

CORK CITY COUNCIL



KINSALE ROAD LANDFILL SITE

Waste Licence Register No: W0012-03

Annual Environmental Report

January 2011 ó December 2011

Prepared by:-

Cork City Council,
Kinsale Road Landfill Site,
Cork.

25th May 2012

DOCUMENT CONTROL SHEET

Kinsale Road Landfill Site Annual Report
Reporting Period January 2011 to December 2011

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1 INTRODUCTION

1.1 Scope and Purpose of the Report

Cork City Council holds a Waste Licence (Register No. W0012-03) to operate a landfill site at the Kinsale Road, Cork. The aim of this Annual Environmental Report is to provide a review of activities at Kinsale Road landfill site within the past 12 months.

1.2 Background to the Report

The Landfill site at Kinsale Road has been in operation since the 1960s. The site was issued with a waste licence by the Environmental Protection Agency (EPA) on 2nd February 2000 (Register No. 12-1), with a new licence issued on 29th November 2002 (Register No. W0012-02). The most recent licence was issued on 3rd May 2011 (Register No. W0012-03).

In accordance with Condition 11.10 of the Waste Licence, Cork City Council is required to submit to the Agency for its agreement, an Annual Environmental Report for its activities during the previous 12 months.

The first Annual Environmental Report covering the period February 2nd 2000 to February 1st 2001 was submitted to the Agency in March 2001.
This report covers the period from January 2011 to December 2011.

1.3 Site Location and Operator details

The landfill is owned and operated by Cork City Council, City Hall, Cork. The address of the facility is as follows.

Kinsale Road Landfill Site,
Ballyphehane,
Curraghconway,
Inchisarsfield,
South City Link Road,
Cork.

The National Grid Reference for the site is 168033E 069658N.

The facility contact details are as below

- Facility Manger: Kevin Ryan
- Contact No: 021 4705913
- Fax No: 021 4319930

- Landfill Technician: Patrick Foley
- Contact No: 021 4705914

- Supervisor: Pascal Cooney

- Junior Foreman: Michael Reck

- Weighbridge Operator
- Contact No: 021 4705920

- Environment Department,
City Hall,
Cork
- Contact No: 021 4924726
- Fax No: 021 4924054

- City Hall
- Contact No. 021 4924000 / 4966222

2 SITE DESCRIPTION AND ACTIVITIES

2.1 Description of the Site

The facility is a municipal solid waste and non-hazardous industrial waste disposal facility. The site (including former land filling areas) is approximately 72 hectares.

Landfilling at the site ceased on the 15th July 2009.

Up to the 15th July 2009, the facility accepted domestic and commercial Municipal Solid Waste as well as limited quantities of approved non-hazardous industrial sludges. The facility also includes a Civic Amenity Site and a Landfill Gas Combustion plant that operates on site.

The facility is located within 3 km of Cork City at the South City Link Road, in the townlands of Ballyphehane, Curraghconway and Inchisarsfield. The site occupies a large expanse of low-lying peat bog, bounded by the north and east by the Trabeg River, to the west by the South City Link Road and on the south by the Tramore River and South Ring Road.

The site has been operational since the early 1960s. The majority of the developments (commercial and residential) within 500m of the landfill have occurred subsequent to the commencement of waste disposal operations.

Works are ongoing at the site to upgrade the facility in accordance with the conditions of the Waste Licence. These works include leachate collection and treatment system, surface water collection, road infrastructure as well as final capping and restoration of the site.

2.2 Waste Management activities at the Facility

Waste Activities Licensed at the Kinsale Road Landfill Site are restricted to those outlined in the Waste Licence as detailed below: -

Licensed Waste Disposal Activities, in accordance with the Third Schedule of the Waste Management Acts 1996 ó 2010.

Class 1.	Deposit on, in or under land (including landfill) [Principal Activity].
Class 2.	Land treatment, including biodegradation of liquid or sludge discards in soils
Class 4.	Surface impoundment, including placement of liquid or sludge discards into pits, ponds or lagoons.
Class 5.	Specially engineered landfill, including placement into lined discrete cells which are capped and isolated from one another and the environment.
Class 7.	Physico-chemical 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 5 or paragraphs 8 to 10 of this Schedule (including evaporation, drying and calcination).
Class 11.	Blending or mixture prior to submission to any activity referred to in a preceding paragraph of this Schedule.
Class 12.	Repacking 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.

Licensed Waste Recovery Activities, in accordance with the Fourth Schedule of the Waste Management Acts 1996 ó 2010.

Class 2.	Recycling or reclamation of organic substances which are not used as solvents (including composting and other biological processes).
Class 3.	Recycling or reclamation of metals and metal compounds.
Class 4.	Recycling or reclamation of other inorganic materials.
Class 10.	The treatment of any 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 a preceding paragraph of this Schedule.
Class 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.

2.3 Quantities and Composition of Waste Received, Disposed of and Recovered.

Kinsale Road landfill site is licensed to send municipal waste off site for disposal / recovery up to a maximum of 22,000 tonnes of per annum.

Other waste types and quantities allowed for disposal as per Schedule A of the Waste Licence are as per Table 2.3 below.

Table 2.3 Waste Types.

Waste Type		Maximum ^{Note 2} (Tonnes Per Annum)	
Non-Hazardous Wastes <small>Note 1</small>	Mixed Municipal Waste for recovery/disposal off-site <i>Accepted at Civic Waste Facility</i>	5,000	
	Storage of Waste prior to Recovery <i>(including glass, beverage/food cans, textiles, paper and cardboard, plastics, timber, metals, non-hazardous batteries, non-hazardous WEEE accepted at the Civic Waste Facility)</i>		
	Construction & Demolition Waste <i>Accepted at the facility for recovery and use in site construction works and landfill restoration.</i>	300,000 ^{Note 3}	
	Residual Municipal Waste for offsite recovery and/or disposal <i>Accepted at Waste Transfer Station</i>	22,000 ^{Note 4}	
	Green Waste (for Composting) <i>Accepted at Civic Waste Facility</i>	^{Note 5}	
	Inert Waste - Imported for restoration purposes	^{Note 6}	
Non-Hazardous Waste Total		327,000	
Hazardous Wastes <small>Note 7</small>	20 01 21 Fluorescent Tubes and other mercury-containing waste	6	
	20 01 27 Paints, inks, adhesives and resins containing dangerous substances	20	
	16 05 04 Gases in pressure containers (including halons) containing dangerous substances		
	20 01 34 Batteries and accumulators other than those mentioned in 20 01 33	12	
	All Chapter 13 Wastes ^{Note 8}	Waste Oils	12
	20 01 35 Discarded electrical and electronic equipment other than those mentioned in 20 01 21 & 20 01 23 containing hazardous components.	1,000	
<i>Hazardous Waste Total</i>		1,050	
TOTAL INCLUDING DISPOSAL AND RECOVERY		328,050	

- Note 1:** Any proposals to accept other compatible non-hazardous waste types must be agreed in advance by the Agency.
- Note 2:** The limitation on individual non-hazardous waste types may be varied with the agreement of the Agency subject to the total limit for non-hazardous waste staying the same.
- Note 3:** The maximum tonnage to be processed at the Construction and Demolition Waste Recovery Area shall not exceed 2,000 tonnes per day, unless subject to the prior agreement of the Agency, subject to Condition 3.27.
- Note 4:** Acceptance of Residual Municipal Waste at the facility for off-site disposal, other than that received at the Civic Waste Facility from members of the public, shall not take place until such time as the Waste Transfer Station infrastructure has been installed to the satisfaction of the Agency in accordance with Condition 8.2 of this licence.
- Note 5:** Quantity of Green Waste/ Compost at the facility is limited to a maximum of 2,400m³ at any one time.
- Note 6:** Quantity of waste imported for restoration purposes is limited to 100,000 tonnes per annum for a period of two years from the date of grant of licence, unless otherwise agreed by the Agency.
- Note 7:** Hazardous waste types as detailed, or as may otherwise be agreed in advance by the Agency.
- Note 8:** All Chapter 13 wastes: *Oil Wastes and Wastes of Liquid Fuels* (except, 13 01 01, 13 03 01, 13 05 01, 13 05 02, 13 05 03, 13 07 01, 13 07 02, 13 07 03 and 13 08 01) of the *European Waste Catalogue and Hazardous Waste List*.

Table 2.3.1 Quantities of Waste received prior to reporting period.

	<i>Non-Hazardous Waste</i>	<i>Hazardous Waste</i>
Deposited in landfill prior to report period.	2.737 million tonnes estimated	Not known if any
C&D waste stored at C&D facility prior to report period.	15,000 tonnes	Nil

No waste was landfilled at the site during the reporting period.

Table 2.3.2 Quantities of Waste transferred offsite during the reporting period (monthly).

<i>Month</i>	<i>Waste transferred off site (tonnes)</i>
Jan-11	221
Feb-11	135
Mar-11	116
Apr-11	110
May-11	110
Jun-11	175
Jul-11	142
Aug-11	86
Sep-11	73
Oct-11	65
Nov-11	90
Dec-11	74
Total	1,396

Table 2.3.3 Classes of Waste received for recovery / recycling off site.

Waste Description	EWC Code	Name of Recovery Company
Paper	20 01 01	Greenstar
		Cork Recycling
Metal	20 01 06	Pouladuff Dismantlers
Timber	20 01 07	CTO Environmental
Plastic	20 01 03	Cork Recycling
Glass Bottles	20 01 02	Rehab Recycling Partnership
Aluminium Cans	20 01 05	Rehab Recycling Partnership
Oil	13 00 00	ENVA
Green Waste	20 02 01	CTO Environmental Solutions
Cardboard	20 01 01	Cork Recycling
WEEE	20 01 35	KMK
Aerosols	16 05 04	SLR
Paints	20 01 27	SLR
Car Batteries	16 06 01	KMK
Household Batteries	16 06 01 / 16 06 02	KMK
	16 06 04 / 20 01 34	

2.3.4 Landfill Inputs and Outputs (Waste and Recycling) See end of section.

2.4 Landfill Capacity

2.4.1 The landfilling of waste at the facility ceased as of 15th July 2009.

2.5 Economic Contribution

Provision made for Landfilling Operations expenditure in the reporting period was €1,279,500

This can be broken down as:

Landfilling Operations expenditure	2011 Provision (€)
Salaries & Wages	265,300
City Council Plant	83,300
Plant Hired	20,000
Materials - Cover Soil	10,000
- Road Making Materials	5,000
Maintenance of Buildings	30,000
Site Security	30,000
Materials / Chemicals	20,000

E.P.A. Licence and Monitoring	100,000
Maintenance of Mechanical and Electrical Plant	235,000
Vermin Control	12,000
ESB, Telephone, Water charges	70,000
Miscellaneous	35,000
Sampling & External Testing at Lab.	70,000
Landscaping of capped areas	15,000
Sewer Connection - County Council Levy	15,000
Transport of Waste	263,900
Total	1,279,500

A figure of €500,000 in respect of Loan Charges for capital works including final restoration was included in the 2011 Adopted Budget.

Provision made for Recycling Facilities expenditure in the reporting period was €328,900. This can be broken down as:

Recycling Facilities expenditure	2011 Provision (€)
Salaries & Wages	263,900
C.A.S. Recycling	45,000
WEEE Management	20,000
Total	328,900

Waste Totals for Kinsale Road Landfill Site - 2011

All weights in tonnes

Commodity	Jan-11	Feb-11	Mar-11	Apr-11	May-11	Jun-11	Jul-11	Aug-11	Sep-11	Oct-11	Nov-11	Dec-11	Total
Municipal	94	75	88	85	91	98	83	86	73	65	83	73	992
Non Levy	127	60	28	25	19	77	60	0	0	0	7	1	404
Total Transferred Off Site	221	135	116	110	110	175	142	86	73	65	90	74	1,396

Commodity	Jan-11	Feb-11	Mar-11	Apr-11	May-11	Jun-11	Jul-11	Aug-11	Sep-11	Oct-11	Nov-11	Dec-11	Total
Rubble imported for capping	98	351	229	238	371	452	388	436	129	289	308	205	3,494
Soil imported for capping	0	0	0	2,937	2,193	0	25	541		137	0	0	5,834

Domestic Recycling	Jan-11	Feb-11	Mar-11	Apr-11	May-11	Jun-11	Jul-11	Aug-11	Sep-11	Oct-11	Nov-11	Dec-11	Total
WEEE Out	66.2	67.8	79.54	61.62	62.48	74.36	64.12	71.96	55.14	58.94	72.40	59.18	793.74
Plastic Bottles	1.68	0.52	1.4	1.08	0.96	1.16	1.06	1.30	1.50	0.74	0.88	1.24	13.52
Plastic Wrappers	2.08	1.34	1.9	1.78	2.22	1.8	1.62	1.58	1.56	1.28	1.58	1.78	20.52
Cardboard	6.7	4.98	4.98	5.36	5.04	5.06	5.42	5.34	4.84	3.98	4.56	5.18	61.44
Paper	9.94	7.98	8.26	9.16	7.48	7.82	12.3	7.02	11.28	7.08	9.12	11.38	108.82
News & Pams	0.32	0.76	0.6	0.54	0.5	0.52	0.6	0.52	0.38	0.84			5.58
Metal	8.8	4.74	6.24	12.22	6.94	8.42	5.42	9.50	6.46	3.26	7.00	6.04	85.04
Green Waste (CA)	4.7	3.82	14.38	19.08	24.34	19.38	22.68	15.68	8.06	10.64	7.46	7.12	157.34
Christmas Trees	57.28	1.66											58.94
Timber (CA)	12.82	10.46	16.78	16.28	14.14	13.5	11.3	13.24	12.56	9.84	11.98	8.58	151.48
Glass	5.1	4.18	0	0	3.7	3.22	3.24	3.82	4.10	0.00	2.44	4.48	34.28
Drink Cans	0	0	0	0	0	0	0	0	0	0	0	0	0.00
Oil	0	2.36	0	0	1.46	0	1.54	0	1.14	0	0.96	0	7.46
Paint	1	2.78	0	2.9	2.6	0	2.54	2.52	2.50	0	2.56	0	19.40
Clothes	0.9	0.86	0.64	0.82	1.18	0.82	1.28	0.94	1.08	0.78	0.76	3.66	13.72
CA Site Recycling Total inc. WEEE Out	177.52	114.24	134.72	130.84	133.04	136.06	133.12	133.42	110.60	97.38	121.70	108.64	1531.28

Commercial Recycling	Jan-11	Feb-11	Mar-11	Apr-11	May-11	Jun-11	Jul-11	Aug-11	Sep-11	Oct-11	Nov-11	Dec-11	Total
Timber Waste	335.88	383.06	771.68	644.66	565.42	411.68	328.2	355.26	257.68	277.28	277.78	234.22	4842.80
Green Waste	34.08	42.6	73.02	114.34	172.36	192.68	222.82	132.66	105.24	137.80	113.06	88.68	1429.34

Total (inc CA Site)	Jan-11	Feb-11	Mar-11	Apr-11	May-11	Jun-11	Jul-11	Aug-11	Sep-11	Oct-11	Nov-11	Dec-11	Total
Timber	348.70	393.52	788.46	660.94	579.56	425.18	339.50	368.50	270.24	287.12	289.76	242.80	4994.28
Green (inc Xmas Trees)	96.06	48.08	87.40	133.42	196.70	212.06	245.50	148.34	113.30	148.44	120.52	95.80	1645.62

3 SITE DEVELOPMENT WORKS

3.1 Site Development Works during the Reporting Period.

The Waste Licence sets out conditions relating to the completion of certain works within the designated periods following the date of grant of the licence. The works referred to generally formed part of site development works.

M&E works for landfill gas and leachate management

M & E works are ongoing. These include maintenance of the Leachate Conditioning Plant and the continued balancing of the landfill gas field.

MISCELLANEOUS WORKS:

1. Ongoing maintenance of Site Roads.
2. Regular cleaning of Gravel Trap at Leachate Conditioning Plant with replacement of gravel as required.
3. CTO Environmental Solutions Ltd. operates a timber reprocessing facility and green waste composting facility on behalf of Cork City Council at the Landfill Site. Shredded timber is sent exclusively to Eirebloc Ltd, Lisarda, Macroom, Co. Cork where it is further processed and utilised to manufacture inserts for pallets. 35 staff are employed by Eirebloc Ltd. manufacturing approx. 30 million units per annum.

Capping Works Completed in 2011

Design and execution of Capping Works (Contract 10)

These works have now been completed (July 2011) and this has resulted a final engineered cap over an area of approximately 20 hectares within the area bounded by the swale.

In all, the recently completed Capping Works (Contract 10) entailed the installation of 94 additional landfill gas wells. Connection of same to the gas collection network via a complex manifold system, placement of a liner system, drainage system and over liner soil layer to required specifications. The entire area was grassed seeded and there is now a well established grass sward over the site.

Three no. sumps were constructed for the collection of condensate below the liner and four no. deep boreholes were drilled in the central portion of the landfill site to enable deep level extraction of leachate.

Cork City Council is in the process of procuring the pumps, 7 in all (3 no. pumps for the collection of condensate below liner and 4 no. borehole pumps). It is expected that the pumps will be installed and operational by autumn 2012.

Capping Works planned for 2012 / 2013

The final phase of capping and landscaping for the facility is due to commence in the latter half of 2012.

The total area to be capped is 7.5ha.

The works shall entail:

1. Mobilisation to site by the Contractor
2. Regrading including some cut and fill to achieve the required cap profile
3. The installation of new gas extraction system
4. The installation of a subliner gas collection system (including pipework and drainage geo-composite)
5. The installation of an LLDPE liner or other as approved by the Agency
6. The installation of a subsurface water collection layer (i.e. a drainage geocomposite)
7. The placement of subsoil above the liner
8. The placement of topsoil
9. Grass seeding and landscaping
10. The construction of an access road including pedestrian walkway and cycle way

As of May 2012 preliminary meetings with design consultants have taken place.

Capping works are expected to be completed by end 2013.

Waste Licence Review application – W0012-03

A new waste licence was awarded to Cork City Council, Kinsale Road Landfill Site on 3rd May 2011 following an extensive review period of approximately 6 months.

Other planned works for 2012 are:

- SCADA system upgrades (reporting/management system).
- Installation / renewal of control valves and systems to optimise gas collection.
- Installation / renewal of control valves and systems to optimise storm water treatment.
- Upgrading of site roadways.
- Miscellaneous minor capital works and works arising from Operational Procedures.
- Investigate the potential of constructing a recharge point for electric vehicles in association with Electricity Suppliers.
- Investigate the potential of constructing a recharge point for Compressed Natural Gas (CNG) powered vehicles in association with Bord Gais.
- Investigate the potential of constructing a Renewable Energy Park, including the installation of a photo voltaic array as well as a wind turbine.

The estimated cost of the Site Development Works Programme to be carried out in 2012 / 2013 is approximately €5.0 million (subject to the availability of funding).

4 ENVIRONMENTAL INCIDENTS AND COMPLAINTS

4.1 Incidents

(An Incident is defined on page 3 of Waste Licence W0012-03).

Condition 11 of the Waste Licence requires Cork City Council to make written records of environmental incidents and complaints. Operational Procedure OP/17 "Recording of Complaints and Suggestions" describes the internal reporting of Non Conformances and incidents relating to the facility. Cork City Council documents all non-conformances and incidents on an internal Non Conformance Report Form SF/05.

The following number of incidents, non compliances and non conformances were recorded in 2011:

Incidents	26
Non-Conformances	0
Non-Compliances	6

4.2 Complaints

Condition 11.6 of the Waste Licence requires Cork City Council to make written records of all complaints relating to the operation of the facility.

Complaints are dealt with in accordance with the Operational Procedure OP/17 "Recording of Complaints / Suggestions".

4.3 Analysis of Complaints

Total number of complaints was 0 (2 in 2010) in this reporting period.

4.4 Review of Nuisance Controls

In accordance with Condition 6 of the Waste License, Cork City Council are required to ensure that vermin, birds, flies, mud, dust and litter do not give rise to nuisances at the facility or in the immediate area of the facility.

Cork City Council ensures that the activities are carried out in a manner such that odours do not result in significant impairment or interference with amenities or the environment beyond the facility boundary.

The road network in the vicinity of the facility is kept free from any debris caused by vehicles entering or leaving the facility. Any such debris or deposited materials is removed without delay.

Litter Control

Litter fencing is no longer required at the facility as landfilling has ceased (July 2009). Litter picking teams are organised as required to collect any wind blown litter or other waste, placed on or in the vicinity of the facility.

All vehicles removing waste and materials from the facility (Civic Amenity Site and Timber Processing & Green Waste Composting facilities) are appropriately covered.

Dust Control

In dry weather, site roads and any other areas used by vehicles are sprayed with water as and when required to minimise airborne dust nuisance.

Prior to exiting the facility, all waste vehicles use the vehicle wash.

Bird Control

This is no longer an issue as all the waste has been covered and final capping of the site is ongoing.

Odour

Odour from the landfill site is minimised through the extraction of landfill gas and through the application of odour control substances as required.

No odour complaints were received during the reporting period.

Flies

Flies are controlled through the use of control substances as deemed necessary by the pest control experts.

Vermin

Vermin are controlled through the use of baiting as deemed necessary by the pest control experts.

Noise

Noise is minimised / controlled by operating the facility between the hours of 8am ó 4pm. Contractors may operate between the hours of 8am ó 6pm in agreement with the City Council.

5 ENVIRONMENTAL MANAGEMENT PROGRAMME

5.1 Environmental Objectives

5.2 Site Management Structure

5.2.1 Organisational Chart

Environmental Objectives and Targets

Management Programme

5.1 Environmental Objectives

1 Environmental Objective 1:

Completion of Final Capping in accordance with the Conditions of the Waste Licence W0012-03

Objective 1: Completion of Final Capping in accordance with the Conditions of Waste Licence W0012-03				
Responsibility: Cork City Council, Planning Consultants, Capping Design Consultants			Start Date: June 2011	
			Revised Date:	
Target: To complete the capping works on site and to develop a park with multiple amenities for use by members of the public				
Task	Details	Due Date	By Whom	Status
1	Appointment of Planning Consultants to develop a Master Plan for the site	Sept 2011	CCC	Complete
2	Brady Shipman Martin (BSM) (appointed Planning Consultants) to produce a Master Plan with input from various City Council departments	March 2012	BSM	Draft complete
3	Appointment of Engineering Consultants for capping design	Feb 2012	CCC	Complete (RPS appointed)
4	BSM to present Master Plan to EPA	May 2012	BSM	Complete
5	Final capping design and amenities infrastructure design (partial) completion of SEW to be sent to EPA for review and approval	Oct 2012	RPS / CCC	
6	Invitation to tender for construction of capping works (and ancillary works) contract Capping works due for completion Autumn / Winter 2013 (provisional)	Nov 2012 (provisional)	RPS / CCC Capping Contractor	
Objectives Completed:				
Signature: _____			Date: _____	

5.2 Site Management Structure

The Staff Management Structure for the facility is detailed in the Organisational Chart. The responsibilities of the site staff are listed below.

Facility Manager

The Facility Manager has overall responsibility for operation of the facility in accordance with the conditions of the Waste Licence and best operational practices.

The Facility Manager co-ordinates all of the activities and contractors on site and implements procedures and practices in accordance with the Environmental Management Programme.

Landfill Technician

The Environmental Technician carries out monitoring, sampling and analysis at the facility under the supervision of the facility manager and is based at the landfill site.

Site Supervisor and Junior Foreman

The Supervisor and Junior Foreman are responsible for ensuring that the site staff carry out their designated duties, and liaise with the Facility Manager in the implementation of procedures and practices at the facility. Both have completed the FÁS "Waste Management" course.

Relief Site Supervisor

The Relief Site Supervisor performs the functions of the Site Supervisor in the event of his / her absence. The Relief Site Supervisor has also completed the FÁS "Waste Management" course.

Weighbridge Operator

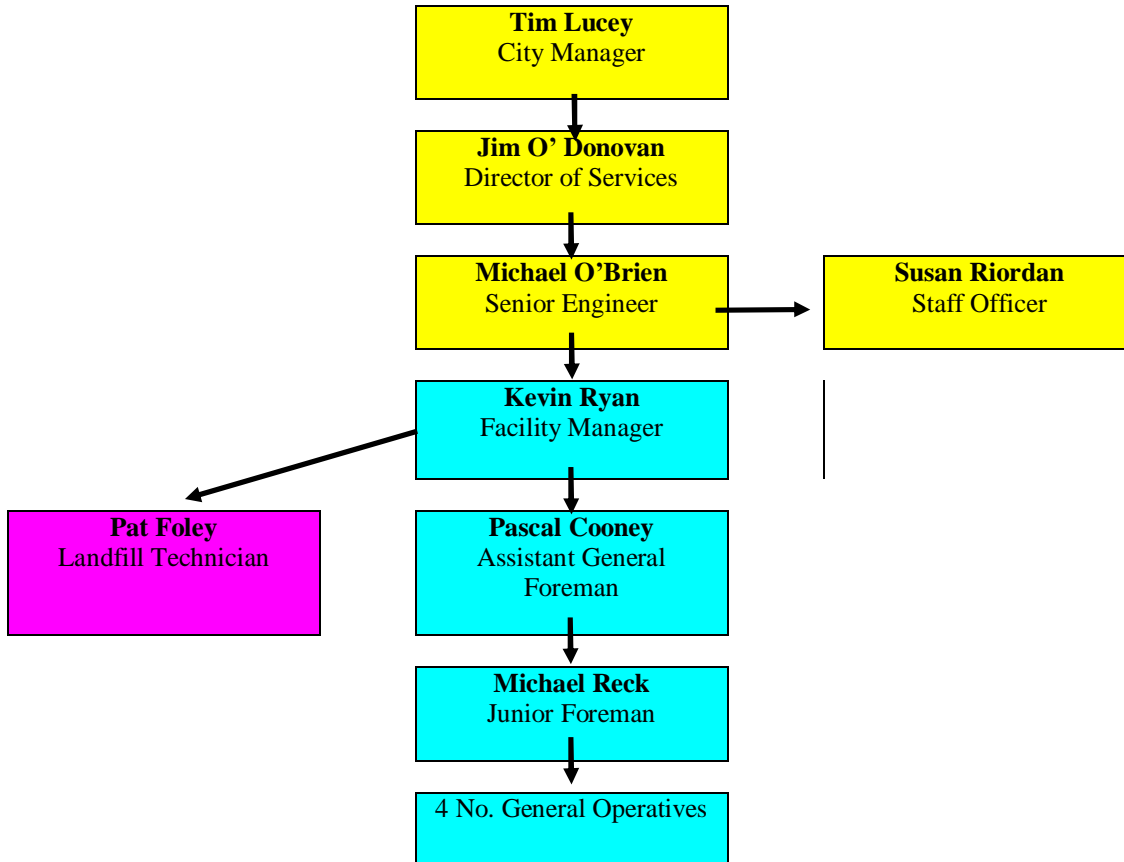
The Weighbridge Operator records incoming waste and controls access to the facility.

Staff Officer Environment

The Staff Officer Environment (not based on site) is responsible for the maintenance of the Waste Licence public file including dealing with queries from the public. Duties also include liaising with waste and recycling contractors regarding acceptance of waste / recyclables and accounts etc.

5.2.1 Organisational Chart

The Management Structure of **Kinsale Road Landfill Site**, including **Environmental Monitoring (Laboratory)** and **Administration (City Hall)**.



6 ENVIRONMENTAL MONITORING AND CONTROL

The following areas were monitored during the reporting period:

6 (a) Summary Report on Emissions

- 6.1 Noise
- 6.2 Landfill Gas
- 6.3 Emissions from Bioverda Power Systems Ltd.
- 6.4 Emissions to Sewer
- 6.5 Discharge from Storm Water Pond and Reed Beds
- 6.6 Dust

6 (b) Summary of Results and Interpretation of Environmental Monitoring

- 6.7 Ground Water
- 6.8 Biological Survey of Streams
- 6.9 Surface Water
- 6.10 Particulates and Odour
- 6.11 Nuisances
- 6.12 Compost

Graphs

- Ground Water Wells ó Greenhills & Nemo Rangers

Reports

- Biological Survey of Streams Report
- Air Emissions testing of the Flare Unit & Gas Utilisation Engine
- PRTR Table for Flare Unit & Gas Utilisation Engine
- Landfill Gas Surface Emissions Survey

6 (a)

Summary Report on Emissions

Noise Emissions

Monitoring Locations

Within the Landfill B1-B4

B1 is located just north of the reception area or west perimeter.

B2 is located to the north perimeter.

B3 is located to the east perimeter.

B4 is located to the south perimeter.

Outside the Landfill A1-A4

A4 is located north of landfill in Secondary School Grounds (Christ King).

A1 is located at the end of Greenhills.

Monitoring Details

Monitoring was carried out on the 5th December 2011 by S E Chemist and Assistant Scientist Cork City Council.

The instrument used was the Cell 495, Type 1.

Monitoring Results

The results (day-time) are presented below. Previous year's results are in brackets.

	Leq(A)	L10	L90
B1	61 (60) (62)	64(62)	58 (53)
B2	50 (54) (55)	53 (54)	41 (53)
B3	59 (47 (48)	64 (49)	51 (46)
B4	67 (59) (62)	70 (60)	63 (56)
A1	60 (57) (46)	64(60)	55 (44)
A4	59 (45) (57)	62 (46)	55(44)

Limits

The dB(A) Leq 30 minutes should not exceed 55 during the day and 45 at night at the sensitive locations A1 and A4.

Results and Interpretation.

It was cold with a moderate north westerly wind.

There were no Landfill operations or timber recycling operations in progress. There was no audible noise from the landfill at any location. Landfill operations have ceased for two years but they were never but a minor influence at any noise monitoring location.

The overriding noise source at each location was traffic.

The differences from site to site and from year to year generally reflect traffic influences.

B1 was about same as last year.

B2 was about same as last year. The impacts here are traffic with a small input from ESB transformer station outside Landfill. This site is shielded from the prevailing traffic influence by the brow of the landfill dome.

B3, towards Greenhills, and B4 near the South Ring Road were higher than last year due to increased traffic on the South Ring Road.

It would not be possible to separate landfill impact from traffic and other sounds in order to check compliance with the licence.

The nearest outside station A4 (Christ King School) was higher than last year due to school activities.

A1 (end of Greenhills) was a little higher than last year due to traffic.

The landfill does not operate at night.

One third Octave Band Analysis

The one-third-octave band analysis shows that the noise regime in the landfill and surrounding areas is dominated by traffic. The B4 position (South) is clearly dominated by traffic and the profile is similar to A1. B2 and B3 lose some of the higher pitched levels due to distance. The overall pattern at each station is similar indicating the predominant traffic influence from surrounding roads.

Landfill Gas

Buildings

Limits

The limits in the licence are 1% v/v (20% LEL) for methane and 1.5% v/v for carbon dioxide.

Monitoring Details

Six buildings are monitored on a weekly basis. The instrument used was the Gasdata GFM Series and the monitoring was carried out by the Landfill Technicians.

Summary of the Results

No methane was detected and only minute traces of CO₂. The Park and Ride administration building had no methane shows.

Interpretation

No landfill gases are entering the buildings.

Gas Monitoring Wells

Trigger Levels

These are 1.0 % v/v for methane and 1.5% v/v for carbon dioxide “measured in any service duct or manhole on at or immediately adjacent to the facility and/or at any point located outside the body of the waste.”

Monitoring Details

The instrument used was the Gasdata GFM Series and the monitoring was carried out by the Landfill Technicians.

The wells (DP) in the old landfill area across the South Link Road are into the body of the waste and were designed to check for gas generation not migration. They could not be expected to comply with the trigger levels.

DP1 and DP2 are not being monitored due to health and safety reasons.

There are 15 other wells drilled around the periphery of the old landfill site and along the South Link Road - 137 to 175; these would most likely be drilled into some waste.

Most of the wells to the north, east and south and west of the landfill LG1-LG19 are drilled into soil surrounding the landfill and are designed to check for migration of methane laterally to surrounding areas.

Due to shows of gas, in the eastern and north eastern periphery; approximately fifty new wells have been installed off site in the green area between Greenhills and the landfill. Many of these new wells were designed to function as venting wells/monitoring wells. From 2005, the wells closest to the landfill periphery (LG) have been used as monitoring wells and the middle wells for venting purposes (two weeks venting and one week capped). Wells are drilled to different depths and have different sensitivities. There are local soil factors that make it difficult to assess trends and comparisons. In addition weather plays a role in gas migration through soil.

Monitoring Results (2010 Results in brackets)

Old Landfill Area

Park and Ride

The 15 periphery wells that are monitored on a daily or weekly basis around the old landfill site and along the South Link Road show the presence of gas on the odd occasion.

In 2011 wells numbered 137, 138, 139 and 140 showed gas on the odd occasion (less than 3% of the time) most likely linked to the flare going down.

141-142 showed trace amounts of CO₂.

The wells 171-175, monitored weekly (July - Dec), showed no CH₄ - same as last year.

Trials have shown that there is insufficient gas in this sector for power generation although gas is pulled for destruction by flaring.

The Park and Ride building showed no evidence of gas in 2011.

Present Landfill Area

There are no shows of gas in the wells monitored in the **southern** and **western** perimeters of the landfill.

Northern Sector LG1-LG4:

LG1 could not be monitored in 2011.

LG2 had no CH₄ shows in 2011 (1 in 2010).

LG3 and LG4 had no CH₄ exceedances during the reporting period.

Eastern Sector

LG5-LG8

In the **eastern sector** of the landfill, methane levels began exceeding trigger levels in 2002 and this led to increased monitoring on a daily and weekly basis in addition to the monthly monitoring normally undertaken up to then.

The gas interceptor trench (constructed in 2004) and venting procedures have stabilised gas levels in the eastern perimeter wells and reduced if not eliminated gas shows in wells further east although the situation in LG9A and LG10A is anomalous.

The situation needs further investigation as these wells (LG9A and 10A) are most likely drilled into waste and therefore are not suitable for monitoring potential gas migration.

Methane concentrations over the years at the eastern landfill periphery wells LG5A, LG6A and LG8A are steadily decreasing in gas with time. It is interesting to examine the reasons for the fluctuations with time for gas concentrations.

LG5A is a well on generally dry ground while the other three wells are progressively more on wetter ground. It is the landfill technicians' experience that gas levels are higher in the wells after rain. LG5A has a pattern of increased gas levels in summer time probably due to increased biological activity promoting increased gas production and drier soil facilitating the lateral passage of gas. If there is rain on the surface layers in summer then gas transmission to the air is inhibited and lateral passage increased. The pattern is repeated in LG6A but not to the same extent because it is in more boggy soil where lateral passage of gas is slow. There is also less gas in LG6A. There is less consistency in the pattern for LG8A.

Interpretation of gas presence and passage through soil is inherently difficult; there is a range of confounding factors.

LG5 had no gas in 2011 but LG5A showed gas consistently (2 exceptions with no gas shows) in the range of 0.2 - 48% v/v CH₄.

The gas levels in LG5A are decreasing: the average in 2008 was 27%, 2009 was 21%, 2010 was 17% and 2011 was 16% v/v CH₄.

LG6 had no gas but LG6A showed gas 74% of the time in the range of .01-14% v/v CH₄.

LG6A is showing a decreasing trend in CH₄ shows and percentage v/v: the average in 2008 was 24%, 12% in 2009, 9.2% in 2010 and 7.4 % in 2011.

LG7A and LG8 had no gas but LG8A showed a two exceedances.

These wells are in a line nearest the landfill; wells that are further out towards Greenhills show far lower levels of gas and most show no gas.

LG9A and LG10A were not measured in 2011 as they are contaminated by leachate. A more suitable location for these wells will have to be found for these wells.

Some of the new wells, with the tag A, drilled in proximity to the older wells generally show a stronger presence of gas than the original wells. This may be due to the greater depth drilled, the variability of the gas in the area, differing gas well construction methods or soil disturbance.

There are other wells east of the LG5-11 line but these are being used for venting as well as monitoring so more variations in monitored trends would be expected. Gas readings are taken twice a week in the Greenhills area.

In the intermediate line, LG51, LG53 and TP9 all wells were free of CH₄ gas with the exception of LG52 which had one show of 2.3%v/v CH₄.

In the line farthest from the Landfill, there were no exceedances.

Interpretation

The wells to the south and west show no evidence of methane migration. Gas concentrations in the eastern periphery wells began to decline in 2005 and decreased further in 2008, 2009, 2010 and 2011. The decline could be due to the installation of the gas interceptor trench in late 2004 preventing the flow of gas eastward. It could also be due to the venting measures in the green area to the east. The wells east of the landfill periphery have reduced considerably in gas. The shallow gas wells in Greenhills were free of gas in 2007, 2008, 2009, and 2010. No measurements at these shallow wells were carried out in 2011. Interpretation of gas presence and passage through soil is inherently difficult and there are extraneous confounding factors such as atmospheric pressure, temperature, soil water saturation, biological processes and soil disturbance. The consistent decline in average levels in wells in the eastern sector over the last few years is very encouraging.

Measures to Control Gas

The analysis of trace components in the gas did not conclusively establish the origin of the gas. Consultants who examined the data suggested that the gas could be derived from the landfill, historical private waste deposits in the area east of the landfill or from the peat itself.

A programme of measures to control gas from the possible sources listed above has been in place since early 2005. These measures incorporate an intensive monitoring regime at stations inside and outside the Landfill, suction and flaring of gas on 36 wells constructed on the eastern periphery of the landfill (now discontinued as per Agency agreement), a 700 metre long gas interceptor trench along the eastern periphery and vent pits.

The measures being taken are controlling the situation. The advice received was to initiate a slow and steady reduction in monitoring.

Carbon Dioxide

The carbon dioxide levels were exceeded in most wells.

Where there is presence of carbon dioxide in preference to methane, it may be due to aerobic landfill conditions. The presence of oxygen will also be more noticeable in these wells (as is the case). Aerobic conditions are more likely to occur at shallow, uncapped landfill sites or any other condition that allows air into the refuse - such as at perimeter locations. Carbon dioxide has asphyxiate but no explosive properties.

The majority of the wells have increased levels of carbon dioxide in the summer time probably due to warmer conditions promoting microbiological activity.

Gas Combustion Plant Intake

There are no limits in the licence.

The instrument used was the Gasdata GFM Series and the monitoring was carried out by the Landfill Technician on a weekly basis.

Summer concentrations are generally higher than winter.

Emissions from Landfill Gas Combustion Plant

Monitoring Requirements

Inlet

Methane	weekly monitoring	as %v/v
Carbon dioxide	weekly monitoring	as %v/v
Oxygen	weekly monitoring	as %v/v
Total Sulphur	Annually	
Total Chlorine	Annually	
Total Fluorine	Annually	

Outlet

SO ₂	Annually
NO _x	Annually
CO	Continuous
Particulates	Annually
TA Luft Cl I, II, III organics	Annually
HCL	Annually
HF	Annually

Carbon Monoxide Continuous Monitoring of the Landfill Gas Engine TV01

Limits for Carbon Monoxide Continuous Monitoring (last year's results in brackets)

The limits in the licence are 1300 mg/m³ for 30-minute average and 650 for daily average.

The Agency by letter dated 17/07/03 has asked that concentrations exceeding 2800 mg/m³ for the 30-minute averages and concentrations exceeding 1400mg/m³ for the daily averages be regarded as incidents and reported.

TVO1 (Landfill Gas Combustion Engine)

The 30-minute average varied from 0 - 5311 (0 - 12,620) mg/m³.

Daily averages varied from 0 - 689 (0-1260) mg/ m³.

TV01 had one exceedance in the first half of the year during engine start up.

Note: Analysis of the data above refers only to Jan - June 2011.

No analysis of data for period July - Dec 2011.

Emission Limits on Outlet

The license limits on the emissions from TVO1 are as follows.

NO _x as NO ₂	500 mg/m ³
CO	1400 mg/m ³
Particulates	130 mg/m ³
TA Luft CLI	20 mg/m ³ (at mass flows>0.1kg/hr)
TA Luft CLII	100 mg/m ³ (at mass flows>2 kg/hr)
TA Luft CLIII	150 mg/m ³ (at mass flows>3 kg/hr)
HCL	50 mg/m ³ (at mass flows>0.3kg/hr)
HF	5 mg/m ³ (at mass flows>0.05kg/hr)

Monitoring Results

Report in Appendix.

All results of the exhaust from the engine TVO1 and landfill flare are within the emission limit values for the parameters NO_x, CO, particulates, TNMVOC, TOC, HCl /HF. While no limits are given in license for SO₂, results were low.

The Report estimates that the methane destruction in the landfill flare is 99%.

Emissions to Sewer

Methane (Results in brackets are for previous year)

Headspace and aqueous probe methane measurements that are automatic and continuous have been discontinued because they are very inaccurate.

Grab samples sent to outside laboratories are also not accurate. A standard that was sent to an outside private laboratory was returned at 10% of the true value. This reflects the loss of the volatile gas in transit and is not a reflection on the accuracy of the outside laboratory.

The replacement monitoring system in operation is based on samples taken from the discharge and subjected to GC analysis in the Cork City Laboratory.

In the second half of 2009, a new splash plate was installed in the conditioning plant and was very effective in reducing methane levels in the leachate to well within the license limit.

Flow

Leachate is collected, conditioned, discharged to sewer and further on to Carrigrenan waste water treatment plant.

Stormwater from capped areas is directed to reed beds via the swale and stormwater ponds. The temporary leachate treatment plant was upgraded and made operational at the end of 2008. This plant is designed to treat potential contaminated storm water from the temporary capped areas of the site within the swale.

The flow through the main conditioning plant recorded through the 150 mm (6 inch) discharge line varied from 0 - 17 (0-14) m³ per hour. There was 0 exceedance (0). The licence limit is 25 m³/hr.

The cumulative flow, recorded by the Scada system, in 2011 was 85,525, (79,857) (55,000), (68,000), (104,243) (122,627) (121,454) m³. The flow recorded was up this year.

pH

The pH results are in required range 7-9.

24 Hour Composite Concentrations (Results in brackets are for previous year)

Samples are taken every month.

BOD values are always low, 12 - 50 mg/l, probably due to ammonia suppression in the test.

The ammonium results varied from 130 - 250 (130-280) mg/l. The limit for ammonium is 600mg/l for 95% of the samples. All the samples taken complied with the license.

The other parameters: pH, sulphate and suspended solids are well within the limits.

24 Hour Composite Loads

All the discharge values for the various parameters are low in concentration and load except for ammonium.

The ammonium load varied from 31 - 55 (9-76) kg/day {licence limit is 248 kg/day}.

Discharge from the Stormwater Retention Pond / Reed beds

Status

This facility was constructed and reeds planted in 2004. It was commissioned in 2005

Results

Reedbed Discharge to Tramore River (SRP5)

There were no exceedances in 2011 (0) for the suspended solids limit of 35 mg/l.

Dust Deposition

No Dust Deposition testing was carried out in 2011.

6 (b)

Summary of Results and Interpretation of
Environmental Monitoring

Groundwater Monitoring

Limits

There are no limits on the licence.

Monitoring Locations

A map of the approximate locations is at the end of this section.

The groundwater flow is from west to east.

BR1 and OB1 are bedrock and overburden wells on the northern perimeter of the landfill.

BR2 and OB2 are located on the north-east perimeter.

BR3 and OB3 are located on the eastern perimeter (down gradient).

BR7 and OB7 are located on the southern perimeter. OB7 is located in an area where refuse was deposited and is contaminated with leachate.

The wells NW1 to NW9 are designed to check the efficiency of the leachate collection system. NW1 is in the south west corner just north of the Tramore stream and just east of the South City Link. The wells move in numbered order, anti clockwise, to the north east corner (NW9). The wells are on the landfill side of the streams. The well NW9 was re-drilled outside the leachate collection drain in 2001.

Monitoring Details

All samples were taken and analysed by City Council laboratory personnel. The analysis for pesticides, PAH, organochlorines was undertaken in the U.K.

Monitoring Results and Discussion

Monitoring Results (Results in brackets are for last year)

Ammonium in Wells

Overburden Wells

The overburden wells show no pollution in OB1 and OB2 but very high ammonium levels in OB3, 400 (340) mg/l and less so in OB7, 75 (69) mg/l. These shallow wells are drilled into or very near the body of the waste and at peripheral locations and would be expected to show pollution.

Metals were at or below limits of detection except for manganese 1.2 (1) mg/l.

Manganese is generally high in groundwaters in the Cork area.

Cyanide concentrations were below 0.005 (0.005) mg/l.

Mercury was below 0.00002 (<0.00002) mg/l

Bedrock Wells

Groundwater to the southwest, west and north show no pollution but the wells to the north east show trace values and the well to east (BR3) is heavily contaminated with ammonium concentrations up to 490 (520) mg/l.

The results indicate very high concentrations of pollutants in this well, the highest values quoted below are from this well.

Recent investigations have shown that this well is inside the sheet pile wall where leachate is collected for return to conditioning plant and sewer discharge. The well is being impacted directly by leachate and is not a proper representation of the down-gradient impact of the landfill. A more suitable location for this well is being sought (onsite or offsite).

Conductivity varies 370 – 6470 (390-6900) $\mu\text{S/cm}$.

Chloride levels are normal except for BR3, 922 (922) mg/l.

The other parameters of Visibility/Odour, oxygen, TOC, TON did not show any remarkable trends or concentrations except for BR3.

TOC varies 2 – 220 (2-500) mg/l.

TON varies 1-39 (1-11) mg/l.

Cyanide was below detection limit of 0.005mg/l.

Chromium was below detection limit of 0.002 mg/l.

Mercury was below 0.00002 except at BR2, 0.00007 mg/l.

Pesticides and herbicides were below detection - generally 0.03 $\mu\text{g/l}$.

PAH's were below detection- generally <0.03 $\mu\text{g/l}$.

Chlorinated hydrocarbons were below detection limits (generally 0.5-10 $\mu\text{g/l}$)

Benzene was below detection limits (0.1 $\mu\text{g/l}$)

NW Wells

The wells NW1 to NW9 are designed to check the efficiency of the leachate collection system consisting of the collection drain and the sheet pile wall in front of NW 1 and 2.

The average concentrations over time are shown in Table 1.

Table 1

Mean Total Ammonium (mg/l)

	NW1	NW2	NW3	NW4	NW5	NW6	NW7	NW8	NW9
2002	64	135	25	53	-	28	119	31	-
2003	35	-	25	35	-	21	35	27	0.5
2004	24	-	18	26	-	67	85	21	0.2
2005	DRY	DRY	16	20	-	78	167	13	0.1
2006	24	DRY	25	37	-	98	73	43	0.3
2007	21	27	21	26	3.3	113	47	15	0.3
2008	20	24	47	30	0.3	129	63	15	0.1
2009	7.5	27	20	35	0.3	166	45	11	0.2
2010	18	34	26	39	2.1	129	21	16	1.9
2011	19	39	21	45	2	139	73	11	4

The table shows that ammonia concentrations are high particularly around NW6. The levels in this well started to increase in 2004.

The mean water well levels show no major change over the years.

Ground Water Wells - Greenhills and Nemo Rangers

In April 2011, 6 new groundwater wells were drilled in the Greenhills estate and Nemo Rangers area to satisfy recommendations set out in an EPA audit to assess the potential for ground water contamination from a leachate plume.

The wells were drilled in the green area of Greenhills estate immediately adjacent to the eastern periphery of the landfill site (4 wells, 2 shallow, 2 deep) and in the Nemo Rangers complex (2 wells, 1 shallow and 1 deep).

The following parameters are measured on a monthly basis in each of the wells: Temperature, pH, Conductivity, Ammonium, Chloride, Oxygen, COD, TON, TOC and Suspended Solids.

Due to the fact that monitoring of the wells only commenced in May 2011 it is difficult to get trend for the results. However analysis of the data does suggest a small degree of contamination of the ground water at depth with elevated values of ammonium, chloride and conductivity. A more complete picture of the situation will become apparent over time with more data sets.

The 2011 monitoring data and graphs for Ammonium, Chloride and Conductivity are at the end of this section in the appendix.

Biological Survey of Streams

Monitoring Locations

Tramore Stream

Sample sites listed are in downstream order as follows:

Samples were taken at the beginning of the old landfill (E) roughly equivalent to EM1, just below the South City Link roughly EM2 (C), halfway along landfill near OB7 (D) and near EM6 (F) below all landfill and downstream of confluence with Trabeg.

Trabeg

Samples were taken at farthest possible upstream point although still in landfill near EM7 (A) and, before confluence with Tramore, near EM8 (B).

Monitoring Details

These surveys were undertaken by the Aquatic Services Unit at UCC in July.

The Report is attached.

The licence conditions specify an annual kick sampling biological assessment of the Tramore and Trabeg streams. This was not possible for the Trabeg because of its structure.

Interpretation

Biological quality is graded from Q1 (bad) to Q5 (good).

The Report states: "All of the sites showed similar results to 2010"

Tramore Stream

The Tramore site upstream of the landfill remained at Q2 level (moderately or seriously polluted). The sites within the landfill were of same quality to last year, Q2. The sites remain moderately or seriously polluted.

The downstream station on the Tramore shows the impact of the Trabeg in addition. The station had the same rating as last year (Q2).

Trabeg stream

The sites are unsuited to kick sampling and difficult to assign a Q rating. The upstream is probably Q2 and downstream not better than Q2. This rating is due to the influence of overflowing combined storm & sewer chambers further upstream of the Landfill Site.

Surface Water Monitoring

Limits

There are no limits on the licence.

Monitoring Locations

Tramore River:

The Tramore River flows to the south of the landfill.

EM0 is about one km upstream of all landfill.

EM1 is just upstream of the bridge on the Kinsale Road and just above all landfill.

EM9 is upstream of the bridge over the South Link Road - at the end of the old landfill across the South Link Road and just before the present landfill site.

EM2 is at the beginning of the present landfill and just below the bridge over the South Link Road. It is almost in the same location as EM9.

EM10, as shown in the licence documents, has been moved from the point of confluence of the Tramore and Trabeg to about 20 yards upstream of the Tramore and has been renamed EM11. Sampling at a confluence is not good practice - samples taken could represent either the Tramore or the Trabeg or a varying mixture of the two. This EM11 site is also too near the landfill to ensure adequate mixing of the discharges and receiving waters. Mixing is not complete at this site and the sample may not always fully represent the dilution in the stream.

EM6 is about 300 meters downstream of the confluence of the Tramore and Trabeg. At this point, discharges from the landfill are adequately mixed with the receiving waters. This was the historical sampling point for the downstream sample. Possibly at times it may be affected by the back up of tidal waters but it remains the best option for a downstream sample

Trabeg Stream

EM7 and EM8 are on the Trabeg stream that skirts around the north and east of the landfill and then joins the Tramore. EM7 is upstream and EM8 is downstream.

Monitoring Details

The samples were taken and analysed by Cork City Council laboratory personnel

The stations are listed in downstream order (the first station - EM0 is furthest upstream)

Interpretation

Surface water monitoring is very variable with time and little significance can be placed on comparison between quarterly results from differing years.

Ammonium and BOD

There can be some contamination of the upstream waters on occasion and this has been noticed in the ecological report.

Because of the variability to be expected in surface waters there is no clear trend over the quarters.

Tramore

Generally, upstream Tramore (EM1) has BOD values varying from 0-6 mg/l over the 2000-2006 period but have declined since 2006 to values about 3mg/l and below. The values for 2011 were all 1.5mg/l BOD (3 recorded values of 1.5mg/l).

Downstream values (EM6-10) ranged from 1-27mg/l over the 2000-2006 period but have declined since 2006 to values about 5mg/l and below.

Generally, EM1 has ammonium values ranging from 0-2 mg/l over the 2000-2006 period but have declined since 2006 to values below 0.4 mg/l. The values for 2011 ranged from 0.03 - 0.07mg/l NH₄.

Downstream values (EM6-10) ranged from 0-22 mg/l over the 2000-2006 period but have declined since 2006 to values below 0.44mg/l. The values for 2011 ranged from 0.01 - 0.08mg/l NH₄.

Trabeg

Generally, upstream Trabeg (EM7) has BOD values varying from 1-14 mg/l over the 2000-2010 period. The average value for 2011 was 8.4 mg/l BOD.

The downstream values (EM8) have BOD ranging from 1-14 mg/l. The values for 2011 ranged from 7.7 - 9.6 mg/l BOD.

EM7 has ammonium values varying from 0.01-20mg/l in the period 2000-2010. The higher values were observed prior to 2007 and have declined substantially since then to values below 1mg/l. The values for 2011 ranged from 0.03 - 0.11 mg/l NH₄.

Since landfill leachate is much higher in ammonium values than sewage, this may indicate that pollution from landfill activities has decreased substantially but sewage pollution upstream has remained.

EM8 is similar. Ammonium values varied from 0.02- 37 mg/l in the period 2000-2006 but have declined substantially since 2006 to values below 1mg/l.

Other Parameters

The more extended annual list of heavy metals, pesticides, PAH, organochlorines etc. does not show any remarkable trend or concentrations. Generally these are at or below limits of detection as in the past.

There is generally little difference between upstream and downstream values for these parameters.

Weekly Visual Inspections

Normally there is nothing unusual reported. The most common observation over the stretch of waters inspected is muddy.

EM8 (downstream - Trabeg) is generally described as stagnant and greenish. Algae are occasionally observed at the downstream locations and this is not surprising because the river at these locations is relatively stagnant, at the top of the tide.

EM7 (upstream in the Trabeg) occasionally displays sewage fungus indicating pollution upstream of landfill.

Particulates and Odour

Particulates (Results for previous year in brackets)

Particulates as measured by the total suspended particulate parameter were below the EU limits and guide values in 2011 as in 2010.

Particulates as measured by the PM10 parameter are measured outside and within the landfill boundary. There is a trigger level of 50 µg/m³ for boundary monitoring. It would not be possible to separate ambient levels and the contribution from the facility.

The station outside the landfill at Heatherton Park to the north east of the landfill at S3, where samples are being taken daily for PM10, had 13 days (6 days) in the year when concentrations exceeded 50 µg/m³. These most likely were due to domestic fuel burning in the very cold weather experienced in 2011 and not associated with the landfill. The main contributor at this station is domestic fuel burning.

There needs to be 35 daily samples exceeding the 50 µg/m³ figure to breach the EU standard.

There were no PM10 samples taken at the other stations S1, S2 and S4 (all within the landfill boundary).

Odour

Odour Monitoring Ireland Ltd carried out the odour monitoring.

There are no limits in the licence.

Three no. odour reports were issued in 2011 for Q2, Q3 and Q4.

All ambient odour concentrations were low both for the offsite stations - O1 - O9; and for the on-site stations - A1 - A6.

The highest odour concentration recorded was 114 Ou_E/m³ detected at monitoring location A5 (Heatherton Park).

Hydrogen sulphide concentrations were less than 3ppb at all locations.

GCMS screens illustrated a large array of volatile organic compounds present in the air stream at all monitoring locations (possibly associated with traffic based emissions from the roads surrounding the landfill site).

All ambient air concentrations were low and well within any respective exposure threshold concentrations.

Nuisances

Monitoring Locations

Weekly visual inspections describe the appearance of the landfill from Amberly Heights (south of the landfill), Greenhills Estate (north east) and Heatherton Park (north).

Results (last years in brackets)

There were 90 (129) observations.

Rodents were observed on 0 occasions (0).

Flies were observed on 0 occasions (0).

Odour was observed on 0 (1) occasions.

Birds were noticed on 0 (0) occasions.

Noise was observed on 0 (0) occasions.

Loose litter was seen on 0 (0) occasions.

Compost

The compost as analysed satisfies the limits for heavy metals in a Grade 1 compost.

Appendix

Graphs

- [Ground Water Wells ó Greenhills & Nemo Rangers](#)

Reports

- [Biological Survey of Streams Report](#)
- [Air Emissions testing of the Flare Unit & Gas Utilisation Engine](#)
- [PRTR Table for Flare Unit & Gas Utilisation Engine](#)
- [Landfill Gas Surface Emissions Survey](#)

31-May-11

Well	Temp	pH	Conductivity μS/cm	NH3	chloride	Oxygen	COD	TON	TOC	S. Solids
Greenhills North Deep	17.6	7.37	2.03ms/cm	18	467	4	65	3	4	2394
Greenhills North Shallow	17.1	7.07	3.78mS/cm	3.9	1240	8.88	20	0	17	78
Greenhills South deep	17.3	7.6	479μS/cm	1.3	167	1.78	7	4	2	1587
Greenhills South shallow	17	7.07	831μS/cm	0.59	38	9.18	2	0	4	96

15-Jun-11

Well	Temp	pH	Conductivity μS/cm	NH3	chloride	Oxygen	COD	TON	TOC	S. Solids
Greenhills North Deep	14.8	7.24	1,644	19	120	6.07	114	14	3	444
Greenhills North Shallow	14.5	7.5	3,530	4.6	1,187	5.26	8	6	19	7.6
Greenhills South deep	14.2	7.21	466	1.5	60	5	3	10	1.5	6
Greenhills South shallow	14.4	7.45	926	0.57	173	4.75	1	2	3	8.8

13-Jul-11

Well	Temp	pH	Conductivity μS/cm	NH3	chloride	Oxygen	COD	TON	TOC	S. Solids
Greenhills North Deep	19	7.47	1,763	4	486	5.37	13	0	4	25.6
Greenhills North Shallow	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry
Greenhills South deep	18.5	7.35	803	1	144	5.16	15	0	2	24.4
Greenhills South shallow	18.2	7.08	471	1	34	3.84	10	0	3	153

24-Aug-11

Well	Temp	pH	Conductivity	NH3	chloride	Oxygen	COD	TON	TOC	S. Solids
			μS/cm							
Greenhills North Deep	16.2	7.64	1,616	40	127	5.57	90	2	24	39.8
Greenhills North Shallow	15.2	7.68	2,040	4	208	5.04	14	0	3	12.1
Greenhills South deep	14.5	7.8	471	2	56	6.11	13	3	3	29
Greenhills South shallow	14.7	7.68	727	2	103	8.56	15	2	3	155

22-Sep-11

Well	Temp	pH	Conductivity	NH3	chloride	Oxygen	COD	TON	TOC	S. Solids
			μS/cm							
Greenhills North Deep	15.2	7.43	1,610	5.1	443	4.07	1	11	2	9.2
Greenhills North Shallow	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY
Greenhills South deep	14.7	7.27	469	1.8	86	5.03	1	13	2	33
Greenhills South shallow	15.2	7.37	666	1.5	34	5.61	3	1	2	173

18-Oct-11

Well	Temp	pH	Conductivity	NH3	chloride	Oxygen	COD	TON	TOC	S. Solids
			μS/cm							
Greenhills North Deep	15	7.27	1,707	4.59	403	6.05	11	3	0	24
Greenhills North Shallow	16	7.45	2,270	5.44	51	8.46	52	13	3	1,014
Greenhills South Deep	14.4	7.4	677	3.8	47	4.14	<1	15	6	15.6
Greenhills South shallow	13.9	7.19	475	1.33	37	7.37	10	2	0	105

16-Nov-11

Well	Temp	pH	Conductivity	NH3	chloride	Oxygen	COD	TON	TOC	S. Solids
			μS/cm							
Greenhills North Deep	16.3	7.28	1,284	5	213	4.88	29	3	12	14.4
Greenhills North Shallow	16.6	7.24	1,758	1	19.9	6.78	19	3	13	474
Greenhills South deep	16	7.28	928	10	46.8	3.05	117	3	25	39
Greenhills South shallow	16	7.26	468	1	44	3.78	>1	3	6	6.8

**AN ASSESSMENT OF THE WATER QUALITY STATUS OF
SELECTED SITES ON THE TRAMORE AND TRABEG RIVERS
USING BIOLOGICAL METHODS**

(September - 2011)

Commissioned by: Cork City Council
Carried out by: Aquatic Services Unit – UCC.
(January 2012)

Introduction

As part of their waste licence conditions for the Kinsale Road Landfill, Cork City Council commissioned the Aquatic Services Unit, to undertake a biological assessment of the water quality status of selected sites on the Tramore and Trabeg rivers. Both rivers flow adjacent to or through the site of the landfill and have in the past, at least, been impacted by leachate from the landfill. The fieldwork for the 2011 monitoring was undertaken in late September.

Methods

Two samples (combined as one composite) were taken at each site using a kick-sample technique, where this was possible. Each sample was collected in areas of moderate to shallow swift current in coarse substrate usually comprising small to large stones and cobbles. The samples were then sieved to remove silt and poured into a white sorting tray. There the macroinvertebrates present are identified and their notional abundance estimated. The macroinvertebrate data arising is then assessed using the same biotic index system used by the Environmental Protection Agency (EPA) in their ongoing monitoring of biological quality in Irish rivers. The index assigns a score to the macroinvertebrate collection at a given site depending on the relative proportion of pollution sensitive and pollution tolerant organisms present. The greater the number and diversity of pollution sensitive types present (particularly, certain mayflies, stoneflies and cased caddis flies) the higher the score or quality class assigned to a given site. The highest score category is Q5 which indicates pristine water quality conditions and is recognised by having a high proportion of pollution sensitive species and very few or any pollution tolerant forms, whereas Q1 at the other end of the scale indicates gross pollution. The table below indicates the Q-value scores, which can be assigned and the corresponding degree of pollution associated with them.

Q-Value	Degree of Pollution
Q5, Q4-5, Q4	Unpolluted
Q3-4	Slightly Polluted
Q3, Q2-3	Moderately Polluted
Q2, Q 1-2, Q1	Serious to Gross Pollution

It's important to point out that few sites on the Tramore and Trabeg rivers have sites, which could be said to be ideal for this system of biological monitoring, and some are completely un-suitable (e.g. Sites A and B). In the latter cases the flow is very sluggish and the bottom material consists mainly of mud or peaty mud. In these cases, general observations and experience are used in order to gauge the likely biological water quality status. Furthermore, the second most upstream site on the Tramore River at the 'ford' within the landfill was partially modified since the survey in 2009 by the installation of a crump weir for discharge gauging. This weir has resulted in the water upstream becoming stiller and more sluggish than usual and this appears to be increasing the rate of plant encroachment at Site C upstream of the landfill.

Results

Samples were taken on September 23rd 2011 at sites the positions for which were agreed with the EPA and listed in the conditions of the licence.

Site A (Trabeg River: Upstream Site)

There was no perceptible flow at the site, and it retained a muddy bottom which had a loose cover of filamentous green algae (~5%) (Plate 1). Water was slightly turbid. The near total cover of Water Starwort (*Callitriche* sp.) of 2010 was now confined to the margins where it ranged from 15-20% cover on the left bank and ~5-10% cover along the right bank. Small amounts of Water plantain (*Alisma plantago-aquatica*) and Hemlock water dropwort (*Oenanthe crocata*) were also noted. These conditions are similar or slightly improved on last year. Net-sweeps through the aquatic vegetation and surface sediment were dominated by chironomid midge larvae (Tanypodinae with some *Chironomus*), with occasional, *Asellus*, juvenile Water boatmen (Corixidae sp.), snails (*Lymnaea peregra*), *Baetis* and stickleback. Overall, while the flow conditions and substrate were not suitable for assigning a Q-value, the conditions would point to a Q-rating of around Q2 to Q2-3, i.e. similar to last year.

The left bank behind was dominated by Willow, Bramble and Fuchsia with nettle also common. The right bank was dominated by a range of herbaceous species including nettle, Hedge bindweed, Creeping Thistle, *O. crocata* and *Phalaris*. Occasional small willow were also present.

Site B (Trabeg River: 2nd Site Downstream)

This site is like Site 1 in being a very slack flow site dominated by a muddy bottom and also with a slight cloudiness in the water on the day. There was no out-gassing from the muddy sediment noted at the time. In-channel submerged plant cover was lower than in 2010 with just 5-10% cover of *Callitriche* sp. Filamentous green alga was locally abundant on the sheltered margins of the left bank, while a narrow-leaved pondweed (*Potamogeton* sp.) was also noted at the site. *Apium* occurred occasionally at the margins. The left bank was dominated by Willow, backing bramble, grass, occasional hedge bindweed and Water figwort, with clumps of *Phalaris* at the water's edge. Common reed (*Phragmites*) was present on the same side of the channel about 30m upstream (Plate 2). The right bank included a range of herbaceous species including *Phalaris*, hard rush (*Juncus inflexus*), thistle, *Angelica*, great willow herb (*Epilobium hirsutum*) and water pepper (*Persicaria hydropiper*). Scattered small willow were also present.

Nets-weeps through submerged vegetation and the sediment surface were dominated by *Asellus*, with frequent juvenile water boatmen (Corixidae), *Lymnaea peregra* and planorbid snails, chironomid midges (*Chironomus* and Tanypodinae) and an unidentified leech. Like Site A, the conditions were unsuitable for Q-ratings,

because of the muddy substrate and almost standing water conditions. Conditions were similar to last year and Q-rating of Q2 to Q2-3 is suggested.

Site C (Tramore River: most upstream site within the landfill boundary)

This site is at a fording point in the Tramore River within the precincts of landfill and at the same point is crossed by a kind of bridge for carrying pipes. Since the 2009 sampling, a crump weir has been built at this site for discharge gauging and this has had the effect of creating a stilling basin immediately upstream, with water backed-up and very laminar. Since 2011 there seems to have been some angular limestone cobble added to the ford as far less silt was in evidence. Immediately upstream of this ford, the channel has become completely occluded by heavy in-stream growth of Great reedmace / Bull-rush (*Typha latifolia*) and branched burr-reed (*Sparganium erectum*) with low-growing Brooklime (*Veronica beccabunga*) at the margins (Plate 3). From about 10m downstream, of the gauging weir the channel is choked in-stream by a total cover of *Potamogeton natans* with large marginal stands of *S. erectum* and *Typha* along the left bank with about 20% cover of filamentous algae elsewhere (Plate 4). Clumps of *Glyceria* sp. (Flote grass) were also noted. Willow was common backing both banks upstream and downstream of the ford.

Kick-samples were taken in immediately downstream of the weir in a spot with silted sand and gravel. The results are at presented in the table below. They indicate grossly polluted conditions very similar to 2010.

Macroinvertebrates in Site C kick-samples

Common Name of Group	Scientific Name	Notional Abundance
Non-biting Midges	<i>Chironomus</i>	++/+
Non-biting Midges	Tanypodinae	++
Water Beetles	Haliplid adult	+
Wandering Snail	<i>Lymnaea peregra</i>	+++
Pea Mussels	Sphaeridae	+++
Water Hog Louse	<i>Asellus</i>	++++D
Segmented worms	<i>Lumbriculus variegatus</i>	+++
Water mites	Acari	+++
Leech	<i>Hellobdella stagnalis</i>	+++
Leech	<i>Glossiphonia complanata</i>	++
Oligochaete worms	Lumbricidae	+
Oligochaete worms	Tubificidae	+
Stickleback		1
EPA Q-value		Q 2 (Q2-3)

Site D (*Tramore River: 2nd site downstream of boundary*)

The sampling point is at a constriction in the river where the channel flows over a small loose limestone boulder weir (Plate 5) immediately downstream of a sluggish stretch, which was dominated by Broad-leaved Pondweed (80-90% cover) and Fool's watercress (*Apium nodiflorum*) 5-10% cover. The left bank margin had a loose stand of *Typha* and Woody nightshade (*Solanum dulcamara*), while the left bank proper had nettle, great willow herb, Himalayan balsam (*Impatiens glandulifera*) and grass backed by willow and alder. The right bank was dominated by grass, Great Willowherb (*Epilobium hirsutum*) nettle and hedge bindweed backed by willow and alder. About 5-10% filamentous green algal cover (*Cladophora*) are common on the stones of the semi-submerged 'weir', *Callitriche stagnalis* was also present on the weir.

In channel, the substrate of the kick-sampling area (just on the weir) comprised angular limestone cobbles and small boulders in a moderate to swift turbulent flow. Results were very similar to 2010 (see Table below).

Kick-sample results Site D:

Common Name of Group	Scientific Name	Notional Abundance
Black fly larvae	Simuliidae	+++
midge larva	Ceratopogonidae	++
Water beetle adult	Coleoptera	+
Water Hoglouse	<i>Asellus aquaticus</i>	++++D
FW shrimp	<i>Gammarus (juv)</i>	+/+
Ram's Horn snails	<i>Planorbis sp.</i>	++/+
FW limpet	<i>Ancylus fluviatilis</i>	+
Leeches	<i>Glossiphonia complanata</i>	+++
Leeches	<i>Helobdella stagnalis</i>	+++
Segmented worms	Tubificidae	+
Water mites	Acari	+++
Flatworms	Tricladia	+/+
Oligochaete worms	<i>Lumbriculus</i>	++
EPA Q-value		Q2

Site E (*Tramore River upstream of the landfill: outside the boundary to the west*)

Access to the site remains extremely difficult despite and a machete had to be used again to allow access. Here the channel, which has been generally over-widened upstream as a result of drainage, narrows through the eye of a small bridge (W6780 6943). The upstream area is becoming completely silted up due to urban siltation and is destined to become a wetland or marsh over the next decade if it continues at the current rate and it isn't dredged out (Plate 6). This site was chosen as it is the only one in this section of channel which can be sampled; the listed site (200m u/s) is pure sandy mud and therefore unsuitable. However, the new crump weir within the landfill (Site C) looks as if it may be contributing to the water backing up at this site, so that when it came to kick-sampling there was no perceptible flow and all that could be done was to disturb the heavily silted cobbles with the heel of a wader boot and sweep the pond net through the suspension to sample any dislodged invertebrates.

The channel here is 2-3m wide (Plate 7). The site is very shaded and effectively plant free. Immediately upstream of the bridge the channel is much wider (>10m) and comprises deeply silted channel with large stands of *Typha* and *Sparganium erectum*, which are now encroaching on virtually the entire channel. Willow and alder dominates the left bank, while the RHS bank had Willow, Alder, nettle, Water figwort (*Scrophularia auriculata*), winter heliotrope (*Petasites fragrans*) and other herbaceous species. There is also a very large growth of the alien invasive species Japanese Knotweed (*Fallopia japonica*) just upstream of the bridge. The site remains seriously polluted.

Kick-sample results Site E:

Common Name of Group	Scientific Name	Notional Abundance
Non-biting Midges	<i>Chironomus</i>	+/+
Non-biting Midges	Tanypodinae	++++
Water Hoglouse	<i>Asellus aquaticus</i>	+
Pea mussels	Sphaeridae	++++D
Leeches	<i>Glossiphonia complanata</i>	+
Leeches	<i>Helobdella stagnalis</i>	+
Fish	Stickleback	1
EPA Q-value		Q2

Site F (150m downstream of the confluence of the Tramore and Trabeg Rivers).

This site was 150m to 200m downstream of the confluence of the Tramore and Trabeg Rivers. Samples were taken in short riffle where the channel narrows and where the substrate comprises silted large pebble/small cobble and gravel in a moderate to moderately swift turbulent flow (Plate 8). There was about 20-25% loose cover of the estuarine alga *Enteromorpha* on the substrate. Marginally the right bank had *Apium nodiflorum* and grass backed by Willow, while the left margin also had *Apium* backed in places by dense *Phalaris* with gorse bramble and grass higher up on the bank. Horned Pondweed (*Zannichellia palustris*), which was locally abundant at and downstream of the site in 2010 was not noted in 2011.

Kick-samples results indicate a very similar mix of species and dominance as compared to 2010 and therefore essentially the same water quality.

Kick-sample results Site F:

Common Name of Group	Scientific Name	Notional Abundance
Non-biting Midges	Chironomidae	+/+
Non-biting Midges	Tanypodinae	++/+
Water beetle adult	Dytiscidae	+
Water Hoglouse	<i>Asellus aquaticus</i>	++++D
Freshwater shrimp	<i>Gammarus</i> sp.	++++
Jenkin's Spire shell	<i>Potamopyrgus jenkinsi</i>	+++/+
Pea mussels	Sphaeridae	+++
Leeches	<i>Glossiphonia complanata</i>	+
Leeches	<i>Trocheta</i>	+
EPA Q-value		Q2

Conclusion

In 2011 produced very similar results to 2010 with only marginal differences in macroinvertebrate communities since last year. Subtle changes in Site A and B on the Trabeg related to alterations in the cover of submerged macrophytes which had been more widespread in 2010, while at Sites C and D on the Tramore, the gradual siltation of the channel and encroachment of emergent species such as *Typha* and *Sparganium* is a continuing feature. Overall, water quality hasn't changed.



Plate 1 Trabeg River: Site A - 23-09-2011



Plate 2 Trabeg River: Site B (view of channel) 23-09-2011



Plate 3 Tramore River: Site C (view upstream) showing emergent *Sparganium* and *Typha* blocking the channel. Note new cobble at ford in the foreground. 23-09-2011



Plate 4 Tramore River: Site C (view downstream) 23-09-2011.



Plate 5 Tramore River: Site D (view of submerged 'weir') 23-09-2011.



Plate 6 Tramore River: Site E (view d-s to kick-sampling point, showing heavy in-channel growth of *Typha* and *Sparganium*) 23-09-2011



Plate 7 Tramore River: Site E - view of kick-sample site under bridge (23-09-2011)



Plate 8 Tramore River Site F: kick-sampling site (23-09-2010)



ODOUR & ENVIRONMENTAL ENGINEERING CONSULTANTS

Unit 32 De Granville Court, Dublin Rd, Trim, Co. Meath

Tel: +353 46 9437922
 Fax: +353 46 9483696
 Mobile: +353 86 8550401
 E-mail: info@odourireland.com
www.odourireland.com

TITLE: AIR EMISSION TESTING OF ONE LANDFILL FLARE AND ONE GAS UTILISATION ENGINE LOCATED IN KINSALE RD LANDFILL, BALLYPHEHANE, CURRAGHCONWAY, INCHISARFIELD, SOUTH CITY LINK ROAD, CORK.

PREFORMED BY ODOUR MONITORING IRELAND ON BEHALF OF CORK CITY COUNCIL

PREPARED BY:	Dr. John Casey
ATTENTION:	Mr. Kevin Ryan
LICENCE NUMBER:	WL0012-03
LICENCE HOLDER:	Cork City Council
FACILITY NAME:	Kinsale Road Landfill Facility
DATE OF MONITORING VISIT:	05 th December 2011
NAME AND ADDRESS OF CLIENT ORGANISATION:	Kinsale Road Landfill, Ballypnehane, Curraghconway, Inchisarsfield, South City Link Road, Cork
NAME AND ADDRESS OF MONITORING ORGANISATION:	Odour Monitoring Ireland, Unit 32 DeGranville Court, Dublin Road, Trim, Co. Meath
DATE OF REPORTING:	06 th Jan 2012
NAME AND THE FUNCTION OF THE PERSON APPROVING THE REPORT:	Dr. Brian Sheridan, Managing Partner, Odour Monitoring Ireland
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REVIEWERS:	


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Document Amendment Record

Client: Cork City Council

Project: Air emission testing of one Landfill flare and one gas utilisation engine located in Kinsale Road Landfill, Ballyphehane, Curraghconway, Inchisarsfield, South City Link Road, Cork.

Project Number: 2011A400(1)			Document Reference: Air emission testing of one Landfill flare and one gas utilisation engine located in Kinsale Road Landfill, Ballyphehane, Curraghconway, Inchisarsfield, South City Link Road, Cork		
2011A400(1)	Document for review	B.A.S.	JMC	B.A.S	06/01/2012
Revision	Purpose/Description	Originated	Checked	Authorised	Date
					

Signing sheet



Brian Sheridan Ph.D Eng

For and on behalf of Odour Monitoring Ireland

1. Executive Summary

The results of the monitoring exercise are contained in Section 2 of this report.

- CO, NO_x as NO₂, T A Luft Organics, HCL, HF, TPM and TOC emissions from TV01 and Flare 1 were within the emission limit values specified in Waste licence W0012-3.

1.1 Monitoring Objectives

This report has been prepared by Odour Monitoring Ireland and contains the results of emission testing carried out on 1 No. Enclosed ground flare and 1 No. Gas utilisation engine at Kinsale Rd Landfill, Ballyphehane, Curraghconway, Inchisarsfield, South City Link Road, Cork. The emission testing was carried out in compliance with the requirements of Waste licence W012-03. The emission testing was carried out by Odour Monitoring Ireland on behalf of Cork City Council.

1.2 Special Monitoring Requirements

There were no special monitoring requirements for this campaign.

1.3 The substances to be monitored at each emission point

The parameters listed in *Table 1.1* were monitored using the appropriate instrumentation as illustrated in *Table 1.1*. All monitoring was carried out in accordance with Environmental Protection Agency Office of Environmental Enforcement (OEE) Air Emission Monitoring Guidance Note 2 (AG2).

Table 1.1. Monitored parameters and techniques for Kinsale Road Landfill 1 No. Enclosed flare and 1 No. Gas utilisation engine.

Sample location	Parameter	Analytical method
1 Landfill Flare and 1 Gas utilisation engine TV01 outlet	Volumetric airflow rate & Temperature ($^{\circ}\text{C}$)	Pitot in accordance with EN13284-1 where possible. MGO coated K type thermocouple and PT100 Volumetric airflow rate theoretical calculated for Landfill flare.
1 Landfill Flare and 1 Gas utilisation engine TV01 outlet	Oxides of nitrogen (NO_x as NO_2), Carbon monoxide (CO), Carbon dioxide (CO_2), Sulphur dioxide (SO_2), and Oxygen (O_2)	Horiba PG250 All analytes, Oxygen EN14789, Oxides of Nitrogen Chemiluminescence, Carbon Monoxide EN15085.
1 Gas utilisation engine TV01 outlet	T A Luft Organics	Sorbent tubes and analysis via thermal desorption in accordance with ISEN13649:2002
1 Landfill Flare outlet	Total Volatile Organic Carbon	Portable Signal 3030PM FID calibrated with Propane in accordance with EN13526:2002.
1 Gas utilisation engine TV01 outlet	Total Particulates (TPM)	TCR Tecora in accordance with ISEN13284-1
1 Landfill Flare and 1 Gas utilisation engine TV01 outlet	Hydrogen chloride (HCL)	Impinger train containing high purity deionised water solution in accordance ISEN 1911:2010
1 Landfill Flare and 1 Gas utilisation engine TV01 outlet	Hydrogen fluoride (HF)	Impinger train containing 0.10 molar sodium hydroxide ISEN 15713:2006

This report presents details of this monitoring programme. This environmental monitoring was carried out Dr. John Casey, Managing Partner, Odour Monitoring Ireland on the 05th December 2011. Methodology, Results, Discussion and Conclusions are presented herein.

2. Monitoring Results

This section will present the results of the monitoring exercise.

2.1 Operating Information

Emission Point Reference	Date	Process Type	Process Duration	Fuel	Feedstock	Abatement	Load
TV01	05/12/2011	Gas Utilisation Engine	Continuous	Landfill Gas	N/A	None	Landfill Gas
Flare 1	05/12/2011	Landfill flare	Continuous	Landfill Gas	N/A	None	Landfill Gas

Note: ¹ Flare 1 is located in the landfill gas compound

2.2 Monitoring Result Reference Conditions

Emission Point Reference	Temperature (K)	Pressure	Moisture Correction	Oxygen Correction (%)
TV01	K	101.3	Yes	5
Flare 1	K	101.3	Yes	3

2.3. Sampling Location Summary

Comment	Yes/No
Recommended 5 hydraulic diameters straight length before sampling plane	Yes
Recommended 2 hydraulic diameters straight length after sampling plane	Yes
Ports number <1.5m - 2 ports >1.5m - 4 ports	1 port on flare and engine
Appropriate port size	Yes
Suitable working platform	Yes

Note: Temperature and airflow rate traverse measurements were performed across the stack in one plane only on the flare and engine.

2.4. Sampling time runs for monitoring of 1 landfill flare and 1 gas utilisation engine.

Parameter	Approx. Sampling period for 1 landfill flare	Approx. Sampling period for 1 gas utilisation engines
Inlet CH ₄	35 minutes	40 minutes
Inlet O ₂	35 minutes	40 minutes
Volumetric air flow rate	Theoretically calculated	Manually calculated
SO ₂	35 minutes	40 minutes
NO _x	35 minutes	40 minutes
CO	35 minutes	40 minutes
O ₂	35 minutes	40 minutes
CO ₂	35 minutes	40 minutes
Stack gas temp	35 minutes	40 minutes
THC	35 minutes	40 minutes
TA Luft Organics	-	40 minutes
TOC	35 minutes	-
TPM	-	33 minutes
HCL	33 minutes	35 minutes
HF	31 minutes	38 minutes

2.5. Characteristics of raw inlet gas to enclosed Landfill flare

Inlet compound identity	Flare 1	Unit values
CH ₄	54	%
CO ₂	29.5	%
O ₂	1.5	%
Total Landfill gas volumetric airflow rate	410	m ³ /hr

2.6. Theoretically calculated landfill gas exhaust volume and physical characteristics from the Landfill flare.

Parameter	Enclosed flare 1
Total Volumetric methane loading (m ³ /hr)	221
Total Volumetric Oxygen loading (m ³ /hr)	6.15
Ratio to complete combustion of methane assuming no excess Oxygen	9.57
Oxygen concentration level in flue gas (%)	11.57
Flue gas temperature (Kelvin) ²	1277
Theoretical calculated Volumetric exhaust airflow rate (m ³ /h)	5,651
Normalised average exhaust airflow rate (Nm ³ h ⁻¹) ³	1,208

Notes: ¹ denotes data from 05th Dec. 2011.
² denoted converted from degrees Celsius to Kelvin (°C + 273.15);
³ denotes normalised to 273.15 Kelvin and 101.3 kPa.

Table 2.7. Emission value results from landfill gas flare 1

Hasse flare 1 front	Conc.	Units	Adjusted units (mg/m ³)	Oxygen corrected emission concentration to 3 (mgN/m ³)	Expanded uncertainty as percentage of limit value (%)	Emission limit Values	Operating Status
Carbon monoxide (CO)	1.00	ppm	1.25	2.40	8.97	50 mg/Nm ³	As Normal
Temperature	1004	degrees	1277K	-	-	-	As Normal
Oxygen (O ₂)	11.57	%	11.57	-	-	-	As Normal
Oxides of nitrogen (NO _x as NO ₂)	34.00	ppm	69.82	133.96	22.57	150 mg/Nm ³	As Normal
Sulphur dioxide (SO ₂)	3.00	ppm	8.57	16.44	-	-	As Normal
Carbon dioxide (CO ₂)	5.20	%	-	-	-	-	As Normal
Total Organic Compound (TOC)	1.4	ppm	2.24	4.30	25.97	10 mg/Nm ³	As Normal
Hydrogen Fluoride (HF)	0.42	mgN/m ³	0.42	0.81	-	<5 mg/Nm ³ (at mass flow > 0.050 kg/hr)	As Normal
Hydrogen Chloride (HCL)	0.64	mgN/m ³	0.64	1.24	-	<50 mg/Nm ³ (at mass flow > 0.30 kg/hr)	As Normal
Volumetric Airflow rate (Nm ³ /hr)	-	-	-	629.61	-	<3,000 m ³ /hr	As Normal

Notes:

Leak check results for Horiba = <2%

Leak check results for Signal = <2%

Leak check results HCL = <2%

Leak check results HF = <2%

Span (<2% range) and drift values within acceptable tolerance (<1%) for Horiba.

Span (<2% range) and drift values within acceptable tolerance (<1%) for Signal.

Table 2.8. Emission value results from TV01

Parameter	Conc.	Units	Adjusted units (mg/m ³)	Oxygen corrected emission concentration to 5% (mgN/m ³)	Expanded uncertainty as percentage of limit value (%)	Emission limit Values	Operating Status
Total Organic Compound (TOC)	0.95	ppm	1.52	1.69	-	² 20 mg/Nm ³ (at mass flow of 0.10 kg/hr)	As Normal
Temperature	374.49	degrees	647 K	-	-	-	As Normal
Carbon monoxide (CO)	622.53	ppm	778.16	862.82	5.31	1400 mg/Nm ³	As Normal
Oxygen (O ₂)	6.56	%	-	-	-	-	As Normal
Oxides of nitrogen (NO _x as NO ₂)	208	ppm	427.14	473.61	8.46	500 mg/Nm ³	As Normal
Sulphur dioxide (SO ₂)	3	ppm	8.57	9.50	-	-	As Normal
Carbon dioxide (CO ₂)	8.18	%	-	-	-	-	As Normal
Particulates (TPM)	25	mgN/m ³	25.00	65.72	-	130 mg/Nm ³	As Normal
Hydrogen Fluoride (HF)	0.49	mgN/m ³	0.49	0.54	-	<5 mg/Nm ³ (at mass flow > 0.050 kg/hr)	As Normal
Hydrogen Chloride (HCL)	0.29	mgN/m ³	0.29	0.32	-	<50 mg/Nm ³ (at mass flow > 0.30 kg/hr)	As Normal
Volumetric Airflow rate (Nm ³ /hr)	-	-	-	1755.45	-	-	As Normal

Notes:

² denotes limit values TA Luft Organics Class I 20 mg/m³ (at mass flows >0.1 kg/hr), Class II 100 mg/m³ (at mass flows >2 kg/hr), Class 150 mg/m³ (at mass flows >3 kg/hr)

Leak check results for Horiba = <2%

Span (<2% range) and drift values within acceptable tolerance (<1%) for Horiba.

DI % for Total particulates = +4.35%

Total particulates filter weight gain measured in UKAS accredited Laboratory RPS Labs

Angle of flow = <15 degrees

Negative flow in stack = None

Pitot pressure difference = >5 Pa

Ratio of flow measurement = <3:1

Number of ports = 1

Straight length before sample point = >5 –in compliance

Straight length after sample point = >5 – in compliance

Sample blank = < 0.95% which is <10% ELV – Compliant

Leak check results = <1% for blanks and sample runs

Pitot leak check = OK

3. Discussion of results

Tables 2.1 to 2.8 present the results of the emission monitoring carried out on the 1 landfill flare stack burner and 1 gas utilisation engine located in Kinsale Rd Landfill, Ballyphehane, Curraghconway, Inchisarsfield, South City Link Road, Cork.

There was very little variation at one traverse in oxygen and flue gas temperature profiles across the stack during the monitoring exercise (i.e. less than 15% as recommended by the Environment Agency, UK (Environment Agency, 2002)).

A high temperature Inconel 625 and ceramic probe (Testo, Germany) was used to prevent variations in CO emissions data. Normal stainless steel probes when subjected to temperatures above 600°C can release CO from within the structure of the material and cause the recording of erroneous results (Environment Agency, 2002).

Correction of data to 3% & 5% oxygen was performed. Due to possible inaccuracies in airflow rate measurement, it was not possible to determine the oxygen intake of the flare through the louver system using measurement. Since the volume of intake air required for complete combustion was known and the oxygen concentration in the exhaust flue gas was known, the volume of intake excess fuel air could be theoretically calculated through numerous iterations using the Solver program (i.e. Microsoft Excel). This allows for the calculation of the volume of intake excess air through the louver landfill flare intake system (Environment Agency, 2002).

4. Conclusion

The following conclusions can be drawn from this study:

1. A theoretical exhaust flue gas volume was calculated for the landfill flare. Actual measurements were performed on the gas utilisation engine TV01.
2. NO_x as NO₂, SO₂, CO, O₂, T A Luft Organics, HCL, HF, TPM and TOC monitoring and analysis was carried out in accordance with specified requirements;
3. All data was standardised to 273.15 Kelvin, 101.3 kPa;
4. All data is presented as Oxygen corrected to 3% and 5% (v/v) using the appropriate equations;
5. CO, NO_x as NO₂, T A Luft Organics, HCL, HF, TPM and TOC emissions from TV01 and Flare 1 were within the emission limit values specified in Waste licence W0012-3.

5. References

1. Environment Agency. (2002). Guidance for Monitoring Enclosed Landfill Gas Flares. www.environment-agency.co.uk
2. McVay, M., (2003). Personal communication. Environment Agency, Wales, UK.
3. Environmental Protection Agency. (2009). Air Emissions Monitoring Guidance Note 2 (AG2).

6. Appendix I-Sampling, analysis

6.1.1 Location of Sampling

Kinsale Rd Landfill, Ballyphehane, Curraghconway, Inchisarsfield, South City Link Road, Cork,

6.1.2 Date & Time of Sampling

05th December 2011

6.1.3 Personnel Present During Sampling

Dr. John Casey, Odour Monitoring Ireland, Trim, Co. Meath.
MCERTS: MM0674

6.1.4 Instrumentation check list

Testo 350 MXL/454 in stack analyser;
Federal Method 2 S type pitot and MGO coated thermocouple;
L type pitot tube
Testo 400 handheld and appropriate probes.
Ceramic and Inconel 625 sampling probes.
Portable Signal 3030PM FID calibrated with Propane with non-methane hydrocarbon cutter.
TCR Tecora.
Horiba PG250

European PRTR Table Kinsale Rd Landfill flare and gas utilisation engine only.

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

	Carbon Monoxide (CO) (kg/yr)	Carbon dioxide (CO₂) (kg/yr)	Nitrogen Oxides (NO_x as NO₂) (kg/yr)	TNMVOC's (kg/yr)	Sulphur dioxide (SO₂) (kg/yr)	Total particulates (kg/yr)	Methane (kg/yr)
Flare	13	562,811	738	-	91	-	24
BY01	13,116	2,470,240	7,272	26	146	1,068	8,609
Totals	13,129	3,033,051	8,010	26	237	1,068	8,633
Emission Limits	500,000	100 million	100,000	100,000	150,000	50,000	100,000
Compliance	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: ¹ denotes the flare is operated on standby when gas utilisation engine failure occurs, therefore this is not added to the total emission value for the combustion plant in PRTR reporting.

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



ODOUR & ENVIRONMENTAL ENGINEERING CONSULTANTS

Unit 32 De Granville Court, Dublin Rd, Trim, Co. Meath

Tel: +353 46 9437922

Mobile: +353 87 6829011

E-mail: info@odourireland.com

john@odourireland.ie

Website: www.odourireland.com

W0012-03-VOC/SURFACEEMISSIONS/2012/1 LANDFILL GAS SURFACE EMISSIONS SURVEY AT KINSALE ROAD LANDFILL FACILITY, BALLYPHEHANE, CURRAGHCONWAY, INCHISARSFIELD, SOUTH CITY LINK ROAD, CORK., CORK.

PERFORMED BY ODOUR MONITORING IRELAND ON BEHALF OF CORK CITY COUNCIL

PREPARED BY:	Dr. John Casey
ATTENTION:	Mr. Kevin Ryan
LICENCE NUMBER:	WL0012-3
LICENCE HOLDER:	Cork City Council
FACILITY NAME:	Kinsale Landfill Facility
DATE OF MONITORING VISIT:	27 th Feb. 2012
NAME AND ADDRESS OF CLIENT ORGANISATION:	Kinsale Road landfill facility, Ballypnehane, Curraghconway, Inchisarsfield, South City Link Road, Cork., Cork
NAME AND ADDRESS OF MONITORING ORGANISATION:	Odour Monitoring Ireland, Unit 32 DeGranville Court, Dublin Road, Trim, Co. Meath
DATE OF REPORTING:	25 th Oct. 2011
NAME AND THE FUNCTION OF THE PERSON APPROVING THE REPORT:	Dr. Brian Sheridan, Managing Partner, Odour Monitoring Ireland
REPORT NUMBER:	2012119(1)
REVIEWERS:	

Document No. 2012119(ver.1)
Visit No: 01
Year: 2012

WL0012-03
Cork City Council
Kinsale Road Landfill Facility

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DOCUMENT AMENDMENT RECORD

Client: Cork City Council

Title: W0012-03-VOC/SurfaceEmissions/2012/1 Landfill Gas Surface emissions Survey at Kinsale Road landfill facility, Ballyphehane, Curraghconway, Inchisarsfield, South City Link Road, Cork., Cork.

Project Number: 2012119			Document	Reference:	W0012-03-
2012119(1)	Document for review	JWC	BAS	JWC	28/02/2012
Revision	Purpose/Description	Originated	Checked	Authorised	Date
					

Executive Summary

Cork City Council commissioned Odour Monitoring Ireland to perform a landfill gas surface emissions survey of Kinsale Road landfill facility (i.e. Waste licence number 12-03) in order to ascertain any likely sources of landfill gas surface emissions from the operating landfill. Landfill gas surface emissions are the predominant source of odour emissions from landfills in Ireland. The survey was carried out on the 27th February 2012.

During the surface emissions survey, the following tasks were performed on site:

1. Identification the key mechanisms that lead to the release of landfill gas surface emissions from the site.
2. Identify geographically on a site map, the locations of landfill gas surface emissions in order to perform remediation of the identified surface emissions areas.

The following conclusions were drawn from survey:

- Five zones of surface emissions were identified within the landfill facility that exceeded recommended trigger levels. These zones are identified geographically on a site map contained in *Appendix 1* of this report.
- There were 5 surface emissions zone greater than or equal to 500 ppm around identified features. There were 0 surface emissions zones greater than or equal to 100 ppm instantaneous reading on open surfaces within the landfill footprint.

1. Introduction

1.1. Background to work

Odour Monitoring Ireland was commissioned by Cork City Council to perform a specified independent Volatile organic compound surface emissions survey at Kinsale Road landfill facility. The assessment involved a Volatile organic compound (VOC) surface emissions survey of the landfill facility in order to ascertain the VOC emission points and mark them upon a map for remediation. This report presents a summary of the findings of a VOC surface emissions survey at Kinsale Road landfill facility, Ballyphehane, Curraghconway, Inchisarsfield, South City Link Road, Cork., Cork. The report is based on scientific measurements and observations made during a site visit conducted on the 27th February 2012.

1.2. Scope of work

The main aims of the survey included:

- Surface emissions monitoring in accordance with AG6 requirements.
- Discussion meeting with landfill manager once survey was complete in order to communicate main surface emissions areas for immediate remediation, where necessary.
- Identification of short-term mitigation measured to be implemented within the operating landfill to reduce surface emissions,

2. Techniques used

This section describes the techniques used throughout the study. The surface emissions surveying and reporting was performed by Dr. John Casey, Odour Monitoring Ireland. Dr. John Casey has performed surface emissions monitoring survey's on behalf of Odour Monitoring Ireland for regulatory bodies in Ireland and Northern Ireland, local authorities in Ireland, private waste operators in Ireland and borough councils in Northern Ireland. A full documented list of previous survey's is available upon request.

2.1. "Odour hog" monitoring within the landfill

The "Odour hog" (i.e. Version 2, 4 years old with less than 3.5 second response time for the FID) VOC analyser is a portable, intrinsically safe, survey VOC dual monitor, which provides fast and accurate readings of organic and inorganic vapours. A Photo ionisation detector (PID) uses an Ultraviolet (UV) light source (*photo*) to ionise a gas sample and detect its concentration. Ionisation occurs when a molecule absorbs the high energy UV light, ejecting a negatively charged electron and forming of positively charged molecular ion. The gas becomes electrically charged. These charged particles produce a current that is easily measured at the sensor electrodes. Only a small fraction of the VOC molecules are ionised. A PID does not respond to methane. A FID is similar to a flame thermocouple detector, but measures the ions from the flame instead of the heat generated. The FID detects the methane fraction, which provides greater sensitivity in terms of methane surface emissions detection but not necessarily odour hence why the PID data is also interpreted. The FID/PID analyser was calibrated with certified reference material isobutylene and methane before commencement of the survey, see calibration certificates for gases used in Appendix II. The calibration readings were rechecked in accordance with AG6 requirements.

Using the continuous kinematic "Odour hog" with integrated GPS (i.e Magellan Professional with sub centimetre accuracy post processed), the capping of the landfill was surveyed for potential surface emissions areas. Those areas identified were geo-referenced and highlighted for remediation. This technique is useful for comparison in surface emissions area within the same landfill facility on different survey's. The surface emissions maps generated for the particular facility can be used to assess the effectiveness of implemented mitigation techniques and to qualitatively assess the nature of surface emissions from the facility. All surface emissions surveying was carried out in accordance with "*Surface VOC Emissions Monitoring on Landfill Facilities (AG6)*".

Efforts should be made to attain surface emissions <100 ppm from open surfaces and <500 ppm around features such as vertical wells, leachate collection sumps, leachate slope risers and other projections out of the waste body (Casey et al., 2008). These are minimum standards, which should lead to greater landfill collection efficiencies thus reducing the impact on the general environment.

2.2. Meteorological conditions

Table 2.1 illustrates the predominant wind direction during the monitoring exercise. The meteorological conditions were characterised for the day of monitoring and were as follows:

Table 2.1. Meteorological conditions during TVOC survey.

27 th Feb. 2012	
Average wind speed 3 m s ⁻¹	Wind direction southerly
Temperature 10 ⁰ C	1001 mbar
Dry weather	Capping moisture content low
Relative Humidity 71%	Cloud cover 3 Okta

During the TVOC and gas field survey, wind deviated from a southerly direction. Capping moisture content was low.

2.3 Current landfill gas collection infrastructure on the facility

There is a total of 4 vertical deep borehole wells (pumps to be installed in latter part 2012), 10 periphery pumping stations and 46 gravity condensate / leachate removal devices on the facility. There are 2 of operational installed landfill gas enclosed flares (1,250 m³/hr (Duty), & 2,500 m³/hr (Duty) capacity. In addition there is one installed gas utilisation engine on the facility (1 MW capacity). At the time of the survey the gas utilisation engine was in operation. The central dome of the site (20 ha) is capped. Work on the final phase of capping (7.5 ha) will commence in Summer / Autumn 2012.(see *Figure 6.1*).

3. Results

3.1. Volatile organic compound surface emissions locations identified within Kinsale Road landfill facility

Figure 6.2 and Table 3.1 illustrates the results obtained for the capping surface emissions survey. A total of 5 individual surface emissions zones were identified. Each surface emissions zone is discussed separately in this manner in order to allow for the development of remediation strategies to mitigate the individual surface emissions areas.

Table 3.1. Capping VOC surface emissions locations results with source identities correlating with *Figure 6.2 (see Appendix I)*.

Location ID	Easting (m)	Northing (m)	Max VOC conc. (ppm)	Identification and Mitigation	Recommended trigger levels
K1	168393	69697	1,675	Discrete Feature: Permanent Cap, Vertical Well P4GW40. Investigate and remediate the cause of the surface emissions.	<500ppm
K2	168332	69515	3,054	Discrete Feature: Permanent Cap, Vertical Well P4GW81. Investigate and remediate the cause of the surface emissions.	<500ppm
K3	168405	69475	2,338	Discrete Feature: Permanent Cap, Vertical Well P4GW11. Investigate and remediate the cause of the surface emissions.	<500ppm
K4	168302	69317	3,779	Discrete Feature: Permanent Cap, Vertical Well P4GW13. Investigate and remediate the cause of the surface emissions.	<500ppm
K5	168173	69381	520	Discrete Feature: Permanent Cap, Vertical Well P4GM2. Investigate and remediate the cause of the surface emissions.	<500ppm

Five sources of landfill gas surface emissions were identified (*see Figures 6.2 and Table 3.1*) within the landfill.

Surface emissions locations K1, K2, K3, K4 and K5 appeared to be present as a result of landfill gas flux from gas wells. These are localised sources.

There were 5 surface emissions zone greater than or equal to 500 ppm around identified features. There were 0 surface emissions zones greater than or equal to 100 ppm instantaneous reading on open surfaces within the landfill footprint.

3.2. Close out meeting with landfill manager

Following completion of the surface emissions survey, the surface emissions team and the landfill manager discussed all aspects and general conclusions of the survey. The landfill manager was informed of the potential areas of surface emissions.

4. Conclusions

The following conclusions were drawn from the survey of Kinsale Road Landfill facility:

- The surface emissions contour map generated from the kinematic Volatile organic compound (VOC) survey illustrated surface areas of landfill gas surface emissions.
- Surface emissions locations K1, K2, K3, K4 and K5 appeared to be present as a result of landfill gas flux from gas wells. These are localised sources.
- There were 5 surface emissions zone greater than or equal to 500 ppm around identified features. There were 0 surface emissions zones greater than or equal to 100 ppm instantaneous reading on open surfaces within the landfill footprint.

5. References

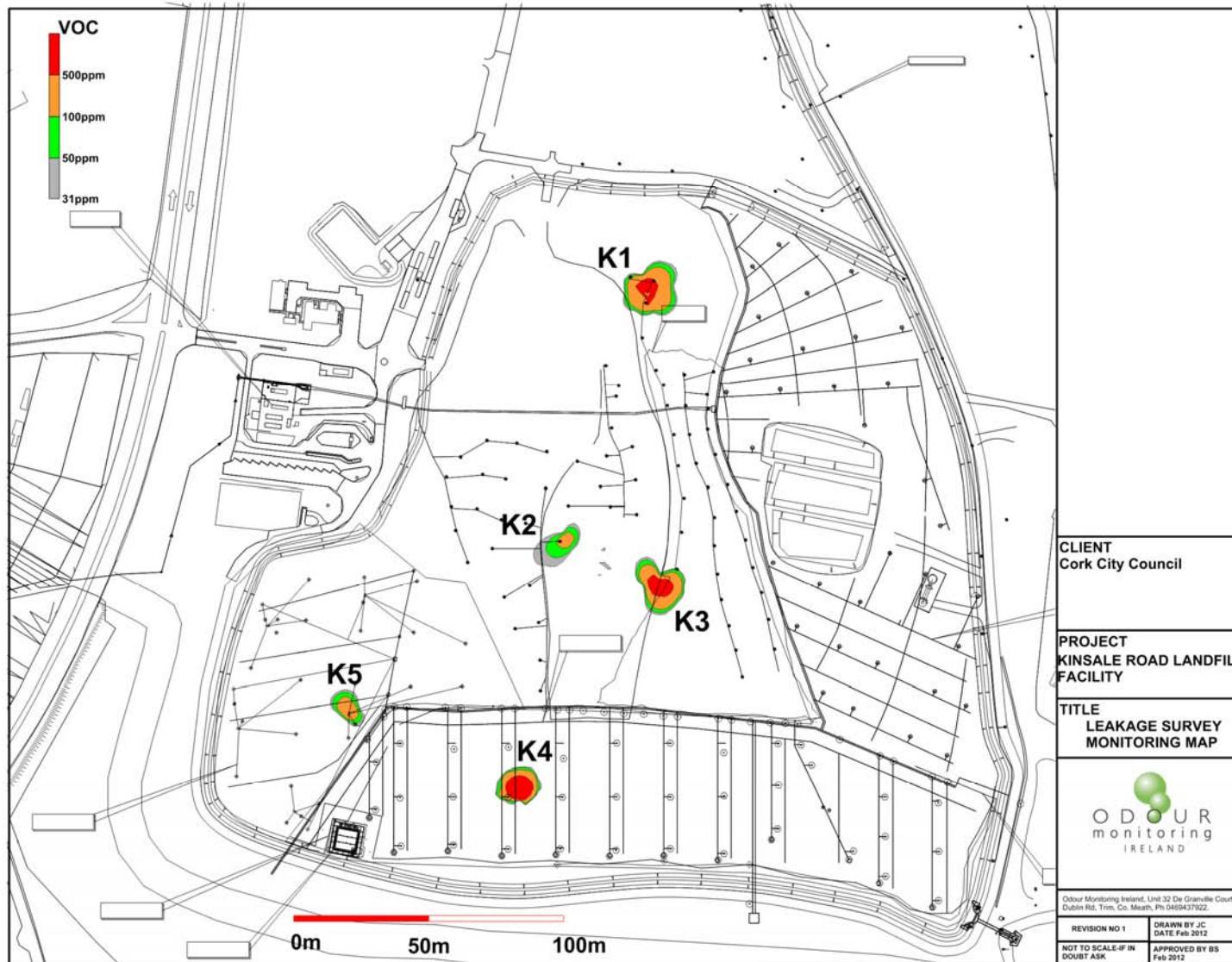
- Casey, J.W., Sheridan, B.A., Henry, M., Reynolds, K., (2008). Effective tools for managing odours from landfill facilities. International Conference on Environmental Odour Monitoring and Control, Rome, Italy, July 6-8, 2008.

6. *Appendix I- Volatile organic compound surface emissions contour map & Cell capping outline & LFG infrastructure map*

Figure 6.1. Cell capping outline & LFG infrastructure on the facility.



Figure 6.2. Landfill gas surface emissions monitoring within the operating landfill facility (colour scale area indicating TVOC gas colour scale).



7. Appendix II-Calibration certificates and procedures.

7.1 Span & Calibration procedure

Necessary Calibration gases: Zero gas (0ppm), 100ppm and 500ppm methane (Calibration certificates below).

Calibration is carried out in accordance with manufacturers guidelines.

Location: Zero span instrument onsite.

Frequency: Before, midway through, and after the surface emissions survey, typically therefore at 3-4 hour intervals. If the survey only last 2 to 3 hours the instrument is checked before and after the event.

Instrument settling: The FID is switched on and left to settle for a period of 30 minutes minimum.

Span Procedure: The zero and span gases shall be introduced under the same flow and pressure conditions using the sample probe at the end of the sample line. The adjustment procedure shall be as follows:

- a) Feed the zero gas (0ppm) into the FID and set the zero;
- b) Feed the span gas (100ppm) and adjust the instrument accordingly;
- c) Feed the zero gas into the FID once more and check that the reading returns to zero; if not repeat steps a) to c).
- d) repeat procedure A to C to verify

Equipment is maintained and operated as specified by the manufacturer.

Document No. 2012119(ver.1)
Visit No: 01
Year: 2012

WL0012-03
Cork City Council
Kinsale Road Landfill Facility

Scientific & Technical Gases Ltd

Certificate of Composition 29485-6-1

**Order No E-MAIL Cylinder No Customer ODOUR MONITORING I
Cylinder Valve C10 Our Ref 29485 Cylinder Size 112DA Nett Wt
(Kg) 0.12 Gross Wt (Kg) 1.2**

Component Requested Value Certified Value

METHANE 500PPM 500PPM AIR (ZERO GRADE) BALANCE BALANCE

Pressure 1000PSI Volume 112LTR Valid Until *February 2013*

Please note all units are in *MOL%* and accuracy is *+/-2%*. Relative mixtures traceable to standards calibrated at the National Physics Laboratory, Teddington, Middlesex, England

Certified by S. Banks UN NO 1956 Date 10/02/2010

Document No. 2012119(ver.1)
Visit No: 01
Year: 2012

WL0012-03
Cork City Council
Kinsale Road Landfill Facility

Scientific & Technical Gases Ltd

Certificate of Composition 29485-1-1

**Order No E-MAIL Cylinder No Customer ODOUR MONITORING I
Cylinder Valve C10 Our Ref 29485 Cylinder Size 112DA Nett Wt
(Kg) 0.12 Gross Wt (Kg) 1.2**

Component Requested Value Certified Value

AIR ZERO GRADE ZERO GRADE

Pressure 1000PSI Volume 1000PSI Valid Until *February 2013*

Please note all units are in *MOL%* and accuracy is $\pm 2\%$. Relative mixtures traceable to standards calibrated at the National Physics Laboratory, Teddington, Middlesex, England

Certified by S. Banks UN NO 1002 Date 10/02/2010

Document No. 2012119(ver.1)
Visit No: 01
Year: 2012

WL0012-03
Cork City Council
Kinsale Road Landfill Facility

Scientific & Technical Gases Ltd

Certificate of Composition 29485-5-1

**Order No E-MAIL Cylinder No Customer ODOUR MONITORING I
Cylinder Valve C10 Our Ref 29485 Cylinder Size 112DA Nett Wt
(Kg) 0.12 Gross Wt (Kg) 1.2**

Component Requested Value Certified Value

METHANE 100PPM 100PPM AIR (ZERO GRADE) BALANCE BALANCE

Pressure 1000PSI Volume 112LTR Valid Until *February 2013*

Please note all units are in *MOL%* and accuracy is *+/-2%*. Relative mixtures traceable to standards calibrated at the National Physics Laboratory, Teddington, Middlesex, England

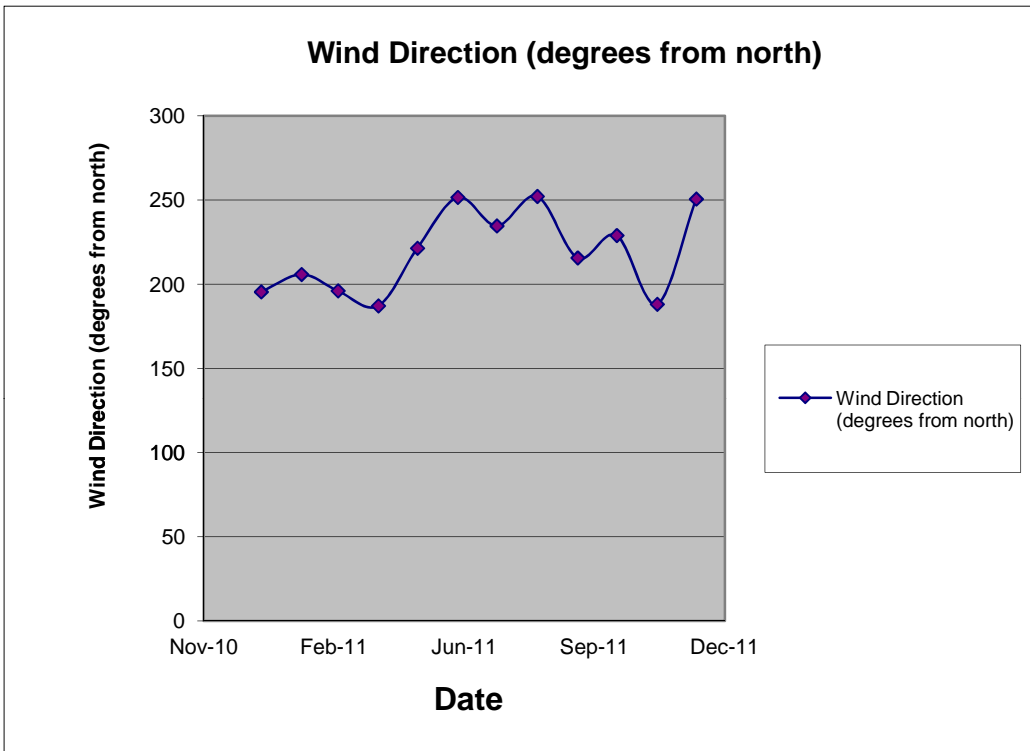
Certified by S. Banks UN NO 1956 Date 10/02/2010

7 OTHER INFORMATION

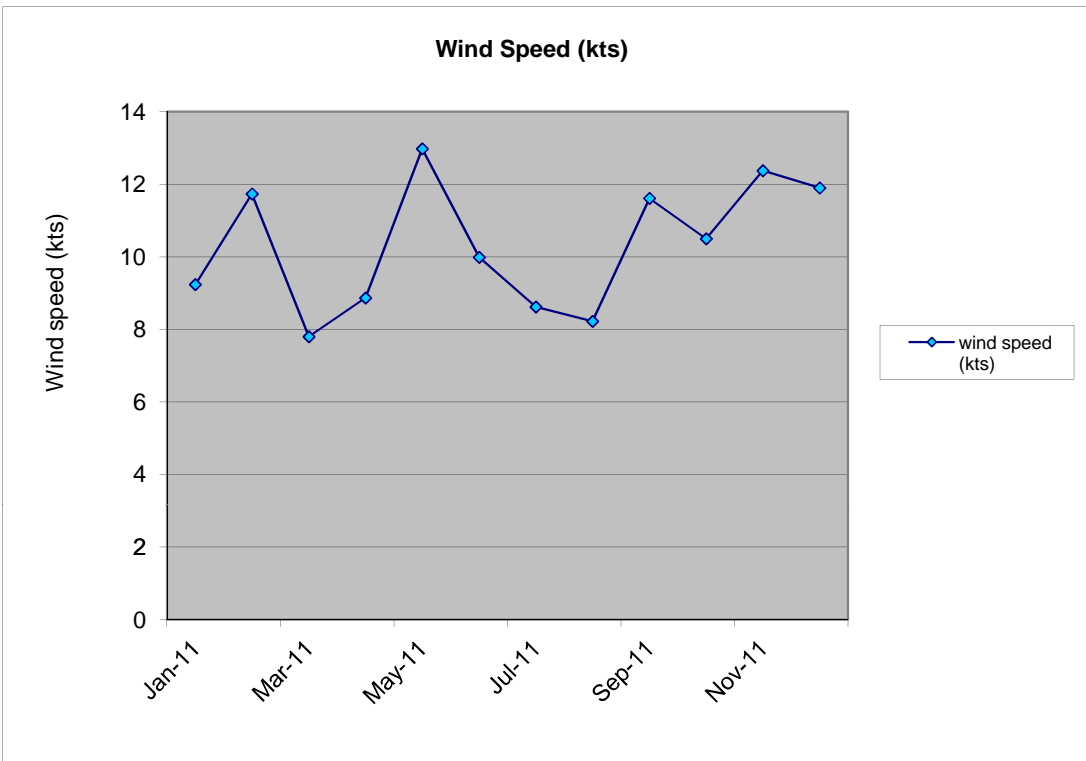
Information is attached for the following topics:

- 7.1 Meteorological Data
- 7.2 Resource Consumption
- 7.3 Compost Report
- 7.4 Slope Stability Report
- 7.5 Environmental Monitoring Locations

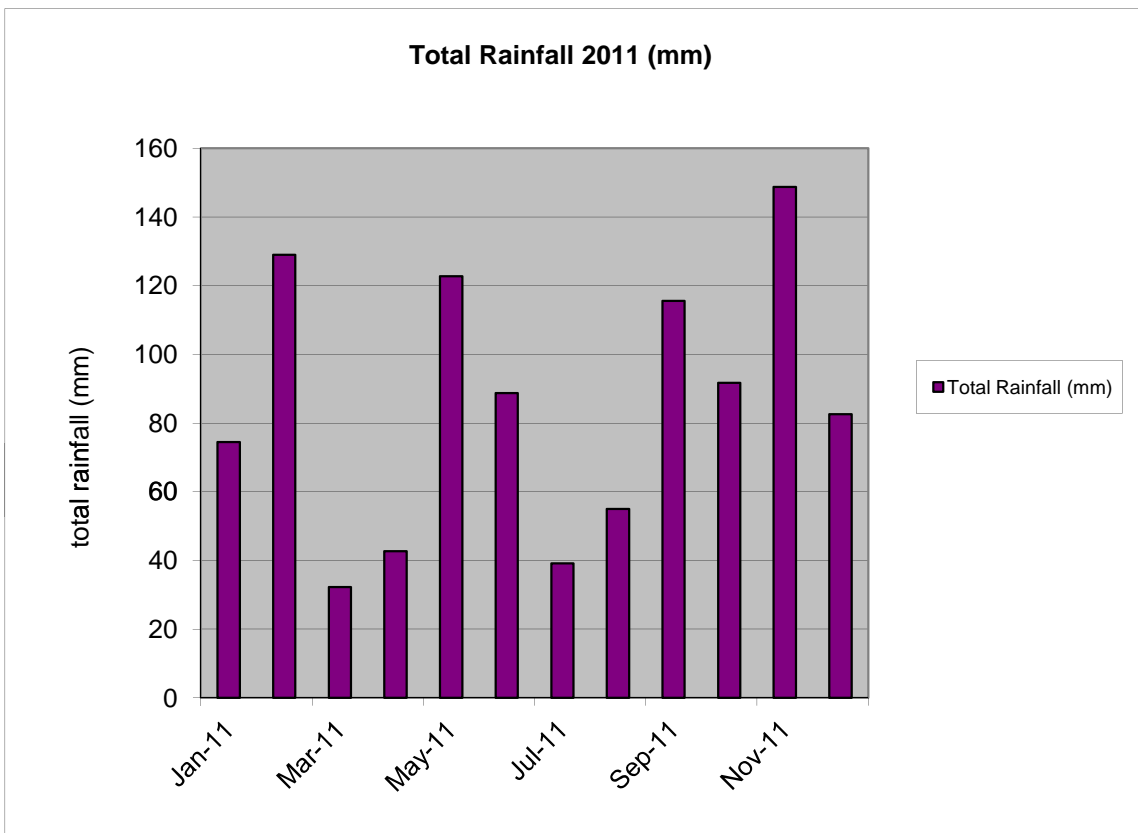
Month	Wind Direction (degrees from north)
Jan-11	195
Feb-11	206
Mar-11	196
Apr-11	187
May-11	221
Jun-11	252
Jul-11	235
Aug-11	252
Sep-11	216
Oct-11	229
Nov-11	188
Dec-11	251



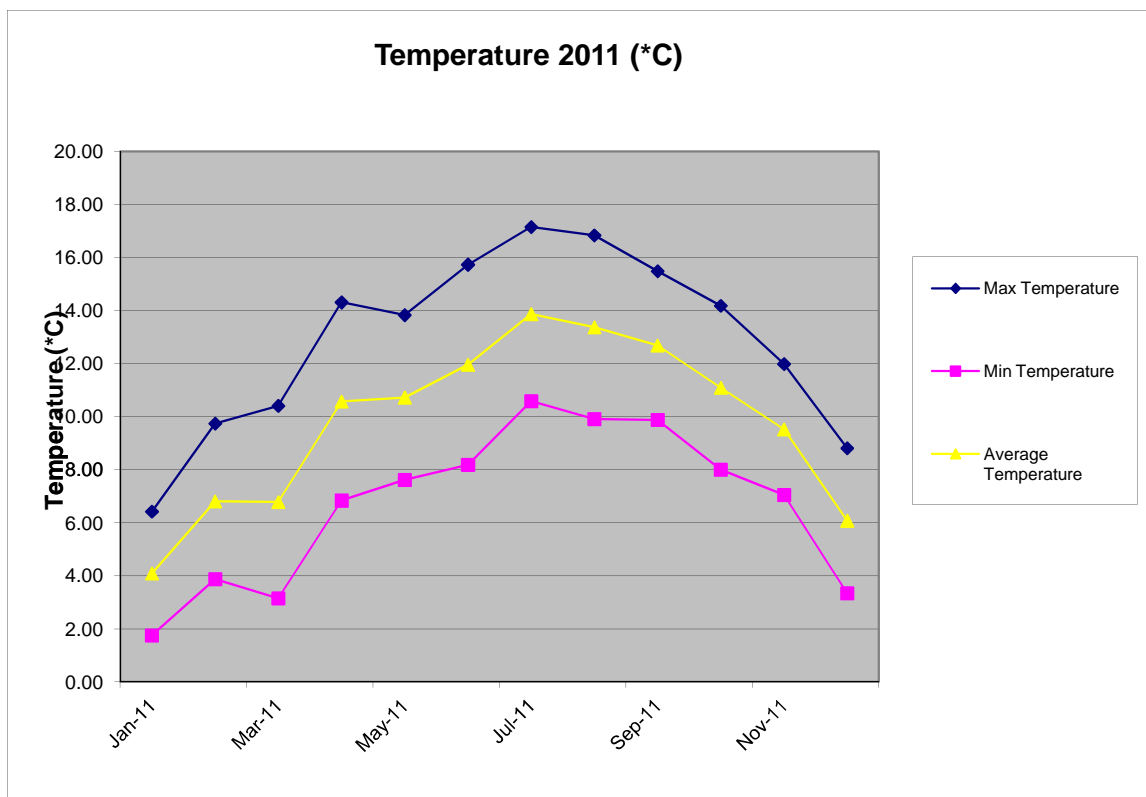
Month	wind speed (kts)
Jan-11	9
Feb-11	12
Mar-11	8
Apr-11	9
May-11	13
Jun-11	10
Jul-11	9
Aug-11	8
Sep-11	12
Oct-11	11
Nov-11	12
Dec-11	12



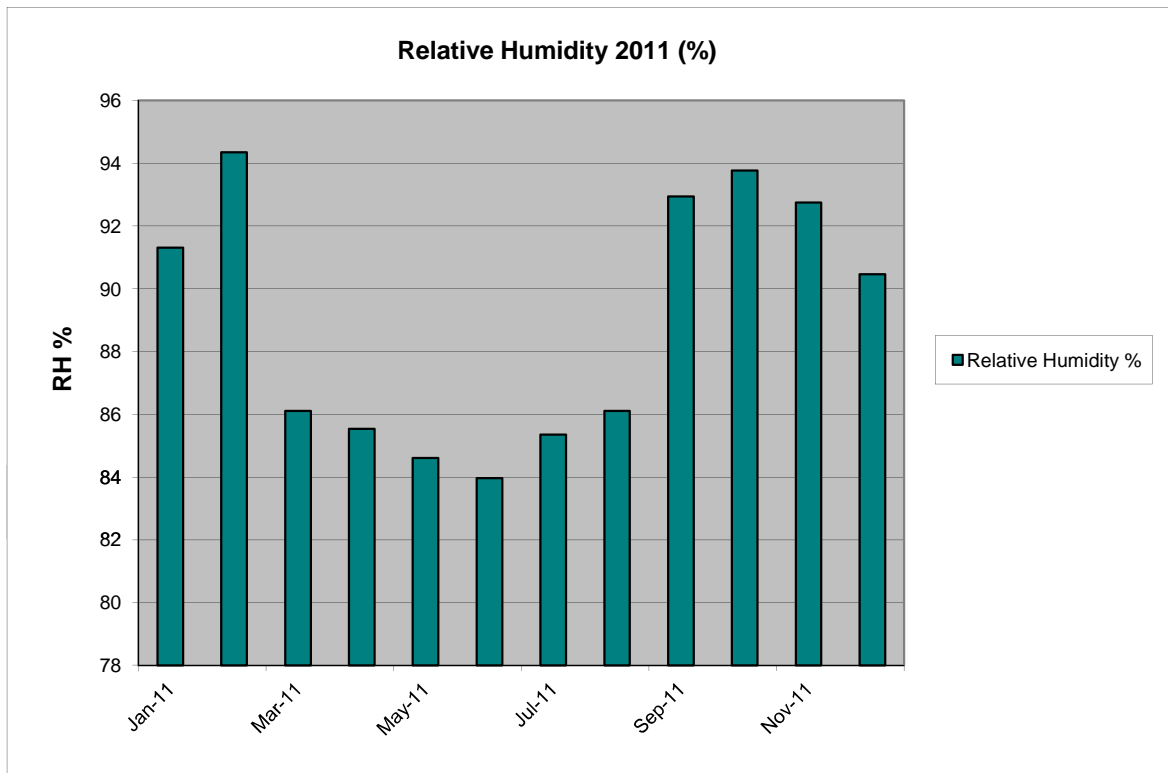
Date	Total Rainfall (mm)
Jan-11	75
Feb-11	129
Mar-11	32
Apr-11	43
May-11	123
Jun-11	89
Jul-11	39
Aug-11	55
Sep-11	116
Oct-11	92
Nov-11	149
Dec-11	83
Total	1023



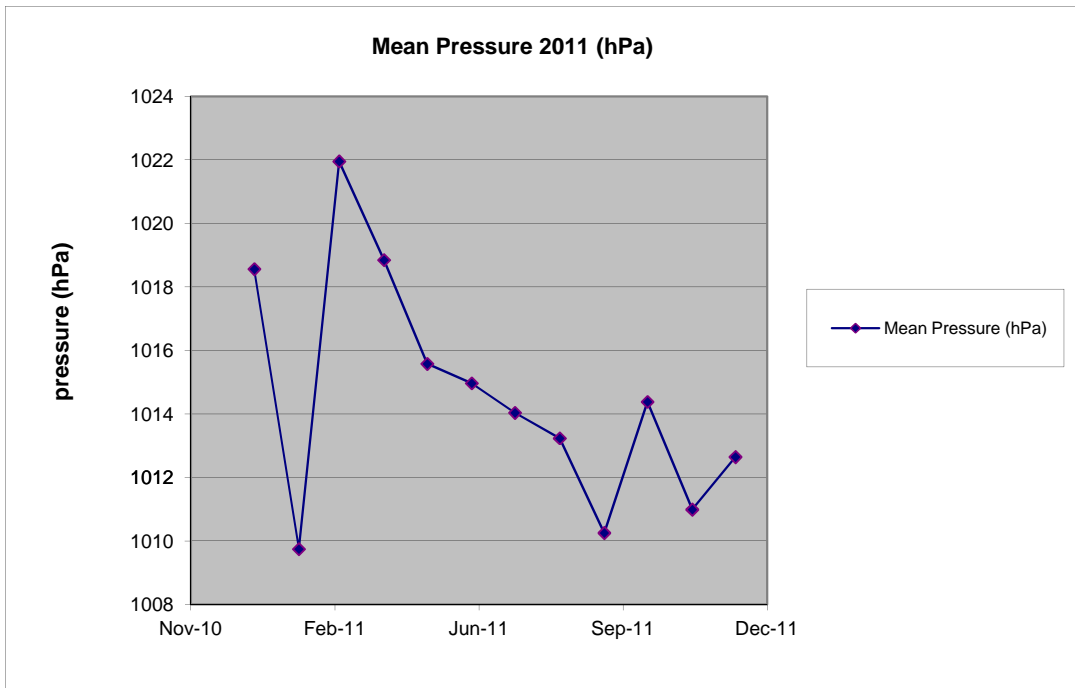
Date	Max Temperature	Min Temperature	Average Temperature
Jan-11	6.42	1.75	4.09
Feb-11	9.74	3.88	6.81
Mar-11	10.41	3.15	6.78
Apr-11	14.31	6.84	10.58
May-11	13.83	7.61	10.72
Jun-11	15.73	8.18	11.96
Jul-11	17.15	10.59	13.87
Aug-11	16.84	9.91	13.37
Sep-11	15.48	9.88	12.68
Oct-11	14.18	8.00	11.09
Nov-11	11.99	7.05	9.52
Dec-11	8.82	3.34	6.08



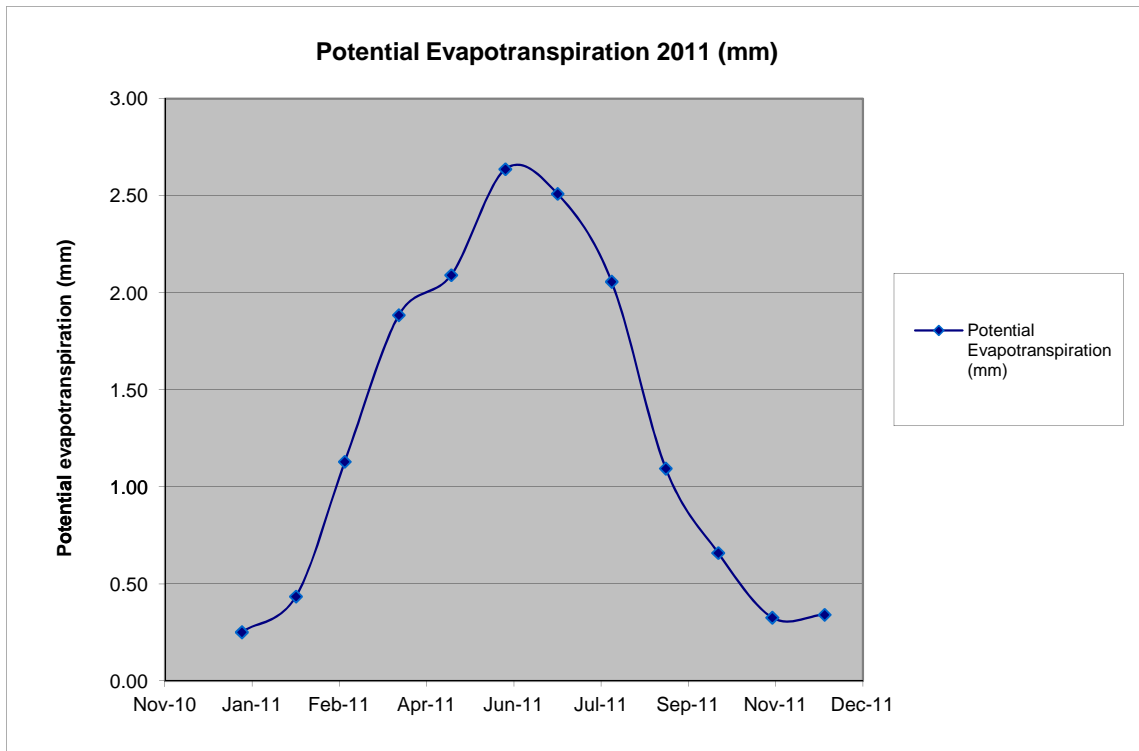
Date	Relative Humidity %
Jan-11	91
Feb-11	94
Mar-11	86
Apr-11	86
May-11	85
Jun-11	84
Jul-11	85
Aug-11	86
Sep-11	93
Oct-11	94
Nov-11	93
Dec-11	90



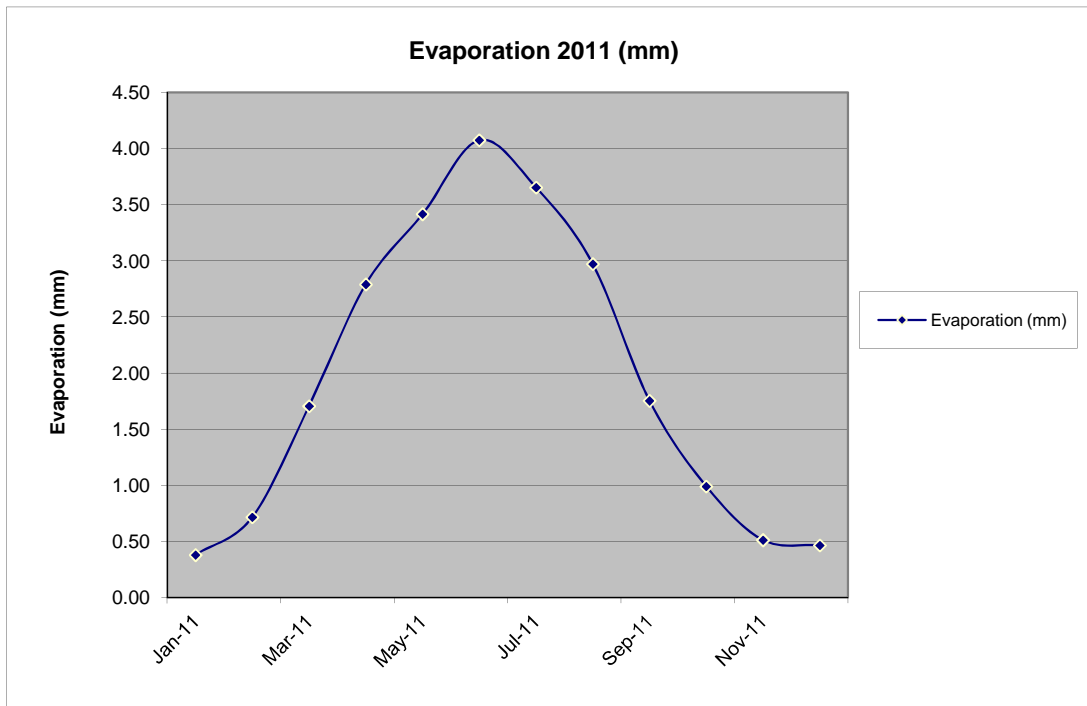
Date	Mean Pressure (hPa)
Jan-11	1019
Feb-11	1010
Mar-11	1022
Apr-11	1019
May-11	1016
Jun-11	1015
Jul-11	1014
Aug-11	1013
Sep-11	1010
Oct-11	1014
Nov-11	1011
Dec-11	1013



Date	Potential Evapotranspiration (mm)
Jan-11	0.25
Feb-11	0.43
Mar-11	1.13
Apr-11	1.88
May-11	2.09
Jun-11	2.64
Jul-11	2.51
Aug-11	2.06
Sep-11	1.09
Oct-11	0.66
Nov-11	0.33
Dec-11	0.34



Date	Evaporation (mm)
Jan-11	0.38
Feb-11	0.72
Mar-11	1.71
Apr-11	2.79
May-11	3.42
Jun-11	4.08
Jul-11	3.65
Aug-11	2.97
Sep-11	1.75
Oct-11	0.99
Nov-11	0.51
Dec-11	0.47



7.2 Resource Consumption

Site machinery involved in operation of the facility during the reporting period involved the following plant: –

1 No. Tractor;
1 no. rigid truck;
1 No. Water Bowser; and
1 No. tractor mounted Road Brush.
2 no. jeeps.

1 no. shredder, 1 no. compost turner and 1 no. manitou (with front loader) also operated on site at the Green Waste & Timber shredding facility (operated by CTO Env. Ltd.)

During the period approximately 5,000 litres of fuel was consumed on site by Cork City Council machinery.

The electricity and telephone costs for the reporting period were €44,000 and €5,415 respectively.

The majority of electricity used throughout the period was for office / canteen / weighbridge accommodation, leachate conditioning plant and pumping system, public lighting and vehicle washing operations.

Water usage on site during the reporting period was 24,799 m³.



Test Report

Lab Report Number: 1001F04

Analysis Number: 99A/54958

Customer ID: CTO.E1

Analysis Type: Misc. Tests (99A)

Contact Name: AIDAN STAFFORD

Delivery By: Courier

Company Name: CTO ENVIRONMENTAL SOLUTIONS LTD

Sample Card Number: 5117/4

Address: ROSTELLAN
MIDDLETON
CO CORK

Sample Condition: Acceptable

Sample Type: Compost

Date Sample Received: 30/09/2011

Sample Reference: COMPOST SAMPLES

Date Analysis Commenced: 30/09/2011

Sample Description: KINSALE ROAD AUGUST

Date Certificate Issued: 11/10/2011

Parameter	Method	Result	Unit
Carbon Nitrogen Ratio*	Calculation	13:1	R
Arsenic*	ICP-MS	3.6	mg/kg
Cadmium*	ICP-MS	0.42	mg/kg
Chromium*	ICP-MS	20.6	mg/kg
Copper*	ICP-MS	48.9	mg/kg
Mercury*	ICP-MS	0.19	mg/kg
Nickel*	ICP-MS	17.2	mg/kg
Lead*	ICP-MS	56.2	mg/kg
Zinc*	ICP-MS	144.1	mg/kg
AT4 over 4 days*	OxiTop Control System SOP 2010	1.7	mg O2/g DM
Chloride*	Ion Selective Electrode	not poss	mg/kg
Dry Matter*	Drying @ 105°C	72.0	% DM
E-Coli**^	Pour Plate	Negative	c.f.u./g
Potassium*	ICP-MS	4212	mg/kg DM
Kjeldahl Nitrogen*	Kjeldahl Nitrogen	1.2	%
Organic Matter	Dry Ashing @ 500 SOP 2007	27.7	%
Phosphorus*	ICP-MS	1170	mg/kg DM
pH	Electrometry SOP 2001	8.3	pH units
Salmonella**^	ELISA	Negative	/ 25g
Sulphate 2:1 Water:Soil (SO3)*	BS 1377 : Part3 : 1990	310	mg/kg
Total Organic Carbon*	Oxidation & Colourimetry	not poss	mg/l

Signed: W. McCall

Date: 11/10/11

Wendy McCall - Laboratory Manager

* = not INAB Accredited ^ = Subcontracted

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SLOPE STABILITY REPORT

**KINSALE ROAD LANDFILL, CORK
WASTE LICENCE W0012-03**

ORIGINAL

April 2012





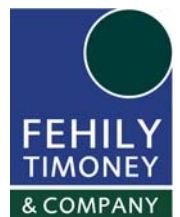
ENVIRONMENTAL BALANCE IN DESIGN AND CONSTRUCTION

SLOPE STABILITY REPORT

KINSALE ROAD LANDFILL, CORK
WASTE LICENCE W0012-03

COPY

April 2012

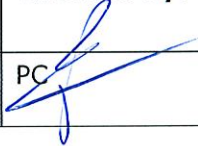



SLOPE STABILITY REPORT

KINSALE ROAD LANDFILL CORK

WASTE LICENCE W0012-03

User is Responsible for Checking the Revision Status of This Document

Rev. Nr.	Description of Changes	Prepared by:	Checked by:	Approved by:	Date:
1	Issue to Client with minor text edits	AG/MG	PC 	AS 	03.04.2012

Client: Cork City Council

Keywords: Kinsale Road, landfill, capping, slope stability, waste licence W0012-03

Abstract: This slope stability report was prepared in order to comply with the waste licence. Analyses of rotational and translational slip failures of the waste slopes are presented.

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1. INTRODUCTION

1.1. Purpose

This report presents the results of a slope stability assessment carried out for Kinsale Road Landfill. This is in accordance with the EPA waste licence issued to the site.

1.2. Site Description

Kinsale Road Landfill is located to the south of Cork City, adjacent to the South Ring Road and operates under Waste Licence Reg. No. W0012-03.

1.3. Slope Stability Analysis Method

SLOPE/W software of GEO-SLOPE International Ltd. was used to assess the stability of Kinsale Road Landfill. SLOPE/W is a general software tool for the slope stability analysis of earth structures. It uses the limit equilibrium method of analysis by using the idea of dissecting a potential sliding mass into vertical slices. It assesses the factor of safety for both moment and force equilibrium based on various methods, including Bishops, Janbu and Morgenstern-Price.

Using this software, it is possible to deal with complex stratigraphy, highly irregular pore-water pressure conditions, a variety of linear and nonlinear shear strength models, virtually any kind of slip surface shape, concentrated loads and pressure lines. Limit equilibrium formulations based on the method of slices are also being applied more and more to the stability analysis of structures such as tieback walls, nail or fabric reinforced slopes, and even the sliding stability of structures subjected to high horizontal loading arising.

Traditionally, the factor of safety is defined as that factor by which the shear strength of the soil must be reduced in order to bring the mass of soil into a state of limiting equilibrium along a selected slip surface. The results of the analysis show the overall stability of the embankment expressed as a factor of safety.

The definition of factor of safety used within SLOPE/W is:

$$F = \frac{\text{Available restoring moment (or forces)}}{\text{Total disturbing moment (or forces)}}$$

Design values for use in the slope stability analysis have been derived using Eurocode 7 (IS EN 1997-1) Design Approach 3. This design approach is considered to be the most logical approach for slope stability analysis as it includes partial factors for both material properties and variable loads (for example traffic loads).

1.4. Limitations of Slope Stability Analysis

Updated shear strength parameters for the landfill waste has been estimated based on parameters used by Kolsch (1995).

Groundwater or leachate in landfills may occur in irregular perched bodies as opposed to interconnected liquid bodies. For the purposes of this analysis a natural groundwater/leachate table only has been assumed in analyses based on historical leachate/groundwater levels recorded on site.

1.5. Factors Controlling the Stability of Landfill Slopes

The factors controlling the stability of landfill slopes are:

- Slope geometry
- Geology
- Properties of the landfill wastes
- Properties of the supporting soil
- Groundwater/leachate levels within the waste
- Groundwater levels in the supporting soil
- Surcharge.

2. Design Criteria

2.1. Slope Geometry

Using the latest topographical survey by Focus Surveys Ltd. presented on Drawing No. 00-004_Z4, updated September 2011, a typical cross-section through the waste slopes of the site was taken at the location shown on Drawing LW12-011-02-001 Rev A. The side slope analysed is considered representative of the existing capped slopes on site.

Section A-A, on the southern side of the landfill, is approximately 20 m high, 300 m long.

2.2. Geology

The Geological Survey of Ireland (GSI) maps and website for this area along with our knowledge of the site from previous site investigations show that the site is underlain by Carboniferous age limestone, mudstone and sandstone.

The GSI website also shows that alluvial and glacial deposits are extensive in this area. Previous site investigations show that the landfill is underlain by deposits of compressed peat, alluvial silty clay and glacial till (gravelly clay or gravel).

2.3. Factors of Safety

In accordance with the principals of Eurocode 7 (IS EN 1997-1), rather than using a global factor of safety as per previous design codes, the factors of safety (termed partial factors) are applied to the chosen characteristic values to obtain design values. Actions (influences) are multiplied by the safety factor, while resistances are divided by the safety factor.

In accordance with Eurocode 7 (IS EN 1997-1), geotechnical checks must be carried out to ensure that the resistance preventing a slide are greater than or equal to the actions which cause a slide, i.e.:

$$E_d \leq R_d$$

Where

E_d = Sum of design actions

R_d = Sum of design resistances

By adopting the methods of analysis given in Eurocode 7 (IS EN 1997-1), the factor of safety against failure is **included** in the partial factors (ranging from 1.0 to 1.3 for various parameters) applied to the analysis rather than to the end result. In order to verify that this condition is met, the resulting "safety ratio" must be equal or greater than 1.0 in order to verify that the above condition is met. i.e.: An in-situ "safety ratio" of less than 1.0 indicates that the slope currently has an inadequate factor of safety against failure and therefore is potentially unstable. Ratios greater than 1.0 indicate an adequate factor of safety against failure and are considered stable.

2.4. Physical Make-up

The slopes considered for analyses are assumed to consist of the following layers, as derived for previous slope analyses on the site:

- 0.5 to 1.0 layer clay capping material
- Waste body comprising of new waste and older waste
- Underlying peat, silty clay, glacial till and bedrock

2.5. Waste Parameters

Table 2.1 below shows the parameters used for the landfill waste materials.

Table 2.1: Characteristic Parameters for Waste Materials

Material	Waste (Old)	Waste (Fresh)
Cohesion (c')	10 kN/m ²	10 kN/m ²
Effective friction angle (φ')	22°	15°
Unit weight γ	11 kN/m ³	9.5 kN/m ³

The parameters shown in Table 2.1 above are the typical range of values from published papers on the properties of waste. For the purpose of this analysis, the waste has been divided into both fresh waste and underlying old waste.

Table 2.2: Partial Factors Used to Derive Design Parameters

Set	Partial Factor	Parameter	
M2	$\gamma_{c'}$	1.25	Effective cohesion
	$\gamma_{\phi'}$	1.25	Effective angle of friction
	γ_{γ}	1	Soil density
A2	γ_Q	1.3	Traffic Loading (variable unfavourable)
R3	$\gamma_{R,e}$	1	Earth resistance

Table 2.2 shows the partial factors which have been applied to the characteristic values to give the derived parameters in Table 2.3 and 2.5 used during the slope stability analyses. The design parameter is derived by are multiplied or dividing the characteristic values by the associated partial factor, i.e. $22(\phi') / 1.25(\gamma_{\phi'}) = 17.6^\circ$.

Table 2.3: Design Parameters for Waste Materials

Material	Waste (Old)	Waste (Fresh)
Cohesion (c')	7.1 kN/m ²	8 kN/m ²
Effective friction angle (ϕ')	17.6°	12°
Unit weight γ	11 kN/m ³	9.5 kN/m ³

2.6. Properties of the Supporting Soil and Capping Layer

Table 2.4 below shows the parameters used for the clay capping and the underlying strata.

Table 2.4: Characteristic Parameters for Supporting Materials

Material	Clay Capping	Peat	Silty Clay	Glacial Till
Cohesion, c' , kN/m ²	4	0	0	0
Friction angle, ϕ' , °	29	15	26	33
Bulk unit weight, γ , kN/m ³	18	14	19	20

Table 2.5: Design Parameters for Typical Supporting Materials

Material	Clay Capping	Peat	Silty Clay	Glacial Till
Cohesion, c' , kN/m ²	3.2	0	0	0
Friction angle, ϕ' , °	23.2	12	20.8	26.4
Bulk unit weight, γ , kN/m ³	18	14	19	20

2.7. Groundwater Levels within the Waste Material

To model the effects of groundwater/leachate within the waste, a groundwater level at the toe of the slopes was assumed for the purpose of the analyses at approximately 13 mOD. This level is considered to be representative of the typical maximum levels recorded from historical data. In reality, the groundwater levels are maintained several metres below this level due to pumping and treatment of leachate. The lower groundwater levels will tend to improve the overall slope stability.

2.8. Surcharge

A modelled surcharge 20 kN/m^2 was conservatively applied to the slopes during the analyses to simulate the movement of vehicles on the slopes. After applying a partial factor of 1.3 as per IS EN 1997-1 Design Approach 3 (variable, unfavourable action), a design load of 26 kN/m^2 has been applied to the models. It should be noted that without applying this surcharge, the calculated factor of safety for the sections will also improve.

3. Results

3.1. Slope Stability Analyses

Models were run on a representative section to assess the slope stability of the landfill waste embankments. The results of those analyses are summarised in Table 3.1 with safety ratios calculated for Bishop, Janbu and Morgenstern-Price methods. Table 3.1 also presents the material parameters applied, the groundwater level simulated, and the length and type of the relevant slip.

The critical slope analysis is presented graphically for the slope in Figure 3.1 using the Morgenstern-Price method of analysis.

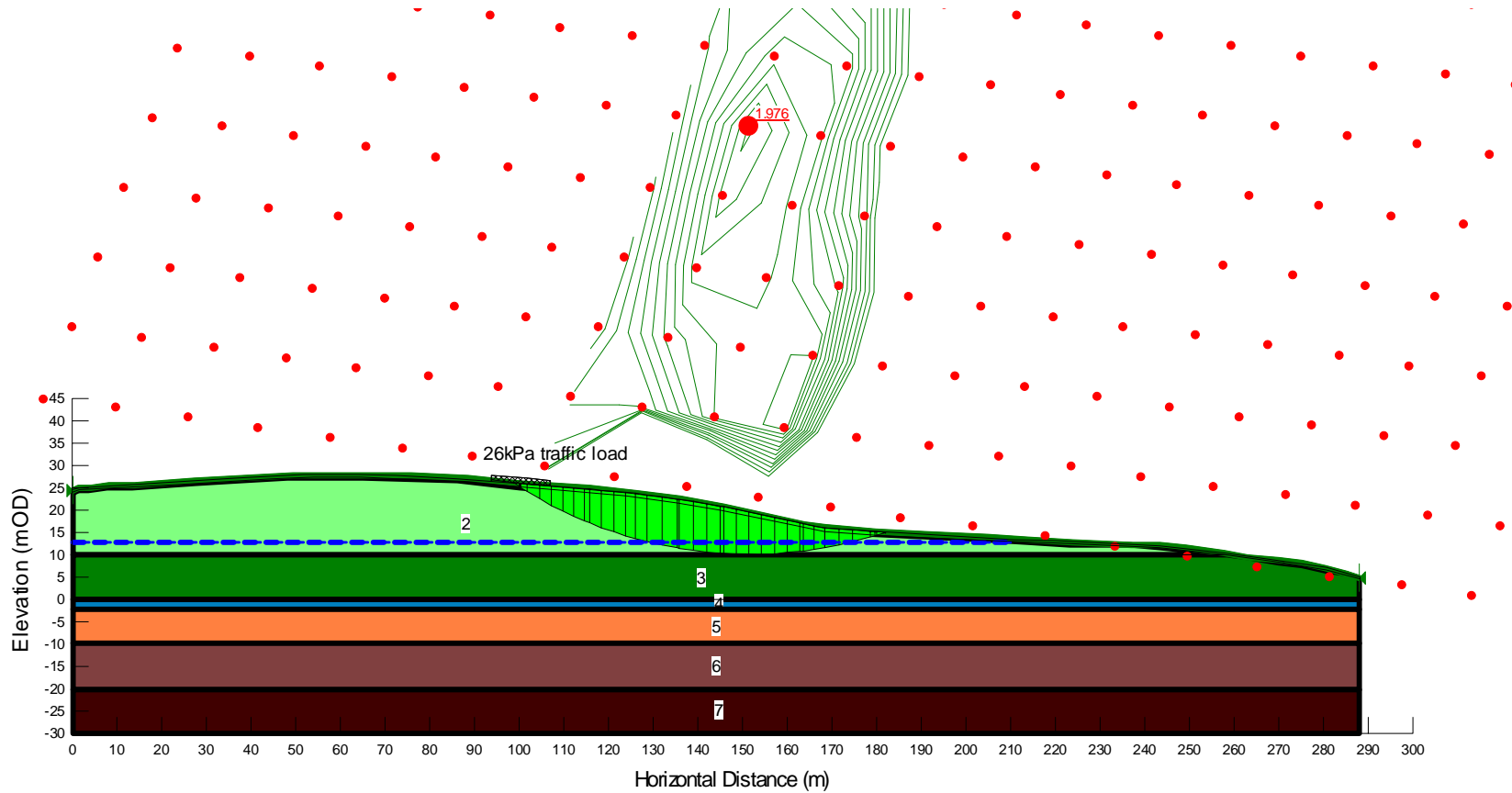
3.2. Model Results

Safety ratios for potential slope failures (Table 3.1) for typical maximum groundwater levels (13.0 mAOD) ranged from 1.90 to 1.98. Analyses were undertaken for both deep-seated (rotational) type slips and shallow (translational) type although the deep rotational failures gave the lower safety ratios.

Table 3.1: Slope Analysis Results

Slope name	Leachate Level at toe of slope (mAOD)	Morgenstern-Price FoS	Bishop FoS	Janbu FoS	Slip Length (m)	Slip type & location
Section A-A	13.0	1.98	1.98	1.90	80	Deep rotational slip through clay capping and waste

Figure 3.1: Typical slope failure for Section A-A (Morgensten-Price Method) for Groundwater Level of 13m AOD.



Material #:	1	Description:	Clay Cap	Model:	MohrCoulomb	Wt:	18	Cohesion:	3.2	Phi:	23.2	Piezometric Line:	0
Material #:	2	Description:	New Waste	Model:	MohrCoulomb	Wt:	9.5	Cohesion:	8	Phi:	12	Piezometric Line:	1
Material #:	3	Description:	Old Waste	Model:	MohrCoulomb	Wt:	11	Cohesion:	7.1	Phi:	17.6	Piezometric Line:	0
Material #:	4	Description:	Peat	Model:	MohrCoulomb	Wt:	14	Cohesion:	0	Phi:	12	Piezometric Line:	0
Material #:	5	Description:	Silty Clay	Model:	MohrCoulomb	Wt:	19	Cohesion:	0	Phi:	20.8	Piezometric Line:	0
Material #:	6	Description:	Glacial Till	Model:	MohrCoulomb	Wt:	20	Cohesion:	0	Phi:	26.4	Piezometric Line:	0
Material #:	7	Description:	Bedrock	Model:	Bedrock	Piezometric Line:	0						

4. Discussion and Conclusions

Safety ratios against deep-seated rotational failures of the landfill embankment within the waste and underlying strata ranged from 1.90 to 1.98. The length of the potential failure is approximately 80 m. The safety ratios are considered satisfactory for both interim and permanently capped slopes.

It is noted that a groundwater level of 13 mAOD is considered to be the most representative model based historical data. This analysis gave safety ratios which were above 1.9 for the slopes analysed. It is noted that the slope analysed is typical for the landfill, however localised slopes may be steeper than the slope analysed, hence safety ratios may also be higher within certain parts of the site.

Based on the analysis models presented, the landfill side slopes studied in this report are considered to be stable under the typical maximum groundwater conditions encountered historically.

In order to maintain the safety ratios for final capped slopes, groundwater/leachate levels must be regularly monitored to prevent a build up of levels within the waste body, which could cause potential instability of the landfill slopes.

5. References

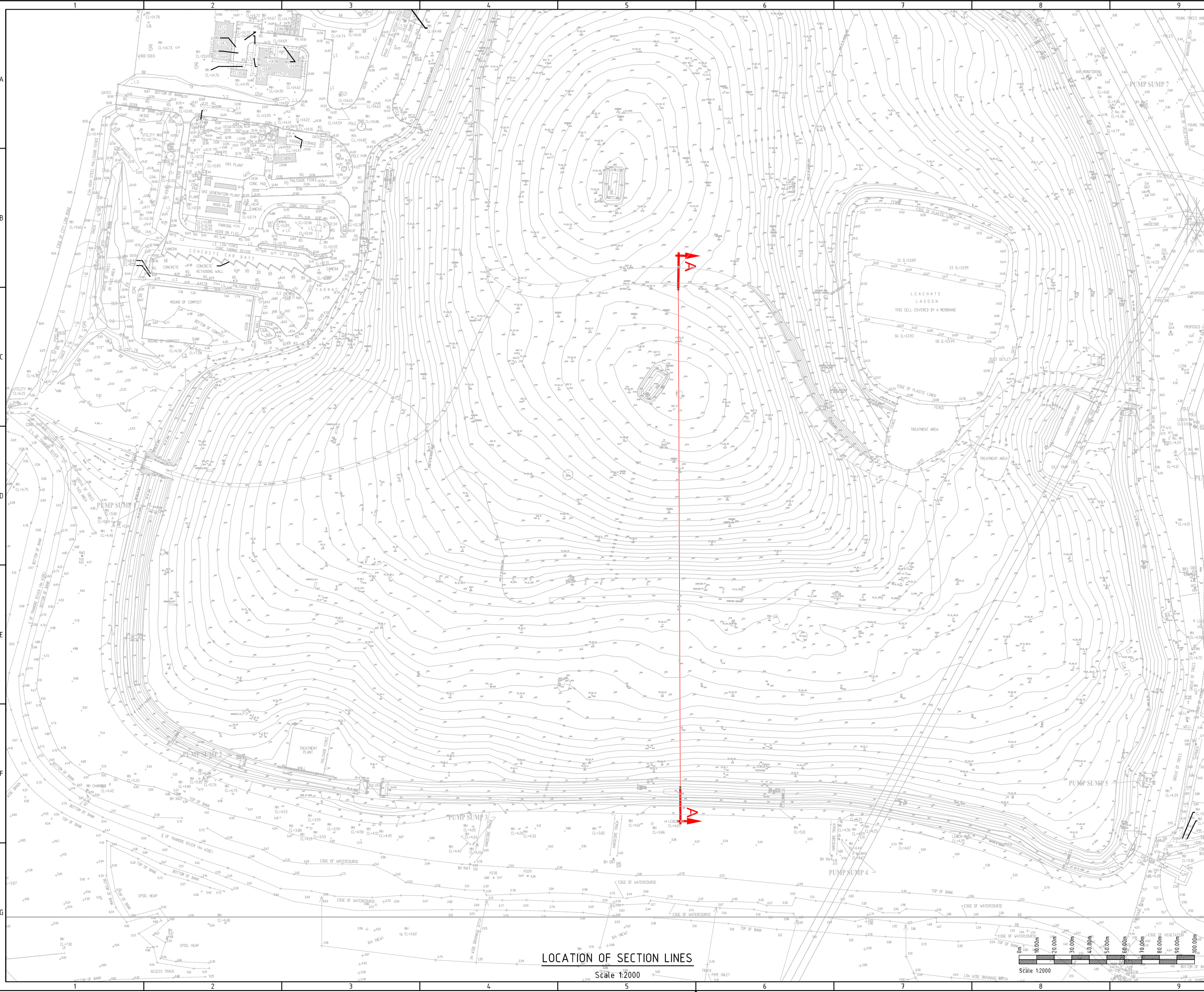
1. Kolsch (1995) Material values for some mechanical properties of domestic waste, Proceedings 5th Sardinia International Landfill Symposium, Vol 2, pp 711-729.
2. E Kavazanjian, JR, N Matasovic & R C Bachus (1999), Large diameter static and cyclic laboratory testing of municipal solid waste, Vol 3, Sardinia Landfill Symposium pp 437-444.
3. S Thomas, A A Aboura, J P Gourc, P Gotteland, H Billard, T Delineau, T Gisbert, J F Ouvry and M Vuillemin, (1999), Vol 3, Sardinia Landfill Symposium, pp 445-452.
4. Gifford Consulting Engineers Report. Kinsale Road Landfill Slope Stability Report Ref 2001/011/08/KRL-WRL_SlopeStabReport.doc (3 Dec 2001).
5. Fehily Timoney & Company. Kinsale Road Landfill Slope Stability Report Ref CE08_011_07_Rpt001-0 (28 Jan 2009).
6. Fehily Timoney & Company. Kinsale Road Landfill Slope Stability Report Ref LW10_011_01_Rpt001-0 (14th January 2010).
7. Survey provided by Focus Surveys Ltd., Kinsale Road Landfill Site, Ref: 00-004_Z4, dated Sept 2011.

Appendix A

Drawing Number: LW12-011-02_001 Rev A

Drawing Title: Existing Topographic Survey showing
Section lines for Slope Stability Analysis





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LEGEND
 Line of Section for Slope Stability Analysis

NOTES
 1. Based on Topographic Site Survey Drawing Number 00-004_Z4 Received from Cork City Council.
 2. Refer to Report LW12-011-01 RPT 001 Slope Stability, for Figures Relating to Sections Section A-A - Figure 3.1



LOCATION MAP
 Scale 1:20000

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				Rev Origin	Date	Description

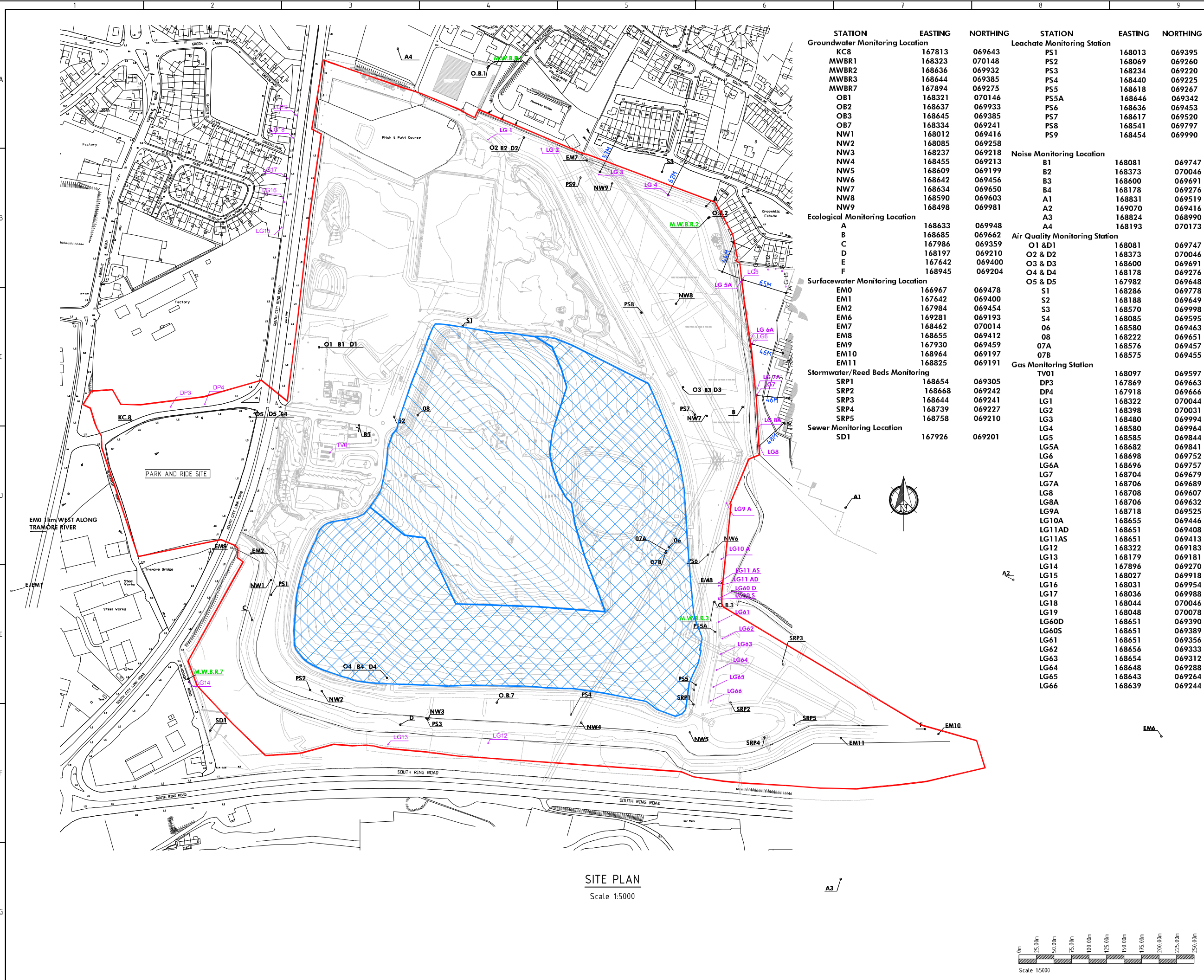
Name of Client
 CORK CITY COUNCIL

Name of Job
 KINSALE ROAD LANDFILL
 2011 ANNUAL
 ENVIRONMENTAL REPORT

Title of Drawing
 EXISTING TOPOGRAPHIC SURVEY
 SHOWING SECTION LINES
 FOR SLOPE STABILITY ANALYSIS

Scale Used	This Drawing was printed to
1:2000	A3
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 CONSULTANTS IN ENGINEERING & ENVIRONMENTAL SCIENCES
 W: www.fehilytimoney.ie, E: info@ftco.ie
 Core House, Pouladuff Rd, Cork, Ireland.
 T: +353-21-4964133, F: +353-21-4964464
 Unit 16, 3rd Floor, North Park Offices
 North Park Business Park, North Road, Dublin 11, Ireland.
 T: +353-1-6583500, F: +353-1-6583501



SITE PLAN
Scale 1:5000

STATION	EASTING	NORTHING	STATION	EASTING	NORTHING
Groundwater Monitoring Location					
KC8	167813	069643	Leachate Monitoring Station		
MWBR1	168323	070148	PS1	168013	069395
MWBR2	168636	069932	PS2	168069	069260
MWBR3	168644	069385	PS3	168234	069220
MWBR7	167894	069275	PS4	168440	069225
OB1	168321	070146	PS5	168618	069267
OB2	168637	069933	PS5A	168646	069342
OB3	168645	069385	PS6	168636	069453
OB7	168334	069241	PS7	168617	069520
NW1	168012	069416	PS8	168541	069797
NW2	168085	069258	PS9	168454	069990
NW3	168237	069218	Noise Monitoring Location		
NW4	168455	069213	B1	168081	069747
NW5	168609	069199	B2	168373	070046
NW6	168642	069456	B3	168600	069691
NW7	168634	069650	B4	168178	069276
NW8	168590	069603	A1	168831	069519
NW9	168498	069981	A2	169070	069416
Ecological Monitoring Location					
A	168633	069948	A3	168824	068990
B	168685	069662	A4	168193	070173
C	167986	069359	Air Quality Monitoring Station		
D	168197	069210	O1 & D1	168081	069747
E	167642	069400	O2 & D2	168373	070046
F	168945	069204	O3 & D3	168600	069691
Surfacewater Monitoring Location					
EM0	166967	069478	O4 & D4	168178	069276
EM1	167642	069400	O5 & D5	167982	069648
EM2	167984	069454	S1	168286	069778
EM6	169281	069193	S2	168188	069649
EM7	168462	070014	S3	168570	069998
EM8	168655	069412	S4	168085	069595
EM9	167930	069459	S5	168580	069463
EM10	168964	069197	S6	168222	069651
EM11	168825	069191	S7A	168576	069457
Stormwater/Reed Beds Monitoring					
SRP1	168654	069305	S7B	168575	069455
SRP2	168668	069242	Gas Monitoring Station		
SRP3	168644	069241	TV01	168097	069597
SRP4	168739	069227	DP3	167869	069663
SRP5	168758	069210	DP4	167918	069666
Sewer Monitoring Location					
SD1	167926	069201	LG1	168322	070044
			LG2	168398	070031
			LG3	168480	069994
			LG4	168580	069964
			LG5	168585	069844
			LG5A	168682	069841
			LG6	168698	069752
			LG6A	168696	069757
			LG7	168704	069679
			LG7A	168706	069689
			LG8	168708	069607
			LG8A	168706	069632
			LG9A	168718	069525
			LG10A	168655	069446
			LG11AD	168651	069408
			LG11AS	168651	069413
			LG12	168322	069183
			LG13	168179	069181
			LG14	167896	069270
			LG15	168027	069918
			LG16	168031	069954
			LG17	168036	069988
			LG18	168044	070046
			LG19	168048	070078
			LG60D	168651	069390
			LG60S	168651	069389
			LG61	168651	069356
			LG62	168656	069333
			LG63	168654	069312
			LG64	168648	069288
			LG65	168643	069264
			LG66	168639	069244

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LEACHATE MONITORING STATION-(PS1)
NOISE MONITORING LOCATION-(B1/A1)
AIR QUALITY MONITORING STATION-(D1/S1/O1)
ODOUR MONITORING LOCATION (O6/O7A/O7B)
GAS MONITORING STATION-(LG1/DP1/TV01)
SURFACEWATER MONITORING LOCATION-(EM1)
GROUNDWATER MONITORING LOCATION-(BR1/OB1/KC8/NW1)
STORMWATER/REED BEDS MONITORING-(SRP1)
SEWER MONITORING LOCATION-(SD1)
ECOLOGICAL MONITORING LOCATION-(A)

LEGEND

- FACILITY BOUNDARY
- CAPPED AREA
- AREA OF CURRENT CAPPING CONTRACT

Rev.	Drawn	Check	App'd	Rev. Origin	Rev. Date	Description
A	AK	AK	AK	Cork	27.01.11	ISSUE FOR 2010 AER

Name of Client
CORK CITY COUNCIL

Name of Job
KINSALE ROAD LANDFILL
2010 AER

Title of Drawing
EXISTING ENVIRONMENTAL MONITORING LOCATIONS

Scales Used
1:5000

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LW11-011-01-001

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CONSULTANTS IN ENGINEERING & ENVIRONMENTAL SCIENCES
FEHILY TIMONEY & COMPANY
 W: www.fehilytimoney.ie, E: info@ftcs.ie
 Core House, Pouladuff Rd, Cork, Ireland.
 T: +353-21-4964133, F: +353-21-4964664
 Unit 16, Third Floor, North Park Offices,
 North Park, Dublin 11, Ireland.
 T: +353-1-6833500, F: +353-1-6833501



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[Guidance to completing the PRTR workbook](#)

AER Returns Workbook

Version 1.1.13

REFERENCE YEAR	2011
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1. FACILITY IDENTIFICATION

Parent Company Name	Cork City Council
Facility Name	Kinsale Road Landfill
PRTR Identification Number	W0012
Licence Number	W0012-03

Waste or IPPC Classes of Activity

No.	class_name
3.1	Deposit on, in or under land (including landfill).
3.1.1	Blending or mixture prior to submission to any activity referred to in a preceding paragraph of this Schedule.
3.1.2	Repackaging prior to submission to any activity referred to in a preceding paragraph of this Schedule.
3.1.3	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.
3.2	Land treatment, including biodegradation of liquid or sludge discards in soils.
3.2	Surface impoundment, including placement of liquid or sludge discards into pits, ponds or lagoons.
3.4	Specially engineered landfill, including placement into lined discrete cells which are capped and isolated from one another and the environment.
3.5	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.
3.7	The treatment of any waste on land with a consequential benefit for an agricultural activity or ecological system.
4.10	Use of waste obtained from any activity referred to in a preceding paragraph of this Schedule.
4.11	Exchange of waste for submission to any activity referred to in a preceding paragraph of this Schedule.
4.12	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.
4.13	Recycling or reclamation of organic substances which are not used as solvents (including composting and other biological transformation processes).
4.2	Recycling or reclamation of metals and metal compounds.
4.3	Recycling or reclamation of other inorganic materials.
4.4	
Address 1	Ballyphehane
Address 2	Curraghconway
Address 3	Inchisarsfield
Address 4	South City Link Road, Cork.
	Cork
Country	Ireland
Coordinates of Location	-8.46079 51.8781
River Basin District	IESW
NACE Code	3821
Main Economic Activity	Treatment and disposal of non-hazardous waste
AER Returns Contact Name	Kevin Ryan
AER Returns Contact Email Address	kevin_ryan@corkcity.ie
AER Returns Contact Position	Kevin Ryan
AER Returns Contact Telephone Number	021 4705913
AER Returns Contact Mobile Phone Number	086 8152765
AER Returns Contact Fax Number	021 4319930
Production Volume	0.0
Production Volume Units	
Number of Installations	0
Number of Operating Hours in Year	0
Number of Employees	0
User Feedback/Comments	
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?	No
Have you been granted an exemption ?	No
If applicable which activity class applies (as per Schedule 2 of the regulations) ?	
Is the reduction scheme compliance route being used ?	

4.1 RELEASES TO AIR

[Link to previous years emissions data](#)

| PRTR# : W0012 | Facility Name : Kinsale Road Landfill | Filename : W0012_2011_updated.xlsm | Return Year : 2011 |

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SECTION A : SECTOR SPECIFIC PRTR POLLUTANTS

POLLUTANT		METHOD			Please enter all quantities in this section in KGs			
No. Annex II	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				
02	Carbon monoxide (CO)	M	OTH	Single sample, measured and multiplied to give annual figure	13129.0	13129.0	0.0	0.0
03	Carbon dioxide (CO2)	M	OTH	Single sample, measured and multiplied to give annual figure	3033051.0	3033051.0	0.0	0.0
07	Non-methane volatile organic compounds (NMVOC)	M	OTH	Single sample, measured and multiplied to give annual figure	26.0	26.0	0.0	0.0
01	Methane (CH4)	C	OTH	Total estimated methane generated	3816683.0	3816683.0	0.0	0.0
08	Nitrogen oxides (NOx/NO2)	M	OTH	Single sample, measured and multiplied to give annual figure	8010.0	8010.0	0.0	0.0
					0.0	0.0	0.0	0.0

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

SECTION B : REMAINING PRTR POLLUTANTS

POLLUTANT		METHOD			Please enter all quantities in this section in KGs			
No. Annex II	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	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)

POLLUTANT		METHOD			Please enter all quantities in this section in KGs			
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				
244	Total Particulates	M	OTH	Single sample, measured and multiplied to give annual figure	1068.0	1068.0	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: Please enter summary data on the quantities of methane flared and / or utilised	Kinsale Road Landfill				Facility Total Capacity m3 per hour
	T (Total) kg/Year	M/C/E	Method Code	Designation or Description	
Total estimated methane generation (as per site model)	0.0				N/A
Methane flared	34359.0	M	OTH	Continuous measurement	0.0 (Total Flaring Capacity)
Methane utilised in engine/s	1341708.0	M	OTH	Continuous measurement	0.0 (Total Utilising Capacity)
Net methane emission (as reported in Section A above)	8633.0	M	OTH	Single sample, measured and multiplied to give annual figure	N/A

4.2 RELEASES TO WATERS

[Link to previous years emissions data](#)

| PRTR# : W0012 | Facility Name : Kinsale Road Landfill | Filename : W0012_2011_updated.xlsm | Return Year : 2011 |

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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 concerns Releases from your facility

RELEASES TO WATERS					Please enter all quantities in this section in KGs			
POLLUTANT		M/C/E	Method Used		QUANTITY			
No. Annex II	Name		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 B : REMAINING PRTR POLLUTANTS

RELEASES TO WATERS					Please enter all quantities in this section in KGs			
POLLUTANT		M/C/E	Method Used		QUANTITY			
No. Annex II	Name		Method Code	Designation or Description	Emission Point 1	T (Total) KG/Year	A (Accidental) KG/Year	F (Fugitive) KG/Year
					0.0	0.0	0.0	0.0

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

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

RELEASES TO WATERS					Please enter all quantities in this section in KGs			
POLLUTANT		M/C/E	Method Used		QUANTITY			
Pollutant No.	Name		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

4.3 RELEASES TO WASTEWATER OR SEWER

[Link to previous years emissions data](#)

| PRTR# : W0012 | Facility Name : Kinsale Road Landfill | Filename : W0012_2011_updated.xlsm | F

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SECTION A : PRTR POLLUTANTS

OFFSITE TRANSFER OF POLLUTANTS DESTINED FOR WASTE-WATER TREATMENT OR SEWER					Please enter all quantities in this section in KGs			
POLLUTANT		METHOD			QUANTITY			
No. Annex II	Name	M/C/E	Method Code	Designation or Description	Emission Point 1	T (Total) KG/Year	A (Accidental) KG/Year	F (Fugitive) KG/Year
					0.0	0.0	0.0	0.0

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

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

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

4.4 RELEASES TO LAND

[Link to previous years emissions data](#)

| PRTR# : W0012 | Facility Name : Kinsale Road Landfill | Filename : W0012_2011_updated.xlsm | Return Year : 2011 |

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SECTION A : PRTR POLLUTANTS

POLLUTANT		METHOD			Please enter all quantities in this section in KGs		
RELEASERS TO LAND		METHOD			QUANTITY		
No. Annex II	Name	M/C/E	Method Code	Designation or Description	Emission Point 1	T (Total) KG/Year	A (Accidental) KG/Year
					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)

POLLUTANT		METHOD			Please enter all quantities in this section in KGs		
RELEASERS TO LAND		METHOD			QUANTITY		
Pollutant No.	Name	M/C/E	Method Code	Designation or Description	Emission Point 1	T (Total) KG/Year	A (Accidental) KG/Year
					0.0	0.0	0.0

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

5. ONSITE TREATMENT & OFFSITE TRANSFERS OF WASTE

| PRTR# : W0012 | Facility Name : Kinsale Road Landfill | Filename : W0012_2011_updated.xlsm | Return Year : 2011 |

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Please enter all quantities on this sheet in Tonnes

0

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	15 01 03	No	4944.28	wooden packaging	R3	M	Weighed	Offsite in Ireland	CTO Environmental (operating under Kinsale Road Landfill Site Licence),W0012-03		Kinsale Road Landfill Site,..Cork,..Ireland		
Within the Country	20 02 01	No	1645.62	biodegradable waste	R3	M	Weighed	Offsite in Ireland	CTO Environmental (operating under Kinsale Road Landfill Site Licence),W0012-03		Kinsale Road Landfill Site,..Cork,..Ireland		
Within the Country	15 01 01	No	170.26	paper and cardboard packaging	R3	M	Weighed	Offsite in Ireland	Cork Recycling,CK WMC 39/01		Lehenaghmore Togher,..Cork,..Ireland		
Within the Country	15 01 07	No	34.28	glass packaging	R5	M	Weighed	Offsite in Ireland	Gandon Enterprises Ltd.,CK WMC 146/03		Monaghan's Road,..Cork,..Ireland		
Within the Country	20 01 40	No	85.04	metals	R4	M	Weighed	Offsite in Ireland	Pouladuff Dismantlers,CK WMC 99/02		Forge Hill,..Cork,..Ireland		
Within the Country	15 01 02	No	34.04	plastic packaging	R3	M	Weighed	Offsite in Ireland	Cork Recycling,CK WMC 39/01		Lehenaghmore Togher,..Cork,..Ireland		
Within the Country	13 02 04	Yes	7.46	mineral-based chlorinated engine, gear and lubricating oils	R5	M	Weighed	Offsite in Ireland	ENVA,W0184-01		Clonminam Industrial Estate,..Portlaoise,County Laois,Ireland	ENVA,W0184-01,Clonminam Industrial Estate,..Portlaoise,County Laois,Ireland	Clonminam Industrial Estate,..Portlaoise,County Laois,Ireland
Within the Country	16 02 14	No	793.74	discarded equipment other than those mentioned in 16 02 09 to 16 02 13	R5	M	Weighed	Offsite in Ireland	KMK Metals Recycling,W0013-02		Road,Tullamore,County Offaly,Ireland		
Within the Country	20 01 27	Yes	18.16	paint, inks, adhesives and resins containing dangerous substances	D10	M	Weighed	Offsite in Ireland	SRCL,W0055-02		420 - 430 Beech Road ,Western Industrial Estate Naas Road ,Dublin,D 12,Ireland	Lindenschmidt KG Umweltservice,AZ: 54.1.21 - 2.970.11,Krombacher Strasse,42/46,Kreuztal - Krombach,57223,Germany	Krombacher Strasse,42/46,Kreuztal - Krombach,57223,Germany

* Select a row by double-clicking the Description of Waste then click the delete button

[Link to previous years waste data](#)

[Link to previous years waste summary data & percentage change](#)