

COMHAIRLE CHONDAE AN CABHÁIN

Cavan County Council



Annual Environmental Report 2013

Belturbet Landfill WL 92-1

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Boylan Engineering (Eng. & Environmental Consultancy) was commissioned by Cavan County Council to prepare the following Annual Environmental Report.

<u>Contents</u>	<u>Page</u>
1.0 INTRODUCTION	5
2.0 REPORTING PERIOD	6
3.0 WASTE ACTIVITIES CARRIED OUT AT THE FACILITY	6
4.0 QUANTITY AND COMPOSITION OF THE WASTE	6
5.0 SUMMARY REPORT ON EMISSIONS	6
5.1 Surface Water	7
5.2 Ground Water	7
5.3 Leachate	11
5.4 Gas	13
6.0 RESULTS SUMMARY & INTERPRETATION OF MONITORING	14
7.0 RESOURCE & ENERGY CONSUMPTION SUMMARY	14
8.0 VOLUME OF LEACHATE PRODUCED	15
9.0 REPORT ON DEVELOPMENT WORKS UNDERTAKEN DURING REPORTING PERIOD	15
10.0 REPORT ON RESTORATION OF COMPLETED CELLS	15
11.0 SITE SURVEY SHOWING EXISTING LEVELS OF THE FACILITY AT THE END OF REPORTING YEAR	15
12.0 ESTIMATED ANNUAL & CUMULATIVE QUANTITIES OF LANDFILL GAS EMITTED FROM THE FACILITY	15
13.0 FULL TITLE AND A WRITTEN SUMMARY OF ANY PROCEDURES DEVELOPED BY THE LICENSEE	16
14.0 TANK & BUND TESTING AND INSPECTION REPORT	16
15.0 REPORTED INCIDENTS AND COMPLAINTS	16
16.0 REPORTS ON FINANCIAL PROVISION MADE UNDER THIS LICENCE	16
17.0 REPORT ON TRAINING OF STAFF	17
18.0 ANY OTHER ITEMS SPECIFIED BY THE AGENCY	17

List of Tables

Table 5.1	Surface Water Summary Results	7
Table 5.2	Groundwater Summary Results	8
Table 5.3	Leachate Summary Results	11
Table 5.4	Gas Emissions Summary Results	13
Table 16.1	Management Structure 2013	16

List of Graphs

Graph 5.1	Groundwater-Ammonia	9
Graph 5.2	Groundwater Total-Coliforms	9
Graph 5.3	Groundwater –Conductivity	10
Graph 5.4	Groundwater –Potassium	10
Graph 5.5	Leachate- Ammonia	12
Graph 5.6	Leachate- Conductivity	12
Graph 5.7	Gas-Methane	13
Graph 5.7	Gas- Carbon Dioxide	15

List of Appendices

Appendix A	PRTR Emissions Report , Landfill Gas Survey
Appendix B	Site Monitoring Locations Map
Appendix C	Quarter 4 Monitoring Report
Appendix D	Declaration of True Copy

1.0 INTRODUCTION

Belturbet Landfill has been operated as waste disposal facility by Cavan County Council since the late 1979. The site was operated as a traditional landfill and is located on the Belturbet - Ballyconnell road (R200) approximately 4.5km west of Belturbet on the north side. The site was originally operated as a limestone quarry and comprises of some 1.65 acres. The rock is composed of the Darty Limestone Formation from the Lower Carboniferous period.

A Waste Licence for the facility was issued by the EPA on 13th February 2002, Ref WL 92-1. Condition 11.4 of Waste Licence requires the submission of an Annual Environmental Report for Belturbet Landfill facility. This document is produced in order to comply with requirements of Condition 11.4. The site at Belturbet was closed in February 2002. Prior to closing the site a temporary cap was placed on site.

The requirements for reporting of Annual Environmental Information arise under individual EPA licences issued under the EPA Acts 1992 – 2008, the Waste Management Acts 1996 – 2008 and other legislation.

This AER will provide information as outlined in Schedule F of the Licence “Content of the Annual Environmental Report”.

2.0 REPORTING PERIOD

The reporting period for the purposes of this AER is 1st January 2013 to 31st December 2013.

3.0 WASTE ACTIVITIES CARRIED OUT AT THE FACILITY

There were no waste activities carried out at the facility.

4.0 QUANTITY AND COMPOSITION OF THE WASTE

There is no longer any waste being accepted at the site. The quantity of waste accepted is zero tonnes.

5.0 SUMMARY REPORT ON EMISSIONS

The PRTR Regulations are the European Communities (European Pollutant Release and Transfer Register) Regulation 2007, S.I. No. 123 of 2007), which signed into Irish Law on 22 March 2007 the E-PRTR Regulation, (EC) No 166/2006, concerning the establishment of a European Pollutant Release and Transfer Register. The summary of emissions is detailed in the (PRTR) Report which appears in Appendix A of this report. The PRTR has been uploaded onto the EPA website in accordance with our responsibility as Licensee.

A register of Environmental Monitoring is now established and shall be maintained. Cavan County Council now carries out sampling as required by the Licence.

5.1 Surface Water

Killynaher Lake is part of the Lough Oughter System and is a Special Area of Conservation. The lake quality is A2 status.

Table 5.1 Surface water summary results

	Parameter	Ammonia	pH	Cond	BOD	COD	Total Suspended Solids	Cl	DO
	Units	mg/l N	pH Units	us/cm	mg/l	mg/l	mg/l	mg/l	mg/l
SW Killynaher Lake	Qtr 4 2013	0.129	7.8	340	<1	12	<5	17	10
	Qtr 3 2013	0.266	8.1	345	13	31	<5	21	8.7
	Qtr 2 2013	0.05	8.3	310	3	23	<5	17	10
	Qtr 1 2013	0.108	7.6	338	5	23	<5	18	10.6
S.I No. 294/1989		0.2	≥5.5 and ≤8.5	1000	5	40	50	250	

There were only 1 marginal exceedance in the surface water sampling suite during 2013. This exceedance in Ammonia cannot be definitively attributed to the landfill as the surface water body “Killynaher Lake” lies within a predominant agricultural catchment which is exposed to activities such as slurry spreading.

5.2 Groundwater

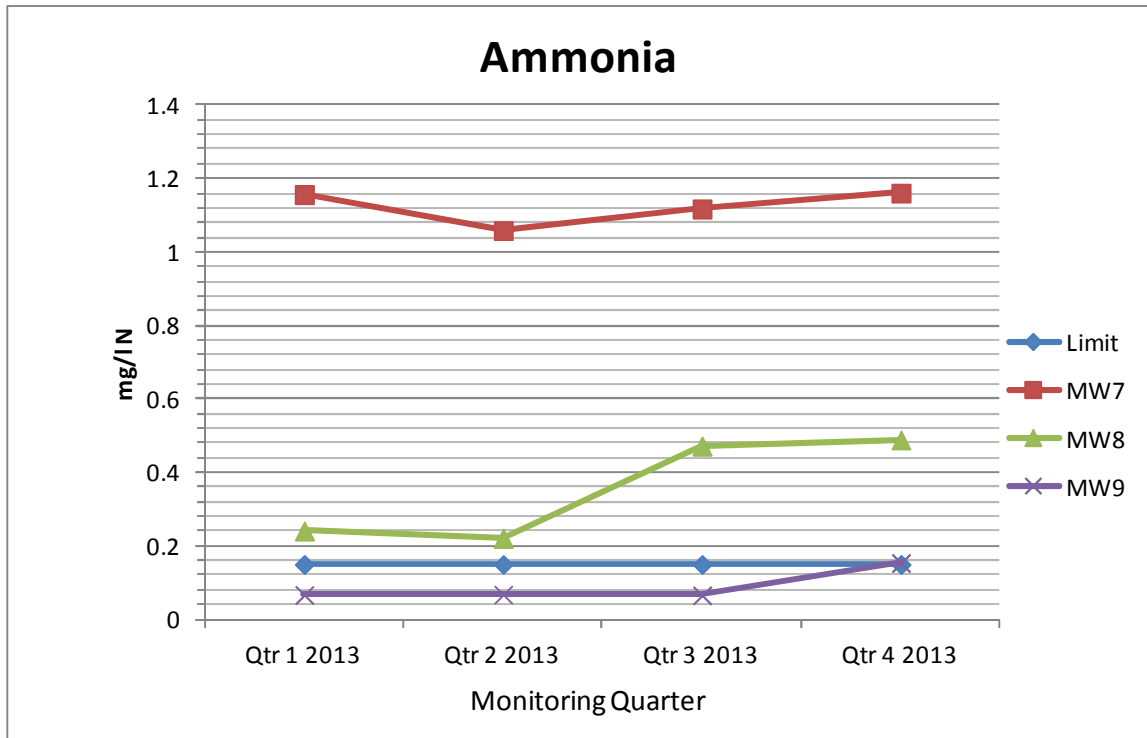
This landfill underwent the process of final capping during 2012. Ground water samples were extracted from MW 7 and MW 8 as per the waste licence. An addition ground water well was constructed along the South East boundary between the landfill and the nearest dwelling house; this well was constructed in conjunction with the capping works and is labelled MW 9. Monitoring of this well will began in 2013 as per the waste licence.

Table 5.2 Ground water summary results

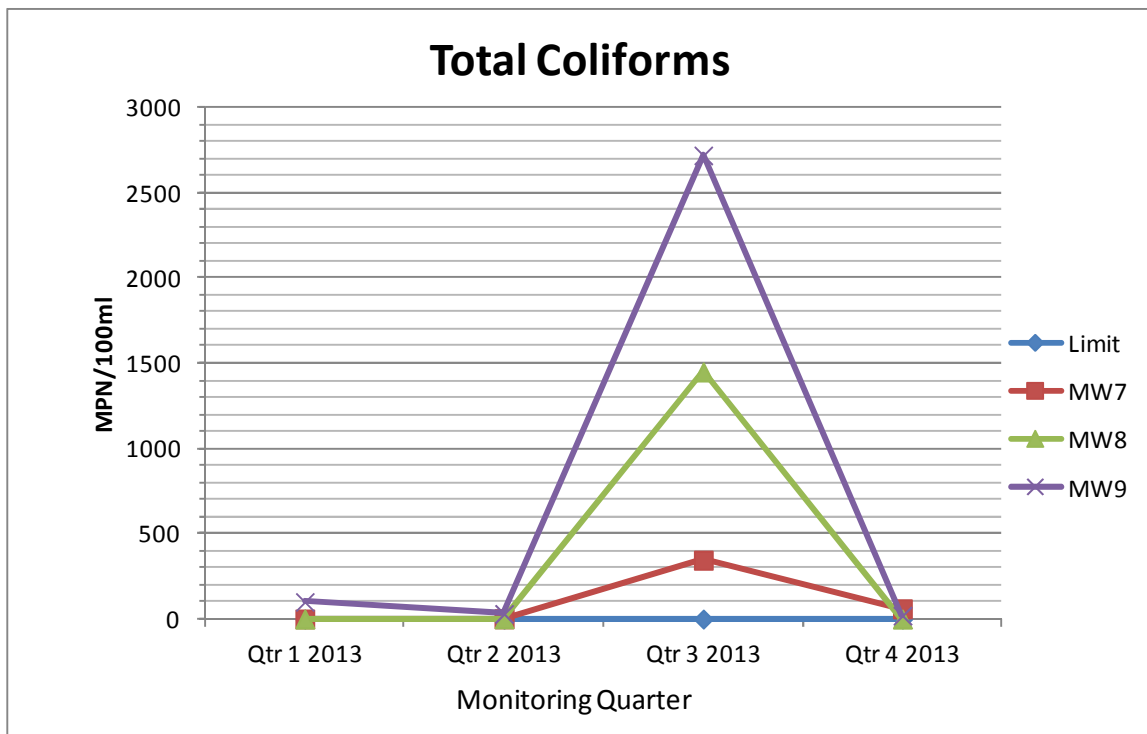
The following table and graphs show environmental monitoring results for the site.

	Parameter	TOC	E.Coli	Ammonia	TON	Tot Coliforms	pH	Cond	Cl	DO	Fe	K	Na
	Units	mg/l	MPN/100ml	mg/l N	mg/l N	MPN/100ml	pH Units	us/cm	mg/l	mg/l	mg/l	mg/l	mg/l
MW 7	Qtr 4 2013	1.45	0	1.161	<0.138	60	7.6	626	9	9	54.8	9.3	46.2
	Qtr 3 2013	1.06	0	1.118	<0.138	345	7.8	660	10.9	6.8	42	8.1	58
	Qtr 2 2013	0.8	0	1.059	<0.138	2	7.8	617	10.7	7.5	83.9	8.9	40.9
	Qtr 1 2013	0.74	1	1.157	<0.138	1	7.8	647	10.1	5.2	<20	8.3	48.9
MW 8	Qtr 4 2013	2.02	0	0.489	<0.138	0	7.2	1155	222.5	11	193.2	6.4	43.9
	Qtr 3 2013	2.05	0	0.472	<0.138	1450	7.2	1026	154.5	3.5	145.6	5.5	37.6
	Qtr 2 2013	0.96	0	0.221	<0.138	1	7.2	1046	180.4	3.9	215.4	5.9	34.8
	Qtr 1 2013	0.9	0	0.241	<0.138	0	7.3	1104	161.6	8.3	53.2	5.6	39.4
MW 9	Qtr 4 2013	2.33	0	0.154	0.157	20	7.1	710	<2.6	8	<20	3.6	4.7
	Qtr 3 2013	1.4	220	0.066	<0.138	2720	7.3	709	11.9	2.9	1049.5	2.9	6.5
	Qtr 2 2013	1.09	0	0.068	<0.138	30	7.3	667	3.9	6.4	23	2.4	4.4
	Qtr 1 2013	1.21	0	0.067	<0.138	100	7	706	4.1	10.7	28.1	5.9	4.4
Interim Guide Value		NAC	0	0.15	NAC	0	≥6.5 & ≤9.5	1000	30	NAC	0.2	5	150

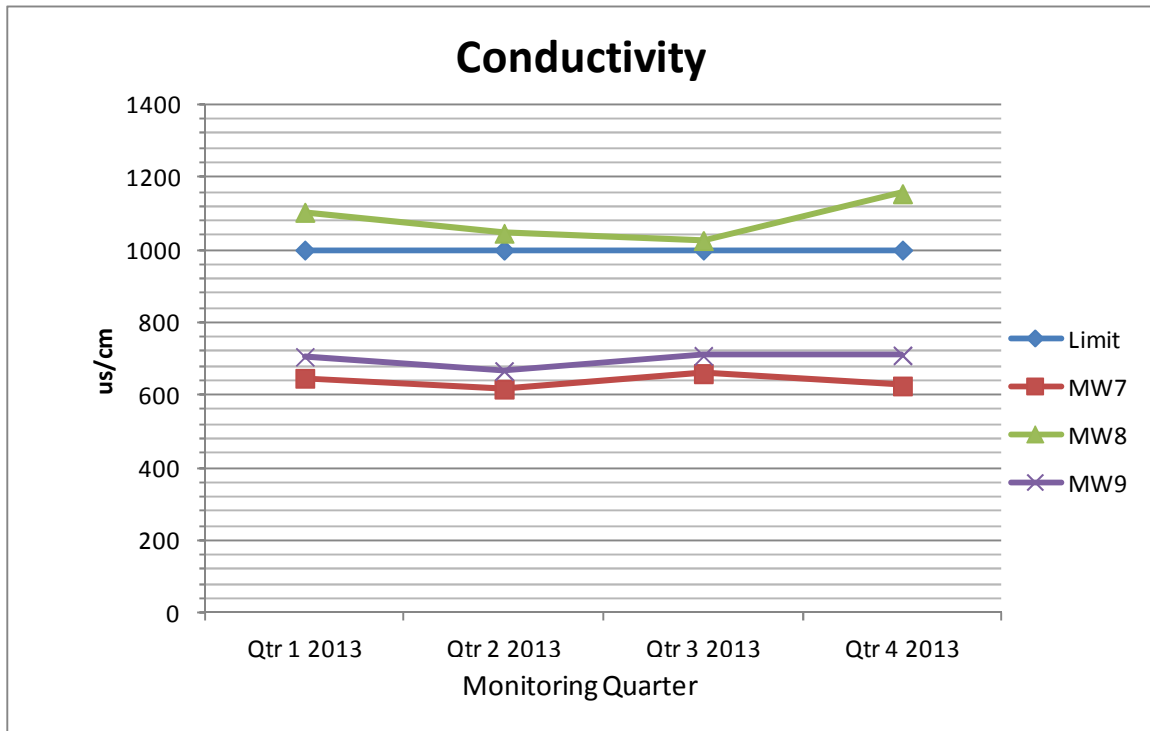
Graph 5.1



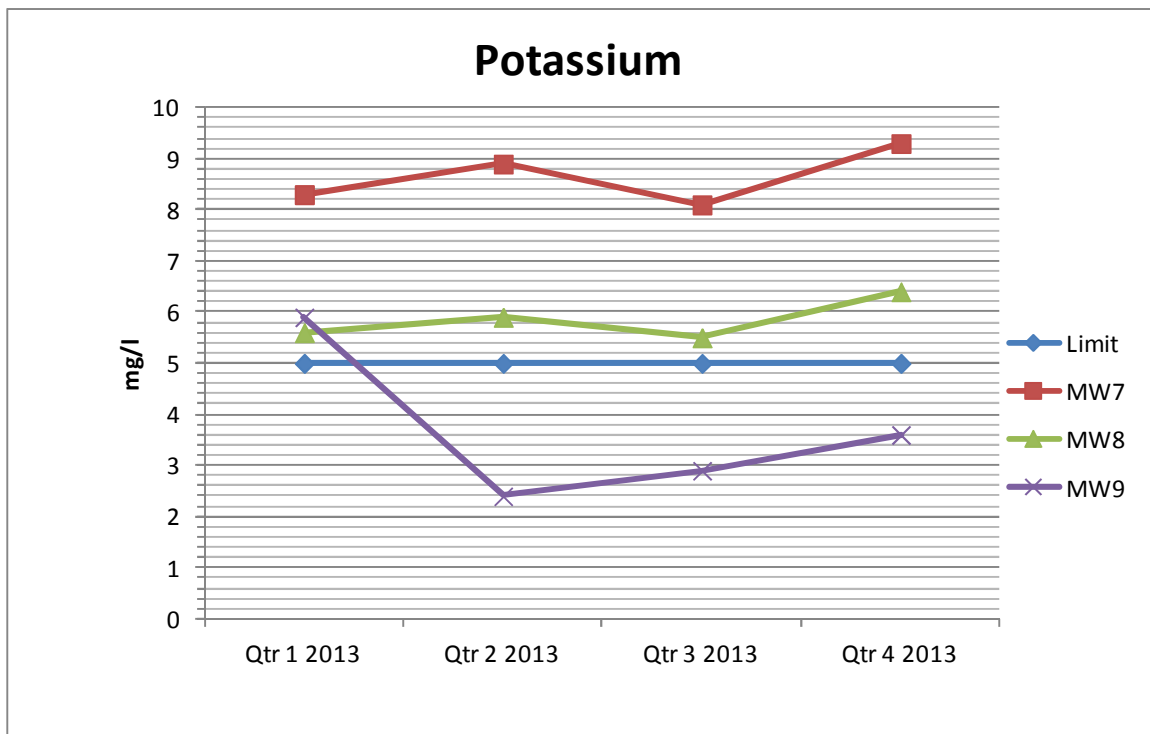
Graph 5.2



Graph 5.3



Graph 5.4



As detailed in the above graphs, there were numerous ground water exceedances at this landfill during 2013.

Exceedances occurred in the following parameters:

- Ammonia: Elevated levels of this parameter were prevalent during 2013. Levels such as those recorded are not unusual in a mature landfill such as this. Levels will gradually decrease as the landfill matures.
- Chloride: This parameter is a strong indication of contamination from a landfill source.
- Conductivity: Elevated levels of this parameter are commonly associated with pollution of an organic nature and therefore may be attributed to the landfill.
- Total Coliforms: Exceedances in this parameter are attributed to the natural decomposition of the organic materials in this landfill.
- Potassium: Elevated levels of potassium can be associated with landfill contamination but it can also be associated with contamination from agricultural sources such as fertilizers. Therefore direct contamination from the landfill cannot be concluded.

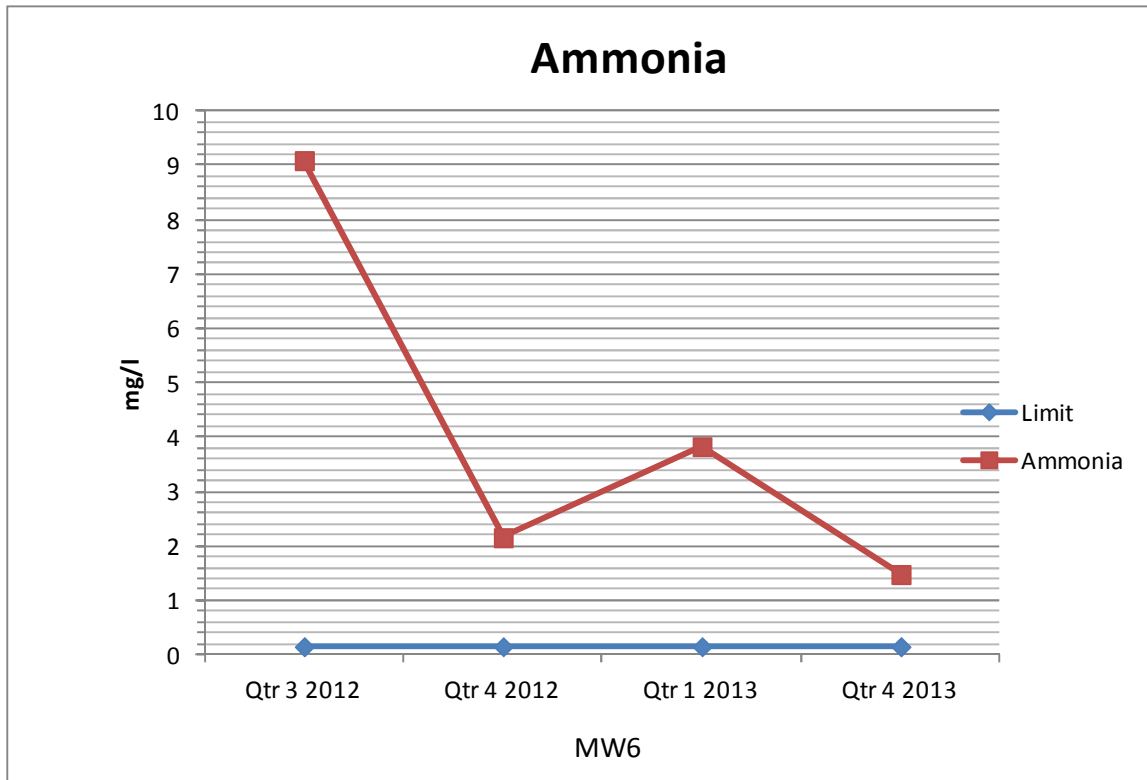
5.3 Leachate Monitoring

Monitoring Well MW5 was sampled for Leachate during quarter one of 2012. However after capping of the landfill the well was found to be dry and so samples have been obtained from Well MW6 since then.

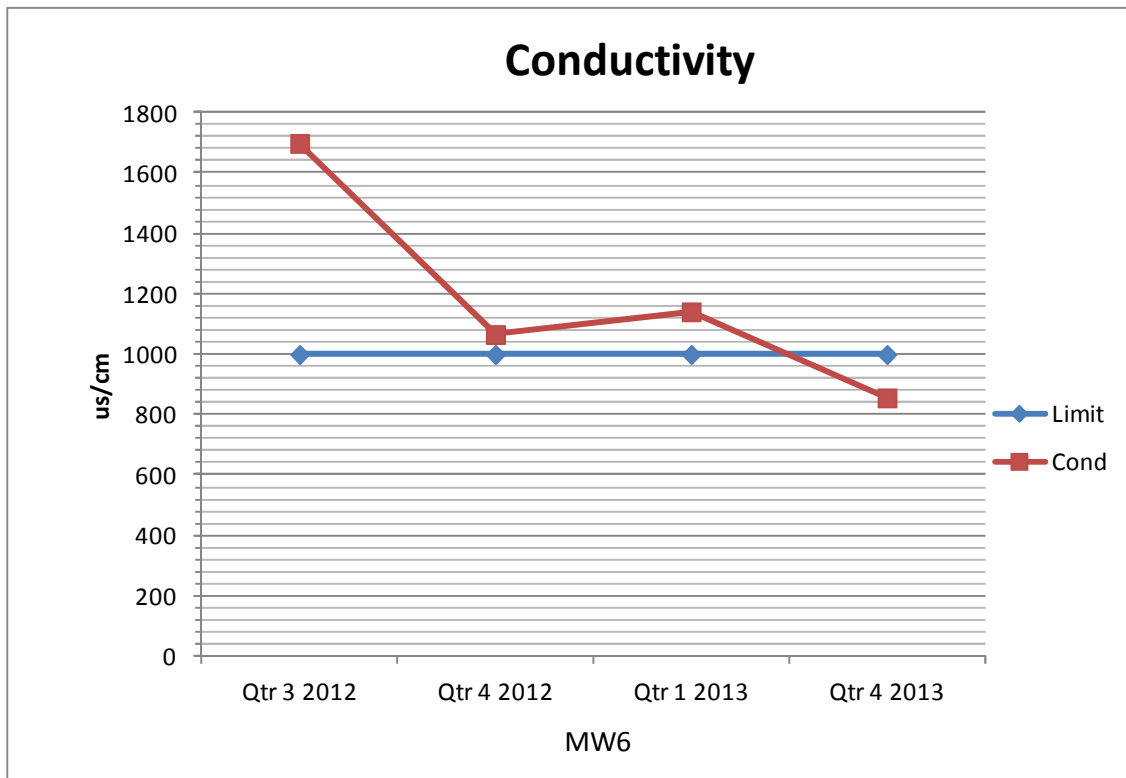
Table 5.3 Leachate summary results

	Parameter	Ammonia	TON	pH	Cond	BOD	COD	Cl
	Units	mg/l N	mg/l N	pH Units	us/cm	mg/l	mg/l	mg/l
MW 6	Qtr 4 2013	1.478	<0.69	7.4	856	7	15	62.7
	Qtr 3 2013	-	-	-	-	-	-	-
	Qtr 2 2013	-	-	-	-	-	-	-
	Qtr 1 2013	3.831	<0.69	7.2	1141	4	18	26.5
Interim Guide Values		0.15	NAC	≥6.5&≤9.5	1000			200

Graph 5.5



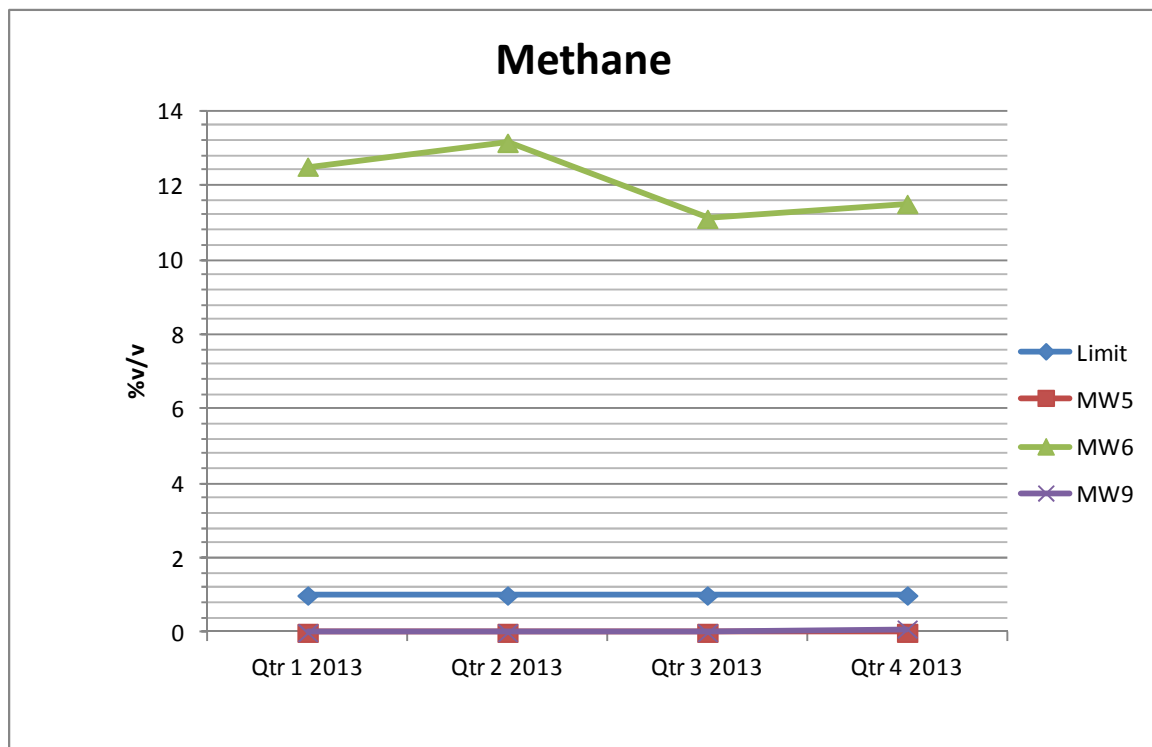
Graph 5.6



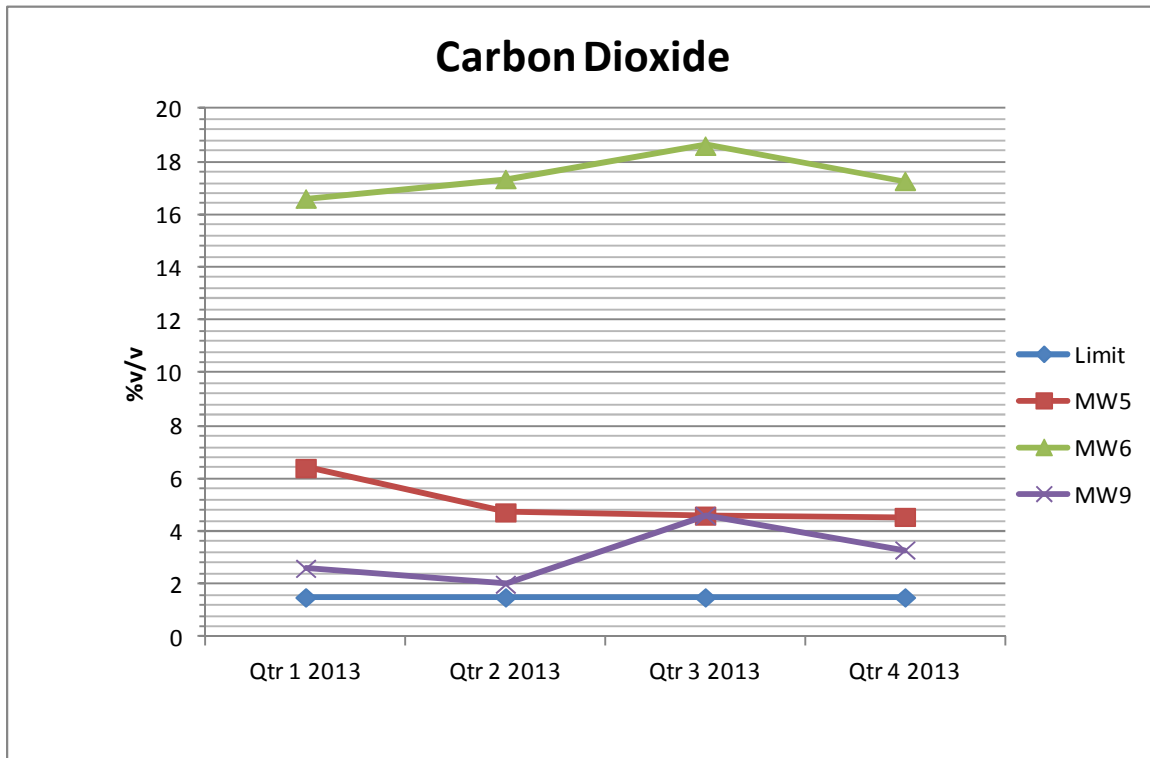
5.4 Gas Emissions monitoring summary results

Parameter		CH ₄	CO ₂	O ₂	H ₂ S	Barometric Pressure
Units		1% v/v	1.5 % v/v	%	PPM	mb
Client Ref	Qtr	-	-	-	-	-
MW 5	Qtr 4 2013	0	4.55	18.41	0	1023
	Qtr 3 2013	0	4.6	18.4	0	1000
	Qtr 2 2013	0	4.7	11.0	0	997
	Qtr 1 2013	0	6.4	3.4	0	980
MW 6	Qtr 4 2013	11.5	17.27	0.309	0	1023
	Qtr 3 2013	11.1	18.6	0	0	999
	Qtr 2 2013	13.1	17.3	0	0	997
	Qtr 1 2013	12.5	16.6	0	0	980
MW9	Qtr 4 2013	0.1	3.3	17.08	0	1023
	Qtr 3 2013	0	4.6	17.4	0	1000
	Qtr 2 2013	0	2.0	19.9	0	997
	Qtr 1 2013	0	2.6	16.6	0	980
Limit		1	1.5			

Graph 5.7



Graph 5.8



Gas emissions have remained steady at locations MW 5 and MW 6 during 2013 and are typical of a mature landfill. Monitoring of MW 9 a newly constructed gas migration well begun in quarter 4 2012. Results obtained show that there is very little methane present at this location.

6.0 SUMMARY OF RESULTS & INTERPRETATION OF ENVIRONMENTAL MONITORING

As presented in the information above and in Appendix 3, apart from slight elevations in certain parameters, there appears to be no environmental pollution associated with this landfill. We will continue to monitor this facility and monitoring will be increased following restoration works with the insertion of new boreholes on adjacent lands etc.

7.0 RESOURCE & ENERGY CONSUMPTION

There is no energy consumption or resource use on the site. There is no landfill gas of any value produced as can be seen from the PRTR Report

8.0 VOLUME OF LEACHATE PRODUCED

The volume of Leachate produced is unknown.

9.0 REPORT ON DEVELOPMENT WORKS UNDERTAKEN DURING THE REPORTING PERIOD AND A TIMESCALE FOR THOSE PROPOSED DURING THE COMING YEAR

Final capping of this landfill was completed during 2012. However the final phase is due for completion in 2014. This involves installation of a piped conduit for the surface water cap discharge to Killynaher Lake and the addition of monitoring boreholes on adjacent farmlands. Negotiations are ongoing with adjacent landowners and their solicitors.

10.0 REPORT ON THE RESTORATION OF COMPLETED CELLS/PHASES

Belturbet Landfill was capped in 2012 according to specifications submitted and approved by the EPA Castlebar office.

A fully engineered and lined system was installed and the site has been improved significantly. There is however some outstanding works unfinished. The cap surface water collection system and monitoring boreholes are due to be installed on Mr Reilly's lands as soon as agreement can be reached. Agreement was reached previously but other queries have arisen in the meantime. We hope to get a resolution to this issue by the end of 2014. Also the fencing of the site will be completed.

11.0 SITE SURVEY SHOWING THE EXISTING LEVELS OF THE FACILITY AT THE END OF THE REPORTING PERIOD

Site Survey is included in Appendix B.

12.0 ESTIMATED ANNUAL AND CUMULATIVE QUANTITIES OF LANDFILL GAS EMITTED FROM THE FACILITY

This information is reported in the PRTR Report attached in Appendix A. The estimated quantity of Methane released is 16,600kgs/yr. Page one from the Annual Gas Survey is also presented in Appendix A.

**13.0 FULL TITLE AND A WRITTEN SUMMARY OF ANY PROCEDURES
DEVELOPED BY THE LICENCE IN THE YEAR WHICH RELATES TO THE
FACILITY**

There are no written procedures required for this site.

14.0 TANK & BUND TESTING INSPECTION

There are no tanks or bunds on site.

15.0 REPORTING INCIDENTS & COMPLAINTS SUMMARIES

There were no complaints reported or recorded for this site during the reporting period.

**16.0 REPORTS ON FINANCIAL PROVISION MADE UNDER THIS LICENCE,
MANAGEMENT AND STAFFING STRUCTURE OF THE FACILITY AND A
PROGRAMME FOR PUBLIC INFORMATION.**

Provision will be made in Cavan County Council Official Estimates for Charges as required under Condition 12 of Waste Licence Ref. 92-1.

Table 16.1 Management Structure 2013-2014

Position	Name	Duties
Director of Services Environment	Eoin Doyle	Oversee and assign responsibilities to staff regarding landfill
Senior Executive Officer	John Brannigan	Oversee general supervision, monitoring and reporting of the site.
Landfill Operations Manager	Sinead Fox	Responsible for general supervision, monitoring and reporting of the site.

Contact Person for Sanitary Authority for 2013/ 2014:

John Brannigan

Senior Executive Officer

Waste Management Section

Cavan County Council

Farnham Street,

Cavan

Programme for Public Information:

Cavan County Council informs local residents of any works that are taking place at the landfill facility.

17.0 REPORT ON TRAINING OF STAFF

Landfill Operations Manager Sinead Fox for Cavan County Council deals with in full with any issues identified by the Agency Inspectors or any other party. Sinead has been fully trained by the FAS Waste Management Training Course, Control of Landfill Gas and carries a Safe Pass.

18.0 ANY OTHER ITEMS SPECIFIED BY THE AGENCY

No other items have been specified.

APPENDIX A
PRTR Emissions
Report,
Landfill Gas Survey



Environmental Protection Agency

| PRTR# : W0092 | Facility Name : Belturbet Landfill | Filename : W0092_2013(1).xls
| Return Year : 2013 |

[Guidance to completing the PRTR workbook](#)

AER Returns Workbook

Version 1.1.17

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

1. FACILITY IDENTIFICATION

Parent Company Name	Cavan County Council
Facility Name	Belturbet Landfill
PRTR Identification Number	W0092
Licence Number	W0092-01

Waste or IPPC Classes of Activity

No.	class_name
3.1	Deposit on, in or under land (including landfill).
3.13	Storage prior to submission to any activity referred to in a preceding paragraph of this Schedule, other than temporary storage, pending collection, on the premises where the waste concerned is produced.
4.11	Use of waste obtained from any activity referred to in a preceding paragraph of this Schedule.
4.13	Storage of waste intended for submission to any activity referred to in a preceding paragraph of this Schedule, other than temporary storage, pending collection, on the premises where such waste is produced.
4.2	Recycling or reclamation of organic substances which are not used as solvents (including composting and other biological transformation processes).
4.3	Recycling or reclamation of metals and metal compounds.
4.4	Recycling or reclamation of other inorganic materials.
Address 1	Rahaghan
Address 2	Belturbet
Address 3	Co Cavan
Address 4	
	Cavan
Country	Ireland
Coordinates of Location	-7.51132 54.0873
River Basin District	GBNIIENW
NACE Code	3821
Main Economic Activity	Treatment and disposal of non-hazardous waste
AER Returns Contact Name	Vincient Craig
AER Returns Contact Email Address	vcraig@cavancoco.ie
AER Returns Contact Position	Landfill Operations Manager
AER Returns Contact Telephone Number	0494378418
AER Returns Contact Mobile Phone Number	
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	1
User Feedback/Comments	
Web Address	

2. PRTR CLASS ACTIVITIES

Activity Number	Activity Name
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?	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. 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) ?	No
--	----

4.1 RELEASES TO AIR

[Link to previous years emissions data](#)

[PRTR# : W0092 | Facility Name : Belturbet Landfill | Filename : W0092_2013(1).xls | Return Year : 2013 |

12/02/2014 12:26

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 Code	Designation or Description	Emission Point 1	T (Total) KG/Year	A (Accidental) KG/Year	F (Fugitive) KG/Year
03	Carbon dioxide (CO2)	C	OTH	GASSIM	0.0	46400.0	0.0	46400.0
01	Methane (CH4)	C	OTH	GASSIM	0.0	0.0	0.0	16600.0

* 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 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)

POLLUTANT		METHOD			Please enter all quantities in this section in KGs			
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

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	Belturbet 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)	16600.0	C	OTH	GASSIM	N/A
Methane flared	0.0				0.0 (Total Flaring Capacity)
Methane utilised in engine/s	0.0				0.0 (Total Utilising Capacity)
Net methane emission (as reported in Section A above)	16600.0	C	OTH	GASSIM	N/A

A survey of landfill sites to determine the quantity of methane flared and or recovered in utilisation plants for 2013

Please choose from the drop down menu the license number for your site	<input type="text" value="W0092"/>
Please choose from the drop down menu the name of the landfill site	<input type="text" value="Belturbet Landfill"/>
Please enter the number of flares operational at your site in 2013	<input type="text" value="0"/>
Please enter the number of engines operational at your site in 2013	<input type="text" value="0"/>
Total methane flared	<input type="text" value="0"/> kg/year
Total methane utilised in engines	<input type="text" value="0"/> kg/year

Please note that the closing date for receipt of completed surveys is 31/03/2014

Introduction

The Office of Climate Licensing and Resource Use (OCLR) of the Environmental Protection Agency acts as the inventory agency in Ireland with responsibility for compiling and reporting national greenhouse gas inventories to the European Commission and the United Nations Framework Convention on Climate Change. In addition to meeting international commitments Ireland's national greenhouse gas inventory informs national agencies and Government departments as they face the challenge to curb emissions and meet Ireland's targets under the Kyoto Protocol. The national inventory also informs data suppliers, making them aware of the importance of their contributions to the inventory process and a means of identifying areas where input data may be improved.

It is on this basis that the Environmental Protection Agency is asking landfill operators to partake in this survey so that the most up to date information on methane flaring and recovery in utilisation plants at landfill sites is used in calculating the contribution of the waste sector to national greenhouse gas emissions

The Environmental Protection Agency wishes to thank you for partaking in this survey. If you have any questions about the survey and how to complete it please view the "Help sheet" worksheet. If however, your query is not answered by viewing the "Help sheet" worksheet please contact:

LFGProject@epa.ie

Once completed please send the completed file as an attachment clearly stating the name and or license number of the landfill site (e.g. W000 Xanadu landfill_2013) to:

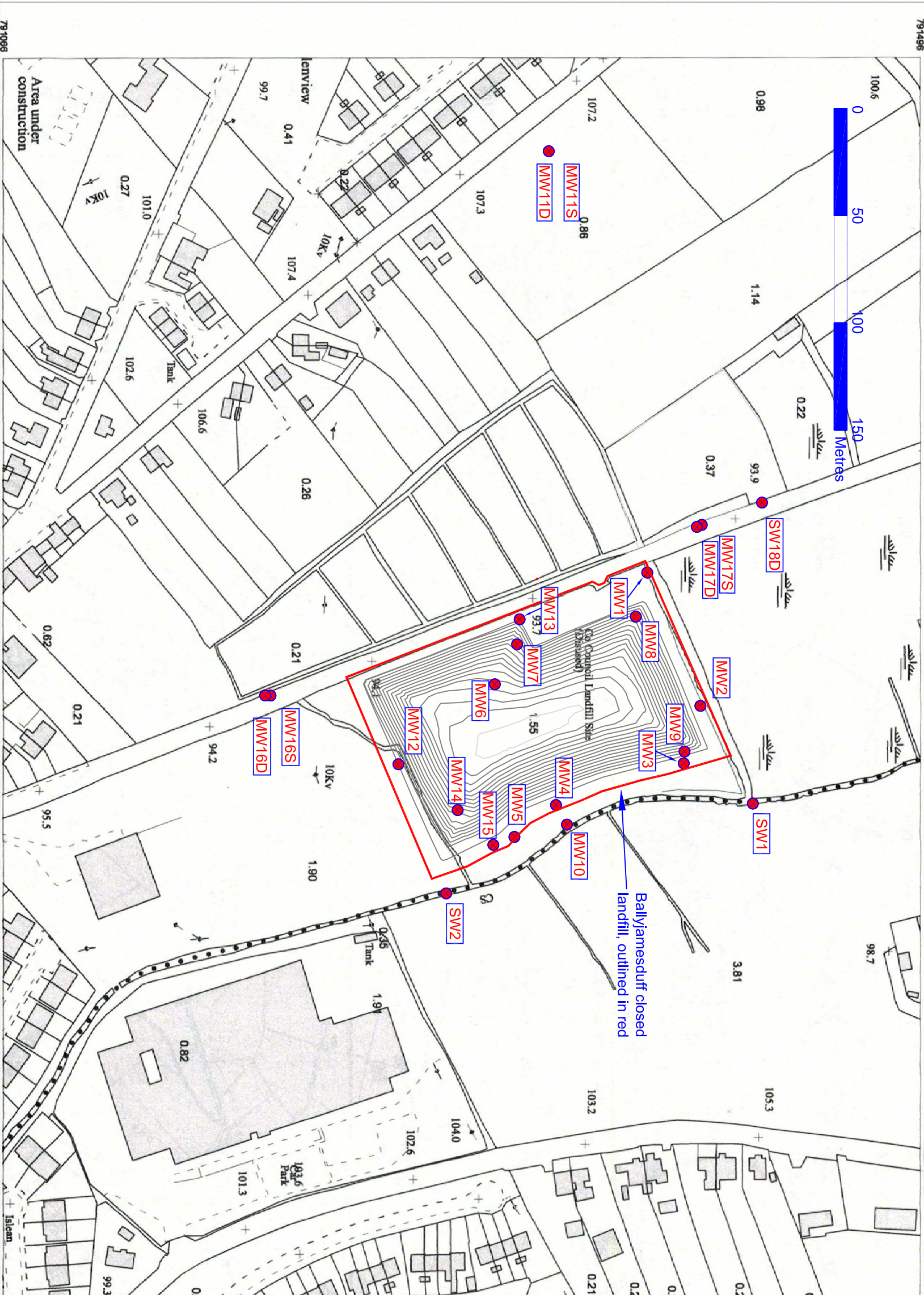
LFGProject@epa.ie

APPENDIX B

Site Map

Surveyed 2003
Revised 2011
Levelled

Rural PLACE Map



Ordnance Survey Ireland Licence No. EN 0049012
Ordnance Survey Ireland / Government of Ireland
(Copyright Licence to Boylan Engineering)

Please Note
Do not scale from drawing.
All dimensions should be verified on site before construction and any discrepancies found brought to the attention of the Engineer.
All drawings remain the property of the Boylan Engineering, permission must be sought to copy any drawing or section there of.

NOTES / LEGEND



Client: Cavan County Council

Project:
Ballyamesduff Landfill (WL93-01)



Main St., Mullagh, Kells, Co. Meath.
Phone: 046 - 828 6000
Email: info@boylanengineering.ie
Website: www.boylanengineering.ie

Drawn By	A. Clarke	Approved by	B. Keating
Drawing No.	001	Drawing Name	Monitoring Well Locations
Date	11.06.2012	Scale	1:2000
		Rev.	000

APPENDIX C
Q4 Monitoring Report



GROUND WATER MONITORING REPORT FOR BELTURBET LANDFILL W0092-01

Client: Cavan County Council

Site Location: Rahaghan, Belturbet

Report No.: CCC-04-01-03-04-Rev-0

Produced by: Brona Keating, BSc, P.Grad.Dip. Environmental Eng.

Approved by: 
Cathal Boylan, BEng, CEng, MIEI
CHARTERED ENGINEER

Date: 19th December 2013

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Web: www.boylanengineering.ie

Rev.	Date	Description

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I SUMMARY

Boylan Engineering (Eng. & Environmental Consultancy) was commissioned by Cavan County Council to carry out Environmental Monitoring at Belturbet Landfill (W0092-01), Rahaghan, Belturbet, Co Cavan for quarter four 2013.

Brona Keating, Environmental Consultant carried out all monitoring. This report shall document the findings.

Table of Contents

- 1.0 Introduction
- 2.0 Methodology
 - 2.1 Environmental Sampling
 - 2.2 Laboratory Analysis
 - 2.3 Monitoring Locations
 - 2.4 Weather Report
- 3.0 Summary of Results
- 4.0 Discussion
- 5.0 Conclusion

List of Tables

- 1.0 Ground Water 04th Quarter Monitoring

Appendix

- 1.0 Historical Data
- 2.0 Analysis Methods
- 3.0 Field Sheets
- 4.0 COC/Sample Submission form
 - Lab Reports
 - Landfill Map

1. INTRODUCTION

Belturbet landfill was operated as a disposal facility by Cavan County Council from 1979 until its closure in February 2002. The facility was operated as a traditional landfill and is located on the Belturbet Ballyconnell road (R200) approximately 4.5 kilometres West of Belturbet town. The site which was originally a limestone quarry comprises some 0.65 hectares. The bedrock surrounding the landfill is Darty Limestone Formation from the Lower Carboniferous period. A waste licence was issued by the EPA on the 13th of February 2002. Some remedial works were carried out after the closure of the site.

Condition 8.1 of the waste licence requires that monitoring be carried out in accordance with Schedule D of the licence. The following report give details of the groundwater, sampling programme conducted on site and also summarises findings and analytical results for quarter four 2013.

The purpose of environmental monitoring at closed landfills is to:

- Ensure the facility is compliant with the waste license
- Ensure the facility is not causing environmental pollution
- Ensure the facility is not posing a risk to human health
- Ensure the facility is not creating an unacceptable risk to atmosphere, water, soil, plants or animals
- Ensure the facility is not adversely affecting the countryside or places of interest
- Compare actual site behavior with expected/modeled behavior
- Establish a reliable database of information for the landfill throughout its life

According to the Response matrix for landfills, Belturbet landfill is situated in the R4 Zone. This zone was categorized using a vulnerability rating combined with the aquifer category for the area. Landfills situated in R4 Zones are unacceptable in accordance with today's standards detailed in the EPA Landfill Design Manual or conditions of a waste licence - (EPA, groundwater protection Responses for Landfills). Unfortunately this landfill was constructed prior to this guidance and conditions were issued only after its closure.

The generation of Leachate is one of the main hazards to groundwater from the disposal of waste by land filling. The conditions within a landfill vary over time from aerobic to anaerobic thus allowing for different chemical reactions to take place. Most landfill leachates have a high BOD, COD, Ammonia, Chloride, Sodium, Potassium, Hardness and Boron levels - (EPA, groundwater protection Responses for Landfills).

2.0 METHODOLOGY

2.1 Environmental Sampling

The following procedure is conducted by Boylan Engineering to ensure accurate groundwater monitoring:

- ISO 5667: Guidance on sampling of groundwaters is adhered to.
- Prior to sampling, the depth of water in groundwater wells is measured by dipping. Dipping the wells before sampling allows for calculation of the volume of water in the well. This data is recorded on the field sheet for volume calculation which is presented in appendix 3.
- Once the volume was calculated the boreholes are purged three times their volume before sampling.
- Sampling is conducted using a Waterra inertial lift pump and associated tubing, pumping water directly from the borehole to the appropriate sampling bottles.
- Designated tubing is used at each location.
- Having obtained a representative sample the following parameters are measured on-site using a Hanna HI 98129 combination waterproof high accuracy.
 - Conductivity
 - Temperature
 - pH
- Boylan Engineering operate a Sample Submission/Chain of Custody form, which accompanies the samples at all times. These forms are located in the appendix 4.

2.2 Laboratory Analysis

- Samples are sent to Environmental Laboratory Service (ELS) (Ireland) for analysis of the required parameters in designated cool boxes with ice packs. These boxes insure that samples are maintained at a consistent temperature between 0 °C and 4 °C on their journey to the laboratory.
- On arrival at the laboratory, samples are stored between 0 °C and 4 °C.
- All samples received are inspected by Laboratory Manager Mr. Brendan Murray.
- All samples are assigned a unique reference number and are recorded on the Laboratory Information Management System (LIMS)
- All staff involved in the analysis of samples hold a minimum honours science degree.
- In the event of a Quality Control Check failure for a given parameter, a note will be included on the analysis report detailing the QC fail.
- Analysis of samples is conducted under the INAB accreditation and associated quality control procedures are employed in every aspect of analysis.
- Analysis methods are listed in Appendix 3.

2.3 Monitoring Locations

Quarter 4 2013					
Monitoring Well	Sample Type	Cover Level M (OD Malin Head)	Water Level M (OD Malin Head)	Water Depth M (Top of Casing)	National Grid Co-Ordinates
MW1	GW	TBC	-	TBC	TBC
MW5	Gas & Leachate	TBC	-	TBC	TBC
MW6	Gas & Leachate	TBC	-	TBC	TBC
MW7	Gas & GW	TBC	-	TBC	TBC
MW 9	Gas & GW	TBC	-	TBC	TBC
Killynaher Lake	SW	TBC	-	TBC	TBC

2.4 Weather Report

REPORTS FROM BALLYHAISE (A)							
Date	Rainfall	Max	Min	Grass Min Temp	Mean Wind Speed	Gusts	Sunshine
	(mm)	Temp	Temp	(°C)	(knots)	(if >= 34 knots)	(hours)
		(°C)	(°C)				
19/11/2013	0.2	6.6	-0.4	-1.8	7		

3.0 SUMMARY OF RESULTS

Table 1.0 04th Quarter Ground water monitoring 2013

Report Number	71307																	
Monitoring Date:	19/11/2013																	
Method	Site Tests	Site Tests	Site Tests	Site Tests	Site Tests	Total Organic Carbon (TOC)	Coliforms	Ammonia	AQ2-UP1	Coliforms	Titralab		AQ2-UP2	Dissolved Oxygen	Ion Chromatography	Titralab		
Method Number	Site Tests	Site Tests	Site Tests	Site Tests	Site Tests	EW123	MIC133	EW154M	EW154M	MIC133	EW153		EW154M-1	EW043	EW137	EW153		
Parameter	Sample temperature (to be tested onsite)	Cond	pH	Water Level from TOC	Visual Inspection	Total Organic Carbon (TOC)	E. Coli	Ammonia (as N)	TON (as N)(Calc)	Total Coliforms	pH	Conductivity @20 DegC	Chloride	Dissolved Oxygen	Fluoride	Alkalinity Total (R2 pH4.5)		
Units	Deg C	us/cm	pH units	Meter's		mg/L	MPN/100ml	mg/l N	mg/l N	MPN/100 ml	pH Units	uscml@20	mg/L	mg/L	mg/L	mg/L CaCO3		
Limit of Detection	-	-	-	-	-	0.25	0	0.007	0.138	0	0.3	25	2.6	1.0	0.1	10		
Date Testing Initiated	19.11.13					20.11.13												
ELS Ref	Client Ref																	
71307/001	MW7	10.2	650	7.7	5.5	clear	1.45	0	1.161	<0.138	60	7.6	626	9	9	2.3	309	
71307/002	MW8	10.4	1172	7.2	5.71	clear	2.02	0	0.489	<0.138	0	7.2	1155	222.5	11	0.3	313	
71307/003	MW9	10.8	723	7.1	-	heavy silt	2.33	0	0.154	0.157	20	7.1	710	<2.6	8	0.2	149	
IGV		1000	≥6.5 and ≤9.5			NAC	0	0.15		0	≥6.5 and ≤9.5	1000	30	NAC	1	NAC		
Method	Metals-Dissolved														AQ2-UP2	Total Cyanide High (Sub)	Total Phosphorus-TP	Residue on Evaporation (Tot Solids-TS)
Method Number	EM130														EW154M-1	DEFAULT	EW146	EW060
Parameter	Iron-Dissolved	Potassium-Dissolved	Sodium-Dissolved	Cadmium-Dissolved	Chromium-Total	Manganese-Dissolved	Calcium-Dissolved	Copper-Dissolved	Lead-Dissolved	Magnesium-Dissolved	Mercury-Dissolved	Zinc-Dissolved	Boron-Dissolved	Sulphate	Total Cyanide High	Total Phosphorus-TP	Residue on Evaporation (Tot Solids-TS)	
Units	ug/L	mg/L	mg/L	ug/L	ug/L	ug/L	mg/L	mg/L	ug/L	mg/L	ug/L	ug/L	mg/L	mg/L	ug/L	mg/l P	mg/L	
Limit of Detection	20.0	0.2	0.5	0.1	1	1	1	0.003	0.3	0.3	0.02	1	0.02	5	9	0.1	10	
Date Testing Initiated	20.11.13																	
ELS Ref	Client Ref																	
71307/001	MW7	54.8	9.3	46.2	<0.1	<1	20.2	40.2	<0.003	<0.3	43.3	<0.02	7.7	0.37	35.9	<10	0.01	1560
71307/002	MW8	193.2	6.4	43.9	<0.1	<1	21.7	158	<0.003	0.4	40.3	<0.02	21.8	0.04	70	<10	<0.01	830
71307/003	MW9	<20	3.6	4.7	<0.1	8.8	22.3	141	<0.003	<0.3	18.2	<0.02	5.1	<0.02	13.2	<10	0.26	5330
IGV		200	5	150	5	30	50	200	0.03	10	50	1	100	1	200	10	-	-
Exceedance																		
NOTES	NAC- No Abnormal Change IGV - Interim Guide Value																	

As there are no limits set in the waste licence for groundwater, results are compared to the Interim Guide Values for the protection of Groundwater in Ireland, where available.

4.0 DISCUSSION

Monitoring of groundwater is a common and necessary event in landfill sites both during their active life and post closure. The significance of such monitoring is so the facilities can demonstrate that there is no potential for the migration of hazardous constituents from the unit into the groundwater systems.

Monitoring was conducted on 19th November 2013. Results in Hatched Red indicate where the interim guide value has been exceeded. Results from the fourth quarter 2013 show that there were exceedances at the ground water monitoring locations for parameters; Ammonia, E-Coli, Total Coliforms, Conductivity and Chloride as detailed in table 1.0 Previous results detailed in the historical data show that exceedances for these parameters are on par with previous monitoring events.

Historical results for comparison purposes are presented in tabular and graphic form in Appendix 1.

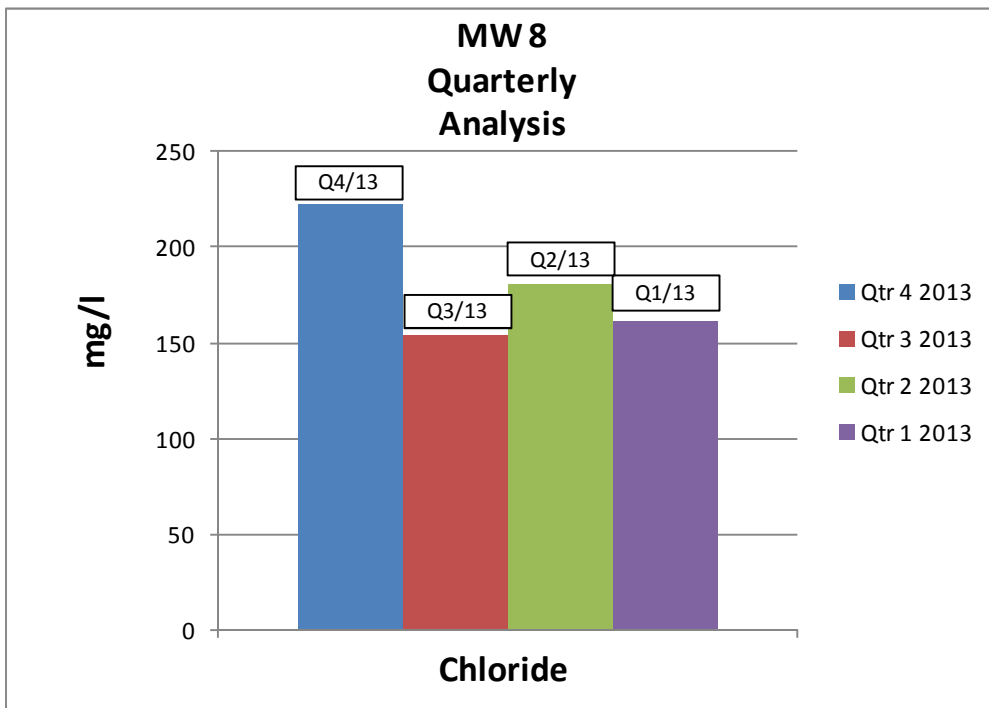
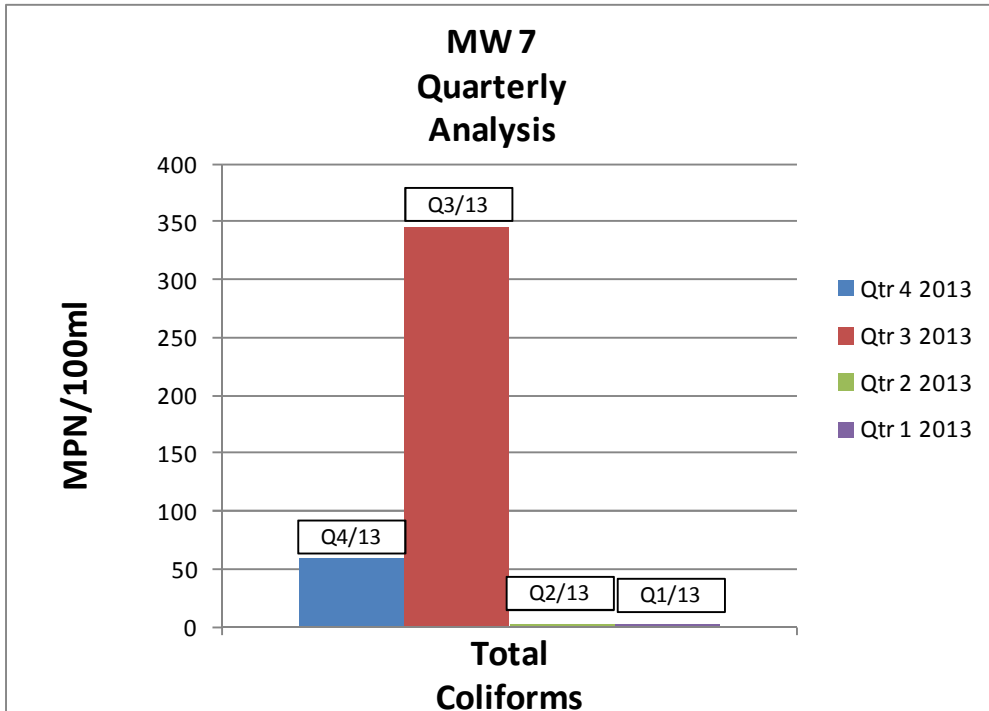
5.0 CONCLUSION

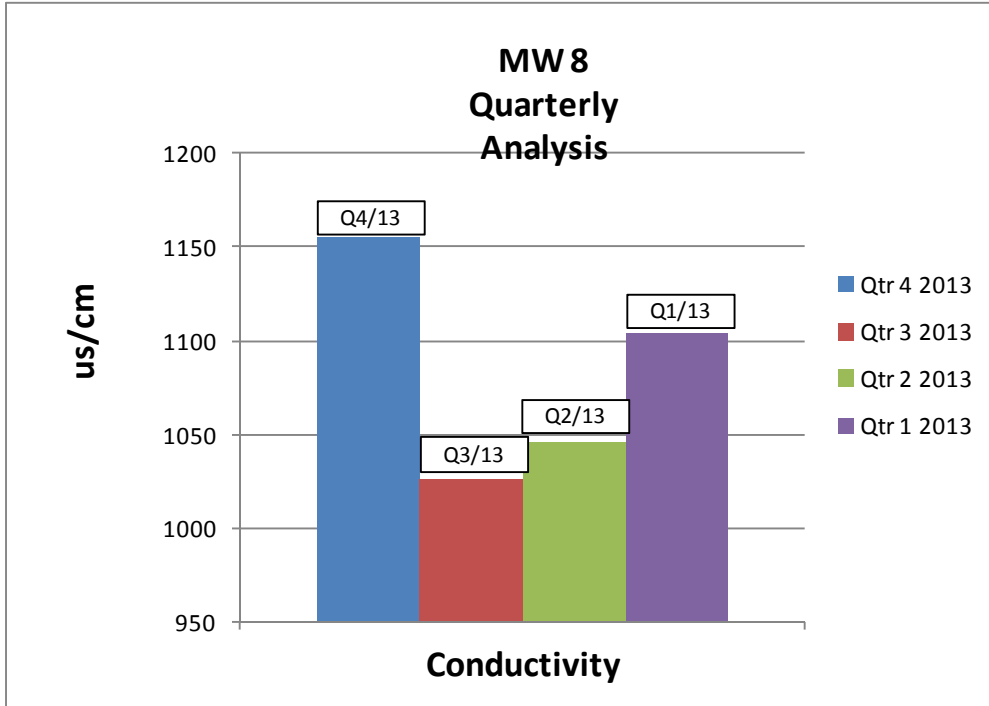
The results obtained are relatively consistent with previous monitoring events and do not show any signs of dramatic exceedences. Therefore there is no evidence of any major negative environmental impact associated with this landfill. The next environmental and landfill gas monitoring event will take place during the first quarter 2014.

APPENDIX 1- Historical Data- Tables

	Parameter	TOC	E.Coli	Ammonia	TON	Tot Coliforms	pH	Cond	Cl	DO	Fe	K	Na
	Units	mg/l	MPN/100ml	mg/l N	mg/l N	MPN/100ml	pH Units	us/cm	mg/l	mg/l	mg/l	mg/l	mg/l
MW 7	Qtr 4 2013	1.45	0	1.161	<0.138	60	7.6	626	9	9	54.8	9.3	46.2
	Qtr 3 2013	1.06	0	1.118	<0.138	345	7.8	660	10.9	6.8	42	8.1	58
	Qtr 2 2013	0.8	0	1.059	<0.138	2	7.8	617	10.7	7.5	83.9	8.9	40.9
	Qtr 1 2013	0.74	1	1.157	<0.138	1	7.8	647	10.1	5.2	<20	8.3	48.9
MW 8	Qtr 4 2013	2.02	0	0.489	<0.138	0	7.2	1155	222.5	11	193.2	6.4	43.9
	Qtr 3 2013	2.05	0	0.472	<0.138	1450	7.2	1026	154.5	3.5	145.6	5.5	37.6
	Qtr 2 2013	0.96	0	0.221	<0.138	1	7.2	1046	180.4	3.9	215.4	5.9	34.8
	Qtr 1 2013	0.9	0	0.241	<0.138	0	7.3	1104	161.6	8.3	53.2	5.6	39.4
MW 9	Qtr 4 2013	2.33	0	0.154	0.157	20	7.1	710	<2.6	8	<20	3.6	4.7
	Qtr 3 2013	1.4	220	0.066	<0.138	2720	7.3	709	11.9	2.9	1049.5	2.9	6.5
	Qtr 2 2013	1.09	0	0.068	<0.138	30	7.3	667	3.9	6.4	23	2.4	4.4
	Qtr 1 2013	1.21	0	0.067	<0.138	100	7	706	4.1	10.7	28.1	5.9	4.4
Interim Guide Value		NAC	0	0.15	NAC	0	≥6.5 & ≤9.5	1000	30	NAC	0.2	5	150

HISTORICAL RESULTS- Graphs





APPENDIX 2- ANALYSIS METHODS

ELS LTD INAB ACCREDITATION SCHEDULE SUMMARY SHEET		
<p>Miscellaneous (P,G,W,S) Ammonia/Ammonium 0.007-1mg/lN EW003 Chloride 2.6-250 mg/l EW015 Fluoride 0.1 - 2 mg/l EW137 COD 8-1500 mg/l EW094 Nitrate 0.12-50 mg/l N EW034 Nitrite 0.013-1 mg/l N EW035 pH + - 10 ppt Units EW138 Phosphate 0.009-1 mg/l P EW007 TOC 0.25-100mg/l EW123 Total Phosphorous 0.03-1 mg/l P EW002</p> <p>Miscellaneous (P,G,S) Bromate 1 to 50µg/l BRO3 (EW137) Colour 2.5-50mg/l PtCo (EW021) Conductivity 132-2000 us/cm EW139 Dissolved Oxygen 1 to 10 mg/l (EW043) Sulphate 1-750mg/l SO4(EW016) Suspended Solids 5-1000mg/l (EW013) Total Dissolved Solids 1-1000mg/l(EW046) Total Hardness 3-330mg/l CaCO3 (EM099) Total Oxidised Nitrogen 0.138-51mg/l N (EW051)</p> <p>Metals EML30 (P,G,S) Aluminium 5.0 - 500 µg/l Antimony 0.1 - 10µg/l Arsenic 0.2 - 20µg/l Barium 1.0 - 100µg/l Boron 0.02 - 2mg/l Cadmium 0.1 - 10µg/l Calcium 1.0 - 100mg/l Chromium 1.0 - 100µg/l Cobalt 1.0 - 100µg/l Copper 3 - 4000µg/l Iron 5.0 - 500µg/l Lead 0.3 - 30µg/l Magnesium 0.3 - 20mg/l Manganese 1.0 - 100µg/l Mercury 0.02 - 2µg/l Molybdenum 1.0 - 100µg/l Nickel 0.5 - 50µg/l Potassium 0.2 - 20mg/l Selenium 0.2 - 30µg/l Sodium 0.5 - 50mg/l Strontium 1.0 - 100µg/l Tin 1.0 - 100µg/l Vanadium 1.0 - 100µg/l Zinc 1.0 - 100µg/l</p> <p>SI439 Potable Water VOCs & THM EO25 (P,G,S) Benzene 0.1-35 µg/l 1,2-Dichloroethane 0.1-35 µg/l Tetrachloroethane 0.1-35 µg/l Trichloroethane 0.1-35 µg/l Chloroform 1.0-150 µg/l Bromoform 1.0-35 µg/l Dibromochloromethane 1.0-35 µg/l Bromodichloromethane 2.0-35 µg/l</p>	<p>Other VOC's EO025 (P,G,S) Bromomethane 0.5 - 35 µg/l Ethyl Ether/Diethyl Ether 0.5 - 35 µg/l 1,1 Dichloroethane 0.5 - 35 µg/l Iodomethane/Methyl Iodide 0.5 - 35 µg/l Carbon Disulphide 0.5 - 35 µg/l Allyl Chloride 0.5 - 35 µg/l Methylene Chloride/DCM 5.0 - 35 µg/l 2-Propenenitrile/Acrylonitrile 2.0 - 35 µg/l Chloromethyl Cyanide 0.5 - 35 µg/l Hexachlorobutadiene 0.5 - 35 µg/l Trans-1,2 Dichloroethane 0.5 - 35 µg/l MIBK 0.5 - 35 µg/l 1,1 Dichloroethane 0.5 - 35 µg/l 1,2 Dichloropropane 0.5 - 35 µg/l Cis-1,2 Dichloroethane 0.5 - 35 µg/l Methyl Acrylate 0.5 - 35 µg/l Bromochloromethane 0.5 - 35 µg/l Tetrahydrofuran 0.5 - 35 µg/l 1,1,1 Trichloroethane 0.5 - 35 µg/l 1-Chlorobutane 0.5 - 35 µg/l Carbon Tetrachloride 0.5 - 35 µg/l 1,1 Dichloropropane 0.5 - 35 µg/l 1,2 Dichloropropane 0.5 - 35 µg/l Dibromomethane 0.5 - 35 µg/l Methyl Methacrylate 0.5 - 35 µg/l 1,5 Dichloropropane, cis, 0 - 55 µg/l MIBK/4 Methyl 2 Pentanone 2.0 - 35 µg/l Toluene 0.5 - 35 µg/l 1,3 Dichloropropane, trans 2.0 - 35 µg/l Ethyl Methacrylate 2.0 - 35 µg/l 1,1,2 Trichloroethane 0.5 - 35 µg/l 1,3 Dichloropropane 0.5 - 35 µg/l 2 Hexanone 1.0 - 35 µg/l 1,2 Dibromoethane 0.5 - 35 µg/l Chlorobenzene 0.5 - 35 µg/l 1,1,1,2 Tetrachloroethane 2.0 - 35 µg/l Ethyl Benzene 0.5 - 35 µg/l m & p Xylene 0.5 - 35 µg/l O Xylene 0.5 - 35 µg/l Styrene 2.0 - 35 µg/l Isopropyl Benzene 0.5 - 35 µg/l Bromobenzene 0.5 - 35 µg/l 1,1,2,2 Tetrachloroethane 0.5 - 35 µg/l 1,2,3 Trichloropropane 2.0 - 35 µg/l Propyl Benzene 0.5 - 35 µg/l 2-Chlorotoluene 0.5 - 35 µg/l 4 Chlorobenzene 0.5 - 35 µg/l 1,3,5 Trimethylbenzene 0.5 - 35 µg/l Tert Butyl Benzene 0.5 - 35 µg/l 1,2,4 Trimethylbenzene 0.5 - 35 µg/l Sec Butyl Benzene 0.5 - 35 µg/l 1,3 Dichlorobenzene 0.5 - 35 µg/l P Isopropyltoluene 0.5 - 35 µg/l 1,4 Dichlorobenzene 0.5 - 35 µg/l 1,2 Dichlorobenzene 0.5 - 35 µg/l N Butyl Benzene 0.5 - 35 µg/l Hexachloroethane 0.5 - 35 µg/l 1,2 Dibromo 3Chloropropane 2.0 - 35 µg/l 1,2,4 Trichlorobenzene 0.5 - 35 µg/l 1,2,3 Trichlorobenzene 0.5 - 35 µg/l</p>	<p>PAH EO129 (P,G,S) <i>Range 0.01 - 0.2 µg/l</i> Acenaphthene Benzo (a) Anthracene Benzo (a) Pyrene Benzo (b) Fluoranthene Benzo (ghi) Perylene Benzo (k) Fluoranthene Chrysene Dibenzo (ah) Anthracene Fluoranthene Fluorene Indeno (1,23-cd) Pyrene Phenanthrene Pyrene</p> <p>Acid Herbicides (P,G,S) <i>Range 0.01 - 0.2 µg/l</i> 2,4,5-T H 2,4-D H 2,4-DB H MCPA H Picloram II</p> <p>Organophosphorus Pesticides (P,G,S) <i>Range 0.01 - 0.2 µg/l</i> Fenitrothion OP Methyl Fenitrothion OP Fenathion OP Thionazin OP</p> <p>Organochlorine Pesticides (P,G,S) <i>Range 0.01 - 0.2 µg/l</i> Aldrin BHC Alpha isomer OC BHC Beta isomer OC BHC Delta isomer OC Dieldrin OC Endosulphan Alpha isomer OC Endosulphan Beta isomer OC Endosulphan Sulphate OC Endrin CC Heptachlor Epoxide OC Heptachlor OC Lindane OC P,P DDE OC P,P-DDD OC P,P-DDT OC</p>

Notes
 1. Sample Matrix: P=Potable Water (Drinking), G=Ground Water, S=Surface Water, W=Waste Water

APPENDIX 3 – FIELD SHEETS

ON SITE SAMPLING FORM								
Facility Name: <i>Belturbet</i>				Waste Licence No:				
Report To: <i>19/11/13</i>								
Sampling Date:				Sample Type (GW, SW, Leachate) <i>All</i>				
Personnel: <i>B. heading</i>				Weather: <i>Dry</i>				
Other Remarks:				GPS:				
Sample Ref No	Sample Type	Time	DO Level	Elec Cond (us)	pH pH units	Temp °C	Visual	Instrument
<i>MW7</i>	<i>GW</i>			<i>650</i>	<i>7.7</i>	<i>10.2</i>	<i>clear</i>	
<i>MW8</i>	<i>GW</i>			<i>1172</i>	<i>7.2</i>	<i>10.4</i>	<i>clear</i>	
<i>MW9</i>	<i>GW</i>			<i>723</i>	<i>7.1</i>	<i>10.8</i>	<i>Heavy silt</i>	
<i>Lake</i>	<i>SW</i>			<i>347</i>	<i>7.9</i>	<i>7.8</i>		

Cavan County Council Groundwater Sampling Per.										
Site Reference: <i>Beltwood</i>		Permit No.			Date: <i>19/11/13</i>		Personnel: <i>R.H.</i>			
Sample Ref	Depth of Well	Depth of water below Ground Level	Depth of water column	Diameter of well	Radius of well	Radius squared	Volume of water in well	Volume of water in well	Volume of water to purge	Time to purge
(Shallow/Deep)	(m)	(m) B	A-B=h	(m)	(m)	(m ²)	(m ³) $\pi r^2 h$	litres	(litres x 3)	(mins)
	A	B		C	(C/2) = r	r ²		(m ³ x 1000)		
<i>MW7</i>	<i>31.2</i>	<i>5.48</i>	<i>25.72</i>	<i>0.05</i>	<i>0.025</i>	<i>0.000625</i>	<i>0.050475</i>	<i>50.67</i>	<i>151.42</i>	<i>25 min</i>
<i>MW8</i>	<i>31.12</i>	<i>5.68</i>	<i>25.44</i>	<i>0.05</i>	<i>0.025</i>	<i>0.000625</i>	<i>0.04926</i>	<i>49.92</i>	<i>149.78</i>	<i>25 min</i>
<i>MW9</i>	<i>10.2</i>	<i>6.10</i>	<i>4.1</i>	<i>0.05</i>	<i>0.025</i>	<i>0.000625</i>	<i>0.0020625</i>	<i>8.046</i>	<i>24.138</i>	<i>4 min</i>
				<i>0.05</i>	<i>0.025</i>	<i>0.000625</i>				
				<i>0.05</i>	<i>0.025</i>	<i>0.000625</i>				
				<i>0.05</i>	<i>0.025</i>	<i>0.000625</i>				
				<i>0.05</i>	<i>0.025</i>	<i>0.000625</i>				
				<i>0.05</i>	<i>0.025</i>	<i>0.000625</i>				
				<i>0.05</i>	<i>0.025</i>	<i>0.000625</i>				
				<i>0.05</i>	<i>0.025</i>	<i>0.000625</i>				
				<i>0.05</i>	<i>0.025</i>	<i>0.000625</i>				
				<i>0.05</i>	<i>0.025</i>	<i>0.000625</i>				



CAVAN COUNTY COUNCIL
CLOSED LANDFILL MONITORING INTEGRITY FORM

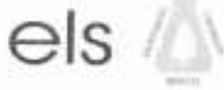
SITE Belturbet

DATE 19/11/15

PERSONNEL R. Heeting

ITEM	CONDITION			COMMENTS
	GOOD	NEEDS MAINTENANCE	N/A	
GROUNDWATER MONITORING WELLS				
-Labeled	/			
-Well cap integrity	/			
-Water drainage	/			
-Locks	/			
LANDFILL GAS VENTS				
-Riser condition	/			
-Concrete collar condition	/			
-Screen condition	/			
LANDFILL GAS MONITORING WELLS				
-Labeled	/			
-Well cap integrity	/			
-Water drainage	/			
-Traffic protection	/			
-Concrete collar condition	/			
-Screen Condition	/			
-Locks	/			
SURFACE WATER MONITORING LOCATIONS				
-Access	/			
-Disturbance	/			

APPENDIX 4 – CHAIN OF CUSTODY/SAMPLE SUBMISSION



Environmental Laboratory Services Ltd
 10000 Business Campus,
 Mains Industrial Park,
 Blackrock,
 Co. Du.
 Tel: 021-450141

SAMPLE SUBMISSION FORM

DETAILS TO APPEAR ON ANALYSIS REPORT

Contact Name: Beyton Eng
 Address: Mullagh
Cavan

Customer Name: Beyton Eng 6602
 PO Number: _____

NOTE: Use a separate sheet for different PO Numbers
 For all customers a PO Number must be provided with the samples

CONTRACT DETAILS

ELS Quote No: 406

NOTE: To reduce potential for error this field must be completed
 Use a separate sheet for different Quote Numbers

Results Due (Tick):

<input type="checkbox"/> 7 days	<input type="checkbox"/> 10 days	<input type="checkbox"/> 14 days
<input type="checkbox"/> 21 days	<input checked="" type="checkbox"/> 28 days	<input type="checkbox"/> 35 days

NOTE: Standard lead time is 14 working days and 25 working days for test sets-contrast.
 Deviations should be agreed in advance and may incur an extra charge

SAMPLE DETAILS

Number	Sample Reference	Tests Requested	Number of bottles submitted	Sample Type
	<small>NOTE: Whatever appears in this section, is the ONLY detail that will appear on the analysis report (Do not write the required detail on the bottles as it is normally not clear)</small>	<small>NOTE: To reduce potential for error please complete this field closely indicating per quart, per sheet attached or list the specific tests below</small>		<small>Drinking Water (DW), Ground Water (GW), Surface Water (SW), Waste Water (WW), Sludge, Soil, Sed, Solvent, Air</small>
21307 1-	MW 7	see QN	full set	GW
2-	MW 8	"	"	"
3-	MW 8	"	"	"
4-				
5-				

ONLY FIVE SAMPLES ALLOWED PER SUBMISSION SHEET

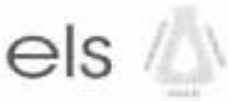
ADDITIONAL INFORMATION AND SIGNATURES

To be filled by the person submitting samples

Signature: [Signature] Phone No: _____
 Date: 19/11/17
 No. samples submitted: 3 No. of pages: 1 of 3
 Additional Info: _____

To be filled by ELS Ltd

Signature: [Signature]
 Date: 20/11/17 Time: _____
 Condition: satisfactory unsatisfactory - see notes above
 Additional Info: _____



Environmental Laboratory Services Ltd
 Avon, Business Campus,
 Manor Industrial Park,
 Blackrock,
 Cork,
 Tel: 021 4561414

SAMPLE SUBMISSION FORM

DETAILS TO APPEAR ON ANALYSIS REPORT

Contact Name: Brian Keating
 Address: Boylan

Customer Name: Boylan **6604**
 PO Number: Boylan
 NOTE: Use a separate sheet for different PO Numbers
 For all customers a PO Number must be provided with the samples

CONTRACT DETAILS

ELS Quote No: L106
 NOTE: To reduce potential for error this field must be completed
 Use a separate sheet for different Quote Numbers

Results Due (Tick)

<input type="checkbox"/> 1 Week	<input type="checkbox"/> 2 Weeks	<input type="checkbox"/> 3 Weeks
<input type="checkbox"/> 4 Weeks	<input checked="" type="checkbox"/> 5 Weeks	<input type="checkbox"/> 6 Weeks

NOTE: Standard lead time is 10 working days and 15 working days for test sets contracts.
 Deviations should be agreed in advance and may incur an extra charge

SAMPLE DETAILS

Number	Sample Reference <small>NOTE: Whatever appears in this section, is the ONLY detail that will appear on the analysis report (Do not write the required detail on the bottles as it is normally not clear)</small>	Tests Requested <small>NOTE: To reduce potential for error please complete this field clearly indicating per quote, per sheet attached or list the specific tests below</small>	Number of bottles submitted	Sample Type <small>Drinking Water (DW), Ground Water (GW), Surface Water (SW), Waste Water (WW), Sludge, SeW, Salt/soil, Air</small>
71306	ww6	see cal	10 lit	ww
2				
3				
4				
5				

ONLY FIVE SAMPLES ALLOWED PER SUBMISSION SHEET

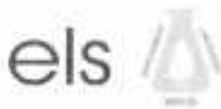
ADDITIONAL INFORMATION AND SIGNATURES

To be filled by the person submitting samples

Signature: Brian Keating Phone No: _____
 Date: 19/11/13
 No. samples submitted: 1 No. of pages: 3 of 3
 Additional info (if any): _____

To be filled by ELS Ltd

Signature: AN
 Date: 20/11/13 Time: _____
 Condition: Satisfactory Unsatisfactory - See notes above
 Additional info: _____



Environmental Laboratory Services Ltd
 Green Business Campus,
 Malen Industrial Park,
 Blackrock,
 Cork
 Tel: 021 4521111

SAMPLE SUBMISSION FORM

DETAILS TO APPEAR ON ANALYSIS REPORT

Contact Name: Brian Healy
 Address: Boylan Eng
Mullagh

Customer Name: Boylan Eng **6603**
 PO Number:

NOTE: Use a separate sheet for different PO Numbers
 For all customers a PO Number must be provided with the samples

CONTRACT DETAILS

ELS Quote No: 1106
 NOTE: In order to avoid any error this field must be completed
 Use a separate sheet for different Quote Numbers

Results Due (Tick) 10 days 15 days 20 days
 25 days 30 days Other

NOTE: Standard lead time is 10 working days and 15 working days for out-subs-contract.
 Deviations should be agreed in advance and may incur an extra charge

SAMPLE DETAILS

Number	Sample Reference	Tests Requested	Number of bottles submitted	Sample Type
71805	SW1	see on sheet	full set	SW
1				
2				
3				
4				
5				

ONLY FIVE SAMPLES ALLOWED PER SUBMISSION SHEET

ADDITIONAL INFORMATION AND SIGNATURES

To be filled by the person submitting samples
 Signature: Brian Healy Phone No:
 Date: 19/11/13
 No. samples submitted: No. of pages: 2 of 3
 Additional info/notes:

To be filled by ELS Ltd
 Signature:
 Date: 20/11/13 Time:
 Condition: satisfactory Unsatisfactory - See notes above
 Additional info:



SURFACE WATER MONITORING REPORT FOR BELTURBET LANDFILL W0092-01

Client: Cavan County Council

Site Location: Rahaghan, Belturbet

Report No.: CCC-04-01-03-04-Rev-0

Produced by: Brona Keating, BSc, P.Grad.Dip. Environmental Eng.

Approved by: 
Cathal Boylan, BEng, CEng, MIEI
CHARTERED ENGINEER

Date: 19th December 2013

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Web: www.boylanengineering.ie

Rev.	Date	Description

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I SUMMARY

Boylan Engineering (Eng. & Environmental Consultancy) was commissioned by Cavan County Council to carry out Environmental Monitoring at Belturbet Landfill (W0092-01), Rahaghan, Belturbet, Co Cavan for quarter four 2013.

Brona Keating, Environmental Consultant carried out all monitoring. This report shall document the findings.

Table of Contents

- 1.0 Introduction
- 2.0 Methodology
 - 2.1 Environmental Sampling
 - 2.2 Laboratory Analysis
 - 2.3 Monitoring Locations
 - 2.4 Weather Report
- 3.0 Summary of Results
- 4.0 Discussion
- 5.0 Conclusion

List of Tables

- 1.0 Surface Water 04th Quarter Monitoring

Appendix

- 1.0 Historical Data
- 2.0 Analysis Methods
- 3.0 Field Sheets
- 4.0 COC/Sample Submission form
 - Lab Reports
 - Landfill Map

1. INTRODUCTION

Belturbet landfill was operated as a disposal facility by Cavan County Council from 1979 until its closure in February 2002. The facility was operated as a traditional landfill and is located on the Belturbet Ballyconnell road (R200) approximately 4.5 kilometres West of Belturbet town. The site which was originally a limestone quarry comprises some 0.65 hectares. The bedrock surrounding the landfill is Darty Limestone Formation from the Lower Carboniferous period. A waste licence was issued by the EPA on the 13th of February 2002. Some remedial works were carried out after the closure of the site.

Condition 8.1 of the waste licence requires that monitoring be carried out in accordance with Schedule D of the licence. The following report give details of the surface water sampling programme conducted on site and also summarises findings and analytical results for quarter four 2013.

The purpose of environmental monitoring at closed landfills is to:

- Ensure the facility is compliant with the waste license
- Ensure the facility is not causing environmental pollution
- Ensure the facility is not posing a risk to human health
- Ensure the facility is not creating an unacceptable risk to atmosphere, water, soil, plants or animals
- Ensure the facility is not adversely affecting the countryside or places of interest
- Compare actual site behavior with expected/modeled behavior
- Establish a reliable database of information for the landfill throughout its life

According to the Response matrix for landfills, Belturbet landfill is situated in the R4 Zone. This zone was categorized using a vulnerability rating combined with the aquifer category for the area. Landfills situated in R4 Zones are unacceptable in accordance with today's standards detailed in the EPA Landfill Design Manual or conditions of a waste licence - (EPA, groundwater protection Responses for Landfills). Unfortunately this landfill was constructed prior to this guidance and conditions were issued only after its closure.

The generation of Leachate is one of the main hazards to groundwater from the disposal of waste by land filling. The conditions within a landfill vary over time from aerobic to anaerobic thus allowing for different chemical reactions to take place. Most landfill leachates have a high BOD, COD, Ammonia, Chloride, Sodium, Potassium, Hardness and Boron levels - (EPA, groundwater protection Responses for Landfills).

2.0 METHODOLOGY

2.1 Environmental Sampling

The following procedure is conducted by Boylan Engineering to ensure accurate surface water monitoring:

- Surface water samples are taken by grab sample using a Telescoup and Pendulum beaker.
- Having obtained a representative sample the following parameters are measured on-site using a Hanna HI 98129 combination waterproof high accuracy.
 - Conductivity
 - Temperature
 - pH
- Boylan Engineering operate a Sample Submission/Chain of Custody form, which accompanies the samples at all times. These forms are located in the appendix 4.

2.2 Laboratory Analysis

- Samples are sent to Environmental Laboratory Service (ELS) (Ireland) for analysis of the required parameters in designated cool boxes with ice packs. These boxes insure that samples are maintained at a consistent temperature between 0 °C and 4°C on their journey to the laboratory.
- On arrival at the laboratory, samples are stored between 0 °C and 4 °C.
- All samples received are inspected by Laboratory Manager Mr. Brendan Murray.
- All samples are assigned a unique reference number and are recorded on the Laboratory Information Management System (LIMS)
- All staff involved in the analysis of samples hold a minimum honours science degree.
- In the event of a Quality Control Check failure for a given parameter, a note will be included on the analysis report detailing the QC fail.
- Analysis of samples is conducted under the INAB accreditation and associated quality control procedures are employed in every aspect of analysis.
- Analysis methods are listed in Appendix 3.

2.3 Monitoring Locations

Quarter 4 2013					
Monitoring Well	Sample Type	Cover Level M (OD Malin Head)	Water Level M (OD Malin Head)	Water Depth M (Top of Casing)	National Grid Co-Ordinates
MW1	GW	TBC	-	TBC	TBC
MW5	Gas & Leachate	TBC	-	TBC	TBC
MW6	Gas & Leachate	TBC	-	TBC	TBC
MW7	Gas & GW	TBC	-	TBC	TBC
MW 9	Gas & GW	TBC	-	TBC	TBC
Killynaher Lake	SW	TBC	-	TBC	TBC

2.4 Weather Report

REPORTS FROM BALLYHAISE (A)							
Date	Rainfall	Max	Min	Grass Min Temp	Mean Wind Speed	Gusts	Sunshine
	(mm)	Temp	Temp	(°C)	(knots)	(if >= 34 knots)	(hours)
		(°C)	(°C)				
19/11/2013	0.2	6.6	-0.4	-1.8	7		

3.0 SUMMARY OF RESULTS

Table 1.0 04th Quarter Surface water monitoring 2013

Report Number 20690	71305																
Monitoring Date:	19/11/2013																
Method	Site Tests	Site Tests	Site Tests	Site Tests	AQ2	Titralab		5-Day	HACH	Gravimetric	AQ2	Inolab	Titralab	AQ2-UP2	Total Phosphorus-TP	AQ2-UP1	
Method Number	Site Tests	Site Tests	Site Tests	Site Tests	EW003	EW138	EW139	EW001	EW094	EW013	EW015	EW043	EW153	EW154M-1	EW146	EW154M	
Parameter	Sample temperature (to be tested onsite)	Cond	pH	DO	Ammonia	pH	Cond	BOD	COD	Total Suspended Solids	Cl	DO	Alkalinity Total (R2 pH4.5)	Sulphate	Total Phosphorus-TP	TON (as N)(Calc)	
Units	Deg C	us/cm	pH units	mg/l	mg/l N	pH Units	us/cm	mg/l	mg/l	mg/l	mg/l	mg/l	mg/L CaCO3	mg/L	mg/l P	mg/l N	
Limit of Detection	-	-	-	-	0.007	25	25	1	8	5	2.6	1.0	10	5	0.1	0.138	
Date Testing Initiated	19.11.13				20.11.13												
ELS Ref	Client Ref																
71305/001	SW1 Lake	7.8	347	7.9	9.0	0.129	7.8	340	<1	12	<5	16.8	10	155	10.2	0.04	0.142
S.I No. 294/1989					0.2	≥5.5 and ≤8.5	1000	5	40	50	250	-	NAC	200	-		
Method	Metals-Dissolved												Metals-Total				
Method Number																	
Parameter	Iron-Dissolved	Manganese-Dissolved	Potassium-Dissolved	Sodium-Dissolved	Cadmium-Dissolved	Calcium-Dissolved	Copper-Dissolved	Lead-Dissolved	Magnesium-Dissolved	Mercury-Dissolved	Zinc-Dissolved	Chromium-Total					
Units	ug/L	ug/L	mg/L	mg/L	ug/L	mg/L	mg/L	ug/L	mg/L	ug/L	ug/L	ug/L					
Limit of Detection	20	1	0.5	0.5	0.1	1	0.003	0.3	0.3	0.02	1	1					
Date Testing Initiated	20.11.13																
ELS Ref	Client Ref																
71305/001	SW1 Lake	<20	4.9	4.8	12.9	<0.1	56.3	<0.003	<0.3	3.9	<0.02	3.6	<1				
S.I No. 294/1989		200	50	-	-	5	-	0.03	0.01	-	1	100	30				
Exceedance of waste licence	[Redacted]																
NOTES																	
1	Sub-contract analysis denoted by *																
2	ND - Concentration was below the limit of detection																
3	NAC- No Abnormal Change																

As there are no limits set in the waste licence for surface water, results are compared to S.I. No. 294/1989 — European Communities (Quality of Surface Water Intended For The Abstraction of Drinking Water) Regulations, 1989.

4.0 DISCUSSION

As there are no limits set in the waste licence for surface water, results are compared to limits detailed in S.I. No. 294/1989 — European Communities (Quality of Surface Water Intended or The Abstraction of Drinking Water) Regulations, 1989.

A surface water sample was taken at SW2 (Killynaher lake) which is in the vicinity of the landfill. Results show that all parameters were within levels stipulated by the aforementioned document.

Historical results for comparison purposes are presented in tabular form in Appendix 1

5.0 CONCLUSION

The results obtained are relatively consistent with previous monitoring events and therefore there is no evidence of any major negative environmental impact associated with this landfill. The next environmental and landfill gas monitoring event will take place during the first quarter 2014.

APPENDIX 1- Historical Data- Tables

	Parameter	Ammonia	pH	Cond	BOD	COD	Total Suspended Solids	Cl	DO
	Units	mg/l N	pH Units	us/cm	mg/l	mg/l	mg/l	mg/l	mg/l
SW Killynaher Lake	Qtr 4 2013	0.129	7.8	340	<1	12	<5	17	10
	Qtr 3 2013	0.266	8.1	345	13	31	<5	21	8.7
	Qtr 2 2013	0.05	8.3	310	3	23	<5	17	10
	Qtr 1 2013	0.108	7.6	338	5	23	<5	18	10.6
S.I No. 294/1989		0.2	≥5.5 and ≤8.5	1000	5	40	50	250	

APPENDIX 2- ANALYSIS METHODS

ELS LTD INAB ACCREDITATION SCHEDULE SUMMARY SHEET		
<p>Miscellaneous (P,G,W,S) Ammonia/Ammonium 0.007-1mg/lN EW003 Chloride 2.6-750 mg/l EW005 Fluoride 0.1 - 2 mg/l EW137 COD 8-1500 mg/l EW094 Nitrate 0.12-50 mg/l N EW034 Nitrite 0.013-1 mg/l N EW035 pH = 10 pH Units EW138 Phosphate 0.009-1 mg/l P EW007 TOC 0.25-130mg/l EW123 Total Phosphorous 0.03-1 mg/l P EW002</p> <p>Miscellaneous (P,G,S) Bromate 1 to 50µg/l BRO3 (EW137) Colour 2.5-50mg/l PtCo (EW021) Conductivity 132-6000 us/cm EW139 Dissolved Oxygen 1 to 10 mg/l (EW043) Sulphate 1-250mg/l SO4(EW016) Suspended Solids 5-1000mg/l (EW113) Total Dissolved Solids 1-1000mg/l (EW046) Total Hardness 3-330mg/l CaCO3 (EM099) Total Oxidised Nitrogen 0.138-51mg/l N (EW051)</p> <p>Metals EML30 (P,G,S) Aluminium 5.0 – 500 µg/l Antimony 0.1 – 10µg/l Arsenic 0.1 - 20µg/l Barium 1.0 - 100µg/l Boron 0.02 – 2mg/l Cadmium 0.1 – 10µg/l Calcium 1.0 – 100mg/l Chromium 1.0 - 100µg/l Cobalt 1.0 - 100µg/l Copper 3 - 400µg/l Iron > 0 - >60µg/l Lead 0.3 - 30µg/l Magnesium 0.3 - 20mg/l Manganese 1.0 - 100µg/l Mercury 0.02 - 2µg/l Molybdenum 1.0 - 100µg/l Nickel 0.5 - 50µg/l Potassium 0.3 - 20mg/l Selenium 0.3 - 20µg/l Sodium 0.5 - 50mg/l Strontium 1.0 - 100µg/l Tin 1.0 - 100µg/l Vanadium 1.0 - 100µg/l Zinc 1.0 - 100µg/l</p> <p>SI49 Potable Water VOCs & THM EO25 (P,G,S) Benzene 0.1-35 µg/l 1,2-Dichloroethane 0.1-35 µg/l Tetrachloroethane 0.1-35 µg/l Trichloroethene 0.1-35 µg/l Chloroform 1.0-150 µg/l Bromoform 1.0-35 µg/l Dibromochloromethane 1.0-35 µg/l Bromodichloromethane 2.0-35 µg/l</p>	<p>Other VOC's EO26 (P,G,S) Bromomethane 0.5 - 35 µg/l Ethyl Ether/Diethyl Ether 5 - 35 µg/l 1,1 Dichloroethane 0.5 - 35 µg/l Isodimethane/Methyl Iodide 0.5 - 35 µg/l Carbon Disulphide 0.5 - 35 µg/l Allyl Chloride 0.5 - 35 µg/l Methylene Chloride/DCM 5.0 - 35 µg/l 2-Propenenitrile/Acrylonitrile 2.0 - 35 µg/l Chloromethyl Cyanide 0.5 - 35 µg/l Hexachlorobutadiene 0.5 - 35 µg/l Trans-1,2 Dichloroethane 0.5 - 35 µg/l MREO 5 - 35 µg/l 1,1 Dichloroethane 0.5 - 35 µg/l 1,2 Dichloropropane 0.5 - 35 µg/l Cis-1,2 Dichloroethane 0.5 - 35 µg/l Methyl Acrylate 0 - 35 µg/l Bromochloromethane 0.5 - 35 µg/l Tetrahydrofuran 0 - 35 µg/l 1,1,1 Trichloroethane 0.5 - 35 µg/l 1-Chlorobutane 0.5 - 35 µg/l Carbon Tetrachloride 0.5 - 35 µg/l 1,1 Dichloropropane 0.5 - 35 µg/l 1,2 Dichloropropane 0.5 - 35 µg/l Dibromomethane 0.5 - 35 µg/l Methyl Methacrylate 0.5 - 35 µg/l 1,3 Dichloropropene, cis 1.0 - 35 µg/l MIBK/4 Methyl 2 Pentanone 2.0 - 35 µg/l Toluene C 5 - 35 µg/l 1,3 Dichloropropene trans 0.5 - 35 µg/l Ethyl Methacrylate 2.0 - 35 µg/l 1,1,2 Trichloroethane 0.5 - 35 µg/l 1,5 Dichloropropane 0.5 - 35 µg/l 1 Hexanone 1.0 - 35 µg/l 1,2 Dibromoethane 0.5 - 35 µg/l Chlorobenzene 0.5 - 35 µg/l 1,1,1,2 Tetrachloroethane 2.0 - 35 µg/l Ethyl Benzene 0.5 - 35 µg/l m & p Xylene 0.5 - 35 µg/l o Xylene 0.5 - 35 µg/l Styrene 2.0 - 35 µg/l Isopropyl Benzene 0.5 - 35 µg/l Bromobenzene 0.5 - 35 µg/l 1,1,2,2 Tetrachloroethane 0.5 - 35 µg/l 1,2,3 Trichloropropane 2.0 - 35 µg/l Propyl Benzene C 5 - 35 µg/l 1-Chlorotoluene 0.5 - 35 µg/l 4 Chlorotoluene 0.5 - 35 µg/l 1,3,5 Trimethylbenzene 0.5 - 35 µg/l Tert Butyl Benzene 0.5 - 35 µg/l 1,2,4 Trimethylbenzene 0.5 - 35 µg/l Sec Butyl Benzene 0.5 - 35 µg/l 1,3 Dichlorobenzene 0.5 - 35 µg/l P Isopropyltoluene 0.5 - 35 µg/l 1,4 Dichlorobenzene 0.5 - 35 µg/l 1,2 Dichlorobenzene 0.5 - 35 µg/l N Butyl Benzene 0.5 - 35 µg/l Hexachloroethane 5.0 - 35 µg/l 1,2 Dibromo 3Chloropropane 2.0 - 35 µg/l 1,2,4 Trichlorobenzene 0.5 - 35 µg/l 1,2,3 Trichlorobenzene 0.5 - 35 µg/l</p>	<p>PAH EO129 (P,G,S) <i>Range 0.01 - 0.2 µg/l</i> Acenaphthene Benzo (a) Anthracene Benzo (a) Pyrene Benzo (b) Fluoranthene Benzo (ghi) Perylene Benzo (k) Fluoranthene Chrysene Dibenzo (ah) Anthracene Fluoranthene Fluorene Indeno (1,2,3 cd) Pyrene Phenanthrene Pyrene</p> <p>Acid Herbicides (P,G,S) <i>Range 0.01 - 0.2 µg/l</i> 2,4,5-T H 2,4-D H 2,4-DB H MCPA H Picloram H</p> <p>Organophosphorus Pesticides (P,G,S) <i>Range 0.01 - 0.2 µg/l</i> Fenitrothion OP Methyl Parathion OP Parathion OP Imidacloprid OP</p> <p>Organochlorine Pesticides (P,G,S) <i>Range 0.01 - 0.2 µg/l</i> Aldrin BHC Alpha isomer OC BHC Beta isomer OC BHC Delta isomer OC Dieldrin OC Endosulphan Alpha isomer OC Endosulphan Beta isomer OC Endosulphan Sulphate OC Endrin CC Heptachlor Epoxide OC Heptachlor OC Lindane OC P,P DDE OC P,P-DDD OC P,P-DDT OC</p>

Notes

1. Sample Matrix: P=Potable Water (Drinking), G=Ground Water, S=Surface Water, W=Waste Water

APPENDIX 4 – CHAIN OF CUSTODY/SAMPLE SUBMISSION



Environmental Laboratory Services Ltd
Acree Business Campus,
Milton Industrial Park,
Blackrock,
Co. Wick
Tel: 021-4534141

SAMPLE SUBMISSION FORM

DETAILS TO APPEAR ON ANALYSIS REPORT

Contact Name: Berna Hearty
Address: Baylan Eng
Mullbeg

Customer Name: Baylan Eng
PO Number: 6603

NOTE: Use a separate sheet for different PO Numbers
For all customers a PO Number must be provided with the samples

CONTRACT DETAILS

ELS Quote No: 106

NOTE: To reduce potential for error this field must be completed
Use a separate sheet for different Quote Numbers

Results Due (Tick)

<input type="checkbox"/> 10 days	<input type="checkbox"/> 15 days	<input type="checkbox"/> 20 days
<input type="checkbox"/> 25 days	<input checked="" type="checkbox"/> 30 days	<input type="checkbox"/> 35 days

NOTE: Standard lead time is 10 working days and 15 working days for spot sub-contract.
Deviation should be agreed in advance and may incur an extra charge

SAMPLE DETAILS

Number	Sample Reference	Tests Requested	Number of bottles submitted	Sample Type
	NOTE: Whatever appears in this section, is the ONLY detail that will appear on the analysis report (Do not write the required detail on the bottles as it is normally not clear)	NOTE: To reduce potential for error please complete this field clearly indicating per quote per sheet attached or list the specific tests below		Drinking Water (DW), Ground Water (GW), Surface Water (SW), Waste Water (WW), Sludge, Soil/Silt, Solvent, Air
71305	SW1	see on sheet attached	full set	SW
2				
4				
4				
7				

ONLY FIVE SAMPLES ALLOWED PER SUBMISSION SHEET

ADDITIONAL INFORMATION AND SIGNATURES

To be filled by the person submitting samples

Signature: B. Hearty Phone No: _____
Date: 19/11/13
No. samples submitted: _____ No. of pages: 2 of 3
Additional info: _____

To be filled by ELS Ltd

Signature: _____ Date: 20/11/13 Time: _____
Condition: Satisfactory Unsatisfactory - See notes above
Additional info: _____



LEACHATE MONITORING REPORT FOR BELTURBET LANDFILL W0092-01

Client: Cavan County Council

Site Location: Rahaghan, Belturbet

Report No.: CCC-04-01-03-04-Rev-0

Produced by: Brona Keating, BSc, P.Grad.Dip. Environmental Eng.

Approved by: 
Cathal Boylan, BEng, CEng, MIEI
CHARTERED ENGINEER

Date: 14th December 2013

Boylan Engineering
Company Reg. 430482
Address: Main St., Mullagh, Kells Co. Meath.
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Fax: 046 – 928 6002
Email: info@boylanengineering.ie
Web: www.boylanengineering.ie

Rev.	Date	Description

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I SUMMARY

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Brona Keating, Environmental Consultant carried out all monitoring. This report shall document the findings.

Table of Contents

- 1.0 Introduction
- 2.0 Methodology
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 - 2.4 Monitoring Locations
 - 2.5 Weather Report
- 3.0 Summary of Results
- 4.0 Discussion
- 5.0 Conclusion

List of Tables

- 1.0 Leachate 04th Quarter Monitoring

Appendix

- 1.0 Historical Data
- 2.0 Analysis Methods
- 3.0 COC/Sample Submission form
 - Lab Reports
 - Landfill Map

1. INTRODUCTION

Belturbet landfill was operated as a disposal facility by Cavan County Council from 1979 until its closure in February 2002. The facility was operated as a traditional landfill and is located on the Belturbet Ballyconnell road (R200) approximately 4.5 kilometres West of Belturbet town. The site which was originally a limestone quarry comprises some 0.65 hectares. The bedrock surrounding the landfill is Darty Limestone Formation from the Lower Carboniferous period. A waste licence was issued by the EPA on the 13th of February 2002. Some remedial works were carried out after the closure of the site.

Condition 8.1 of the waste licence requires that monitoring be carried out in accordance with Schedule D of the licence. The following report give details of the leachate sampling programme conducted on site and also summarises findings and analytical results for quarter four 2013.

The purpose of environmental monitoring at closed landfills is to:

- Ensure the facility is compliant with the waste license
- Ensure the facility is not causing environmental pollution
- Ensure the facility is not posing a risk to human health
- Ensure the facility is not creating an unacceptable risk to atmosphere, water, soil, plants or animals
- Ensure the facility is not adversely affecting the countryside or places of interest
- Compare actual site behavior with expected/modeled behavior
- Establish a reliable database of information for the landfill throughout its life

According to the Response matrix for landfills, Belturbet landfill is situated in the R4 Zone. This zone was categorized using a vulnerability rating combined with the aquifer category for the area. Landfills situated in R4 Zones are unacceptable in accordance with today's standards detailed in the EPA Landfill Design Manual or conditions of a waste licence - (EPA, groundwater protection Responses for Landfills). Unfortunately this landfill was constructed prior to this guidance and conditions were issued only after its closure.

The generation of Leachate is one of the main hazards to groundwater from the disposal of waste by land filling. The conditions within a landfill vary over time from aerobic to anaerobic thus allowing for different chemical reactions to take place. Most landfill leachates have a high BOD, COD, Ammonia, Chloride, Sodium, Potassium, Hardness and Boron levels - (EPA, groundwater protection Responses for Landfills).

2.0 METHODOLOGY

2.1 Environmental Sampling

The following procedure is conducted by Boylan Engineering to ensure accurate leachate monitoring:

- ISO 5667: Guidance on sampling of groundwaters is adhered to.
- Prior to sampling, the depth of water in leachate wells is measured by dipping. Dipping the wells before sampling allows for calculation of the volume of water in the well.
- Sampling is conducted using a Waterra inertial lift pump and associated tubing, pumping water directly from the borehole to the appropriate sampling bottles.
- Designated tubing is used at each location.
- Boylan Engineering operate a Sample Submission/Chain of Custody form, which accompanies the samples at all times. These forms are located in the appendix 3.

2.2 Laboratory Analysis

- Samples are sent to Environmental Laboratory Service (ELS) (Ireland) for analysis of the required parameters in designated cool boxes with ice packs. These boxes insure that samples are maintained at a consistent temperature between 0 °C and 4 °C on their journey to the laboratory.
- On arrival at the laboratory, samples are stored between 0 °C and 4 °C.
- All samples received are inspected by Laboratory Manager Mr. Brendan Murray.
- All samples are assigned a unique reference number and are recorded on the Laboratory Information Management System (LIMS)
- All staff involved in the analysis of samples hold a minimum honours science degree.
- In the event of a Quality Control Check failure for a given parameter, a note will be included on the analysis report detailing the QC fail.
- Analysis of samples is conducted under the INAB accreditation and associated quality control procedures are employed in every aspect of analysis.
- Analysis methods are listed in Appendix 2.

2.3 Monitoring Locations

Quarter 4 2013					
Monitoring Well	Sample Type	Cover Level M (OD Malin Head)	Water Level M (OD Malin Head)	Water Depth M (Top of Casing)	National Grid Co-Ordinates
MW1	GW	TBC	-	TBC	TBC
MW5	Gas & Leachate	TBC	-	TBC	TBC
MW6	Gas & Leachate	TBC	-	TBC	TBC
MW7	Gas & GW	TBC	-	TBC	TBC
MW 9	Gas & GW	TBC	-	TBC	TBC
Killynaher Lake	SW	TBC	-	TBC	TBC

2.4 Weather Report

REPORTS FROM BALLYHAISE (A)							
Date	Rainfall	Max	Min	Grass Min Temp	Mean Wind Speed	Gusts	Sunshine
	(mm)	Temp	Temp	(°C)	(knots)	(if >= 34 knots)	(hours)
		(°C)	(°C)				
19/11/2013	0.2	6.6	-0.4	-1.8	7		

3.0 SUMMARY OF RESULTS

Table 1.0 04th Quarter Leachate monitoring 2013

Report Number	71306															
Monitoring Date	19/11/2013															
Method	Site Tests	Site Tests	Site Tests	AQ2							Coliforms		Ion Chromatography	AQ2-UP2	Total Cyanide High (Sub)	
Method Number	Site Tests	Site Tests	Site Tests	EW003	EW051	EW138	EW139	EW001	EW094	EW015	MIC133		EW137	EW154M-1	DEFAULT	
Parameter	Sample temperature (to be tested onsite)	Water Level from TOC	Visual Inspection	Ammonia	TON	pH	Cond	BOD	COD	Cl	E. Coli	Total Coliforms	Fluoride	Sulphate	Total Cyanide High	
Units	Deg C	Meter's		mg/l N	mg/l N	pH Units	us/cm	mg/l	mg/l	mg/l	MPN/100ml		mg/L	mg/L	ug/L	
Limit of Detection	-	-	-	0.035	0.69	0.3	25	1	8	13	10	10	0.1	5	9	
Date Testing Initiated	19.11.13			20.11.13												
ELS Ref	Client Ref															
71306/001	MW6	-	-	-	1.478	<0.69	7.4	856	7	15	62.7	10	10	1.4	45.7	<9
IGV				0.15	NAC	≥6.5&≤9.5	1000	-	-	200	0	0	1	200	10	
Method	Total Phosphorus-TP	Metals-Total	Metals-Dissolved													
Method Number	EW146		EM130													
Parameter	Total Phosphorus-TP	Chromium-Total	Manganese-Dissolved	Potassium-Dissolved	Sodium-Dissolved	Cadmium-Dissolved	Calcium-Dissolved	Copper-Dissolved	Lead-Dissolved	Magnesium-Dissolved	Mercury-Dissolved	Zinc-Dissolved	Boron-Dissolved	Iron-Dissolved		
Units	mg/l P	ug/L	ug/L	ug/L	mg/L	mg/L	ug/L	mg/L	mg/L	ug/L	mg/L	ug/L	ug/L	ug/L		
Limit of Detection	0.1	1	1	0.2	0.5	0.1	1	0.003	0.3	0.3	0.02	1	0.02	20		
Date Testing Initiated	20.11.13															
ELS Ref	Client Ref															
71306/001	MW6	0.4	5.1	14.2	8.4	22.3	<0.1	82.3	<0.003	<0.3	59.6	<0.02	6.1	0.19	<20	
IGV		-	30	50	5	150	5	200	0.03	10	50	1	100	1	200	
Exceedance	[Redacted]															
NOTES																
1	Sub-contract analysis denoted by *															
2	ND - Concentration was below the limit of detection															
3	NAC- No Abnormal Change															
4	IGV - Interim Guide Value															

As there are no limits set in the waste licence for leachate, results are compared to the Interim Guide Values for the protection of Groundwater in Ireland, where available

4.0 DISCUSSION

Leachate consists of water that has become contaminated as it passes through a waste disposal site. It contains insoluble waste constituents which have not degraded chemically or biochemically. This leachate can cause a treat to surrounding surface and ground waters. The composition of leachate will vary depending on the age of the landfill. As there are no limits set in the waste licence for leachate, results are compared to the Interim Guide Values for the protection of Groundwater in Ireland, where available. Results in Hatched Red indicate where the interim guide value has been exceeded. A leachate sample was abstracted from well MW6 during quarter two monitoring. Results show that the Interim Guide Value was exceeded at well MW6 on this occasion for the parameters Ammonia, E-coli, Total Coli forms, Fluoride, Potassium & Mercury. These results are consistent with those obtained in previous monitoring events at MW6.

Historical results for comparison purposes are presented in tabular form in Appendix 1.

5.0 CONCLUSION

The results obtained are relatively consistent with previous monitoring events and do not show any signs of dramatic exceedences. Therefore there is no evidence of any major negative environmental impact associated with this landfill. The next environmental monitoring event will take place during the first quarter 2014.

APPENDIX 1- Historical Data- Tables

	Parameter	Ammonia	TON	pH	Cond	BOD	COD	Cl
	Units	mg/l N	mg/l N	pH Units	us/cm	mg/l	mg/l	mg/l
MW 6	Qtr 4 2013	1.478	<0.69	7.4	856	7	15	62.7
	Qtr 3 2013	-	-	-	-	-	-	-
	Qtr 2 2013	-	-	-	-	-	-	-
	Qtr 1 2013	3.831	<0.69	7.2	1141	4	18	26.5
Interim Guide Values		0.15	NAC	≥6.5&≤9.5	1000			200

APPENDIX 2- ANALYSIS METHODS

ELS LTD INAB ACCREDITATION SCHEDULE SUMMARY SHEET		
<p>Miscellaneous (P,G,W,S) Ammonia/Ammonium 0.007-1mg/lN EW003 Chloride 2.6-250 mg/l EW015 Fluoride 0.1-2 mg/l EW137 COD 8-1500 mg/l EW094 Nitrate 0.15-50 mg/l N EW034 Nitrite 0.013-1 mg/l N EW035 pH 4 – 10 pH Units EW158 Phosphate 0.009-1 mg/l P EW007 TOC 0.25-100mg/l EW123 Total Phosphorous 0.03-1 mg/l P EW002</p> <p>Miscellaneous (P,G,S) Bromate 1 to 50µg/l BRO3 (EW137) Colour 2.5-50mg/l PtCo (EW021) Conductivity 152-6000 us/cm EW139 Dissolved Oxygen 1 to 10 mg/l (EW043) Sulphate 1-250mg/l SO4(EW016) Suspended Solids 5-1000mg/l (EW013) Total Dissolved Solids 1-1000mg/l (EW046) Total Hardness 3-330mg/l CaCO3 (EM099) Total Oxidised Nitrogen 0.138-51mg/l N (EW051)</p> <p>Metals EM139 (P,G,S) Aluminium 5.0 – 500 µg/l Antimony 0.1 – 10µg/l Arsenic 0.1 - 20µg/l Barium 1.0 - 100µg/l Boron 0.01 – 2mg/l Cadmium 0.1 – 10µg/l Calcium 1.0 – 100mg/l Chromium 1.0 - 100µg/l Cobalt 1.0 - 100µg/l Copper 3 - 4000µg/l Iron 5.0 - 500µg/l Lead 0.3 - 30µg/l Magnesium 0.3 – 20mg/l Manganese 1.0 - 100µg/l Mercury 0.02 - 2µg/l Molybdenum 1.0 - 100µg/l Nickel 0.5 - 50µg/l Potassium 0.2 – 20mg/l Selenium 0.2 - 20µg/l Sodium 0.5 – 50mg/l Strontium 1.0 - 100µg/l Tin 1.0 - 100µg/l Vanadium 1.0 - 100µg/l Zinc 1.0 - 100µg/l</p> <p>SI439 Potable Water VOCs & THM EO025 (P,G,S) Benzene 0.1-35 µg/l 1,2-Dichloroethane 0.1-35 µg/l Tetrachloroethane 0.1-35 µg/l Trichloroethane 0.1-35 µg/l Chloroform 1.0-150 µg/l Bromoform 1.0-35 µg/l Dibromochloromethane 1.0-35 µg/l Bromodichloromethane 2.0-35 µg/l</p>	<p>Other VOC's EO025 (P,G,S) Bromomethane 0.5 - 35 µg/l Ethyl Ether Diethyl Ether 0.5 - 35 µg/l 1,1 Dichloroethane 0.5 - 35 µg/l Isodimethane Methyl Iodide 0.5 - 35 µg/l Carbon Disulphide 0.5 - 35 µg/l Allyl Chloride 0.5 - 35 µg/l Methylene Chloride DCM 5.0 - 35 µg/l 2-Propenenitrile Acrylonitrile 2.0 - 35 µg/l Chloromethyl Cyanide 0.5 - 35 µg/l Hexachlorobutadiene 0.5 - 35 µg/l Trans-1,2 Dichloroethene 0.5 - 35 µg/l MIBK 0.5 - 35 µg/l 1,1 Dichloroethane 0.5 - 35 µg/l 1,2 Dichloropropane 0.5 - 35 µg/l Cis-1,2 Dichloroethane 0.5 - 35 µg/l Methyl Acrylate 0.5 - 35 µg/l Bromochloromethane 0.5 - 35 µg/l Tetrahydrofuran 0.5 - 35 µg/l 1,1,1 Trichloroethane 0.5 - 35 µg/l 1-Chlorobutane 0.5 - 35 µg/l Carbon Tetrachloride 0.5 - 35 µg/l 1,1 Dichloropropene 0.5 - 35 µg/l 1,2 Dichloropropane 0.5 - 35 µg/l Dibromomethane 0.5 - 35 µg/l Methyl Methacrylate 0.5 - 35 µg/l 1,5 Dichloropropene, cis, 0 - 35 µg/l MIBK/4 Methyl 2 Pentanone 2.0 - 35 µg/l Toluene 0.5 - 35 µg/l 1,3 Dichloropropene, trans 2.0 - 35 µg/l Ethyl Methacrylate 2.0 - 35 µg/l 1,1,2 Trichloroethane 0.5 - 35 µg/l 1,3 Dichloropropane 0.5 - 35 µg/l 2 Hexanone 1.0 - 35 µg/l 1,2 Dibromoethane 0.5 - 35 µg/l Chlorobenzene 0.5 - 35 µg/l 1,1,1,2 Tetrachloroethane 2.0 - 35 µg/l Ethyl Benzene 0.5 - 35 µg/l m & p Xylene 0.5 - 35 µg/l O Xylene 0.5 - 35 µg/l Styrene 2.0 - 35 µg/l Isopropyl Benzene 0.5 - 35 µg/l Bromobenzene 0.5 - 35 µg/l 1,1,2,2 Tetrachloroethane 0.5 - 35 µg/l 1,2,3 Trichloropropane 2.0 - 35 µg/l Propyl Benzene 0.5 - 35 µg/l 1-Chlorotoluene 0.5 - 35 µg/l 4 Chlorobutane 0.5 - 35 µg/l 1,3,5 Trimethylbenzene 0.5 - 35 µg/l Tert Butyl Benzene 0.5 - 35 µg/l 1,2,4 Trimethylbenzene 0.5 - 35 µg/l Sec Butyl Benzene 0.5 - 35 µg/l 1,3 Dichlorobenzene 0.5 - 35 µg/l P Isopropyltoluene 0.5 - 35 µg/l 1,4 Dichlorobenzene 0.5 - 35 µg/l 1,2 Dichlorobenzene 0.5 - 35 µg/l N Butyl Benzene 0.5 - 35 µg/l Hexachloroethane 5.0 - 35 µg/l 1,2 Dibromo 3Chloropropane 2.0 - 35 µg/l 1,2,4 Trichlorobenzene 0.5 - 35 µg/l 1,2,3 Trichlorobenzene 0.5 - 35 µg/l</p>	<p>FAH EO129 (P,G,S) <i>Range 0.01 - 0.2 µg/l</i> Acenaphthene Benzo (a) Anthracene Benzo (a) Pyrene Benzo (b) Fluoranthene Benzo (ghi) Perylene Benzo (k) Fluoranthene Chrysene Dibenzo (ah) Anthracene Fluoranthene Fluorene Indeno (1,2,3-cd) Pyrene Phenanthrene Pyrene</p> <p>Acid Herbicides (P,G,S) <i>Range 0.01 - 0.2 µg/l</i> 2,4,5-T E 2,4-D H 2,4-DB E MCPA H Picloram II</p> <p>Organophosphorus Pesticides (P,G,S) <i>Range 0.01 - 0.2 µg/l</i> Fenphox OP Methyl Parathion OP Isratuon OP Thionazin OP</p> <p>Organochlorine Pesticides (P,G,S) <i>Range 0.01 - 0.2 µg/l</i> Aldrin BHC Alpha isomer OC BHC Beta isomer OC BHC Delta isomer OC Dieldrin OC Endosulphan Alpha isomer OC Endosulphan Beta isomer OC Endosulphan Sulphate OC Endrin OC Heptachlor Epoxide OC Heptachlor OC Lindane OC P,P' DDE OC P,P'-DDD OC P,P'-DDT OC</p>

Notes
 1. Sample Matrix: P=Potable Water (Drinking), G=Ground Water, S=Surface Water, W=Waste Water

APPENDIX 3 – CHAIN OF CUSTODY/SAMPLE SUBMISSION



Environmental Laboratory Services Ltd
 Acorn Business Centre,
 Manor Industrial Park,
 Blackrock,
 Co. Wick,
 Tel: 021-4536142

SAMPLE SUBMISSION FORM

DETAILS TO APPEAR ON ANALYSIS REPORT

Contact Name: Brona Healy
 Address: Baylan

Customer Name: 6604
 PO Number: [Signature]
 NOTE: Use a separate sheet for different PO Numbers
 For all customers a PO Number must be provided with the samples

CONTRACT DETAILS

ELN Quote No: L106
 NOTE: To reduce potential for error this field must be completed
 Use a separate sheet for different Quote Numbers

Results Due (Tick)

 NOTE: Standard lead time is 10 working days and 15 working days for test sub-contract.
 Deviations should be agreed in advance and may incur an extra charge.

SAMPLE DETAILS

Number	Sample Reference	Tests Requested	Number of bottles submitted	Sample Type
	NOTE: Whatever appears in this section, is the ONLY detail that will appear on the analysis report (Do not write the required detail on the bottles as it is normally not clear)	NOTE: To reduce potential for error please complete this field clearly indicating per spm, per sheet attached or list the specific tests below		Drinking Water (DW), Ground Water (GW), Surface Water (SW), Waste Water (WW), Sludge, Soil/Silt, Sediment, Air
71306	ww6	see cal	100 100	ww
2				
3				
4				
5				

ONLY FIVE SAMPLES ALLOWED PER SUBMISSION SHEET

ADDITIONAL INFORMATION AND SIGNATURES

To be filled by the person submitting samples

Signature: [Signature] Phone No: _____
 Date: 19/11/13
 No. samples submitted: 1 No. of pages: 3 of 3
 Additional Info: _____

To be filled by ELS Ltd

Signature: [Signature]
 Date: 19/11/13 Time: _____
 Condition: Satisfactory Unsatisfactory - See notes above
 Additional Info: _____

NOTES FOR CUSTOMER



GAS MONITORING REPORT FOR BELTURBET LANDFILL W0092-01

Client: Cavan County Council

Site Location: Rahaghan, Belturbet

Report No.: CCC-04-01-03-04-Rev-0

Produced by: Brona Keating, BSc, P.Grad.Dip. Environmental Eng.

Approved by: 
Cathal Boylan, BEng, CEng, MIEI
CHARTERED ENGINEER

Date: 06th December 2013

Boylan Engineering
Company Reg. 430482
Address: Main St., Mullagh, Kells Co. Meath.
Phone: 046 – 928 6000 / 087 – 820 5470
Fax: 046 – 928 6002
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Web: www.boylanengineering.ie

Rev.	Date	Description

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I SUMMARY

Boylan Engineering (Eng. & Environmental Consultancy) was commissioned by Cavan County Council to carry out Environmental Monitoring at Belturbet Landfill (W0092-01), Rahaghan, Belturbet, Co Cavan for quarter four 2013.

Brona Keating, Environmental Consultant carried out all monitoring. This report shall document the findings.

Table of Contents

- 1.0 Introduction
- 2.0 Methodology
 - 2.1 Landfill Gas Analysis
 - 2.2 Monitoring Locations
 - 2.3 Weather Report
- 3.0 Summary of Results
- 4.0 Discussion
- 5.0 Conclusion

Tables

- 3.0 Landfill Gas 04th Quarter Monitoring

Appendix

- 1.0 Historical Data
- 2.0 Landfill Gas Breakdown
- 3.0 Field Sheets
- 4.0 Calibration Certificate GA 2000
 - Landfill Map

1. INTRODUCTION

Belturbet landfill was operated as a disposal facility by Cavan County Council from 1979 until its closure in February 2002. The facility was operated as a traditional landfill and is located on the Belturbet Ballyconnell road (R200) approximately 4.5 kilometres West of Belturbet town. The site which was originally a limestone quarry comprises some 0.65 hectares. The bedrock surrounding the landfill is Darty Limestone Formation from the Lower Carboniferous period. A waste licence was issued by the EPA on the 13th of February 2002. Some remedial works were carried out after the closure of the site.

Condition 8.1 of the waste licence requires that monitoring be carried out in accordance with Schedule D of the licence. The following report give details of the landfill gas sampling programme conducted on site and also summarises findings and analytical results for quarter four 2013.

The purpose of landfill gas monitoring at closed landfills is to:

- Ensure the facility is compliant with the waste license
- Ensure the facility is not causing environmental pollution
- Ensure the facility is not posing a risk to human health
- Ensure the facility is not creating an unacceptable risk to atmosphere, water, soil, plants or animals
- Ensure that the facility is not causing a nuisance through noise or odors
- Ensure the facility is not adversely affecting the countryside or places of interest
- Compare actual site behavior with expected/modeled behavior
- Assess the effectiveness of gas control measures installed at the site
- Establish a reliable database of information for the landfill throughout its life

Landfill gas is generated by decomposition of organic materials in waste deposited at landfills. Typically, the gas is a mixture of Methane (up to 65% by volume) Carbon Dioxide (up to 35% per volume). It can also contain minor constituents at low concentrations (typically less than 1% volume contains 120-150 trace constituents).

The landfill directive requires that appropriate measures are taken in order to control the accumulation and migration of landfill gas.

2.0 METHODOLOGY

2.1 Landfill Gas Analysis

The following procedure is employed by Brona Keating of Boylan Engineering to ensure accurate monitoring:

- EPA, Landfill Manual, landfill monitoring 2nd Edition is adhered to.
- Prior to sampling, a dip meter is used to measure water levels, if present, in the wells.
- GA 2000 landfill gas analyser is used to measure the gas levels.
- The analyser is purged and connected to the sealed well monitoring nozzle.
- The monitoring nozzle is turned to the open position and the analyser measured the gas levels at 60 second intervals for no less than 10 minutes. The analyser is allowed to run for this period of time to allow for a representative average to be obtained.
- All data is recorded on the Gas Analysis field sheet.
- The instrument is removed after 10 minutes and the monitoring nozzle returned to the closed position.
- The GA2000 is switched off between each monitoring location so as to allow the instrument to purge.
- This process is repeated at each monitoring location.
- Data for the GA 2000 was downloaded in the Boylan Engineering office.

2.3 Monitoring Locations

Quarter 4 2013					
Monitoring Well	Sample Type	Cover Level M (OD Malin Head)	Water Level M (OD Malin Head)	Water Depth M (Top of Casing)	National Grid Co-Ordinates
MW1	GW	TBC	-	TBC	TBC
MW5	Gas & Leachate	TBC	-	TBC	TBC
MW6	Gas & Leachate	TBC	-	TBC	TBC
MW7	Gas & GW	TBC	-	TBC	TBC
MW 9	Gas & GW	TBC	-	TBC	TBC
Killynaher Lake	SW	TBC	-	TBC	TBC

2.4 Weather Report

REPORTS FROM BALLYHAISE (A)							
Date	Rainfall	Max	Min	Grass Min Temp	Mean Wind Speed (knots)	Gusts	Sunshine
	(mm)	Temp	Temp	(°C)		(if >= 34 knots)	(hours)
		(°C)	(°C)				
06/12/2013	0.8	8.7	3.4	1.7	6.6		

3.0 SUMMARY OF RESULTS

Table 1.0 04th Quarter Landfill Gas monitoring 2013

Method		GA 2000	GA 2000	GA 2000	GA 2000	GA 2000
Parameter		CH ₄	CO ₂	O ₂	H ₂ S	Barometric Pressure
Units		% v/v	% v/v	%	PPM	mb
Date Testing		06/12/2013				
GA 2000 Ref	Client Ref					
1	MW 5	0	4.55	18.41	0	1023
3	MW 6	11.5	17.27	0.309	0	1023
2	MW9	0.1	3.3	17.08	0	1023
	Limit	1	1.5			
Exceedance, outside waste mass						
NOTES						
1	Instrument Serial No: GA 07721					
2	Limit: Schedule C2, Licence					

4.0 DISCUSSION

4.4 Landfill Gas

The rate of gas generation at a landfill site varies through the life of a landfill and is dependent on several factors such as waste type, depths, moisture content, degree of compaction, landfill pH, temperature and the length of time since the waste was deposited. Landfill gas can move in any direction within the waste body and migrate from a site. The potential for gas migration will depend on the gas quality, volume, the site engineering works, geological characteristics of the surrounding strata and on man-made pathways such as sewers and drains.

Results obtained from monitoring during quarter four, 2013 show elevated readings for Methane and Carbon Dioxide at well MW 6. However this well is located within the waste mass and elevated levels of these gases are not uncommon. This result is relatively consistent with previous readings. Although it is preferable that the results are within the limits stipulated within the licence, it is worth while noting that they have not increased since previous monitoring events.

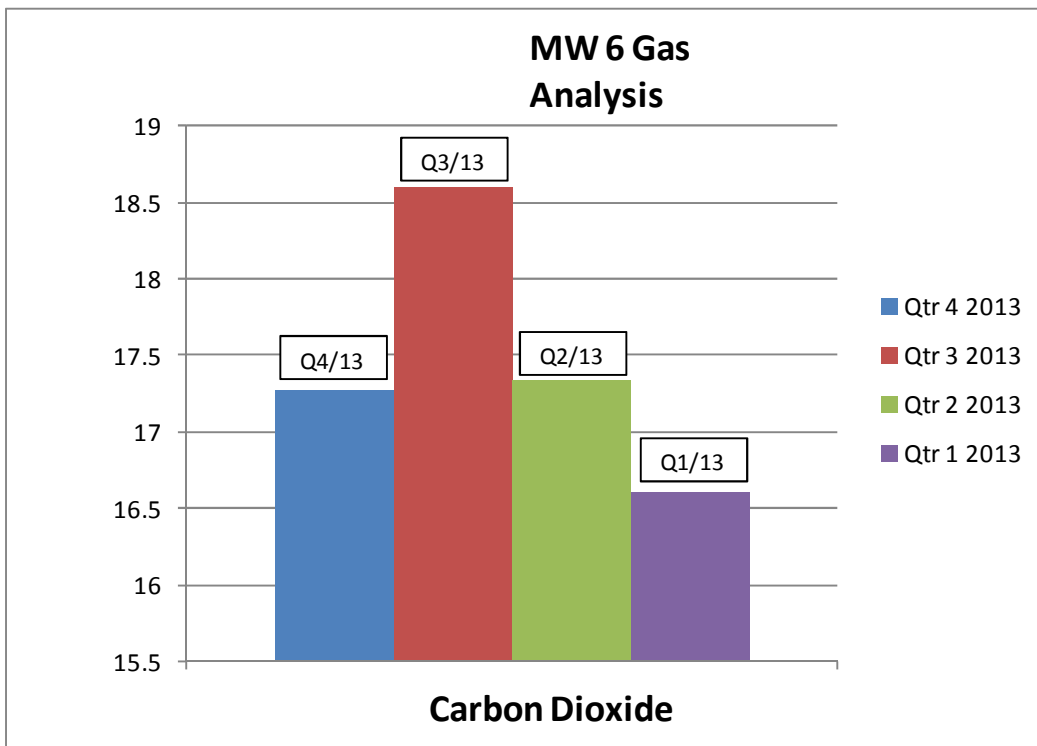
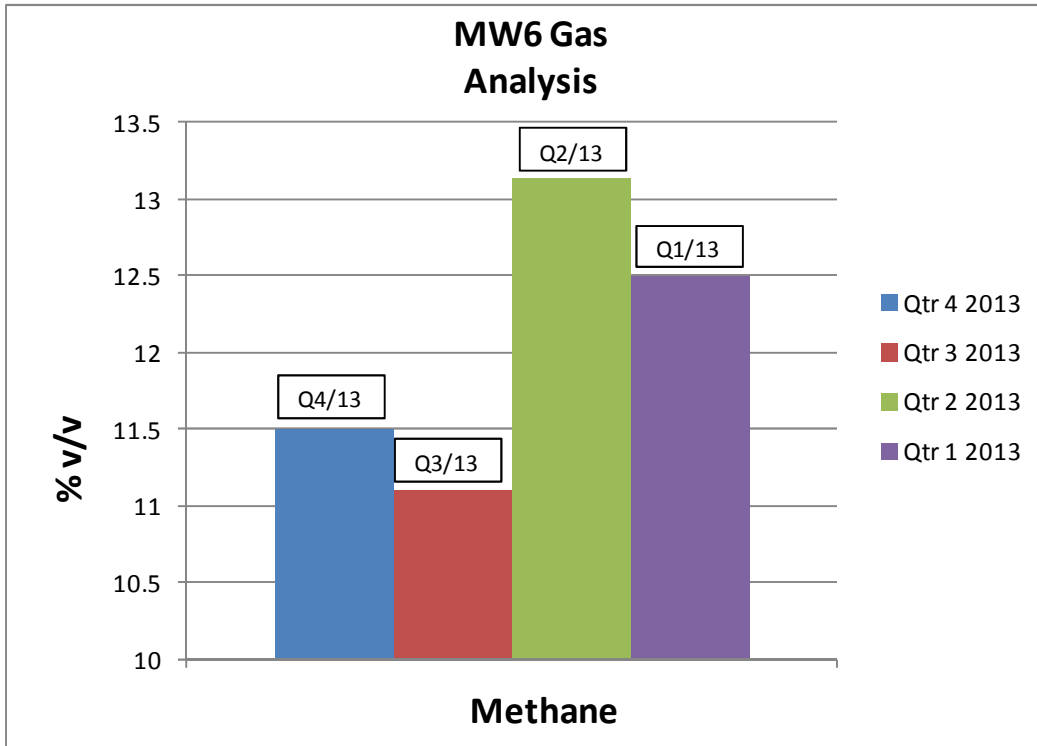
5.0 CONCLUSION

The results obtained from landfill gas analysis are also relatively consistent with previous monitoring events and do not show any signs of dramatic exceedances; therefore there is no evidence of any major negative environmental impact associated with this landfill. However, it is important to monitor the trend in exceedance of Methane at this landfill and any dramatic increase in the parameter should be regarded as critical. The Methane content of landfill gas is flammable, forming potentially explosive mixtures in certain conditions, which raises concern about its uncontrolled migration and release. The next environmental and landfill gas monitoring will be conducted in the first quarter of 2014.

APPENDIX 1- Historical Data- Tables

Method		GA 2000	GA 2000	GA 2000	GA 2000	GA 2000
Parameter		CH ₄	CO ₂	O ₂	H ₂ S	Barometric Pressure
Units		% v/v	% v/v	%	PPM	mb
Date Testing		06/12/2013				
GA 2000 Ref	Client Ref					
1	MW 5	0	4.55	18.41	0	1023
3	MW 6	11.5	17.27	0.309	0	1023
2	MW9	0.1	3.3	17.08	0	1023
	Limit	1	1.5			
Exceedance, outside waste mass						
NOTES						
1	Instrument Serial No: GA 07721					
2	Limit: Schedule C2, Licence					

HISTORICAL RESULTS- Graphs



APPENDIX 2- LANDFILL GAS BREAKDOWN

MW 5

06/12/2013 11:43	0	4.7	18.3	0	1023
06/12/2013 11:44	0	4.7	18.3	0	1023
06/12/2013 11:45	0	4.7	18.3	0	1023
06/12/2013 11:46	0	4.6	18.3	0	1023
06/12/2013 11:47	0	4.6	18.3	0	1023
06/12/2013 11:48	0	4.5	18.3	0	1023
06/12/2013 11:49	0	4.5	18.6	0	1023
06/12/2013 11:50	0	4.5	18.6	0	1023
06/12/2013 11:51	0	4.5	18.6	0	1023
06/12/2013 11:52	0	4.4	18.5	0	1023
06/12/2013 11:53	0	4.4	18.5	0	1023

MW 6

06/12/2013 12:26	11.6	17.3	3.4	0	1023
06/12/2013 12:27	11.7	17.4	0	0	1023
06/12/2013 12:28	11.5	17.3	0	0	1023
06/12/2013 12:29	11.7	17.4	0	0	1023
06/12/2013 12:30	11.4	17.3	0	0	1023
06/12/2013 12:31	11.5	17.3	0	0	1023
06/12/2013 12:32	11.4	17.2	0	0	1023
06/12/2013 12:33	11.7	17.2	0	0	1023
06/12/2013 12:34	11.5	17.2	0	0	1023
06/12/2013 12:35	11.5	17.2	0	0	1023
06/12/2013 12:36	11.6	17.2	0	0	1023

MW 9

06/12/2013 12:13	0.1	3.3	17.9	0	1023
06/12/2013 12:14	0.1	3.3	17.1	0	1023
06/12/2013 12:15	0.1	3.3	17	0	1023
06/12/2013 12:16	0.1	3.3	17	0	1023
06/12/2013 12:17	0.1	3.3	17	0	1023
06/12/2013 12:18	0.1	3.3	17	0	1023
06/12/2013 12:19	0.1	3.3	17	0	1023
06/12/2013 12:20	0.1	3.3	17	0	1023
06/12/2013 12:21	0.1	3.3	17	0	1023
06/12/2013 12:22	0.1	3.3	17	0	1023
06/12/2013 12:23	0.1	3.3	16.9	0	1023

APPENDIX 3 – FIELD SHEETS

Landfill Gas Monitoring Form	
Facility Name: <i>bellbisset</i> Waste License No: Licensee: <i>Cavan ce</i>	Facility Address: <i>bellbisset</i>
Date of Licensing:	Date of sampling: <i>06/12/13</i>
Instrument Used: <i>GA2000</i>	Date next full calibration: <i>2014</i> Last field calibration: (inc date & gases)
Monitoring Personnel: <i>Brian Kearney</i>	Weather: <i>Dry</i>

Results									
Station Number	Time	GA2000 ID	CH ₄	CO ₂	O ₂	CO	H ₂ S	Barometric Pressure (mbar)	Comments
<i>MWS</i>	<i>11:13</i>	<i>1</i>	<i>0</i>	<i>4.7</i>	<i>18.3</i>	<i>/</i>	<i>0</i>	<i>1023</i>	
<i>MW9</i>	<i>12:13</i>	<i>2</i>	<i>0.1</i>	<i>3.3</i>	<i>17.9</i>	<i>/</i>	<i>0</i>	<i>1023</i>	
<i>MW1</i>	<i>12:26</i>	<i>3</i>	<i>11.6</i>	<i>17.3</i>	<i>3.4</i>	<i>/</i>	<i>0</i>	<i>1023</i>	

General Comments:

APPENDIX 4 – CALIBRATION CERTIFICATE-GA2000

CALIBRATION CERTIFICATE

MAKE: Geotechnical Instruments CERT NO: 10915
 MODEL: GA2000
 SERIAL No: 7841
 CUSTOMER: CSL

CALIBRATION DATE: 9/7/13
 NEXT CALIBRATION DUE: Jan 14

Calibration Method

Test gases of known concentrations are directed past the instrument sensors.
 Instrument allowed to stabilise and readings taken.

TEST RESULTS

<u>GAS/CONCENTRATION</u>	<u>INITIAL READING</u>	<u>FINAL READING</u>
60.0% Vol. Methane	58.1	60.1
40.0% Vol. Carbon Dioxide	38.4	40.0
20.9% Vol. Oxygen	21.1	20.9
5.0% Vol. Oxygen	4.5	4.5
0.0% Vol. Oxygen	0.0	0.0
200 ppm Carbon Monoxide	207	203
25 ppm Hydrogen Sulphide	28	25

TEST GAS ANALYSIS CERTIFICATION

<u>Gas</u>	<u>Lot No.</u>	<u>Cylinder No.</u>	<u>Exp.Date</u>	<u>Supplier</u>
CH4/CO2 mix	S25099	2	May-15	Stg
O2	850293	20	Feb-14	Calgaz
H2S	1393098	109	Oct-14	Calgaz
CO	1377075	12	Oct-15	Calgaz

Instrument Passed as fit for Service

Tested By:



APPENDIX D

Declaration



Cavan County Council

Comhairle Chontae an Chabháin

Teach Na Cúirte, An Cabháin
Courthouse, Cavan



CHAMBERS IRELAND
COUNTY/CITY COUNCIL
OF THE YEAR 2011



Declaration

Belturbet Landfill WL0092/1

Cavan County Council hereby certifies that the content of the full pdf, AER W0092-012013AER.pdf uploaded to the EPA website is a true copy of the original AER.

Signed Sinead Fox Dated 10/2/14

Sinead Fox
Waste Management
Cavan County Council