



Wexford County Council

Killurin Landfill
W0016-02

Annual Environmental Report 2013

Quality Control Sheet

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Contents Page

Annual Environmental Report 2013	1
EXECUTIVE SUMMARY	5
1 INTRODUCTION	6
1.1 General Information	6
1.2 Site information	6
2 MANAGEMENT & STAFFING STRUCTURE	7
2.1 Management and staffing structure for Killurin Landfill on 31 st December 2013	7
2.2 Financial provisions	8
2.3 Environmental Management System	8
3 REPORTED INCIDENTS & COMPLAINTS SUMMARIES	12
3.1 Incidents	12
3.2 Complaints	12
4 DEVELOPMENT WORKS UNDERTAKEN DURING THE REPORTING PERIOD & THOSE PROPOSED FOR THE COMING YEAR	13
4.1 Landfill Engineering Works	13
4.2 Restoration and Aftercare	13
5 WASTE ACCEPTANCE & HANDLING	15
5.1 Waste Activities carried out at the Facility	15
5.2 Total Quantity of Waste Consigned Off Site	15
5.3 Remaining capacity of the site	15
6 ENVIRONMENTAL NUISANCES	18
6.1 Review of environmental nuisance control at the facility for the reporting period	18
7 RESOURCE & ENERGY CONSUMPTION	19
7.1 Electricity and Energy Usage	19
7.2 Water	19
7.3 Diesel	19
8 ENVIRONMENTAL MONITORING & EMISSIONS SUMMARY	20
8.1 Summary report on emissions	20
8.2 Environmental Monitoring	21
9 WATER BALANCE CALCULATIONS	29

APPENDICES

- A1 PRTR 2013
- A2 Topographical and Monitoring location drawings
- A3 Meteorological Data
- A4 Air emission report
- A5 Water Balance Calculation

EXECUTIVE SUMMARY

This *Annual Environmental Report* has been prepared for Killurin Landfill, Waste Licence 16-2, for the reporting period from **1 January 2013 to 31 December 2013 inclusive**. The report includes the information specified in Schedule G of the Waste Licence, Content of the Annual Environmental Report, in accordance with Waste Licensing - *Draft Guidance on Environmental Management Systems (EMS) and Reporting to the Agency, 1999*'. The main topics discussed with this report are as follows:

- ◆ General Site Information
- ◆ Management and Staffing
- ◆ Reported Incidents and Complaints
- ◆ Development Works
- ◆ Waste Acceptance and Handling
- ◆ Emissions Management
- ◆ Environmental Nuisances
- ◆ Resource and Energy Consumption
- ◆ Environmental Monitoring and Emissions

Killurin Landfill was closed to accepting waste on the 07 June 2008. No waste was accepted to landfill in 2013.

Wexford County Council continued to carry out a comprehensive environmental monitoring programme during 2013, in compliance with the waste licence conditions (Schedule D), to assess the significance of emissions. The monitoring programme included Landfill Gas, Leachate Level & Quality, Surface Water Quality, Groundwater Level & Quality, Odour monitoring and Meteorological monitoring as well as Topographical.

WCC submitted a Leachate Management Plan to the EPA in July 2013, which was deemed to be to the Agency's general satisfaction. In accordance with this plan, works commenced on site in October 2013 to complete final capping of the landfill haul road and to install additional leachate abstraction boreholes. This work is programmed for completion in March 2014.

1 INTRODUCTION

1.1 General Information

The Annual Environmental Report (AER) for Killurin Landfill includes the information specified in Schedule G of the Waste Licence 16-2, *Content of Annual Environmental Report* and has been prepared in accordance with the Environmental Protection Agency (EPA) publication *Waste Licensing – Draft Guidance on Environmental Management Systems (EMS) and Reporting to the Agency, 1999*.

The reporting period for this AER is **1st January 2013 to 31st December 2013 inclusive**.

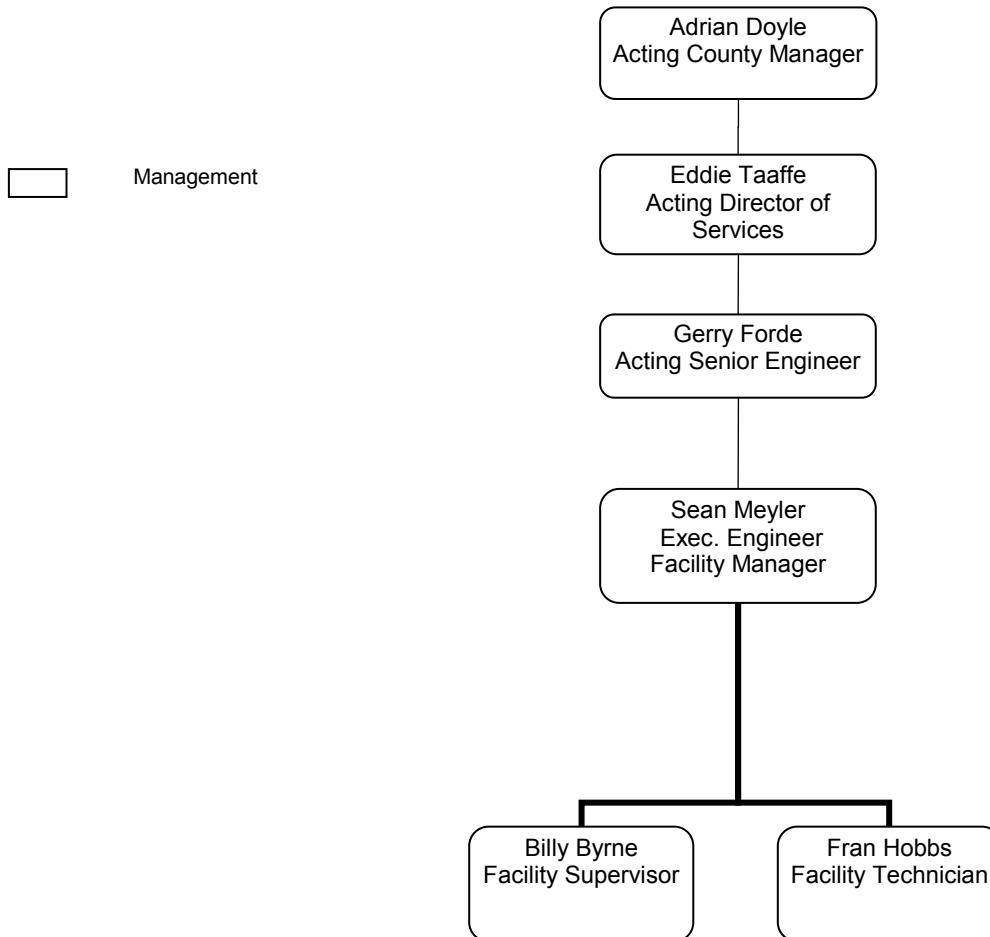
1.2 Site information

Table 1 Site information for Killurin Landfill

KILLURIN LANDFILL	
Waste licence register no:	W0016-2
Name and address of operator:	Wexford County Council County Hall Spawell Road County Wexford
Name and address of facility:	Killurin Landfill Killurin County Wexford
Site Description:	Killurin Landfill site is located in the town land of Newtown lower, Killurin, close to Deeps Bridge on a meander of the eastern bank of the River Slaney. The site is approximately 11km from Wexford town and covers an area of 10.7 hectares, of which 4.9 hectares are landfill and the remainder is CA site, buildings, car parking and buffer zones/screening. The facility is located in what once was a sand and gravel quarry. The area surrounding the site is rural with a mixed pattern of highly productive pasture and arable land use, with the River Slaney being the prominent landscape feature. Landfilling and CA site operations ceased in June 2008.

2 MANAGEMENT & STAFFING STRUCTURE

2.1 Management and staffing structure for Killurin Landfill on 31st December 2013



Killurin Landfill was operated by Wexford County Council during 2013 with consultancy support provided by sub consultants including Fehily Timoney & Company and Irish Biotech Services.

2.2 Financial provisions

In accordance with Condition 12.1 Wexford County Council paid a sum of €15,699 to the Environmental Protection Agency for the management and monitoring of the waste licence.

2.2.1 *Provision for the Closure, Restoration and Aftercare*

Wexford County Council (WCC), as a Local Authority, has made the necessary provisions, for the development, management, restoration and aftercare of Killurin Landfill. WCC has assigned engineering and technical staff to manage the facility. Wexford County Council is committed to the ongoing provision of funding for all site development works, environmental monitoring costs and restoration and aftercare works at Killurin Landfill for the duration of the Waste Licence.

2.3 Environmental Management System

2.3.1 *Environmental Management Programme*

The site has an operational environmental management system (EMS) in accordance with the Waste Licence condition 2.3.2.1. Implementation of the EMS continued during this reporting period (January 2012 - December 2012). The Objectives and Targets of the EMS were reviewed and revised for the reporting period 2012.

2.3.2 *Environmental objectives and targets.*

Table 2 below provides the Objectives and Targets for 2012 and details progress made regarding each objective. Table 3 provides the Objectives and Targets for 2013 and the methods by which they will be achieved.

An environmental management plan (EMP) was prepared as part of the EMS for the facility. The EMP comprises information on the following topics:

- Site description
- Site infrastructure
- Leachate Collection and treatment Leachate Management System
- Landfill Gas Abatement Methods
- Surface water Control Measures
- Environmental Monitoring
- Site Security and Site Offices
- Operational Matters
- Vermin control
- Fires
- Restoration and Aftercare

Table 2 **Achievements of Objectives and Targets for 2013**

Achievement of Objectives and Targets for 2013			
	Comments	Target	Progress
Objective No 1:			
1.1 Review and update leachate management plan document	Leachate Management Plan was completed and submitted to the Agency in July 2013. Implementation of Plan ongoing at end of reporting period.	2013	Achieved
Objective No 2:			
2.1 Update and review the Restoration and Aftercare plan	Revised restoration and Aftercare document completed and submitted to the EPA in July 2013	2013	Achieved
Objective No 3:			
3.1 Complete the capping of the landfill	Construction of the final capping of the perimeter haul road commenced in October 2013. By end of the reporting period, work was approximately 50% complete.	Sep/Oct 2013	c. 50% and projected for completion in March 2014
Objective No 4:			
4.1 Leachate extraction system and landfill gas system	Installation of additional leachate extraction wells have been identified as part of the leachate management plan. These were planned to be installed as part of the landfill capping project in 2013. Works had commenced by end of the reporting period.	Sep/Oct 2013	c. 10% and projected for completion in March 2014
4.2 Maintenance of Leachate extraction system	Revise the maintenance schedule and items as per the leachate management plan for servicing of the pumped extraction system	2013	Achieved
Objective No 5:			
5.1 Maintain site records and performance of site procedures	Maintain existing filing system and record storage for the facility, in particular the retention of records for historical review of the facility's environmental performance.	2013	Achieved and ongoing
Objective No 6:			
6.1 Ensure ongoing maintenance of the following site infrastructure: Roads; Surface Water drainage infrastructure; Weighbridge; Site offices and Plant shed; Landfill gas extraction system; Leachate extraction system.	All of the items of existing infrastructure were to be maintained as required and in accordance with suppliers/manufacturers instructions where applicable.	2013	Achieved

Table 3 Objectives and Targets for 2014

Objectives and Targets for 2014			
	Comments	Target	Responsibility
Objective No 1:			
1.1 Complete capping of the landfill perimeter haul road	Complete construction works, which commenced in October 2013	March 2014	Facility Manager / Facility Technician
Objective No 2:			
2.1 Complete installation of additional leachate abstraction wells	Complete installation of 16 additional deep leachate abstraction wells, which commenced in October 2013	March 2014	Facility Manager / Facility Technician
Objective No 3:			
3.1 Undertake improvements to existing leachate management infrastructure	Replace existing leachate rising main to increase discharge rate; replace compressor to improve air supply to pneumatic leachate abstraction pumps	April 2014	Facility Manager / Facility Technician
Objective No 4:			
4.1 Optimise landfill gas extraction from waste body	Connect new leachate abstraction wells to LFG extraction system and rebalance gas field	May 2014	Facility Manager / Facility Technician
Objective No 5:			
5.1 Implement revised environmental monitoring regime in accordance with the Leachate management Plan	Following completion of landfill capping works and commissioning of improved leachate abstraction system, commence enhanced environmental monitoring as detailed in the LMP	May 2014 and ongoing thereafter	Facility Manager / Facility Technician
Objective No 6:			
6.1 Evaluate effectiveness of the initial works carried out in accordance with the leachate management plan	Interrogate environmental monitoring data and abstracted leachate data to evaluate effectiveness of the perimeter road capping works and enhanced leachate abstraction system	June 2014 and ongoing thereafter	Facility Manager / Facility Technician

2.3.3 Corrective action Procedure

Procedures are in place in accordance with Condition 2.3.2.3 of the licence to monitor, measure, audit and record the environmental performance of the environmental management system. These procedures establish how non-conformance within the system is dealt with and how any corrective and preventive action is carried out. A corrective action procedure was

prepared in October 2008 (reviewed in 2010) and is included in the overall EMS report.

2.3.4 Awareness and Training Programme

In accordance with Condition 2.3.2.4 of the licence, an awareness and training programme has been developed to increase environmental awareness among staff and identify training needs of all personnel working at Killurin Landfill. The facility manager has overall responsibility for reviewing training needs on an annual basis to ensure that all staff have the necessary skills and level of awareness to carry out their duties to the highest environmental and safety standards. Training records are kept on file at Holmestown Waste Management Facility.

2.3.5 Full title of any procedures developed by the licensee in the year which relates to the facility operation

No additional procedures were developed or submitted during the reporting period.

2.3.6 Report on communication programme

The site’s EMS includes a procedure for communication. In addition Wexford County Council provides the following documentation for public viewing at Holmestown Waste Management Facility:

Table 4 List of records available for public access in relation to the landfill

List of records available for public viewing
Waste Licence W0016-2
Waste Licence application
Correspondence with the EPA
Incident / complaints records
Audit records
Waste acceptance records
Material acceptance dockets
All monitoring records
Leachate removal records
Vermin control reports

3 REPORTED INCIDENTS & COMPLAINTS SUMMARIES

3.1 Incidents

No incidents were reported during this reporting period. However ongoing elevated levels of ammonia (which are decreasing over time) are still being recorded in downstream groundwater boreholes. Refer to quarterly monitoring reports and the Leachate Management plan for further details.

3.2 Complaints

No complaints were received during this reporting period.

4 DEVELOPMENT WORKS UNDERTAKEN DURING THE REPORTING PERIOD & THOSE PROPOSED FOR THE COMING YEAR

4.1 Landfill Engineering Works

4.1.1 *Completed Engineering Works 2013*

Engineering works for 2013 as detailed in the Leachate Management Plan were progressed as follows

- C. 50% completion of capping works to the perimeter landfill access road
- Continue the leachate extraction infrastructure maintenance works programme

4.1.2 *Proposed Engineering Works 2014*

Proposed engineering works for 2014 as detailed in the Leachate Management Plan are summarized as follows

- Completion of capping works to the perimeter landfill access road
- Install 16 additional dual purpose leachate extraction/monitoring and landfill gas extraction wells
- Install new leachate collection pipework system
- Surface water Management Works
- Continue the leachate extraction infrastructure maintenance works programme

4.2 Restoration and Aftercare

A revised restoration and aftercare plan was submitted to the EPA for approval in July 2013.

Restoration and aftercare works carried out in 2013 include:

- C. 50% completion of capping works to the perimeter landfill access road

Restoration and aftercare development works planned for 2014 include:

- Completion of capping works to the perimeter landfill access road

5 WASTE ACCEPTANCE & HANDLING

5.1 Waste Activities carried out at the Facility

No waste disposal operations took place on site at Killurin Landfill during the reporting period 1st January 2013 to 31st December 2013.

5.2 Total Quantity of Waste Consigned Off Site

A summary of the total quantity of waste consigned off site at Killurin Landfill for the period 1st January 2013 to 31st December 2013 is presented below in Table 5.

The total volume of leachate transported off site for treatment at Wexford Wastewater Treatment Works was 3,518 Tonnes.

5.3 Remaining capacity of the site

Killurin Landfill closed at the end of June 2008. There is no remaining landfill capacity.

Table 5

Waste consigned off-site from Killurin Landfill from 1st January to 31st December 2013 (tonnes)

Waste Out	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Yearly totals
LEACHATE	464	336	341	191	142	164	111	150	82	591	577	369	3,518
Total													3,518

6 ENVIRONMENTAL NUISANCES

6.1 Review of environmental nuisance control at the facility for the reporting period

Nuisances at Killurin Landfill are logged in a monthly tick-box report and action is taken immediately to address any identified issues. Table 7 below summarises the measures implemented on site to combat environmental nuisances during 2013.

Table 6 Environmental Nuisance Control during 2013

Nuisance	Mitigation Measures in Place
Vermin	Permanent bait points set up on site (internal and external). Inspections carried out on a monthly basis. If infection found then weekly inspections until rodent free. Monthly reports produced and kept at Holmestown site office.
Litter	Killurin landfill is litter free.
Flies	No flies present.
Odour	No odour emissions

7 RESOURCE & ENERGY CONSUMPTION

7.1 Electricity and Energy Usage

Electricity usage for the reporting period was estimated at 76350 kWh.

7.2 Water

Domestic water usage data was not recorded.

7.3 Diesel

Total diesel fuel consumption (for operations) is estimated to be 0 litres from 1st January to 31st December 2013.

8 ENVIRONMENTAL MONITORING & EMISSIONS SUMMARY

8.1 Summary report on emissions

A summary of emissions monitoring at Killurin Landfill carried out during this reporting period (January 2013 – December 2013) is contained in Table 8 below. The E-PRTR Regulation (EC) No. 166/2006 concerning the establishment of a European Pollutant Release and Transfer Register came into force in February 2006 and was brought into Irish law through SI No 123 of 2007. As a result all industries have to annually report environmental emissions and waste transfer data through a web-based form as part of their AER. The PRTR 2013 document is included in Appendix A1.

Table 7 A summary of Emissions monitoring as specified in Waste Licence W0016-2

Emission Monitoring	Frequency
Landfill Gas	Continuously (Dwellings adjacent to Landfill, Flare) Weekly (Site Accommodation) Monthly (Landfill Gas & Leachate Wells) Annual (Flare emissions)
Leachate	Monthly (Level & Analysis Note 2) Quarterly (Analysis) Annually (Analysis)
Surface water	Weekly (Visual) Quarterly (Analysis) Annually (Analysis)
Groundwater Levels	Monthly (Borehole Level)
Groundwater	Quarterly (Analysis) (Note 2) Annually (Analysis)
Noise	As required (Note 1)
Dust	As required (Note 1)
River Water	Quarterly (Analysis)

Note 1: When specific engineering works are being carried out

Note 2: As detailed in the Leachate Management Plan additional monitoring of groundwater and leachate around and within the Landfill footprint took place during 2013

8.2 Environmental Monitoring

Wexford County Council carries out a comprehensive environmental monitoring programme, in compliance with the waste licence conditions, to assess the significance of emissions. The monitoring programme includes Landfill Gas, Leachate Level & Quality, Surface Water Quality, Groundwater Level & Quality, Noise and Dust monitoring (as required), Odour monitoring and Meteorological monitoring, as well as Flare emission and Topographical.

Monitoring during this reporting period was carried out according to Schedule D of Waste Licence W0016-2, Quarters 1, 2, 3 and 4 results for 2013 are summarised in this chapter. Additional monitoring was also carried out as detailed in the Leachate Management Plan. A monitoring point location plan is provided see Appendix A2.

8.2.1 Landfill gas

In accordance with Schedule D.1 of the Waste Licence W0016-2, the following monitoring has been carried out and reported to the Agency.

- Monitoring boreholes within waste LB2, LB3, LB4, LB5, LB6, LB7, LB8, LB12, LB13 and LB14 as specified in the licence.
- Monitoring boreholes boundary locations GW1, GW9, GW10, GW11, GW17, GW18, GW19, GBH1 and GBH2
- Perimeter boreholes T1, T2, T3, T5, T6, T7, T9, T10, T11, T12, T13, T14, T15, T16, T17, T18 and T19 were monitored on a monthly basis by Wexford County Council site staff.

The majority of boreholes have varying levels of gas quality over the reporting period and no particular trend could be identified. Gas monitoring details are provided in Table 9 below.

Table 8 **Gas Monitoring Points**

Off site and on site gas boreholes		
CO2 and CH4 levels (monthly)	36 points	In waste gas monitoring wells LB 2 - LB8, LB 12 - LB 14
		Boundary gas monitoring wells T1 –T3, T5- T7, T9- T19 GW1, GW9- GW11, GW17-GW19.
		Resident gas boreholes: GB1 and GB2
Residential Dwelling gas alarms		
CO2 and CH4 levels (continuously)	2 points	Two closest residences
CO2 and CH4 levels (weekly)	8 points	All site buildings

Perimeter boreholes

Methane and Carbon Dioxide levels are elevated in gas monitoring wells T14, T15, T16, GW17, GW18 and GW19. The elevated Methane and Carbon Dioxide levels result from the location of these boreholes which are either in or on the periphery of the waste body. WCC propose to discontinue monitoring at these locations as they are no longer deemed as being peripheral wells. T17, T18, T19, GBH1 and GBH2 are in a similar orientation but further removed from the waste body and are considered suitable for ongoing monitoring in this area. No exceedences of licence limits were recorded at T17, T18, T19, GBH1 or GBH2 which would indicate that no landfill gas migration off site has taken place.

Carbon Dioxide levels in T2, T3, T5, T6, T7, T9, T11, T12 and T13 are slightly elevated. The most likely cause of the slightly elevated readings is their location in a mature wooded area. The exceedences are low (max 10% in T6).

No exceedences of licence limits were recorded at any of the remaining peripheral gas monitoring wells. This indicates that landfill gas migration off site has not taken place.

Methane (CH₄)

Resident's boreholes

The following was recorded at resident's boreholes during this reporting period:

- ◆ **GB1 at Carley's:** Methane levels at this monitoring location were seen to be below the 1.0% volume per volume (v/v) trigger-level throughout the reporting period.
- ◆ **GB2 at Foxes:** Methane levels at this monitoring location were seen to be below the 1.0% volume per volume (v/v) trigger-level throughout the reporting period.

The CH₄ trigger level at the gas monitoring wells is 1.0% volume by volume (v/v).

Carbon Dioxide (CO₂)

Resident's boreholes

The following was recorded at resident's boreholes during this reporting period:

- ◆ **GB1 at Carley's:** All results were below the 1.5% volume per volume (v/v) trigger-level.
- ◆ **GB2 at Foxe's:** All results were below the 1.5% volume per volume (v/v) trigger-level.

The CO₂ trigger level at the gas monitoring wells is 1.5% volume by volume (v/v).

Monitoring boreholes GBH1 and GBH2 are located on the resident's side of the gas migration cut off trench. The cut off trench consists of an excavated trench along the landfill boundary adjacent to Carley's and Fox's residents. Installed in this trench is an impermeable geotextile membrane with a series of gas extraction wells installed on the landfill side. The results indicate that the gas migration cut off trench combined with the gas abstraction system is operating as designed. Continuous monitoring for the detection of landfill gas was carried out at Carley's and Fox's residents. Landfill gas was not detected at either residence in 2013.

Methane and Carbon Dioxide levels (as expected) remain elevated in the dual leachate/Gas monitoring wells which are located in the waste body (LB 2 – LB7, LB 12 - LB 14). This gas is being continuously extracted and flared off.

8.2.2 Flare Emissions

An air emission test of the landfill flare was carried out by AXIS environmental services on the 11th October 2013. NO_x, CO, HCL, HF and TOC were found to be in compliance with the emission limit values contained in Waste Licence W0016-2 – Schedule C5. The report is included in Appendix A4.

8.2.3 Leachate levels and monitoring

Leachate monitoring points

Leachate Monitoring			
Level	10 points	LB2-LB8, LB12-LB16	Weekly
Analysis	1 point	Leachate storage tanks	Annually

Leachate levels

Leachate levels were taken at 10 leachate boreholes during 2013 in compliance with Schedule D.5 of the waste licence. Samples for analysis were obtained from the leachate storage tanks in 2013 in compliance with Schedule D.5. The levels were recorded using a dip meter on a monthly basis by Wexford County Council staff at the landfill. The annual analysis results of the leachate removed from the tanks in 2013 is detailed in Table 10. The quantity exported off-site in 2013 was 3,518 tonnes compared to 4,325 tonnes in 2012.

Leachate is collected from 30 extraction wells located around the site within the waste boundary. This leachate is directed to the three holding tanks located in the northwest of the landfill. It is then removed by road tanker on a routine basis and transported to Wexford Wastewater Treatment Plant for treatment in accordance with Waste Licence Condition 6.6.

Leachate monitoring

Annual monitoring was undertaken on 15th April 2013. A leachate sample was collected from the leachate storage tanks. The sample was analysed for a range of parameters as defined in Table D.5.1 of the Waste Licence 16-2.

The typical characteristics of leachate generated on site are presented in Table 10. The results are similar to those obtained for the last reporting period and are in general indicative of a landfill in the methanogenic stage of decomposition of organic compounds i.e. conversion of organic compounds to landfill gas.

Table 9 Leachate analysis results 2013

Sampling Points		Tanks
Sampling Date		15/04/2013
Parameters	Units	Annual
Temperature	°C	9.9
Ammonia	mg/l N	340
Biochemical Oxygen Demand	mg/l O ₂	35
Chemical Oxygen Demand	mg/l O ₂	553
Chloride	mg/l Cl	521
Conductivity	µS/cm	5750
Fluoride	mg/l F	<2.5
Mercury	µg/l	<0.5
Nitrite	mg/l N	nm
Ortho-Phosphate	mg/l P	0.58
pH	pH	7.7
Sulphate	mg/l SO ₄	<25
Total Oxidised Nitrogen	mg/l N	4.57
Aluminum	µg/l	77
Antimony	µg/l	2.5
Arsenic	µg/l	12
Barium	µg/l	140
Beryllium	µg/l	<0.5
Boron	µg/l	1700
Cadmium	µg/l	<0.5
Calcium	mg/l	86
Chromium	µg/l	33
Cobalt	µg/l	7.6
Copper	µg/l	13
Iron	µg/l	4600
Lead	µg/l	1.1
Magnesium	mg/l	58
Manganese	µg/l	460
Molybdenum	µg/l	1.4
Nickel	µg/l	36
Potassium	mg/l	210
Selenium	µg/l	23
Sodium	mg/l	440
Thallium	µg/l	<0.5
Uranium	µg/l	<0.5
Vanadium	µg/l	35
Zinc	µg/l	75

Additional leachate analysis was undertaken during 2013 from 28 number leachate wells located within the waste body, the results of this analysis is to be submitted as part of the quarterly Leachate Management Plan review reports.

Inspection and testing of leachate storage tanks

The tanks were tested in December 2011 and are due to be re-tested in December 2014.

8.2.4 Surface Water

Under Schedule D.5 of the Waste Licence 16-2, surface water monitoring was required in the locations listed below. SW1 is located upstream of the site, SW2 is situated downstream of the site SW3 is located on the eastern side of the site adjacent to the landfill flare compound and SW4 is located at the southern tip of the facility (see monitoring point location drawing in Appendix A2). The site streams regularly run dry during the drier months of the year and consequently surface water samples cannot be obtained. These are discussed in subsequent sections.

Table 10 **Surface water monitoring locations and frequency**

Surface water monitoring locations and frequency			
Parameter	Location	Name	Frequency
Visual Inspection/ Odour	Off site (River Slaney)	S1, S2, S3	Quarterly
Chemical analysis	Off site (River Slaney)	S1, S2, S3	Quarterly
Visual inspection	On site	SW1, SW2, SW3 and SW4	Weekly
Chemical analysis	On site	SW1, SW2, SW3 and SW4,	Quarterly and Annual

Visual inspection of surface water

Surface water on site consists of a series of open and piped drains. Weekly visual inspections of surface water were conducted for monitoring points SW1, SW2, SW3 (Is a surface water manhole that collects surface water from the upper cap subsurface drainage layer and is adjacent to the flare compound, monitoring commenced in Q4, 2012) and SW4, and quarterly at off-site locations (River Slaney) S1, S2 and S3. All surface water details are included in previously submitted monitoring reports for the landfill. No visual abnormalities were recorded for any of the surface water inspection points during the reporting period.

Surface water quality analysis

Results for all surface water monitoring carried out in 2013 have been submitted to the Agency in quarterly monitoring reports. Due to dry periods it was not always possible to retrieve samples from all of the monitoring points. No sample was obtainable from SW4 in Q1, SW3 in Q2, SW1, SW2, SW3 & SW4 in Q3 and SW3 in Q4.

All sampling and analysis was carried out in accordance with recognised quality assurance and control procedures. The detailed monitoring results are presented in

the quarterly monitoring reports submitted to the Agency in the reporting period. The range of analysis is as specified in Schedule D.5 of the Waste Licence 16-2 and includes parameters such as ammoniacal nitrogen, BOD, COD, dissolved oxygen, pH, electrical conductivity, suspended solids and temperature. No atypical results were recorded during the quarterly monitoring in 2013.

River water

The river water monitoring results for the river Slaney are presented in the quarterly monitoring reports submitted to the Agency in the reporting period. Monitoring location S1 is located upstream of the landfill, monitoring location S2 in the river adjacent to the landfill and monitoring location S3 is located downstream of the landfill and all are located within the tidal zone of the river estuary.

Ammonia results were relatively low. There is no evidence from the upstream and downstream river results that the landfill is impacting negatively on the Slaney.

8.2.5 Groundwater

Table 11 **Groundwater monitoring locations**

Groundwater Monitoring Locations		
Downgradient	1 point	GW1
Downgradient (border of reed beds)	1 point	GW9
Downgradient (border of reed beds)	1 point	GW10
Upgradient	1 point	GW11
Upgradient	1 point	GW17
Upgradient	1 point	GW18
Upgradient	1 point	GW19
Upgradient	1 point	GBH1
Upgradient	1 point	GBH2

Groundwater levels

Groundwater levels were measured on a monthly basis using a dip meter. The groundwater dip levels have been submitted to the Agency in the quarterly monitoring reports. Groundwater levels remained relatively constant throughout the monitoring period, with only minor variations in groundwater levels in accordance with prevailing weather conditions. During the drier months the groundwater levels were seen to gradually decrease while during wetter periods where prolonged rain was evident, levels of groundwater were noted to rise slightly over a number of months.

Groundwater quality boreholes

No significant variation from historical result trends were noted in 2013. The highest levels of contaminants have been recorded in the boreholes located along the south east side of the landfill. These BH's are on the maximum hydraulic groundwater gradient that falls from the landfill towards the river. Samples were taken from both soil and underlying rock layers. In both cases the distribution of contamination was not even, with certain boreholes recording higher results than others. This may be due to preferential flow paths caused by gravel/sand lenses in the soils and increased permeability due to higher levels of fracturing or faults in the underlying rock. The

result trends show that leachate management on site has had a beneficial effect on these wells and Ammonal, Chloride and Conductivity levels have been decreasing since 2006. Boreholes with low contaminant readings have exhibited little change since 2006. This may be due to the lower permeability and recharge in these zones. Further information on the above can be found in the quarterly monitoring reports and the quarterly Leachate Management Plan review reports.

Boreholes GW17-19 are included as groundwater (and peripheral gas) monitoring locations in Table D1.1 of the Licence. They have been reported as dry since 2006. The boreholes are too shallow and too close to the landfill. GBH1 and GBH2 are in a similar orientation and are considered suitable for ongoing monitoring in this area. This revision has been included in the updated Leachate Management Plan

Private Well water analysis

Table 12 Private well monitoring locations

Drinking water		
Private residence	UV treated	Kitchen tap

Quarterly and annually monitoring was carried out on drinking water samples from our neighbour’s private well.

Additional private well / groundwater analysis was undertaken during 2013 from 3 number private wells located above the western bank of the river Slaney opposite the landfill, the results of this analysis is to be submitted as part of the quarterly Leachate Management Plan review reports

8.2.6 Noise

No noise survey was undertaken during 2013. The construction works which commenced in Q4 2013 will be subjected to a noise survey in January 2014, while both capping and well drilling works are ongoing, to check noise levels at the optimum time.

8.2.7 Dust

No dust monitoring was undertaken during 2013. The Q4 construction works commenced outside of the dust monitoring season and were therefore not subjected to dust monitoring.

8.2.8 Meteorological monitoring

All 2013 meteorological monitoring information was obtained from the Met Éireann weather station located at Johnstown Castle, Wexford; this station is within 10km of the Killurin Landfill site. The monitoring data is contained in Appendix A3.

8.2.9 Topographical Survey

A topographical survey of the site was carried out by Wexford County Council staff in March 2014. The topographical survey drawing is contained in Appendix A2.

Given that the landfill has not accepted waste since 2008, and that the site has been largely capped (excepting the perimeter road, with final cap under construction at end of 2013), the enclosed topographical survey was carried out for the purpose of checking settlement in the waste body. There appears to have been very little settlement since the 2012 AER topographical survey was carried out. The maximum observed level for the 2012 AER survey was 30.261 mOD, as compared to a level of 30.2 mOD for the 2013 AER survey.

There has been some minor changes to levels along the route of the perimeter road due to capping works, but these are inconsequential in relation to settlement or stability.

8.2.10 Slope Stability Assessment

A walkover slope stability assessment was conducted in March 2014 to check for any visible signs of slippage or instability on the flanks of the waste body. None were noted. It was concluded that the waste body remained stable during 2013.

9 Water Balance Calculations

The objective of the assessment of water balance calculations is to understand and predict the liquid inputs and outputs of the facility. Water balance calculations have been calculated for the period 1st January 2013 to 31st December 2013 to estimate the approximate volume of leachate generated on site. This volume can then be compared to the volume of leachate leaving site, by tanker over the weighbridge.

The water balance addressed the volume of leachate generated at the site including the estimated annual infiltration of rainfall. The water balance methodology is described below and the calculation is shown in Appendix A5.

The water balance calculations are based on the methodology specified in the EPA's Landfill Site Design Manual. The calculation used is as follows: -

$$L_o = [ER(A) + LW + IRCA + ER(I)] - [aw]$$

L_o = leachate produced (m^3)

ER = effective rainfall (m) (Use actual rainfall (R) for active cells)

A = area of cell (m^2)

LW = liquid waste (m^3)

IRCA = infiltration through restored and capped areas (m)

I = surface area of lagoon (m^2)

a = absorptive capacity of new waste (m^3/t)

w = weight of waste deposited (t/a)

An absorptive capacity of $0.025 m^3$ per tonne was assumed.

The meteorological data used was obtained from the nearby Met Eireann meteorological station at Johnstown Castle. The total rainfall from 1st January 2013 to the 31st December 2013 was approximately 880 mm. Meteorological data is presented in Appendix A3.

The water balance calculation considers three infiltration types influencing leachate generation:

- Infiltration directly through the permanently capped areas, estimated at 5%
- Infiltration due to direct precipitation through the uncapped perimeter access road
- Infiltration due to run-off from the upper capped areas onto the uncapped perimeter access road

Final capping works on the perimeter access road commenced in November 2013. The water balance calculation takes account of capped areas of the access road by 31st December 2013.

The estimated volume of leachate generated for the period 1st January 2013 to the 31st December 2013 is $5,590 m^3$ (a calculation summary is included in Appendix A5). During the same period $3,517 m^3$ of leachate was removed from the site for treatment in the waste water treatment plant at Wexford. A monthly breakdown of leachate volumes removed is presented in Table 5 above.

It should be noted that this calculation is based on an assumed infiltration rate through the permanent cap of 5%. Due to the dilute and disperse nature of the landfill, it is difficult to reconcile the infiltration rate with the actual volumes of leachate generated. However, this water balance calculation does show a deficit between leachate generation and leachate removal of 2,073 m³. It is expected that this deficit will reduce significantly in subsequent years following the full implementation of restoration and leachate abstraction works detailed in our previously submitted Leachate Management Plan (by Fehily Timoney and Company, July 2013).

APPENDICES



[Guidance to completing the PRTR workbook](#)

AER Returns Workbook

Version 1.1.18

REFERENCE YEAR	2013
-----------------------	------

1. FACILITY IDENTIFICATION

Parent Company Name	Wexford County Council
Facility Name	Killurin Landfill Site
PRTR Identification Number	W0016
Licence Number	W0016-02

Waste or IPPC Classes of Activity

No.	class_name
3.1	Deposit on, in or under land (including landfill).
3.10	Release of waste into a water body (including a seabed insertion). Repackaging prior to submission to any activity referred to in a preceding paragraph of this Schedule.
3.12	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.
3.13	Surface impoundment, including placement of liquid or sludge discards into pits, ponds or lagoons.
3.4	The treatment of any waste on land with a consequential benefit for an agricultural activity or ecological system.
4.10	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	
Address 1	Newtown Lower
Address 2	Killurin
Address 3	Co. Wexford
Address 4	
	Wexford
Country	Ireland
Coordinates of Location	-6.56116 52.3816
River Basin District	IESE
NACE Code	3821
Main Economic Activity	Treatment and disposal of non-hazardous waste
AER Returns Contact Name	Sean Meyler
AER Returns Contact Email Address	sean.meyler@wexfordcoco.ie
AER Returns Contact Position	Facility Manager
AER Returns Contact Telephone Number	053 9120922
AER Returns Contact Mobile Phone Number	0877406265
AER Returns Contact Fax Number	
Production Volume	0.0
Production Volume Units	
Number of Installations	0
Number of Operating Hours in Year	0
Number of Employees	3
User Feedback/Comments	Closed landfill no permanent staff presence on site, Leachate collection and landfill gas infrastructure maintenance ongoing, leachate tankered off site ongoing, environmental monitoring ongoing, general site maintenance ongoing.
Web Address	

2. PRTR CLASS ACTIVITIES

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

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

Is it applicable?	
Have you been granted an exemption ?	
If applicable which activity class applies (as per Schedule 2 of the regulations) ?	
Is the reduction scheme compliance route being used ?	

4. WASTE IMPORTED/ACCEPTED ONTO SITE

[Guidance on waste imported/accepted onto site](#)

Do you import/accept waste onto your site for on-site treatment (either recovery or disposal activities) ?	
--	--

4.1 RELEASES TO AIR

[Link to previous years emissions data](#)

| PRTR# : W0016 | Facility Name : Killurin Landfill Site | Filename : W0016_2013_Final.xls | Return Year : 2013 |

09/04/2014 15:03

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		QUANTITY			
			Method Code	Designation or Description	Flare Emission Point 1	T (Total) KG/Year	A (Accidental) KG/Year	F (Fugitive) KG/Year
01	Methane (CH4)	C	ALT	GasSim model	0.0	0.0	0.0	0.0
08	Nitrogen oxides (NOx/NO2)	M	EN 14792:2005		0.0	202141.0	0.0	202141.0
02	Carbon monoxide (CO)	M	EN 15058:2004		37.0	37.0	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		QUANTITY			
			Method Code	Designation or Description	Flare 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)

POLLUTANT		METHOD			Please enter all quantities in this section in KGs			
Pollutant No.	Name	M/C/E	Method Used		QUANTITY			
			Method Code	Designation or Description	Flare Emission Point 1	T (Total) KG/Year	A (Accidental) KG/Year	F (Fugitive) KG/Year
351	Total Organic Carbon (as C)	M	ALT	EN12619:2013	0.0	0.0	0.0	0.0
				EN1911:2010 and	13.0	13.0	0.0	0.0
319	Inorganic acids	M	ALT	EN15713:2010	3.0	3.0	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

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:		Killurin Landfill Site			
Please enter summary data on the quantities of methane flared and / or utilised		M/C/E	Method Used		Facility Total Capacity m3 per hour
T (Total) kg/Year			Method Code	Designation or Description	
Total estimated methane generation (as per site model)	552927.0	C	EST	GasSim	N/A
Methane flared	350786.0	M	OTH	Continuous analyser	1250.0 (Total Flaring Capacity)
Methane utilised in engine/s	0.0	C	OTH	Not applicable	0.0 (Total Utilising Capacity)
Net methane emission (as reported in Section A above)	202141.0	C	EST	Total estimated methane	N/A

4.2 RELEASES TO WATERS

[Link to previous years emissions data](#)

SECTION A : SECTOR SPECIFIC PRTR POLLUTANTS

RELEASES TO WATERS	
POLLUTANT	
No. Annex II	Name

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

SECTION B : REMAINING PRTR POLLUTANTS

RELEASES TO WATERS	
POLLUTANT	
No. Annex II	Name

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

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

RELEASES TO WATERS	
POLLUTANT	
Pollutant No.	Name

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

Data on ambient monitoring of storm/surface water or groundwater, conducted as part of your licence requirements, should NOT

Please enter all quantities in this section in KGs				
M/C/E	Method Used		Emission Point 1	T (Total) KG/Year
	Method Code	Designation or Description		
			0.0	0.0

then click the delete but

Please enter all quantities in this section in KGs				
M/C/E	Method Used		Emission Point 1	T (Total) KG/Year
	Method Code	Designation or Description		
			0.0	0.0

then click the delete but

Please enter all quantities in this section in KGs				
M/C/E	Method Used		Emission Point 1	T (Total) KG/Year
	Method Code	Designation or Description		
			0.0	0.0

then click the delete but

To be submitted under AER / PRTR Reporting as this only concerns Releases from your facility

QUANTITY	
A (Accidental) KG/Year	F (Fugitive) KG/Year
0.0	0.0

QUANTITY	
A (Accidental) KG/Year	F (Fugitive) KG/Year
0.0	0.0

QUANTITY	
A (Accidental) KG/Year	F (Fugitive) KG/Year
0.0	0.0

4.3 RELEASES TO WASTEWATER OR SEWER

[Link to previous years emissions data](#)

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 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 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 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

4.4 RELEASES TO LAND

[Link to previous years emissions data](#)

SECTION A : PRTR POLLUTANTS

RELEASES TO LAND	
POLLUTANT	
No. Annex II	Name

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

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

RELEASES TO LAND	
POLLUTANT	
Pollutant No.	Name

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

METHOD			Please enter all quantities
M/C/E	Method Code	Designation or Description	Emission Point 1
			0.0

) then click the delete button

METHOD			Please enter all quantities
M/C/E	Method Code	Designation or Description	Emission Point 1
			0.0

) then click the delete button

in this section in KGs	
QUANTITY	
T (Total) KG/Year	A (Accidental) KG/Year
0.0	0.0

in this section in KGs	
QUANTITY	
T (Total) KG/Year	A (Accidental) KG/Year
0.0	0.0

5. ONSITE TREATMENT & OFFSITE TRANSFERS OF WASTE

| PRTR#: W0016 | Facility Name : Killurin Landfill Site | Filename : W0016_2013_Final.xls | Return Year : 2013 |

09/04/2014 15:03

Please enter all quantities on this sheet in Tonnes

5

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 : 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		Haz Waste: Name and Licence/Permit No of Recover/Disposer	Haz Waste: Address of Recover/Disposer				
Within the Country	02 02 02	No	0.0	animal-tissue waste landfill leachate other than those mentioned	D10	M	Weighed	Offsite in Ireland	Waterford Proteins Ltd. ,Dept of Agriculture R919		Ferrybank, ,Waterford ,Ireland			
Within the Country	19 07 03	No	3517.0	in 19 07 02	D9	M	Volume Calculation	Offsite in Ireland	Wexford WWTP Wexford County Council, "		Pumping Station, Trinity Street ,Wexford, ,Ireland			
Within the Country	20 01 40	No	0.0	metals	R4	M	Weighed	Offsite in Ireland	Mulligan Dismantling and Salvage Ltd,WP/05/20		Inch,Gorey,County Wexford, ,Ireland			

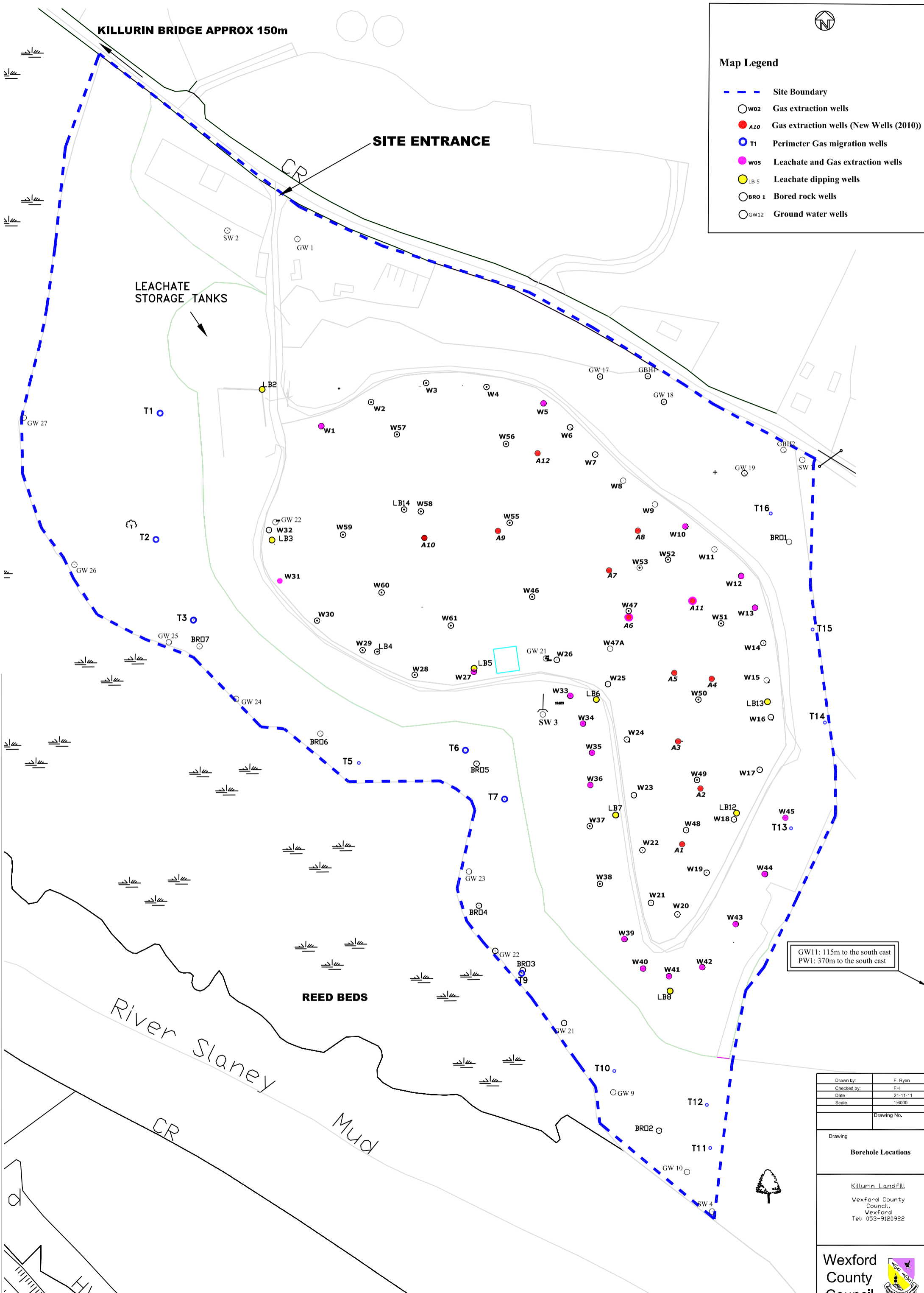
* Select a row by double-clicking the Description of Waste then click the delete button

[Link to previous years waste data](#)

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

[Link to Waste Guidance](#)

A2 Topographical and Monitoring location drawings



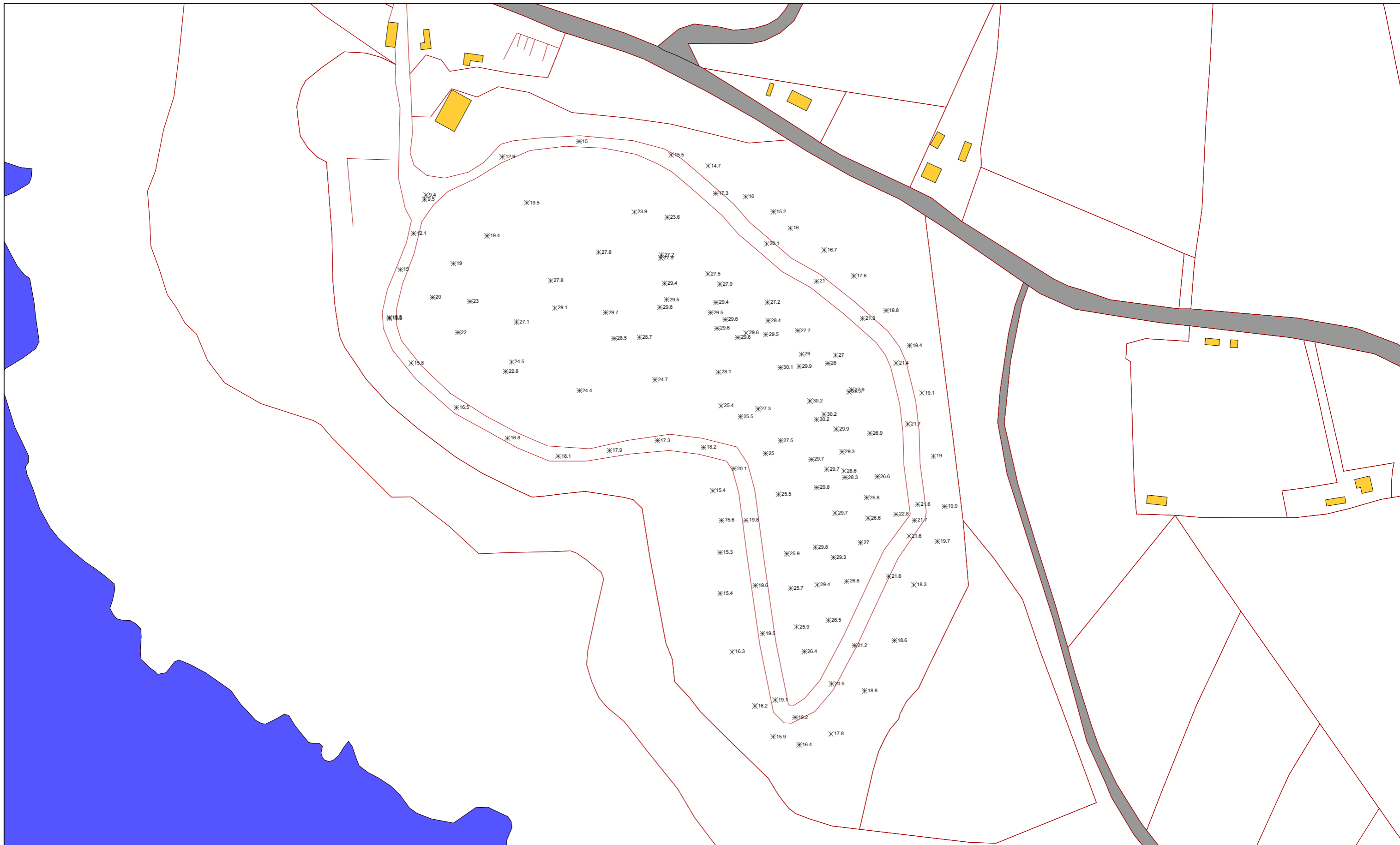
Map Legend

- Site Boundary
- W02 Gas extraction wells
- A10 Gas extraction wells (New Wells (2010))
- T1 Perimeter Gas migration wells
- W05 Leachate and Gas extraction wells
- LB 5 Leachate dipping wells
- BRD 1 Bored rock wells
- GW12 Ground water wells

GW11: 115m to the south east
 PW1: 370m to the south east

Drawn by:	F. Ryan
Checked by:	FH
Date:	21-11-11
Scale:	1:6000
Drawing No.	

Drawing
Borehole Locations
 Killurín Landfill
 Wexford County Council,
 Wexford
 Tel: 053-9120922



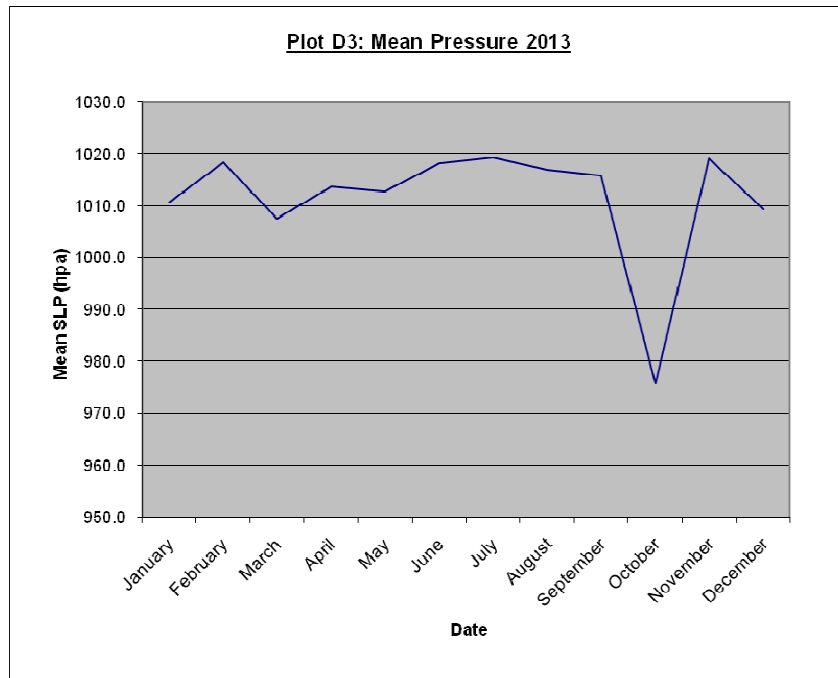
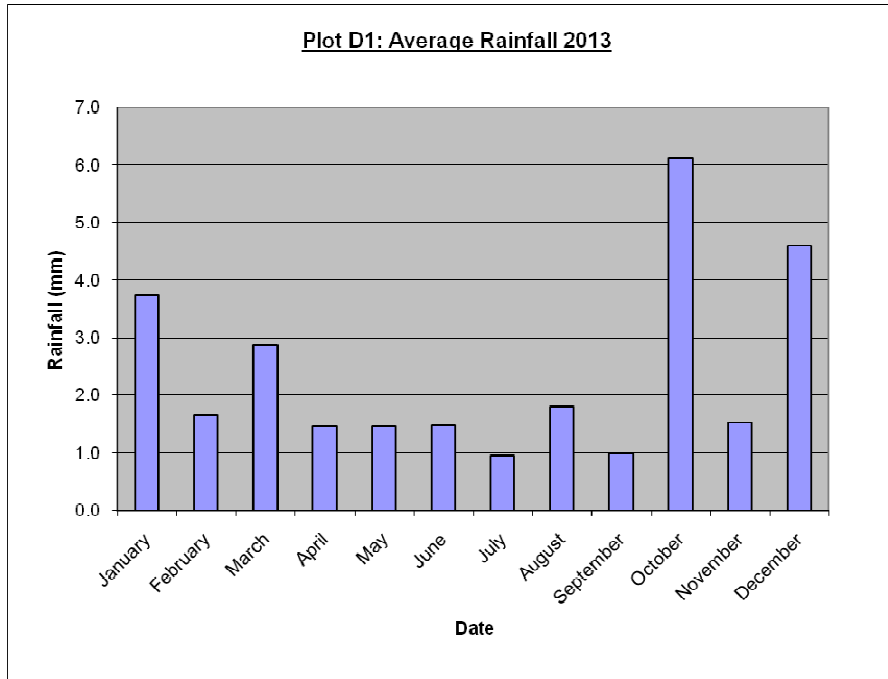
Killurin Landfill Mar 2014 Elevation surevy

© Ordnance Survey Ireland. All rights reserved. Licence number 2010/34/CCMA/Wexford Local Authority

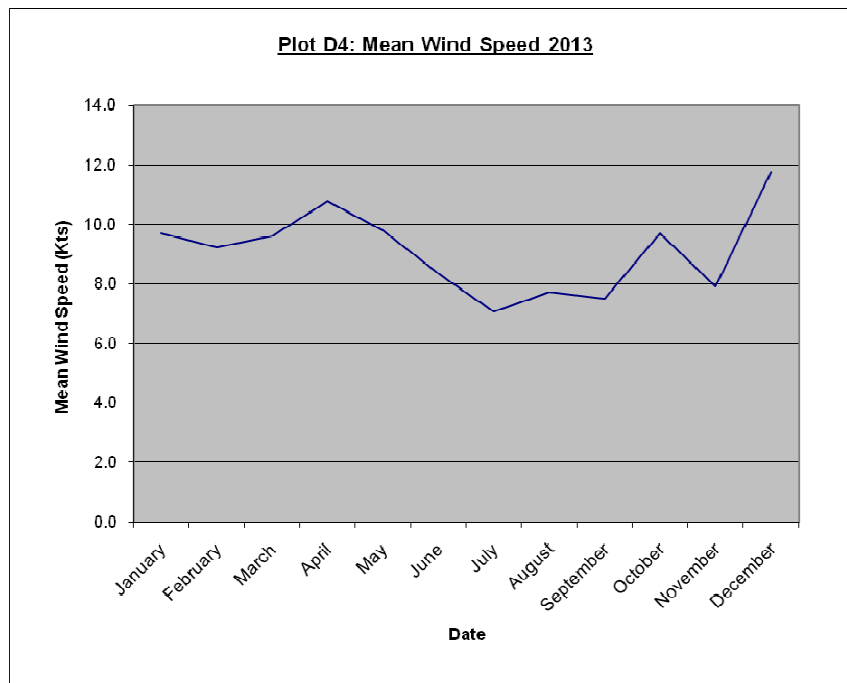
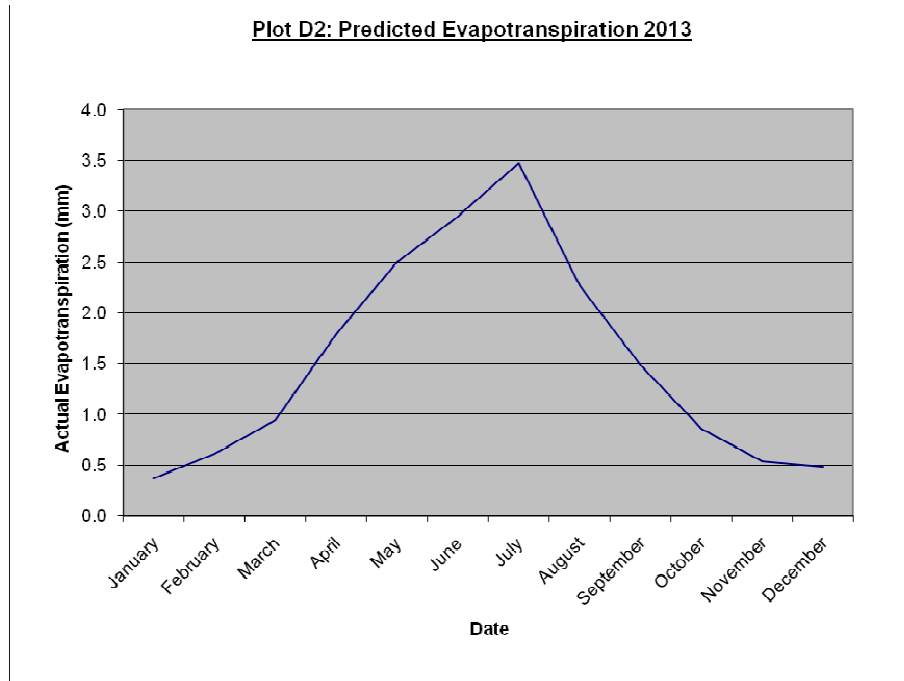
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Drawn by: EL	Checked by:SM
Date: 26 Mar 2014	Map No: 1

A3 Meteorological Data

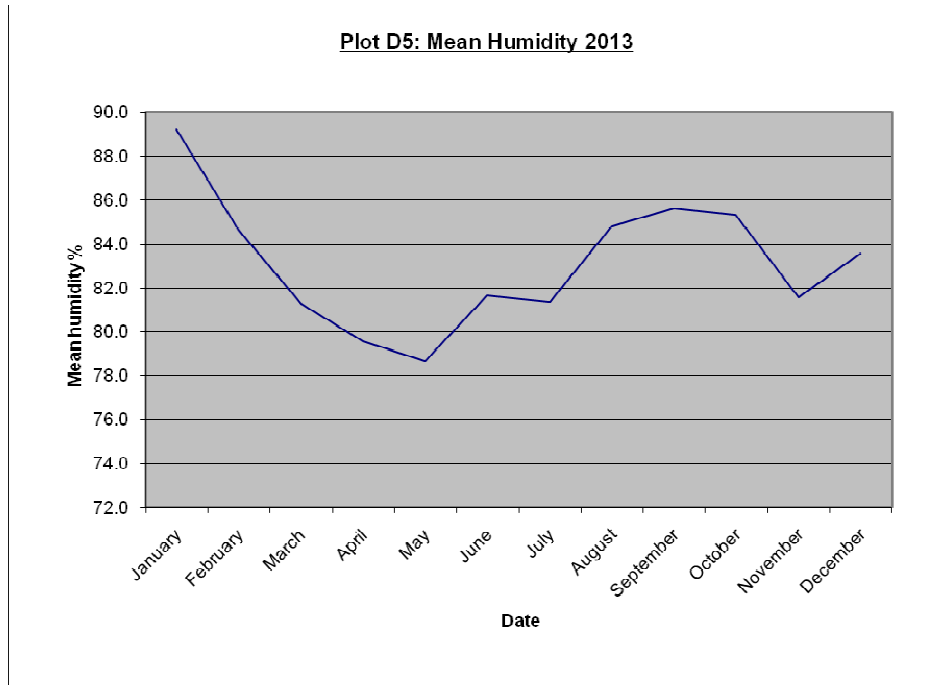
Appendix D – Meteorological Graphs



Appendix D – Meteorological Graphs



Appendix D – Meteorological Graphs



A4 Air emission report



Emissions To Atmosphere Report

October 2013

Killurin Landfill,

Newtown Lower,
Killurin,
Co Wexford.

Licence Number: WL016-02
Report Date: 06th November 2013

Report Number:
3650-13-02
Version No: 0

AXIS environmental services
40 Coolraine Heights, Old Cratloe Road, Limerick
Phone: 061 324587 Mobile: 087 6367436
Email: info@axisenv.ie Website: www.axisenv.ie

Report for the Periodic Monitoring of Emissions to Air

Part 1: Executive Summary

Licence No: WL0016-02

Operator: Wexford Co Co

Installation: Killurin Landfill, Newtown Lower, Killurin, Co Wexford.

Contact Name: Fran Hobbs

Contact No. 053 9120922

Contract Technician: Mark McGarry

Monitoring Dates: 11th October 2013

Monitoring Organisation: AXIS environmental services

Address: 40 Coolraine Heights,
Old Cratloe Road,
Limerick

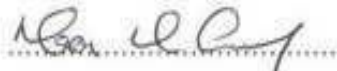
Date of Report: 06th November 2013

Report Approved By: Mark Mc Garry

MCERTS Reg. No. MM05 573

Function: Environmental Manager

Signed:



Contents

- 1. Part 1 – Executive Summary**
 - 1.1 Monitoring Objectives**
 - 1.2 Special Monitoring Requirements**
 - 1.3 Summary of Methods**
 - 1.4 Results Combustion Plant**
 - 1.5 Monitoring Deviations**
- 2. Part 2 – Supporting Information**
 - Appendix I: General Information**
 - Appendix II: Raw Data**
 - Appendix III: Uncertainty of Measurement**
 - Appendix IV: Certificates of Analysis**

1 Part 1: Executive Summary

1.1 Monitoring Objectives

Killurin Landfill is required to carry out air emissions monitoring as set out in the Licence W0016-02. Monitoring was carried out as part of the requirements in the licence. All procedures were carried out to standard methods as listed and EPA AG2 / MCERTS requirements. A summary of compliance standings has been listed below:

Emission Point	Process Name	Parameters	Licence Limits	Units	Reference Conditions	Emission Summary
Landfill Flare	Flare	NOx as NO ₂	150	mg/Nm ³	Standard temperature and pressure, dry gas referenced to 5% oxygen	Compliant
		CO	50	mg/Nm ³		Compliant
		TOC	10	mg/Nm ³		Compliant
		Hydrogen Chloride	50	mg/Nm ³		Compliant
		Hydrogen Fluoride	5	mg/Nm ³		Compliant
Notes:						

1.2 Special Monitoring Requirements

None

1.3 Summary of Methods

Substance	Standard Method	AG2 Compliant	SOP	Limit of Detection	Calculation Spreadsheet
Flow Rates	Calculated	AG7	-	-	5018
NO _x	EN 14792	Yes	2021	<0.5	
CO	EN 14791	Yes	2021	<0.5	
TOC	EN 12619	Yes	2007	<0.5	
HCl	EN 1911	Yes	2014	<0.05	
HF	ISO 15713	Yes	2020	<0.05	

1.4 Monitoring Results

This table presents atmospheric emissions from analysis undertaken on behalf of Killurin Landfill.

Emission Point Reference: Flare Outlet										
Substance to be Monitored	Emission Limit Value	Periodic Monitoring Result	Units Reference Conditions 273 K, 101.3 kPa	Uncertainty Of Measurement +/-	Stack Flow Rate Nm ³ /Hr	Limit Nm ³ /Hr	Date of Sampling	Sampling Start/End Times	Method Reference	Operating Status
NOx as NO ₂	150	68.4	mg/Nm ³	3.85	1,266	3,000	11-10-2013	12:18 – 12:48	EN 14792	As Normal
CO	50	3.5	mg/Nm ³	0.91			12:18 – 12:48	EN 14791		
TOC	10	1.24	mg/Nm ³	0.10			12:18 – 12:48	EN 12619		
Hydrogen Chloride	50	0.22	mg/Nm ³	0.01			12:18 – 12:48	EN 1911		
Hydrogen Fluoride	5	<0.10	mg/Nm ³	0.01			12:18 – 12:48	ISO 15713		
Additional Information										

1.5 Monitoring Results

This table presents atmospheric emissions from analysis undertaken on behalf of Killurin Landfill.

Emission Point Reference: Flare Inlet										
Substance to be Monitored	Emission Limit Value	Periodic Monitoring Result	Units Reference Conditions 273 K, 101.3 kPa	Uncertainty Of Measurement +/-	Stack Flow Rate Nm ³ /Hr	Limit Nm ³ /Hr	Date of Sampling	Sampling Start/End Times	Method Reference	Operating Status
Total Sulphur	-	2.29	mg/Nm ³	-	-	-	11-10-2013	12:10 – 12:40	USEPA M26	As Normal
Total Chloride	-	0.9	mg/Nm ³	-				12:10 – 12:40	USEPA M26	
Total Fluoride	-	<0.29	mg/Nm ³	-				12:10 – 12:40	USEPA M26	
Additional Information										

1.6 Monitoring Deviations

Emission Point Reference	Substance Deviations	Monitoring Deviations	Other Relevant Information
Killurin Flare	All substances were monitored as per licence requirements for the annual suite	None	None

Report for the Periodic Monitoring of Emissions to Air

Part 2: Supporting Information

Waste Number: W0016-012
Operator: Wexford County Council
Installation: Killurin Landfill
Monitoring Dates: 11th October 2013

Organisation and Monitoring Team Details

AXIS environmental services,
40 Coolraine Heights,
Old Cratloe Road,
Limerick.

Email: info@axisenv.ie
Phone: 061 324587
Fax: 061 324587
Mobile: 087 6367436

Date of Report: 06th November 2013

Report Approved By: Mark Mc Garry

MCERTS Reg. No: MM05 573

Function: Environmental Manager

Signed:



Appendix I

Sampling Personnel

Team Leader	Mark McGarry
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Equipment Checklist References

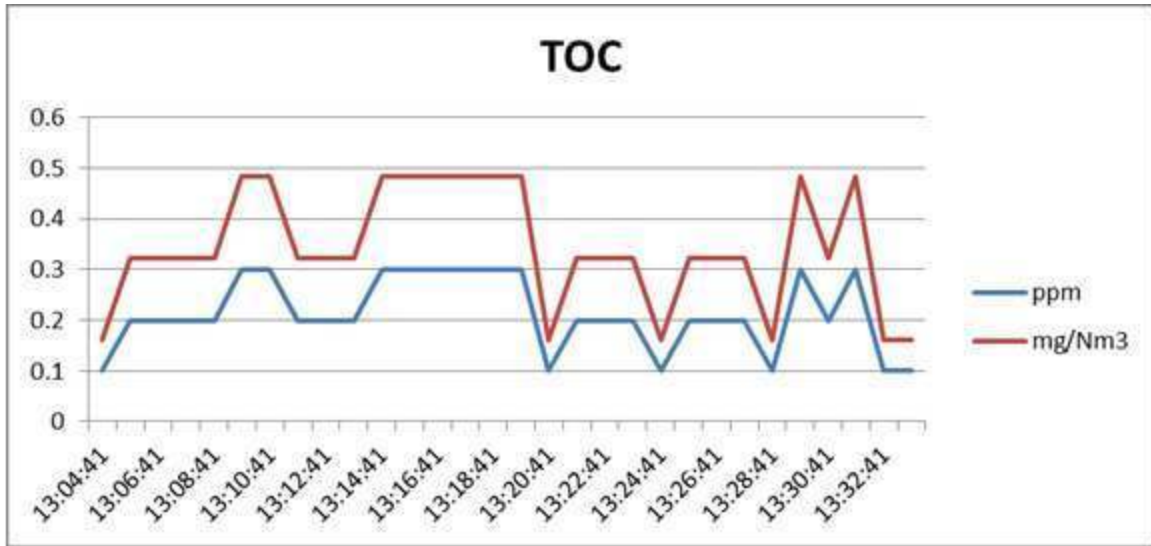
Equipment	Reference Number
Horiba	AX066
Flow Meter	AX018
S-type Pitot	AX012
Heated Line	AX004
Horiba PG250	AX025
Chiller	AX026
FID	AX015

Appendix II – Raw Data

Title:	Flue Gas Analysis								
Method:	EN 15058, 14792, 14789, SO2 By IR								
Client:	Killurin Landfill								
Log Sheet Complete by:	Mark McGarry								
Test Date:	11th October 2013								
Equipment Used:	ASL12LK504								
Stack Name:	Landfill Flare								
Test Time:	12:18 - 12:48								
Reference O₂:	3	%							
Stack Flow Rate	1266.16	Nm ³ /hr							
Calibration Details	Before	After	Drift	ELV					
NO			0		mg/nm3 @ Ref Conditions				
CO			0		mg/nm3 @ Ref Conditions				
SO2			0		mg/nm3 @ Ref Conditions				
O2			0		%				
Date/Time	Data source	CO	CO2	NOx	O2	SO2	CO	NOx	SO2
		<i>ppm</i>	<i>vol%</i>	<i>ppm</i>	<i>vol%</i>	<i>ppm</i>	<i>mg/Nm3 Reference O2</i>		
11/10/2013 12:18		1.300	4.920	8.700	15.450	4.600	5.3	58.7	43.2
11/10/2013 12:19		0.533	5.050	10.833	15.290	3.900	2.1	71.0	35.6
11/10/2013 12:20		0.667	4.757	9.900	15.637	3.333	2.8	69.1	32.4
11/10/2013 12:21		0.533	4.997	10.167	15.357	3.367	2.2	67.4	31.1
11/10/2013 12:22		0.200	5.250	10.833	15.050	2.800	0.8	68.1	24.5
11/10/2013 12:23		0.467	4.707	9.900	15.690	2.133	2.0	69.8	21.0
11/10/2013 12:24		0.033	4.450	9.333	16.000	1.900	0.2	70.0	19.9
11/10/2013 12:25		0.733	4.643	9.767	15.787	1.533	3.2	70.2	15.4
11/10/2013 12:26		0.700	4.367	9.367	16.103	1.367	3.3	71.8	14.6
11/10/2013 12:27		0.667	4.357	8.800	16.120	1.833	3.1	67.7	19.6
11/10/2013 12:28		1.267	3.827	8.067	16.727	1.233	6.8	71.0	15.1
11/10/2013 12:29		0.567	4.613	8.767	15.853	0.867	2.5	63.8	8.8
11/10/2013 12:30		0.867	4.690	9.833	15.743	0.533	3.8	70.1	5.3
11/10/2013 12:31		0.633	4.703	10.100	15.717	0.133	2.7	71.6	1.3
11/10/2013 12:32		1.100	3.843	8.100	16.700	0.000	5.9	70.9	0.0
11/10/2013 12:33		0.733	4.823	9.233	15.610	0.633	3.1	64.1	6.1
11/10/2013 12:34		0.700	4.307	9.400	16.173	0.333	3.3	73.1	3.6
11/10/2013 12:35		0.267	4.680	9.033	15.777	-0.300	1.2	64.8	-3.0
11/10/2013 12:36		0.700	5.157	10.600	15.203	0.067	2.7	68.4	0.6
11/10/2013 12:37		1.000	4.743	10.267	15.663	0.200	4.3	72.0	2.0
11/10/2013 12:38		1.133	5.070	10.067	15.317	0.167	4.5	66.3	1.5
11/10/2013 12:39		1.300	5.287	11.033	15.033	-0.167	5.0	69.1	-1.5
11/10/2013 12:40		1.000	5.410	11.100	14.900	-0.733	3.7	68.0	-6.3
11/10/2013 12:41		0.633	5.123	10.933	15.220	-0.333	2.5	70.7	-3.0
11/10/2013 12:42		0.933	4.340	9.533	16.127	-0.933	4.4	73.4	-10.0
11/10/2013 12:43		1.000	4.083	7.867	16.453	-0.900	5.0	65.0	-10.4
11/10/2013 12:44		1.167	4.493	9.033	15.987	-0.467	5.3	67.6	-4.9
11/10/2013 12:45		1.133	4.553	9.067	15.900	-0.400	5.1	66.6	-4.1
11/10/2013 12:46		0.867	4.670	9.267	15.763	-1.000	3.8	66.3	-10.0
11/10/2013 12:47		0.800	4.183	8.933	16.313	-1.267	3.9	71.6	-14.1
11/10/2013 12:48		0.867	4.090	7.933	16.443	-1.000	4.4	65.4	-11.5
11/10/2013 12:49		0.933	5.023	9.700	15.377	-1.433	3.8	64.5	-13.3
Average		0.8	4.7	9.5	15.8	0.7	3.5	68.4	6.6

Title:	<u>Determination of Total Organic Compounds</u>
Method:	EN 12619
Client:	0
Log Sheet Complete by:	0
Stack Reference:	0

Run 1	Time	ppm	mg/Nm³
1	13:04:41	0.1	0.161
2	13:05:41	0.2	0.322
3	13:06:41	0.2	0.322
4	13:07:41	0.2	0.322
5	13:08:41	0.2	0.322
6	13:09:41	0.3	0.483
7	13:10:41	0.3	0.483
8	13:11:41	0.2	0.322
9	13:12:41	0.2	0.322
10	13:13:41	0.2	0.322
11	13:14:41	0.3	0.483
12	13:15:41	0.3	0.483
13	13:16:41	0.3	0.483
14	13:17:41	0.3	0.483
15	13:18:41	0.3	0.483
16	13:19:41	0.3	0.483
17	13:20:41	0.1	0.161
18	13:21:41	0.2	0.322
19	13:22:41	0.2	0.322
20	13:23:41	0.2	0.322
21	13:24:41	0.1	0.161
22	13:25:41	0.2	0.322
23	13:26:41	0.2	0.322
24	13:27:41	0.2	0.322
25	13:28:41	0.1	0.161
26	13:29:41	0.3	0.483
27	13:30:41	0.2	0.322
28	13:31:41	0.3	0.483
29	13:32:41	0.1	0.161
30	13:33:41	0.1	0.161
Average		0.21	0.34
Adjusted for O₂ and Moisture			1.24



Title: Determination of Inorganic
 Comounds

Method: EN 1911 & USEPA M26
Client: Killurin Landfill
Log Sheet Complete by: Mark McGarry
Test Date: 11/10/2013
Laboratory Used: RPS
Certificate Numbers: WK13-6485
Stack Reference: Flare Inlet

	Chloride	Fluoride	Sulphate	
Leak Check Results				
Prior to test:	<0.001	<0.001	<0.001	l/min
Post Test:	<0.001	<0.001	<0.001	l/min
Sample Volume Flow Rate:	2	2	2	l/min
Standard Requirement:	<2	<2	<2	%
Test Result:	<0.5	<0.5	<0.5	%
Test Status	Pass	Pass	Pass	

Calibration Details

Pump Number:	EQ532	EQ533	EQ532	
Calibration Unit:	AX028	AX028	AX028	
Calibration Rate Before Test:	2.02	2.04	2.02	litres per minute
Calibration Rate After Test:	2.020	2.04	2.020	litres per minute
Average sample Volume:	2.02	2.04	2.02	litres per minute
Sample Test Time:	30	30	30	minutes
Pump Gas Temperature:	8	8	8	°C
Pump Sample Pressure:	101	101	101	kPa
Actual Sample Volume:	0.06060	0.06120	0.06060	m ³
Normalised Gas Volume:	0.05870	0.05928	0.05870	Nm ³

Stack Flow Rates

Diameter:	-	m
Average Velocity:	-	m/s
Average Temperature:	--	°C
Average Pressure:	-	kPa
Actual Flow Rate:	-	m ³ /Hr
Normalised Flow Rate:	-	Nm ³ /Hr

Chloride, Bromide, Ammonia Results

Laboratory Result	0.05	0.16	1.64	ug/ml
Impinger final Volume	101	109	101	ml
Factor	1	-	1	
Concentration	0.005	0.017	0.166	mg
Sample Volume	0.059	0.059	0.059	Nm ³
Emissions Concentration	0.09	0.29	2.82	mg/Nm ³
Uncertainty	4.77	4.75	0.00	%

Title: Determination of Inorganic Comounds
Method: EN 1911 & USEPA M26
Client: Killurin Landfill
Log Sheet Complete by: Mark McGarry
Test Date: 11/10/2013
Laboratory Used: RPS
Certificate Numbers: WK13-6485
Stack Reference: Flare

	HCl	HF	
Leak Check Results			
Prior to test:	<0.001	<0.001	l/min
Post Test:	<0.001	<0.001	l/min
Sample Volume Flow Rate:	2	2	l/min
Standard Requirement:	<2	<2	%
Test Result:	<0.5	<0.5	%
Test Status	Pass	Pass	

Calibration Details

Pump Number:	EQ532	EQ533	
Calibration Unit:	AX028	AX028	
Calibration Rate Before Test:	2.02	2.04	litres per minute
Calibration Rate After Test:	2.020	2.04	litres per minute
Average sample Volume:	2.02	2.04	litres per minute
Sample Test Time:	30	30	minutes
Pump Gas Temperature:	8	8	°C
Pump Sample Pressure:	101	101	kPa
Actual Sample Volume:	0.06060	0.06120	m ³
Normalised Gas Volume:	0.05870	0.05928	Nm ³

Stack Flow Rates

Diameter:	-	m
Average Velocity:	-	m/s
Average Temperature:	--	°C
Average Pressure:	-	kPa
Actual Flow Rate:	-	m ³ /Hr
Normalised Flow Rate:	1266.0	Nm ³ /Hr

Chloride, Bromide, Ammonia Results

Laboratory Result	0.08	0.05	ug/ml
Impinger final Volume	44	33	ml
Factor	1.028	-	
Concentration	0.004	0.002	mg
Sample Volume	0.059	0.059	Nm ³
Emissions Concentration	0.06	0.03	mg/Nm ³
Adjusted Concentration	0.22	0.10	3%

Mass Emissions	0.00027	0.00012	kg/hr
Licence Limits	0.3	0.21	kg/hr
Uncertainty	4.77	4.75	%

A5 Water Balance Calculation

Appendix A5

Water Balance Calculation for Killurin Landfill 2013

Month	Rainfall (mm)	Evaporation (mm)	Effective Rainfall (mm)	Capped Area (above road) (m ²)	Capped Area (Below road) (m ²)	Open Area (Haul Road) (m ²)	Additional runoff to haul road (effective area) (m ²)	Capped Infiltration (m ³)	Infiltration through incident rain on haul road (m ³)	Infiltration from runoff to haul road (m ³)	Total Leachate Production (m ³)	Cumulative Leachate Production (m ³)	Leachate Tankered Offsite (m ³)
Jan-13	115.9	11.7	104.2	39,282	15,340	6,600	39,282	316.5	257.9	460.5	1,034.9	1,034.9	463.9
Feb-13	46.4	17.3	29.1	39,282	15,340	6,600	39,282	126.7	72.0	128.6	327.3	1,362.3	335.8
Mar-13	89.2	29.3	59.9	39,282	15,340	6,600	39,282	243.6	148.3	264.7	656.6	2,018.8	341.3
Apr-13	44	53.8	0	39,282	15,340	6,600	39,282	120.2	-	-	120.2	2,139.0	191.3
May-13	45.5	77.4	0	39,282	15,340	6,600	39,282	124.3	-	-	124.3	2,263.3	141.8
Jun-13	44.4	88.4	0	39,282	15,340	6,600	39,282	121.3	-	-	121.3	2,384.5	163.8
Jul-13	29.9	107.7	0	39,282	15,340	6,600	39,282	81.7	-	-	81.7	2,466.2	110.6
Aug-13	56.1	70.3	0	39,282	15,340	6,600	39,282	153.2	-	-	153.2	2,619.4	149.5
Sep-13	30	44.7	0	39,282	15,340	6,600	39,282	81.9	-	-	81.9	2,701.3	81.9
Oct-13	189.6	26.8	162.8	39,282	15,340	6,600	39,282	517.8	402.9	719.4	1,640.2	4,341.5	590.9
Nov-13	46.1	16.3	29.8	39,282	15,340	6,600	39,282	125.9	73.8	131.7	331.4	4,672.9	576.5
Dec-13	142.6	15	127.6	39,282	15,340	3,960	39,282	389.5	189.5	338.3	917.3	5,590.2	369.5
Total	880	559	513					2,403	1,144	2,043	5,590		3,517

seammy:
capping progress c. 40% by end of December

seammy:
capping progress c. 40% complete, reducing this quantity by 40%

Notes:

The calculation was carried out using MS Excel following the method from the EPA Landfill Manual on Landfill Site Design, as shown:

$$Lo = [ER(A) + LW + IRCA + ER(I)] - a(W)$$

where:

Lo = leachate produced (m³)

ER = effective rainfall, (ER) is defined as Total Rainfall (R) minus Actual Evapotranspiration (AE) i.e. ER=R-AE

A = area of cell (m²)

LW = liquid waste (m³)

IRCA = infiltration through restored and capped areas (m³)

I = surface area of lagoons (m²)

a = absorptive capacity of waste (m³/t)

W = weight of waste deposited (t/a)

* Infiltration Rates (%)
Look to Design Criteria for exact figures (Ranges from 5% to 100%)