
GORTADROMA LANDFILL SITE
ANNUAL ENVIRONMENTAL REPORT 2009

Waste License Register: No. W0017-03

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ANNUAL ENVIRONMENTAL REPORT

**FOR THE REPORTING PERIOD
JANUARY 2009 TO DECEMBER 2009**

FOR

**LIMERICK COUNTY COUNCIL
COUNTY BUILDINGS
DOORADOYLE
LIMERICK**

Approved By:

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EURO environmental services
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Project Manager

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1.0 INTRODUCTION AND SITE DESCRIPTION

1.1 Introduction

Gortadroma Landfill, Ballyhahill, County Limerick is operated by Limerick County Council (LCC) in accordance with Waste License Register No. 0017- 03 issued by the Environmental Protection Agency on 22nd September 2005.

The reporting period for the purposes of the Annual Environmental Report is January 2009 to December 2009. The report has been completed by EURO environmental services and includes information provided by Limerick County Council.

The Annual Environmental Report (AER) for Gortadroma landfill includes, where applicable, the information specified in Schedule G of the Waste License, Content of Annual Environmental Report, in accordance with the EPA publication Waste Licensing - Draft Guidance on Environmental Management Systems and Reporting to the Agency.

1.2 Site Description

The landfill site is located in the townland of Gortadroma, Ballyhahill, County Limerick, which is located approximately 12 km north of Newcastle West and 9 km south-west of Foynes. The location of the site is shown in Figure B2 of the Waste License Application (W0017-03). The facility is known and operates as the Gortadroma Landfill.

The site is located in a landscape of undulating lowlands separated by areas of gently sloping farmland. There are pockets of poorly-drained fields and bogland located at low points. The location of the landfill site itself is on a gentle south-facing slope.

The land use in the area is predominantly agricultural with a mixture of pasture and a significant amount of marginal agricultural land as damp pasture.

The bedrock underlying the general area has been mapped as the Cummer Flagstone Formation which is Namurian in age and up to 230m thick. These generally consist of bedded, argillaceous, coarse siltstones and mudstones overlain by an upper unit of more massive fine grained quartzitic, argillaceous sandstones or coarse siltstones with alternating mudstones.

There are two main soil types underlying this site; (a) sand and gravel and (b) silty clay and these are overlain in places by peat.

The site lies within the White River catchment. This river flows from east to west just to the south of the site. The regional formation has been classified as a poor aquifer by the Geological Survey of Ireland.

Long term meteorological reports from Shanagolden (1960 - 1997) indicate that the annual mean rainfall in the locality is estimated at 1100 millimetres (mm) with the months of October to January receiving the greatest monthly rates.

The site is bounded by agricultural land on the eastern, western and northern perimeters. Local Road L1226 bounds the site to the south.

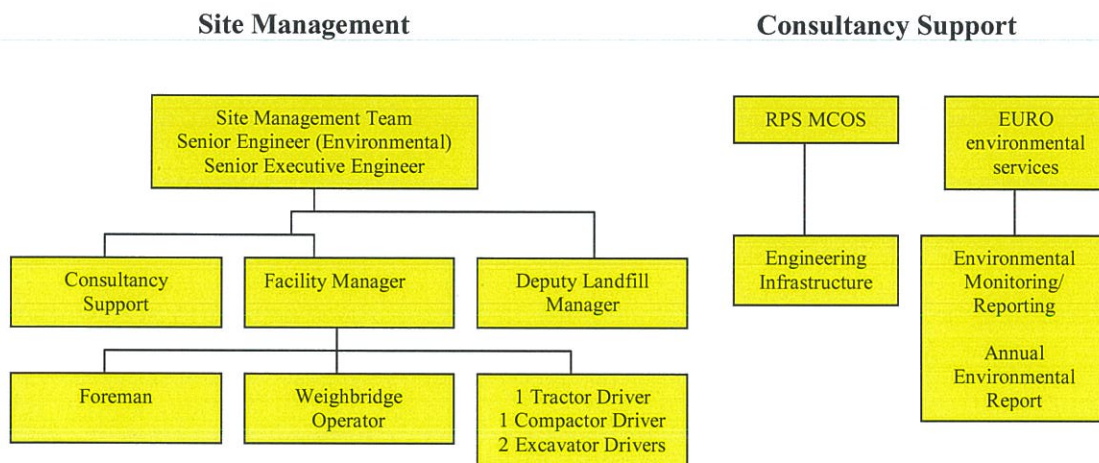
The current landfill facility at Gortadroma including the extension area occupies an area of 76 hectares.

2.0 MANAGEMENT OF THE ACTIVITY

2.1 Management of the Activity

The site is managed and operated by Limerick County Council. Details of the management structure for the facility were submitted to the Agency as part of the Environmental Management Programme in November 2000, February 2002, March 2003, March 2004, March 2005, March 2006, February 2007, January 2008 and January 2009. The management structure is outlined in Figure 2.1 below.

Figure 2.1 Management Structure



LCC has overall responsibility for the management and operation of the Gortadroma Landfill site. The LCC senior engineer is responsible for the management of municipal waste and waste facilities in the County. With reference to Condition 2.1 of the Waste License, the facility manager for landfill, and a deputy site manager have responsibility for day to day site operation.

The facility manager and the deputy landfill manager are present on site from day to day during the operation of the facility. The facility manager has overall responsibility for the monitoring and day to day operations at the landfill. The senior executive engineer has responsibilities for areas such as development and waste license applications.

2.2 Environmental Management System

An Environmental Management System (EMS) is in operation for the site and is updated annually in accordance with site requirements and conditions, as required under Condition 2.2 of the Waste License.

2.3 Environmental Management Programme

The objective of the EMP is to act as the site manual, which will assist the site in achieving its objectives and targets during the current and future operation of the site. An updated EMP for 2010 has been prepared and was submitted separately to the Agency in January 2010.

2.4 Schedule of Environmental Objectives and Targets for 2010

The schedule of Environmental Objectives and Targets for the forthcoming year is described in the EMP for 2010, which was forwarded separately to the Agency and will become part of the public record for the site. The list of objectives and targets is reproduced from the EMP in Appendix I.

2.5 Report on the progress towards achievement of the Environmental Objectives and Targets contained in 2009

The 9 objectives and targets established for the EMP of Jan 2009 were reviewed to assess the progress towards achievement. In total 5 objectives were completed and 4 are ongoing. Section 4.1 outlines the progress made towards achievement of the objectives and targets contained in the previous year's report.

2.6 Procedures developed by the licensee in 2009

There was 1 new procedure developed during 2009 'SOP 13 'Procedure to be followed in the event of an incident'.

2.7 Report on programme for Public Information

LCC submitted details of a Waste License Communications Programme to the Agency in May 2000, in accordance with Condition 2.7 of the then Waste License. The Agency requested additional information in September 2000 in relation to the follow-up of complaints and incidents and the availability of information to the public. A detailed response was submitted and the Programme was approved by the Agency on November 1st, 2000.

LCC provide the following documentation for the public to view:

- Waste License 17-1 (superseded), WL17-2 (superseded), WL0017-03 (currently in operation)
- Environmental Impact Statement
- Conditioning Plan
- Waste License Application form
- Waste License Review Application
- Periodic reports
- All monitoring records
- Waste transfer and acceptance dockets
- Leachate removal log books
- Incident/Complaints reports
- Once-off reports submitted to the Agency
- MSDS sheets
- Calibration records
- Bait box inspection records
- Rejected loads log
- Bird control reports
- Agency correspondence, EPA approvals and request for additional information
- Monitoring personnel, experience and training
- Audit records
- Litter fines, rejected load, compliance, bund integrity
- Daily site log
- Weekly site inspection forms
- Surface water inspection forms
- Litter picking reports
- Monthly review of odour control measures report

3.0 NOTIFICATION AND RECORD KEEPING

All copies of environmental data and prescribed reports obtained and prepared on behalf of the licensee are forwarded to the Agency. Copies of reports and correspondence are retained and available for inspection at Gortadroma Landfill reception building.

Waste records and leachate removal logbooks are retained in the site office.

3.1 Non-Compliances

There was 1 notification of non-compliance issued by the AGENCY to L.C.C on the 23rd November 2009. This relates to non-compliance with the Phosphorus ELV in the treated leachate discharge to surface water on the 13th and 28th October 2009. The non-compliance is detailed in Table 3.1.

Table 3.1 Details of Non-Compliances at Gortadroma Landfill Facility during 2009 (with reference to certain conditions of the site waste license)

Non-compliance	Date	Details	Date of Response	Details
1	23/11/09	Notification of Non-Compliance: Exceedence of emission limit value for Phosphorus in treated leachate discharge to surface water on 13 th and 28 th October 2009.		The elevated levels of phosphorus were due to the addition of phosphorus fertiliser as a food source during the start up of the leachate treatment plant. The quantity of phosphorus fertiliser added was reduced to 1 kg per day and the levels of phosphorus at the outlet of the leachate treatment plant had reduced below the emission limit of 2 mg/L.

3.2 Reported Incidents and Complaints Summaries

3.2.1 Incidents

During the reporting period a total of 3 incidents occurred and were reported to the Agency. They are summarised in Table 3.2.

Table 3.2 Summary of Incidents and their Corrective Actions, 2009

Date	Nature of Incident	Corrective Actions/Conclusions
23/03/2009	Limerick County Council received approval from the Agency to commence recirculation of leachate on to cells 12 and 13 on the 20 th of June 2008. During routine inspection of the site this morning a small amount of black staining was observed on the grass edge of the eastern side of cell 13. A sample was taken and found to be contaminated. The staining was confined to a small area and the source of the leachate was most likely to be from a defect in the connection between the base liner HDPE and capping LLDPE.	Leachate recirculation on to cells 12 and 13 was stopped and Limerick County Councils Consulting Engineers RPS had been informed. During recent investigation a defect was observed on the bootleg around the gas well on Cell 13. A repair will be carried out in the near future and a report will be sent to the Agency.
09/11/2009	The monthly report for treated leachate discharge for October 2009 showed that sample results recorded exceeded the emission limit for phosphorus of 2 mg/L on two occasions. The elevated levels of phosphorus were due to the addition of phosphorus fertiliser as a food source during the start up of the leachate treatment plant.	The quantity of phosphorus fertiliser added was reduced to 1 kg per day and the levels of phosphorus at the outlet of the leachate treatment plant had reduced below the emission limit of 2 mg/L.
25/11/2009	Exceedence of leachate level in cell 15, with overflow into adjacent cell 16 which contained clean surface water. The reason for the over flow was due to the excessive rainfall recorded in last week (134 mm) and a total rainfall to date for November of 325 mm.	<p>The following measures were put in place to ensure containment of leachate until weather conditions improved;</p> <ul style="list-style-type: none"> • Tankering of leachate was increased from 120 m3 per day to 150 m3 per day, with the additional 30 m3 being transferred to Rathkeale Waste Water Treatment Plant. • The Leachate treatment plant was in operation and up to 120 m3 per day of treated leachate was being discharged to the White River. • The freeboard in the raw leachate lagoon was at 1 meter. In order to maintain this freeboard Limerick County Council had decided to stop extracting leachate on a temporary basis from leachate collections sumps at cell 9, cell 10 and cell 13. The level of leachate in these three abstraction sumps was just in excess of 1 meter and the leachate abstraction pumps were switched on manually from time to time while maintaining the freeboard in the leachate holding lagoon. • The over flow of leachate from cell 15 to 16 was stopped and the leachate level at the base of cell 15 had been reduced to 0.5 meters. The contaminated water in cell 16 was being tankered off site. <p>The combination of the above measures ensured that all leachate generated was contained.</p>

3.2.2 Complaints

In summary there were 20 complaints or queries during the reporting period of January 1st to December 31st, 2009. The vast majority of complaints were attributed to odour. Other issues included flies, and bird control at the site. Complaints were responded to as soon as possible and were recorded in the complaints register. Corrective action, if considered necessary, is recorded. Details of all complaints, responses and corrective actions are maintained and available for inspection on-site. There was an increase in the number of complaints from 18 in 2008 to 20 in 2009.

3.3 Waste Records

All waste materials accepted at the site are recorded on two separate documents, including a waste transfer document and a computer printout of the waste accepted. The following details are recorded:

Computer Printout:

- Ticket Number/Transaction Number
- Customer code
- Operator / driver signature
- Net weight
- Vehicle Registration Number
- Contractor Name
- Waste Code for site
- Waste Type
- Name of person who checked load
- Waste Source
- Accepted or rejected status
- Weight entering and weight of container leaving site
- Waste collection permit number

Waste Transfer Docket includes additional headings of:

- How waste is contained
- European waste catalogue number
- Physical description
- Odour/Description of odour
- Special problems/requirements of waste
- Knowledge with regard to waste
- Waste Producer
- Waste Collection Permit Number

All waste records are retained at the site office.

4.0 SITE INFRASTRUCTURE

Table 4.1 Report on Development Works Undertaken during 2009

	Objective	Reason for undertaking project	Project summary	Target in 2009 EMP	Status January 2010
1	Install condensate lances on 5 landfill gas manifolds on Cells 1/10.	Reduce condensate going to the Flare	Condensate lances to be fabricated and installed by LCC. SEW submitted to Agency.	Quarter 1 2009	Completed
2	Electrical distribution system to be installed in extension area.	Power supply for pumps and temporary flare.	System to be designed and tendered during quarter 1 2009.	Quarter 3 2009	Temporary system installed.
3	Fabricate leachate spillage tray near raw leachate lagoon	Collect any leachate spillage that may occur during tankering.	Steel tray to be Fabricated and drainage to be diverted to raw leachate lagoon.	Quarter 2 2009	Completed
4	Install gas main between gas compound and extension area	Gas collection	Gas main to be designed and tendered for during quarter 1 2009.	Quarter 3 2009	Ongoing- Included in 2010 Targets.
5	Upgrade Scada System	Increase control and including extension area	Existing Scada system to be upgraded or new Scada System to be installed.	Quarter 3 2009	Up-grades to existing system completed.
6	Gas Utilisation	Licence Condition	ESB substation and grid connection in place. Contract for supply of engine agreed.	Quarter 1 2009	Gas engine in operation since June 2009.
7	Install horizontal gas collection system in active cell 15.	Reduce odour nuisance	Horizontal gas collection pipe work to be put in place at different waste lifts and connected to flare	Ongoing	In progress- 6 rows of pipe and ring main installed.
8	Label all gas extraction wells and gas manifolds	Achieve better control over gas field	Labels fabricated and to be placed on wells and manifolds.	Quarter 1 2009	All wells cells 1 to 10 labeled. Cells 11 to 13 to be completed.
9	Install temporary liner on exposed side slope of cell 14 and place temporary cap on top.	Reduce odour nuisance	Temporary liner ordered	Quarter 1 2009	Completed.

4.2 Lagoon Structures Inspection Report

Concrete Diesel Bund

The concrete diesel bund structure at Gortadroma Landfill Development has been tested to the requirements of Section 9 of BS 8007:1987 British Standard Code of Practice of Concrete Structures for Retaining Aqueous Liquids.

The test under BS 8007 calls for a 7-day test. The recorded levels for the test carried out on the above structure are outlined in Table 4.2. The decrease in water level over the 8-day test period was 0.03 mm. The still well and hook gauge method was applied to record water levels. BS 8007 allows for a decrease in water level of up to 10mm in the concrete bund within the test period. The actual decrease in water level was 0.03 mm which is within the standard, thus the concrete diesel bund integrity is within the requirements of BS 8007.

Note: Bunded area was not exposed to rainfall or evaporation during the test period.

Table 4.2 Concrete Diesel Bund Test Record

Water Level in Bund (mm)	Change +/- (mm)	Control Water Level (mm)	Change +/- (mm)	Date	Time
17.10		N/A		02/11/09	10:00am
17.09	-0.01	N/A	N/A	03/11/09	10:00am
17.09	0.00	N/A	N/A	04/11/09	10:00am
17.09	0.00	N/A	N/A	05/11/09	10:00am
17.08	-0.01	N/A	N/A	06/11/09	10:00am
17.08	0.00	N/A	N/A	07/11/09	10:00am
17.07	-0.01	N/A	N/A	08/11/09	10:00am
Net Change	-0.03	N/A	N/A		

Aeration Basin HDPE Integrity

The integrity of the geomembrane liner installed at the Aeration Basin at the Gortadroma Landfill Development was carried out in accordance with Contract Specifications. Further to this a Mobile Electrical Leak Location Survey (MELLS) was carried out using geophysical techniques, to verify the integrity of the system. The MELLS identified two (2) No. defects which were subsequently repaired, re-tested and found to be acceptable.

4.3 Calculated remaining capacity of the site and the year in which final capacity is expected to be reached

Cells 1 to 13 are now filled to capacity. The three available cells for waste disposal 14, 15 and 16 have a design capacity of approximately 750,000 m³. However, when filling these cells without adjacent cells to east and south, the capacity is reduced to 500,000 m³. Waste disposal commenced in cell 14 in early October 2007 and in cell 15 in December 2008. Approximately 176,460 tonnes of waste have been placed in cells 14/15 at the 31st December 2009 at a compaction rate of 1 tonne/m³. Therefore the remaining void capacity is approximately 323,540 m³.

Table 4.3 Estimated volumes in each cell

Cell	Final Capacity (t)
5	108,790
6	110,174
7	125,583
8	119,692
9	48,301
10	84,161
11-13	308,000
14-16	550,000

4.4 Area Occupied by Waste

The area occupied by waste at Gortadroma Landfill is 138,980m². Cells 1-4 are unlined and occupy an area of 20,800m², while cells 5-13 are lined cells and occupy an area of 94,800m². Cell 14 is lined and occupies an area 8,600 m². Cell 15 is the current active cell and occupies an area of 14,780 m².

4.5 Tank, pipeline and bund testing and inspection report

The integrity and water tightness of all bunds, tanks and pipelines must be demonstrated on a 3-yearly basis. The concrete diesel bund was tested during November 2009. The reports along with the certificate of integrity of these tests are presented in Appendix II.

5.0 WASTE ACCEPTANCE AND HANDLING

5.1 Licensed waste disposal activities carried out at the facility

Part I of the Waste License details the activities that are licensed at the site under the Waste Management Act, 1996: Third Schedule and include:

- Class 1: Deposit on, in or under land (including landfill)
- Class 5: Specially engineered landfill, including placement into lined discrete cells which are capped and isolated from one another and the environment;
- 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;
- 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;
- Class 11: Blending or mixture prior to submission to any activity referred to in a preceding paragraph of this Schedule;
- Class 13. Storage prior to submission to any activity referred to in a preceding paragraph of this Schedule, other than temporary storage, pending collection, on the premises where the waste concerned is produced.

5.2 Licensed recovery activities under the Waste Management Act, 1996, Fourth Schedule

- Class 2. Recycling or reclamation of organic substances which are not used as solvents. (including composting and other biological transformation processes);
- Class 3. Recycling or reclamation of metals and metal compounds;
- Class 4. Recycling or reclamation of other inorganic materials;
- Class 9: Use of any waste principally as a fuel or other means to generate energy;
- Class 10. The treatment of waste on land with a consequential benefit for an agricultural activity or ecological system;
- Class 11. Use of waste obtained from any activity referred to in a preceding paragraph of this Schedule;
- Class 12: Exchange of waste for submission to any activity referred to in preceding paragraph of this schedule;
- Class 13. Storage of waste intended for submission to any activity referred to in preceding paragraphs of Schedule A, other than temporary storage, pending collection, on the premises where such waste is produced. (Limited to the temporary storage of recyclable and reusable waste pending their collection).

5.3 Quantity and composition of waste received, disposed of and recovered during the reporting period and each previous year

The total tonnage of materials received at the site from January 2009 to December 2009 inclusive, and during each previous years, is given in Table 5.1 below.

Table 5.1 Annual Waste Tonnages to 2009

Year	Tonnage Accepted at Site
1998	91,631
1999	120,358
2000	125,186
2001	132,678
2002	138,320
2003	82,184
2004	50,219
2005	43,252
2006	82,119
2007	39,578
2008	56,070
2009	103,834

Waste source and tonnes per month for this reporting period are summarised in Table 5.2 and in Figure 5.1 overleaf. A more detailed summary is presented in Appendix III.

5.4 Methods of Waste Deposition

Cell 11 was filled to final capacity during the end of October 2007 and capping completed during Quarter 1 2008. Landfilling commenced in cell 14 on the 30th October 2007. Phase 1 of landfilling was completed on the 8th December 2008. Cell 14 has gas a horizontal gas collection system is temporarily capped. Cell 15 is current active cell which landfilling commenced on 9th December 2008.

Table 5.2 Quantities of Waste Types Accepted at Gortadroma during 2009

Month	Commercial/Industrial	Private Domestic	Council Refuse	City Street Cleaning	Sludge
January	1899.82	10486.68	66.74	55.12	0
February	2182.02	10066.50	62.76	44.12	0
March	2199.80	10332.32	133.92	62.88	0
April	2099.82	10712.28	66.08	84.22	0
May	2068.74	10464.79	31.82	59.32	0
June	2058.80	10668.44	28.56	59.28	0
July	2543.12	7612.34	23.34	56.60	0
August	1246.50	4439.68	34.74	40.90	0
September	1234.56	4174.70	24.36	56.82	0
October	1127.02	1899.76	20.44	44.38	0
November	1214.12	764.16	26.36	50.26	9.18
December	725.36	405.78	27.64	34.78	2.00
SUBTOTAL	20,599.68	82,027.43	546.76	648.68	11.18
ANNUAL TOTAL			103,834 tonnes		

5.5 Recyclables

Table 5.3 below outlines the quantity of recyclables transferred from Gortadroma Civic Amenity Site for recovery during 2009. In addition to this the following materials were accepted on site for reuse, road making and as landfill cover:

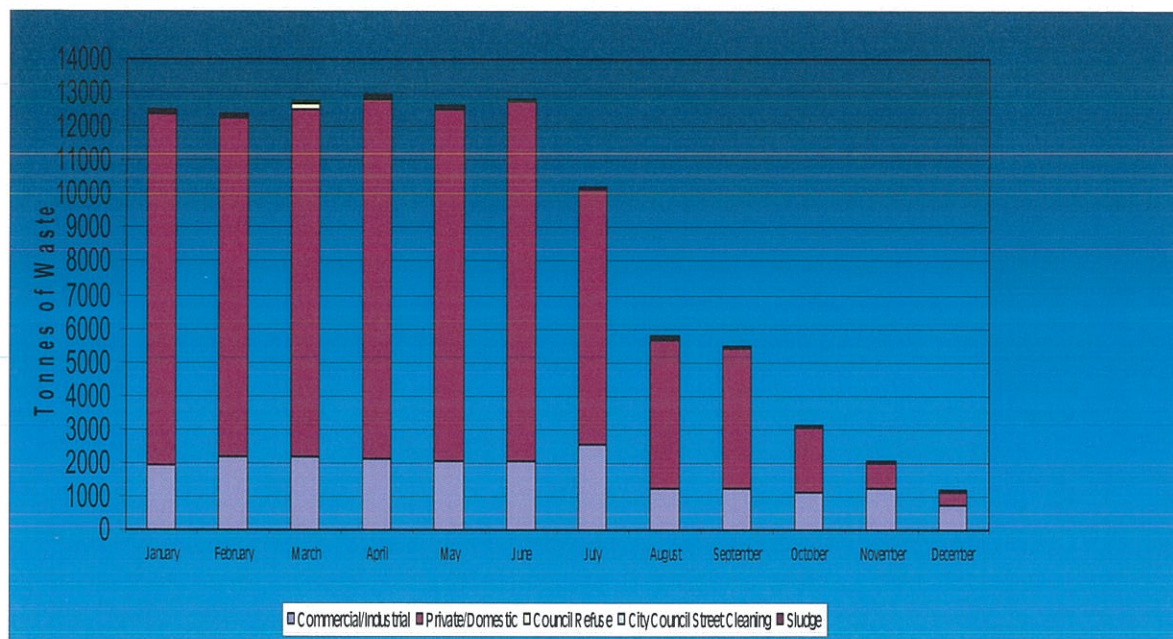
- EWC 17 05 04 Soil & Stones 48.58 Tonnes
- EWC 17 01 03 C&D Waste (tiles & ceramics) 756.30 Tonnes
- EWC 19 10 04 Automobile Shredder Residue 4051.16 Tonnes

Also 14.30 Tonnes of green waste was accepted on site and transferred of-site to Mungret composting facility.

Table 5.3 Recyclables transferred from Civic Amenity Site for recovery during 2009

Waste Type Name	EWC Code	Quantity Tonnes
Plastic Bottles	20 01 39	8.4
Tetrapacks	20 01 01	1.96
Newspapers/ Magazines	20 01 01	36.49
Glass	20 01 02	9.41
Food Cans	20 01 05	7.13
Drink Cans	20 01 05	2.56
Carboard	20 01 01	24.02
LDA Non-Haz	20 01 36	8.77
Fridge Freezers	20 01 35	26.15
Mixed Metals	20 01 40	91.56
Textiles	20 01 11	7.04
Small WEEE	20 01 35	23.08
WasteTyres	16 01 03	9.0

Figure 5.1 Waste Types and Quantities Received During 2009



6.0 ENVIRONMENTAL NUISANCES

6.1 Report on environmental nuisance control at the facility for 2009

The site is inspected daily and weekly by the landfill manager and recorded on separate inspection sheets. The daily inspection sheet records environmental nuisances such as flies, loose litter, vermin, birds, odour, dust, fires and complaints. The sheet also provides for the recording of descriptions of works on the day of inspection and provides for comments and required actions.

Litter picking is carried out daily and as required. Daily and weekly inspection sheets are maintained at the site office. The site manager carries out daily litter inspection in the area surrounding the landfill site. An overhead CCTV camera has been located at the weighbridge to enable inspection of loads brought to the facility. The weighbridge operator inspects each load brought to the facility and ensures that they are covered with appropriate netting.

An active litter management plan has been agreed with the Agency and has made provisions for an 8m high anti-litter fence placed at the north eastern corner of the site. The Agency has approved the use of Geo-hess as daily waste cover. In the event of wind speeds in excess of 8m/s an inspection is required to check the possibility of litter becoming airborne. In the event of litter becoming airborne, the site will be temporarily closed. Wind conditions are constantly monitored by staff.

Weekly inspection sheet provides for the recording of nuisances as well as site security, infrastructure and housekeeping.

A wheel wash is in use at the site and all vehicles exiting the tip head pass through the wash. A suction sweeper is employed two times per week to brush the access road outside the landfill and the entrance road into the landfill. LCC also carries out a daily odour check at 5 sensitive locations along the perimeter road of the landfill. Results of all inspections are recorded in the daily log sheet.

Cells 1-13 are fully capped and landfill gas extracted from this area is utilised in the landfill gas engine since June 2009. Landfill gas extracted from Cell 14 through a horizontal pipe network is also diverted to the gas utilisation engine. Landfill gas extracted from Cell 15 through a horizontal pipe network is diverted to a temporary 500m³/hr flare. All exposed side slopes on Cells 14 and 15 are covered with temporary liner to minimise odours.

Limerick County Council employ a full-time falconer and this prevents birds congregating at the landfill. A daily log of bird activity on site has been completed.

Rodent infestation is prevented by the following measures:

- Application of daily cover material
- Approx 30 bait boxes are at the perimeter of landfill and they are serviced on the first Thursday of every month by Rentokil.

7.0 EMISSIONS AND ENVIRONMENTAL IMPACTS

7.1 Summary Report on Emissions

A summary of emissions is contained in Table 7.1 below.

Table 7.1 Emissions Summary

Emission	Significance
Noise	Noise monitoring during the reporting period indicated daytime LAeq readings at all locations were within the licence limit of 55dB (A). Night time readings at M10 exceeded the limit of 45 dB (A) due to dogs barking and distant traffic movements.
Dust	During the course of the year there were no exceedences of the limit of 350 mg/m ² /day as specified in Schedule C.3 of the Waste Licence.
Odour	Odourous compounds measured at the landfill site were all recorded below the Licence limit of detection. Issues with nuisance odours continue to be reduced following restoration of phases and commissioning of the gas flare system.
Landfill Gas	Methane did exceed the trigger level at Monitoring Borehole C21 four times during the monitoring period. Carbon dioxide exceedences have been detected at a number of monitoring points as outlined in Chapter 9. Gas monitoring in gas vents is indicative of early stages of waste decomposition and are also discussed in Chapter 9.
Emission to surface water	There was 19,733.1m ³ of treated leachate discharged to the White River during 2009.
Leachate	A volume of 24,695.70 m ³ was tankered off site to waste water treatment plants.

7.2 Resource and Energy Consumption

Resource and energy consumption for on site can be summarised for 2009 as follows:

Table 7.2 Energy Consumption Summary

Energy	2004	2005	2006	2007	2008	2009
Diesel fuel (used for council machinery and pumps)	19,020 litres	10,529 litres	11,947 litres	9,812 litres	27,288 litres	33,793 litres
Pesticides: BioKill Pro (fly spray) concentrate	900 litres	700 litres	900 litres	750 litres	690 litres	850 litres
Electricity consumption	635,700 kWh	517,500 kWh	380,405 kWh	604,631 kWh	469,310 kWh	381,936 kWh

7.3 Estimated Annual and Cumulative Quantities of Gas Emitted from the Site

At Gortadroma Landfill there are 16 distinct landfill cells. 15 of these are now occupied by waste. The landfill is considered to be two separate landforms, cells 1-13 as the main area of landfill to date and cells 14-16 as the extension area which may be extended again in the future. Cells 1-14 are connected to a gas engine (600m³/hr) and cell 15 is connected to a temporary gas flare (500m³/hr). Two Gassim models have been created to model this scenario. One for those cells connected to the engine (cells 1-14) and one to the temporary flare (cell 15).

Filling operations ceased in Cells 1-13 at the end of September 2007 and recommenced in the extension area at the beginning of October 2007. Waste operations have continued in Cells 14 and 15 since then.

There are currently 130 gas wells at Gortadroma Landfill within Cells 1-13. The landfill gas collected by these vertical wells is transported via a manifold system with two mains connecting to a carrier main and in turn to a 1,500m³/hr gas flare, located within the gas compound within the southern portion of the site. The last wells were connected to this flare in 2008. There are no vertical wells to date within cells 14 -16 yet there is an extensive horizontal gas collection system. As cell 14 and 15 were filled a series of horizontal gas collection pipe-work was installed and connected to a temporary 500m³/hr flare.

Landfill Gas is produced principally in the year after the waste is deposited. Therefore when discussing volumes of gas generated in 2009 it is appropriate to discuss waste quantities and compositions principally from 2008. In 2008 a total of 56,070.46 tonnes of waste was landfilled at Gortadroma. This was an increase over the previous year, 2007, and as such it would generally be predicted that this would result in a slight increase in the volume of landfill gas generated on-site in 2009. 103,833 tonnes of waste was deposited in cell 15 in 2009 which would also have some impact on gas generation for that year.

The landfill Gas package, GASSIM is used to model the gas production at Gortadroma. Figure 1.1 & Figure 1.2, taken from GASSIM, illustrates the total bulk landfill gas which is generated from the landfill in the period 2000-2009.

For 2009 approximately 907m³/hr of landfill gas was generated from cells 1-14 and approximately 68m³/hr from cell 15, giving a combined volume of 975m³/hr at the 50th percentile for the average for the year.

Of the total bulk gas generated at Gortadroma in 2009 approximately 600m³/hr is collected from cells 1-14 and used to generate electricity through an engine at the gas compound area. Towards the end of last year 175m³/hr was approximately flared from cell 15.

Figure 7.1 Total Bulk Landfill Gas Generated 2000-2009, cells 1-14

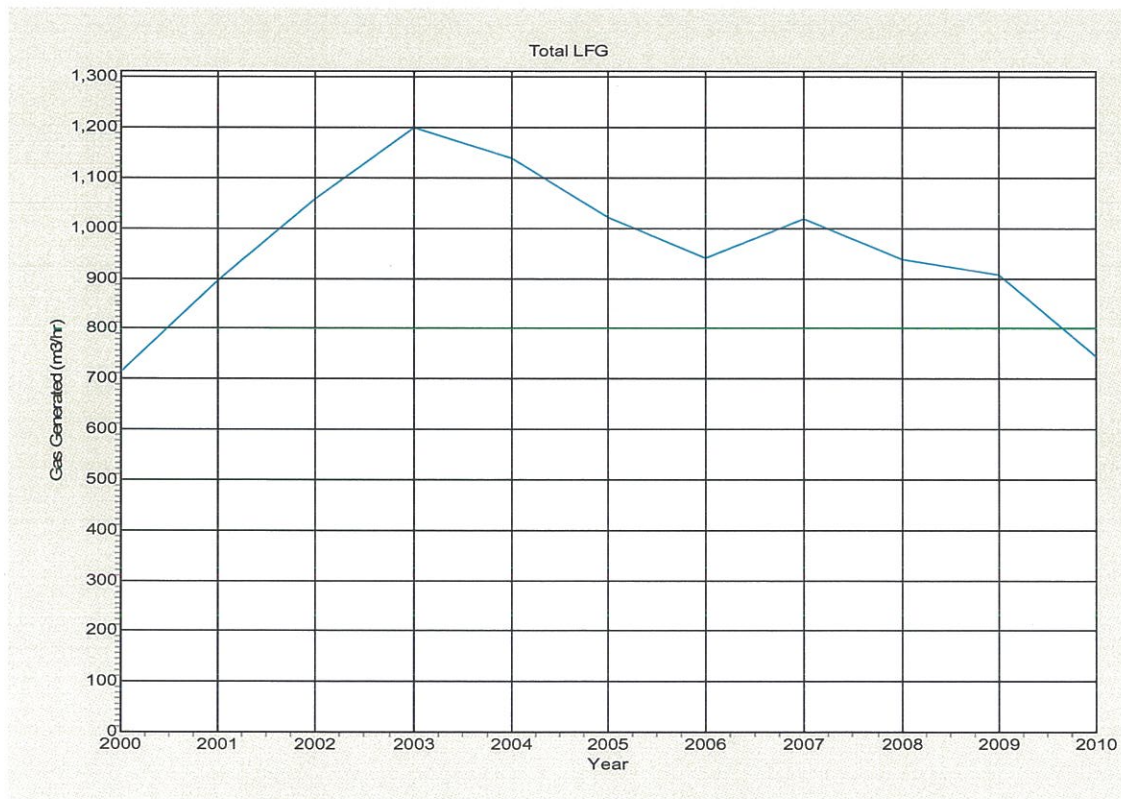
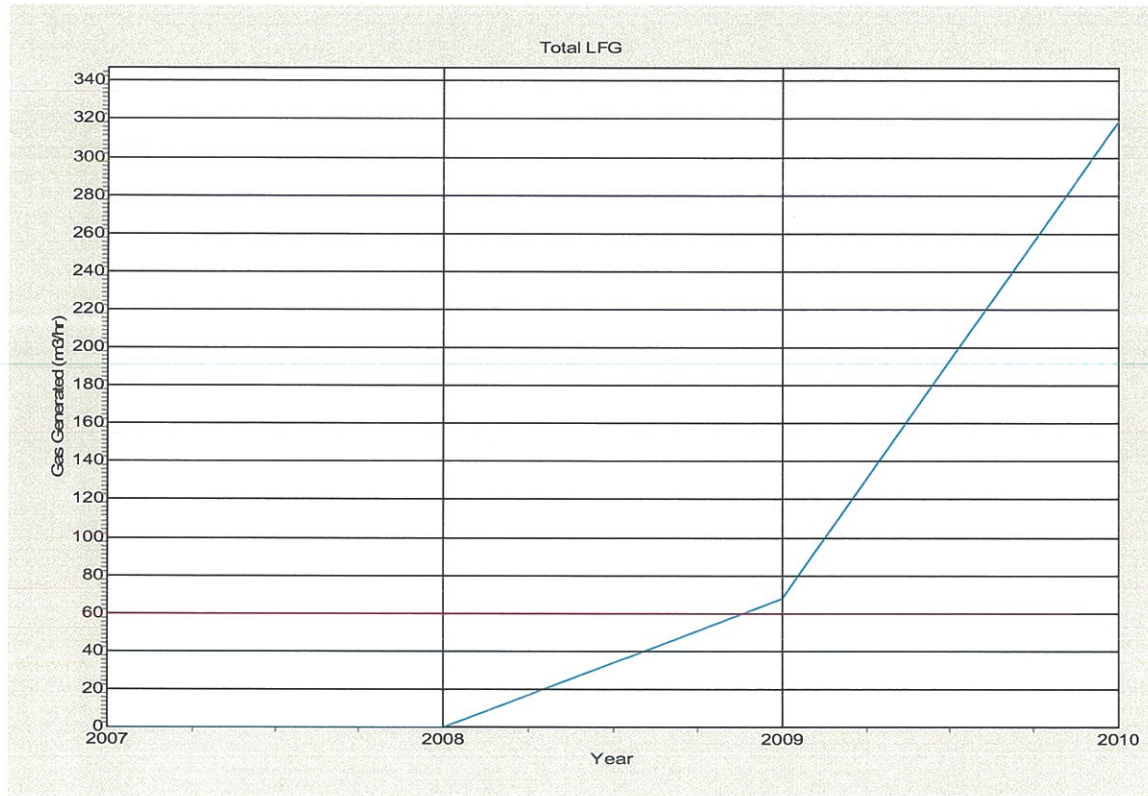


Figure 7.2 Total Bulk Landfill Gas Generated 2008-2009, cell 15



Of the total bulk gas generated at Gortadroma in 2009 approximately 596m³/hr (555 m³/hr from cells 1-14; 41 m³/hr from cell 15) was modelled as methane. The total engine output of methane, post combustion, was estimated at 3.5m³/hr (99% destruction efficiency - majority from the engine, insignificant volume from 500m³/hr temporary flare for 2009).

Figure 7.3 Methane Produced from cells 1-14 and Engine Methane Output (from cells 1-14)

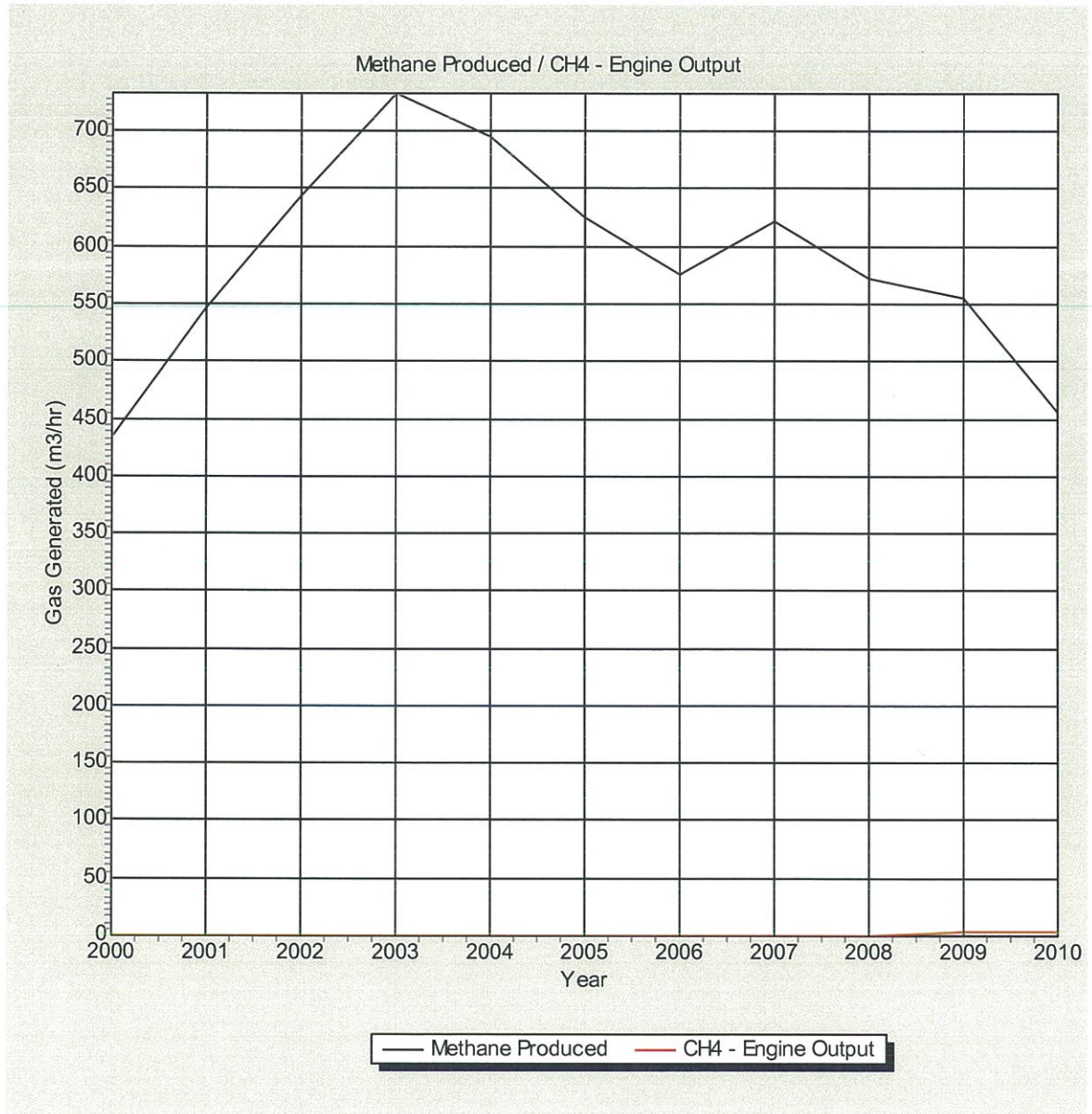
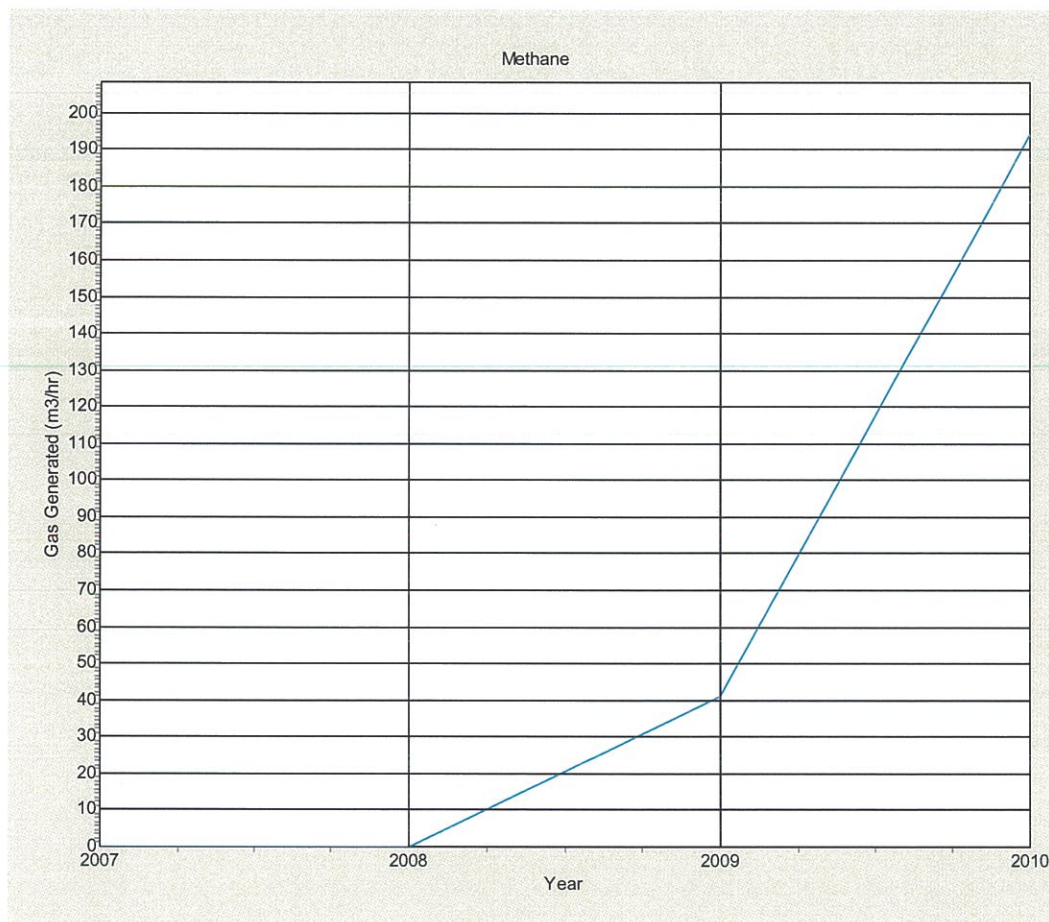


Figure 7.4 Methane Produced from cell 15



GASSIM also estimates the global warming potential of the emissions from Gortadroma Landfill in 2009. This is estimated in tonnes of Carbon Dioxide, as CO₂ is used as a baseline molecule by which the global warming impacts of all gases are measured. Emissions of other greenhouse gases are converted to a CO₂ equivalent on the basis of their global warming potential (GWP). For example, the GWP of methane is 21, which means that one tonne of methane is equivalent to 21 tonnes of CO₂.

According to the GASSIM model of Gortadroma landfill a total of 934 tonnes of methane was emitted from the cells 1-14 and 692 tonnes from cell 15 in 2009. This figure includes fugitive emissions and methane emissions post flaring. Using a GWP factor of 21 these volumes of methane are equivalent to 15,466 tonnes of Carbon Dioxide. GASSIM also estimates that 11,800 tonnes of Carbon Dioxide was generated, post engine from cells 1-14 and 1,270 tonnes post flare from cell 15 in 2009. Combining these two results yields a total equivalent Carbon Dioxide emission of 28,536 tonnes for 2009 for Gortadroma Landfill.

7.4 Estimated Annual and Cumulative Quantity of Indirect Emissions to Groundwater

Gortadroma Landfill consists of 16 individual landfill cells. Cells 5-16 contain a fully engineered liner while Cells 1-4 have an in-situ clay base. Cells 1-4 have been fully capped with 1m of subsoil/topsoil, drainage blanket, GCL and an LLDPE geosynthetic layer. This capping system essentially prevents any ingress of water into these cells. This removes the possibility of the leachate head increasing and thus assuming that the leachate head will reduce and eventually stabilise and that the emissions to groundwater will be significantly reduced. In addition leachate pumping wells have been installed within each of the four cells. The function of these pumps is to draw down the leachate head within the four cells. These pumps have been operational since mid December 2003 and are drawing the leachate head down constantly. The leachate abstraction wells were re-drilled in August 2004 in an attempt to retrieve leachate from a lower level, since the original wells had run dry. Five wells were drilled, four to abstract leachate and a fifth to monitor the leachate head. Leachate levels were maintained at 1m from the base of the wells throughout the year and additional pumping was carried out when capacity in the treatment plant allowed for it.

Table 7.3 Depths of the wells and the leachate heads

Well ID	Depth of Well b.g.l.	Leachate Levels b.g.l
1/4a	11.4m	10.4
1/4b	12m	11
1/4c	16.7m	15.7
1/4d	13.75m	12.75

The leachate head is reducing within cells 1-4 due to the lack of ingress of water into the cells and the pumping from the cells. The pumps will only activate when there is sufficient volume available in the leachate management system.

At the highest point of cells 1-4 the depth from ground level to the basal clay liner is approximately 14m, and varies between 11 and 16m below the top of the cap across the cells. At present (taking the annual average values) the head of leachate is at between 10-16m (average 12.5m) below ground level, giving an estimated leachate head of 1.5m above the base of the cells. On average, across cells 1-4, the leachate head is assumed to be 1.5m over an area of 22,000m². It is assumed that the waste has an overall moisture content of 25% below this level.

$1.5\text{m} \times 22,000\text{m}^2 \times 0.25 = 8,250\text{ m}^3$ of leachate within cells 1-4 in 2008. This figure can be used to calculate the hydraulic gradient above the basal clay liner per unit area.

The hydraulic conductivity of the clay liner can be taken to be approximately 1×10^{-9} m/s.

Using Darcy's law, ($Q=kiA$) the flow volume through the clay liner can be calculated as follows:

Where k is the hydraulic conductivity of the clay liner (using 1×10^{-9} in this incidence)

$I = (h + L)/L$ (m/m) is the hydraulic gradient, where h is the head of leachate (taken to be 0.375 in this case because of the relationship between the hydraulic conductivity of the waste and its moisture content) and L is the thickness of the mineral layer (1m in this case), therefore I is 1.375.

A is the area, in this case 22,000m².

Therefore the flow (Q) can be calculated to be $3.0 \times 10^{-5} \text{ m}^3/\text{s}$ through the clay liner at the base of cells 1-4.

For the one-year period of 2009 the flow rate of leachate emissions to groundwater is calculated to be 930 m³/year (or 2.5m³/day).

A 1m head of leachate is not exceeded above the base of the wells, and the pumps within cells 1-4 are rarely operational due to a lack of leachate in the borehole, indicating that their max pumping depths have been achieved at this stage.

It is assumed that as the leachate head is reduced in cells 1-4 through the limited ingress of water and the leachate abstraction pumping, the leachate head within cells 1-4 will continue to reduce, at very low detection rates, thereby reducing the flow rate through the clay basal liner and limiting the emissions to groundwater. Ground water monitoring in the surrounding boreholes should indicate a marked improvement in groundwater quality in the future.

7.5 Theoretical leachate generated vs. tankered

The theoretical leachate generated was calculated for each month of 2009 using the following data.

- Monthly rainfall figures in meters;
- Effective cell area open m² for each month and hard standing area (1,320 m²) from the composting slab and waste inspection area;
- The effective area open for each of the months January to December 2009 was 24,700 m².

Table 7.4 Theoretical Leachate Volumes and Tankered

Month 2009	Rainfall m	Effective area open m ²	Theoretical Leachate produced m ³	Volume of leachate discharged m ³	Volume of leachate tankered off-site m ³
January	0.17401	24,700	4298	3692	0
February	0.023	24,700	568.1	3280	2,323.72
March	0.0898	24,700	2218.1	3715.8	2,455.28
April	0.1376	24,700	3398.72	1607.8	2466.6
May	0.1552	24,700	3833.4	0	2335.32
June	0.0638	24,700	1575.9	0	2361.54
July	0.128	24,700	3161.6	0	1298.2
August	0.1858	24,700	4589.3	0	1761.98
September	0.0806	24,700	1990.8	0	2437.42
October	0.1197	24,700	2956.6	2427.4	2433.56
November	0.3681	24,700	9092.1	3506.5	2613.36
December	0.1158	24,700	2860.3	1503.6	2208.72
Annual Total	1.64141		40,542.92	19,733.1	24,695.7

7.6 Volume of Leachate Produced and Volume of Leachate Transported/Discharged off-site

There was 19733.1 m³ of treated leachate discharged to the White River during 2009.

The difference between the actual figure generated and that, which should be generated in theory (Table 7.4), is attributed to some infiltration through the GCL capping on Cells 5-10. Repairs were carried out on the capping of Cells 8 and 10 recently and a Report will be forwarded to the Agency in the near future.

A volume of 24,695.7 m³ was tankered off site to waste water treatment plants. All tankered leachate was collected and sent to wastewater treatment plants (WWTPs) in Castletroy and Newcastle West.

Figures 7.5 to 7.7 summarise daily and monthly volumes of leachate being tankered off-site. The total volume of leachate tankered off-site between January and December 2009 was 24,695.7 m³.

Figure 7.5 2009 Monthly Tankered Leachate

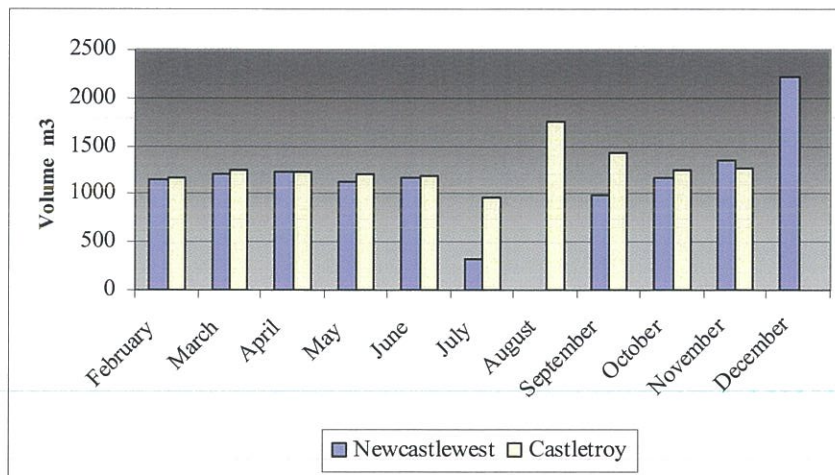
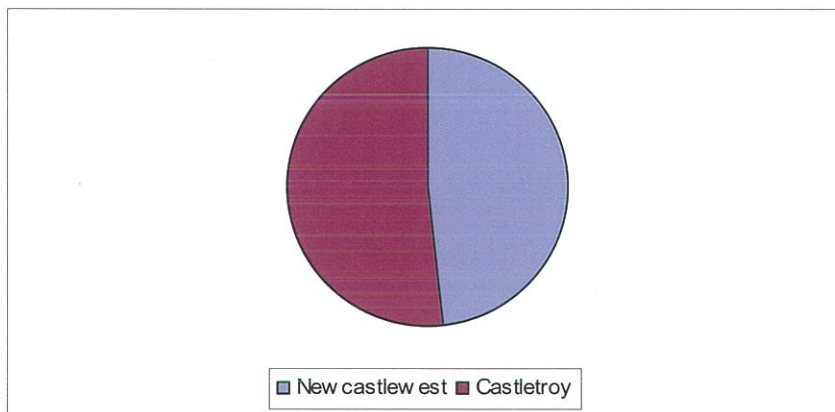


Figure 7.7 Location of Tankered 2009 Leachate



7.7 Monthly Surface Water Balance

The surface water management system at Gortadroma is designed so that all surface water entering the site boundary and all run-off from the site is collected and diverted through the surface water lagoons at the main entrance to the site. The storm water lagoons are the designated point of discharge of surface water from the landfill. The monthly totals of surface water discharged are provided in Table 7.7 below.

The design catchment area for the stormwater lagoons is 90 hectares in total. Of the 90 hectares, 35 are the licenced site which contains 11 hectares of landfill area, 3.3 hectares of which are open cells. Approximately 5% of the remaining 24 hectares can be classified as hard standing areas.

The total catchment, which feeds to the surface water lagoons, can be broken down into common permeability areas as follows:

Table 7.5 Percentage run-offs for each area

Area	Type	Percentage Run-off
55 hectares	Agricultural land	35%
11.56 hectares	Landfill area - capped	75%
3.3 hectares	Landfill area - open cells	0%
1.2 hectares	Hardstanding areas	90%
22.8 hectares	Other land within licenced boundary	35%

The predicted estimated flow in l/sec can be assessed using a simple equation based on area, rainfall (for 2009) and percentage run offs from table 7.5. Since the volumes are required monthly a figure for each month has been generated in Table 7.7, and follows the procedure set out below for an annual figure.

$$Q = \text{Area (m}^2\text{)} \times \text{Rainfall (m for 2009)} \times \text{percentage runoff.}$$

The flows for the different areas listed in Table 7.5 above can be calculated and then added together for a total flow in m³/year. Since the rainfall data from 2009 is being used the Total Flow is specifically for 2009.

Table 7.6 Surface water flow from each area and total for the site 2009

Area (m ²)	Rainfall (m)	Percentage Run-Off	Q (m ³ /year)
550,000	1.64141	0.35	315,971.4
115,600	1.64141	0.75	142,310.2
33,000	1.64141	0.00	0
12,000	1.64141	0.90	17,727.2
228,000	1.64141	0.35	130,984.5
Total Flow (m³)			606,993.3

Table 7.7 Monthly Surface Water Balance

Month (2009)	Rainfall (m)	Record of discharge from surface water lagoons (m ³)
January	0.17401	64,348.87
February	0.023	8505.4
March	0.0898	33,208.04
April	0.1376	50,884
May	0.1552	57392.96
June	0.0638	23593.24
July	0.128	47334.4
August	0.1858	68708.84
September	0.0806	29805.88
October	0.1197	44265.06
November	0.3681	136123.3
December	0.1158	42822.84
Annual Total	1.64141	606,993.3

Volumes of surface water discharge during 2009 do not include large volumes extracted from the storm water tanks for road spraying. It does not include surface water over topping the retaining berm during very high flows. This method of calculation is a preliminary estimate and does not take account of storm conditions, light rainfalls, lag times between rain falling and entering the stream, evaporation and transpiration and as such is reflecting a larger, more conservative volume of surface water discharged from the site.

8.0 RESTORATION AND AFTERCARE

8.1 Report on restoration of completed cells/phases

The remaining life span of each cell and time frame for restoration of these cells is outlined in Table 8.1. This time frame is estimated at January 2010 filling rates. The restoration dates indicate the period in which the restoration / final capping contract will be carried out. Phase 1 of landfilling has been completed in cell 14 and the 2 exposed site slopes on this cell has been lined with a temporary liner. The top of cell 14 has been temporary capped. Cell 15 is current active cell.

A Closure Restoration & Aftercare Management plan (CRAMP) will be developed and submitted to the Agency during 2010.

Table 8.1 Life Spans and Proposed Restoration Dates

Cell No.	Life Span –Years (Based on Current Filling Rates)	Proposed Date for Commencement of Restoration
1-4		Restored
5		Restored
6		Restored
7		Restored
8		Restored
9		Restored
10		Restored
11		Restored
12		Restored
13		Restored
14	0.3	Q3 2011
15	1.2	Q3 2011

9.0 ENVIRONMENTAL MONITORING

Monitoring is carried out according to Schedule C of Waste Licence W0017-03. There is permanent access to all permanent on-site monitoring points. All monitoring equipment was calibrated during the reporting period.

9.1 Landfill Gas

In accordance with Schedule C.2.1 of Waste Licence W0017-03, the following points are monitored on a monthly basis for methane (CH₄), carbon dioxide (CO₂), oxygen (O₂), atmospheric pressure and temperature:

- Perimeter gas monitoring locations - C1 to C22. (Results for perimeter locations have been grouped according to their location at the northern, southern, eastern or western boundary.);
- Gas vents - Cells 1-4, Vents A-D; 5A, 6A, 7A, 9A, 10B, 8B, 11A, 12A, 13B, 14A and 15A;
- Site Office - gas levels continuously monitored and gas alarm installed.

9.1.1 Perimeter Gas Monitoring

Methane

Methane did exceed the trigger level of 1% (v/v) at Monitoring Borehole C21 four times during the monitoring period.

Carbon dioxide

Exceedences of the CO₂ trigger level occurred at several locations during the reporting period and are outlined in Table 9.1.

Table 9.1 Exceedences of CO₂ trigger levels

Location	Date
C2	January, February, March, April, May, June, July, August, September, October, November, December
C3	January, February, March, April, May, June, July, August, September, November, December
C4	January, February, March, April, May, June, July, August, September, October, November, December
C5	No exceedences
C7	July, August, September
C8	No exceedences
C11	No exceedences
C12	January, February, March, October
C14	January, February, March, August, September, October
C15	July, August
C16	January, February, March, April, October
C17	January, February, March, April, May, October
C18	June, July, August, September, October, November, December
C19	February, September
C21	January, February, March, April, May, June, July, August, September, October, November, December
C22	April, May, June, July, August, September, October, November, December

These exceedences are not accompanied by elevated methane levels. Exceedences of CO₂ levels at these boreholes have all previously been reported as incidents and are highlighted in all quarterly monitoring reports.

9.1.2 Site Office Gas Monitoring

Monitoring of methane and carbon dioxide levels in the site office has indicated that there have been no breaches of the trigger levels during the 2009 reporting period.

9.1.3 Gas Vent Monitoring

Gas quality is measured at a total of 15 points. Results for most cells indicate that levels of CH₄ and CO₂ were relatively low for in-waste wells until capping works were completed. Landfill gas levels from mature waste can be in the region of 60% methane, 40% carbon dioxide; these levels are now being seen on occasion in Cells 1 - 4, 5, 6, 7, 8, 9, 10, 11, 12 and 13.

9.1.4 Landfill Gas Flare

EURO environmental services personnel conducted the monitoring surveys for the landfill gas flare on 3rd April 2009. All parameters monitored over the course of the first survey complied with the Waste License limits. A monitoring survey was also conducted on the gas utilisation plant on the 11th November 2009. The results recorded for Nitrogen Oxide (NOX) exceeded the licence limit and was reported as an incident to the Agency.

9.2 Dust

On-site dust monitoring was carried out by EURO environmental services as per Schedule C.3, once per quarter as outlined in Table 9.2 below. Dust monitoring was carried out using Standard Method VDI 2119 (Measurement of Dust-fall, Determination of Dust-fall using Bergerhoff Instrument (Standard Method German Institute) at six locations labeled D1, D3, D4, D5, D6 and D7 on Figure 1.

Results for dust monitoring are presented in Table 9.2.

Table 9.2 Dust Monitoring Results

Sampling Point	Dust Deposition Rate mg/m ² /day			
	27 th January to 24 th February 2009	3 rd June to 30 th June 2009	25 th August to 22 nd September 2009	25 th November to 22 nd December 2009
D1	53.54	n/a	313.01	76.5
D3	65.3	233.58	n/a	105.9
D4	64.72	297.13	116.5	116.5
D5	66.48	194.16	185.2	125.3
D6	130.61	n/a	148.8	118.9
D7	132.38	n/a	n/a	328.3

n/a – Dust jar invalid

There were 3 exceedences of the limit of 350mg/m²/day as specified in Schedule B.1 of the waste license, one recorded at D3, D5 and D7.

9.3 Odour

On-site odour monitoring was carried out quarterly by EURO environmental services as per Schedule C.3. Odour monitoring was carried out at four monitoring locations namely M1, M2, M7 and M10. Monitoring was carried out in order to identify if measurable concentrations of hydrogen sulphide, mercaptans, organic acids and volatile organic compounds were present. In all cases the measured parameters were below the limit of detection.

9.4 Noise

Noise monitoring was conducted by EURO environmental services personnel on the 10th to 12th June 2009 to satisfy condition 6.9 of Waste Licence Register W0017-3. Results are included in Table 9.3 and in Figures 9.1 and 9.2. The two figures also include the relevant license limit.

Table 9.3 Noise monitoring results

Monitoring Point	L _{Aeq} , 30 mins	
	Daytime	Night time
	10 th and 11 th June 2009	10 th , 11 th and 12 th June 2009
M1	51	44
M2	44	35
M3	50	28
M4	47	24
M5	49	29
M6	44	39
M7	41	30
M9	43	34
M10	43	54*
M11	51	34

(* Exceeds license limit)

The report by EURO environmental services included the following conclusions:

Daytime noise measurements did not exceed the license limit, of 55 dB(A) at any of the monitoring locations.

Night time readings were consistent with calm, dry weather. Only one monitoring location, M10 [54 dB(A)], exceeded the night time license limit of 45 dB(A). This exceedence was mainly due to dogs barking and distant traffic movements.

M2, M6 and M9 had tonal components during the daytime survey which were not attributable to the landfill site.

M1, M2, M4, M5 and M10 had tonal components during the night time survey which were not attributable to the landfill site.

Figure 9.1 2009 Daytime Noise Results

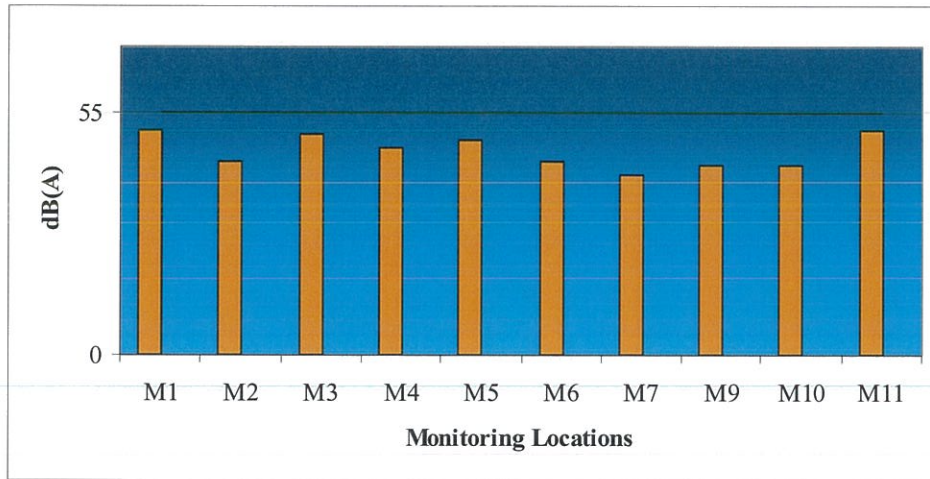
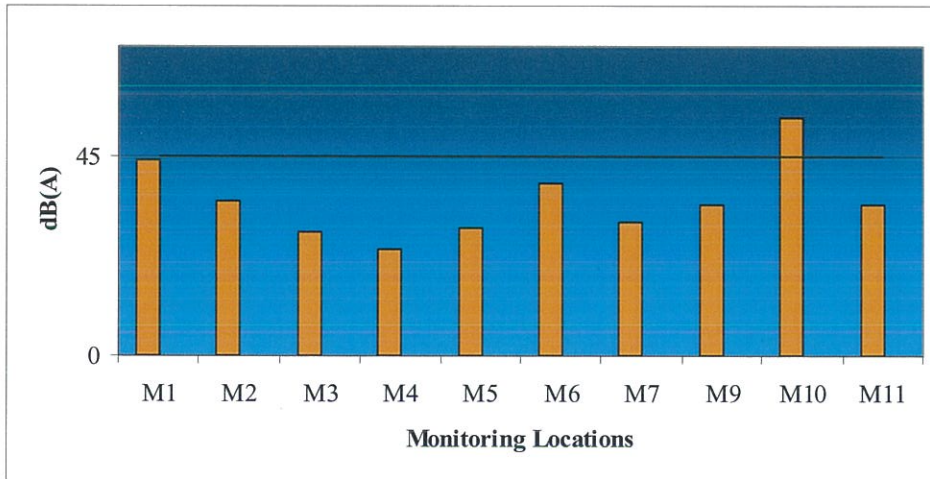


Figure 9.2 2009 Night time Noise Results



9.5 Surface Water

Under Schedules C.2.3 and C.3 of Waste Licence W0017-03 weekly visual inspections and quarterly and annual analysis of surface water monitoring points were conducted at S1, S2, S6, S7, S8, SW1, SW2, SW3, SW4, SW9, SW10 and SW11. In addition, there was weekly analysis of the storm water retention pond (SW4) carried out.

9.5.1 Visual Inspection

Visual inspections are carried out weekly on monitoring points S1, S2, S6, S7, S8, SW1, SW2, SW3, SW4, SW9, SW10 and SW11. Observations of water flow rate, water clarity, colour and vegetation growth are recorded. Inspections throughout the reporting period noted that surface water was generally of good quality. Reports of vegetation growth were also experienced at SW1, SW2, SW3 and S2. Occasionally there was no flow experienced at monitoring locations SW1, SW2 and SW4 in 2009.

9.5.2 Chemical Analysis

Quarterly and annual samples from 12 surface water monitoring locations were taken as specified in Waste Licence 0017-03. The results are compared with the Quality Standards for Surface Water, EC (Quality of Surface Water Intended for the Abstraction of Drinking Water) Regulations, 1988 [S.I. No. 294 of 1989] and the EC (Quality of Salmonid Waters) Regulations, 1988 [S.I. No. 293 of 1988]. The parameters included in the scope of this analysis for which Water Quality Standards exist are listed in Table 9.4 together with the Maximum Admissible Concentration (MAC) for each parameter. It should also be noted that water is not abstracted for potable use from surface water in the immediate vicinity of the site.

The range of conductivity measurements recorded during 2009 was from 174 uS/cm at S2 to 818 uS/cm at SW2. All of the results for conductivity are within the 1000uS/cm limit value as specified in the surface water regulations.

The results for pH for all monitoring locations are of neutral compositions and within the expected range for surface waters.

Ammonia was detected in low concentrations at all monitoring locations. All levels recorded are below the limits specified in the EC (Quality of Salmonid Waters) Regulations, 1988 [S.I. No. 293 of 1988] with the exception of two results recorded at S8 and SW1 during Quarter 2 and two results recorded at SW3 and SW11 during Quarter 3. There were no monitoring locations that exceeded the parametric value during Quarter 4.

The measured results for BOD ranged from <2 mg/L to 30 mg/L. All monitoring location results are within the MAC A3 limit of the Surface Water Regulations. Results have shown that COD concentrations ranged from 13 mg O₂/L to 1142 mg O₂/L. COD. Results were shown to exceed the MAC A3 limit at many locations, however this may be due to several factors including stream substrate type and inputs from surrounding peatland.

Chloride results ranged from 16.42 mg/l Cl to 46.39 mg/l Cl at the surface water monitoring locations.

The results for suspended solids for some of the monitoring locations are low at < 3 mg/l or < 2 mg/l (with revised LOD from lab). The highest concentration of suspended solids of 1414 mg/l was detected at monitoring location S7, where the flow of water was very low and disturbance of the bottom sediments may have caused the high suspended solids result. In total, fourteen monitoring points exceeded the A1 quality standard MAC of 50mg/L, S1 during Quarter 1 at 148 mg/L; S2 during Quarter 2 at 160 mg/L; S7 during Quarters 1, 2 and 3 at 1414 mg/L, 339 mg/L and 1267 mg/L respectively; SW2 during Quarters 1, 2 and 4 at 118 mg/L, 1396 mg/L and 130 mg/L respectively; SW1 during Quarter 2 at 111 mg/L, SW10 during Quarters 2 and 3 at 939 mg/L and 98 mg/L respectively; SW11 during Quarter 2 at 72 mg/L and SW3 during Quarter 3 at 119 mg/L. However, all surface water is diverted to the surface water settling tank before discharge to the White River.

Storm water samples were collected on a weekly basis and analysed for a number of parameters as described in Schedule C.2.3 of Waste Licence W0017- 03. The trigger levels for the discharge from the storm water tank were exceeded for suspended solids on the 13/01/09. This sample was a grab sample and did not exceed the 1.2 times the emission limit as per licence condition 4.3.3. The trigger levels for the discharge from the storm water tank were exceeded for ammonia on the 26/05/09 and 01/12/09. These samples were grab samples and did not exceed the 1.2 times the emission limit as per licence condition 4.3.3.

The measured results for DO range considerably depending on the time of year. The lower measurement values were recorded at monitoring locations where there was an insufficient flow of water and where turbulence and mixing was minimal. There is no specified DO limit under the surface water regulations.

Results for sulphates ranged from <1.39 mg/l at S6 and S7 to 35.56 at surface water monitoring point SW11. All of the results are within the A1 Quality Standard (SI 298 of 1989) of 250 mg SO₄/l.

Iron was detected at concentrations greater than the A1 Surface Water MAC at each location, except for SW1. All monitoring locations were within the A1 MAC of 50 ug/L for lead. With regard to the remaining metal parameters other than iron and lead, all locations, apart from S1, S2, S7, SW3, SW9 and SW11 which exceeded the limit for manganese and S2 which exceeded the limit for copper, comply with A1 Standard for Surface Water Quality as per EC (Quality of Surface Water intended for the abstraction of Drinking Water) Regulations 1988.

Table 9.4 Surface Water Quality Standards for Parameters Analysed

PARAMETER	QUALITY STANDARDS			
	SURFACE WATER REGULATIONS [1]			SALMONID WATERS REGULATIONS [2]
	A1 MAC	A2 MAC	A3 MAC	
Temperature, °C	25	25	25	NS
Dissolved oxygen, mg/L	NS	NS	NS	50% ≥
Dissolved oxygen, % Saturation	> 60%	> 50%	> 30%	NS
Conductivity, µS/cm at 20° C	1000	1000	1000	NS
pH	5.5 – 8.5	5.5 - 9	5.5 – 9.0	6-9
BOD, mg/L O ₂	5	5	7	≤
COD, mg/L O ₂	NS	NS	40	NS
Chloride, mg/L Cl	250	250	250	NS
Total Ammonium, mg N/L	0.16	≤0.80	3.1	≤0.016
Suspended solids, mg/L	50	NS	NS	≤5
Manganese, mg/l Mn	0.05	0.3	1	NS
Copper, mg/l Cu	0.05	0.1	1	NS
Zinc, mg/l Zn	3	5	5	NS
Cadmium, mg/l Cd	0.005	0.005	0.005	NS
Iron, mg/l Fe	0.2	2	2	NS
Sulphates, mg/l SO ₄	200	200	200	NS
Lead, mg/l Pb	0.05	0.05	0.05	NS
Mercury, mg/l Hg	0.001	0.001	0.001	NS
Total Chromium, mg/l Cr	0.05	0.05	0.05	NS

1. EC (Quality of Surface Water Intended for the Abstraction of Drinking Water) Regs, 1988[S.I. No. 294 of 1989] Categories A1, A2 and A3 Surface Waters, as defined in the Regulations are classified on the basis of quality standards requiring simple to intensive methods of treatment. MAC = Maximum Admissible Concentration; NS = Not Specified
2. EC (Quality of Salmonid Waters) Regs, 1988 [S.I. No. 293 of 1988].

9.5.3 Discharge to surface water

There was 19733.1 m³ of treated leachate discharged to surface water in 2009.

9.5.4 White River

As required under Schedule C.3, a biological survey of the White River was conducted on 11th September 2009 at Sites A, B, C and D as shown in Appendix IV.

A summary of trends in biological water quality at these points since 1997 is provided in Table 9.5 below.

Table 9.5 Biological Water Quality along the White River

Site Reference	A	B	C	D
Results 1997	Q4	Q4	Q4	Q4
Results 2000	Q4	Q4	Q4	Q3-4
Results 2001	Q4	Q3-4	Q4	Q3-4
Results 2002	Q4	Q3-4	Q3-4	Q3-4
Results 2003	Q3-4	Q4	Q4	Q4
Results 2004	Q4	Q4-5	Q4	Q4
Results 2005	Q4	Q4	Q4	Q4
Results 2006	Q4	Q4	Q4	Q4
Results 2007	Q4	Q4	Q4	Q4
Results 2008	Q3-4	Q4	Q4	Q4
Results 2009	Q3	Q3	Q3	Q3

These figures show that water quality deteriorated at all four locations over the last year. All sites merited a rating of Q3 indicating moderately polluted conditions and 'doubtful' water quality. Given that at all but the most upstream site (Site A) the deterioration in water quality resulted in a drop of a full Q-rating point from Q4 to Q3, the results of the present survey indicate a very significant general deterioration in the condition of the river.

The results of the present biological water quality assessment contain no evidence of any adverse impact on the Owvane River from the landfill at Gortadroma.

It is notable that heavy siltation of substrates was observed at all four sites at the time of sampling.

Overall, this is a good indicator of the water management at the landfill, as Location B is located upstream of the landfill, C and D are located downstream of the site and A, is located furthest away from the site and all points are achieving a Q3 rating.

9.6 Groundwater

As required under Schedule C.3 of Waste Licence W0017-03, monthly levels were recorded and quarterly/annual analysis conducted on groundwater monitoring points GW2-B, GW2-O, GW8-B, GW8-O, GW SA2, GW3-O, GW5, GW6-O, GW6-B, GW SA1, GW7-B, GW4-O, Collins Well, GW7-O, GW11-B, GW11-O, GW9-B, GW9-O, GW10-O, GW10-B and GW1-O.

9.6.1 Monthly/Quarterly Groundwater Monitoring

When assessing groundwater quality, the limits prescribed in the Drinking Water Regulations (Statutory Instrument No 278 of 2007) are generally used as a guide, based on the principal that uncontaminated groundwater should be potable. Analysis of groundwater during this reporting period indicates that the overall water quality has generally been satisfactory.

Ammoniacal nitrogen has been found in all wells across the site and a number of wells have consistently elevated levels. GW10B had the highest levels of ammonia measured across the site with a high of 2.82 mg/L N being recorded here in Quarter 4. Trigger levels set for ammonia at monitoring locations SA1 (1.2 mg/l), GW5 (2.2 mg/l), and Collins Well (1.7 mg/l) were not exceeded at any time during 2009.

The measured results for Electrical Conductivity ranged from 271 μ S/cm to 853 μ S/cm in 2009. Trigger levels set for Conductivity at SA1 (800 μ S/cm), GW5 (800 μ S/cm), and Collins Well (1,500 μ S/cm) were not exceeded at any time during 2009.

Chloride levels were below the trigger levels set for all of the 2009 monitoring period. Sulphate concentrations, where detected, did not exceed the 250 mg/l limit specified in the Drinking Water Regulations for all samples. Concentrations of Sulphate ranged from <1.39 mg/l to 122.19 mg/l (recorded at GW9-B). Groundwater samples analysed were all below the limit of detection for analysis of organic compounds.

The samples for metal analysis were collected in separate bottles and the water acidified. Consistent with previous monitoring events, Manganese and Iron were the only metals that showed elevated levels above the parametric values. However as iron is naturally present and reflects the basic solid geology of the area, these concentrations are of little significance.

Heavy metals Cadmium and Mercury concentrations were below their respective limits of detection. The wells sampled are monitoring wells only and not used for drinking water purposes.

Total Coliforms were detected at 17 sample locations – GW5, GW SA2, GW3-O, GW2-O, GW2-B, GW1-O, GW8-O, GW8-B, GW6-O, GW6-B, GW7-O, GW9-O, GW9-B, GW10-O, GW10-B, GW11-O and GW11-B. Faecal Coliforms were tested through analysis for *E. coli*. Faecal Coliforms concentrations were detected at five sample locations – GW SA2, GW3-O, GW2-O, GW2-B and GW6-O.

9.6.2 Private Wells

Boreholes sampled were all within the 500m boundary of Gortadroma Landfill. There were 15 boreholes in total both up-gradient and down-gradient of the landfill.

Five wells were determined to be contaminated with total coliforms, five wells exceeded the MAC for iron and eight wells exceeded the MAC for manganese.

South East

Of the seven wells analysed to the south east of the landfill (wells 1-7), two wells had elevated total coliform concentrations, above the Maximum Admissible Concentration (MAC), one had elevated levels of iron, one had elevated levels of manganese.

North West

Parameters that were elevated above the MAC were total coliforms on PW15 and PW17, iron on PW14 and PW18 and manganese on PW14, PW15, PW17 and PW18. As the wells were within 500 metres of each other and are upstream of the landfill site, it is unlikely that the landfill was contributing to the elevated coliform concentrations. Conclusions would indicate that agricultural practices or poor percolation areas might be responsible.

South West

Well number PW20 did show total coliforms contamination, while PW20 and PW24 showed manganese concentrations above the recommended MAC. Well PW 20 showed elevated concentrations of Iron as well.

Limerick County Council have issued the results to all Well Owners and have also issued Boil-Notices where appropriate.

9.7 Leachate

9.7.1 Leachate Levels

Under Schedule C2.5 in Waste License W0017-03, leachate levels in cells are monitored on a weekly basis at two locations in cells 5, 6, 7, 8, 9, 10, 11, 12, 13, 14 and 15. Levels are also monitored in Cells 1 to 4 A, 1 to 4 B and 1 to 4 C. Exceedences in leachate levels of 1m over the top of the liner at the base of Cells 9, 10, 13 and 15 were reported as an incident to the Agency on the 25th November 2009.

9.7.2 Leachate Composition Analysis

A leachate sample is collected from the raw leachate storage lagoon and analysed on a quarterly and annual basis in accordance with Table C.2.5 in Waste Licence W0017-03. Quarterly monitoring requirements for leachate include measurement of BOD and COD levels. The results for these parameters are within the expected range for leachate from a landfill site.

Conductivity and pH were measured on-site on the day of the sampling. The conductivity result was 3380 $\mu\text{S}/\text{cm}$, which is lower than that recorded in 2008 (7610 $\mu\text{S}/\text{cm}$). The pH result was 8.7.

Ammonia (64.15 mg/L N) concentrations were lower to those found in the previous annual monitoring. Sulphate (3.12 mg/L SO_4) concentrations were higher to those found in the previous annual monitoring. Chloride concentration was lower than previously with a value of 449.44 mg/L.

Concentrations of metals were in general lower to the results observed in 2008. Trace concentrations of cadmium (<0.09 $\mu\text{g}/\text{L}$), chromium (26.7 $\mu\text{g}/\text{L}$), copper (2.4 $\mu\text{g}/\text{L}$), cyanide (6 $\mu\text{g}/\text{L}$), nickel (48.5 $\mu\text{g}/\text{L}$), zinc (13.9 $\mu\text{g}/\text{L}$) and lead (<0.38 $\mu\text{g}/\text{L}$) were found. Sodium (508.50 mg/L) and potassium (261.30 mg/L) were also detected.

There was a decrease in the concentration of total phosphorous from 2.468 mg/l P to 0.607 mg/l P. There was a decrease in the concentration of iron (563.8 $\mu\text{g}/\text{L}$) and a decrease in manganese (212.2 $\mu\text{g}/\text{L}$) on the previous annual monitoring event. A fluoride concentration level of 0.46 mg/L was recorded.

Pesticides, volatile and semi-volatile organic carbons were below the limit of detection.

9.7.3 Leachate Treatment Plant

The following volumes of treated leachate were discharged to the White River during 2009.

Month	Volume of Treated Leachate Discharged m ³
January	3692.0
February	3280.0
March	3715.8
April	1607.8
October	2427.4
November	3506.5
December	1503.6

All treated leachate discharged during 2009 complied with the licence limits with the exception of Phosphorus concentrations, which were exceeded on two separate dates, 13/10/09 and 28/10/09.

9.8 Meteorological Monitoring

Meteorology is monitored in accordance with Schedule C.3 of Waste Licence W0017-03. A Vaisala Meteorological station was installed at the landfill in June 2000. The following parameters are recorded:

- Temperature
- Evaporation
- Evapotranspiration
- Relative Humidity
- Pressure
- Wind Direction
- Wind Speed
- Precipitation

A summary of meteorological data recorded during the reporting period is provided in Appendix V.

9.9 Ecological Monitoring

During the December 2000 ecological survey 98 plant species were identified, 4 more than a survey carried out in 1997. It was considered that there has been no loss of floral biodiversity due to operations of the site since the last survey in 1997.

The ecological survey of August 2001 reported 114 plant species were identified, and no loss of floral, faunal or habitat diversity was noted.

During the ecological survey of July 2002 a total of 129 floral species were noted. This represents a slight increase in diversity, and although seasonal and observational factors must be taken into account, the increase reflects the appearance of many opportunistic grasses and forbs which are common to disturbed ground and which are found around recently disturbed or capped areas of the site.

The Ecological Survey carried out during October 2003 referred new habitats having been created within the landfill site, pointed out that the landfill did not appear to be having any significant impacts on the ecology of the land in the surrounding areas. In relation to the White River the survey indicated that it had an excellent diversity of riparian fauna, with important species such as otter and dipper (and undoubtedly kingfisher), all of which are dependent on good water quality.

The survey carried out in 2004 referred to new habitats been created within the landfill site. Of these, unfertilised grassland (on the consolidated landfill) and immature woodland strips were the most obvious. The landfill does not appear to be having any impacts on the habitats which surround the site, none of which are considered of conservation importance. The White River is the most significant ecological feature in the area. The survey indicated that it had an excellent diversity of riparian fauna, with important species such as otter, kingfisher and dipper, all of which are dependent on good water quality. On available information, the landfill site did not seem to be affecting the populations of these animals.

The 2005 survey was carried out in December and found that the habitats within the landfill site itself were continuing to develop in terms of their establishment and biodiversity. It appeared that the landfill operations were not impacting on the surrounding area, and based on the results of both the aquatic and terrestrial surveys conducted, it would appear that the landfill activities are not having a significant impact on the habitats and species in the riparian zone of the White River.

The 2006 survey found that new habitats have been, and are being, created within the landfill site. Of these, unfertilised grassland, immature woodland and a pond are the most obvious.

The landfill does not appear to be having any impacts on the habitats which surround the site, none of which are considered of conservation importance.

The Owvane/White River is the most significant ecological feature in the area. Survey indicates that it has an excellent diversity of riparian fauna, with important species such as otter, kingfisher and dipper, all of which are dependent on moderate

to good water quality. On available information, the landfill site does not seem to be affecting the populations of these animals.

The 2007 survey, carried out on 29th November 2007, found that overall the site is currently of minor local ecological value for mammals, especially where construction works are ongoing. It is likely that mammal use of the overall site will increase once construction works have finished, especially in sections set aside from operational activities including screening, planted woodlands, grasslands and ponds. The areas landscaped including the capped landfill and boundary areas are already of some local value for mammals such as Fox (*Vulpes vulpes*), Rabbit (*Oryctolagus cuniculus*), hedgehog (*Erinuseuropaeus*), Wood mouse (*Apodemus sylvaticus*) and Pygmy shrew (*Sorex minutus*). Minor negative impacts on mammals as a result of loss of habitat will be temporary, with long-term positive impacts possible if the site is managed for nature conservation purposes following restoration.

The 2008 survey, carried out on 10th September 2008, concluded that the site is currently of minor local ecological value for mammals, particularly in the active landfill area where a high level of related works are ongoing. It is likely that mammal use of the overall site will increase once landfill operations are complete, especially in sections set aside from operational activities including screening, planted woodlands, grasslands and ponds.

The 2009 survey, carried out on the 1st and 2nd September 2009, concluded that the Site remains of moderate local ecological interest for birds, particularly in areas which have not been disturbed by ongoing Site activities. Bird usage of the Site appears to have decreased slightly since 2008 in terms of species diversity, with 8 no. species recorded in 2008 not observed in 2009. However, 6 no. species were observed during the 2009 survey which were not observed during the 2008 survey; three of these (skylark, jackdaw, hooded crow) were also recorded in the 2007 survey. Habitats on the Site range from low to moderate local ecological value. Overall the Site is currently of minor local ecological value for mammals, particularly in the active landfill area where a high level of related works are ongoing. It is likely that mammal use of the overall Site will increase once landfill operations are complete, especially in sections set aside from operational activities including screening, planted woodlands, grasslands and ponds.

9.10 Pollution Emission Register

The pollution emissions register is described in Appendix VI.

10.0 CONTINGENCY ARRANGEMENTS

LCC have developed and submitted an Emergency Response Procedure (ERP) to the Agency. The ERP is linked to the Major Emergency Plan for LCC and outlines the activation of the ERP, control of operations and responsibility and demobilisation of the ERP.

11.0 FINANCIAL ARRANGEMENTS

Reports on financial provision made under this licence, management and staffing structure of the facility.

11.1 Financial Provision

LCC had made the necessary provisions to ensure that there is adequate funding for the management, development and restoration of Gortadroma landfill site.

According to condition 12.3 of Waste Licence W0017-03 Limerick County Council must provide, as part of the Annual Environmental Report, a statement on the measures taken or adopted at the site in relation to the prevention of environmental damage, and the financial provisions in place in relation to the underwriting of costs for remedial actions following anticipated events or accidents/incidents, as may be associated with the carrying on of the activity.

This statement is presented in Appendix VIII.

12.0 STAFF TRAINING

There was one new Standard Operation Procedure developed at the site during 2009 “SOP 13 Procedure to be followed in the event of an incident”.

APPENDIX I - Objectives and Targets for 2010

Targets & Objective 2010					
	Objective	Reason for Undertaking Project	Project Summary	Target in 2010 EMP.	Responsibility for Project.
1	Install Gas main between Flare/Gas engine compound and cells 14/15.	Increase gas flow from cells 14/15 to gas engine.	SEW to be sent to Agency for agreement. Materials to be ordered and pipe work installed	Quarter 2 2010	Limerick County Council.
2	Install permanent ground water extraction pump beneath cells 14-16	Replace temporary pump and improve energy efficiency.	Pump ordered and installation to be arranged.	Quarter 1 2010	Limerick County Council.
3	Temporary liner to be placed on southern side slope of cell 15.	Reduce landfill gas emissions.	Materials ordered and installation to be arranged.	Quarter 1 2010	Limerick County Council
4	Replace existing temporary 500 m ³ /hr flare with alternative 500 m ³ /hr flare	Alternative flare can be run from existing permanent power supply.	Flare ordered.	Quarter 1 2010	Limerick County Council.
5	Install additional compactor skips for cardboard and plastic bottles in C.A Site.	Reduce double handling and increase manning efficiency.	Compactor skips ordered and installation to be arranged.	Quarter 1 2010	Limerick County Council.
6	Extend Scada control to pumps in extension area.	Increase control and monitoring.	Dynamic Automation to provide design and install system.	Quarter 2 2010	Limerick County Council and Dynamic Automation.

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Project: Gortadroma Landfill Development Concrete Diesel Bund

The concrete diesel bund structure at Gortadroma Landfill Development has been tested to the requirements of Section 9 of BS8007:1987 British Standard Code of Practice of Concrete Structures for Retaining Aqueous Liquids.

The test under BS8007 calls for a 7-day test. The recorded levels for the test carried out on the above structure are outlined in Table 1. The decrease in water level in the concrete bund structure during the eight day test period was **0.03mm**. The still well and hook gauge method was applied to record water levels. BS8007 allows for a decrease in water level of up to 10mm in the concrete bund within the test period. The actual decrease in water level was **0.03mm** which is well within the standard thus the concrete bund integrity is within the requirements of BS8007.

Note: Bunded area was not exposed to rainfall or evaporation during the test period.

TABLE 1: CONCRETE DIESEL BUND TEST RECORD

Water Level in Bund (mm)	Change +/- (mm)	Control Water level (mm)	Change +/- (mm)	Date	Time
17.10		N/A		02/11/09	10.00am
17.09	-0.01	N/A	N/A	03/11/09	10.00am
17.09	0.00	N/A	N/A	04/11/09	10.00am
17.09	0.00	N/A	N/A	05/11/09	10.00am
17.08	-0.01	N/A	N/A	06/11/09	10.00am
17.08	0.00	N/A	N/A	07/11/09	10.00am
17.07	-0.01	N/A	N/A	09/11/09	10.00am
Net Change	-0.03	N/A	N/A		

Approved: Frank Lennon
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HIGH DENSITY POLYETHYLENE MEMBRANE (HDPE) INTEGRITY CERTIFICATE

Based on results of the monitoring of integrity of the geomembrane liner as described herein, Geomembrane Testing Services Limited certifies that the geomembrane installation of Gortadroma Landfill Development, Aeration Basin, Ballyhahill, Co Limerick, was carried out in accordance with the Contract Specifications. Further to this, a Mobile Electrical Leak Location Survey (MELLS) was carried out using geophysical techniques, to verify the integrity of the lining system. The MELLS identified two (2) No. defects which were subsequently repaired, re-tested and found to be acceptable. It is the opinion of Geomembrane Testing Services Limited that the High Density Polyethylene Membrane was free from all defects at the time of final inspection.



Frank Lennon

Geomembrane Testing Services Limited

June 2009

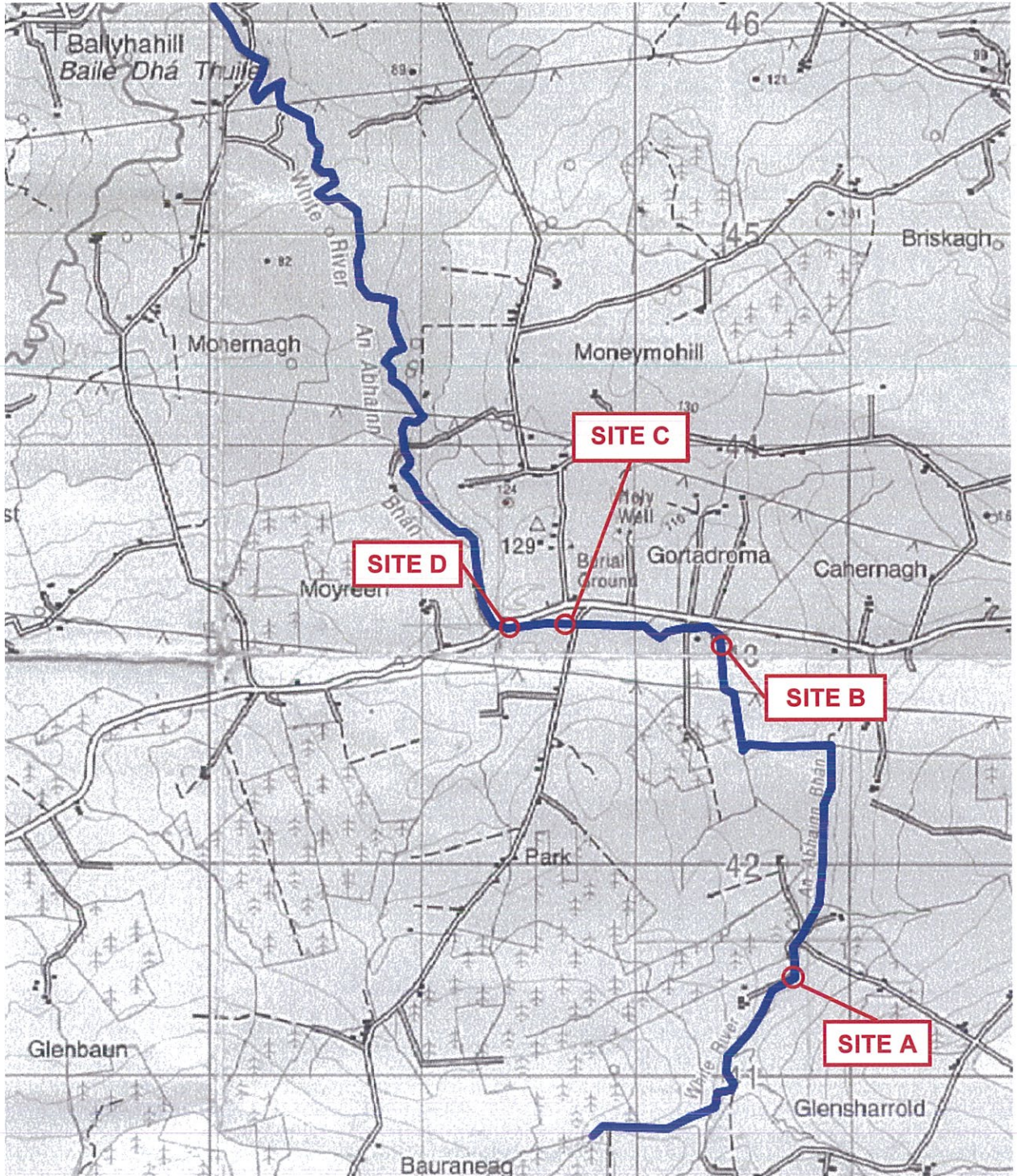
Appendix III - Waste Figures 2009

GORTADROMA WASTE QUANTITIES 2009

SOURCE	JAN	FEB	MAR	APRIL	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC	TOTAL
	TONNES	TONNES	TONNES	TONNES	TONNES	TONNES	TONNES	TONNES	TONNES	TONNES	TONNES	TONNES	TONNES
COMMERCIAL													
VEOLIA	47.04	141.12	82.84	57.88	47.16	36.86	79.00	45.14	42.70	48.30	19.32	70.76	718.12
MR. BIN MAN	40.02	120.86	41.68	78.78	235.18	133.44	54.78	24.88	133.14	6.20	53.42	11.58	933.96
BUCKLEY	100.82	72.28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	173.10
Wards Waste Disposal	61.38	18.70	147.50	53.38	54.00	82.76	65.28	53.92	13.60	36.84	28.98	19.04	635.38
WHITES SKIPS	71.70	106.26	126.68	82.96	119.14	98.52	212.60	114.48	172.54	162.08	189.54	24.46	1,480.96
Fitzgeralds Skip Hire	48.02	102.38	135.16	253.04	134.38	108.34	253.36	219.54	102.20	133.04	79.30	49.68	1,618.44
Ashgrove Recycling	337.02	463.30	410.50	378.46	385.12	387.02	425.74	373.82	410.48	347.40	428.44	222.74	4,570.04
Killarney Waste Disposal	1,183.94	1,137.50	1,255.44	1,195.32	1,093.76	1,211.86	1,452.36	414.72	359.90	393.16	415.12	327.10	10,440.18
SUB-TOTAL	1,889.94	2,162.40	2,199.80	2,099.82	2,068.74	2,058.80	2,543.12	1,246.50	1,234.56	1,127.02	1,214.12	725.36	20,570.18
PRIVATE DOMESTIC													
MR. BIN MAN (Domestic)	4,302.90	3,570.44	3,314.78	3,095.08	3,746.66	5,298.46	1,989.10	381.70	1,000.96	48.02	92.74	6.62	26,847.46
Mr. BIN MAN (Organic Fines)	2,654.60	2,439.98	2,804.48	3,230.50	2,519.00	1,276.66	2,492.56	2,012.40	1,014.38	84.22	233.86	0.00	20,762.64
VEOLIA	12.98	6.02	8.48	14.60	25.88	10.50	7.84	4.28	8.04	12.90	8.88	8.84	129.24
SOUTHWEST BINS	250.52	430.62	361.70	373.10	303.32	311.98	227.76	206.78	197.82	112.72	134.56	99.54	3,010.42
Dillion Waste	180.80	535.04	491.60	602.90	607.66	550.24	462.70	99.38	80.92	77.38	86.58	112.08	3,887.28
Clean Ireland	676.62	937.40	1,069.70	1,065.12	994.47	926.84	65.86	0.00	0.00	0.00	0.00	0.00	5,736.01
Country Clean	2,172.90	1,929.58	2,063.06	2,054.40	2,023.42	2,061.66	2,080.70	1,516.54	1,641.12	1,333.30	0.00	0.00	18,876.68
Local Residents	11.50	13.78	11.22	11.32	10.70	11.80	14.08	12.06	9.64	10.52	10.14	10.76	137.52
Cash	223.86	203.64	207.30	265.26	233.68	220.30	271.74	206.54	221.82	220.70	197.40	167.94	2,640.18
SUB-TOTAL	10,486.68	10,066.50	10,332.32	10,712.28	10,464.79	10,668.44	7,612.34	4,439.68	4,174.70	1,899.76	764.16	405.78	82,027.43
INDUSTRIAL WASTE													
BUCKLEY (Anderson IRL)	9.88	19.62	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	29.50
Limerick County Council													
Housing/Roads/Sanitary	31.28	32.82	28.76	38.40	9.42	20.04	19.74	28.60	22.60	17.64	22.88	19.18	291.36
ENVIROMENT SECTION	11.40	16.48	94.82	16.34	0.74	0.00	0.00	0.00	0.50	0.94	0.00	0.00	141.22
BRING Banks	8.74	5.70	5.96	9.54	13.14	4.38	2.70	4.80	0.00	0.24	2.58	5.42	63.20
Civic Ammenity Sites	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.74	0.92	1.40	0.90	3.04	7.00
Street Cleaning	15.32	7.76	4.38	1.80	8.52	4.14	0.90	0.60	0.34	0.22	0.00	0.00	43.98
SUB-TOTAL	66.74	62.76	133.92	66.08	31.82	28.56	23.34	34.74	24.36	20.44	26.36	27.64	546.76
City Council Street Cleaning	55.12	44.12	62.88	84.22	59.32	59.28	56.60	40.90	56.82	44.38	50.26	34.78	648.68
Screenings													
Cork County Council	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	9.18	2.00	11.18
EPS Mallow	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SUB-TOTAL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	9.18	2.00	11.18
GRAND TOTAL	12,508.36	12,355.40	12,728.92	12,962.40	12,624.67	12,815.08	10,235.40	5,761.82	5,490.44	3,091.60	2,064.08	1,195.56	103,833.73

Appendix IV - Map of Biological Monitoring Locations

MAP 1 BIOLOGICAL MONITORING SITES



Appendix V - Meteorological Data

Annual Meteorological Report

2009

Gortadroma Landfill Site

Waste Licence 0017-03

Limerick County Council

1.0 Introduction

The meteorological station was installed at the Gortadroma landfill in June 2000. The system records hourly and daily values for the various parameters. Data is normally downloaded on a daily basis. However the system is capable of holding eleven days logged files and this ensures that data is recorded when the site is closed at weekends. Precipitation values are recorded automatically and a vat at the rear of the reception building is measured every day to calculate evaporation.

2.0 Attached graphs and data

A number of graphs are attached which summarise the data over the course of the year. These graphs include temperature (24 hour average), Atmospheric pressure (24 hour average), wind speed (24 hour average) and monthly rainfall values. Figure 1 shows the average temperature variation over the course of the year, the range of average temperature was in the order of -3.5 to 18°C . Figure 2 shows the average atmospheric pressure variation over the course of the year, which was in the order of 960 to 1025 hP a. Figure 3 shows that the average wind speed was in the order of 0 m/s to 11.2 m/s. Figure 4 shows the monthly rainfall values. November was the wettest month and February was the driest month.

The annual rainfall recorded was 1641.41 mm and the annual evaporation was 652.45 mm.

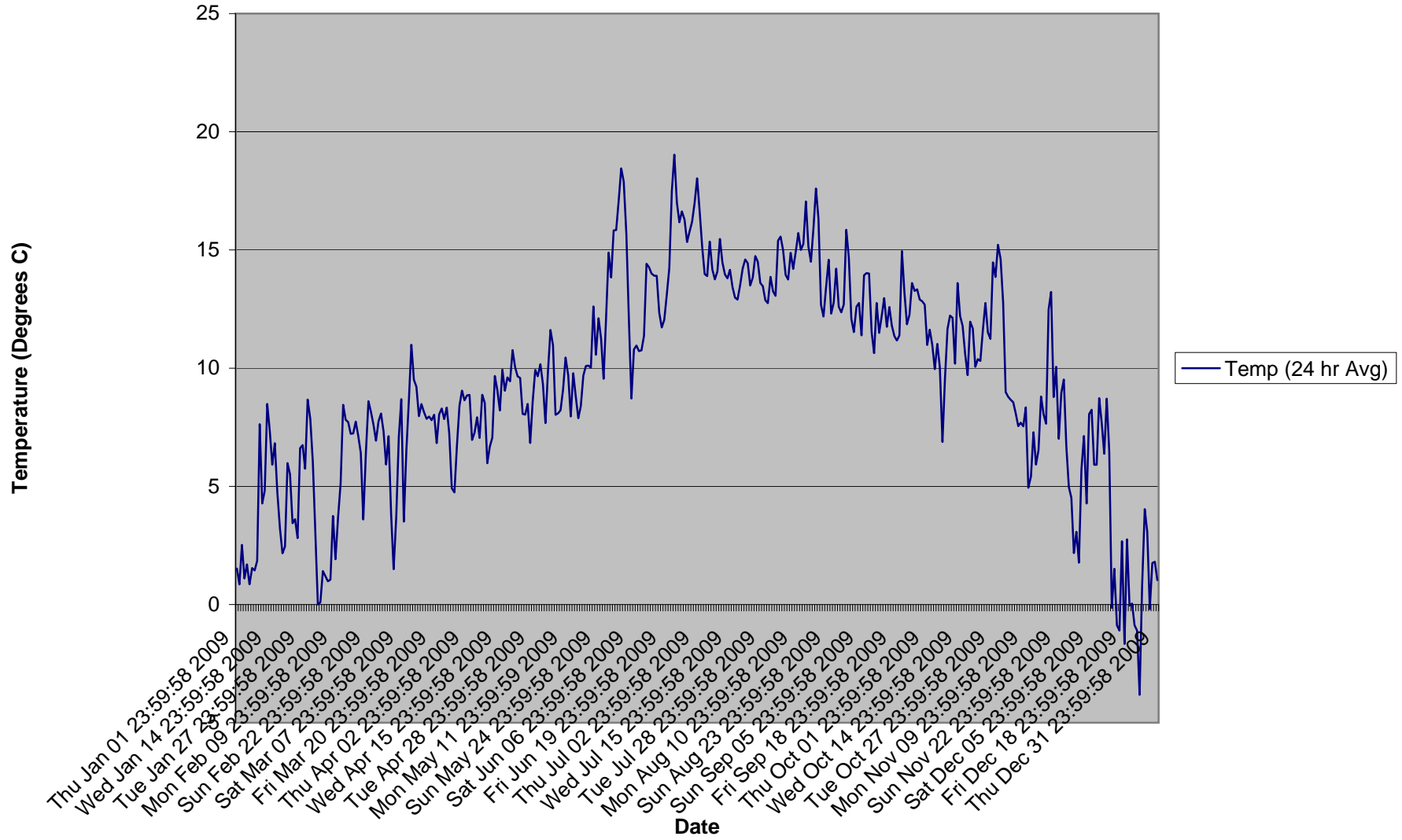
A complete copy of all data is attached for your information and includes the following:

- ◆ Precipitation
- ◆ Evaporation
- ◆ Evapotranspiration
- ◆ Pressure
- ◆ Temperature
- ◆ Wind speed
- ◆ Wind direction
- ◆ Humidity

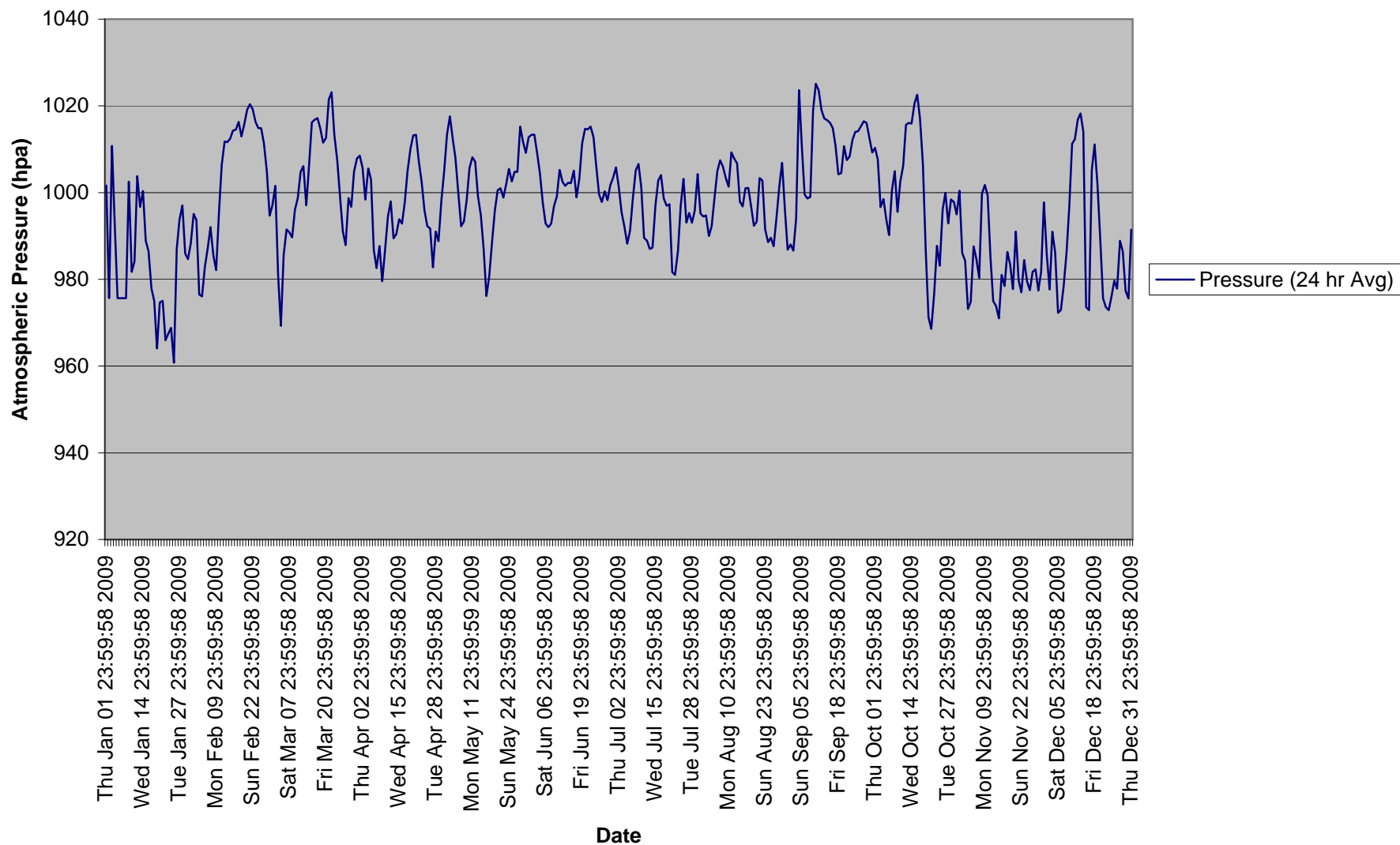
3.0 Conclusion

The meteorological station was a vital component in the operation of our high winds procedure at the site over the course of the year. The precipitation value of 1641.41 mm was 291.58 mm less than recorded the previous year. The evaporation value of 652.45 mm was 57.83 mm greater than the previous year.

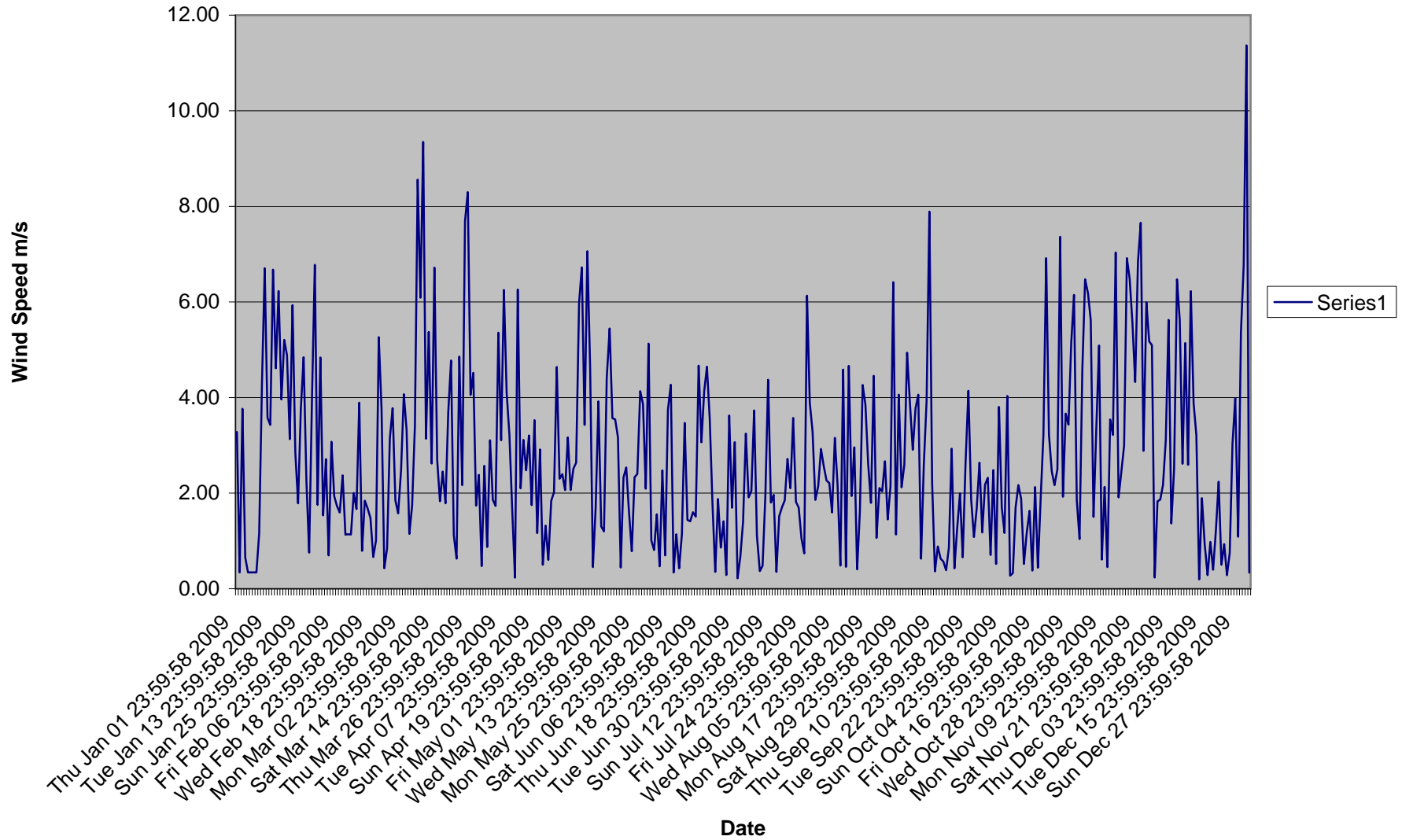
Temp (24 hr Avg)-Figure 1



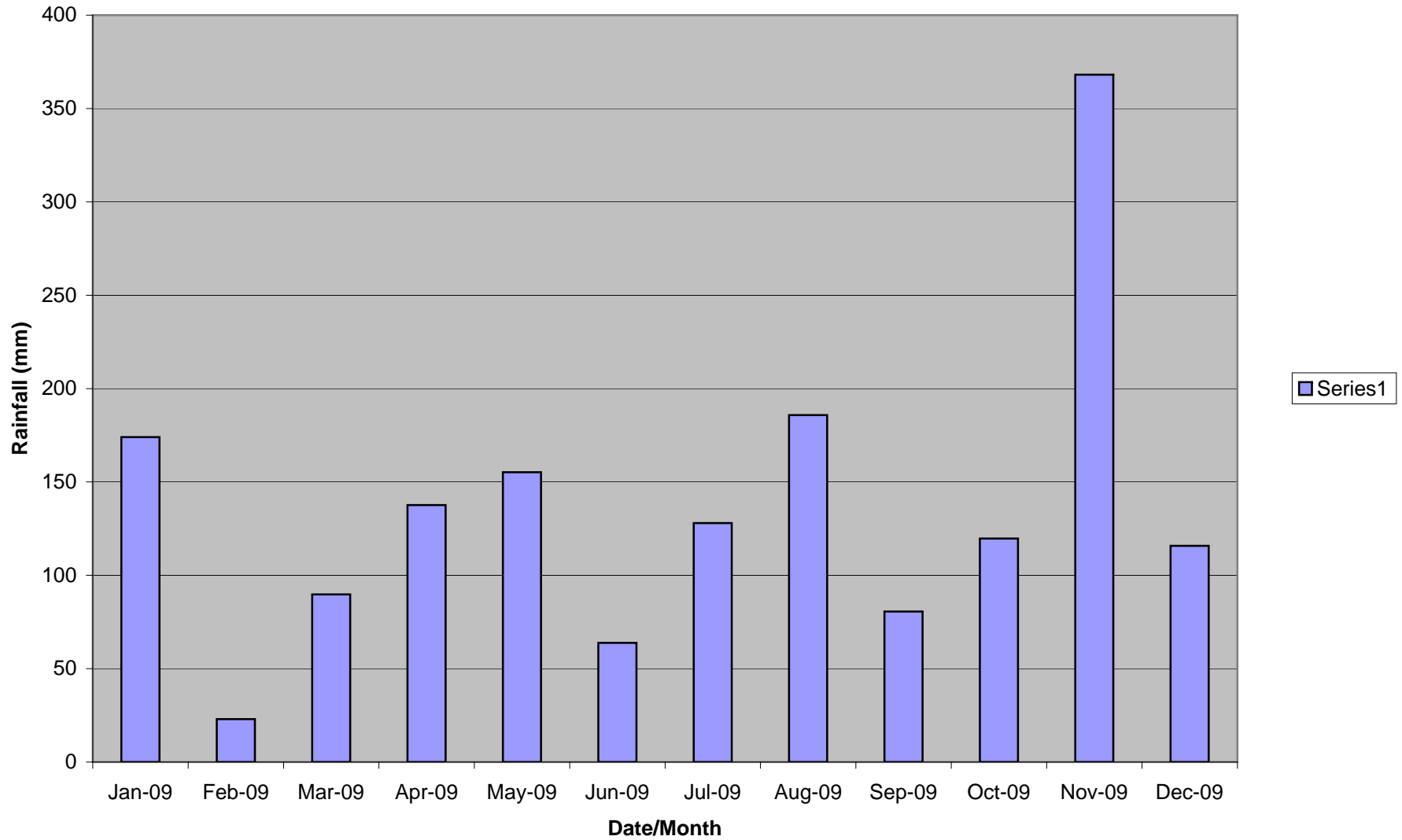
Pressure (24 hr Avg)-Figure 2



Wind Speed- 24 hr Avg-Figure 3



Precipitation 2009- Figure 4





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AER Returns Worksheet

Version 1.1.10

REFERENCE YEAR	2009
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1. FACILITY IDENTIFICATION

Parent Company Name	Limerick County Council
Facility Name	Gortadroma Landfill Site
PRTR Identification Number	W0017
Licence Number	W0017-03

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).
3.11	Blending or mixture prior to submission to any activity referred to in a preceding paragraph of this Schedule.
3.13	Storage prior to submission to any activity referred to in a preceding paragraph of this Schedule, other than temporary storage, pending collection, on the premises where the waste concerned is produced.
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	#####
4.10	The treatment of any waste on land with a consequential benefit for an agricultural activity or ecological system.
4.11	Use of waste obtained from any activity referred to in a preceding paragraph of this Schedule.
4.12	Exchange of waste for submission to any activity referred to in a preceding paragraph of this Schedule.
4.13	Storage of waste intended for submission to any activity referred to in a preceding paragraph of this Schedule, other than temporary storage, pending collection, on the premises where such waste is produced.
4.2	Recycling or reclamation of organic substances which are not used as solvents (including composting and other biological transformation processes).
4.3	Recycling or reclamation of metals and metal compounds.
4.4	Recycling or reclamation of other inorganic materials.
4.9	Use of any waste principally as a fuel or other means to generate energy.

Address 1	Gortadroma
Address 2	Ballyhahill
Address 3	Co. Limerick
Address 4	
Country	Ireland
Coordinates of Location	-9.14882 52.5393
River Basin District	IEGBNISH
NACE Code	3821
Main Economic Activity	Treatment and disposal of non-hazardous waste
AER Returns Contact Name	John OCarroll
AER Returns Contact Email Address	jocarroll@limerickcoco.ie
AER Returns Contact Position	Facility Manager
AER Returns Contact Telephone Number	069 82355
AER Returns Contact Mobile Phone Number	087-7565449
AER Returns Contact Fax Number	069-82350
Production Volume	0.0
Production Volume Units	
Number of Installations	1
Number of Operating Hours in Year	2210
Number of Employees	9
User Feedback/Comments	
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
50.1	General

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

Is it applicable?	
Have you been granted an exemption ?	
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

| PRTR# : W0017 | Facility Name : Gortadroma Landfill Site | Filename : W0017_2009(1).xls | Return Year : 2009 |

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SECTION A : SECTOR SPECIFIC PRTR POLLUTANTS

RELEASES TO AIR									
No. Annex II	POLLUTANT Name	M/C/E	METHOD		Flare		QUANTITY		
			Method Code	Designation or Description	Emission Point 1	Emission Point 2	T (Total) KG/Year	A (Accidental) KG/Year	F (Fugitive) KG/Year
01	Methane (CH4)	E	Estimate	Gassim	13402.8	10424.0	1649826.8	0.0	1626000.0
03	Carbon dioxide (CO2)	E	Estimate	Gassim	0.0	0.0	13070000.0	0.0	13070000.0
08	Nitrogen oxides (NOx/NO2)	M	BS EN: 14792	International Standar	417.18	1876.57	2293.75	0.0	0.0
11	Sulphur oxides (SOx/SO2)	M	BS EN: 14791	International Standar	175.49	0.7884	176.2784	0.0	0.0
02	Carbon monoxide (CO)	M	BS EN: 14789	International Standar	35.23	2652.7	2687.93	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								
No. Annex II	POLLUTANT Name	M/C/E	METHOD		QUANTITY			
			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 AIR								
Pollutant No.	POLLUTANT Name	M/C/E	METHOD		QUANTITY			
			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

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:	Gortadroma Landfill Site				
Please enter summary data on the quantities of methane flared and / or utilised	T (Total) kg/Year	M/C/E	Method Used		Facility Total Capacity m3 per hour
	Total estimated methane generation (as per site model)	3550253.0	E	Gassim	N/A
	Methane flared	1761723.0	E	Gassim	2000.0 (Total Flaring Capacity)
	Methane utilised in engine/s	1751298.0	E	Gassim	600.0 (Total Utilising Capacity)
	Net methane emission (as reported in Section A above)	1649826.8	E	Gassim	N/A

4.2 RELEASES TO WATERS

| PRTR# : W0017 | Facility Name : Gortadroma Landfill Site | Filename : W0017_2009(1).xls | Return Year : 2009 |

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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 con

RELEASES TO WATERS									
POLLUTANT					QUANTITY				
No. Annex II	Name	M/C/E	Method Used		Storm Water (SW/4)	Treated Leachate Discharge	T (Total) KG/Year	A (Accidental) KG/Year	F (Fugitive) KG/Year
			Method Code	Designation or Description	Emission Point 1	Emission Point 2			
18	Cadmium and compounds (as Cd)	M	CRM	Std. Methods 21st Edition.	0.054	0.0	0.054	0.0	0.0
19	Chromium and compounds (as Cr)	M	CRM	Std. Methods 21st Edition.	0.56	0.0	0.56	0.0	0.0
20	Copper and compounds (as Cu)	M	CRM	Std. Methods 21st Edition.	0.66	0.0	0.66	0.0	0.0
21	Mercury and compounds (as Hg)	M	CRM	Std. Methods 21st Edition.	0.016	0.0	0.016	0.0	0.0
22	Nickel and compounds (as Ni)	M	CRM	Std. Methods 21st Edition.	2.18	0.0	2.18	0.0	0.0
23	Lead and compounds (as Pb)	M	CRM	Std. Methods 21st Edition.	0.23	0.0	0.23	0.0	0.0
24	Zinc and compounds (as Zn)	M	CRM	Std. Methods 21st Edition.	2.97	0.0	2.97	0.0	0.0
26	Aldrin	M	CRM	Std. Methods 21st Edition.	0.06	0.0	0.06	0.0	0.0
27	Atrazine	M	CRM	Std. Methods 21st Edition.	0.06	0.0	0.06	0.0	0.0
28	Chlordane	M	CRM	Std. Methods 21st Edition.	0.06	0.0	0.06	0.0	0.0
33	DDT	M	CRM	Std. Methods 21st Edition.	0.06	0.0	0.06	0.0	0.0
34	1,2-dichloroethane (EDC)	M	CRM	Std. Methods 21st Edition.	0.6	0.0	0.6	0.0	0.0
35	Dichloromethane (DCM)	M	CRM	Std. Methods 21st Edition.	0.6	0.0	0.6	0.0	0.0
36	Dieldrin	M	CRM	Std. Methods 21st Edition.	0.06	0.0	0.06	0.0	0.0
41	Heptachlor	M	CRM	Std. Methods 21st Edition.	0.06	0.0	0.06	0.0	0.0
42	Hexachlorobenzene (HCB)	M	CRM	Std. Methods 21st Edition.	0.06	0.0	0.06	0.0	0.0
43	Hexachlorobutadiene (HCBd)	M	CRM	Std. Methods 21st Edition.	0.06	0.0	0.06	0.0	0.0
49	Pentachlorophenol (PCP)	M	CRM	Std. Methods 21st Edition.	0.06	0.0	0.06	0.0	0.0
51	Simazine	M	CRM	Std. Methods 21st Edition.	0.06	0.0	0.06	0.0	0.0
54	Trichlorobenzenes (TCBs)(all isomers)	M	CRM	Std. Methods 21st Edition.	0.06	0.0	0.06	0.0	0.0
57	Trichloroethylene	M	CRM	Std. Methods 21st Edition.	0.6	0.0	0.6	0.0	0.0
58	Trichloromethane	M	CRM	Std. Methods 21st Edition.	0.6	0.0	0.6	0.0	0.0
60	Vinyl chloride	M	CRM	Std. Methods 21st Edition.	0.6	0.0	0.6	0.0	0.0
61	Anthracene	M	CRM	Std. Methods 21st Edition.	0.6	0.0	0.6	0.0	0.0
62	Benzene	M	CRM	Std. Methods 21st Edition.	0.6	0.0	0.6	0.0	0.0
65	Ethyl benzene	M	CRM	Std. Methods 21st Edition.	0.6	0.0	0.6	0.0	0.0
68	Naphthalene	M	CRM	Std. Methods 21st Edition.	0.6	0.0	0.6	0.0	0.0
71	Phenols (as total C)	M	CRM	Std. Methods 21st Edition.	0.6	0.0	0.6	0.0	0.0
73	Toluene	M	CRM	Std. Methods 21st Edition.	0.6	0.0	0.6	0.0	0.0
76	Total organic carbon (TOC) (as total C or COD/3)	M	CRM	Std. Methods 21st Edition.	6879.0	0.0	6879.0	0.0	0.0
79	Chlorides (as Cl)	M	CRM	Std. Methods 21st Edition.	16571.0	0.0	16571.0	0.0	0.0
88	Fluoranthene	M	CRM	Std. Methods 21st Edition.	0.6	0.0	0.6	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				
No. Annex II	Name	M/C/E	Method Used		Storm Water (SW/4)	Treated Leachate Discharge	T (Total) KG/Year	A (Accidental) KG/Year	F (Fugitive) KG/Year
			Method Code	Designation or Description	Emission Point 1	Emission Point 2			
					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 WATERS									
POLLUTANT					QUANTITY				
Pollutant No.	Name	M/C/E	Method Used		Storm Water (SW/4)	Treated Leachate Discharge	T (Total) KG/Year	A (Accidental) KG/Year	F (Fugitive) KG/Year
			Method Code	Designation or Description	Emission Point 1	Emission Point 2			
238	Ammonia (as N)	M	CRM	Std. Methods 21st Edition.	1323.0	8.46	1331.46	0.0	0.0
303	BOD	M	CRM	Std. Methods 21st Edition.	1214.0	110.5	1324.5	0.0	0.0
240	Suspended Solids	M	CRM	Std. Methods 21st Edition.	5475.0	266.0	5741.0	0.0	0.0
					0.0	0.0	0.0	0.0	0.0

4.3 RELEASES TO WASTEWATER OR SEWER

| PRTR# : W0017 | Facility Name : Gortadroma Landfill Site | Filename : W0017_2009(1).xls | Return | 19/03/2010 13:47

SECTION A : PRTR POLLUTANTS

OFFSITE TRANSFER OF POLLUTANTS DESTINED FOR WASTE-WATER TREATMENT OR SEWER								
POLLUTANT		METHOD			QUANTITY			
No. Annex II	Name	M/C/E	Method Used		Leachate tankered to off site waste water treatment plant Emission Point 1	T (Total) KG/Year	A (Accidental) KG/Year	F (Fugitive) KG/Year
			Method Code	Designation or Description				
06	Ammonia (NH3)	M	CRM	Std. Methods 21st Edition.	5.38	5.38	0.0	0.0
13	Total phosphorus	M	CRM	Std. Methods 21st Edition.	27.41	27.41	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 B : REMAINING POLLUTANT EMISSIONS (as required in your Licence)

OFFSITE TRANSFER OF POLLUTANTS DESTINED FOR WASTE-WATER TREATMENT OR SEWER								
POLLUTANT		METHOD			QUANTITY			
Pollutant No.	Name	M/C/E	Method Used		Emission Point 1	T (Total) KG/Year	A (Accidental) KG/Year	F (Fugitive) KG/Year
			Method Code	Designation or Description				
						0.0	0.0	0.0

5. ONSITE TREATMENT & OFFSITE TRANSFERS OF WASTE

| PRTR# : W0017 | Facility Name : Gortadroma Landfill Site | Filename : W0017_2009(1).xls | Return Year : 2009 |

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Transfer Destination	European Waste Code	Hazardous	Quantity (Tonnes per Year)	Description of Waste	Waste Treatment Operation	Method Used		Location of Treatment	Haz Waste : Name and Licence/Permit No of Next Destination Facility Non Haz Waste: Name and Licence/Permit No of Recover/Disposer	Haz Waste : Address of Next Destination Facility Non Haz Waste: Address of Recover/Disposer	Name and License / Permit No. and Address of Final Recoverer / Disposer (HAZARDOUS WASTE ONLY)	Actual Address of Final Destination i.e. Final Recovery / Disposal Site (HAZARDOUS WASTE ONLY)
						M/C/E	Method Used					
Within the Country	20 01 39	No	8.4	Plastic Bottles	R5	M	Weighed	Offsite in Ireland	Marwin Environmental Trading L.t.d,Reg No: IRE/G027/08	The Rubicon Centre,CIT Campus,Bishopstown,Cork,Ireland		
Within the Country	20 01 99	No	1.96	Tetra Packs	R5	M	Weighed	Offsite in Ireland	Marwin Environmental Trading L.t.d,Reg No: IRE/G027/08	The Rubicon Centre,CIT Campus,Bishopstown,Cork,Ireland		
Within the Country	20 01 01	No	36.49	Newspapers and magazines	R5	M	Weighed	Offsite in Ireland	Marwin Environmental Trading L.t.d,Reg No: IRE/G027/08	The Rubicon Centre,CIT Campus,Bishopstown,Cork,Ireland		
Within the Country	20 01 01	No	24.02	Cardboard	R5	M	Weighed	Offsite in Ireland	Marwin Environmental Trading L.t.d,Reg No: IRE/G027/08	The Rubicon Centre,CIT Campus,Bishopstown,Cork,Ireland		
Within the Country	20 01 02	No	9.41	Glass bottles and jars	R5	M	Weighed	Offsite in Ireland	Mr. Binman,W0016-03	Luddenmore,Grange,Killmallock,County Limerick,Ireland		
Within the Country	20 01 99	No	7.13	Food Cans	R5	M	Weighed	Offsite in Ireland	Mr. Binman,W0016-03	Luddenmore,Grange,Killmallock,County Limerick,Ireland		
Within the Country	20 01 40	No	2.56	Drink cans	R5	M	Weighed	Offsite in Ireland	Mr. Binman,W0016-03	Luddenmore,Grange,Killmallock,County Limerick,Ireland		
Within the Country	20 01 40	No	91.56	Mixed scrap metal	R5	M	Weighed	Offsite in Ireland	Erin Recyclers,WPSO/08/93 Cookstown Textile Recyclers,WL No:WM EX 01/11	Deepwater Quay,Finisklin,Sligo Harbour,County Sligo,Ireland		
Within the Country	20 01 11	No	7.04	Textiles	R5	M	Weighed	Offsite in Ireland		Cookstown ,County Tyrone,,Ireland		
Within the Country	16 02 11	Yes	26.15	Fridge Freezers	R5	M	Weighed	Offsite in Ireland	KMK Metals- Recycling,W0113/03	Cappincur Industrial Estate,County Offaly,,Ireland	EMR,EAWML40041/SL0967, Bentley Road South ,Darlaston ,West Midlands ,WS108LW,United Kingdom	Bentley Road South ,Darlaston ,West Midlands ,WS108LW,United Kingdom
Within the Country	16 02 14	No	8.77	LDA non-hazardous	R5	M	Weighed	Onsite in Ireland	KMK Metals- Recycling,W0113/03	Cappincur Industrial Estate,County Offaly,,Ireland Block 648 ,Jordanstown Drive ,Greenogue Ind Estate ,County Dublin ,Ireland,Ireland		
Within the Country	19 10 04	No	4051.16	Automobile Shredder Residue	R5	M	Weighed	Onsite in Ireland	EWM,WFP-DS-09-0012-01 Gortadroma Landfill,WL0017-04	Ballynahill,County LIMERICK,,Ireland		
Within the Country	17 05 04	No	48.58	Soil & Stones	R5	M	Weighed	Onsite in Ireland	Gortadroma Landfill,WL0017-04	Ballynahill,County Limerick,,Ireland		
Within the Country	17 01 03	No	756.3	Tiles & Ceramics	R5	M	Weighed	Onsite in Ireland	Gortadroma Landfill,WL0017-04	Ballynahill,County Limerick,,Ireland		

Appendix VII - Financial Provision

Projected income and expenditure for Limerick County Council waste management section for 2010, is shown below. The calculation for the determination of charges is also shown.

EXPENDITURE	
Gortadroma Landfill	Euro's (€)
Operational Costs	1,546,500
Gortadroma Aftercare	351,000
Landfill Levy	3,480,000
Local Development Fund/Salary/Internal Costs/Loan Charges	3,302,407
All other Waste Costs	
Recovery & Recycling Costs	705,997
Provision of Waste Collection Service	233,719
Street Cleaning	975,082
Waste Reg. Monitoring & Enforcement	946,329
Waste Management Plan	500,126
Litter Management	663,053
Total Expenditure	12,704,213

INCOME	
Landfill Gate Fee	6,250,000
Landfill Levy	3,480,000
Other Income(Fines, Waste Collection Permits) and Environment, Heritage & Local Government	2,974,213
Total Income	12,704,213

Gate Fee Calculation:

Projected tonnage (2010) = 117,000 @ an average rate of €53.40 per tonne.

Aftercare Fund:

The total value of the Gortadroma Landfill aftercare fund at end of 2009 was €4,482,365.