	ug/l	<1
2-Chlorotoluene	ug/l	<1
4-Chlorotoluene	ug/l	<1
Benzene	ug/l	<1
Bromobenzene	ug/l	<1
Bromochloromethane	ug/l	<1
Bromodichloromethane	ug/l	<1
Bromoform	ug/l	<1
Bromomethane	ug/l	<1
Carbon tetrachloride	ug/l	<1
Chlorobenzene	ug/l	<1
Chlorodibromomethane	ug/l	<1
Chloroethane	ug/l	<1
Chloroform	ug/l	<1
Chloromethane	ug/l	<1
Cis-1,2-Dichloroethylene	ug/l	<1
Cis-1,3-Dichloropropene	ug/l	<1
Dibromomethane	ug/l	<1
EthylBenzene	ug/l	<1
Meta/Para-Xylene	ug/l	<1
Ortho-Xylene	ug/l	<1
Styrene	ug/l	<1
Tetrachloroethylene	ug/l	<1
Toluene	ug/l	<1
Trans-1,2-Dichloroethylene	ug/l	<1
Trichlorofluoromethane	ug/l	<1
Vinyl chloride monomer	ug/l	<1

Concentrations expressed as ug/l (ppb)
unless stated otherwise
** = INAB Accredited Tests ++ = Subcontracted Tests n/a = Non-INAB Accredited Tests

The above results relate only to the sample tested
This report should not be regenerated except in full and with the consent of T.E. Laboratories Ltd.

TelLab

ANALYSIS OF AQUEOUS SAMPLE.

Date Sampled:21.04.2009
Date Received: 22.04.2009
Date Analysis Commenced:22.04.2009
Our Ref.:WS-24261, COV/600057/2009, 162990
Your Ref : Arthurstown
Certificate No. L/09/1053

DETERMINAND	Sample ID Lab ID	Balance Tank 80414
Alkalinity	n/a	280
Ammonia as NH3	n/a	0.15
Ammoniacal Nitrogen	n/a	0.12
Arsenic (ug/l)	++	130
BOD	n/a	104
Cadmium (ug/l)	**	8
Chloride	**	2265
Chromium	**	0.34
COD	n/a	2045
Copper	**	<0.05
Cyanide	n/a	<0.02
Fluoride	**	<1
Kjeldhal Nitrogen	n/a	58
Lead (ug/l)	**	15
Magnesium	**	100
Manganese	**	0.69
Mercury (ug/l)	++	1.3
Nickel	**	0.51
Nitrate as N	n/a	2218
Nitrite as N	**	5.7
Orthophosphate as P	**	20
pH	**	6.8
Selenium (ug/l)	++	77
Sulphate	**	106
Suspended Solids	n/a	463
TOC	n/a	535
Zinc	**	0.37
Faecal Coliforms (cfu/20mls)	n/a	**10**
Total Coliforms (cfu/20mls)	n/a	**>100**

Concentrations are expressed as mg/l (ppm)
unless otherwise specified.

** = INAB Accredited Tests ++ = Subcontracted Tests n/a = Non-INAB Accredited Tests

The above results relate only to the sample tested
This report should not be regenerated except in full and with the consent of T.E. Laboratories Ltd.

TelLab

ANALYSIS OF AQUEOUS SAMPLES.

Date Sampled:21.04.2009
Date Received: 22.04.2009
Date Analysis Commenced:22.04.2009
Our Ref.:WS-24261, COV/600057/2009, 162990
Your Ref : Arthurstown
Certificate No. L/09/1053

Volatile Organic Compounds ug/l ++

Determinand	Sample ID Lab ID	Balance Tank 80414
1,1,1,2-Tetrachloroethane		<1
1,1,1-Trichloroethane		<1
1,1,2,2-Tetrachloroethane		<1
1,1,2-Trichloroethane		<1
1,1,2-Trichloroethylene		<1
1,1-Dichloroethane		<1
1,1-Dichloroethylene		<1
1,1-Dichloropropene		<1
1,2,3-Trichloropropane		<1
1,2,4-Trimethylbenzene		<1
1,2-dibromoethane		<1
1,2-Dichlorobenzene		<1
1,2-Dichloroethane		<1
1,2-Dichloropropane		<1
1,3,5-Trimethylbenzene		<1
1,3-Dichlorobenzene		<1
1,3-Dichloropropane		<1
1,4-Dichlorobenzene		<1
2,2-Dichloropropane		<1
2-Chlorotoluene		<1
4-Chlorotoluene		<1
Benzene		<1
Bromobenzene		<1
Bromochloromethane		<1
Bromodichloromethane		<1
Bromoform		<1
Bromomethane		<1
Carbon tetrachloride		<1
Chlorobenzene		<1
Chlorodibromomethane		<1
Chloroethane		<1
Chloroform		<1
Chloromethane		<1
Cis-1,2-Dichloroethylene		<1
Cis-1,3-Dichloropropene		<1
Dibromomethane		<1
Dichlorodifluoromethane		<1
Dichloromethane		<50
EthylBenzene		<1
Isopropyl benzene		<1
Meta/Para-Xylene		<1
n-Propylbenzene		<1
Ortho-Xylene		<1
p-Isopropyltoluene		<1
Sec-Butylbenzene		<1
Styrene		<1
Tert-Butylbenzene		<1
Tetrachloroethylene		<1
Toluene		<1
Trans-1,2-Dichloroethylene		<1
Trans-1,3-Dichloropropene		<1
Trichlorofluoromethane		<1
Vinyl chloride monomer		<1

Concentrations expressed as ug/l (ppb)
unless stated otherwise

** = INAB Accredited Tests ++ = Subcontracted Tests n/a = Non-INAB Accredited Tests

TelLab

ANALYSIS OF AQUEOUS SAMPLES.

Date Sampled:21.04.2009
Date Received: 22.04.2009
Date Analysis Commenced:22.04.2009
Our Ref.:WS-24261, COV/600057/2009, 162990
Your Ref : Arthurstown
Certificate No. L/09/1053

ORGANOCHLORINE PESTICIDES (ng/l) ++

Determinand	Sample ID Lab ID	Balance Tank 80414
123 Trichlorobenzene		<60
124 TCB		<60
135 Trichlorobenzene		<60
Aldrin		70
Endosulphan A		<60
HCH - alpha		<20
Endosulphan B		<60
HCH - beta		<20
Cis-Chlordane		<20
Dichlobenil		114
Dieldrin		<60
Endrin		<60
HCH - gamma		<20
Heptachlor Epoxide		<20
Hexachlorobenzene		<20
Hexachlorobutadiene		<20
Isodrin		<60
DDE (op)		<20
DDE (pp)		<20
TDE (op)		<20
TDE (pp)		<20
DDT (op)		<20
DDT (pp)		<85
Tecnazene		<100
Gamma Chlordane		<20
Triallate		<100
Trifluralin		<100

Concentrations expressed as ng/l
unless stated otherwise

** = INAB Accredited Tests ++ = Subcontracted Tests n/a = Non-INAB Accredited Tests
The above results relate only to the sample tested
This report should not be regenerated except in full and with the consent of T.E. Laboratories Ltd.

TelLab

ANALYSIS OF AQUEOUS SAMPLES.

Date Sampled:21.04.2009
Date Received: 22.04.2009
Date Analysis Commenced:22.04.2009
Our Ref.:WS-24261, COV/600057/2009, 162990
Your Ref : Arthurstown
Certificate No. L/09/1053

Semi Volatile Organic Compounds ug/l ++

	Sample ID	Balance Tank	Blank
Determinand	Lab ID	80414	
1,2,4-Trichlorobenzene		<1	<1
1,2-Dichlorobenzene		<1	<1
1,3-Dichlorobenzene		<1	<1
1,4-Dichlorobenzene		<1	<1
2,4,5-Trichlorophenol		<1	<1
2,4,6-Trichlorophenol		<1	<1
2,4-Dichlorophenol		<1	<1
2,4-Dimethylphenol		<1	<1
2,4-Dinitrophenol		<5	<5
2,4-Dinitrotoluene		<1	<1
2,6-Dinitrotoluene		<1	<1
2-Chloronaphthalene		<1	<1
2-Chlorophenol		<1	<1
2-methyl phenol		<1	<1
2-Methylnaphthalene		<1	<1
2-Nitroaniline		<1	<1
2-Nitrophenol		<1	<1
3-Nitroaniline		<1	<1
3/4-Methylphenol		<1	<1
4-Bromophenyl phenylether		<1	<1
4-Chloro-3-methylphenol		<1	<1
4-Chloroaniline		<1	<1
4-Chlorophenyl phenylether		<1	<1
4-Nitroaniline		<1	<1
4-Nitrophenol		<5	<5
Acenaphthene		<1	<1
Acenaphthylene		<1	<1
Anthracene		<1	<1
Azobenzene		<1	<1
Benzo(a)Anthracene		<1	<1
Benzo(a)Pyrene		<1	<1
Benzo(b/k)Fluoranthene		<1	<1
Benzo(ghi)Perylene		<1	<1
Bis (2-chloroethoxy) methane		<1	<1
Bis (2-chloroethyl) ether		<1	<1
Bis (2-chloroisopropyl) ether		<1	<1
Bis (2-ethylhexyl)phthalate		2	1
Butyl benzylphthalate		<1	<1
Carbazole		<1	<1
Chrysene		<1	<1
Di-n-butylphthalate		<1	<1
Di-n-octylphthalate		<1	<1
Dibenzo(ah)Anthracene		<1	<1
Dibenzofuran		<1	<1
Diethyl phthalate		<1	<1
Dimethyl phthalate		<1	<1
Fluoranthene		<1	<1
Fluorene		<1	<1
Hexachlorobenzene		<1	<1
Hexachlorobutadiene		<1	<1
Hexachlorocyclopentadiene		<5	<5
Hexachloroethane		<1	<1
Indeno(123-cd)Pyrene		<1	<1
Isophorone		<1	<1
Naphthalene		<1	<1
Nitrobenzene		<1	<1
Pentachlorophenol		<5	<5
Phenanthrene		<1	<1
Phenol		<5	<5
Pyrene		<1	<1

Concentrations expressed as ug/l (ppb)
unless stated otherwise

TelLab

ANALYSIS OF AQUEOUS SAMPLE.

Date Sampled:28.07.2009
Date Received: 28.08.2009
Date Analysis Commenced:28.08.2009
Our Ref.:WS-25071, 172473,COV/625081/2009
Your Ref : Arthurstown
Certificate No. L/09/1864

DETERMINAND	Sample ID Lab ID	Balance Tank 82607
Alkalinity	n/a	840
Ammonia as NH3	n/a	22
Ammoniacal Nitrogen	n/a	18
Arsenic (ug/l)	++	<0.2
BOD	n/a	<15
Cadmium (ug/l)	**	12
Chloride	**	2759
Chromium	**	0.80
COD	n/a	3290
Copper	**	0.08
Cyanide	n/a	0.40
Fluoride	**	<1
Kjeldhal Nitrogen	n/a	41
Lead (ug/l)	n/a	<50
Magnesium	**	95
Manganese	**	0.56
Mercury (ug/l)	++	<0.05
Nickel	**	0.52
Nitrate as N	n/a	2631
Nitrite as N	**	246
Orthophosphate as P	**	21
pH	**	8.4
Selenium (ug/l)	++	<0.5
Sulphate	**	113
Suspended Solids	n/a	1035
TOC	n/a	883
Zinc	**	0.59
Faecal Coliforms (cfu/10mls)	n/a	**12**
Total Coliforms (cfu/10mls)	n/a	**>100**

Concentrations are expressed as mg/l (ppm)
unless otherwise specified.

** = INAB Accredited Tests ++ = Subcontracted Tests n/a = Non-INAB Accredited Tests

The above results relate only to the sample tested
This report should not be regenerated except in full and with the consent of T.E. Laboratories Ltd.

T.E. Laboratories

TelLab

ANALYSIS OF AQUEOUS SAMPLES.

Date Sampled:28.07.2009
Date Received: 28.08.2009
Date Analysis Commenced:28.08.2009
Our Ref.:WS-25071, 172473,COV/625081/2009
Your Ref : Arthurstown
Certificate No. L/09/1864

Volatile Organic Compounds ug/l ++

	Sample ID	Balance Tank
Determinand	**Lab ID**	**82607**
Dichlorodifluoromethane	µg/l	<1
Chloromethane	µg/l	<1
Vinyl chloride monomer	µg/l	<1
Bromomethane	µg/l	<1
Chloroethane	µg/l	<1
Trichlorofluoromethane	µg/l	<1
1,1-Dichloroethylene	µg/l	<1
Dichloromethane	µg/l	<50
Trans-1,2-Dichloroethylene	µg/l	<1
1,1-Dichloroethane	µg/l	<1
Cis-1,2-Dichloroethylene	µg/l	<1
2,2-Dichloropropane	µg/l	<1
Chloroform	µg/l	<1
Bromochloromethane	µg/l	<1
1,1,1-Trichloroethane	µg/l	<1
1,1-Dichloropropene	µg/l	<1
Carbon tetrachloride	µg/l	<1
1,2-Dichloroethane	µg/l	<1
Benzene	µg/l	<1
1,2-Dichloropropane	µg/l	<1
1,1,2-Trichloroethylene	µg/l	<1
Bromodichloromethane	µg/l	<1
Dibromomethane	µg/l	<1
Cis-1,3-Dichloropropene	µg/l	<1
Toluene	µg/l	<1
Trans-1,3-Dichloropropene	µg/l	<1
1,1,2-Trichloroethane	µg/l	<1
1,3-Dichloropropane	µg/l	<1
Tetrachloroethylene	µg/l	<1
Chlorodibromomethane	µg/l	<1
1,2-dibromoethane	µg/l	<1
Chlorobenzene	µg/l	<1
1,1,1,2-Tetrachloroethane	µg/l	<1
EthylBenzene	µg/l	<1
Meta/Para-Xylene	µg/l	<1
Ortho-Xylene	µg/l	<1
Styrene	µg/l	<1
Bromoform	µg/l	<1
Isopropyl benzene	µg/l	<1
1,1,2,2-Tetrachloroethane	µg/l	<1
1,2,3-Trichloropropane	µg/l	<1
n-Propylbenzene	µg/l	<1
Bromobenzene	µg/l	<1
1,3,5-Trimethylbenzene	µg/l	<1
Tert-Butylbenzene	µg/l	<1
1,2,4-Trimethylbenzene	µg/l	<1
Sec-Butylbenzene	µg/l	<1
p-Isopropyltoluene	µg/l	<1
2-Chlorotoluene	µg/l	<1
4-Chlorotoluene	µg/l	<1
1,3-Dichlorobenzene	µg/l	<1
1,4-Dichlorobenzene	µg/l	<1
1,2-Dichlorobenzene	µg/l	<1

Concentrations expressed as ug/l (ppb)
unless stated otherwise

** = INAB Accredited Tests ++ = Subcontracted Tests n/a = Non-INAB Accredited Tests

The above results relate only to the sample tested.
This report should not be regenerated except in full and with the consent of T.E. Laboratories Ltd.

TelLab

ANALYSIS OF AQUEOUS SAMPLES.

Date Sampled:28.07.2009
Date Received: 28.08.2009
Date Analysis Commenced:28.08.2009
Our Ref.:WS-25071, 172473,COV/625081/2009
Your Ref : Arthurstown
Certificate No. L/09/1864

Semi Volatile Organic Compounds ug/l ++

	Sample ID	Balance Tank	Blank
Determinand	Lab ID	82607	
Phenol	µg/l	<5	<5
Bis (2-chloroethyl) ether	µg/l	<1	<1
2-Chlorophenol	µg/l	<1	<1
1,3-Dichlorobenzene	µg/l	<1	<1
1,4-Dichlorobenzene	µg/l	<1	<1
1,2-Dichlorobenzene	µg/l	<1	<1
Bis (2-chloroisopropyl) ether	µg/l	<1	<1
2-methyl phenol	µg/l	<1	<1
3/4-Methylphenol	µg/l	<1	<1
Hexachloroethane	µg/l	<1	<1
Nitrobenzene	µg/l	<1	<1
Isophorone	µg/l	<1	<1
2-Nitrophenol	µg/l	<1	<1
2,4-Dimethylphenol	µg/l	<1	<1
Bis (2-chloroethoxy) methane	µg/l	<1	<1
2,4-Dichlorophenol	µg/l	<1	<1
1,2,4-Trichlorobenzene	µg/l	<1	<1
Naphthalene	µg/l	<1	<1
4-Chloroaniline	µg/l	<1	<1
Hexachlorobutadiene	µg/l	<1	<1
4-Chloro-3-methylphenol	µg/l	<1	<1
2-Methylnaphthalene	µg/l	<1	<1
Hexachlorocyclopentadiene	µg/l	<1	<1
2,4,6-Trichlorophenol	µg/l	<1	<1
2,4,5-Trichlorophenol	µg/l	<1	<1
2-Chloronaphthalene	µg/l	<1	<1
2-Nitroaniline	µg/l	<1	<1
Dimethyl phthalate	µg/l	<1	<1
2,6-Dinitrotoluene	µg/l	<1	<1
Acenaphthylene	µg/l	<1	<1
Acenaphthene	µg/l	<1	<1
3-Nitroaniline	µg/l	<1	<1
2,4-Dinitrophenol	µg/l	<5	<5
Dibenzofuran	µg/l	<1	<1
2,4-Dinitrotoluene	µg/l	<1	<1
4-Nitrophenol	µg/l	<5	<5
Diethyl phthalate	µg/l	<1	<1
Fluorene	µg/l	<1	<1
4-Chlorophenyl phenylether	µg/l	<1	<1
4-Nitroaniline	µg/l	<1	<1
Azobenzene	µg/l	<1	<1
4-Bromophenyl phenylether	µg/l	<1	<1
Hexachlorobenzene	µg/l	<1	<1
Pentachlorophenol	µg/l	<5	<5
Phenanthrene	µg/l	<1	<1
Anthracene	µg/l	<1	<1
Carbazole	µg/l	<1	<1
Di-n-butylphthalate	µg/l	<1	<1
Fluoranthene	µg/l	<1	<1
Pyrene	µg/l	<1	<1
Butyl benzylphthalate	µg/l	<1	<1
Benzo(a)Anthracene	µg/l	<1	<1
Chrysene	µg/l	<1	<1
Bis (2-ethylhexyl)phthalate	µg/l	28	2
Di-n-octylphthalate	µg/l	<1	<1
Benzo(b/k)Fluoranthene	µg/l	<1	<1
Benzo(a)Pyrene	µg/l	<1	<1
Indeno(123-cd)Pyrene	µg/l	<1	<1
Dibenzo(ah)Anthracene	µg/l	<1	<1
Benzo(ghi)Perylene	µg/l	<1	<1

Concentrations expressed as ug/l (ppb)
unless stated otherwise

** = INAB Accredited Tests ++ = Subcontracted Tests n/a = Non-INAB Accredited Tests
The above results relate only to the sample tested
This report should not be regenerated except in full and with the consent of T.E. Laboratories Ltd.

TelLab

ANALYSIS OF AQUEOUS SAMPLES.

Date Sampled:28.07.2009
Date Received: 28.08.2009
Date Analysis Commenced:28.08.2009
Our Ref.:WS-25071, 172473,COV/625081/2009
Your Ref : Arthurstown
Certificate No. L/09/1864

ORGANOCHLORINE PESTICIDES (ng/l) ++

Determinand	Sample ID Lab ID	Balance Tank 82607
123 Trichlorobenzene		<6
124 TCB		<6
135 Trichlorobenzene		<6
Aldrin		<6
Endosulphan A		<6
HCH - alpha		<2
Endosulphan B		<6
HCH - beta		<2
Alpha-Chlordane		<2
Dichlobenil		33
Dieldrin		<6
Endrin		<6
HCH - gamma		17
Heptachlor Epoxide		<2
Hexachlorobenzene		<2
Hexachlorobutadiene		<2
Isodrin		<6
DDE (op)		<2
DDE (pp)		<2
TDE (op)		<2
TDE (pp)		<2
DDT (op)		<2
DDT (pp)		9
Tecnazene		<10
Gamma Chlordane		<2
Triallate		<10
Trifluralin		<10

Concentrations expressed as ng/l
unless stated otherwise

** = INAB Accredited Tests ++ = Subcontracted Tests n/a = Non-INAB Accredited Tests
The above results relate only to the sample tested
This report should not be regenerated except in full and with the consent of T.E. Laboratories Ltd.

TelLab

ANALYSIS OF AQUEOUS SAMPLE.

Date Sampled:13.10.2009
Date Received: 13.10.2009
Date Analysis Commenced:13.10.2009
Our Ref.:WS-25612, 09-31927& COV/648422/2009
Your Ref : Arthurstown
Certificate No. L/09/2363

DETERMINAND	Sample ID Lab ID	Balance Tank 84233
Alkalinity	n/a	540
Ammonia as NH4	n/a	17
Ammoniacal Nitrogen	n/a	13
Arsenic (ug/l)	++	Note 1
BOD	n/a	110
Cadmium (ug/l)	**	0.94
Chloride	**	2181
Chromium	**	0.73
COD	n/a	3550
Copper	**	0.08
Cyanide	n/a	0.70
Fluoride	**	<2.5
Kjeldhal Nitrogen	n/a	98
Lead (ug/l)	**	4
Magnesium	**	134
Manganese	**	0.66
Mercury (ug/l)	++	<0.2
Nickel	**	0.48
Nitrate as N	n/a	1875
Nitrite as N	**	406
Orthophosphate as P	**	25
pH	**	7.1
Selenium (ug/l)	++	<3
Sulphate	**	151
Suspended Solids	n/a	565
TOC	n/a	836
Zinc	**	0.51
Faecal Coliforms (cfu/10mls)	n/a	**>100**
Total Coliforms (cfu/10mls)	n/a	**>100**

Concentrations are expressed as mg/l (ppm)
unless otherwise specified.

** = INAB Accredited Tests ++ = Subcontracted Tests n/a = Non-INAB Accredited Tests

The above results relate only to the sample tested
This report should not be regenerated except in full and with the consent of T.E. Laboratories Ltd.

Note 1 - Sample matrix unsuitable for analysis

TelLab

ANALYSIS OF AQUEOUS SAMPLES.

Date Sampled:13.10.2009
Date Received: 13.10.2009
Date Analysis Commenced:13.10.2009
Our Ref.:WS-25612, 09-31927& COV/648422/2009
Your Ref : Arthurstown
Certificate No. L/09/2363

Volatile Organic Compounds ug/l ++

Determinand	Sample ID Lab ID	Balance Tank 84233
Total VOC's	µg/l	<1
1,1 Dichloroethylene	µg/l	<1
Methylene Chloride	µg/l	<1
Trans-1,2-dichloroethylene	µg/l	<1
1,1-dichloroethane	µg/l	<1
2,2-dichloropropane+1,2-dichloroethylene	µg/l	<1
Bromochloromethane	µg/l	<1
Chloroform	µg/l	<1
1,1,1-trichloroethane	µg/l	<1
Carbon tetrachloride + 1,1-dichloropropene	µg/l	<1
Benzene	µg/l	<1
1,2-dichloroethane	µg/l	<1
Trichloroethylene	µg/l	<1
1,2-dichloropropane	µg/l	<1
Dibromomethane	µg/l	<1
Bromodichloromethane	µg/l	<1
cis-1,3-dichloropropene	µg/l	<1
Toluene	µg/l	<1
trans-1,3-dichloropropene	µg/l	<1
1,1,2-trichloroethane	µg/l	<1
Tetrachloroethylene	µg/l	<1
1,3-dichloropropane	µg/l	<1
Dibromochloromethane	µg/l	<1
1,2-dibromoethane	µg/l	<1
Chlorobenzene	µg/l	<1
Ethylbenzene+1,1,1,2-tetrachloroethane	µg/l	<1
m+p-Xylene	µg/l	<1
o-Xylene	µg/l	<1
Styrene	µg/l	<1
Bromoform	µg/l	<1
Isopropylbenzene	µg/l	<1
Bromobenzene	µg/l	<1
1,2,3-trichloropropane	µg/l	<1
n-propylbenzene	µg/l	<1
2-chlorotoluene	µg/l	<1
1,3,5-trimethylbenzene	µg/l	<1
4-chlorotoluene	µg/l	<1
Tert-butylbenzene	µg/l	<1
1,2,4-trimethylbenzene	µg/l	<1
sec-butylbenzene	µg/l	<1
1,3-dichlorobenzene+p-isopropyltoluene	µg/l	<1
1,4-dichlorobenzene	µg/l	<1
n-butylbenzene	µg/l	<1
1,2-dichlorobenzene	µg/l	<1
1,2-dibromo-3-chloropropane	µg/l	<1
1,2,4-trichlorobenzene	µg/l	<1
Hgexachlorobutadiene	µg/l	<1
Naphthalene	µg/l	<1
1,2,3-trichlorobenzene	µg/l	<1

Concentrations expressed as ug/l (ppb)
unless stated otherwise

** = INAB Accredited Tests ++ = Subcontracted Tests n/a = Non-INAB Accredited Tests

The above results relate only to the sample tested.
This report should not be regenerated except in full and with the consent of T.E. Laboratories Ltd.

TelLab

ANALYSIS OF AQUEOUS SAMPLES.

Date Sampled:13.10.2009
Date Received: 13.10.2009
Date Analysis Commenced:13.10.2009
Our Ref.:WS-25612, 09-31927& COV/648422/2009
Your Ref : Arthurstown
Certificate No. L/09/2363

Semi Volatile Organic Compounds ug/l ++

	Sample ID	Balance Tank
Determinand	**Lab ID**	**84233**
Aniline	µg/l	<0.10
Bis(2-chloroethyl)ether	µg/l	<0.10
Phenol	µg/l	<0.10
2-Chlorophenol	µg/l	<0.10
Benzyl Alcohol	µg/l	<0.10
2-Methylphenol	µg/l	<0.10
3&4-Methylphenol	µg/l	<0.10
2,4-dimethylphenol	µg/l	<0.10
Bis-(dichloroethoxy)methane	µg/l	<0.10
2,4-Dichlorophenol	µg/l	<0.10
1,2,4-Trichlorobenzene	µg/l	<0.10
Naphthalene	µg/l	<0.10
4-Chloro-3-methylphenol	µg/l	<0.10
2-Methylnaphthalene	µg/l	<0.10
Hexachlorocyclopentadiene	µg/l	<0.10
2,4,6 Trichlorophenol	µg/l	<0.10
2,4,5 Trichlorophenol	µg/l	<0.10
2-Chloronaphthalene	µg/l	<0.10
2-Nitroaniline	µg/l	<0.10
1,4-dinitrobenzene	µg/l	<0.10
Dimethyl phthalate	µg/l	<0.10
1,3-dinitrobenzene	µg/l	<0.10
Acenaphthylene	µg/l	<0.10
2,6-Dinitrotoluene	µg/l	<0.10
1,2-Dinitrobenzene	µg/l	<0.10
3-Nitroaniline	µg/l	<0.10
Acenaphthene	µg/l	<0.10
Dibenzofuran	µg/l	<0.10
2,4-Dinitrotoluene	µg/l	<0.10
4-Nitrophenol	µg/l	<0.10
2,3,4,6-Tetrachlorophenol	µg/l	<0.10
2,3,5,6-Tetrachlorophenol	µg/l	<0.10
Diethylphthalate	µg/l	<0.10
Fluorene	µg/l	<0.10
4-Chlorophenyl phenyl ether	µg/l	<0.10
4-Nitroaniline	µg/l	<0.10
Diphenylamine/4,6-Dinitro-2-methylphenol	µg/l	<0.10
Azobenzene	µg/l	<0.10
4-Bromophenyl phenyl ether	µg/l	<0.10
Hexachlorobenzene	µg/l	<0.10
Pentachlorophenol	µg/l	<0.10
Phenanthrene	µg/l	<0.10
Anthracene	µg/l	<0.10
Carbazole	µg/l	<0.10
Di-n-butylphthalate	µg/l	<0.10
Benzyl butyl phthalate	µg/l	<0.10
Bis(2-ethylhexyl)ester	µg/l	<0.10
Fluoranthene	µg/l	<0.10
Pyrene	µg/l	<0.10
Benzo(a)anthracene	µg/l	<0.10
Chrysene	µg/l	<0.10
Di-n-octyl phthalate	µg/l	<0.10
Benzo(b)fluoranthene	µg/l	<0.10
Benzo(k)fluoranthene	µg/l	<0.10
Benzo(a)pyrene	µg/l	<0.10
Indeno(1,2,3-cd)pyrene	µg/l	<0.10
Dibenz(a,h)anthracene	µg/l	<0.10
Benzo(ghi)pyrelene	µg/l	<0.10

Concentrations expressed as ug/l (ppb)
unless stated otherwise

** = INAB Accredited Tests ++ = Subcontracted Tests n/a = Non-INAB Accredited Tests
The above results relate only to the sample tested
This report should not be regenerated except in full and with the consent of T.E. Laboratories Ltd.

TelLab

ANALYSIS OF AQUEOUS SAMPLES.

Date Sampled:13.10.2009
Date Received: 13.10.2009
Date Analysis Commenced:13.10.2009
Our Ref.:WS-25612, 09-31927& COV/648422/2009
Your Ref : Arthurstown
Certificate No. L/09/2363

ORGANOCHLORINE PESTICIDES (ng/l) ++

Determinand	Sample ID Lab ID	Balance Tank 84233
123 Trichlorobenzene		<120
124 TCB		<120
135 Trichlorobenzene		<120
Aldrin		<120
Endosulphan A		<120
HCH - alpha		<40
Endosulphan B		<120
HCH - beta		<40
Alpha-Chlordane		<40
Dichlobenil		644
Dieldrin		<120
Endrin		<120
HCH - gamma		<40
Heptachlor Epoxide		<40
Hexachlorobenzene		<40
Hexachlorobutadiene		<40
Isodrin		<120
DDE (op)		<40
DDE (pp)		<40
TDE (op)		<40
TDE (pp)		<40
DDT (op)		<40
DDT (pp)		<70
Tecnazene		<200
Gamma Chlordane		<40
Triallate		<200
Trifluralin		<200

Concentrations expressed as ng/l
unless stated otherwise

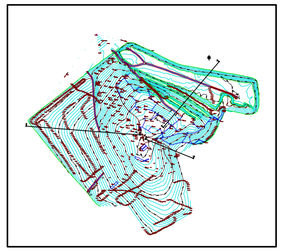
** = INAB Accredited Tests ++ = Subcontracted Tests n/a = Non-INAB Accredited Tests
The above results relate only to the sample tested
This report should not be regenerated except in full and with the consent of T.E. Laboratories Ltd.

APPENDIX 6.1

Topographical Survey

LEGEND

SLOPE STABILITY SECTIONS A — A



KEY PLAN

Scale 1:10000

SITE PLAN

Scale 1:1000

Rev.	Drawn	Chk'd	App'd		
A	PB	AG	AG	Cork 05.03.10	ISSUE TO CLIENT
				Rev Origin / Date	Description

Revision History: A

Name of Client

SOUTH DUBLIN
COUNTY COUNCIL

Name of Job

ARTHURSTOWN LANDFILL
SLOPE STABILITY ASSESSMENT

Title of Drawing

SITE PLAN SHOWING
LINES FOR SLOPE STABILITY
ASSESSMENT

Scales Used	This Drawing was printed to
1:1000	ISO A1

Dwg. No.	Rev.
LW10-054-01-001	A

J:\Dublin-CAD\2010\LW10\054\01\LW1005401_001

FEHILY TIMONEY & COMPANY

CONSULTANTS IN ENGINEERING & ENVIRONMENTAL SCIENCES

Core House, Pouladuff Rd, Cork, Ireland.
T:+353-21-4964133, F:+353-21-4964464

Mill House, Ashtown Gate, Navan Rd, Dublin 15, Ireland.
T:+353-1-6583500, F:+353-1-6583501

W: www.fehilytimoney.ie, E: info@ftco.ie

ORIGINAL DRAWING SIZE A1 - (841 x 594)

NATURAL SCALE 10 0 10 20 50 100mm

AER Returns Worksheet

Version 1.1.10

REFERENCE YEAR	2009

1. FACILITY IDENTIFICATION

Parent Company Name	South Dublin County Council
Facility Name	Arthurstown Landfill
PRTR Identification Number	W0004
Licence Number	W0004-03

Waste or IPPC Classes of Activity

No.	class_name
3.5	Specially engineered landfill, including placement into lined discrete cells which are capped and isolated from one another and the environment.
3.1	Deposit on, in or under land (including landfill).
3.4	Surface impoundment, including placement of liquid or sludge discards into pits, ponds or lagoons.
3.6	Biological treatment not referred to elsewhere in this Schedule which results in final compounds or mixtures which are disposed of by means of any activity referred to in paragraphs 1. to 10. of this Schedule.
3.7	##

Address 1	Arthurstown
Address 2	Kill
Address 3	Co. Kildare
Address 4	
Country	Ireland
Coordinates of Location	-6.56774 53.231
River Basin District	IEEA
NACE Code	3821
Main Economic Activity	Treatment and disposal of non-hazardous waste
AER Returns Contact Name	John Smith (W0004)
AER Returns Contact Email Address	arthurstownlandfill@eircom.net
AER Returns Contact Position	Facility Manager
AER Returns Contact Telephone Number	045 877674
AER Returns Contact Mobile Phone Number	086 8371729 086 3860942
AER Returns Contact Fax Number	045 877849
Production Volume	0.0
Production Volume Units	
Number of Installations	0
Number of Operating Hours in Year	0
Number of Employees	0
User Feedback/Comments	Arthurstown landfill has 4 flares and 11 engines. In the Emissions to Air tab, there is not enough space to enter emissions from each of the 15 stacks so we have summed emissions from 7 engines in the 9th column for data entry.
Web Address	

2. PRTR CLASS ACTIVITIES

Activity Number	Activity Name
5(d)	Landfills
5(c)	Installations for the disposal of non-hazardous waste
5(d)	Landfills

3. SOLVENTS REGULATIONS (S.I. No. 543 of 2002)

Is it applicable?	No
Have you been granted an exemption ?	No
If applicable which activity class applies (as per Schedule 2 of the regulations) ?	
Is the reduction scheme compliance route being used ?	

4.1 RELEASES TO AIR

SECTION A : SECTOR SPECIFIC PRTR POLLUTANTS

RELEASES TO AIR																		
POLLUTANT		METHOD															QUANTITY	
			Method Used			Landfill flare 1	Landfill flare 2	Landfill flare 3	Landfill flare 4	AR01	AR02	AR03	AR04	AR05-AR11				
No. Annex II	Name	M/C/E	Method Code	Designation or Description		Emission Point 1	Emission Point 2	Emission Point 3	Emission Point 4	Emission Point 5	Emission Point 6	Emission Point 7	Emission Point 8	Emission Point 9	T (Total) KG/Year	A (Accidental) KG/Year	F (Fugitive) KG/Year	
01	Methane (CH4)	M	PER	EN12619:1999; EN13526:2002 and non methane hydrocarbon cutter		64.0	58.0	40.0	57.0	12716.0	15723.0	13680.0	17835.0	126474.0	186647.0	0.0	0.0	
02	Carbon monoxide (CO)	M	PER	EN15058		62.0	64.0	54.0	38.0	17291.0	17507.0	20224.0	23350.0	140380.0	218970.0	0.0	0.0	
08	Nitrogen oxides (NOx/NO2)	M	PER	EN14792		1446.0	1687.0	1139.0	970.0	8794.0	8173.0	9768.0	10544.0	68417.0	110938.0	0.0	0.0	
07	Non-methane volatile organic compounds (NMVOC)	M	PER	EN12619:1999; EN13654:2002		156.0	127.0	96.0	97.0	131.0	68.0	149.0	176.0	1492.0	2492.0	0.0	0.0	
11	Sulphur oxides (SOx/SO2)	M	PER	EN14791		1077.0	3888.0	2544.0	1958.0	1756.0	804.0	1531.0	1791.0	4877.0	20226.0	0.0	0.0	
03	Carbon dioxide (CO2)	M	PER	EN15058		1099012.0	1710916.0	985230.0	1074836.0	1298525.0	1336708.0	1615907.0	1742415.0	11253288.0	##########	0.0	0.0	

* Select a row by double-clicking on the Pollutant Name (Column B) then click the delete button

SECTION B : REMAINING PRTR POLLUTANTS

RELEASES TO AIR																		
POLLUTANT		METHOD															QUANTITY	
			Method Used			Landfill flare 1	Landfill flare 2	Landfill flare 3	Landfill flare 4	AR01	AR02	AR03	AR04	AR05-AR11				
No. Annex II	Name	M/C/E	Method Code	Designation or Description		Emission Point 1	Emission Point 2	Emission Point 3	Emission Point 4	Emission Point 5	Emission Point 6	Emission Point 7	Emission Point 8	Emission Point 9	T (Total) KG/Year	A (Accidental) KG/Year	F (Fugitive) KG/Year	
84	Fluorine and inorganic compounds (as HF)	M	PER	EN15713		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
80	Chlorine and inorganic compounds (as HCl)	M	PER	EN1911		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	

* Select a row by double-clicking on the Pollutant Name (Column B) then click the delete button

SECTION C : REMAINING POLLUTANT EMISSIONS (As required in your Licence)

RELEASES TO AIR																		
POLLUTANT		METHOD															QUANTITY	
			Method Used			Landfill flare 1	Landfill flare 2	Landfill flare 3	Landfill flare 4	AR01	AR02	AR03	AR04	AR05-AR11				
Pollutant No.	Name	M/C/E	Method Code	Designation or Description		Emission Point 1	Emission Point 2	Emission Point 3	Emission Point 4	Emission Point 5	Emission Point 6	Emission Point 7	Emission Point 8	Emission Point 9	T (Total) KG/Year	A (Accidental) KG/Year	F (Fugitive) KG/Year	
244	Total Particulates	M	PER	EN13284-1:2002		0.0	0.0	0.0	0.0	2246.0	1304.0	1867.0	2356.0	14296.0	22069.0	0.0	0.0	

* Select a row by double-clicking on the Pollutant Name (Column B) then click the delete button

Additional Data Requested from Landfill operators

For the purposes of the National Inventory on Greenhouse Gases, landfill operators are requested to provide summary data on landfill gas (Methane) flared or utilised on their facilities to accompany the figures for total methane generated. Operators should only report their Net methane (CH4) emission to the environment under T(total) KG/yr for Section A: Sector specific PRTR pollutants above. Please complete the table below:

Landfill: Arthurstown Landfill

Please enter summary data on the quantities of methane flared and / or utilised	T (Total) kg/Year	M/C/E	Method Used: Method Code	Method Used: Designation or Description	Facility Total Capacity m3 per hour	
Total estimated methane generation (as per site model)	41006619.0	C	GasSim / Landgem		N/A	
Methane flared	9848482.56	M	-	CEMS System	10000.0	(Total Flaring Capacity)
Methane utilised in engine/s	27083327.04	M	-	CEMS system	8800.0	(Total Utilising Capacity)
Net methane emission (as reported in Section A above)	4575981.4	C	Calculated	Calculated	N/A	

4.2 RELEASES TO WATERS

SECTION A : SECTOR SPECIFIC PRTR POLLUTANTS

Data on ambient monitoring of storm/surface water or groundwater, conducted as part of your licence requirements, should NOT be submitted under AER / PRTR Reporting as this only concerns Releases from your facility

RELEASES TO WATERS

POLLUTANT					QUANTITY			
			Method Used					
No. Annex II	Name	M/C/E	Method Code	Designation or Description	Emission Point 1	T (Total) KG/Year	A (Accidental) KG/Year	F (Fugitive) KG/Year
13	Total phosphorus	M	CRM	APHA 4500 PB	1.9912305	1.9912305	0.0	0.0
18	Cadmium and compounds (as Cd)	M	CRM	ASTM D 5673	0.0568923	0.0568923	0.0	0.0
19	Chromium and compounds (as Cr)	M	CRM	ICP-MS	0.0568923	0.0568923	0.0	0.0
20	Copper and compounds (as Cu)	M	CRM	ICP-MS	0.42669225	0.42669225	0.0	0.0
21	Mercury and compounds (as Hg)	M	CRM	ASTM D 5673	0.02844615	0.02844615	0.0	0.0
22	Nickel and compounds (as Ni)	M	CRM	ICP-MS	0.14223075	0.14223075	0.0	0.0
23	Lead and compounds (as Pb)	M	CRM	ASTM D 5673	0.0568923	0.0568923	0.0	0.0
24	Zinc and compounds (as Zn)	M	CRM	ICP-MS	0.71115375	0.71115375	0.0	0.0
79	Chlorides (as Cl)	M	CRM	G/39 ILAB accredited method	904.58757	904.58757	0.0	0.0

* Select a row by double-clicking on the Pollutant Name (Column B) then click the delete button

SECTION B : REMAINING PRTR POLLUTANTS

RELEASES TO WATERS

POLLUTANT					QUANTITY			
			Method Used					
No. Annex II	Name	M/C/E	Method Code	Designation or Description	Emission Point 1	T (Total) KG/Year	A (Accidental) KG/Year	F (Fugitive) KG/Year
					0.0	0.0	0.0	0.0

* Select a row by double-clicking on the Pollutant Name (Column B) then click the delete button

SECTION C : REMAINING POLLUTANT EMISSIONS (as required in your Licence)

RELEASES TO WATERS

POLLUTANT					QUANTITY			
			Method Used					
Pollutant No.	Name	M/C/E	Method Code	Designation or Description	Emission Point 1	T (Total) KG/Year	A (Accidental) KG/Year	F (Fugitive) KG/Year
238	Ammonia (as N)	M	CRM	G/O2 ILAB accredited	36.1266105	36.1266105	0.0	0.0
303	BOD	M	CRM	G/O4 ILAB accredited	177.7884375	177.7884375	0.0	0.0
306	COD	M	CRM	ICP-MS	597.36915	597.36915	0.0	0.0
305	Calcium	M	CRM	ICP-MS	3584.2149	3584.2149	0.0	0.0
357	Iron	M	CRM	ICP-MS	2.844615	2.844615	0.0	0.0
320	Magnesium	M	CRM	ICP-MS	483.58455	483.58455	0.0	0.0
321	Manganese (as Mn)	M	CRM	ICP-MS	0.9102768	0.9102768	0.0	0.0
327	Nitrate (as N)	M	CRM	G/39 ILAB accredited	133.127982	133.127982	0.0	0.0
338	Potassium	M	CRM	ICP-MS	116.629215	116.629215	0.0	0.0
341	Sodium	M	CRM	ICP-MS	967.1691	967.1691	0.0	0.0
343	Sulphate	M	CRM	G/39 ILAB accredited	3406.142001	3406.142001	0.0	0.0
240	Suspended Solids	M	CRM	G/19 ILAB accredited	675.5960625	675.5960625	0.0	0.0

* Select a row by double-clicking on the Pollutant Name (Column B) then click the delete button

4.3 RELEASES TO WASTEWATER OR SEWER

SECTION A : PRTR POLLUTANTS

OFFSITE TRANSFER OF POLLUTANTS DESTINED FOR WASTE-WATER TREATMENT OR SEWER

POLLUTANT		METHOD			QUANTITY			
			Method Used					
No. Annex II	Name	M/C/E	Method Code	Designation or Description	Emission Point 1	T (Total) KG/Year	A (Accidental) KG/Year	F (Fugitive) KG/Year
79	Chlorides (as Cl)	M	CRM	G/39 ILAB accredited method	296762.817	296762.817	0.0	0.0
19	Chromium and compounds (as Cr)	M	CRM	ICP-MS	71.103032	71.103032	0.0	0.0
20	Copper and compounds (as Cu)	M	CRM	ICP-MS	2.30854	2.30854	0.0	0.0
82	Cyanides (as total CN)	M	CRM	APHA 4500 CNE	115.427	115.427	0.0	0.0
83	Fluorides (as total F)	M	CRM	G/39 ILAB accredited	57.7135	57.7135	0.0	0.0
23	Lead and compounds (as Pb)	M	CRM	G/39 ILAB accredited	2.885675	2.885675	0.0	0.0
21	Mercury and compounds (as Hg)	M	CRM	ASTM D 5673	1.15427	1.15427	0.0	0.0
13	Total phosphorus	M	CRM	APHA 4 500 PB	7664.3528	7664.3528	0.0	0.0
24	Zinc and compounds (as Zn)	M	CRM	ICP-MS	72.141875	72.141875	0.0	0.0
18	Cadmium and compounds (as Cd)	M	CRM	ASTM D 5673	2.30854	2.30854	0.0	0.0
22	Nickel and compounds (as Ni)	M	CRM	ICP-MS	58.636916	58.636916	0.0	0.0

* Select a row by double-clicking on the Pollutant Name (Column B) then click the delete button

SECTION B : REMAINING POLLUTANT EMISSIONS (as required in your Licence)

OFFSITE TRANSFER OF POLLUTANTS DESTINED FOR WASTE-WATER TREATMENT OR SEWER

POLLUTANT		METHOD			QUANTITY			
			Method Used					
Pollutant No.	Name	M/C/E	Method Code	Designation or Description	Emission Point 1	T (Total) KG/Year	A (Accidental) KG/Year	F (Fugitive) KG/Year
238	Ammonia (as N)	M	CRM	G/O2 ILAB accredited	6925.62	6925.62	0.0	0.0
303	BOD	M	CRM	G/O4 ILAB accredited	10157.576	10157.576	0.0	0.0
306	COD	M	CRM	G/O3 ILAB accredited	728344.37	728344.37	0.0	0.0
305	Calcium	M	CRM	ICP-MS	27.356199	27.356199	0.0	0.0
320	Magnesium	M	CRM	ICP-MS	9695.868	9695.868	0.0	0.0
321	Manganese (as Mn)	M	CRM	ICP-MS	174.987332	174.987332	0.0	0.0
357	Iron	M	CRM	ICP-MS	2250.8265	2250.8265	0.0	0.0
338	Potassium	M	CRM	ICP-MS	153864.191	153864.191	0.0	0.0
341	Sodium	M	CRM	ICP-MS	444047.669	444047.669	0.0	0.0
343	Sulphate	M	CRM	G/39 ILAB accredited	12161.38872	12161.38872	0.0	0.0
327	Nitrate (as N)	M	CRM	G/39 ILAB accredited	274485.406	274485.406	0.0	0.0

* Select a row by double-clicking on the Pollutant Name (Column B) then click the delete button