COMHAIRLE CHONDAE AN CABHÁIN

Cavan County Council

Annual Environmental Report

2016

Ballyjamesduff Landfill WL0093-1

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

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1.0 INTRODUCTION

Ballyjamesduff Landfill has been operated as waste disposal facility by Cavan County Council since the late 1960s. It is located off the Derrylurgan road, approximately 600m north of Ballyjamesduff town on the eastern side of the Derrylurgan road. The site is predominantly bog and comprises some 1.62 hectares. The site was operated as a traditional landfill constructed on peat and relies on the properties of the peat bog for attenuation, dilution and dispersal.

A Waste Licence for the facility was issued by the EPA on 7th March 2002, Ref WL 93-1. Condition 11.4 of Waste Licence Ref. 93-1 requires the submission of an Annual Environmental Report (AER) for Ballyjamesduff Landfill facility. This document is produced in order to comply with requirements of Condition 11.4. The reporting period for the purposes of this AER is 1st January 2015 to 31st December 2015.

The site at Ballyjamesduff was closed in early March 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 2016 to 31st December 2016.

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 the full scope of sampling as required by the Licence.

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5.1 Surface Water

As detailed by table 5.1, there were slight exceedances in the surface water analysis for parameters COD, Ammonia and BOD. Sample SW1 is located upstream of the landfill while SW2 is located downstream. All monitoring locations are detailed in the site map which is presented in Appendix B.

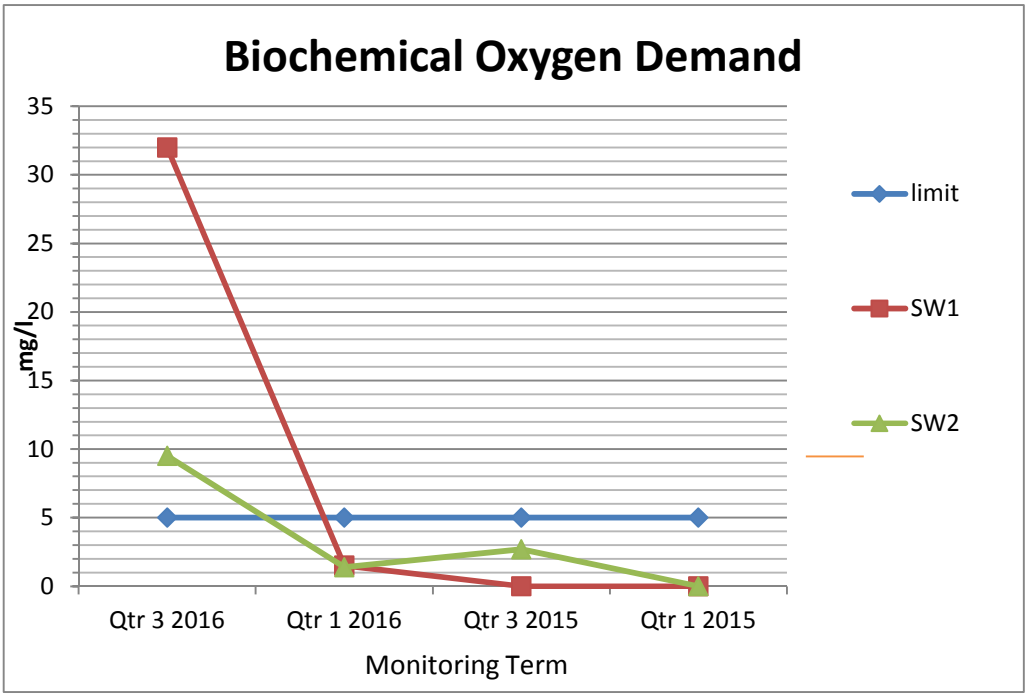
All parameters have been assessed against water limits as outlined in the European Communities (Drinking Water) (No.2) Regulations 2007. Results in Bold Italics indicate where the interim guide value has been exceeded.

Table 5.1 Surface water summary results

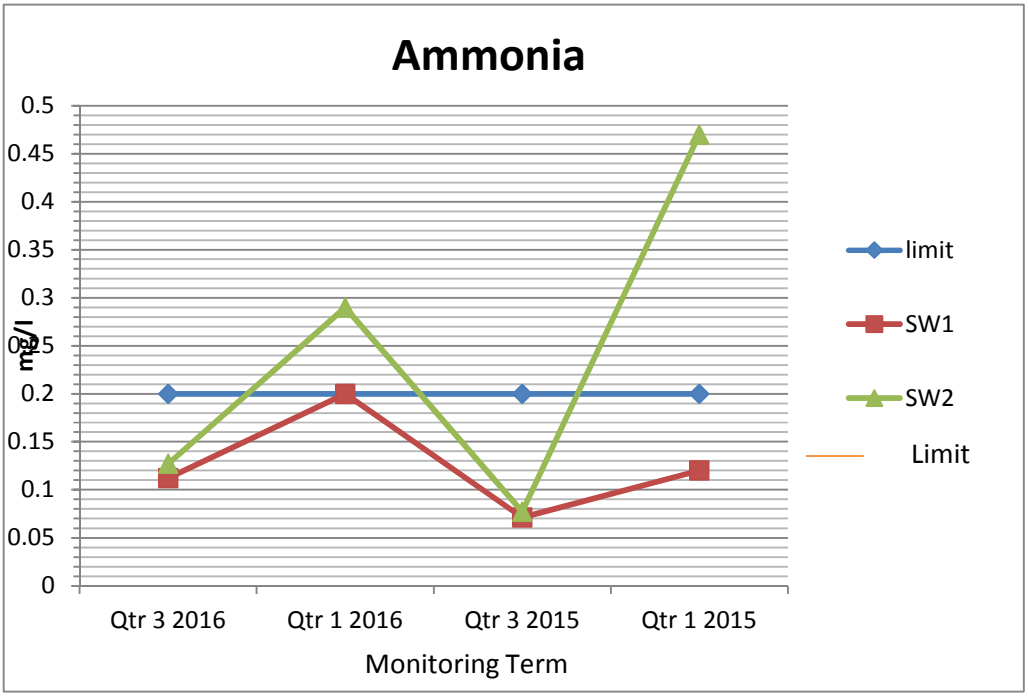
	Surface Water Historical Results								
	Parameter	Ammonia	pH	Cond	BOD	COD	Total Suspended Solids	Cl	DO
	Units	mg/l N	pH Units	us/cm	mg/l	mg/l	mg/l	mg/l	mg/l
SW1	Second biannual 2016	0.112	7	239	***32***	***61***	138	12	<1
	First biannual 2016	0.2	7.5	191	1.5	19	9	12	10
	Second biannual 2015	0.071	7.5	304	<1	19	<5	15	9
	First biannual 2015	0.12	7.4	180	<1	31	<5	12.5	10
SW2	Second biannual 2016	0.127	7.1	244	***9.5***	***52***	26	13	<1
	First biannual 2016	**0.29**	7.6	198	1.4	21	13	12	10
	Second biannual 2015	0.077	7.3	300	2.7	21	34	16	8
	First biannual 2015	***0.47***	7.2	199	<1	34	7	13	10
Discharge Cap	Second biannual 2016	***0.353***	7.1	540	<2	19	11	3.5	7
	First biannual 2016	***1.2***	7.5	191	<1	19	<5	7.6	6
	Second biannual 2015	***7.9***	7.3	708	<2.6	19	8	20	4
	First biannual 2015	0.18	7.4	363	-	-	-	11.5	10
S.I No. 294/1989 A1		0.2	≥5.5 and ≤8.5	1000	5		50	250	>60%

A comprehensive report of all results obtained in 2016 is presented in Appendix C.

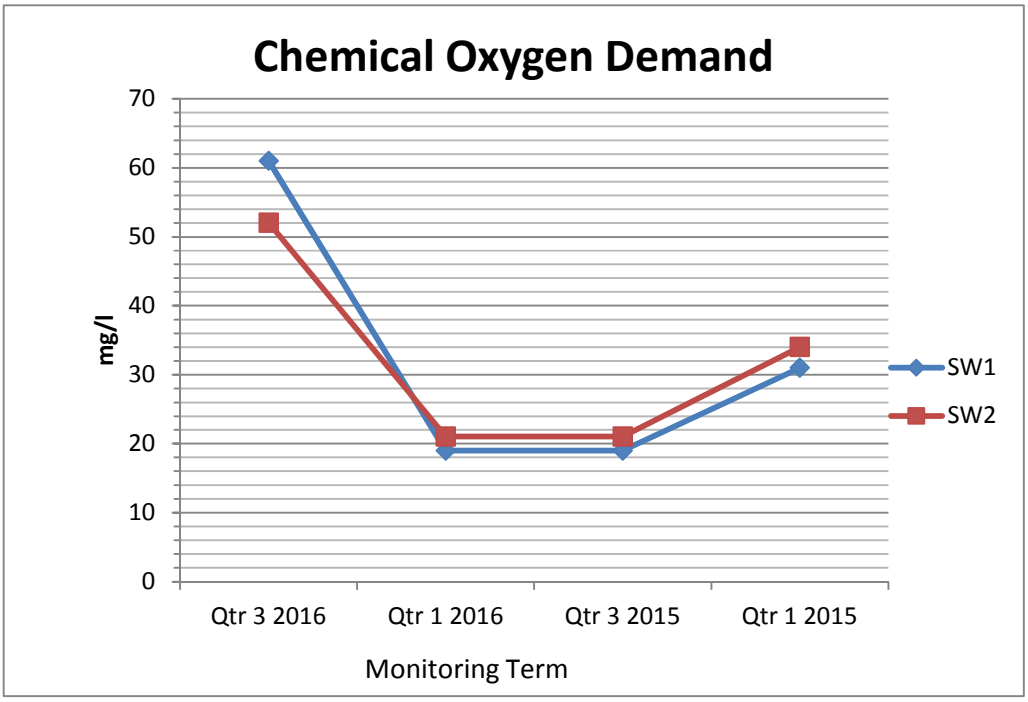
Graph 5.1



Graph 5.2



Graph 5.3



All surface water locations were found to be within limits specified in the above regulations with the exception of BOD, COD and Ammonia. Elevations from these parameters cannot be definitively associated to the landfill due to the presence of increased decaying organic matter in the form of decaying vegetation due to the winter season.

5.2 Groundwater

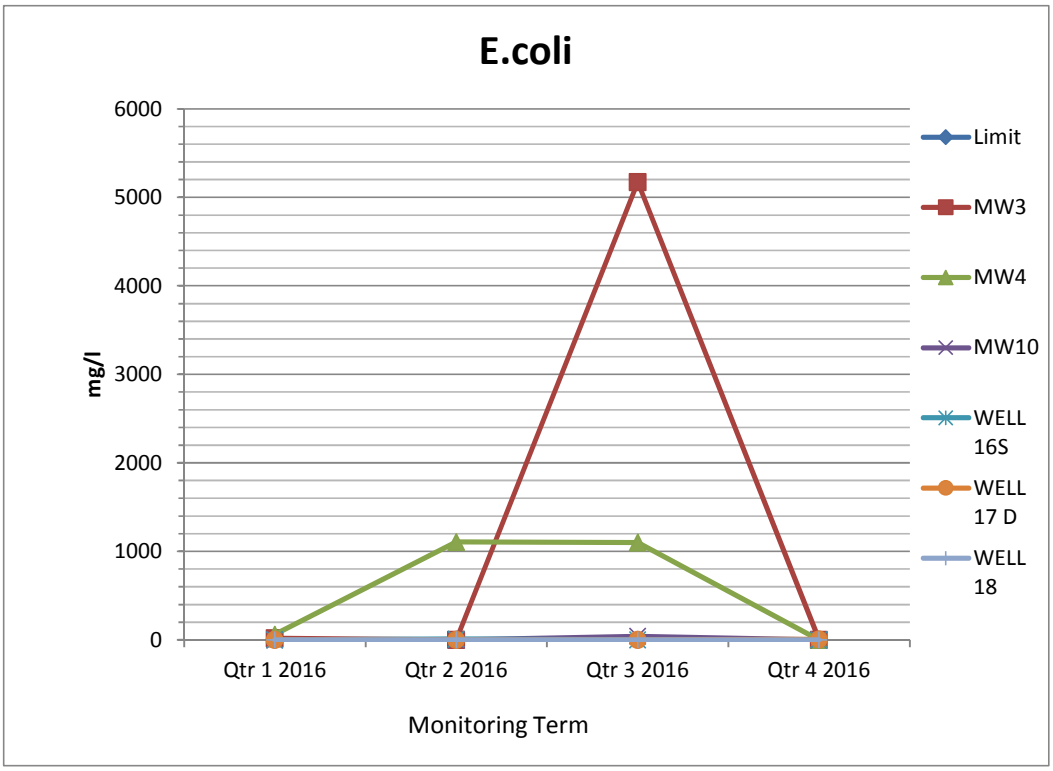
The following table details all reoccurring exceedances at all groundwater wells during 2016. Results in Hatched Red indicate where the interim guide value has been exceeded when compared to limits stipulated by the Environmental Protection Agency.

Table 5.2 Groundwater Summary Results

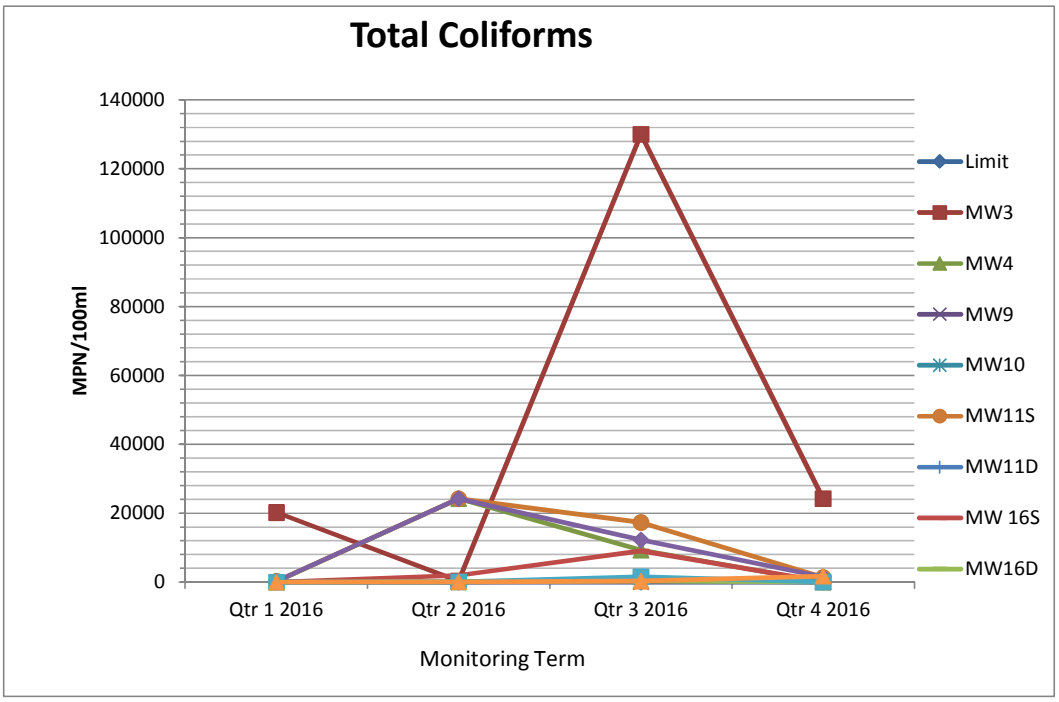
	Parameter	TOC	E.Coli	Ammonia	TON	Tot Coliforms	pH	Cond	Cl	DO	Total Phenols	Fe	K	Na
	Units	mg/l	MPN/ 100ml	mg/l N	mg/l N	MPN/ 100ml	pH Units	us/cm	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l
MW3	Qtr 4 2016	3.21	<10	***9.4***	<0.138	***24197***	7.3	667	15	<1	<0.1	***8900***	5.2	18.9
	Qtr 3 2016	32.89	***5172***	***29***	<0.138	***129970***	7	858	22	<1	<0.1	***23000***	***10.2***	22.5
	Qtr 2 2016	16.59	0	***21***	<0.138	***290***	7.3	774	24	<1	<0.1	***32000***	***11.4***	29.6
	Qtr 1 2016	15.18	***20***	***0.15***	<0.138	***20224***	7.3	674	21	<1	<0.1	***21000***	***8.6***	27.4
	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	mg/l
MW4	Qtr 4 2016	-	-	-	-	-	-	-	-	-	-	-	-	-
	Qtr 3 2016	19	***1100***	***0.59***	0.18	***9340***	7.1	291	9.6	4	<0.1	***870***	4.1	10.5
	Qtr 2 2016	18.62	***1106***	***2***	<0.138	***24197***	6.9	381	18	6	<0.10	***1400***	***6.5***	12
	Qtr 1 2016	14.67	***60***	***0.71***	<0.138	***130***	7	463	28	1	<0.1	***1500***	***5.4***	13.2
	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	mg/l
MW9	Qtr 4 2016	35.01	0	***23***	4.742	***20***	7	***1072***	***34***	4	<0.1	***5700***	***13.6***	43.6
	Qtr 3 2016	-	-	-	-	-	-	-	-	-	-	-	-	-
	Qtr 2 2016	26.56	<10	***42***	0.202	***<10***	7.4	***1247***	***60***	7	<0.10	***24000***	***28.6***	49.5
	Qtr 1 2016	-	-	-	-	-	-	-	-	-	-	-	-	-
	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	mg/l
MW10	Qtr 4 2016	15.61	<10	***42***	<0.138	***52***	6.8	***1292***	***72***	<1	<0.1	***38000***	***22.9***	43.7
	Qtr 3 2016	30.25	***40***	***47***	<0.138	***482***	6.8	***1374***	***84***	<1	<0.1	***27000***	**21.6**	45.2
	Qtr 2 2016	43.02	0	***34***	<0.138	0	7.1	***1083***	***57***	<1	<0.1	***37000***	***21***	38.9
	Qtr 1 2016	40.53	0	***38***	<0.138	0	6.8	***1129***	***61***	1	<0.1	***38000***	***21.9***	41.3
	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	mg/l
MW11S	Qtr 4 2016	2.13	<10	***0.55***	0.876	***1360***	7.1	***1243***	***290***	3	<0.1	<20	1.3	40.4
	Qtr 3 2016	29.1	0	***0.17***	0.981	***17329***	7.1	***1252***	***290***	5	<0.1	<20	1.4	42.8
	Qtr 2 2016	3.47	0	0.11	1.17	***24196***	7.3	***1284***	***290***	3	<0.1	***74***	1.7	52.3
	Qtr 1 2016	1.66	0	0.042	1.027	***247***	7.2	***1207***	***300***	4	<0.1	<20	1.4	51.4
	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	mg/l
MW11D	Qtr 4 2016	0.62	0	0.045	<0.138	***5***	7.5	407	8.2	6	<0.1	<20	1.2	17.1
	Qtr 3 2016	3.06	0	0.038	<0.138	***365***	7.6	410	9.2	4	<0.1	<20	1.2	18.4
	Qtr 2 2016	0.52	0	0.029	<0.138	0	7.6	410	10	5	<0.1	<20	1.5	23
	Qtr 1 2016	8.05	0	0.046	<0.138	***48***	7.7	397	7.5	6	<0.1	<20	1.2	21.8
	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	mg/l
MW16S	Qtr 4 2016	3.23	<10	***0.19***	0.182	***173***	7.6	494	20	8	<0.1	<20	2.7	22.1
	Qtr 3 2016	12.51	0	***0.19***	0.157	***9100***	7.5	476	20	5	<1.7	<20	2.6	18.1
	Qtr 2 2016	1.06	***10***	***0.16***	<0.138	***1989***	7.5	470	19	4	<0.10	<20	3.6	20.8
	Qtr 1 2016	2.48	0	0.07	<0.138	***1***	7.6	456	18	4	<0.1	***58***	1.4	21.3
	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	mg/l
MW16D	Qtr 42016	3.12	0	0.11	<0.138	***16***	7.5	489	20	6	<0.1	25	1.2	15.5
	Qtr 3 2016	0.88	0	0.066	<0.138	***299***	7.6	496	21	7	<0.1	***21***	1.3	17.3
	Qtr 2 2016	0.35	0	0.073	<0.138	***120***	7.4	492	22	5	<0.1	***93***	1.6	22.6
	Qtr 1 2016	2.63	0	0.074	<0.138	***1***	7.6	483	21	6	<0.1	***65***	1.5	22.1
	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	mg/l
MW17S	Qtr 4 2016	5.32	<10	***8***	<0.138	***1500***	6.9	488	14	2	<0.1	***6400***	2	20.4
	Qtr 3 2016	29.73	0	***6.1***	<0.138	***12230***	7	480	16	4	<0.1	***5900***	1.7	19.5
	Qtr 2 2016	7.82	0	***6.3***	<0.138	***24196***	6.9	485	15	<1	<0.1	***9600***	2.2	26.3
	Qtr 1 2016	6.35	0	***8.3***	<0.138	***260***	7	474	15	2	<0.1	***12000***	2.1	25
	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	mg/l
MW17D	Qtr 4 2016	0.28	***5***	***0.32***	<0.138	***47***	7.5	521	16	4	0.06	***270***	1.6	20.4
	Qtr 3 2016	1.61	0	***0.34***	<0.138	***1553***	7.5	470	15	5	<0.1	***300***	1.8	24.2
	Qtr 2 2016	12.22	0	***0.3***	<0.138	***80***	7.5	493	18	6	<0.1	***380***	2.1	28.6
	Qtr 1 2016	1.5	0	***0.32***	<0.138	***8***	7.6	483	15	8	<0.1	***330***	2	29
	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	mg/l
MW18	Qtr 4 2016	0.31	***1***	0.064	<0.138	***1733***	7.5	485	14	6	<0.1	150	1.4	17.9
	Qtr 3 2016	0.78	0	0.034	<0.138	***276***	7.5	476	15	6	<0.1	***150***	1.9	25
	Qtr 2 2016	0.41	0	0.041	<0.138	***101***	7.4	485	15	6	<0.1	***300***	2.3	29.5
	Qtr 1 2016	5.19	0	0.099	<0.138	***20***	7.6	472	14	4	<0.1	***250***	2.1	30.3
IGV		NAC	0	0.15	NAC	0	≥6.5 &≤9.5	1000	30	NAC	0.0005	0.200	5	150

The following graphs detail all groundwater exceedances.

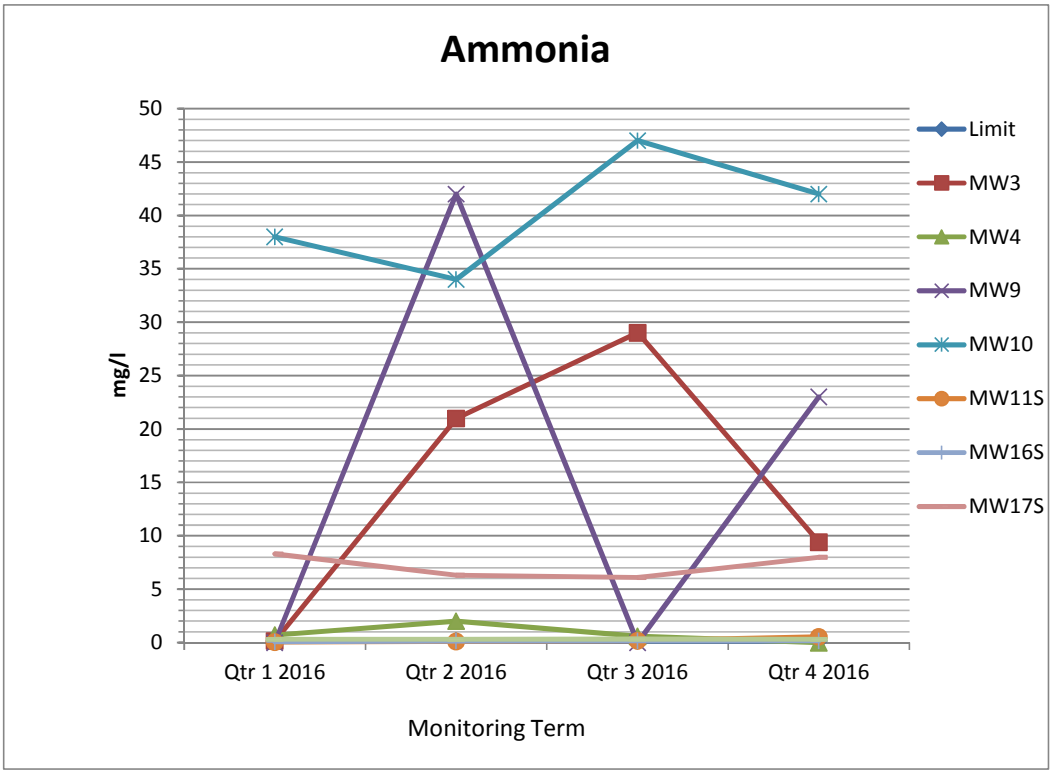
Graph 5.4



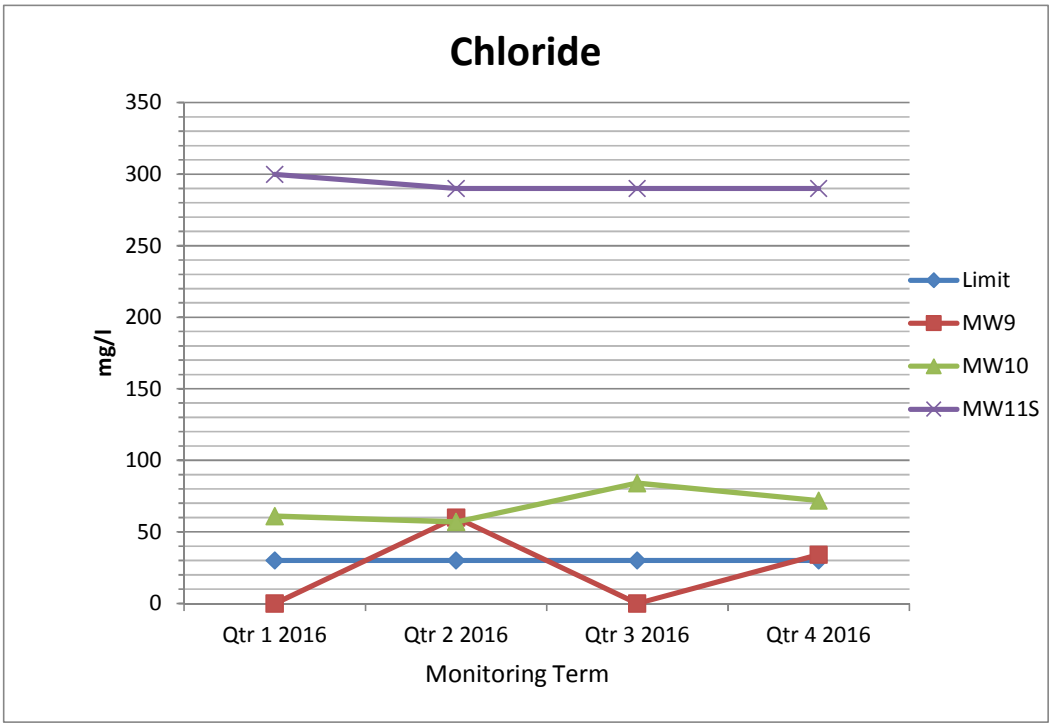
Graph 5.5



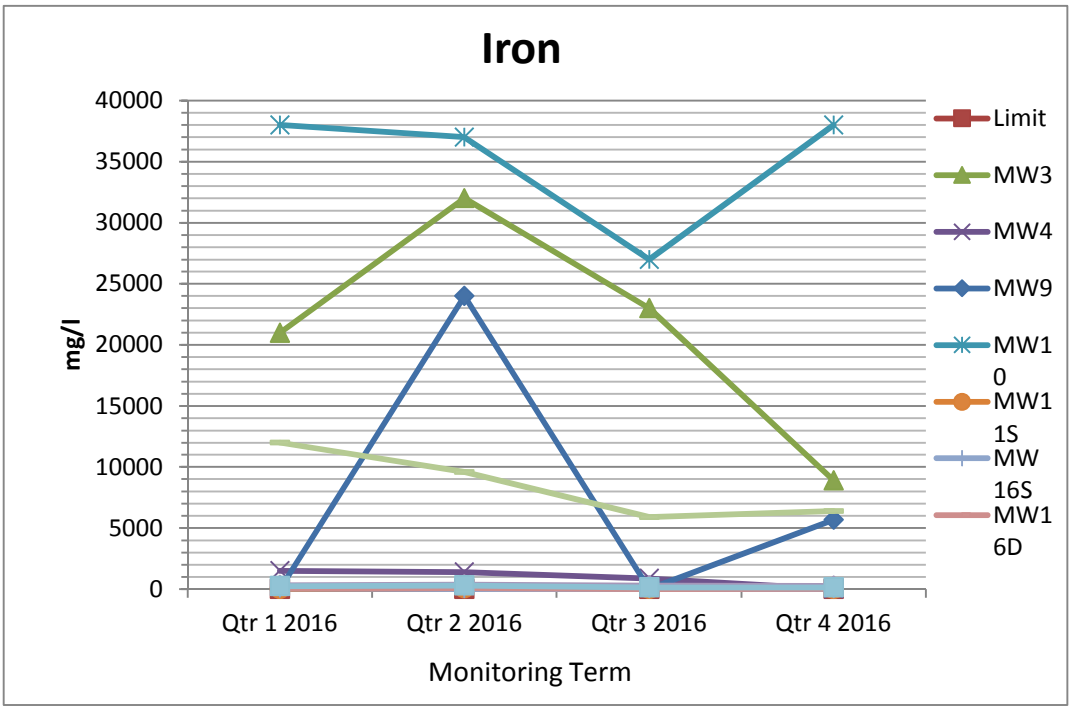
Graph 5.6



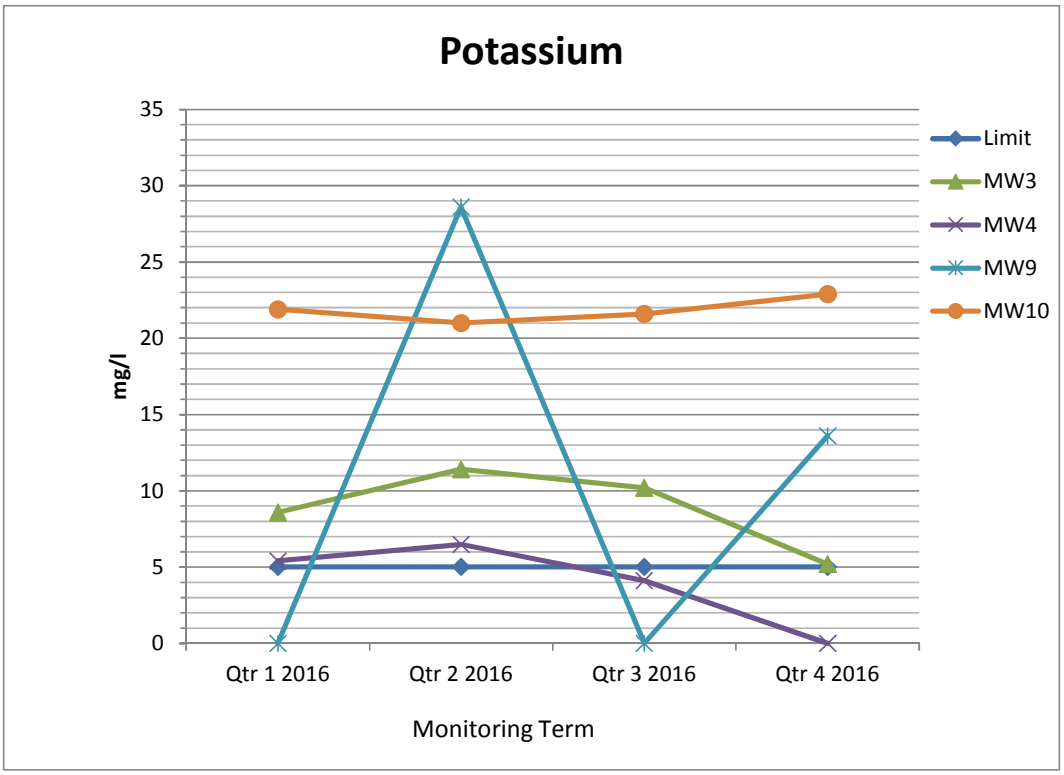
Graph 5.7



Graph 5.8



Graph 5.9



As detailed in the above graphs, there were numerous ground water exceedances at this landfill during 2016.

Exceedances occurred in the following parameters:

- ***Escherichia coli:*** Elevated levels of this parameter were found in samples MW3, MW4, MW10, MW16S, 17D and MW18. It is not uncommon for wells in the vicinity of a landfill to be contaminated with *E. coli.* It is also attributed to influx of contamination from other sources such as septic tanks, slurry spreading and animal faecal contaminations. It should be noted that there were numerous horses present on the landfill for the most part of 2016 and as such the E.Coli contamination cannot be solely attributed to the landfill itself.
- **Ammonia:** Elevated levels of this parameter were prevalent during 2016. Elevated levels of ammonia are strongly associated with pollution from waste water treatment systems and so contamination of these wells by the landfill cannot be definitively concluded.
- **Total Coliforms:** elevated levels of this parameter can be attributed to contamination from organic matter; therefore exceedances in this parameter may not be directly linked to the landfill.
- **Iron:** Although increased iron levels can be attributed to contamination from landfills, it is also strongly associated with the native soils of the Cavan area and therefore cannot be directly linked to the landfill.
- **Chloride:** Historical results obtained from this parameter show frequent elevations when compared to the Interim Guide Values for Ground Water. However, contamination of well 11S from the landfill is impossible due to MW11S being located up gradient of the landfill itself. Therefore an alternative source of chloride contamination should be investigated in this instance.
- **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

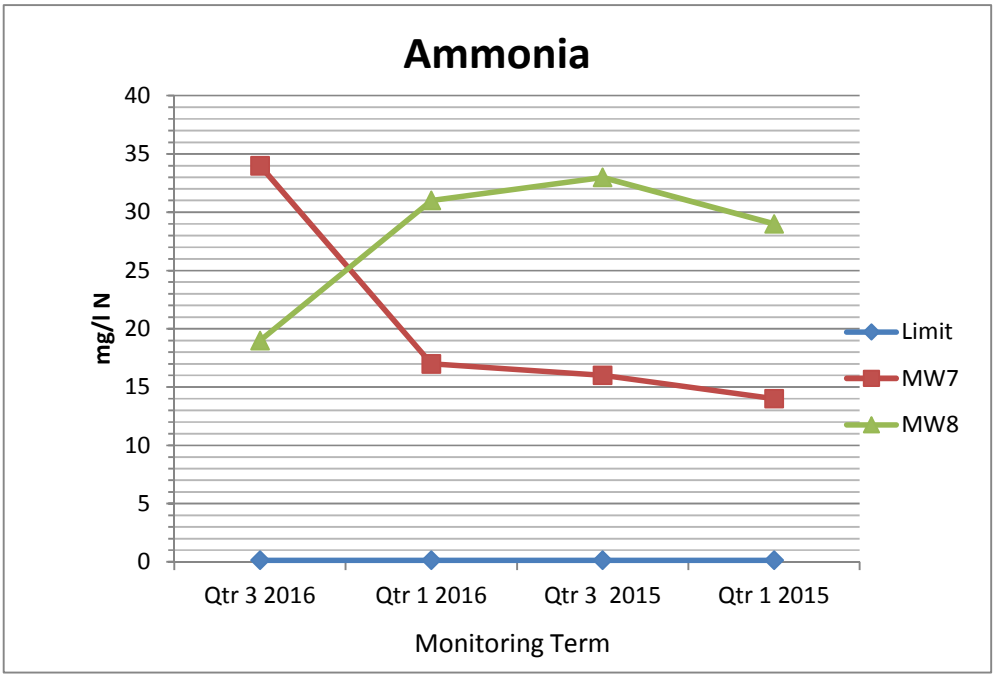
Leachate monitoring is carried out biannually in accordance with the licence.

Re-occurring exceedances are displayed below. Results in Italic bold indicate where the interim guide value has been exceeded when compared to limits stipulated by the Environmental Protection Agency.

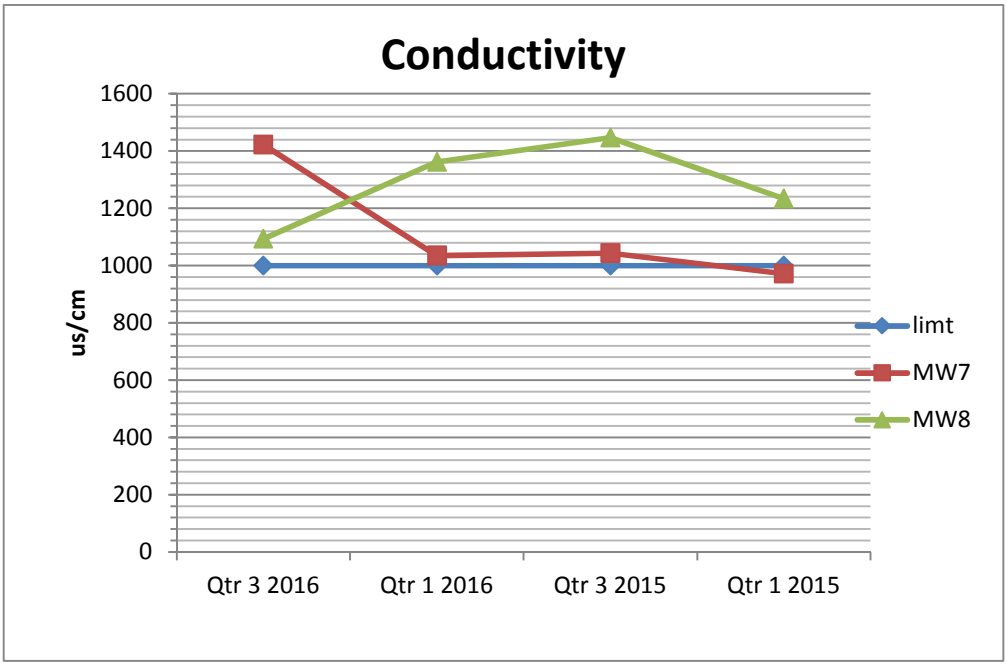
Table 5.3 Leachate Summary Results

		Lechate historical 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
WELL MW 7	Second biannual 2016	***34***	0.83	7.3	***1422***	27	30	43
	First Biannual 2016	***17***	<0.69	7	***1035***	21.9	65	15
	First Biannual 2015	***14***	0.166	8	972			20.7
	Second biannual 2015	***16***	<0.69	6.9	***1044***	<10	69	13
WELL MW 8	Second biannual 2016	***19***	<0.69	6.7	***1094***		30	21
	First Biannual 2016	***31***	<0.69	7.5	***1362***	18.9	46	37
	First Biannual 2015	***29***	1.214	8	***1234***	-	-	33.1
	Second biannual 2015	***33***	1.1	7.4	***1447***	57	89	37
Interim Guide Values		0.15	NAC	≥6.5&≤9.5	1000			200

Graph 6.0



Graph 6.1



As can be seen from the above figures the conductivity reading at this landfill remain steady and are typical of those associated with a mature landfill.

Results obtained for ammonia at these wells are elevated in comparison to Interim Guide Values for groundwater. Although ammonia is associated with leachate, it is also strongly associated with agricultural activities such as manure spreading, an activity which is prevalent in the surrounding area. As such the elevated levels cannot be solely attributed to the landfill at this time.

5.4 Gas Emissions

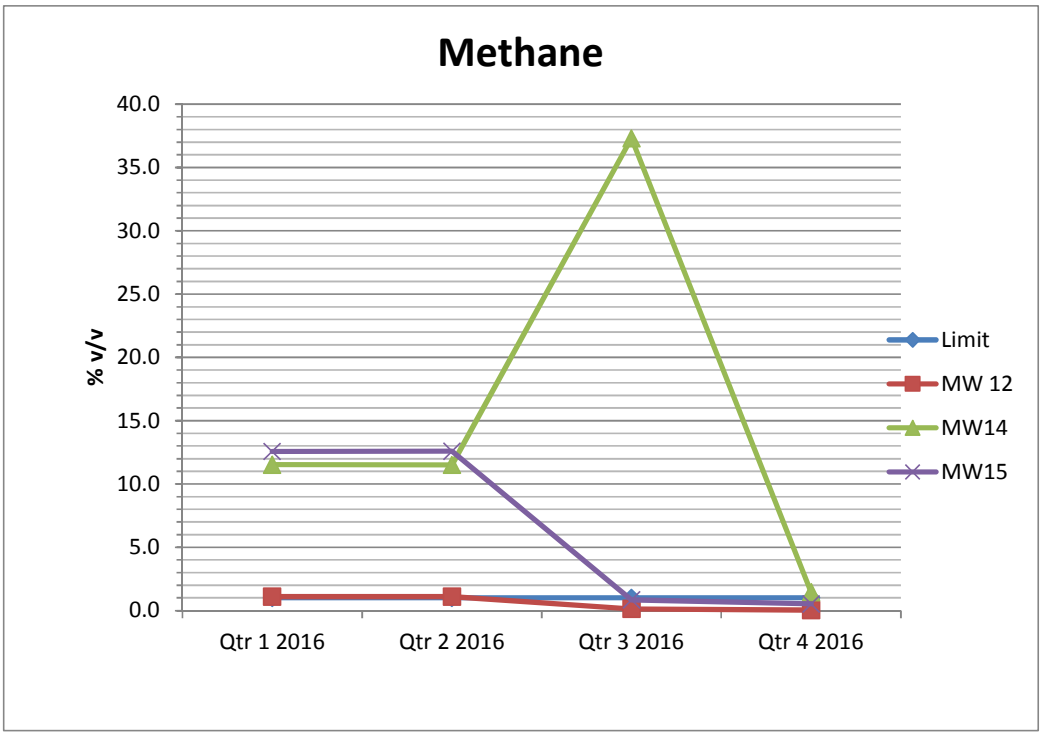
Landfill gas was monitored at seven locations both within and outside the landfill mass. The following table details all results during 2016.

Table 5.4 Gas Emissions Summary Results

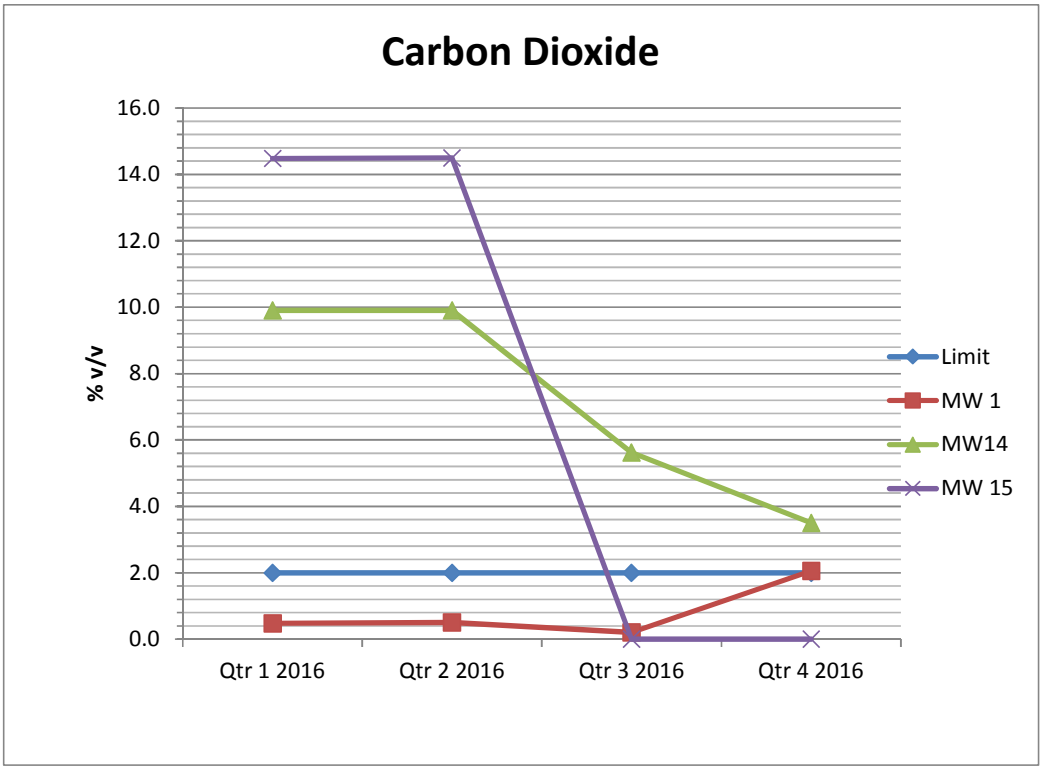
Method		GA 2000	GA 2000	GA 2000	GA 2000	GA 2000
Parameter		CH_4	CO_2	O_2	H_2S	Barometric Pressure
Units		% v/v	% v/v	%	PPM	mb
Client Ref	**Qtr**	-	-	-	-	-
MW 1	Qtr 1 2016	0.1	0.48	20	0	996
	Qtr 2 2016	0.1	0.5	20	0	996
	Qtr 3 2016	0	0.2	20.3	0	996
	Qtr 4 2016	0	**2.06**	20	0	996
MW 2	Qtr 1 2016	0.1	0.4	16.2	0	996
	Qtr 2 2016	0.1	0.4	20.2	0	996
	Qtr 3 2016	0	0.16	21	0	996
	Qtr 4 2016	0	0.2	20	0	996
MW 5	Qtr 1 2016	0.0	0.1	20	0.0	999.0
	Qtr 2 2016	0	0.1	20	0	999
	Qtr 3 2016	0.4	0	20.3	0	999
	Qtr 4 2016	0.1	0	20.28	0	999
MW 12	Qtr 1 2016	***1.1***	1.2	20.42	0	994
	Qtr 2 2016	***1.1***	1.2	20.3	0	994
	Qtr 3 2016	0.1	0.1	20.4	0	997.0
	Qtr 4 2016	0.0	0.8	19.9	0	997.0
MW 13	Qtr 1 2016	0.1	0.1	18.375	0	996
	Qtr 2 2016	0.1	0.1	20.3	0	996
	Qtr 3 2016	0	0.3	20.34	0	996
	Qtr 4 2016	0	0.4	21.5	0	996
MW 14	Qtr 1 2016	***11.54***	***9.9***	14.56	0	995
	Qtr 2 2016	***11.5***	***9.9***	13.3	0	995
	Qtr 3 2016	***37.3***	***5.62***	13.06	0	995
	Qtr 4 2016	***1.46***	***3.5***	18.3	0	995
MW 15	Qtr 1 2016	***12.58***	***14.48***	7.7	0	994
	Qtr 2 2016	***12.6***	***14.5***	9.6	0	994
	Qtr 3 2016	0.86	0	20.12	0	994
	Qtr 4 2016	0.52	0	18.14	0	994
	Limit	**1**	**2**			
Exceedance of waste						

NOTES	
1	Instrument Serial No: GA 07721
2	Limit: Schedule C2, Licence

Graph 6.2



Graph 6.3



Gas Monitoring on the site reveals typical low levels of Methane & Carbon Dioxide and higher levels of Oxygen. There were no exceedances in licence limits for wells located outside the waste mass. The results are typical of a closed landfill.

6.0 SUMMARY OF RESULTS AND INTERPRETATION OF ENVIRONMENTAL MONITORING

As reported in section 4 there were a number of elevations recorded in 2016. It should also be noted that there are no limits specified by the waste licence and so results are compared only to indicator limits from sources such as the Interim Guide Values for Ground water and the Environmental Quality Standards for Surface waters. Included in Appendix C is a copy of the quarter 4 monitoring results as reported by Monitoring Company Boylan Engineering. We are satisfied that we are carrying out the environmental monitoring as specified in the Waste Licence. We are also satisfied that there are no major environmental impacts associated with this facility. We will continue to monitor and report as per the licence requirement.

7.0 RESOURCE &ENERGY CONSUMPTION SUMMARY

As there is in-sufficient gas produced to run a gas flare or engine there is no use for the gas resource on site. There is no energy consumed on site.

8.0 REPORT ON RESTORATION OF FACILITY

The site is fully restored and the cap intact. There were horses grazing on the site during 2016.

9.0 ESTIMATED ANNUAL & CUMULATIVE QUANTITIES OF LANDFILL GAS EMITTED FROM THE FAICILITY

This information is reported in the PRTR Report attached in Appendix A. The estimated quantity of Methane released is 28,400kgs/yr. Page one from the Annual Gas Survey is also presented in Appendix A.

10.0 FULL TITLE & WRITTEN SUMMARY OF ANY PROCEDURES DEVELOPED BY THE LICENSEE IN THE YEAR WHICH RELATES TO THE FACILITY OPERATION

There was no change to or development of any procedures undertaken by the licensee or monitoring contractor in 2016.

11.0 REPORTED INCIDENTS AND COMPLAINTS SUMMARY

There were no incidences in the reporting period 2016. There were no complaints received by the EPA or the Local Authority regarding this facility in the reporting period 2016.

12.0 REVIEW OF NUISANCE CONTROLS

As there are no known nuisances associated with this site there are no nuisance controls in place for parameters such as noise or vermin. There is no odour detectable from the site and as these are the main nuisances associated with landfills the licensee has not reviewed the controls. This is backed up by the absence of any complaints regarding the facility. However if any nuisances arise at the facility the licensee will deal with them using appropriate measures and procedures.

13.0 REPORT ON TRAINING OF STAFF

Landfill Operations Managers Regina Burke and 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, carries a Safe Pass and has been trained in Landfill Gas Management.

Table 13.1 Management Structure 2016

Position	Name	Duties
Director of Services, Environment	Ger Finn	Oversee and assign responsibilities to staff regarding landfill
Acting Senior Engineer	Colm O'Callaghan	Oversee general supervision, monitoring and reporting of the site.
Landfill Operations Manager	Regina Burke/Sinead Fox	Responsible for general supervision, monitoring and reporting of the site.

Contact Person for Sanitary Authority for 2016/ 2017:

Colm O'Callaghan
Acting Senior Engineer
Waste Management Section
Cavan County Council
Farnham Street
Cavan

14.0 ANY OTHER ITEMS SPECIFIED BY THE AGENCY

As per the licence we have included in Appendix B a copy of the most recent Map of the site showing all Monitoring locations.

Guidance to completing the PRTR workbook

PRTR Returns Workbook

Version 1.1.19

REFERENCE YEAR	2016

1. FACILITY IDENTIFICATION

Parent Company Name	Cavan County Council
Facility Name	Ballyjamesduff Landfill
PRTR Identification Number	W0093
Licence Number	W0093-01

Classes of Activity

No.	**class_name**
-	Refer to PRTR class activities below

Address 1	Derrylurgan
Address 2	Ballyjamesduff
Address 3	
Address 4	
	Cavan
Country	Ireland
Coordinates of Location	-7.20884 53.8687
River Basin District	IEGBNISH
NACE Code	3821
Main Economic Activity	Treatment and disposal of non-hazardous waste
AER Returns Contact Name	Brona Keating
AER Returns Contact Email Address	b.keating@boylanengineering.ie
AER Returns Contact Position	Environmental Engineer
AER Returns Contact Telephone Number	0469286000
AER Returns Contact Mobile Phone Number	0870984598
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	0
User Feedback/Comments	None to report
Web Address	www.boylanengineering.ie

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# : W0093 | Facility Name : Ballyjamesduff Landfill | Filename : W0093_2016.xls | Return Year : 2016 | 02/02/2017 13:42

SECTION A : SECTOR SPECIFIC PRTR POLLUTANTS

RELEASES TO AIR					Please enter all quantities in this section in KGs			
POLLUTANT		METHOD				QUANTITY		
			Method Used					
No. Annex II	Name	M/C/E	Method Code	Designation or Description	Emission Point 1	T (Total) KG/Year	A (Accidental) KG/Year	F (Fugitive) KG/Year
03	Carbon dioxide (CO2)	C	OTH	GASSIM	0.0	79600.0	0.0	79600.0
01	**Methane (CH4)**	C	OTH	GASSIM	0.0	28400.0	0.0	28400.0

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

SECTION B : REMAINING PRTR POLLUTANTS

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

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

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

RELEASES TO AIR					Please enter all quantities in this section in KGs			
POLLUTANT		METHOD				QUANTITY		
			Method Used					
Pollutant No.	Name	M/C/E	Method Code	Designation or Description	Emission Point 1	T (Total) KG/Year	A (Accidental) KG/Year	F (Fugitive) KG/Year
					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: Ballyjamesduff Landfill

Please enter summary data on the quantities of methane flared and / or utilised	**T (Total) kg/Year**	**M/C/E**	**Method Used**		**Facility Total Capacity m3 per hour**	
			Method Code	**Designation or Description**		
Total estimated methane generation (as per site model)	28400.0	C	OTH		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)	284400.0	C	OTH		N/A	

Environmental Protection Agency

A survey of landfill sites to determine the quantity of methane flared and or recovered in utilisation plants for 2016

Please choose from the drop down menu the license number for your site	W0093
Please choose from the drop down menu the name of the landfill site	Ballyjamesduff Landfill
Please enter the number of flares operational at your site in 2016	0
Please enter the number of engines operational at your site in 2016	0
Total methane flared	0 kg/year
Total methane utilised in engines	0 kg/year

Please note that the closing date for reciept of completed surveys is 31/03/2017

Introduction

The Office of Environmental Sustainability (OES) 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 emission reduction targets under the Effort Sharing Decision (No. 406/2009/EC). 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.

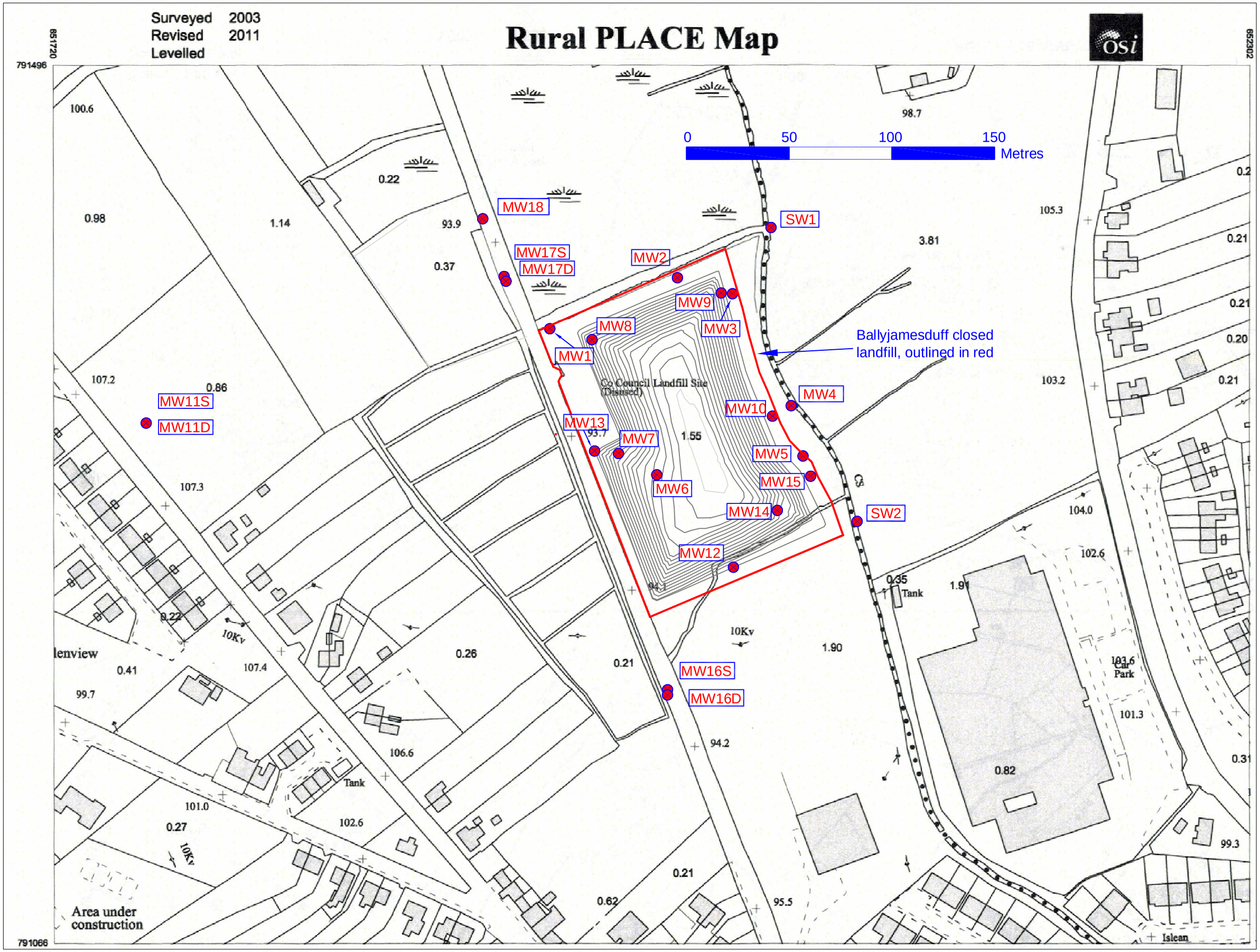
It is on this basis that the Environmental Protection Agency is asking landfill operators to partake in this survey so that the most uptodate information on methane flaring and recovery in utilisation plants at landfills sites is used in calculating the contribution of the landfill sector to national 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_2015) to:
LFGProject@epa.ie

Rural PLACE Map

Surveyed 2003
Revised 2011
Levelled



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

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:
Ballyjamesduff Landfill (WL93-01)

Boylan engineering
Main St., Mullagh, Kells, Co. Meath.
Phone: 046 - 928 6000
Email: info@boylanengineering.ie
Website: www.boylanengineering.ie

Drawn By	Approved by
A. Clarke	B. Keating

Drawing No.	Drawing Name
001	Monitoring Well Locations

Date	Scale	Rev.
06.04.2012	1:2000	000

GAS MONITORING REPORT
FOR BALLYJAMESDUFF LANDFILL
W0093-01
Quarter 3 and 4 2016

Client: **Cavan County Council**

Site Location: **Derrylurgan, Ballyjamesduff**

Report No.: CCC-03-01-06-01-06-Rev 0

Produced by: Terry Keating, B.Sc., Environmental Science

Approved by: _____ **Date:** 23rd November 2016
Bróna Keating, B.Sc., M.Sc., CEnv., MCIWM

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Web: www.boylanengineering.ie

Rev.	Date	Description

I SUMMARY

Boylan Engineering (Eng. & Environmental Consultancy) was commissioned by Cavan County Council to carry out Environmental Monitoring at Ballyjamesduff Landfill (W0093-01), Derrylurgan, Ballyjamesduff, Co Cavan for quarter three and four 2016.

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

Table of Contents

1. 0 INTRODUCTION

Ballyjamesduff landfill is situated approximately 600m from Ballyjamesduff town centre in the town land of Derrylurgan. The site was in operation from the 1960's and comprises some 1.62 hectares. The site was originally peat land which was stripped for commercial purposes and was then operated as a traditional landfill until its closure in March 2002. A waste licence was issued by the Environmental Protection Agency after the closure of the site and remedial works were completed.

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 three and four 2016.

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 Bróna 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.

2.2 Monitoring Locations

Quarter 3 2016					
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	Gas	94.92	94.92		N291352.31 E252020.68
MW2	Gas	92.92	92.92		N291377.38 E252082.84
MW3	GW	94.39	93.31	1.1	N291369.28 E252109.44
MW4	GW	93.65	93.05	0.6	N291309.78 E252129.14
MW5	Gas	92.84	-	n/a	TBC
MW6	Leachate	100.71	-	n/a	TBC
MW 7	Leachate	97.54	-	n/a	TBC
MW8	Leachate	96.56	-	n/a	N291346.99 E252041.22
MW9	GW	95.69	93.85	1.84	N291369.67 E252103.93
MW10	GW	93.95	92.55	1.4	N291314.86 E252138.12
MW11S	GW	TBC	-	2.5	TBC
MW11D	GW	TBC	-	11.7	TBC
MW12	Gas	94.38	-	n/a	N291236.30 E252110.10
MW13	Gas	94.69	-	n/a	TBC
MW14	Gas	98.77	-	n/a	N291263.92 E252131.54
MW15	Gas	93.11	-	n/a	TBC
MW16S	GW	94.02	93.22	0.80	N252076.89 E291174.65
MW16D	GW	94.16	94.16	0.00	N252077.36 E291173.27
MW17S	GW	93.59	92.69	0.90	N251997.04 E291377.19
MW17D	GW	93.63	93.43	0.20	N251997.80 E291376.00
MW18	GW	93.5	93.5	0.0	N251986.57 E291425.39
SW1	SW	n/a	-	n/a	TBC
SW2	SW	n/a	-	n/a	TBC
Cap	SW	n/a	-	n/a	TBC

Quarter 4 2016					
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	Gas	94.92	94.92		N291352.31 E252020.68
MW2	Gas	92.92	92.92		N291377.38 E252082.84
MW3	GW	94.39	92.44	2.0	N291369.28 E252109.44
MW4	GW	93.65	93.7	0.0	N291309.78 E252129.14
MW5	Gas	92.84	-	n/a	TBC
MW6	Leachate	100.71	-	n/a	TBC
MW 7	Leachate	97.54	-	n/a	TBC
MW8	Leachate	96.56	-	n/a	N291346.99 E252041.22
MW9	GW	95.69	95.69	0	N291369.67 E252103.93
MW10	GW	93.95	92.35	1.6	N291314.86 E252138.12
MW11S	GW	TBC	-	3.1	TBC
MW11D	GW	TBC	-	12.1	TBC
MW12	Gas	94.38	-	n/a	N291236.30 E252110.10
MW13	Gas	94.69	-	n/a	TBC
MW14	Gas	98.77	-	n/a	N291263.92 E252131.54
MW15	Gas	93.11	-	n/a	TBC
MW16S	GW	94.02	93.12	0.90	N252076.89 E291174.65
MW16D	GW	94.16	94.16	0.00	N252077.36 E291173.27
MW17S	GW	93.59	92.49	1.10	N251997.04 E291377.19
MW17D	GW	93.63	93.63	0.00	N251997.80 E291376.00
MW18	GW	93.5	93.5	0.0	N251986.57 E291425.39
SW1	SW	n/a	-	n/a	TBC
SW2	SW	n/a	-	n/a	TBC
Cap	SW	n/a	-	-	TBC

2.3 Weather Report

REPORTS FROM BALLYHAISE (A)							
Date	Rainfall	Max	Min	Grass Min Temp	Mean Wind Speed	Maximum Gust	Sunshine
	(mm)	Temp	Temp	(°C)	(knots)	(if >= 34 knots)	(hours)
		(°C)	(°C)				
29/07/2015	6.2	14.2	8.6	6.8	5.5		

REPORTS FROM BALLYHAISE (A)							
Date	Rainfall	Max	Min	Grass Min Temp	Mean Wind Speed	Maximum Gust	Sunshine
	(mm)	Temp	Temp	(°C)	(knots)	(if >= 34 knots)	(hours)
		(°C)	(°C)				
05/10/2015	4	15.4	11.3	9.8	5.2		

3.0 SUMMARY OF RESULTS

Table 3.0 03rd Quarter Landfill Gas monitoring 2016

Method		GA 2000	GA 2000	GA 2000	GA 2000	GA 2000	
Parameter		CH_4	CO_2	O_2	H_2S	Barometric Pressure	Position to waste mass
Units		% v/v	% v/v	%	PPM	mb	
Date Testing		29/07/2016					
GA 2000 Ref	Client Ref						
1	MW 1	0	0.2	20.3	0	996	Outside
3	MW 2	0	0.16	20.52	0	996	Outside
7	MW5	0.4	0	20.3	0	999	Outside
6	MW 12	0.1	0.1	20.4	0	997.0	Inside
2	MW 13	0	0.3	20.34	0	996	Outside
4	MW 14	*17.3*	*5.62*	13.06	0	995	Inside
5	MW 15	0.86	0	20.12	0	994	Outside
	Limit	1	1.5				

Exceedance,outside waste mass

NOTES

1 Instrument Serial No: GA 07721

2 Limit: Schedule C2, Licence

Table 4.0 04th Quarter Landfill Gas monitoring 2016

Method		GA 2000	GA 2000	GA 2000	GA 2000	GA 2000	
Parameter		CH_4	CO_2	O_2	H_2S	Barometric Pressure	Position to waste mass
Units		% v/v	% v/v	%	PPM	mb	
Date Testing		05/10/2016					
GA 2000 Ref	Client Ref						
1	MW 1	0	2.06	19.76	0	996	Outside
3	MW 2	0	0.2	19.58	0	996	Outside
7	MW5	0.1	0	20.28	0	999	Outside
6	MW 12	0.0	0.8	19.9	0	997.0	Inside
2	MW 13	0	0.4	21.5	0	996	Outside
4	MW 14	*1.46*	*3.5*	18.3	0	995	Inside
5	MW 15	0.5	0.0	18.1	0	994.0	Outside
	Limit	1	1.5				

Exceedance,outside waste mass

NOTES

1 Instrument Serial No: GA 07721

2 Limit: Schedule C2, Licence

4.0 DISCUSSION

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 three and four are relatively consistent with previous results and as the well is within the waste mass it is not observed as being an exceedance. It is preferable that the results are within the limits stipulated within the licence.

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 2017.

Method		GA 2000	GA 2000	GA 2000	GA 2000	GA 2000
Parameter		CH_4	CO_2	O_2	H_2S	Barometric Pressure
Units		% v/v	% v/v	%	PPM	mb
Client Ref	**Qtr**	**-**	**-**	**-**	**-**	**-**
MW 1	Qtr 1 2016	0.1	0.48	20	0	996
	Qtr 2 2016	0.1	0.5	20	0	996
	Qtr 3 2016	0	0.2	20.3	0	996
	Qtr 4 2016	0	2.06	20	0	996
MW 2	Qtr 1 2016	0.1	0.4	16.2	0	996
	Qtr 2 2016	0.1	0.4	20.2	0	996
	Qtr 3 2016	0	0.16	21	0	996
	Qtr 4 2016	0	0.2	20	0	996
MW 5	Qtr 1 2016	0.0	0.1	20	0.0	999.0
	Qtr 2 2016	0	0.1	20	0	999
	Qtr 3 2016	0.4	0	20.3	0	999
	Qtr 4 2016	0.1	0	20.28	0	999
MW 12	Qtr 1 2016	***1.1***	1.2	20.42	0	994
	Qtr 2 2016	***1.1***	1.2	20.3	0	994
	Qtr 3 2016	0.1	0.1	20.4	0	997.0
	Qtr 4 2016	0.0	0.8	19.9	0	997.0
MW 13	Qtr 1 2016	0.1	0.1	18.375	0	996
	Qtr 2 2016	0.1	0.1	20.3	0	996
	Qtr 3 2016	0	0.3	20.34	0	996
	Qtr 4 2016	0	0.4	21.5	0	996
MW 14	Qtr 1 2016	***11.54***	***9.9***	14.56	0	995
	Qtr 2 2016	***11.5***	***9.9***	13.3	0	995
	Qtr 3 2016	***37.3***	***5.62***	13.06	0	995
	Qtr 4 2016	***1.46***	***3.5***	18.3	0	995
MW 15	Qtr 1 2016	***12.58***	***14.48***	7.7	0	994
	Qtr 2 2016	***12.6***	***14.5***	9.6	0	994
	Qtr 3 2016	0.86	0	20.12	0	994
	Qtr 4 2016	0.52	0	18.14	0	994
	Limit	**1**	**2**			
Exceedance of waste						

NOTES

1 Instrument Serial No: GA 07721

2 Limit: Schedule C2, Licence

SURFACE WATER MONITORING REPORT FOR BALLYJAMESDUFF LANDFILL W0093-01 Biannual 2 of 2 2016

Client: **Cavan County Council**

Site Location: **Derrylurgan, Ballyjamesduff**

Report No.: CCC-03-01-06-02-03-Rev 0

Produced by: Terry Keating, B.Sc., Environmental Science

Approved by: **Date:** 23rd November 2016
Bróna Keating, B.Sc., M.Sc., CEnv., MCIWM

Boylan Engineering
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Phone: 046 – 928 6000 / 087 – 820 5470
Fax: 046 – 928 6002
Email: info@boylanengineering.ie
Web: www.boylanengineering.ie

Rev.	Date	Description

I SUMMARY

Boylan Engineering (Eng. & Environmental Consultancy) was commissioned by Cavan County Council to carry out Environmental Monitoring at Ballyjamesduff Landfill (W0093-01), Derrylurgan, Ballyjamesduff, Co Cavan for bi annual two 2016.

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

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List of Tables

Appendix

1. 0 INTRODUCTION

Ballyjamesduff landfill is situated approximately 600m from Ballyjamesduff town centre in the town land of Derrylurgan. The site was in operation from the 1960's and comprises some 1.62 hectares. The site was originally peat land which was stripped for commercial purposes and was then operated as a traditional landfill until its closure in March 2002. A waste licence was issued by the Environmental Protection Agency after the closure of the site and remedial works were completed.

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 biannual two 2016.

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, Ballyjamesduff landfill is situated in the R2[1] Zone. This zone was categorized using a vulnerability rating combined with the aquifer category for the area. Landfills situated in R2[1] Zones are acceptable subject to guidance 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.

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 ^{o}C and 4^{o}C on their journey to the laboratory.
- On arrival at the laboratory, samples are stored between 0 ^{o}C and 4 ^{o}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 2016					
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	Gas	94.92	94.92		N291352.31 E252020.68
MW2	Gas	92.92	92.92		N291377.38 E252082.84
MW3	GW	94.39	92.44	2.0	N291369.28 E252109.44
MW4	GW	93.65	93.7	0.0	N291309.78 E252129.14
MW5	Gas	92.84	-	n/a	TBC
MW6	Leachate	100.71	-	n/a	TBC
MW 7	Leachate	97.54	-	n/a	TBC
MW8	Leachate	96.56	-	n/a	N291346.99 E252041.22
MW9	GW	95.69	95.69	0	N291369.67 E252103.93
MW10	GW	93.95	92.35	1.6	N291314.86 E252138.12
MW11S	GW	TBC	-	3.1	TBC
MW11D	GW	TBC	-	12.1	TBC
MW12	Gas	94.38	-	n/a	N291236.30 E252110.10
MW13	Gas	94.69	-	n/a	TBC
MW14	Gas	98.77	-	n/a	N291263.92 E252131.54
MW15	Gas	93.11	-	n/a	TBC
MW16S	GW	94.02	93.12	0.90	N252076.89 E291174.65
MW16D	GW	94.16	94.16	0.00	N252077.36 E291173.27
MW17S	GW	93.59	92.49	1.10	N251997.04 E291377.19
MW17D	GW	93.63	93.63	0.00	N251997.80 E291376.00
MW18	GW	93.5	93.5	0.0	N251986.57 E291425.39
SW1	SW	n/a	-	n/a	TBC
SW2	SW	n/a	-	n/a	TBC
Cap	SW	n/a	-	-	TBC

2.4 Weather Report

REPORTS FROM BALLYHAISE (A)							
Date	Rainfall	Max	Min	Grass Min Temp	Mean Wind Speed	Maximum Gust	Sunshine
	(mm)	Temp	Temp	(°C)	(knots)	(if >= 34 knots)	(hours)
		(°C)	(°C)				
05/10/2016	0.1	15.6	9.8	7.4	6.6		

3.0 SUMMARY OF RESULTS

Table 1.0 02nd Biannual Surface water monitoring 2016

Report Number		102128													
Monitoring Date		05/10/2016													
Method		**Site Tests**	**Site Tests**	**Site Tests**	**Site Tests**	**Ammonia**	**Titralab**	**Titralab**	**BOD**	**COD**	**Suspended Solids**	**AQ2-UP2**	**Dissolved Oxygen**	**Total Phosphorus-TP**	**AQ2-UP1**
Method Number		**Site Tests**	**Site Tests**	**Site Tests**	**Site Tests**	**EW003**	**EW138**	**EW139**	**EW001**	**EW094**	**EW013**	**EW015**	**EW043**	**EW146**	**EW154M**
Parameter		Sample temperature (to be done onsite)	Cond	pH	Visual Inspection	Ammonia	pH	Cond	BOD	COD	Suspended Solids	Cl	DO	Total Phosphorus-TP	TON (as N)(Calc)
Units		Deg C	us/cm	pH units	-	mg/l N	pH Units	uscm-1@20	mg/L	mg/L	mg/L	mg/L	mg/L	mg/l P	mg/l N
Limit of Detection		-	-	-	-	0.007	0.3	25	1	8	5	2.6	1.0	0.01	0.138
Date Testing Initiated		5.10.16				06.10.16									
ELS Ref	**Client Ref**														
90033/001	BJD SW 1	9.3	345	7.5	Clear	0.112	7	239	***32***	***61***	138	12	<1	1.52	<0.138
90033/002	BJD SW 2	9.1	333	7.69	Clear	0.127	7.1	244	***9.5***	***52***	26	13	<1	1.06	<0.138
90033/003	BJD Discharge Cap	12.2	695	7.48	Clear	***0.353***	7.1	540	<2	19	11	3.5	7	0.04	0.159
S.I No. 294/2009						0.2	≥5.5 and ≤8.5	1000	5	40		250			NAC

Method		**Titralab**	**AQ2-UP2**	**Total Metals**	**Metals-Dissolved**										
Method Number		**EW153**	**EW154M-1**	**EM130**											
Parameter		Alkalinity Total (R2 pH4.5)	Sulphate	Chromium-Total	Iron-Dissolved	Manganese-Dissolved	Potassium-Dissolved	Sodium-Dissolved	Cadmium-Dissolved	Calcium-Dissolved	Copper-Dissolved	Lead-Dissolved	Magnesium-Dissolved	Mercury-Dissolved	Zinc-Dissolved
Units		mg/L CaCO3	mg/L	ug/L	ug/L	ug/L	mg/L	mg/L	ug/L	mg/L	mg/L	ug/L	mg/L	ug/L	ug/L
Limit of Detection		10	1	1	20	1	0.2	0.5	0.1	1	0.003	0.3	0.3	0.02	1
Date Testing Initiated		06.10.16													
ELS Ref	**Client Ref**														
90033/001	BJD SW 1	101	34	<3	***2700***	***1600***	4.2	10	<0.1	29.1	<0.003	<0.3	5.5	<0.02	3.8
90033/002	BJD SW 2	77	17	<3	***1200***	***1700***	4.7	10.1	<0.1	29.3	<0.003	<0.3	5.7	<0.02	2.3
90033/003	BJD Discharge Cap	262	68	<3	260	***820***	2.9	5.9	<0.1	79.8	<0.003	<0.3	18	<0.02	5.1
S.I No. 294/2009		NAC	200	30	1000	300		150	5		0.03	10		1	100

Exceedance

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 license for surface water, results are compared to the S.I. No. 294/1989 — European Communities (Quality of Surface Water Intended for the Abstraction of Drinking Water) Regulations, 1989 where available.

Surface water samples were taken at SW1 and at SW2 and at the discharge cap.

With regard to all surface water samples, there were some minor elevations for the parameters ammonia BOD, COD, Iron and Manganese which are attributed to stagnation as a result of low flows in the Cap Discharge chamber at the time of monitoring. All remaining results were within specified limits.
Historical results for comparison purposes are presented in tabular form in Appendix 1.

5.0 CONCLUSION

The surface results obtained are relatively consistent with previous monitoring events and do not show any signs of concerning exceedances. Therefore there is no evidence of any major negative environmental impact associated with this landfill. Information relating to previous results can be seen in the historical data tables in Appendix 1.

		Surface Water Historical 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
SW1	Second biannual 2016	0.112	7	239	***32***	***61***	138	12	<1
	First biannual 2016	0.2	7.5	191	1.5	19	9	12	10
	Second biannual 2015	0.071	7.5	304	<1	19	<5	15	9
	First biannual 2015	0.12	7.4	180	<1	31	<5	12.5	10
SW2	Second biannual 2016	0.127	7.1	244	***9.5***	***52***	26	13	<1
	First biannual 2016	**0.29**	7.6	198	1.4	21	13	12	10
	Second biannual 2015	0.077	7.3	300	2.7	21	34	16	8
	First biannual 2015	***0.47***	7.2	199	<1	34	7	13	10
Discharge Cap	Second biannual 2016	***0.353***	7.1	540	<2	19	11	3.5	7
	First biannual 2016	***1.2***	7.5	191	<1	19	<5	7.6	6
	Second biannual 2015	***7.9***	7.3	708	<2.6	19	8	20	4
	First biannual 2015	0.18	7.4	363	-	-	-	11.5	10
S.I No. 294/1989 A1		0.2	≥5.5 and ≤8.5	1000	5		50	250	>60%

ELS LTD INAB ACCREDITATION SCHEDULE SUMMARY SHEET

Miscellaneous (P,G,W,S)
Ammonia/Ammonium 0.007-1mg/l N EW154
Chloride 2.6-250 mg/l EW154
Flouride 0.1 - 2 mg/l EW137
COD 8-1500 mg/l EW094
Nitrate 0.12-50 mg/l N EW154
Nitrite 0.013-1 mg/l N EW154
pH 4 – 10 pH Units EW153
Phosphate 0.009-1 mg/l P EW154
Alkalinity 10-1000mg/l EW153
TOC 0.25-100mg/l EW123
BOD 1-1300mg/l EW001
Total Nitrogen 1-100mg/l N EW140
Total Phosphorous 0.01-40 mg/l P EW143
Suspended Solids 5-1000mg/l EW013
Dissolved Oxygen 1 to 10 mg/l EW043
Conductivity 25-6000 us/cm EW154

Miscellaneous (P,G,S)
Bromate 1 to 50ug/l BRO3 EW137
Colour 2.5-50mg/l PtCCo EW154
Sulphate 1-250mg/l SO4 EW154
Total Dissolved Solids 15-1000mg/l EW046
Total Hardness 3-330mg/l CaCO3 EM099
Total Oxidised Nitrogen 0.138-51mg/l N EW051
Turbidity 0.11-150 NTU EW136
TKN Calculation 1-49 mg/l EW010

Metals EM130 (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 20.0 - 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

SI439 Potable Water VOCs & THM
EO025 (P,G,S,W)
Benzene 0.1-35 µg/l
1.2-Dichloroethane 0.1-35 µg/l
Tetrachloroethene 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

Other VOC's EO025 (P,G,S,W)
Bromomethane 0.5 - 35 µg/l
Ethyl Ether/Diethyl Ether 0.5 - 35 µg/l
11 Dichloroethene 0.5 - 35 µg/l
Iodomethane/Mehyl 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
Chlormethyl Cyanide 0.5 - 35 µg/l
Hexachlorobutadiene 0.5 - 35 µg/l
Trans-1,2 Dichloroethene 0.5 - 35 µg/l
MtBE 0.5 - 35 µg/l
11 Dichloroethane 0.5 - 35 µg/l
Cis-12 Dichloroethene 0.5 - 35 µg/l
Methyl Acrylate 5.0 - 35 µg/l
Bromochloromethane 0.5 - 35 µg/l
Tetrahydrofuran 5.0 - 35 µg/l
111 Trichloroethane 0.5 - 35 µg/l
1-Chlorobutane 0.5 - 35 µg/l
Carbon Tetrachloride 0.5 - 35 µg/l
11 Dichloropropene 0.5 - 35 µg/l
12 Dichloropropane 0.5 - 35 µg/l
Dibromomethane 0.5 - 35 µg/l
Methyl Methacrylate 0.5 - 35 µg/l
13 Dichloropropene, cis 2.0 - 35 µg/l
MIBK/4 Methyl 2 Pentanone 2.0 - 35 µg/l
Toluene 0.5 - 35 µg/l
13 Dichloropropene,trans 2.0 - 35 µg/l
Ethyl Methacrylate 2.0 - 35 µg/l
112 Trichloroethane 0.5 - 35 µg/l
13 Dichloropropane 0.5 - 35 µg/l
2 Hexanone 1.0 - 35 µg/l
12 Dibromoethane 0.5 - 35 µg/l
Chlorobenzene 0.5 - 35 µg/l
1112 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
Stryene 2.0 - 35 µg/l
Isopropyl Benzene 0.5 - 35 µg/l
Bromobenzene 0.5 - 35 µg/l
1122 Tetrachloroethane 0.5 - 35 µg/l
123 Trichloropropane 2.0 - 35 µg/l
Propyl Benzene 0.5 - 35 µg/l
2-Chlorotoluene 0.5 - 35 µg/l
4 Chlorotoluene 0.5 - 35 µg/l
135 Trimenthylbenzene 0.5 - 35 µg/l
Tert Butyl Benzene 0.5 - 35 µg/l
124 Trimethlbenzene 0.5 - 35 µg/l
Sec Butyl Benzene 0.5 - 35 µg/l
13 Dichlorobenzene 0.5 - 35 µg/l
P Isopropyltoluene 0.5 - 35 µg/l
14 Dichlorobenzene 0.5 - 35 µg/l
12 Dichlorobenzene 0.5 - 35 µg/l
N Butyl Benzene 0.5 - 35 µg/l
Hexachloroethane 5.0 - 35 µg/l
12 Dibromo 3Chloropropane 2.0 - 35 µg/l
124 Trichlorobenzene 0.5 - 35 µg/l
123 Trichlorobenzene 0.5 - 35 µg/l

Other VOC's EO025 (P,G,S)
22 Dichloropropane 0.5 - 35 µg/l

PAH EO129 (P,G,S)
Range 0.01 - 0.2 µg/l
Acenaphthene
Benzo (a) Anthracene
Benzo (a) Pyrene
Benzo (b) Fluoranthene
Benzo (ghi) Perylene
Benzo (k) Fluoranthene
Chrysene
Dibenzo (ah) Anthracene
Fluoranthene
Fluorene
Indeno (123-cd) Pyrene
Phenanthrene
Pyrene

Acid Herbicides (P,G,S)
Range 0.01 - 0.2 µg/l
2,4,5-T H
2,4-D H
2,4-DB H

Organophosphorus Pesticides(P,G,S)
Range 0.01 - 0.2 µg/l
Famphur OP
Methyl Parathion OP
Parathion OP

Organochlorine Pesticides (P,G,S)
Range 0.01 - 0.2 µg/l
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

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

Quarter 3 2016

ON SITE SAMPLING FORM

Facility Name: Ballyjamesduff | **Waste Licence No:** W0093-01

Report To:

Sampling Date: 28.07.16 | **Sample Type (GW, SW, Leachate)** All

Personnel: Terry Keating | **Weather:** Dry

Other Remarks: | **GPS:**

Sample Ref No	Sample Type	Time	DO Level	Elec Cond (us)	pH pH units	Temp °C	Visual
3	GW	-	-	885	7.4	14.4	Heavy Silt
4	GW	-	-	295	8.2	14.8	Peaty
9	GW	-	-	-	-		-
10	GW	-	-	1265	7.6	13.7	Peaty
11S	GW	-	-	905	7.3	13.8	Clear
11D	GW	-	-	420	7.8	14.2	Clear
16S	GW	-	-	481	7.5	13	Clear
16D	GW	-	-	488	7.51	10.7	Clear
17S	GW	-	-	514	7.1	13.8	Heavy Silt
17D	GW	-	-	471	7.2	11.5	Clear
18	GW	-	-	482	7.6	11.9	Clear
SW1	SW	-	-	-	-	-	-
SW2	SW	-	-	-	-	-	-
Cap	SW	-	-	-	-	-	-

COMMENTS:

Quarter 4 2016

ON SITE SAMPLING FORM

Facility Name: Ballyjamesduff | **Waste Licence No:** W0093-01

Report To:

Sampling Date: 05.10.16 | **Sample Type (GW, SW, Leachate)** All

Personnel: Terry Keating | **Weather:** Dry

Other Remarks: | **GPS:**

Sample Ref No	Sample Type	Time	DO Level	Elec Cond (us)	pH pH units	Temp °C	Visual
3	GW	-	-	353	7.4	13.7	Black
4	GW	-	-	-	-		Peaty
9	GW	-	-	-	-		Merky
10	GW	-	-	-	-		Black
11D	GW	-	-	1213	7.3	14.1	Clear
11S	GW	-		1272	7.5	14.7	Brown
16S	GW	-	-	258	6.8	15.3	Brown
16D	GW	-	-	238	6.8	12.5	Clear
17S	GW	-	-	-	7.7	14.1	Heavy Silt
17D	GW	-	-	524	7.6	13.9	Clear
18	GW	-	-	523	7.3	13.8	Clear
SW1	SW	-	-	-	-	-	-
SW2	SW	-	-	-	-	-	-
Cap	SW	-	-	-	-	-	-

COMMENTS: MW 10 , Meter stopped working, MW9 monitoring well was sampled at a later date, as it had all ready been taken as a revisit for Quarter 3 and was deemed to close to Quarter 4 to be sampled again. MW 4 well was dry.

GROUND WATER MONITORING REPORT FOR BALLYJAMESDUFF LANDFILL W0093-01 Quarters 3 and 4 2016

Client: **Cavan County Council**

Site Location: **Derrylurgan, Ballyjamesduff**

Report No.: CCC-03-01-06-02-06-Rev 0

Produced by: Terry Keating, B.Sc., Environmental Science

Approved by: _____ **Date:** 23rd November 2016
Bróna Keating, B.Sc., M.Sc., CEnv. MCIWM

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Email: info@boylanengineering.ie
Web: www.boylanengineering.ie

Rev.	Date	Description

I SUMMARY

Boylan Engineering (Eng. & Environmental Consultancy) was commissioned by Cavan County Council to carry out Environmental Monitoring at Ballyjamesduff Landfill (W0093-01), Derrylurgan, Ballyjamesduff, Co Cavan for quarter three and four 2016.

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

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Appendix

1. 0 INTRODUCTION

Ballyjamesduff landfill is situated approximately 600m from Ballyjamesduff town centre in the town land of Derrylurgan. The site was in operation from the 1960's and comprises some 1.62 hectares. The site was originally peat land which was stripped for commercial purposes and was then operated as a traditional landfill until its closure in March 2002. A waste licence was issued by the Environmental Protection Agency after the closure of the site and remedial works were completed.

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 three and four 2016.

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, Bailieborough landfill is situated in the R2[1] Zone. This zone was categorized using a vulnerability rating combined with the aquifer category for the area. Landfills situated in R2[1] Zones are acceptable subject to guidance 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

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 ^{o}C and 4^{o}C on their journey to the laboratory.
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- Analysis methods are listed in Appendix .

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MW1	Gas	94.92	94.92		N291352.31 E252020.68
MW2	Gas	92.92	92.92		N291377.38 E252082.84
MW3	GW	94.39	93.31	1.1	N291369.28 E252109.44
MW4	GW	93.65	93.05	0.6	N291309.78 E252129.14
MW5	Gas	92.84	-	n/a	TBC
MW6	Leachate	100.71	-	n/a	TBC
MW 7	Leachate	97.54	-	n/a	TBC
MW8	Leachate	96.56	-	n/a	N291346.99 E252041.22
MW9	GW	95.69	93.85	1.84	N291369.67 E252103.93
MW10	GW	93.95	92.55	1.4	N291314.86 E252138.12
MW11S	GW	TBC	-	2.5	TBC
MW11D	GW	TBC	-	11.7	TBC
MW12	Gas	94.38	-	n/a	N291236.30 E252110.10
MW13	Gas	94.69	-	n/a	TBC
MW14	Gas	98.77	-	n/a	N291263.92 E252131.54
MW15	Gas	93.11	-	n/a	TBC
MW16S	GW	94.02	93.22	0.80	N252076.89 E291174.65
MW16D	GW	94.16	94.16	0.00	N252077.36 E291173.27
MW17S	GW	93.59	92.69	0.90	N251997.04 E291377.19
MW17D	GW	93.63	93.43	0.20	N251997.80 E291376.00
MW18	GW	93.5	93.5	0.0	N251986.57 E291425.39
SW1	SW	n/a	-	n/a	TBC
SW2	SW	n/a	-	n/a	TBC
Cap	SW	n/a	-	n/a	TBC

Quarter 4 2016					
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	Gas	94.92	94.92		N291352.31 E252020.68
MW2	Gas	92.92	92.92		N291377.38 E252082.84
MW3	GW	94.39	92.44	2.0	N291369.28 E252109.44
MW4	GW	93.65	93.7	0.0	N291309.78 E252129.14
MW5	Gas	92.84	-	n/a	TBC
MW6	Leachate	100.71	-	n/a	TBC
MW 7	Leachate	97.54	-	n/a	TBC
MW8	Leachate	96.56	-	n/a	N291346.99 E252041.22
MW9	GW	95.69	95.69	0	N291369.67 E252103.93
MW10	GW	93.95	92.35	1.6	N291314.86 E252138.12
MW11S	GW	TBC	-	3.1	TBC
MW11D	GW	TBC	-	12.1	TBC
MW12	Gas	94.38	-	n/a	N291236.30 E252110.10
MW13	Gas	94.69	-	n/a	TBC
MW14	Gas	98.77	-	n/a	N291263.92 E252131.54
MW15	Gas	93.11	-	n/a	TBC
MW16S	GW	94.02	93.12	0.90	N252076.89 E291174.65
MW16D	GW	94.16	94.16	0.00	N252077.36 E291173.27
MW17S	GW	93.59	92.49	1.10	N251997.04 E291377.19
MW17D	GW	93.63	93.63	0.00	N251997.80 E291376.00
MW18	GW	93.5	93.5	0.0	N251986.57 E291425.39
SW1	SW	n/a	-	n/a	TBC
SW2	SW	n/a	-	n/a	TBC
Cap	SW	n/a	-	-	TBC

2.4 Weather Report

REPORTS FROM BALLYHAISE (A)							
Date	Rainfall	Max	Min	Grass Min Temp	Mean Wind Speed	Maximum Gust	Sunshine
	(mm)	Temp	Temp	(°C)	(knots)	(if >= 34 knots)	(hours)
		(°C)	(°C)				
28/07/2016	11.9	18.5	12.6	12.6	4.2		

REPORTS FROM BALLYHAISE (A)							
Date	Rainfall	Max	Min	Grass Min Temp	Mean Wind Speed	Maximum Gust	Sunshine
	(mm)	Temp	Temp	(°C)	(knots)	(if >= 34 knots)	(hours)
		(°C)	(°C)				
05/10/2015	4	15.4	11.3	9.8	5.2		

3.0 SUMMARY OF RESULTS

Table 1.0 03rd Quarter Ground water monitoring 2016

Report Number		99426																
Monitoring Date:		28.7.16																
Method		**Site Tests**	**Site Tests**	**(TOC)**	**Coliforms**	**AQ2**		**Coliforms**	**Titralab**		**AQ2-UP2**	**Dissolved Oxygen**	**Total Cyanide High**	**PhenolsTotal -Index (Sub1)**	**Metals-Dissolved**		
Method Number		**Site Tests**	**Site Tests**	**EW123**	**MIC133**	**EW003**	**EW051**	**MIC133**	**EW138**	**EW139**	**EW015**	**EW043**	**ug/L**	**Sub-Con**	**EM130**		
Parameter		Sample temperature (onsite)	Cond	TOC	E.Coli	Ammonia	TON	Total Coliforms	pH	Cond	Cl	DO	Total Cyanide High (Sub)	Total Phenols	Fe	K	Na
Units		Deg C	us/cm	mg/l	MPN/ 100ml	mg/l N	mg/l N	MPN/ 100ml	pH Units	us/cm	mg/l	mg/l		mg/l	ug/l	mg/l	mg/l
Limit of Detection		-	-	0.250	0.000	0.007	0.138	0.000	0.300	25.000	2.600	1.000		0.15	5.0	0.2	0.5
Date Testing Initiated		28.07.2016		29.07.2016													
ELS Ref	**Client Ref**																
99426/009	MW3	14.4	885	32.89	***5172***	***29***	<0.138	***129970***	7	858	22	<1	<10	<0.1	***23000***	**21.6**	45.2
99426/010	MW4	14.8	295	19	***1100***	***0.59***	0.18	***9340***	7.1	291	9.6	4	<10	<0.1	***870***	2.6	18.1
99426/001	MW10	13.7	1265	30.25	***40***	***47***	<0.138	***482***	6.8	***1374***	***84***	<1	<10	<0.1	**27000**	1.3	17.3
99426/007	11S	13.8	905	29.1	0	***0.17***	0.981	***17329***	7.1	***1252***	***290***	5	<10	<0.1	<20	1.7	19.5
99426/008	11D	14.2	420	3.06	0	0.038	<0.138	***365***	7.6	410	9.2	4	<10	<0.1	<20	1.8	24.2
99426/002	MW 16S	13	481	12.51	0	***0.19***	0.157	***9100***	7.5	476	20	5	<10	<1.7	<20	1.9	25
99426/003	MW 16D	10.7	488	0.88	0	0.066	<0.138	***299***	7.6	496	21	7	<10	<0.1	21	1.4	42.8
99426/004	MW 17S	13.8	514	29.73	0	***6.1***	<0.138	***12230***	7	480	16	4	<10	<0.1	***5900***	1.2	18.4
99426/005	MW 17D	11.5	471	1.61	0	***0.34***	<0.138	***1553***	7.5	470	15	5	<10	<0.1	***300***	***10.2***	22.5
99426/006	MW18	11.9	482	0.78	0	0.034	<0.138	***276***	7.5	476	15	6	<10	<0.1	150	4.1	10.5
IGV				NAC	0	0.15	NAC	0	≥6.5 &≤9.5	1000	30	NAC		0.0005	200	5	150
Exceedance																	

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

Table 2.0 04th Quarter Ground water monitoring 2016

Report Number:	102125/102837
Monitoring Date:	05/10/2016

Method		Site Tests					TOC	Ammonia	AQ2-UP1	Titralab		Titralab	AQ2-UP2		DO	Total Cyanide High	Total Phosphorus-TP	PhenolsTotal
Method Number		Site Tests					DEFAULT	EW003	EW154M	EW153			EW154M		EW043	DEFAULT	EW146	DEFAULT
Parameter		Sample temperature (to be done onsite)	Cond	pH	Water Level from TOC	Visual Inspection	TOC	Ammonia	TON (as N)(calc)	pH	Cond	Alkalinity Total (R2 pH4.5)	Chloride	Sulphate	Dissolved Oxygen	Total Cyanide High	Total Phosphorus-TP	Phenols-Total
Units		Deg C	us/cm	pH units	Meter's	-	mg/l	mg/l N	mg/l N	pH Units	us/cm	mg/L CaCO3	mg/l	mg/l	mg/l	ug/L	mg/l P	mg/L
Limit of Detection		-	-	-	-	-	0.25	0.007	0.138	0.3	25	10	2.6	1.0	1.0	10	0.01	0.15
Date Testing Initiated		06.10.16					07.10.16											
ELS Ref	Client Ref																	
102125/001	MW3	13.7	353	7.4	2.0	Black	3.21	***9.4***	<0.138	7.3	667	382	15	7.5	<1	<10	2.47	<0.1
102125/002	MW 4	13.5	344	7.3	1.6		No Sample collected											
102125/003	MW 9	12.9	355	7.3	2.8	black	35.01	***23***	4.742	7	***1072***	406	***34***	35	4	<9	1.21	<0.1
102125/004	MW 10	13.4	358	7.4	1.6	Black	15.61	***42***	<0.138	6.8	***1292***	614	***72***	2.8	<1	<9	0.75	<0.1
102125/005	11S	14.7	1272	7.5	3.1	Brown	2.13	***0.55***	0.876	7.1	***1243***	220	***290***	40	3	<9	0.09	<0.1
102125/006	11D	14.1	1213	7.3	12.1	Clear	0.62	0.045	<0.138	7.5	407	207	8.2	15	6	<9	0.04	<0.1
102125/007	MW 16S	15.3	258	6.8	0.9	Brown	3.23	***0.19***	0.182	7.6	494	210	20	57	8	<9	1.2	<0.1
102125/008	MW16D	12.5	238	6.8	G.L	Clear	3.12	0.11	<0.138	7.5	489	185	20	67	6	<9	0.04	<0.1
102125/009	MW17S	14.1	-	7.7	1.1	Clear	5.32	***8***	<0.138	6.9	488	244	14	17	2	<9	1.45	<0.1
102125/010	MW17D	13.9	524	7.6	G.L	Clear	0.28	***0.32***	<0.138	7.5	521	243	16	25	4	<9	0.06	0.06
102837/001	MW18	13.8	523	7.3	G.L	Clear	0.31	0.064	<0.138	7.5	485	238	14	30	6	<9	0.04	<0.1
			1000	≥6.5 and ≤9.5			NAC	0.15	NAC	≥6.5 and ≤9.5	1000	NAC	30	200	NAC	10	-	-

Method		Coliforms	Coliforms	Ion Chromatography	Residue on Evaporation	Metals-Total	Metals-Dissolved											
Method Number		MIC133		EW137	EW060	EM130												
Parameter		Total Coliforms	E. Coli	Fluoride	Residue on Evaporation	Chromium-Total	Iron Dissolved	Manganese Dissolved	Potassium Dissolved	Sodium Dissolved	Cadmium-Dissolved	Calcium-Dissolved	Copper-Dissolved	Lead-Dissolved	Magnesium-Dissolved	Mercury-Dissolved	Zinc-Dissolved	Boron-Dissolved
Units		MPN/100ml	MPN/100ml	mg/L	mg/L	ug/L	ug/L	ug/L	mg/l	mg/l	ug/L	mg/L	mg/L	ug/L	mg/L	ug/L	ug/L	mg/L
Limit of Detection		0		0.1	10.0	1.0	20.0	0.001	0.2	0.5	0.1	1.0	0.00	0.3		0.02	1.0	0.02
Date Testing Initiated		14.10.15																
ELS Ref	Client Ref																	
102125/001	MW3	***24197***	<10	0.12	785	22.7	***8900***	***320***	5.2	18.9	***<0.1***	62	<0.003	<0.3	12.4	<0.02	1.7	0.21
102125/002	MW 4	No Sample collected																
102125/003	MW 9	***20***	0	0.9	635.0	16.9	***5700***	***1200***	***13.6***	43.6	<0.1	100	<0.003	0.5	29.3	0.09	***260***	0.07
102125/004	MW 10	***52***	<10	<0.1	680	4.2	***38000***	***1300***	***22.9***	43.7	***<0.1***	78	<0.003	<0.3	24.5	<0.02	2.3	0.29
102125/005	11S	***1360***	<10	<0.1	1125	11.5	<20	27	1.3	40.4	***<0.1***	140	<0.003	<0.3	42.4	<0.02	4.4	<0.02
102125/006	11D	***5***	0	0.24	176.2	<3	<20	***130***	1.2	17.1	***<0.1***	48	<0.003	<0.3	10.3	<0.02	3	<0.02
102125/007	MW 16S	***173***	<10	0.2	1445	***47.5***	<20	***580***	2.7	22.1	***<0.1***	61	<0.003	<0.3	11.4	<0.02	13	0.02
102125/008	MW16D	***16***	0	0.2	270	3.4	25	***610***	1.2	15.5	***<0.1***	61	<0.003	<0.3	10	<0.02	2	<0.02
102125/009	MW17S	***1500***	<10	0.1	490	13.7	***6400***	***590***	2	20.4	***<0.1***	46	<0.003	<0.3	10.3	<0.02	1.6	0.03
102125/010	MW17D	***47***	***5***	0.12	200	<3	***270***	***810***	1.6	20.4	***<0.1***	60	<0.003	<0.3	11.2	<0.02	9.2	0.02
102837/001	MW18	***1733***	***1***	<0.1	235	<3	150	***490***	1.4	17.9	***<0.1***	54	<0.003	<0.3	9.5	<0.02	1.4	<0.02
		0	0	1	-	30	200	50	5	150	0.005	200	0.03	10	50	1	100	1

Exceedance

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 groundwater, results are compared to the Interim Guide Values for the protection of Groundwater.

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 for Quarter 3 was conducted on the 27th July 2016. The next monitoring event, Quarter 4 was carried out on the 6th of October 2016. Results in italic bold indicate where the interim guide value has been exceeded. Results from the third and fourth Quarters in 2016 show that there were elevations at various ground water monitoring locations for parameters; Iron, Ammonia, Total Coliforms, E-coli, Potassium, Chloride, Manganese and Conductivity. All elevations are similar to previous monitoring events. Results from quarter 3 reveal that the elevated levels are similar to that of quarter two 2016 and historical readings, with E-coli and total coliforms at wells MW4 being recorded. No sample was taken at MW4 during Quarter 4 as well was dry. There were elevations for the parameter Chloride at wells MW10 and MW11S. The well MW11S is situated up gradient of the landfill. The land use is predominately agriculture and therefore this is the most likely source of contamination. Well MW10 is located parallel to a local water course, which runs along an existing farm. This elevated level of the parameter Chloride maybe attributed to local agricultural practices.

Elevated Iron levels can be an indication of contamination. The hypothesis that is proposed is that the source of this Iron is not the landfill leachate, but the native soils beneath the landfill. Iron can become mobilised due to changing pH and/or redox conditions in the environment underneath the landfill. Alternatively, the leachate from the non-hazardous waste may produce reducing conditions beneath the landfill, allowing the solution of Iron from the underlying deposits. Elevated Iron may also be attributed to the natural composition of this area.

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

5.0 CONCLUSION

The groundwater results obtained are relatively consistent with previous monitoring events and do not show any signs of dramatic exceedances. The next monitoring event will be carried out in quarter 1 2017. Information relating to previous results can be seen in the historical data tables in Appendix 1.

	Parameter	TOC	E.Coli	Ammonia	TON	Tot Coliforms	pH	Cond	Cl	DO	Total Phenols	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	mg/l
MW3	Qtr 4 2016	3.21	<10	***9.4***	<0.138	***24197***	7.3	667	15	<1	<0.1	***8900***	5.2	18.9
	Qtr 3 2016	32.89	***5172***	***29***	<0.138	***129970***	7	858	22	<1	<0.1	***23000***	***10.2***	22.5
	Qtr 2 2016	16.59	0	***21***	<0.138	***290***	7.3	774	24	<1	<0.1	***32000***	***11.4***	29.6
	Qtr 1 2016	15.18	***20***	***0.15***	<0.138	***20224***	7.3	674	21	<1	<0.1	***21000***	***8.6***	27.4
	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	mg/l
MW4	Qtr 4 2016	-	-	-	-	-	-	-	-	-	-	-	-	-
	Qtr 3 2016	19	***1100***	***0.59***	0.18	***9340***	7.1	291	9.6	4	<0.1	***870***	4.1	10.5
	Qtr 2 2016	18.62	***1106***	***2***	<0.138	***24197***	6.9	381	18	6	<0.10	***1400***	***6.5***	12
	Qtr 1 2016	14.67	***60***	***0.71***	<0.138	***130***	7	463	28	1	<0.1	***1500***	***5.4***	13.2
	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	mg/l
MW9	Qtr 4 2016	35.01	0	***23***	4.742	***20***	7	***1072***	***34***	4	<0.1	***5700***	***13.6***	43.6
	Qtr 3 2016	-	-	-	-	-	-	-	-	-	-	-	-	-
	Qtr 2 2016	26.56	<10	***42***	0.202	***<10***	7.4	***1247***	***60***	7	<0.10	***24000***	***28.6***	49.5
	Qtr 1 2016	-	-	-	-	-	-	-	-	-	-	-	-	-
	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	mg/l
MW10	Qtr 4 2016	15.61	<10	***42***	<0.138	***52***	6.8	***1292***	***72***	<1	<0.1	***38000***	***22.9***	43.7
	Qtr 3 2016	30.25	***40***	***47***	<0.138	***482***	6.8	***1374***	***84***	<1	<0.1	***27000***	***21.6***	45.2
	Qtr 2 2016	43.02	0	***34***	<0.138	0	7.1	***1083***	***57***	<1	<0.1	***37000***	***21***	38.9
	Qtr 1 2016	40.53	0	***38***	<0.138	0	6.8	***1129***	***61***	1	<0.1	***38000***	***21.9***	41.3
	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	mg/l
MW11S	Qtr 4 2016	2.13	<10	***0.55***	0.876	***1360***	7.1	***1243***	***290***	3	<0.1	<20	1.3	40.4
	Qtr 3 2016	29.1	0	***0.17***	0.981	***17329***	7.1	***1252***	***290***	5	<0.1	<20	1.4	42.8
	Qtr 2 2016	3.47	0	0.11	1.17	***24196***	7.3	***1284***	***290***	3	<0.1	***74***	1.7	52.3
	Qtr 1 2016	1.66	0	0.042	1.027	***247***	7.2	***1207***	***300***	4	<0.1	<20	1.4	51.4
	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	mg/l
MW11D	Qtr 4 2016	0.62	0	0.045	<0.138	***5***	7.5	407	8.2	6	<0.1	<20	1.2	17.1
	Qtr 3 2016	3.06	0	0.038	<0.138	***365***	7.6	410	9.2	4	<0.1	<20	1.2	18.4
	Qtr 2 2016	0.52	0	0.029	<0.138	0	7.6	410	10	5	<0.1	<20	1.5	23
	Qtr 1 2016	8.05	0	0.046	<0.138	***48***	7.7	397	7.5	6	<0.1	<20	1.2	21.8
	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	mg/l
MW16S	Qtr 4 2016	3.23	<10	***0.19***	0.182	***173***	7.6	494	20	8	<0.1	<20	2.7	22.1
	Qtr 3 2016	12.51	0	***0.19***	0.157	***9100***	7.5	476	20	5	<1.7	<20	2.6	18.1
	Qtr 2 2016	1.06	***10***	***0.16***	<0.138	***1989***	7.5	470	19	4	<0.10	<20	3.6	20.8
	Qtr 1 2016	2.48	0	0.07	<0.138	***1***	7.6	456	18	4	<0.1	***58***	1.4	21.3
	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	mg/l
MW16D	Qtr 42016	3.12	0	0.11	<0.138	***16***	7.5	489	20	6	<0.1	25	1.2	15.5
	Qtr 3 2016	0.88	0	0.066	<0.138	***299***	7.6	496	21	7	<0.1	***21***	1.3	17.3
	Qtr 2 2016	0.35	0	0.073	<0.138	***120***	7.4	492	22	5	<0.1	***93***	1.6	22.6
	Qtr 1 2016	2.63	0	0.074	<0.138	***1***	7.6	483	21	6	<0.1	***65***	1.5	22.1
	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	mg/l
MW17S	Qtr 4 2016	5.32	<10	***8***	<0.138	***1500***	6.9	488	14	2	<0.1	***6400***	2	20.4
	Qtr 3 2016	29.73	0	***6.1***	<0.138	***12230***	7	480	16	4	<0.1	***5900***	1.7	19.5
	Qtr 2 2016	7.82	0	***6.3***	<0.138	***24196***	6.9	485	15	<1	<0.1	***9600***	2.2	26.3
	Qtr 1 2016	6.35	0	***8.3***	<0.138	***260***	7	474	15	2	<0.1	***12000***	2.1	25
	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	mg/l
MW17D	Qtr 4 2016	0.28	***5***	***0.32***	<0.138	***47***	7.5	521	16	4	0.06	***270***	1.6	20.4
	Qtr 3 2016	1.61	0	***0.34***	<0.138	***1553***	7.5	470	15	5	<0.1	***300***	1.8	24.2
	Qtr 2 2016	12.22	0	***0.3***	<0.138	***80***	7.5	493	18	6	<0.1	***380***	2.1	28.6
	Qtr 1 2016	1.5	0	***0.32***	<0.138	***8***	7.6	483	15	8	<0.1	***330***	2	29
	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	mg/l
MW18	Qtr 4 2016	0.31	***1***	0.064	<0.138	***1733***	7.5	485	14	6	<0.1	150	1.4	17.9
	Qtr 3 2016	0.78	0	0.034	<0.138	***276***	7.5	476	15	6	<0.1	***150***	1.9	25
	Qtr 2 2016	0.41	0	0.041	<0.138	***101***	7.4	485	15	6	<0.1	***300***	2.3	29.5
	Qtr 1 2016	5.19	0	0.099	<0.138	***20***	7.6	472	14	4	<0.1	***250***	2.1	30.3
IGV		NAC	0	0.15	NAC	0	≥6.5 &≤9.5	1000	30	NAC	0.0005	0.200	5	150

ELS LTD INAB ACCREDITATION SCHEDULE SUMMARY SHEET

Miscellaneous (P,G,W,S)
Ammonia/Ammonium 0.007-1mg/l N EW154
Chloride 2.6-250 mg/l EW154
Flouride 0.1 - 2 mg/l EW137
COD 8-1500 mg/l EW094
Nitrate 0.12-50 mg/l N EW154
Nitrite 0.013-1 mg/l N EW154
pH 4 – 10 pH Units EW153
Phosphate 0.009-1 mg/l P EW154
Alkalinity 10-1000mg/l EW153
TOC 0.25-100mg/l EW123
BOD 1-1300mg/l EW001
Total Nitrogen 1-100mg/l N EW140
Total Phosphorous 0.01-40 mg/l P EW143
Suspended Solids 5-1000mg/l EW013
Dissolved Oxygen 1 to 10 mg/l EW043
Conductivity 25-6000 us/cm EW154

Miscellaneous (P,G,S)
Bromate 1 to 50ug/l BRO3 EW137
Colour 2.5-50mg/l PtCCo EW154
Sulphate 1-250mg/l SO4 EW154
Total Dissolved Solids 15-1000mg/l EW046
Total Hardness 3-330mg/l CaCO3 EM099
Total Oxidised Nitrogen 0.138-51mg/l N EW051
Turbidity 0.11-150 NTU EW136
TKN Calculation 1-49 mg/l EW010

Metals EM130 (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 20.0 - 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

SI439 Potable Water VOCs & THM
EO025 (P,G,S,W)
Benzene 0.1-35 µg/l
1.2-Dichloroethane 0.1-35 µg/l
Tetrachloroethene 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

Other VOC's EO025 (P,G,S,W)
Bromomethane 0.5 - 35 µg/l
Ethyl Ether/Diethyl Ether 0.5 - 35 µg/l
11 Dichloroethene 0.5 - 35 µg/l
Iodomethane/Mehyl 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
Chlormethyl Cyanide 0.5 - 35 µg/l
Hexachlorobutadiene 0.5 - 35 µg/l
Trans-1,2 Dichloroethene 0.5 - 35 µg/l
MtBE 0.5 - 35 µg/l
11 Dichloroethane 0.5 - 35 µg/l
Cis-12 Dichloroethene 0.5 - 35 µg/l
Methyl Acrylate 5.0 - 35 µg/l
Bromochloromethane 0.5 - 35 µg/l
Tetrahydrofuran 5.0 - 35 µg/l
111 Trichloroethane 0.5 - 35 µg/l
1-Chlorobutane 0.5 - 35 µg/l
Carbon Tetrachloride 0.5 - 35 µg/l
11 Dichloropropene 0.5 - 35 µg/l
12 Dichloropropane 0.5 - 35 µg/l
Dibromomethane 0.5 - 35 µg/l
Methyl Methacrylate 0.5 - 35 µg/l
13 Dichloropropene, cis 2.0 - 35 µg/l
MIBK/4 Methyl 2 Pentanone 2.0 - 35 µg/l
Toluene 0.5 - 35 µg/l
13 Dichloropropene,trans 2.0 - 35 µg/l
Ethyl Methacrylate 2.0 - 35 µg/l
112 Trichloroethane 0.5 - 35 µg/l
13 Dichloropropane 0.5 - 35 µg/l
2 Hexanone 1.0 - 35 µg/l
12 Dibromoethane 0.5 - 35 µg/l
Chlorobenzene 0.5 - 35 µg/l
1112 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
Stryene 2.0 - 35 µg/l
Isopropyl Benzene 0.5 - 35 µg/l
Bromobenzene 0.5 - 35 µg/l
1122 Tetrachloroethane 0.5 - 35 µg/l
123 Trichloropropane 2.0 - 35 µg/l
Propyl Benzene 0.5 - 35 µg/l
2-Chlorotoluene 0.5 - 35 µg/l
4 Chlorotoluene 0.5 - 35 µg/l
135 Trimenthylbenzene 0.5 - 35 µg/l
Tert Butyl Benzene 0.5 - 35 µg/l
124 Trimethlbenzene 0.5 - 35 µg/l
Sec Butyl Benzene 0.5 - 35 µg/l
13 Dichlorobenzene 0.5 - 35 µg/l
P Isopropyltoluene 0.5 - 35 µg/l
14 Dichlorobenzene 0.5 - 35 µg/l
12 Dichlorobenzene 0.5 - 35 µg/l
N Butyl Benzene 0.5 - 35 µg/l
Hexachloroethane 5.0 - 35 µg/l
12 Dibromo 3Chloropropane 2.0 - 35 µg/l
124 Trichlorobenzene 0.5 - 35 µg/l
123 Trichlorobenzene 0.5 - 35 µg/l

Other VOC's EO025 (P,G,S)
22 Dichloropropane 0.5 - 35 µg/l

PAH EO129 (P,G,S)
Range 0.01 - 0.2 µg/l
Acenaphthene
Benzo (a) Anthracene
Benzo (a) Pyrene
Benzo (b) Fluoranthene
Benzo (ghi) Perylene
Benzo (k) Fluoranthene
Chrysene
Dibenzo (ah) Anthracene
Fluoranthene
Fluorene
Indeno (123-cd) Pyrene
Phenanthrene
Pyrene

Acid Herbicides (P,G,S)
Range 0.01 - 0.2 µg/l
2,4,5-T H
2,4-D H
2,4-DB H

Organophosphorus Pesticides(P,G,S)
Range 0.01 - 0.2 µg/l
Famphur OP
Methyl Parathion OP
Parathion OP

Organochlorine Pesticides (P,G,S)
Range 0.01 - 0.2 µg/l
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

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

Quarter 3 2016

ON SITE SAMPLING FORM

Facility Name: Ballyjamesduff | **Waste Licence No:** W0093-01

Report To:

Sampling Date: 28.07.16 | **Sample Type (GW, SW, Leachate)** All

Personnel: Terry Keating | **Weather:** Dry

Other Remarks: | **GPS:**

Sample Ref No	Sample Type	Time	DO Level	Elec Cond (us)	pH pH units	Temp °C	Visual
3	GW	-	-	885	7.4	14.4	Heavy Silt
4	GW	-	-	295	8.2	14.8	Peaty
9	GW	-	-	-	-		-
10	GW	-	-	1265	7.6	13.7	Peaty
11S	GW	-	-	905	7.3	13.8	Clear
11D	GW	-	-	420	7.8	14.2	Clear
16S	GW	-	-	481	7.5	13	Clear
16D	GW	-	-	488	7.51	10.7	Clear
17S	GW	-	-	514	7.1	13.8	Heavy Silt
17D	GW	-	-	471	7.2	11.5	Clear
18	GW	-	-	482	7.6	11.9	Clear
SW1	SW	-	-	-	-	-	-
SW2	SW	-	-	-	-	-	-
Cap	SW	-	-	-	-	-	-

COMMENTS:

Quarter 4 2016

ON SITE SAMPLING FORM

Facility Name: Ballyjamesduff | **Waste Licence No:** W0093-01

Report To:

Sampling Date: 05.10.16 | **Sample Type (GW, SW, Leachate)** All

Personnel: Terry Keating | **Weather:** Dry

Other Remarks: | **GPS:**

Sample Ref No	Sample Type	Time	DO Level	Elec Cond (us)	pH pH units	Temp °C	Visual
3	GW	-	-	353	7.4	13.7	Black
4	GW	-	-	-	-		Peaty
9	GW	-	-	-	-		Merky
10	GW	-	-	-	-		Black
11D	GW	-	-	1213	7.3	14.1	Clear
11S	GW	-		1272	7.5	14.7	Brown
16S	GW	-	-	258	6.8	15.3	Brown
16D	GW	-	-	238	6.8	12.5	Clear
17S	GW	-	-	-	7.7	14.1	Heavy Silt
17D	GW	-	-	524	7.6	13.9	Clear
18	GW	-	-	523	7.3	13.8	Clear
SW1	SW	-	-	-	-	-	-
SW2	SW	-	-	-	-	-	-
Cap	SW	-	-	-	-	-	-

COMMENTS: MW 10 , Meter stopped working, MW9 monitoring well was sampled at a later date, as it had all ready been taken as a revisit for Quarter 3 and was deemed to close to Quarter 4 to be sampled again. MW 4 well was dry.

Cavan County Council Groundwater Sampling ref.

3.14

Site Reference: Ballyjamesduff **Permit No.** W0093 **Date:** 28.07.16 **Personnel:** Terry Keating

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
	(m)	(m) B	A-B=h	(m)	(m)	(m^2)	(m3) π r2h	litres	(litres x 3)	(mins)
(Shallow/Deep)	A	B		C	(C/2) = r	r^2		(m^3 x 1000)		
MW3	2.9	1.08	1.82	0.05	0.025	0.00063	0.0036	3.57175	10.7153	2
MW4	2.2	0.6	1.60	0.05	0.025	0.00063	0.0031	3.14	9.42	2
MW9	4.5	1.84	2.66	0.05	0.025	0.00063	0.0052	5.22025	15.6608	3
MW10	3.4	1.4	2.00	0.05	0.025	0.00063	0.0039	3.925	11.775	2
MW11S	5	2.5	2.50	0.05	0.025	0.00063	0.0049	4.90625	14.7188	2
MW11D	30	11.7	18.30	0.05	0.025	0.00063	0.0359	35.9138	107.741	18
MW16S	5	0.8	4.20	0.05	0.025	0.00063	0.0082	8.2425	24.7275	4
MW16D	10	0	10.00	0.05	0.025	0.00063	0.0196	19.625	58.875	10
MW17S	5	0.9	4.10	0.05	0.025	0.00063	0.008	8.04625	24.1388	4
MW17D	15	0.2	14.80	0.05	0.025	0.00063	0.029	29.045	87.135	15
MW18	21	0	21.00	0.05	0.025	0.00063	0.0412	41.2125	123.638	21

Cavan County Council Groundwater Sampling ref.

3.14

Site Reference: Ballyjamesduff **Permit No.** W0093 **Date:** 05.10.16 **Personnel:** Terry Keating

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
	(m)	(m) B	A-B=h	(m)	(m)	(m^2)	(m3) π r2h	litres	(litres x 3)	(mins)
(Shallow/Deep)	A	B		C	(C/2) = r	r^2		(m^3 x 1000)		
MW3	2.9	2	0.90	0.05	0.025	0.00063	0.0018	1.76625	5.29875	1
MW4	2.2	0	2.20	0.05	0.025	0.00063	0.0043	4.3175	12.9525	2
MW9	4.5	0	4.50	0.05	0.025	0.00063	0.0088	8.83125	26.4938	4
MW10	3.4	1.6	1.80	0.05	0.025	0.00063	0.0035	3.5325	10.5975	2
MW11S	5	3.1	1.90	0.05	0.025	0.00063	0.0037	3.72875	11.1863	2
MW11D	30	12.1	17.90	0.05	0.025	0.00063	0.0351	35.1288	105.386	18
MW16S	5	0.9	4.10	0.05	0.025	0.00063	0.008	8.04625	24.1388	4
MW16D	10	0	10.00	0.05	0.025	0.00063	0.0196	19.625	58.875	10
MW17S	5	1.1	3.90	0.05	0.025	0.00063	0.0077	7.65375	22.9613	4
MW17D	15	0	15.00	0.05	0.025	0.00063	0.0294	29.4375	88.3125	15
MW18	21	0	21.00	0.05	0.025	0.00063	0.0412	41.2125	123.638	21

LEACHATE MONITORING REPORT FOR BALLYJAMESDUFF LANDFILL W0093-01 Biannual 2 0f 2 2016

Client: **Cavan County Council**

Site Location: **Derrylurgan, Ballyjamesduff**

Report No.: CCC-03-01-06-02-06-Rev 0

Produced by: Terry Keating, B.Sc., Environmental Science

Approved by: **Date:** 23rd November 2016
Bróna Keating, B.Sc., M.Sc., CEnv.,MCIWM

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Rev.	Date	Description

I SUMMARY

Boylan Engineering (Eng. & Environmental Consultancy) was commissioned by Cavan County Council to carry out Environmental Monitoring at Ballyjamesduff Landfill (W0093-01), Derrylurgan, Ballyjamesduff, Co Cavan for Bi-annual two 2016.

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

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Appendix

1. 0 INTRODUCTION

Ballyjamesduff landfill is situated approximately 600m from Ballyjamesduff town centre in the town land of Derrylurgan. The site was in operation from the 1960's and comprises some 1.62 hectares. The site was originally peat land which was stripped for commercial purposes and was then operated as a traditional landfill until its closure in March 2002. A waste licence was issued by the Environmental Protection Agency after the closure of the site and remedial works were completed.

Condition 8.1 of the waste licence requires that monitoring be carried out in accordance with Schedule D of the licence. The following reports give details of leachate sampling programme conducted on site and also summarises findings and analytical results for Bi-Annual 2 2016.

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
- Assess the effectiveness of gas control measures installed at the site
- Establish a reliable database of information for the landfill throughout its life

According to the Response matrix for landfills, Ballyjamesduff landfill is situated in the R2[1] Zone. This zone was categorized using a vulnerability rating combined with the aquifer category for the area. Landfills situated in R2[1] Zones are acceptable subject to guidance 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 wells is measured by dipping.
- 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 analyser and a Hanna 9164 meter, respectively.
    - Conductivity
    - Temperature
    - pH

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 ^{o}C and 4^{o}C on their journey to the laboratory.
- On arrival at the laboratory, samples are stored between 0 ^{o}C and 4 ^{o}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 2016					
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	Gas	94.92	94.92		N291352.31 E252020.68
MW2	Gas	92.92	92.92		N291377.38 E252082.84
MW3	GW	94.39	92.44	2.0	N291369.28 E252109.44
MW4	GW	93.65	93.7	0.0	N291309.78 E252129.14
MW5	Gas	92.84	-	n/a	TBC
MW6	Leachate	100.71	-	n/a	TBC
MW 7	Leachate	97.54	-	n/a	TBC
MW8	Leachate	96.56	-	n/a	N291346.99 E252041.22
MW9	GW	95.69	95.69	0	N291369.67 E252103.93
MW10	GW	93.95	92.35	1.6	N291314.86 E252138.12
MW11S	GW	TBC	-	3.1	TBC
MW11D	GW	TBC	-	12.1	TBC
MW12	Gas	94.38	-	n/a	N291236.30 E252110.10
MW13	Gas	94.69	-	n/a	TBC
MW14	Gas	98.77	-	n/a	N291263.92 E252131.54
MW15	Gas	93.11	-	n/a	TBC
MW16S	GW	94.02	93.12	0.90	N252076.89 E291174.65
MW16D	GW	94.16	94.16	0.00	N252077.36 E291173.27
MW17S	GW	93.59	92.49	1.10	N251997.04 E291377.19
MW17D	GW	93.63	93.63	0.00	N251997.80 E291376.00
MW18	GW	93.5	93.5	0.0	N251986.57 E291425.39
SW1	SW	n/a	-	n/a	TBC
SW2	SW	n/a	-	n/a	TBC
Cap	SW	n/a	-	-	TBC

2.4 Weather Report

REPORTS FROM BALLYHAISE (A)							
Date	Rainfall	Max	Min	Grass Min Temp	Mean Wind Speed	Maximum Gust	Sunshine
	(mm)	Temp	Temp	(°C)	(knots)	(if >= 34 knots)	(hours)
		(°C)	(°C)				
05/10/2015	4	15.4	11.3	9.8	5.2		

2.0 SUMMARY OF RESULTS

Table 1.0 04th Quarter Leachate monitoring 2016

Report Number		102127/1													
Monitoring Date:		05/10/2016													
Method Number		**Site Tests**	**EW154M**	**EW154M**	**EW153**	**EW153**	**EW001**	**EW096**	**EW154M-1**		**MIC133**		**EW137**	**DEFAULT**	**EW146**
Parameter		Visual Inspection	Ammonia (as N)	TON (as N)(Calc)	pH	Conductivity @20 DegC	BOD	COD	Chloride	Sulphate	E. Coli	Total Coliforms	Fluoride	Total Cyanide High	Total Phosphorus-TP
Units			mg/l N	mg/l N	pH Units	uscm-1@20	mg/L	mg/L	mg/L	mg/L	MPN/100ml	MPN/100ml	mg/L	ug/L	mg/l P
Limit of Detection		-	0.007	0.138	0.3	25	1	8	2.6	1	0	0	0.1	10	0.01
Date Testing		5.10.16	6.10.16												
ELS Ref	**Client Ref**														
102127/1	MW7	Clear	***34***	0.83	7.3	***1422***	27	30	***43***	5.8	<10	***24197***	<0.1	<9	0.8
102127/2	MW8	Clear	***19***	<0.69	6.7	***1094***		30	***21***	5.2	<10	***4611***	0.12	<9	0.3
Inerim Guide Value			0.15	-	≥6.5&≤9.5	1000	-	-	30	200	0	0	1	0.01	-

Method Number		**EM130**												
Parameter		Chromium-Total	Iron-Dissolved	Manganese-Dissolved	Potassium-Dissolved	Sodium-Dissolved	Cadmium-Dissolved	Calcium-Dissolved	Copper-Dissolved	Lead-Dissolved	Magnesium-Dissolved	Mercury-Dissolved	Zinc-Dissolved	Boron-Dissolved
Units		ug/L	ug/L	ug/L	mg/L	mg/L	ug/L	mg/L	mg/L	ug/L	mg/L	ug/L	ug/L	mg/L
Limit of Detection		1	20	1	0.2	0.5	0.1	1	0.003	0.3	0.3	0.02	1	0.02
Date Testing		6.10.16												
ELS Ref	**Client Ref**													
102127/1	MW7	5.2	***11000***	***930***	***35.2***	33.5	<0.1	130.4	<0.003	<0.3	40.5	<0.02	4	0.35
102127/2	MW8	3.5	***93000***	***2900***	***9.4***	13	<0.1	62.5	<0.003	<0.3	32.6	<0.02	1.5	0.28
Inerim Guide Value		30	200	50	5	150	5	200	0.03	10	50	1	100	1

Exceedance	
NOTES	
1	Sub-contract analysis denoted by *
2	ND = Concentration was below the limit of detection

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 bold italics indicate where the interim guide value has been exceeded. A leachate sample was abstracted from wells MW7 and MW8 during quarter four monitoring. Results show that the Interim Guide Values were exceeded on this occasion for the parameters Ammonia, Conductivity, total coliforms, Iron Manganese and Potassium and Chloride. These results are consistent with those obtained in previous monitoring events.

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

5.0 CONCLUSION

The leachate results obtained are 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. Information relating to previous results can be seen in the historical data tables in Appendix 1.

		Lechate historical 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
WELL MW 7	Second biannual 2016	***34***	0.83	7.3	***1422***	27	30	43
	First Biannual 2016	***17***	<0.69	7	***1035***	21.9	65	15
	First Biannual 2015	***14***	0.166	8	972			20.7
	Second biannual 2015	***16***	<0.69	6.9	***1044***	<10	69	13
WELL MW 8	Second biannual 2016	***19***	<0.69	6.7	***1094***		30	21
	First Biannual 2016	***31***	<0.69	7.5	***1362***	18.9	46	37
	First Biannual 2015	***29***	1.214	8	***1234***	-	-	33.1
	Second biannual 2015	***33***	1.1	7.4	***1447***	57	89	37
Interim Guide Values		0.15	NAC	≥6.5&≤9.5	1000			200

ELS LTD INAB ACCREDITATION SCHEDULE SUMMARY SHEET

Miscellaneous (P,G,W,S)
Ammonia/Ammonium 0.007-1mg/l N EW154
Chloride 2.6-250 mg/l EW154
Flouride 0.1 - 2 mg/l EW137
COD 8-1500 mg/l EW094
Nitrate 0.12-50 mg/l N EW154
Nitrite 0.013-1 mg/l N EW154
pH 4 – 10 pH Units EW153
Phosphate 0.009-1 mg/l P EW154
Alkalinity 10-1000mg/l EW153
TOC 0.25-100mg/l EW123
BOD 1-1300mg/l EW001
Total Nitrogen 1-100mg/l N EW140
Total Phosphorous 0.01-40 mg/l P EW143
Suspended Solids 5-1000mg/l EW013
Dissolved Oxygen 1 to 10 mg/l EW043
Conductivity 25-6000 us/cm EW154

Miscellaneous (P,G,S)
Bromate 1 to 50ug/l BRO3 EW137
Colour 2.5-50mg/l PtCCo EW154
Sulphate 1-250mg/l SO4 EW154
Total Dissolved Solids 15-1000mg/l EW046
Total Hardness 3-330mg/l CaCO3 EM099
Total Oxidised Nitrogen 0.138-51mg/l N EW051
Turbidity 0.11-150 NTU EW136
TKN Calculation 1-49 mg/l EW010

Metals EM130 (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 20.0 - 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

SI439 Potable Water VOCs & THM
EO025 (P,G,S,W)
Benzene 0.1-35 µg/l
1.2-Dichloroethane 0.1-35 µg/l
Tetrachloroethene 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

Other VOC's EO025 (P,G,S,W)
Bromomethane 0.5 - 35 µg/l
Ethyl Ether/Diethyl Ether 0.5 - 35 µg/l
11 Dichloroethene 0.5 - 35 µg/l
Iodomethane/Mehyl 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
Chlormethyl Cyanide 0.5 - 35 µg/l
Hexachlorobutadiene 0.5 - 35 µg/l
Trans-1,2 Dichloroethene 0.5 - 35 µg/l
MtBE 0.5 - 35 µg/l
11 Dichloroethane 0.5 - 35 µg/l
Cis-12 Dichloroethene 0.5 - 35 µg/l
Methyl Acrylate 5.0 - 35 µg/l
Bromochloromethane 0.5 - 35 µg/l
Tetrahydrofuran 5.0 - 35 µg/l
111 Trichloroethane 0.5 - 35 µg/l
1-Chlorobutane 0.5 - 35 µg/l
Carbon Tetrachloride 0.5 - 35 µg/l
11 Dichloropropene 0.5 - 35 µg/l
12 Dichloropropane 0.5 - 35 µg/l
Dibromomethane 0.5 - 35 µg/l
Methyl Methacrylate 0.5 - 35 µg/l
13 Dichloropropene, cis 2.0 - 35 µg/l
MIBK/4 Methyl 2 Pentanone 2.0 - 35 µg/l
Toluene 0.5 - 35 µg/l
13 Dichloropropene,trans 2.0 - 35 µg/l
Ethyl Methacrylate 2.0 - 35 µg/l
112 Trichloroethane 0.5 - 35 µg/l
13 Dichloropropane 0.5 - 35 µg/l
2 Hexanone 1.0 - 35 µg/l
12 Dibromoethane 0.5 - 35 µg/l
Chlorobenzene 0.5 - 35 µg/l
1112 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
Stryene 2.0 - 35 µg/l
Isopropyl Benzene 0.5 - 35 µg/l
Bromobenzene 0.5 - 35 µg/l
1122 Tetrachloroethane 0.5 - 35 µg/l
123 Trichloropropane 2.0 - 35 µg/l
Propyl Benzene 0.5 - 35 µg/l
2-Chlorotoluene 0.5 - 35 µg/l
4 Chlorotoluene 0.5 - 35 µg/l
135 Trimenthylbenzene 0.5 - 35 µg/l
Tert Butyl Benzene 0.5 - 35 µg/l
124 Trimethlbenzene 0.5 - 35 µg/l
Sec Butyl Benzene 0.5 - 35 µg/l
13 Dichlorobenzene 0.5 - 35 µg/l
P Isopropyltoluene 0.5 - 35 µg/l
14 Dichlorobenzene 0.5 - 35 µg/l
12 Dichlorobenzene 0.5 - 35 µg/l
N Butyl Benzene 0.5 - 35 µg/l
Hexachloroethane 5.0 - 35 µg/l
12 Dibromo 3Chloropropane 2.0 - 35 µg/l
124 Trichlorobenzene 0.5 - 35 µg/l
123 Trichlorobenzene 0.5 - 35 µg/l

Other VOC's EO025 (P,G,S)
22 Dichloropropane 0.5 - 35 µg/l

PAH EO129 (P,G,S)
Range 0.01 - 0.2 µg/l
Acenaphthene
Benzo (a) Anthracene
Benzo (a) Pyrene
Benzo (b) Fluoranthene
Benzo (ghi) Perylene
Benzo (k) Fluoranthene
Chrysene
Dibenzo (ah) Anthracene
Fluoranthene
Fluorene
Indeno (123-cd) Pyrene
Phenanthrene
Pyrene

Acid Herbicides (P,G,S)
Range 0.01 - 0.2 µg/l
2,4,5-T H
2,4-D H
2,4-DB H

Organophosphorus Pesticides(P,G,S)
Range 0.01 - 0.2 µg/l
Famphur OP
Methyl Parathion OP
Parathion OP

Organochlorine Pesticides (P,G,S)
Range 0.01 - 0.2 µg/l
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

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