

COMHAIRLE CHONDAE AN CABHÁIN

Cavan County Council



Annual Environmental Report

2012

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.

<u>Contents</u>	<u>Page</u>
1.0 INTRODUCTION	5
2.0 REPORTING PERIOD	6
3.0 WASTE ACTIVITIES CARRIED OUT AT THE FACILITY	6
4.0 QUANTITY AND COMPOSITION OF THE WASTE	6
5.0 SUMMARY REPORT ON EMISSIONS	6
5.1 Surface Water	6
5.2 Ground Water	8
5.3 Leachate	16
5.4 Gas	19
6.0 RESULTS SUMMARY & INTERPRETATION OF MONITORING	21
7.0 RESOURCE & ENERGY CONSUMPTION SUMMARY	21
8.0 REPORT ON RESTORATION OF FACILITY	21
9.0 QUANTITIES OF LANDFILL GAS EMITTED FROM FACILITY	21
10.0 PROCEDURES DEVELOPED BY LICENCEE	22
11.0 REPORTED INCIDENTS AND COMPLAINTS SUMMARY	22
12.0 REVIEW OF NUISANCE CONTROLS	22
13.0 REPORT ON TRAINING STAFF	22
14.0 ANY OTHER ITEMS SPECIFIED BY THE EPA	23

List of Tables

Table 5.1	Surface Water Summary Results	7
Table 5.2	Groundwater Summary Results	9
Table 5.3	Leachate Summary Results	17
Table 5.4	Gas Emissions Summary Results	19
Table 12.1	Management Structure 2012	23

List of Graphs

Graph 5.1	Surface Water-Chemical Oxygen Demand	8
Graph 5.2	Ground Water – E.coli	10
Graph 5.3a&b	Groundwater-Ammonia	11
Graph 5.4a&b	Groundwater Total-Coliforms	12
Graph 5.5	Groundwater –Chloride	13
Graph 5.6a&b	Groundwater –Iron	14
Graph 5.7	Groundwater –Potassium	15
Graph 5.8	Leachate- Ammonia	17
Graph 5.9	Leachate- Conductivity	18
Graph 6.0	Gas-Methane	20
Graph 6.1	Gas- Carbon Dioxide	20

List of Appendices

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

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 2012 to 31st December 2012.

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 2012 to 31st December 2012.

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. Monitoring had been reduced at the time of the restoration works and the full sampling regime had not been re-established until 2012 when advised by the Agency.

5.1 Surface Water

As detailed by table 5.1, there were slight exceedances in the surface water analysis for parameters COD 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.

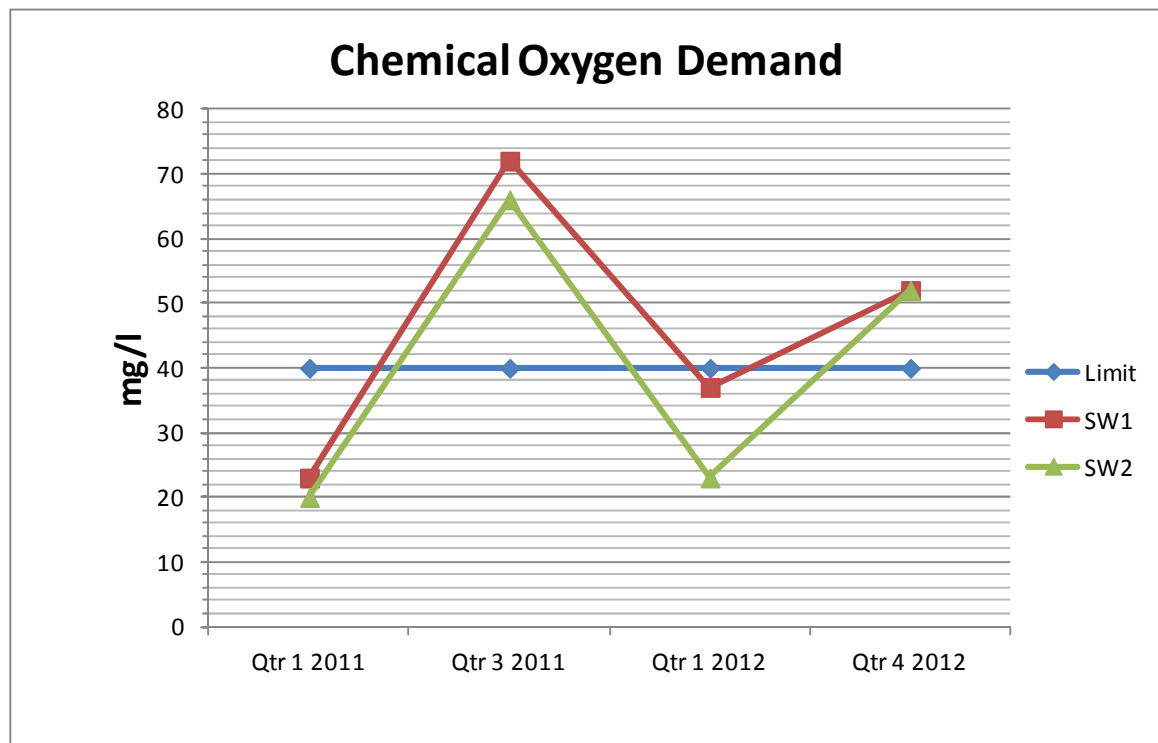
All parameters have been assessed against water limits as outlined in the European Communities (Drinking Water) (No.2) Regulations 2007. Results in Hatched Red indicate where the interim guide value has been exceeded.

Table 5.1 Surface water summary results

	Parameter	BOD	COD
	Units	mg/l	mg/l
SW1	Qtr 4 2012	5	52
	Qtr 1 2012	<1.0	37
	Qtr 4 2011		
	Qtr 3 2011	<2	72.00
SW2	Qtr 4 2012	6	52
	Qtr 1 2012	<1.0	23
	Qtr 4 2011		
	Qtr 3 2011	<2	66.00
Discharge C	Qtr 4 2012	-	-
	Qtr 1 2012	<1.0	29
	Qtr 4 2011		
	Qtr 3 2011	<1.0	39.00
S.I No. 294/1989 A1		5	

A comprehensive report of all results obtained in 2012 is presented in Appendix C.

Graph 5.1



All surface water locations were found to be within limits specified in the above regulations with the exception of COD and BOD on one occasion during 2012. 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

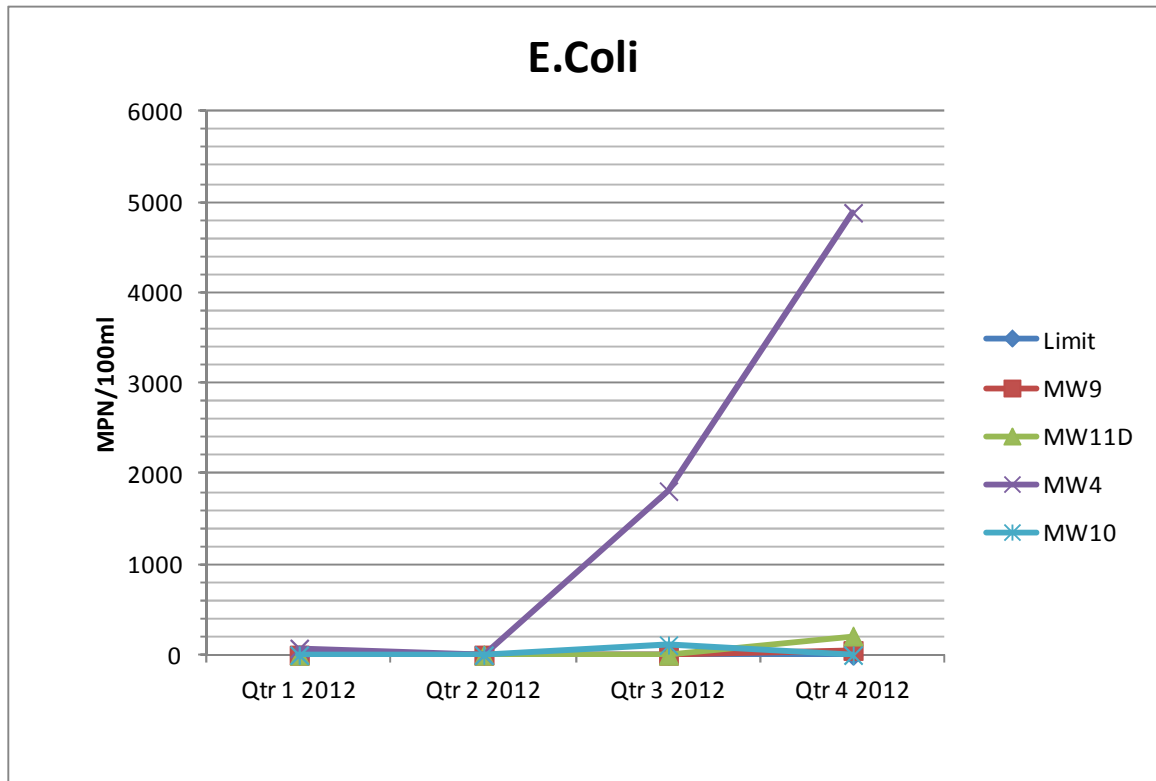
The following table details all reoccurring exceedances at all groundwater wells during 2012. Results in Hatched Red indicate where the interim guide value has been exceeded when compared to limits stipulated by the Environmental Protection Agency.

Table 5.2 Groundwater Summary Results

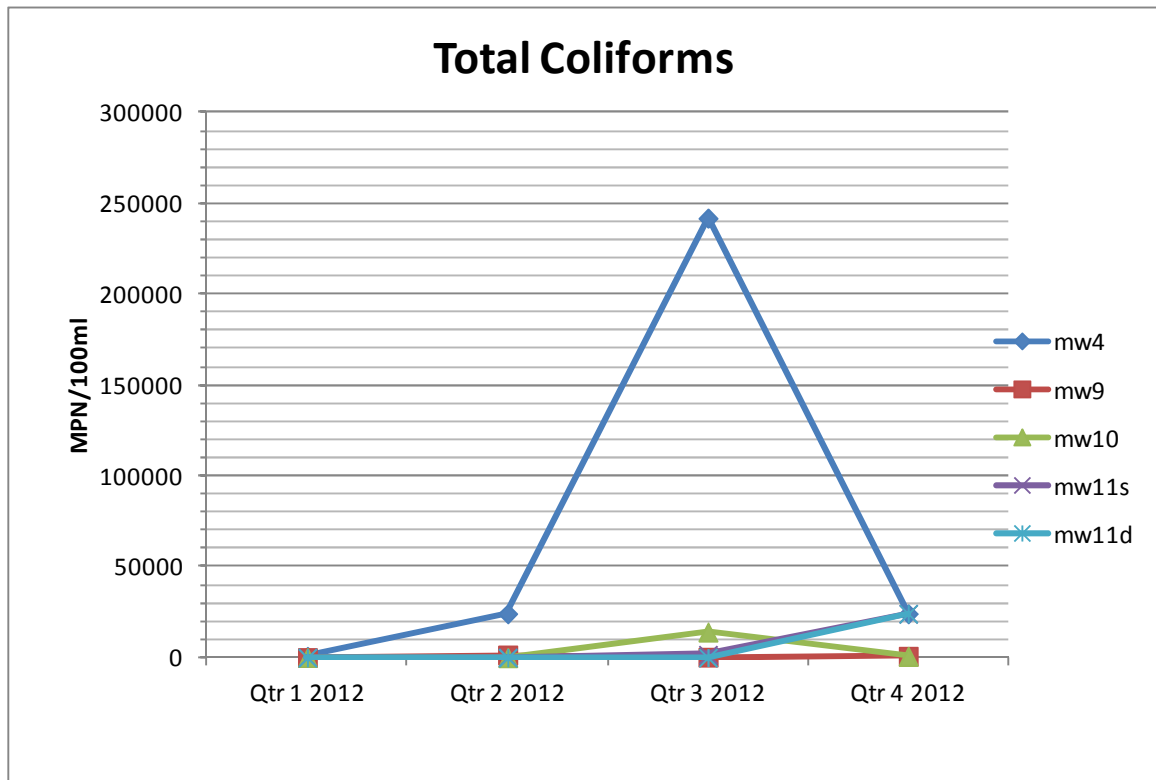
	Parameter	E.Coli	Ammonia	TON	Tot Coliforms	Cond	Cl	Total Phenols	Fe	K
	Units	MPN/100ml	mg/l N	mg/l N	MPN/100ml	us/cm	mg/l	mg/l	mg/l	mg/l
MW 3	Qtr 4 2012	73	26.797	0.949	24197	885	20.1	<0.15	35511.1	13.7
	Qtr 3 2012	0	36.241	0.364	120330	906	19.8	<0.15	26.9055	15.5
	Qtr 2 2012	0	52.293	<0.138	56500	924	19.5	<0.15	30.07	13.3
	Qtr 1 2012	0	48.604	<0.138	7620	902	18.4	<0.15	0.02	3.5
MW 4	Qtr 4 2012	4884	0.671	1.032	24197	271	13	<0.15	1002.4	7.7
	Qtr 3 2012	1810	4.255	0.171	241961	523	23.6	<0.15	2.7653	9.8
	Qtr 2 2012	0	4.077	<0.138	>24196	560	23.2	<0.15	1.645	8.4
	Qtr 1 2012	74	2.615	<0.138	689	436	20.8	<0.15	2.185	9
MW9	Qtr 4 2012	52	12.364	<0.138	794	891	17.1	<0.15	27030.4	12.6
	Qtr 3 2012	0	9.951	0.276	218	823	13.5	<0.15	21.1394	10.5
	Qtr 2 2012	0	9.108	<0.138	1500	823	8.2	<0.15	21.82	9.7
	Qtr 1 2012	0	11.468	<0.138	109	852	9.6	<0.15	21.03	11.2
Well MW 10	Qtr 4 2012	0	28.98	<0.138	727	1077	44.3	<0.15	3156.8	23.8
	Qtr 3 2012	110	25.239	0.522	14136	1044	48.9	<0.15	32.6041	19.6
	Qtr 2 2012	0	24.883	<0.138	3	992	46.7	<0.15	24.84	20.8
	Qtr 1 2012	0	25.504	<0.138	63	973	44.3	0.17	28.2	20.9
WELL 11 S	Qtr 4 2012	130	0.031	0.253	24197	713	98.3	<0.15	31.5	2.8
	Qtr 3 2012	0	0.03	0.477	1610	549	53.4	<0.15	0.0478	1.8
	Qtr 2 2012	0	0.095	0.26	200	851	169.2	<0.15	0.02	3.1
	Qtr 1 2012	0	0.075	0.356	75	627	82.9	<0.15	0.02	2.4
WELL 11D	Qtr 4 2012	210	0.019	<0.138	24197	411	8.5	<0.15	<20	2.1
	Qtr 3 2012	0	0.029	<0.138	20	390	6.6	<0.15	0.02	2.2
	Qtr 2 2012	0	0.096	<0.138	5	398	7.6	<0.15	0.02	2
	Qtr 1 2012	0	0.047	<0.138	7	382	6.6	<0.15	0.02	2.3
WELL 16 S	Qtr 4 2012	0	0.426	0.162	520	517	17.2	<0.15	305.8	8.7
	Qtr 3 2012	0	0.1	0.224	336	472	16.5	<0.15	0.0241	4.2
	Qtr 2 2012	0	0.152	<0.138	0	467	18	<0.15	0.02	3.4
	Qtr 1 2012	0	0.107	0.226	0	473	17.1	<0.15	0.1308	6.5
WELL 16 D	Qtr 4 2012	0	0.069	<0.138	11	487	18.6	<0.15	26.4	2.5
	Qtr 3 2012	0	0.069	<0.138	15	486	17.7	<0.15	0.077	2.3
	Qtr 2 2012	0	0.158	<0.138	0	481	18.6	<0.15	0.0555	2.2
	Qtr 1 2012	0	0.077	<0.138	0	471	16.5	<0.15	0.0365	2.8
WELL 17 S	Qtr 4 2012	0	9.161	<0.138	3654	493	14.1	<0.15	14773.6	3.6
	Qtr 3 2012	0	9.495	<0.138	0	482	13.3	<0.15	11.6897	4.4
	Qtr 2 2012	0	10.368	<0.138	>24196	492	14.8	<0.15	14.87	5.1
	Qtr 1 2012	0	9.878	<0.138	1539	495	13.7	<0.15	17.92	3.8
WELL 17 D	Qtr 4 2012	0	0.297	<0.138	78	495	16	<0.15	334.7	3.2
	Qtr 3 2012	0	0.274	<0.138	130	493	18.3	<0.15	0.3222	3
	Qtr 2 2012	0	0.322	<0.138	56	491	16.5	<0.15	0.2865	3.5
	Qtr 1 2012	0	0.36	<0.138	0	471	14.5	<0.15	0.2969	3.3
WELL 18	Qtr 4 2012	1	3.01	0.425	4	481	14.3	<0.15	415.9	2.9
	Qtr 3 2012	0	0.032	<0.138	3	475	13.5	<0.15	0.342	2.9
	Qtr 2 2012	0	0.083	<0.138	201	481	14.8	<0.15	0.2384	3.2
	Qtr 1 2012	0	0.053	<0.138	0	460	13.7	<0.15	0.2365	3.4
IGV		0	0.15	NAC	0	1000	30	0.0005	0.200	5

The following graphs detail all groundwater exceedances.

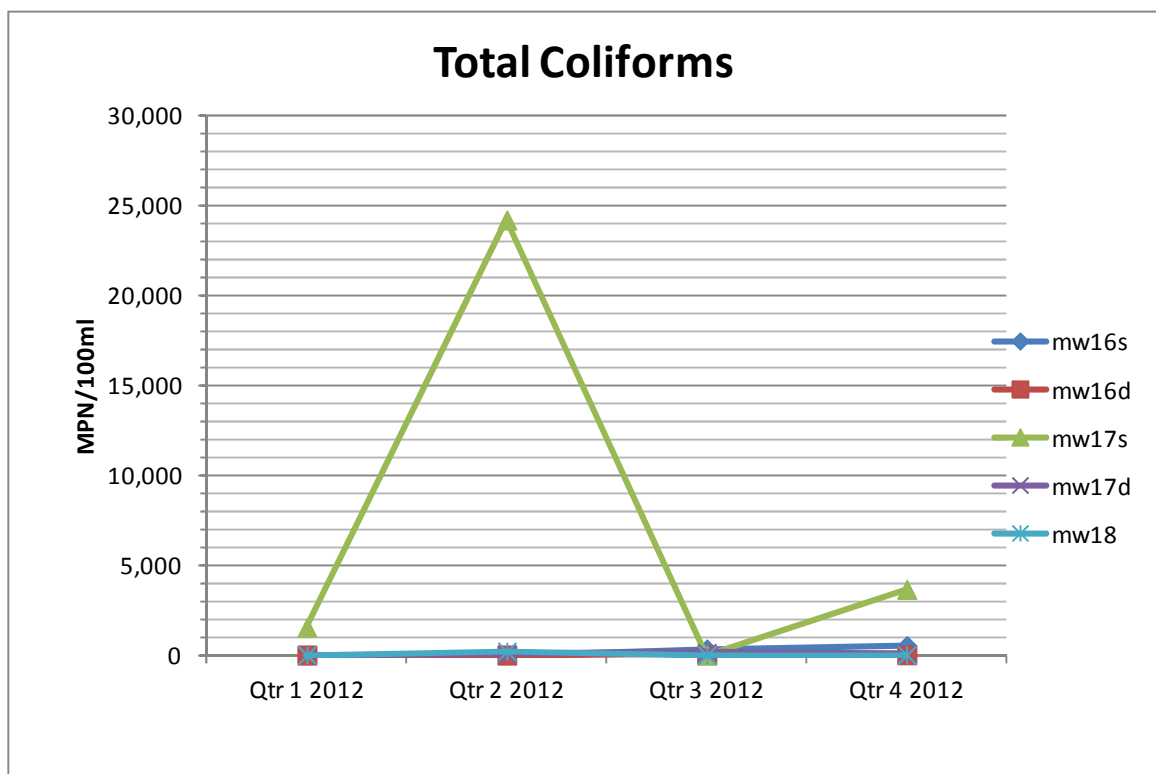
Graph 5.2



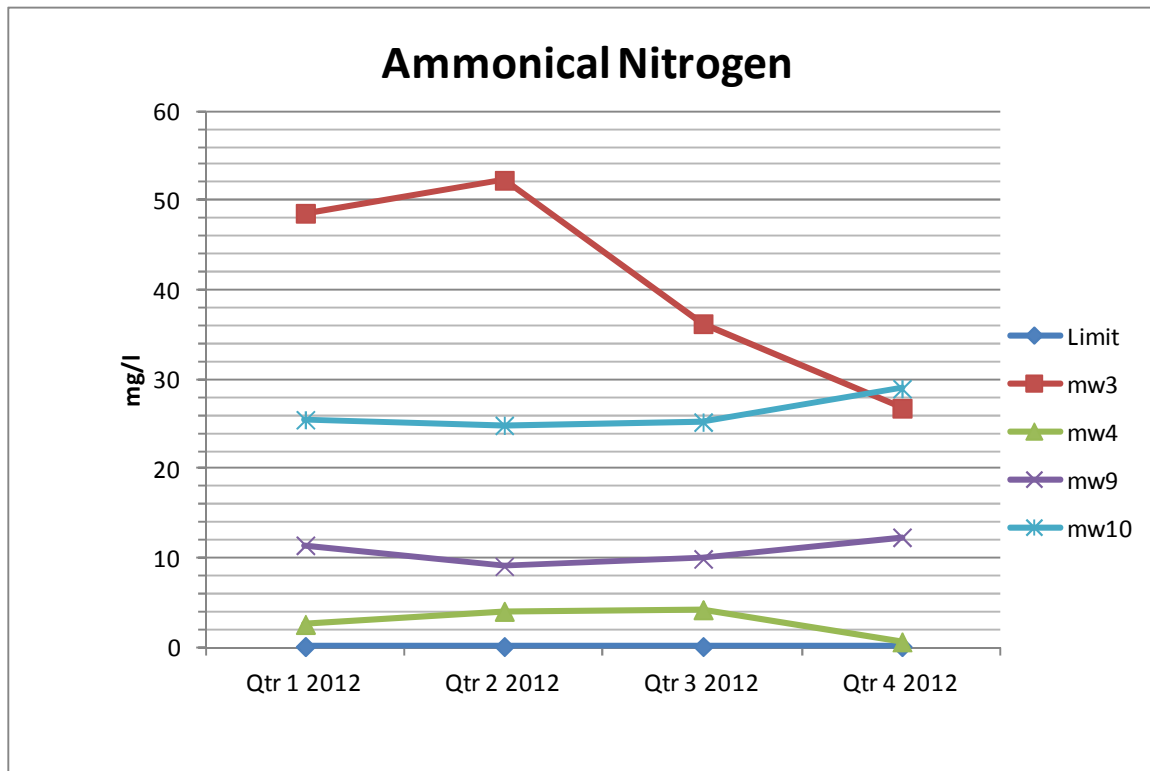
Graph 5.3a



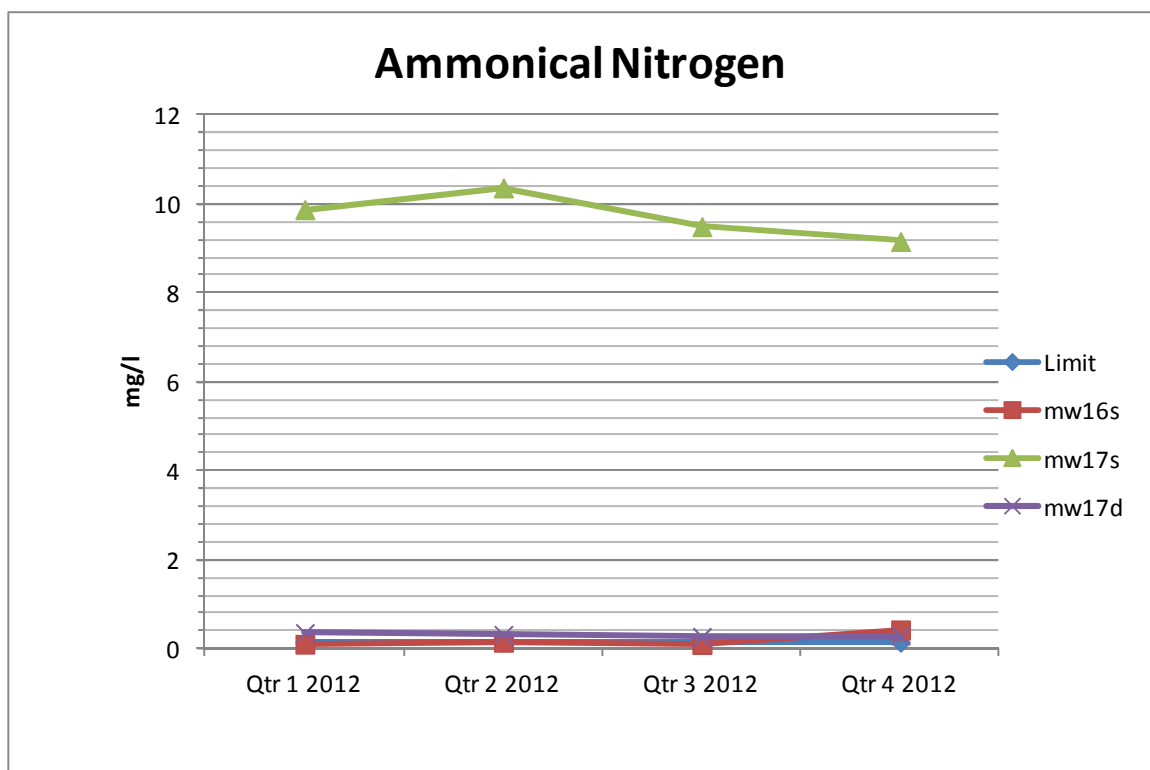
Graph 5.3b



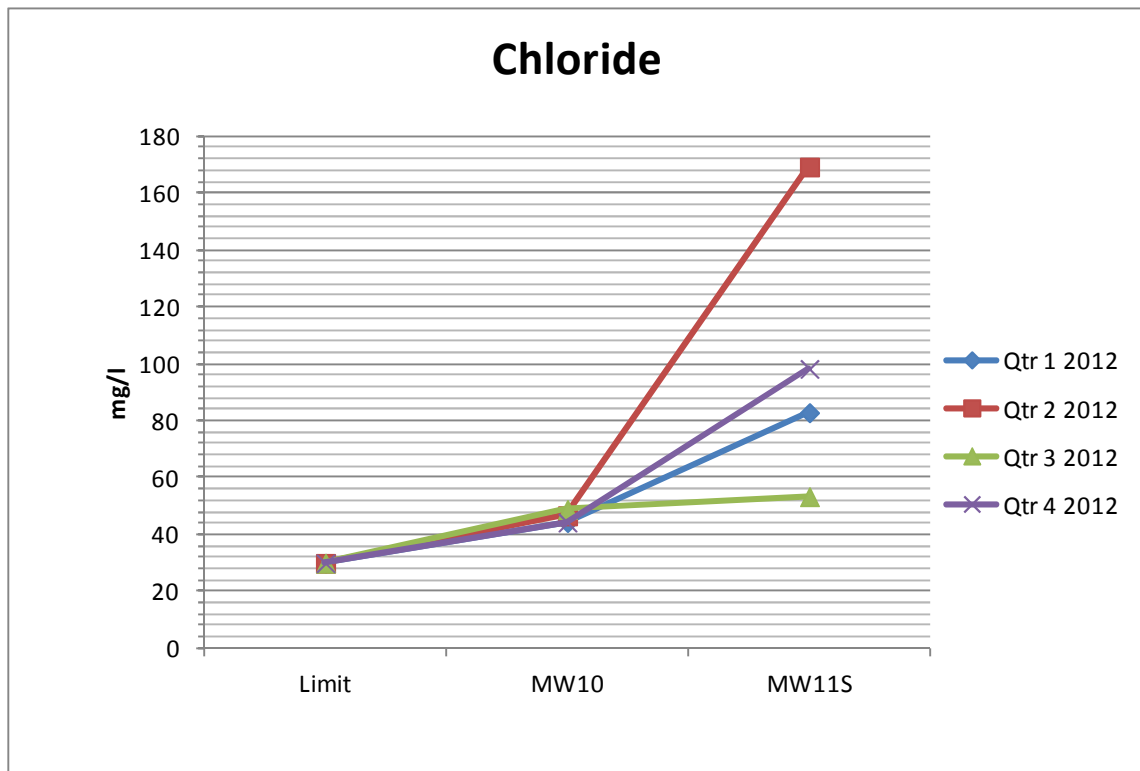
Graph 5.4a



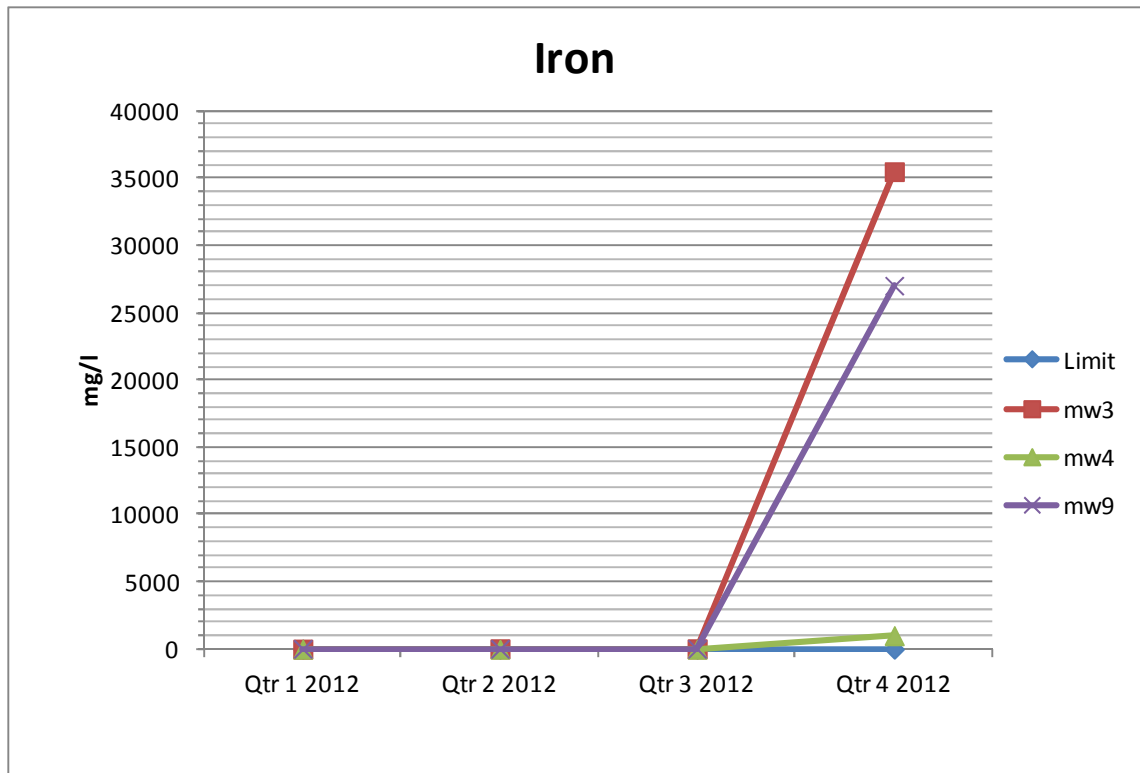
Graph 5.4b



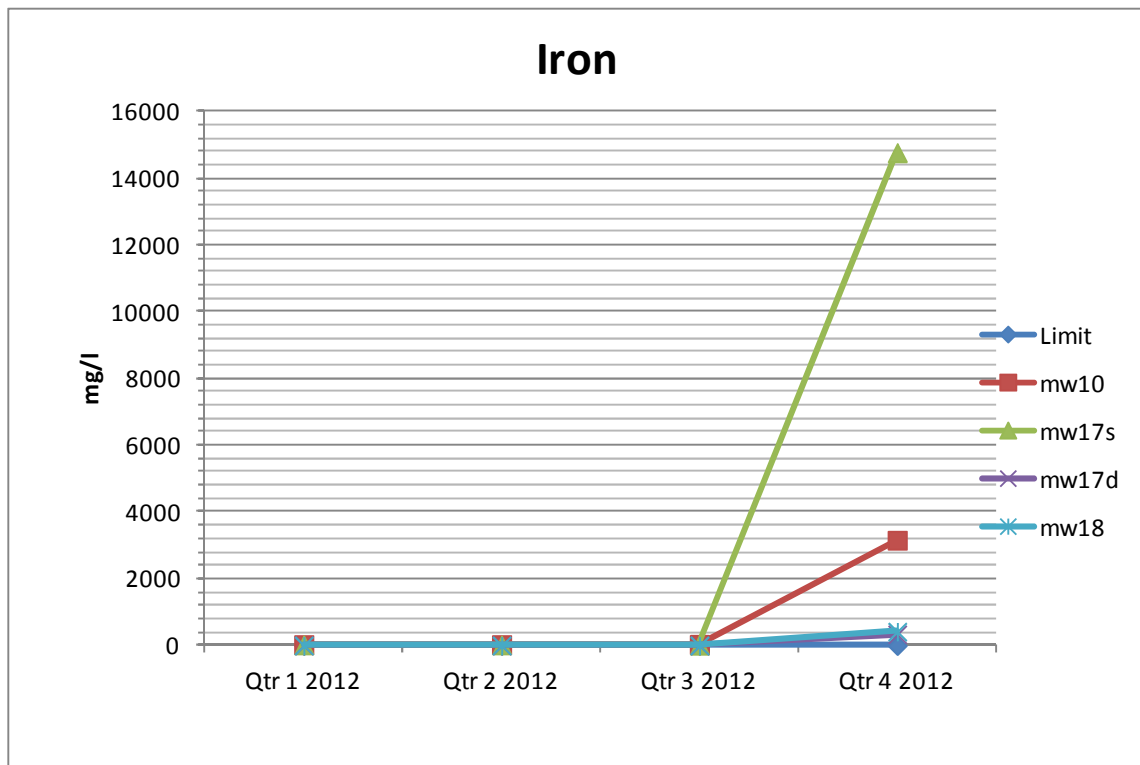
Graph 5.5



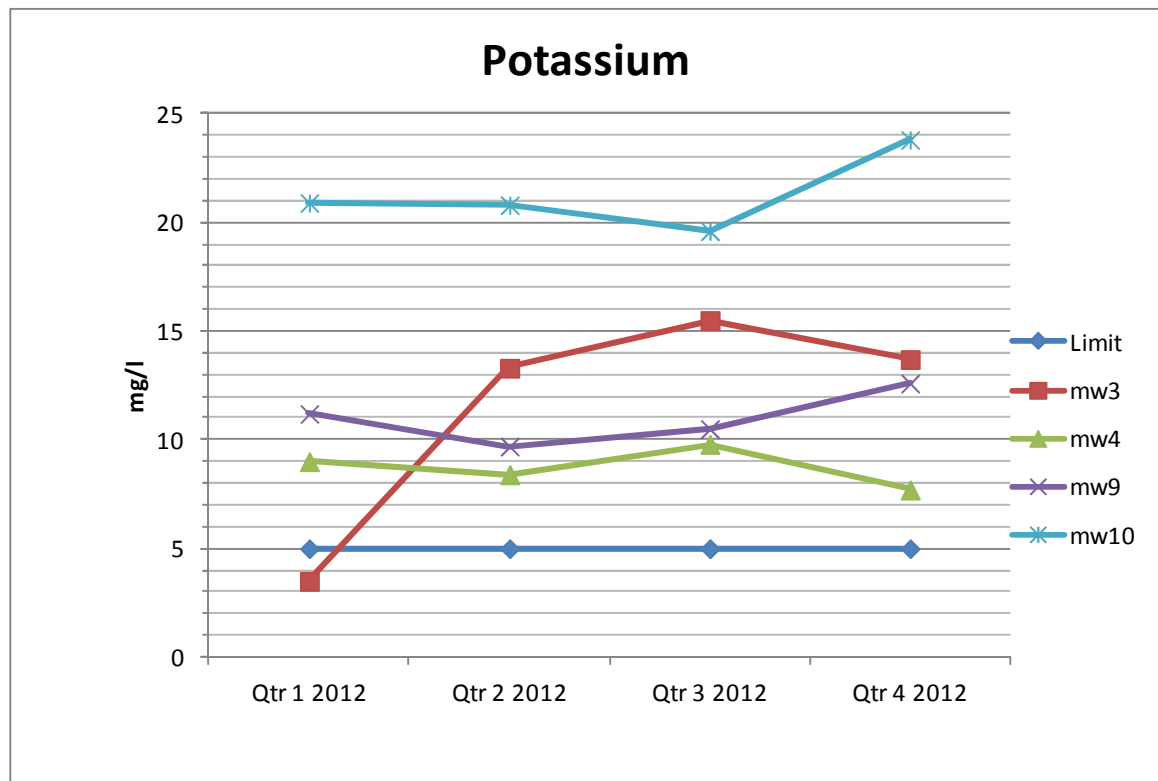
Graph 5.6a



Graph 5.6b



Graph 5.7



As detailed in the above graphs, there were numerous ground water exceedances at this landfill during 2012.

Exceedances occurred in the following parameters:

- ***Escherichia coli***: Elevated levels of this parameter were found in samples MW3, MW4, MW9, MW10, MW11S & MW11D. 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 2012 and as such the E.Coli contamination cannot be solely attributed to the landfill itself.
- **Ammonia**: Elevated levels of this parameter were prevalent during 2012. 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 exceedances. However, during 2012 the exceedances in this parameter were isolated to only two wells, MW10 and MW11S. Contamination of well 11S from the landfill is impossible due to MW11S being located up gradient of the landfill. Therefore chloride contamination should be concluded to be from an alternative source 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.

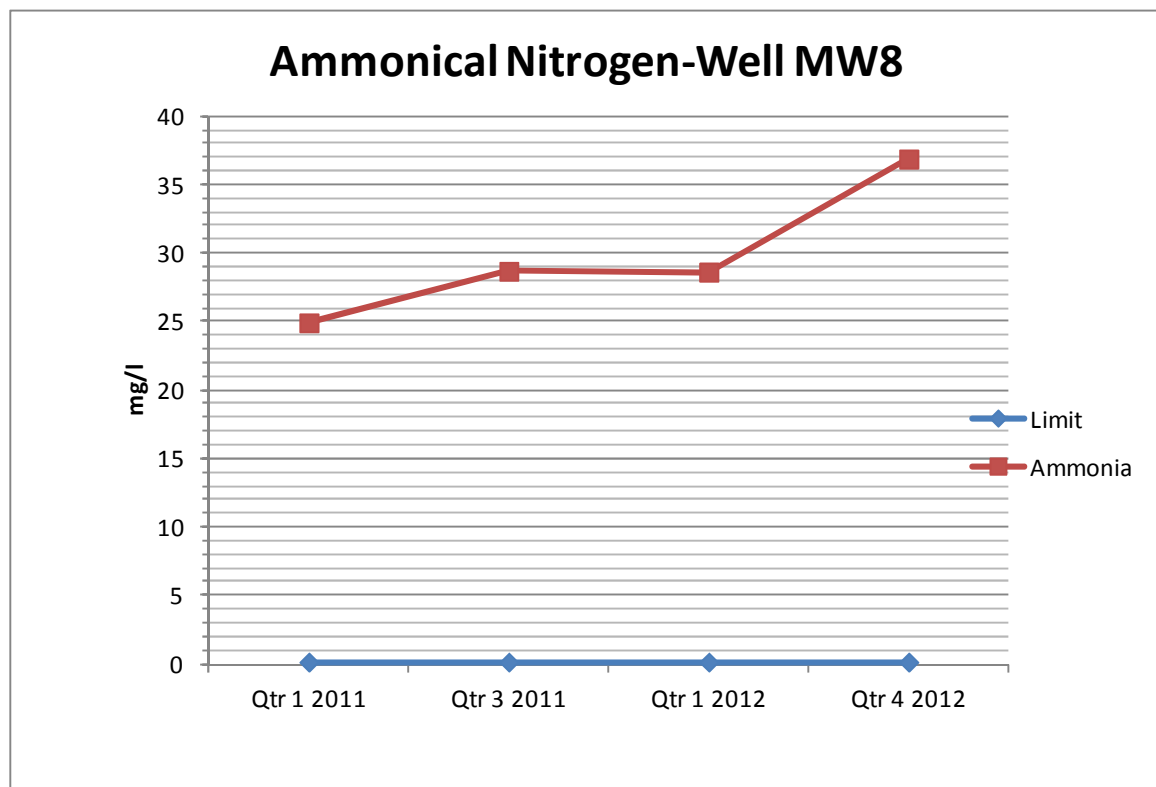
Re-occurring exceedances are displayed below. Results in Hatched Red indicate where the interim guide value has been exceeded when compared to limits stipulated by the Environmental Protection Agency.

Table 5.3 Leachate Summary Results

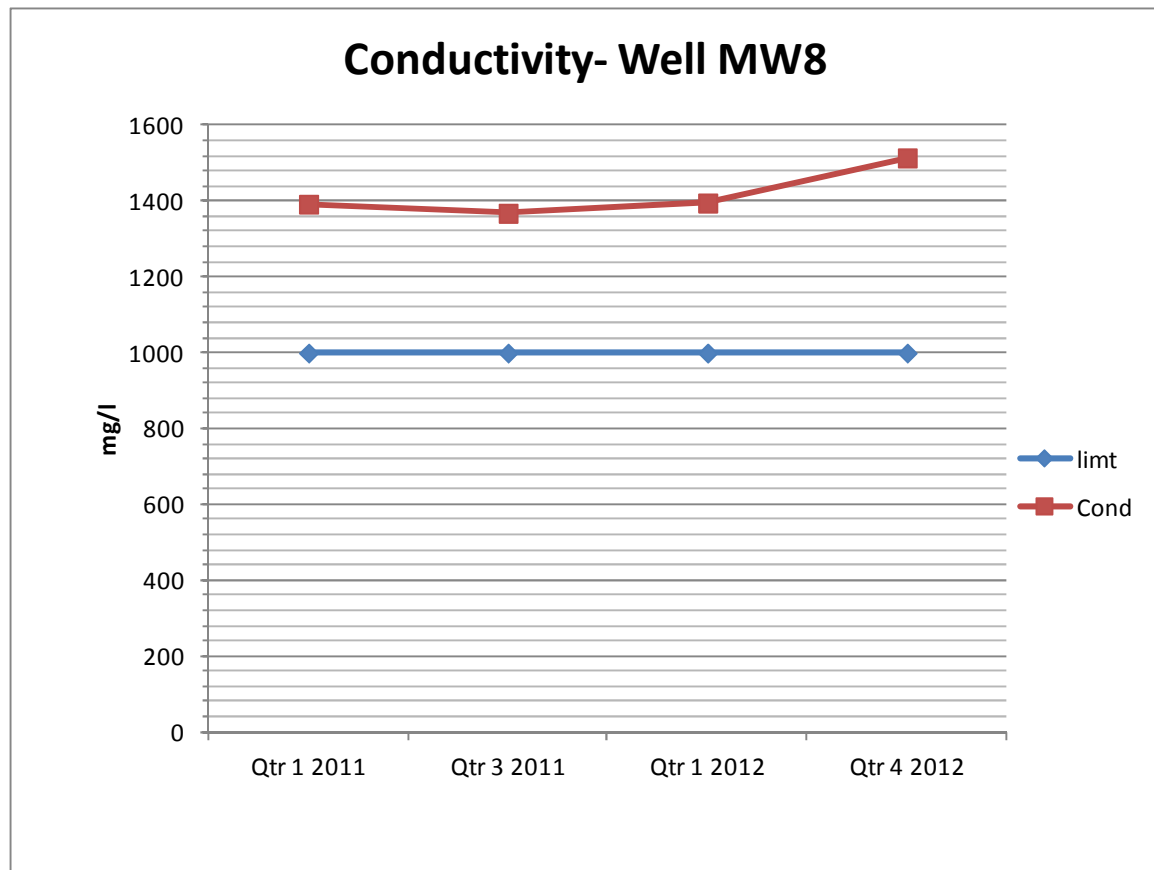
	Parameter	Ammonia	Cond
	Units	mg/l N	us/cm
WELL MW 7	Qtr 4 2012	10.985	1042
	Qtr 1 2012	10.438	975
	Qtr 4 2011		
	Qtr 3 2011	9.45	895
WELL MW 8	Qtr 4 2012	36.89	1515
	Qtr 1 2012	28.627	1396
	Qtr 4 2011		
	Qtr 3 2011	28.688	1369
Interim Guide Values		0.15	1000

- Leachate sample were not available on monitoring event (dry wells)

Graph 5.8



Graph 5.9



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.

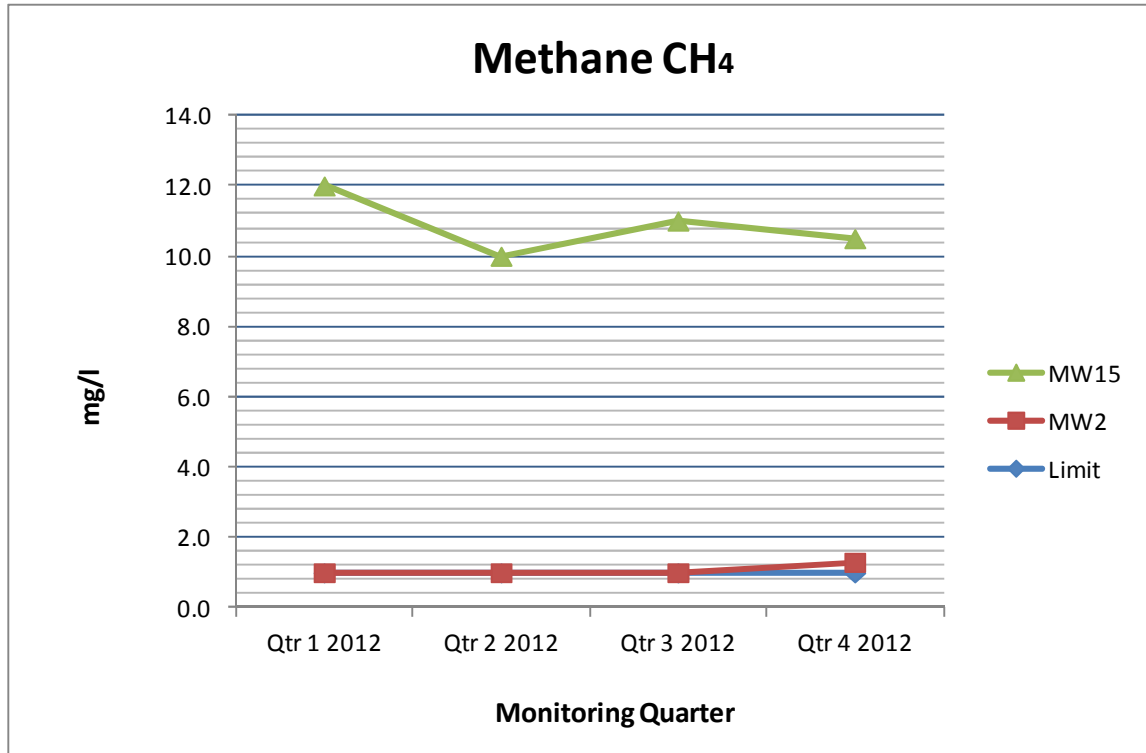
5.4 Gas Emissions

Landfill gas was monitored at five locations both within and outside the landfill mass. The following table details all results during 2012.

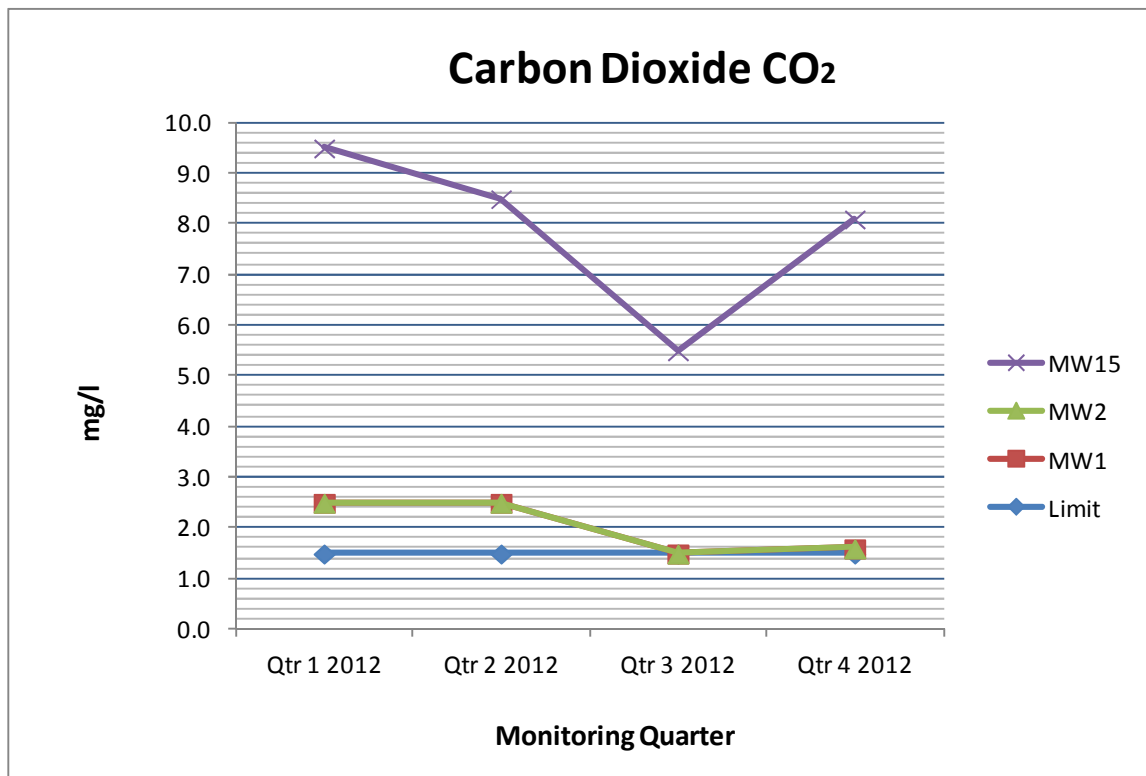
Table 5.4 Gas Emissions Summary Results

Method		GA 2000	GA 2000	GA 2000	GA 2000	GA 2000
Parameter		CH ₄	CO ₂	O ₂	H ₂ S	Barometric Pressure
Units		% v/v	% v/v	%	PPM	mb
Client Ref	Qtr	-	-	-	-	-
MW 1	Qtr 4 2012	0	0.1	20.4	0	974
	Qtr 3 2012	0	0	19	0	1001
	Qtr 2 2012	0	1	21	0	998
	Qtr 1 2012	0	1	20	0	1023
MW 2	Qtr 4 2012	0.3	0.0	18.8	0	973
	Qtr 3 2012	0	0	20	0	1004
	Qtr 2 2012	0	0	21	0	998
	Qtr 1 2012	0	0	21	0	1023
MW 12	Qtr 4 2012	0	0	20.6	0	972
	Qtr 3 2012	0	0	21	0	999
	Qtr 2 2012	0	0	22	0	998
	Qtr 1 2012	0	0	21	0	1022
MW 13	Qtr 4 2012	0	0.3	19.6	0	973
	Qtr 3 2012	0	0	21	0	998
	Qtr 2 2012	0	0	22	0	998
	Qtr 1 2012	0	0	22	0	1022
MW 14	Qtr 4 2012	9.2	6.5	16.3	0	973
	Qtr 3 2012	10	4	20	0	999
	Qtr 2 2012	9	6	16	0	998
	Qtr 1 2012	11	7	15	0	1022
MW 15	Qtr 4 2012	0	0	20.5	0	972
	Qtr 3 2012	0	0	20	0	999
	Qtr 2 2012	0	0	21	0	998
	Qtr 1 2012	0	0	21	0	1022
Limit		1	2			
Exceedance of waste						
NOTES						
1	Instrument Serial No: GA 07721					
2	Limit: Schedule C2, Licence					

Graph 6.0



Graph 6.1



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 2012. 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 insufficient 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 2012.

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

This information is reported in the PRTR Report attached in Appendix A. The estimated quantity of Methane released is 40,000kgs/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 2012.

11.0 REPORTED INCIDENTS AND COMPLAINTS SUMMARY

There were no incidences in the reporting period 2012. There were no complaints received by the EPA or the Local Authority regarding this facility in the reporting period 2012.

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

Table 13.1 Management Structure 2012

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

Contact Person for Sanitary Authority for 2012/ 2013:

John Brannigan
Senior Executive Officer
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.

APPENDIX A
PRTR Emissions
Report,
Landfill Gas Survey



| PRTR# : W0093 | Facility Name : Ballyjamesduff Landfill | Filename : W0093_2012.xls | Return Year : 2012 |

23/03/2013 13:13

[Guidance to completing the PRTR workbook](#)

AER Returns Workbook

Version 1.1.15

REFERENCE YEAR	2012
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1. FACILITY IDENTIFICATION

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

Waste or IPPC Classes of Activity

No.	class_name
3.1	Deposit on, in or under land (including landfill).
3.13	Storage prior to submission to any activity referred to in a preceding paragraph of this Schedule, other than temporary storage, pending collection, on the premises where the waste concerned is produced.
4.11	Use of waste obtained from any activity referred to in a preceding paragraph of this Schedule.
4.13	Storage of waste intended for submission to any activity referred to in a preceding paragraph of this Schedule, other than temporary storage, pending collection, on the premises where such waste is produced.
4.2	Recycling or reclamation of organic substances which are not used as solvents (including composting and other biological transformation processes).
4.4	Recycling or reclamation of other inorganic materials.
Address 1	Derrylurgan
Address 2	Ballyjamesduff
Address 3	Co Cavan
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	vincent Craig
AER Returns Contact Email Address	vcraig@cavancoco.ie
AER Returns Contact Position	Landfill Operations Manager
AER Returns Contact Telephone Number	049-4378410
AER Returns Contact Mobile Phone Number	
AER Returns Contact Fax Number	
Production Volume	0.0
Production Volume Units	
Number of Installations	0
Number of Operating Hours in Year	0
Number of Employees	1
User Feedback/Comments	
Web Address	

2. PRTR CLASS ACTIVITIES

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

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

Is it applicable?	No
Have you been granted an exemption?	No
If applicable which activity class applies (as per Schedule 2 of the regulations) ?	
Is the reduction scheme compliance route being used ?	

4. WASTE IMPORTED/ACCEPTED ONTO SITE

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

Do you import/accept waste onto your site for on-site treatment (either recovery or disposal activities) ?	No
--	----

This question is only applicable if you are an IPPC or Quarry site

4.1 RELEASES TO AIR

[Link to previous years emissions data](#)

[PRTR# : W0093 | Facility Name : Ballyjamesduff Landfill | Filename : W0093_2012.xls | Return Year : 2012]

23/03/2013 13:13

SECTION A : SECTOR SPECIFIC PRTR POLLUTANTS

No. Annex II		POLLUTANT		RELEASURES TO AIR			Please enter all quantities in this section in KGs			
		Name		M/C/E	METHOD		Emission Point 1	QUANTITY		
					Method Code	Designation or Description		T (Total) KG/Year	A (Accidental) KG/Year	F (Fugitive) KG/Year
03		Carbon dioxide (CO2)		C	MAB	GASSIM	0.0	113000.0	0.0	113000.0
01		Methane (CH4)		C	MAB	GASSIM	0.0	40000.0	0.0	40000.0

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

SECTION B : REMAINING PRTR POLLUTANTS

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

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

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

Pollutant No.		POLLUTANT		RELEASURES TO AIR			Please enter all quantities in this section in KGs			
		Name		M/C/E	METHOD		Emission Point 1	QUANTITY		
					Method Code	Designation or Description		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)	40000.0	C	GASSIM	GASSIM	N/A
Methane flared	0.0				0.0 (Total Flaring Capacity)
Methane utilised in engines	0.0				0.0 (Total Utilising Capacity)
Net methane emission (as reported in Section A above)	40000.0	C	GASSIM	GASSIM	N/A

A survey of landfill sites to determine the quantity of methane flared and or recovered in utilisation plants for 2012

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 2012	0
Please enter the number of engines operational at your site in 2012	0
Total methane flared	0 kg/year
Total methane utilised in engines	0 kg/year

Please note that the closing date for receipt of completed surveys is 31/03/2013

Introduction

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

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

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

LFGProject@epa.ie

Once completed please send the completed file as an attachment clearly stating the name and or license number of the landfill site (e.g. W000 Xanadu landfill_2012) to:

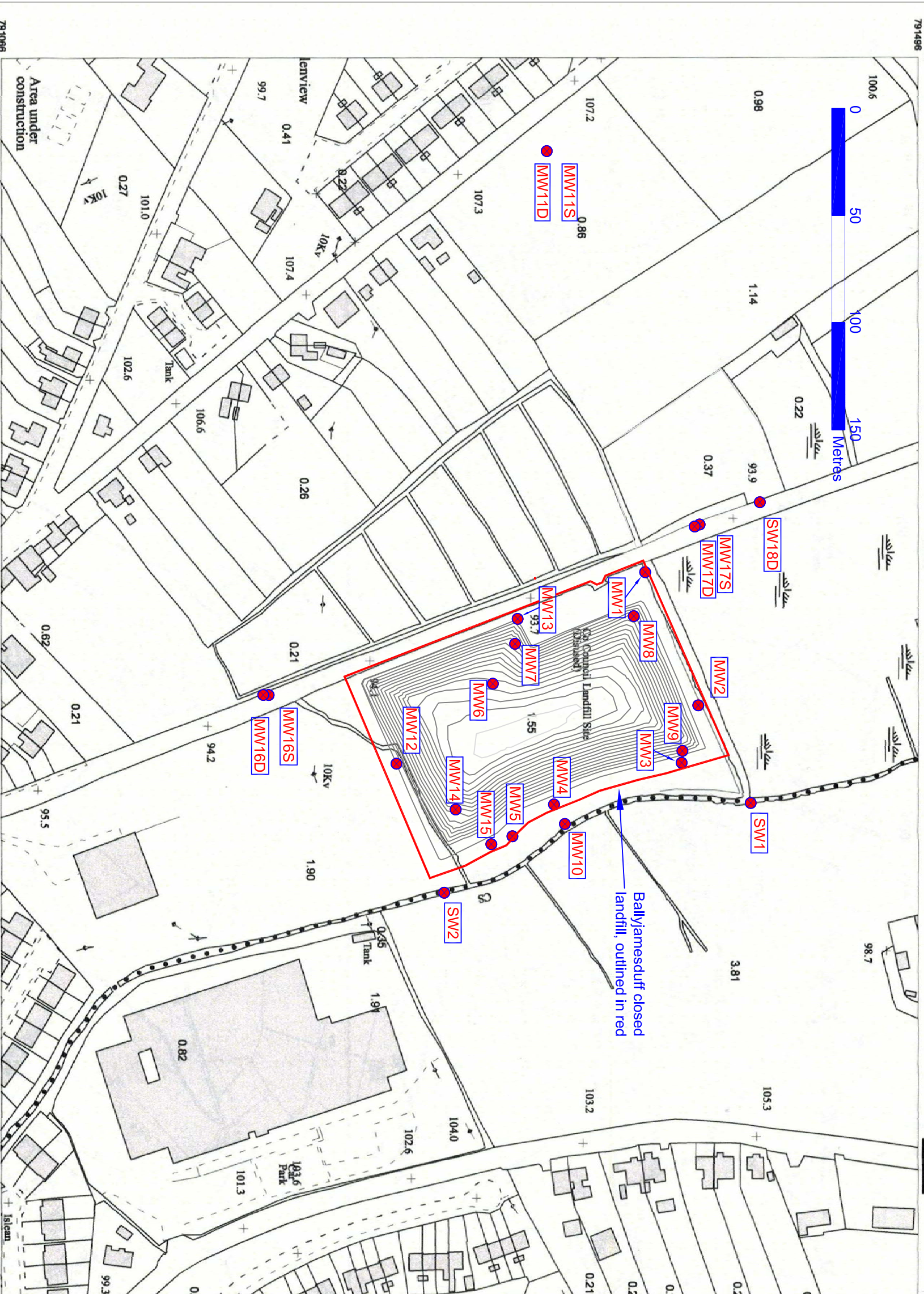
LFGProject@epa.ie

APPENDIX B

Site Map

Surveyed 2003
 Revised 2011
 Levelled

Rural PLACE Map



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

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

NOTES / LEGEND



Client: Cavan County Council

Project:
 Ballyamesduff Landfill (WL93-01)



Main St., Mullagh, Kells, Co. Meath.
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 Website: www.boylanengineering.ie

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

APPENDIX C
Q4 Monitoring Report



**ENVIRONMENTAL MONITORING REPORT
FOR BALLYJAMESDUFF LANDFILL
W0093-01**

Client: Cavan County Council

Site Location: Derrylurgan, Ballyjamesduff

Report No.: CCC-03-01-02-04-Rev 0

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

Approved by:

A handwritten signature in blue ink, appearing to read 'Cathal Boylan', is written over a horizontal line.

Date: 30th November 2012

Cathal Boylan, BEng, CEng, MIEI
CHARTERED ENGINEER

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Rev.	Date	Description

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I SUMMARY

Boylan Engineering (Eng. & Environmental Consultancy) was commissioned by Cavan County Council to carry out Environmental Monitoring at Ballyjamesduff Landfill (W0093-01), Derrylurgan, Ballyjamesduff, Co Cavan for quarter four 2012.

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

Table of Contents

1.0 Introduction	4
2.0 Methodology	6
2.1 Environmental Sampling	6
2.2 Laboratory Analysis	7
2.3 Landfill Gas Analysis	8
2.4 Monitoring Locations	9
2.5 Weather Report	9
3.0 Summary of Results	10
3.1 Ground Water	10
3.2 Surface Water	12
3.3 Leachate	14
3.4 Landfill Gas	16
4.0 Discussion	17
4.1 Ground Water	17
4.2 Surface Water	18
4.3 Leachate	19
4.4 Landfill Gas	20
5.0 Conclusion	21
5.1 Environmental Monitoring	21
5.2 Landfill Gas	21

List of Tables

- 1.0 Ground Water 04th Quarter Monitoring
- 2.0 Surface Water 04th Quarter Monitoring
- 3.0 Leachate 04th Quarter Monitoring
- 4.0 Landfill Gas 04th Quarter Monitoring

Appendix

- 1.0 Historical Data
- 2.0 Landfill Gas Breakdown
- 3.0 Analysis Methods
- 4.0 Field Sheets
- 5.0 COC/Sample Submission form
- 6.0 Calibration Certificate GA 2000
 - Lab Reports
 - Landfill Map

1. 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 groundwater and landfill gas sampling programme conducted on site and also summarises findings and analytical results for quarter four 2012.

The purpose of environmental and 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

According to the Response matrix for landfills, Ballyjamesduff landfill is situated in the R2¹ Zone. This zone was categorized using a vulnerability rating combined with the aquifer category for the area. Landfills situated in R2¹ 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.

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.

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. METHODOLOGY

2.1 Environmental Sampling

The following procedure is conducted by Boylan Engineering to ensure accurate groundwater, surface water and leachate 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 4.
- 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.
- 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 analyser and a Hanna 9164 Dissolved Oxygen meter, respectively.
 - Conductivity
 - Temperature
 - pH
 - DO
- Boylan Engineering operate a Sample Submission/Chain of Custody form, which accompanies the samples at all times. These forms are located in the appendix 5.

2.2 Laboratory Analysis

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

2.3 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.

2.4 Monitoring Locations

Quarter 4 2012					
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	-	n/a	N291352.31 E252020.68
MW2	Gas	92.92	-	n/a	N291377.38 E252082.84
MW3	GW	94.39	92.39	2	N291369.28 E252109.44
MW4	GW	93.65	93.05	0.6	N291309.78 E252129.14
MW8	Leachate	96.56	91.06	5.5	N291346.99 E252041.22
MW9	GW	95.69	92.39	3.3	N291369.67 E252103.93
MW10	GW	93.95	91.95	2	N291314.86 E252138.12
MW11S	GW	106.82	104.42	2.4	N291289.00 E251834.00
MW11D	GW	106.82	95.42	11.4	N291289.00 E251834.00
MW12	Gas	94.38	-	n/a	N291236.30 E252110.10
MW14	Gas	98.77	-	n/a	N291263.92 E252131.54
MW16S	GW	94.02	93.22	0.8	N252076.89 E291174.65
MW16D	GW	94.16	94.16	0	N252077.36 E291173.27
MW17S	GW	93.59	92.64	0.95	N251997.04 E291377.19
MW17D	GW	93.63	93.53	0.1	N251997.80 E291376.00
MW18	GW	93.5	93.5	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

2.5 Weather Report

REPORTS FROM BALLYHAISE (A)							
Date	Rainfall	Max	Min	Grass Min Temp	Mean Wind Speed (knots)	Gusts	Sunshine
	(mm)	Temp	Temp	(°C)		(if >= 34 knots)	(hours)
		(°C)	(°C)				
17/10/2012	14	12.3	5.7	5.3	6.1		
*Met Eireann, Climate Data & reports, Daily Data							

3.0 SUMMARY OF RESULTS

3.1 Ground Water

Table 1.0 4th Quarter Ground water monitoring 2012

Report Number:	61149																			
Monitoring Date:	17.10.12																			
Method	Site Tests							TOC	Ammonia	AQ2-UP1	Titralab		AQ2-UP2		DO	Total Cyanide High (Sub)	Total Phosphorus-TP	PhenolsTotal - Index (Sub1)		
Method Number	Site Tests							DEFAULT	EW003	EW154M	EW153			EW154M		EW043	DEFAULT	EW146	DEFAULT	
Parameter	Sample temperature (to be done onsite)	Cond	pH	DO	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	mg/l	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	17.10.12							18.10.12												
ELS Ref	Client Ref																			
61149/006	MW3	11.5	890	7.21	4.84	2	Heavy Silt	7.68	26.797	0.949	7	885	363.5	20.1	10.2	4.6	<10	3.35	<0.15	
61149/007	MW4	11.2	275	7.12	6.35	0.6	Heavy Silt	11.27	0.671	1.032	7	271	114.5	13	26	6.3	<10	1.01	<0.15	
61149/008	MW9	11	896	7.13	3.38	3.3	Heavy Silt	11.3	12.364	<0.138	7	891	477.3	17.1	9.2	7.9	<10	0.51	<0.15	
61149/009	MW10	11.3	1079	7.21	6.84	2	Heavy Silt	16.42	28.98	<0.138	6.8	1077	505.2	44.3	11	3.3	<10	3.25	<0.15	
61150/001	MW11S	11.2	722	7.11	7.87	2.4	Straw	1.3	0.031	0.253	7.1	713	207	98.3	55	7.8	<10	0.19	<0.15	
61150/002	MW11D	10.9	413	7.69	6.42	11.4	Clear	0.83	0.019	<0.138	7.6	411	209.5	8.5	14	6.4	<10	0.16	<0.15	
61149/001	16S	11.9	519	7.64	4.15	0.8	Straw	2.56	0.426	0.162	7.6	517	179.3	17.2	73	4.1	<10	<0.01	<0.15	
61149/002	16D	10.7	487	7.57	6.85	0	Clear	0.53	0.069	<0.138	7.5	487	176.3	18.6	70.9	6.8	<10	0.32	<0.15	
61149/003	17S	10.8	523	7.18	7.05	0.95	Straw	5.56	9.161	<0.138	6.9	493	234	14.1	19.6	7	<10	2.73	<0.15	
61149/004	17D	10.3	497	7.52	6.09	0.1	Clear	0.82	0.297	<0.138	7.3	495	248.4	16	28.1	6	<10	0.11	<0.15	
61149/005	18	10.4	481	7.72	6.45	0	Clear	0.67	3.01	0.425	7.4	481	241.5	14.3	31.2	6.4	<10	0.06	<0.15	
IGV		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 (Tot Solids-TS)	Metals-Total	Metals-Dissolved												
Method Number	MIC133		EW137	EW060	EM130													
Parameter	Total Coliforms	E. Coli	Fluoride	Residue on Evaporation (Tot Solids-TS)	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	18.10.12																	
ELS Ref	Client Ref																	
61149/006	MW3	24197	73	<0.1	<10	30.9	35511.1	931.9	13.7	31.4	0.1	132.5	0.005	0.3	20.7	<0.02	9.1	0.47
61149/007	MW4	24197	4884	<0.1	<10	75.1	1002.4	886	7.7	11.4	0.2	39.2	0.004	0.4	6	<0.02	102.6	0.03
61149/008	MW9	794	52	<0.1	<10	10.2	27030.4	2112.6	12.6	24.7	0.2	137.4	<0.003	0.5	38.9	<0.02	364.6	0.09
61149/009	MW10	727	0	<0.1	<10	74.2	3156.8	2038.8	23.8	36.1	0.2	159	<0.003	<0.3	25.8	<0.02	4.9	0.3
61150/001	MW11S	24197	130	0.16	<10	19.2	31.5	60	2.8	37.2	0.2	95	<0.003	<0.3	31.4	<0.02	11.6	0.02
61150/002	MW11D	24197	210	0.21	<10	4.2	<20	74.2	2.1	25.2	0.1	62.1	<0.003	<0.3	13.5	<0.02	217	0.03
61149/001	16S	520	0	0.3	<10	7043.4	305.8	1980.6	8.7	23.9	0.2	58.6	0.069	2.4	11.9	0.02	260.2	0.03
61149/002	16D	11	0	0.18	<10	3.4	26.4	757.9	2.5	19.9	0.1	64.5	<0.003	<0.3	12.3	0.02	22.3	0.02
61149/003	17S	3654	0	<0.1	<10	191.4	14773.6	805.9	3.6	24.7	0.1	60.9	<0.003	<0.3	12.5	0.02	6.1	0.03
61149/004	17D	78	0	0.12	<10	<1	334.7	1033.1	3.2	27.5	<0.1	62.9	<0.003	<0.3	14.9	0.02	37.2	0.04
61149/005	18	4	1	<0.1	<10	<1	415.9	1055.9	2.9	33.7	0.1	65.9	<0.003	<0.3	16.6	<0.02	90.2	0.04
IGV	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.

3.2 Surface Water

Table 2.0 04th Quarter Surface water monitoring 2012

Report Number	61147															
Monitoring Date	18/10/2012															
Method	Site Tests	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	Site Tests	EW003	EW138	EW139	EW001	EW094	EW013	EW015	EW043	EW146	EW154M	
Parameter	Sample temperature (to be done onsite)	Cond	pH	DO	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	-	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	17.10.12					18.10.12										
ELS Ref	Client Ref															
61147/001	SW 1	10.1	133	7.63	9.32	Clear	0.061	6.8	127	5	52	16	8.7	9.2	0.22	0.393
61147/002	SW 2	10.1	132	8.21	8.85	Clear	0.051	7.1	126	6	52	75	9.6	8.8	0.23	0.39
-	Discharge Cap	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
S.I No. 294/1989						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	18.10.12														
ELS Ref	Client Ref														
61147/001	SW 1	43.3	21.8	2.1	410.2	26.9	7.7	5.5	0.1	13.4	0.006	<0.3	2.8	0.03	15.1
61147/002	SW 2	48.1	5.9	2.6	407.2	24.6	7.8	5.6	0.1	13.3	0.006	<0.3	2.7	0.03	14.3
-	Discharge Cap	-	-	-	-	-	-	-	-	-	-	-	-	-	-
S.I No. 294/1989	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.

3.3 Leachate

Table 3.0 04th Quarter Leachate monitoring 2012

Report Number	61148														
Monitoring Date:	17/12/2012														
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	uscmm-1@20	mg/L	mg/L	mg/L	mg/L	MPN/100 ml	MPN/100 ml	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	17.10.12	18.10.12													
ELS Ref	Client Ref														
61148/001	MW7	Heavy Silt	10.985	<0.69	6.9	1042	6	79	<13	<5	<10	31	0.11	<9	0.75
61148/002	MW8	Heavy Silt	36.89	<0.69	7.3	1515	54	93	30	<5	73	24197	<0.1	<9	1.41
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	18.10.12													
ELS Ref	Client Ref													
61148/001	MW7	27.2	63981.5	5925.5	11	15	0.2	218.7	0.008	0.5	40.3	<0.02	15	0.23
61148/002	MW8	5.6	2824.8	957.1	39.2	38.9	0.2	177.1	<0.003	<0.3	46.9	<0.02	4	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.

3.2 Landfill Gas

Table 4.0 4th Quarter Landfill Gas monitoring 2012

Method		GA 2000	GA 2000	GA 2000	GA 2000	GA 2000	
Parameter		CH ₄	CO ₂	O ₂	H ₂ S	Baromet ric Pressure	Position to waste mass
Units		% v/v	% v/v	%	PPM	mb	
Date Testing		17/10	17/10	17/10	17/10	17/10	
GA 2000 Ref	Client Ref						
1	MW 1	0	0.1	20.4	0	974	Outside
3	MW 2	0.3	0.0	18.8	0	973	Outside
6	MW 12	0	0	20.6	0	972	Inside
2	MW 13	0	0.3	19.6	0	973	Outside
4	MW 14	9.2	6.5	16.3	0	973	Inside
5	MW 15	0	0	20.5	0	972	Outside
	Limit	1	1.5				
Exceedance, outside waste mass							
NOTES							
1	Instrument Serial No: GA 07721						
2	Limit: Schedule C2, Licence						

4.0 DISCUSSION

4.1 Ground water

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

Monitoring was conducted on the 17th October 2012. Results in Hatched Red indicate where the interim guide value has been exceeded. Results from the fourth quarter 2012 show that there were exceedances at various ground water monitoring locations for parameters; Iron, Potassium, Ammonia, Chloride, Chromium, Manganese, Zinc Total Coliforms, E-coli, and Conductivity. Previous results detailed in the historical data show that these exceedances are on par with previous monitoring events.

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.

4.2 Surface water

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. A sample could not be obtained from the Cap Discharge point due to surface water flooding in the South East of the site.

With regard to all surface water samples, results in hatched red indicate that limits were exceeded for the following parameters: BOD and COD. Previous results detailed in the historical data show that exceedances for each of these parameters is on par with previous monitoring events.

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

4.3 Leachate

Leachate consists of water that has become contaminated as it passes through a waste disposal site. It contains insoluble waste constituents which have not degraded chemically or biochemically. This leachate can cause a treat to surrounding surface and ground waters. The composition of leachate will vary depending on the age of the landfill. As there are no limits set in the waste licence for leachate, results are compared to the Interim Guide Values for the protection of Groundwater in Ireland, where available. Results in Hatched Red indicate where the interim guide value has been exceeded. A leachate sample was abstracted from wells MW7 and MW8 during quarter four monitoring. Results show that the Interim Guide Value was exceeded at on this occasion for the parameters Ammonia, conductivity, E-coli, Total Coliforms, Iron, Manganese, Potassium and Calcium. 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.

4.2 Landfill Gas

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

Results obtained from monitoring during quarter four, 2012 show elevated levels of gas at MW 14. These results 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

5.1 Environmental Monitoring

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

5.2 Landfill Gas Monitoring

The results obtained from landfill gas analysis are also relatively consistent with previous monitoring events and do not show any signs of dramatic exceedences; therefore there is no evidence of any major negative environmental impact associated with this landfill. 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 2013.

APPENDIX 1- HISTORICAL DATA

Groundwater

	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
MW 3	Qtr 4 2012	7.68	73	26.797	0.949	24197	7	885	20.1	4.6	<0.15	35511.1	13.7	31.4
	Qtr 3 2012	10.42	0	36.241	0.364	120330	7	906	19.8	<1	<0.15	26.9055	15.5	27
	Qtr 2 2012	16.29	0	52.293	<0.138	56500	7.2	924	19.5	<1.0	<0.15	30.07	13.3	25.6
	Qtr 1 2012	15.87	0	48.604	<0.138	7620	7.1	902	18.4	<1.0	<0.15	0.02	3.5	15.1
MW 4	Qtr 4 2012	11.27	4884	0.671	1.032	24197	7	271	13	6.3	<0.15	1002.4	7.7	11.4
	Qtr 3 2012	21.11	1810	4.255	0.171	241961	6.8	523	23.6	<1	<0.15	2.7653	9.8	17.7
	Qtr 2 2012	11.25	0	4.077	<0.138	>24196	7.1	560	23.2	<1.0	<0.15	1.645	8.4	21.4
	Qtr 1 2012	11.6	74	2.615	<0.138	689	7	436	20.8	<1.0	<0.15	2.185	9	15.5
MW9	Qtr 4 2012	11.3	52	12.364	<0.138	794	7	891	17.1	7.9	<0.15	27030.4	12.6	24.7
	Qtr 3 2012	9.82	0	9.951	0.276	218	7	823	13.5	<1	<0.15	21.1394	10.5	15.8
	Qtr 2 2012	9.15	0	9.108	<0.138	1500	7.1	823	8.2	<1.0	<0.15	21.82	9.7	12.3
	Qtr 1 2012	5.06	0	11.468	<0.138	109	7.1	852	9.6	<1.0	<0.15	21.03	11.2	15.5
Well MW 10	Qtr 4 2012	16.42	0	28.98	<0.138	727	6.8	1077	44.3	3.3	<0.15	3156.8	23.8	36.1
	Qtr 3 2012	18.45	110	25.239	0.522	14136	6.7	1044	48.9	<1	<0.15	32.6041	19.6	30.9
	Qtr 2 2012	17.08	0	24.883	<0.138	3	6.9	992	46.7	<1.0	<0.15	24.84	20.8	29.8
	Qtr 1 2012	15.2	0	25.504	<0.138	63	6.7	973	44.3	<1.0	0.17	28.2	20.9	29.8
WELL 11 S	Qtr 4 2012	1.3	130	0.031	0.253	24197	7.1	713	98.3	7.8	<0.15	31.5	2.8	37.2
	Qtr 3 2012	1.47	0	0.03	0.477	1610	7	549	53.4	8.3	<0.15	0.0478	1.8	25.9
	Qtr 2 2012	2.29	0	0.095	0.26	200	7.2	851	169.2	7.9	<0.15	0.02	3.1	35.5
	Qtr 1 2012	2.09	0	0.075	0.356	75	7.1	627	82.9	8.2	<0.15	0.02	2.4	28.5
WELL 11D	Qtr 4 2012	0.83	210	0.019	<0.138	24197	7.6	411	8.5	6.4	<0.15	<20	2.1	25.2
	Qtr 3 2012	0.66	0	0.029	<0.138	20	7.4	390	6.6	2.9	<0.15	0.02	2.2	20.3
	Qtr 2 2012	1.95	0	0.096	<0.138	5	7.8	398	7.6	7.5	<0.15	0.02	2	21
	Qtr 1 2012	1.04	0	0.047	<0.138	7	7.5	382	6.6	3.4	<0.15	0.02	2.3	20.1
WELL 16 S	Qtr 4 2012	2.56	0	0.426	0.162	520	7.6	517	17.2	4.1	<0.15	305.8	8.7	23.9
	Qtr 3 2012	1.16	0	0.1	0.224	336	7.6	472	16.5	8.6	<0.15	0.0241	4.2	21.3
	Qtr 2 2012	2	0	0.152	<0.138	0	7.4	467	18	5.3	<0.15	0.02	3.4	20.3
	Qtr 1 2012	1.37	0	0.107	0.226	0	7.5	473	17.1	4.5	<0.15	0.1308	6.5	23.5
WELL 16 D	Qtr 4 2012	0.53	0	0.069	<0.138	11	7.5	487	18.6	6.8	<0.15	26.4	2.5	19.9
	Qtr 3 2012	0.52	0	0.069	<0.138	15	7.4	486	17.7	4.3	<0.15	0.077	2.3	19.9
	Qtr 2 2012	2.46	0	0.158	<0.138	0	7.6	481	18.6	6.8	<0.15	0.0555	2.2	21.7
	Qtr 1 2012	0.75	0	0.077	<0.138	0	7.5	471	16.5	3.3	<0.15	0.0365	2.8	20
WELL 17 S	Qtr 4 2012	5.56	0	9.161	<0.138	3654	6.9	493	14.1	7	<0.15	14773.6	3.6	24.7
	Qtr 3 2012	3.7	0	9.495	<0.138	0	6.8	482	13.3	5.6	<0.15	11.6897	4.4	24.3
	Qtr 2 2012	6.23	0	10.368	<0.138	>24196	6.9	492	14.8	2.5	<0.15	14.87	5.1	22.6
	Qtr 1 2012	6.4	0	9.878	<0.138	1539	6.9	495	13.7	1.1	<0.15	17.92	3.8	23.6
WELL 17 D	Qtr 4 2012	0.82	0	0.297	<0.138	78	7.3	495	16	6	<0.15	334.7	3.2	27.5
	Qtr 3 2012	0.96	0	0.274	<0.138	130	7.4	493	18.3	7.8	<0.15	0.3222	3	26.7
	Qtr 2 2012	1.96	0	0.322	<0.138	56	7.5	491	16.5	6.9	<0.15	0.2865	3.5	29.7
	Qtr 1 2012	1	0	0.36	<0.138	0	7.5	471	14.5	5.4	<0.15	0.2969	3.3	27.1
WELL 18	Qtr 4 2012	0.67	1	3.01	0.425	4	7.4	481	14.3	6.4	<0.15	415.9	2.9	33.7
	Qtr 3 2012	1.1	0	0.032	<0.138	3	7.5	475	13.5	8	<0.15	0.342	2.9	28.1
	Qtr 2 2012	1.58	0	0.083	<0.138	201	7.6	481	14.8	7.7	<0.15	0.2384	3.2	29.7
	Qtr 1 2012	1.17	0	0.053	<0.138	0	7.5	460	13.7	8.7	<0.15	0.2365	3.4	26.5
IGV		NAC	0	0.15	NAC	0	≥6.5 & ≤9.5	1000	30	NAC	0.0005	0.200	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													

Surface water

	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	Qtr 4 2012	0.06	6.8	127	5	52	16	8.7	9.2
	Qtr 1 2012	0.10	7.2	198	<1.0	37	15	15.1	10.5
	Qtr 4 2011								
	Qtr 3 2011	0.07	7.00	232.00	<2	72.00	7.00	13.60	2.70
SW2	Qtr 4 2012	0.05	7.1	126	6	52	75	9.6	8.8
	Qtr 1 2012	0.13	7.2	201	<1.0	23	<5	15.2	10.4
	Qtr 4 2011								
	Qtr 3 2011	0.06	7.10	208.00	<2	66.00	<5.000	11.80	6.30
Discharge Cap	Qtr 4 2012	-	-	-	-	-	-	-	-
	Qtr 1 2012	0.12	7.3	432	<1.0	29	<5	7.3	6.6
	Qtr 4 2011								
	Qtr 3 2011	0.05	7.50	544.00	<1.0	39.00	<5.000	10.70	5.90
S.I No. 294/1989 A1		0.2	≥5.5 and ≤8.5	1000	5		50	250	>60%

Leachate

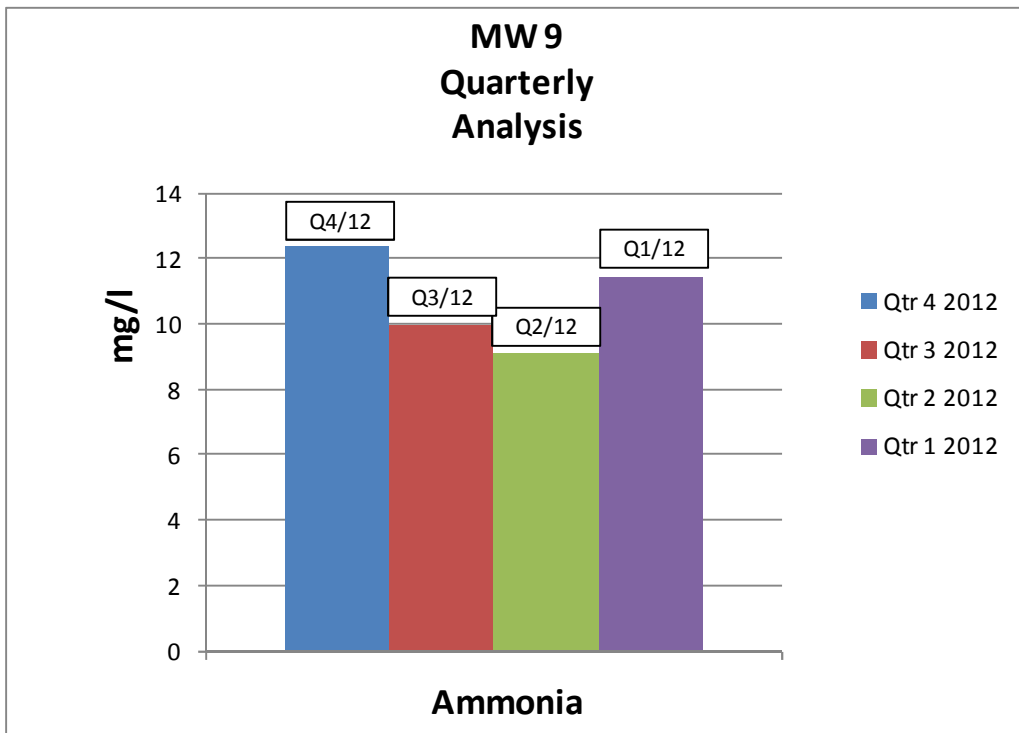
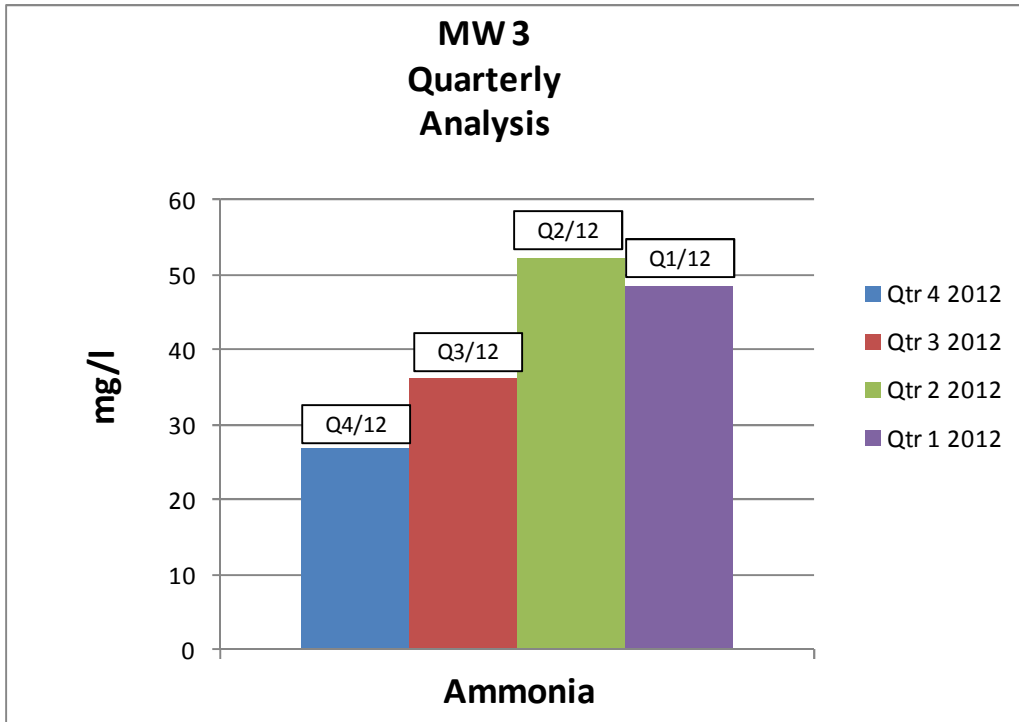
	Parameter	Ammonia	TON	pH	Cond	BOD	COD	Cl
	Units	mg/l N	mg/l N	pH Units	us/cm	mg/l	mg/l	mg/l
WELL MW 7	Qtr 4 2012	10.985	<0.69	6.9	1042	6	79	<13
	Qtr 1 2012	10.438	<0.69	6.8	975	<1.0	100	<13.0
	Qtr 4 2011							
	Qtr 3 2011	9.45	<0.69	6.9	895	17	658	<13.0
WELL MW 8	Qtr 4 2012	36.89	<0.69	7.3	1515	54	93	30
	Qtr 1 2012	28.627	<0.69	7.2	1396	38	156	26.3
	Qtr 4 2011							
	Qtr 3 2011	28.688	<0.69	7.3	1369	65	378	27.6
Interim Guide Values		0.15	NAC	≥6.5&≤9.5	1000			200

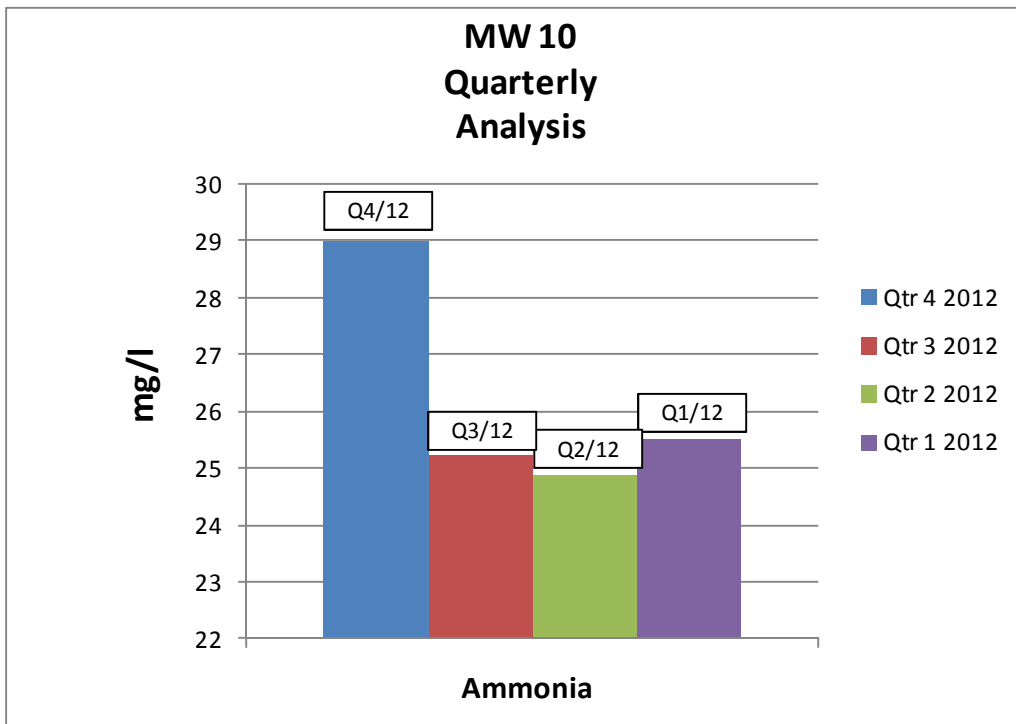
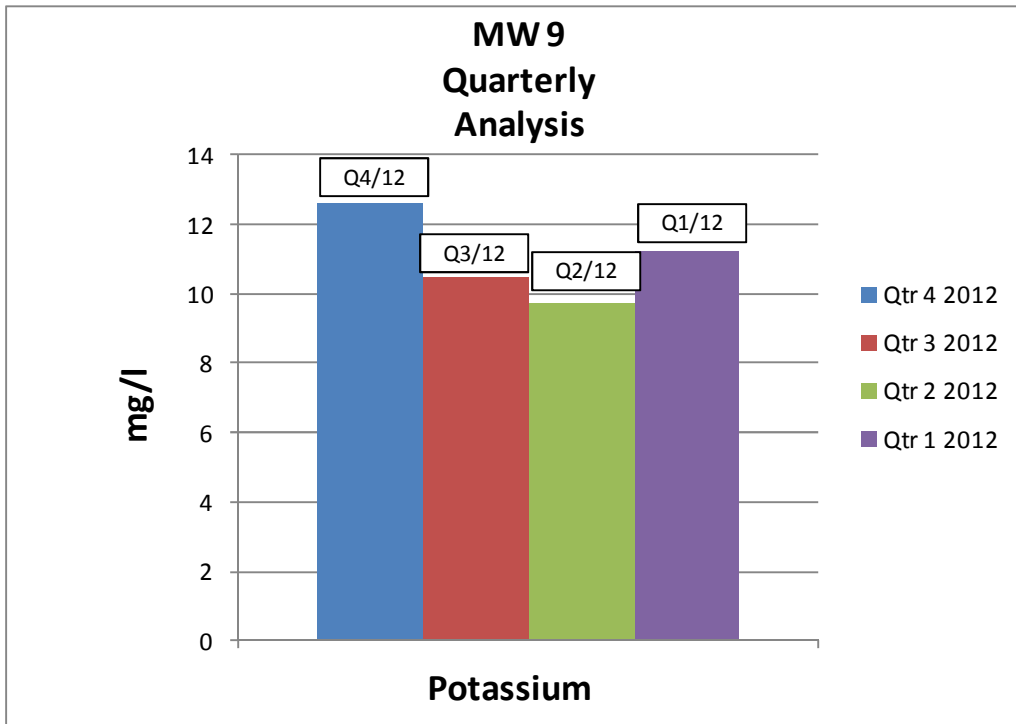
Landfill Gas

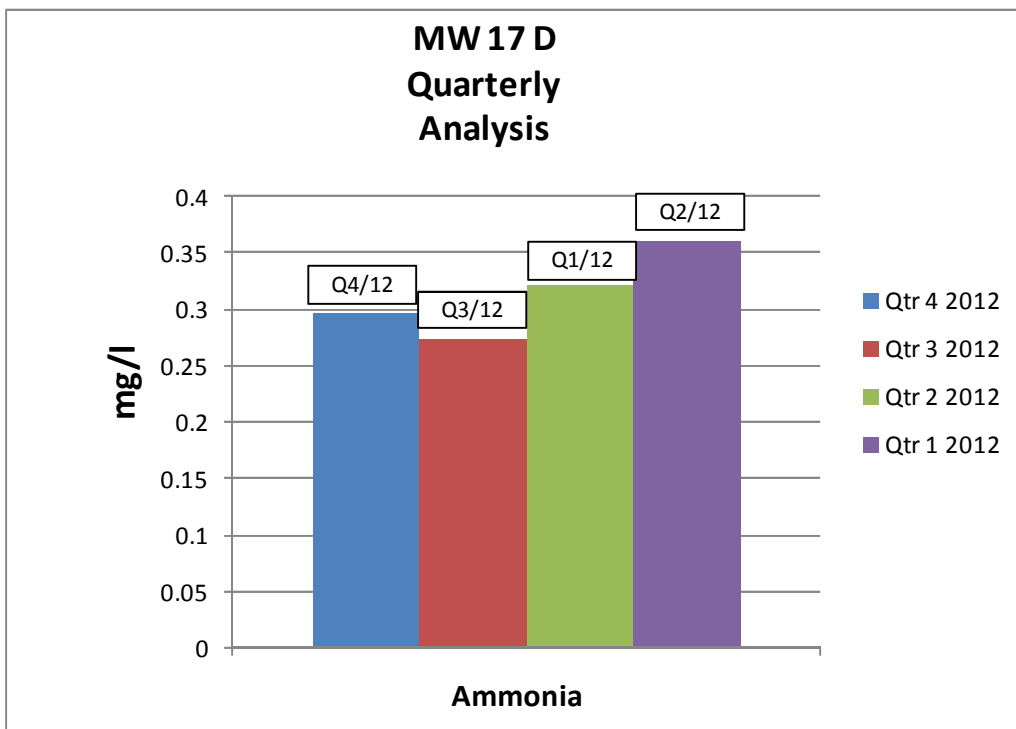
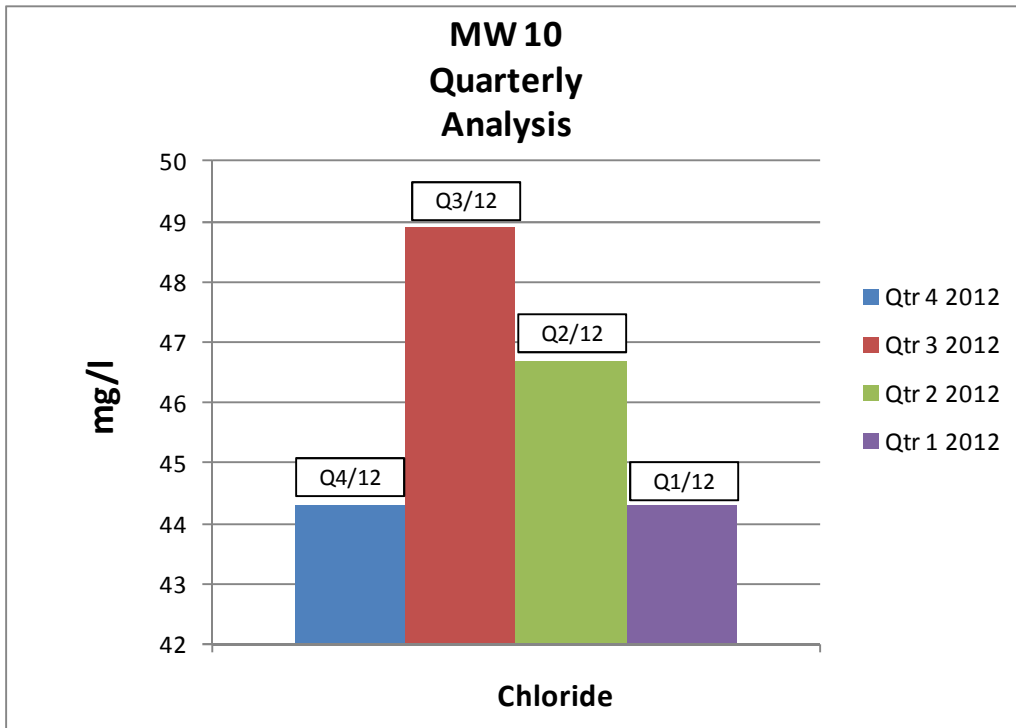
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Parameter		CH ₄	CO ₂	O ₂	H ₂ S	Barometric Pressure
Units		% v/v	% v/v	%	PPM	mb
Client Ref	Qtr	-	-	-	-	-
MW 1	Qtr 4 2012	0	0.1	20.4	0	974
	Qtr 3 2012	0	0	19	0	1001
	Qtr 2 2012	0	1	21	0	998
	Qtr 1 2012	0	1	20	0	1023
MW 2	Qtr 4 2012	0.3	0.0	18.8	0	973
	Qtr 3 2012	0	0	20	0	1004
	Qtr 2 2012	0	0	21	0	998
	Qtr 1 2012	0	0	21	0	1023
MW 12	Qtr 4 2012	0	0	20.6	0	972
	Qtr 3 2012	0	0	21	0	999
	Qtr 2 2012	0	0	22	0	998
	Qtr 1 2012	0	0	21	0	1022
MW 13	Qtr 4 2012	0	0.3	19.6	0	973
	Qtr 3 2012	0	0	21	0	998
	Qtr 2 2012	0	0	22	0	998
	Qtr 1 2012	0	0	22	0	1022
MW 14	Qtr 4 2012	9.2	6.5	16.3	0	973
	Qtr 3 2012	10	4	20	0	999
	Qtr 2 2012	9	6	16	0	998
	Qtr 1 2012	11	7	15	0	1022
MW 15	Qtr 4 2012	0	0	20.5	0	972
	Qtr 3 2012	0	0	20	0	999
	Qtr 2 2012	0	0	21	0	998
	Qtr 1 2012	0	0	21	0	1022
Limit		1	2			
Exceedance of						
NOTES						
1	Instrument Serial No: GA 07721					
2	Limit: Schedule C2, Licence					

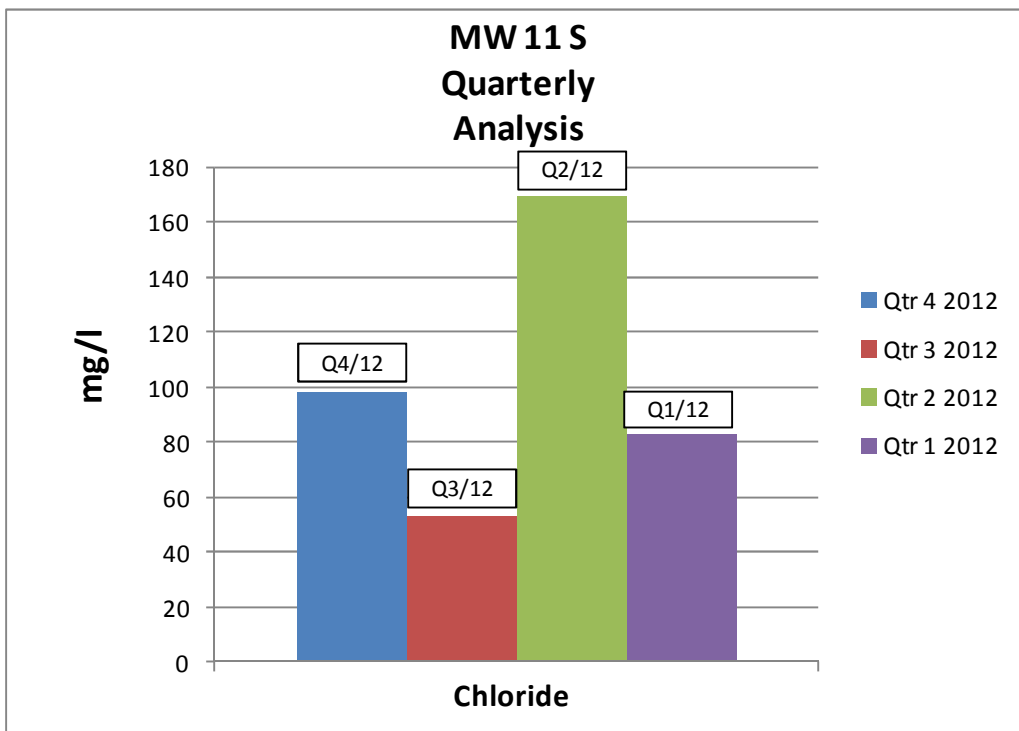
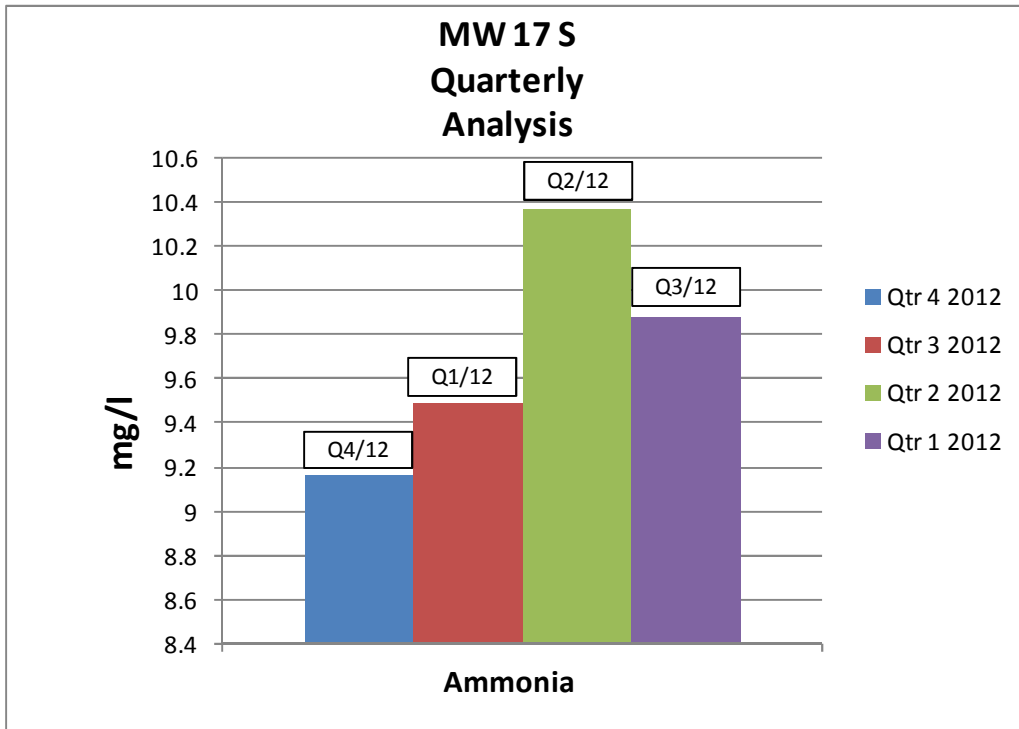
HISTORICAL DATA

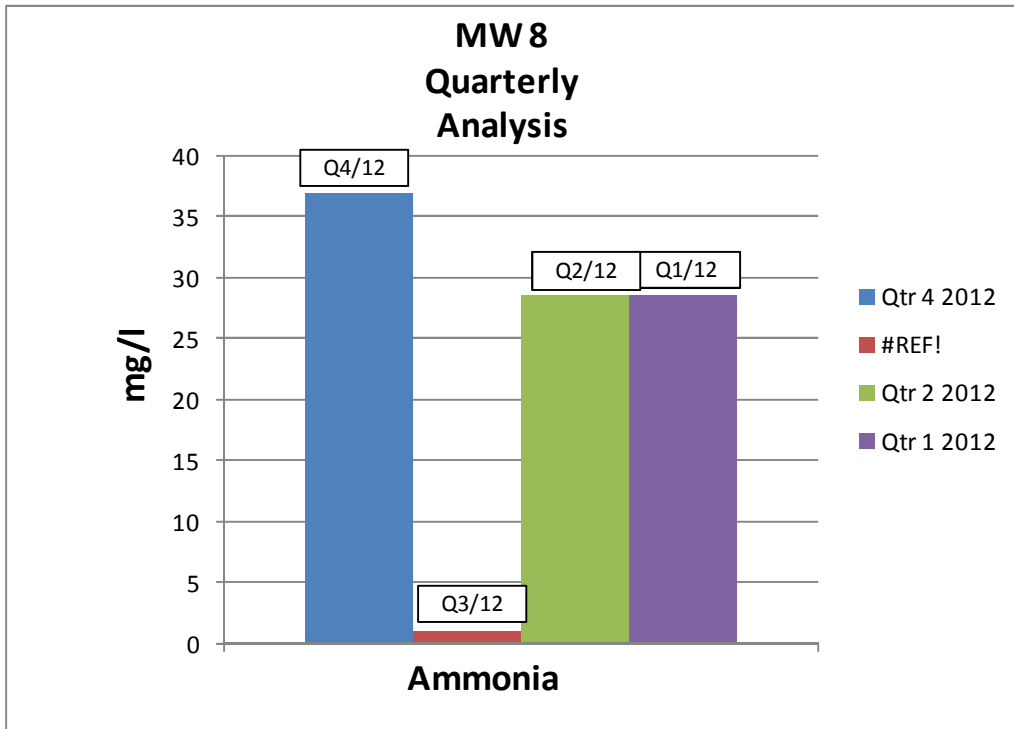
Groundwater



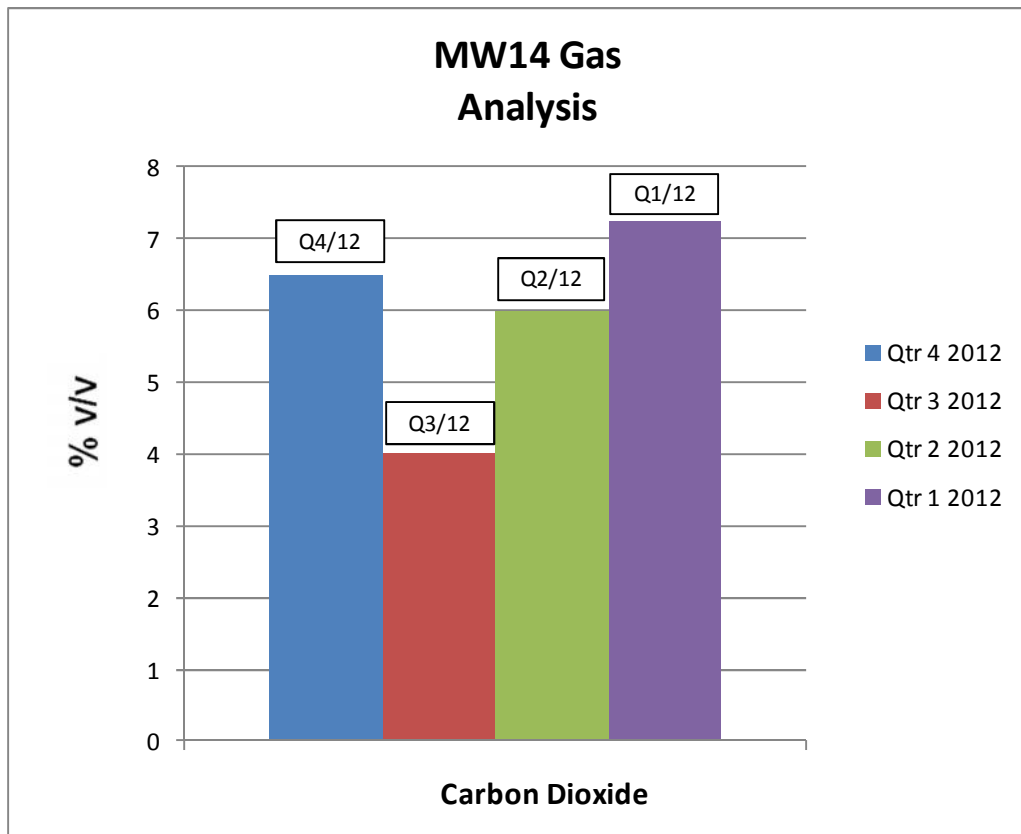
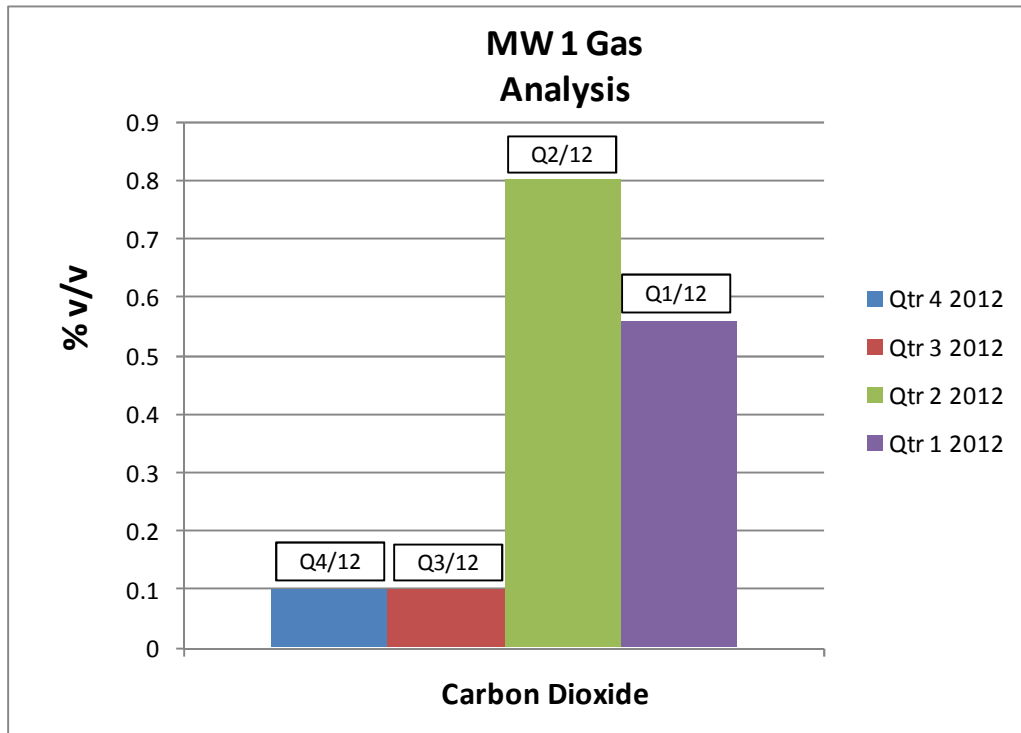








Landfill Gas



APPENDIX 2- LANDFILL GAS BREAKDOWN

MW1

Date/Time	CH4 (%)	CO2 (%)	O2 (%)	H2S	Barometric Pressure (mb)
17/10/2012 08:54	0	0.2	20.4	0	974
17/10/2012 08:55	0	0.1	20.4	0	974
17/10/2012 08:56	0	0.1	20.4	0	974
17/10/2012 08:57	0	0.1	20.4	0	974
17/10/2012 08:58	0	0.1	20.3	0	974
17/10/2012 08:59	0	0.1	20.3	0	974
17/10/2012 09:01	0	0.1	20.4	0	974
17/10/2012 09:02	0	0.1	20.2	0	974
17/10/2012 09:03	0	0.1	20.4	0	974
17/10/2012 09:04	0	0.1	20.3	0	974

MW 2

Date/Time	CH4 (%)	CO2 (%)	O2 (%)	H2S	Barometric Pressure (mb)
17/10/2012 10:40	0.2	0.0	19.7	0	973
17/10/2012 10:41	0.2	0.0	19.7	0	973
17/10/2012 10:42	0.2	0.0	19.8	0	973
17/10/2012 10:43	0.2	0.0	19.8	0	973
17/10/2012 10:44	0.2	0.0	19.8	0	973
17/10/2012 10:45	0.2	0.0	19.8	0	973
17/10/2012 10:46	0.3	0.1	19.7	0	973
17/10/2012 10:47	0.3	0.1	19.7	0	973
17/10/2012 10:48	0.3	0.0	19.8	0	973
17/10/2012 10:49	0.4	0.0	9.8	0	973
17/10/2012 10:50	0.4	0.0	19.8	0	973

MW 12

Date/Time	CH4 (%)	CO2 (%)	O2 (%)	H2S	Barometric Pressure (mb)
17/10/2012 13:40	0	0.1	20.3	0	972
17/10/2012 13:41	0	0	20.6	0	972
17/10/2012 13:42	0	0	20.6	0	972
17/10/2012 13:43	0	0	20.5	0	972
17/10/2012 13:44	0	0	20.6	0	972
17/10/2012 13:45	0	0	20.6	0	972
17/10/2012 13:46	0	0	20.6	0	972
17/10/2012 13:47	0	0	20.6	0	972
17/10/2012 13:48	0	0	20.7	0	972
17/10/2012 13:49	0	0	20.7	0	972
17/10/2012 13:50	0	0	20.7	0	972

MW 13

Date/Time	CH4 (%)	CO2 (%)	O2 (%)	H2S	Barometric Pressure (mb)
17/10/2012 09:11	0	0	19.1	0	973
17/10/2012 09:12	0.1	2.6	17.7	0	973
17/10/2012 09:13	0	0	20.3	0	973
17/10/2012 09:14	0	0.1	20.2	0	973
17/10/2012 09:15	0	0	19.9	0	973
17/10/2012 09:16	0	0	19.8	0	973
17/10/2012 09:17	0	0	19.8	0	973
17/10/2012 09:18	0	0	19.7	0	973
17/10/2012 09:19	0	0.1	19.7	0	973
17/10/2012 09:20	0	0.1	19.7	0	973

MW 14

Date/Time	CH4 (%)	CO2 (%)	O2 (%)	H2S	Barometric Pressure (mb)
17/10/2012 12:54	11.9	8.3	17.9	0	973
17/10/2012 12:55	11.3	7.9	15.4	0	973
17/10/2012 12:56	9.4	6.7	16	0	973
17/10/2012 12:57	8.3	5.9	16.5	0	973
17/10/2012 12:58	8.9	6.5	16.2	0	973
17/10/2012 12:59	7.9	5.4	16.3	0	973
17/10/2012 13:00	8.7	6.1	16	0	973
17/10/2012 13:01	9	6.6	15.9	0	973
17/10/2012 13:02	8.2	5.9	16.4	0	973
17/10/2012 13:03	7.9	5.8	16.5	0	973

MW 15

Date/Time	CH4 (%)	CO2 (%)	O2 (%)	H2S	Barometric Pressure (mb)
17/10/2012 13:15	0	0	20.4	0	972
17/10/2012 13:16	0	0	20.5	0	972
17/10/2012 13:17	0	0	20.4	0	972
17/10/2012 13:18	0	0	20.4	0	972
17/10/2012 13:19	0	0	20.4	0	972
17/10/2012 13:20	0	0	20.4	0	972
17/10/2012 13:21	0	0	20.5	0	972
17/10/2012 13:22	0	0	20.6	0	972
17/10/2012 13:23	0	0	20.5	0	972
17/10/2012 13:24	0	0	20.4	0	972

APPENDIX 3- ANALYSIS METHODS

ELS LTD INAB ACCREDITATION SCHEDULE SUMMARY SHEET		
Miscellaneous (P,G,W,S) Ammonia/Ammonium 0.007-1mg/l N EW003 Chloride 2.6-250 mg/l EW015 Fluoride 0.1 - 2 mg/l EW137 COD 8-1500 mg/l EW094 Nitrate 0.12-50 mg/l N EW034 Nitrite 0.013-1 mg/l N EW035 pH 4 – 10 pH Units EW138 Phosphate 0.009-1 mg/l P EW007 TOC 0.25-100mg/l EW123 Total Phosphorous 0.03-1 mg/l P EW002	Other VOC's EO025 (P,G,S) Bromomethane 0.5 - 35 µg/l Ethyl Ether/Diethyl Ether 0.5 - 35 µg/l 11 Dichloroethane 0.5 - 35 µg/l Iodomethane/Methyl Iodide 0.5 - 35 µg/l Carbon Disulphide 0.5 - 35 µg/l Allyl Chloride 0.5 - 35 µg/l Methylene Chloride/DCM 5.0 - 35 µg/l 2-Propenenitrile/Acrylonitrile 2.0 - 35 µg/l Chloromethyl Cyanide 0.5 - 35 µg/l Hexachlorobutadiene 0.5 - 35 µg/l Trans-1,2 Dichloroethane 0.5 - 35 µg/l MIBK 0.5 - 35 µg/l 11 Dichloroethane 0.5 - 35 µg/l 22 Dichloropropane 0.5 - 35 µg/l Cis-12 Dichloroethane 0.5 - 35 µg/l Methyl Acrylate 0.5 - 35 µg/l Bromochloromethane 0.5 - 35 µg/l Tetrahydrofuran 0.5 - 35 µg/l 111 Trichloroethane 0.5 - 35 µg/l 1-Chlorobutane 0.5 - 35 µg/l Carbon Tetrachloride 0.5 - 35 µg/l 11 Dichloropropane 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 Styrene 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 Trimethylbenzene 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	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 MCPA H Picloram H Organophosphorus Pesticides (P,G,S) Range 0.01 - 0.2 µg/l Fenphur OP Methyl Parathion OP Parathion OP Thionazin 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 Eponide OC Heptachlor OC Lindane OC P,P' DDE OC P,P'-DDD OC P,P'-DDT OC
Miscellaneous (P,G,S) Bromate 1 to 50µg/l BR03 (EW137) Colour 2.5-50mg/l PtCo (EW021) Conductivity 132-6000 us/cm EW139 Dissolved Oxygen 1 to 10 mg/l (EW043) Sulphate 1-250mg/l SO4(EW016) Suspended Solids 5-1000mg/l (EW013) Total Dissolved Solids 1-1000mg/l (EW046) Total Hardness 3-330mg/l CaCO3 (EM099) Total Oxidised Nitrogen 0.138-51mg/l N (EW051)	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 - 400µg/l Iron 5.0 - 500µg/l Lead 0.3 - 30µg/l Magnesium 0.3 - 20mg/l Manganese 1.0 - 100µg/l Mercury 0.02 - 2µg/l Molybdenum 1.0 - 100µg/l Nickel 0.5 - 50µg/l Potassium 0.2 - 20mg/l Selenium 0.2 - 20µg/l Sodium 0.5 - 50mg/l Strontium 1.0 - 100µg/l Tin 1.0 - 100µg/l Vanadium 1.0 - 100µg/l Zinc 1.0 - 100µg/l	
SI439 Potable Water VOCs & THM EO025 (P,G,S) Benzene 0.1-35 µg/l 1,2-Dichloroethane 0.1-35 µg/l Tetrachloroethane 0.1-35 µg/l Trichloroethane 0.1-35 µg/l Chloroform 1.0-150 µg/l Bromoform 1.0-35 µg/l Dibromochloromethane 1.0-35 µg/l Bromodichloromethane 2.0-35 µg/l		

Notes

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

APPENDIX 4 – FIELD SHEETS

Landfill Gas Monitoring Form	
Facility Name: <i>Ballyjamesduff</i> Waste Licence No: <i>93-01</i> Licensee:	Facility Address: <i>Derrylogan</i> <i>Ballyjamesduff</i> <i>Claver</i>
Date of Licensing:	Date of sampling: <i>17/10/12</i>
Instrument Used: <i>GA 2000</i>	Date next full calibration: <i>2013</i> Last field calibration: (inc date & gases)
Monitoring Personnel: <i>Genea Keating</i>	Weather: <i>Dry</i>

Results									
Station Number	Time	GA2000 ID	CH ₄	CO ₂	O ₂	CO	H ₂ S	Barometric Pressure (mbar)	Comments
<i>MW1</i>	<i>08:50</i>	<i>/</i>	<i>0</i>	<i>0.1</i>	<i>20.4</i>	<i>/</i>	<i>0</i>	<i>974</i>	
<i>MW13</i>	<i>09:11</i>	<i>/</i>	<i>0</i>	<i>0.3</i>	<i>19.6</i>	<i>/</i>	<i>0</i>	<i>973</i>	
<i>MW2</i>	<i>10:40</i>	<i>/</i>	<i>0.3</i>	<i>0.0</i>	<i>18.8</i>	<i>/</i>	<i>0</i>	<i>973</i>	
<i>MW14</i>	<i>12:54</i>	<i>/</i>	<i>9.2</i>	<i>6.5</i>	<i>16.3</i>	<i>/</i>	<i>0</i>	<i>973</i>	
<i>MW15</i>	<i>13:15</i>	<i>/</i>	<i>0</i>	<i>0</i>	<i>20.5</i>	<i>/</i>	<i>0</i>	<i>972</i>	
<i>MW12</i>	<i>13:40</i>	<i>/</i>	<i>0</i>	<i>0</i>	<i>20.6</i>	<i>/</i>	<i>0</i>	<i>972</i>	

General Comments:

ON SITE SAMPLING FORM									
Facility Name: <i>Ballymossduff</i>				Waste Licence No: <i>93-01</i>					
Report To:									
Sampling Date: <i>17/10/12</i>					Sample Type (GW, SW, Leachate)				
Personnel: <i>Beana Leahy</i>					Weather: <i>Dry</i>				
Other Remarks:				GPS:					
Sample Ref No	Sample Type	Time	DO Level	Elec Cond (us)	pH pH units	Temp °C	Visual	Instrument	
<i>16 D</i>	<i>GW</i>		<i>6.85</i>	<i>481</i>	<i>7.57</i>	<i>10.7</i>			
<i>165</i>	<i>GW</i>		<i>4.15</i>	<i>519</i>	<i>7.64</i>	<i>11.9</i>			
<i>18</i>	<i>GW</i>		<i>6.65</i>	<i>681</i>	<i>7.72</i>	<i>10.4</i>			
<i>17 D</i>	<i>GW</i>		<i>6.09</i>	<i>497</i>	<i>7.52</i>	<i>10.3</i>			
<i>17 S</i>	<i>GW</i>		<i>7.05</i>	<i>523</i>	<i>7.18</i>	<i>10.8</i>			
<i>115</i>	<i>GW</i>		<i>7.74</i>	<i>722</i>	<i>7.11</i>	<i>11.2</i>			
<i>11 D</i>	<i>GW</i>		<i>6.62</i>	<i>413</i>	<i>7.69</i>	<i>10.9</i>			
<i>MW3</i>	<i>GW</i>		<i>4.84</i>	<i>890</i>	<i>7.21</i>	<i>11.5</i>			
<i>MW9</i>	<i>GW</i>		<i>3.38</i>	<i>896</i>	<i>7.13</i>	<i>11.8</i>			
<i>MW4</i>	<i>GW</i>		<i>6.35</i>	<i>275</i>	<i>7.12</i>	<i>10.2</i>			
<i>MW10</i>	<i>GW</i>		<i>7.21</i>	<i>1079</i>	<i>6.81</i>	<i>11.3</i>			
<i>SW1</i>	<i>SW</i>		<i>9.32</i>	<i>133</i>	<i>7.63</i>	<i>10.1</i>			
<i>SW2</i>	<i>SW</i>		<i>8.85</i>	<i>132</i>	<i>8.21</i>	<i>10.1</i>			
<i>CAG</i>	<i>flooded.</i>								

COMMENTS:

Cavan County Council Groundwater & Leachate Sampling Ref:

Site Reference: *Ballymesduh* Permit No. *93-01* Date: *17/10/12* Personnel: *Bron beating*

Sample Ref (Shallow /Deep)	Depth of Well (m) <i>A</i>	Depth of water below Ground Level (m) <i>B</i>	Depth of Water column (m) <i>A-B=h</i>	Diameter of Well (m) <i>C</i>	Radius of Well (m) $(C/2)=r$	Radius Squared (m ²) <i>r</i> ²	Volume of Water in Well (m ³) $\Pi r^2 h$	Volume of Water in well - Litres (m ³ x 1000)	Volume of water to purge (Litres x 3)	Time to Purge (mins)
<i>16 D</i>	<i>10</i>	<i>0</i>	<i>10</i>	0.05	0.025	0.000625	<i>0.019625</i>	<i>19.62</i>	<i>58.87</i>	<i>10 min purge</i>
<i>16 S</i>	<i>5</i>	<i>0.8</i>	<i>4.2</i>	0.05	0.025	0.000625	<i>0.00824</i>	<i>8.24</i>	<i>24.7</i>	<i>5 min purge</i>
<i>18</i>	<i>21</i>	<i>0</i>	<i>21</i>	0.05	0.025	0.000625	<i>0.041215</i>	<i>41.21</i>	<i>123.6</i>	<i>20 min purge</i>
<i>17 D</i>	<i>15</i>	<i>0.1</i>	<i>14.9</i>	0.05	0.025	0.000625	<i>0.02924</i>	<i>29.24</i>	<i>87.72</i>	<i>15 min purge</i>
<i>17 S</i>	<i>5</i>	<i>0.950</i>	<i>4.05</i>	0.05	0.025	0.000625	<i>0.007948</i>	<i>7.94</i>	<i>23.84</i>	<i>5 min purge</i>

Cavan County Council Groundwater & Leachate Sampling Ref:

Site Reference: *Ballyvaughan* Permit No. *93-01* Date: *17/10/12* Personnel: *Boran Kearney*


Sample Ref (Shallow /Deep)	Depth of Well (m) <i>A</i>	Depth of water below Ground Level (m) <i>B</i>	Depth of Water column (m) <i>A-B=h</i>	Diameter of Well (m) <i>C</i>	Radius of Well (m) $(C/2)=r$	Radius Squared (m ²) r^2	Volume of Water in Well (m ³) $\pi r^2 h$	Volume of Water in well - Litres (m ³ x 1000)	Volume of water to purge (Litres x 3)	Time to Purge (mins)
<i>11S</i>	<i>5</i>	<i>2.4</i>	<i>2.6</i>	0.05	0.025	0.000625	<i>0.00510</i>	<i>5.10</i>	<i>15.30</i>	<i>3 min Purge</i>
<i>11D</i>	<i>30</i>	<i>11.4</i>	<i>18.6</i>	0.05	0.025	0.000625	<i>0.03650</i>	<i>36.50</i>	<i>109.5</i>	<i>20 min Purge</i>
<i>MW3</i>	<i>2.9</i>	<i>2.0</i>	<i>0.9</i>	0.05	0.025	0.000625	<i>0.001766</i>	<i>1.766</i>	<i>5.29</i>	<i>2 min Purge</i>
<i>MW4</i>	<i>3.4</i>	<i>0.6</i>	<i>3.36</i>	0.05	0.025	0.000625	<i>0.0065547</i>	<i>6.55</i>	<i>19.66</i>	<i>5 min Purge</i>
<i>MW9</i>	<i>4.5</i>	<i>3.3</i>	<i>1.2</i>	0.05	0.025	0.000625	<i>0.002355</i>	<i>2.35</i>	<i>7.06</i>	<i>2 min Purge</i>

Cavan County Council Groundwater & Leachate Sampling Ref:

Site Reference: *Ballyjamesduff* Permit No. *93-01* Date: *17/10/12* Personnel: *Brona Keating*

Sample Ref (Shallow /Deep)	Depth of Well (m) <i>A</i>	Depth of water below Ground Level (m) <i>B</i>	Depth of Water column (m) <i>A-B=h</i>	Diameter of Well (m) <i>C</i>	Radius of Well (m) $(C/2)=r$	Radius Squared (m ²) <i>r</i> ²	Volume of Water in Well (m ³) $\pi r^2 h$	Volume of Water in well - Litres (m ³ x 1000)	Volume of water to purge (Litres x 3)	Time to Purge (mins)
<i>MW10</i>	<i>3.4</i>	<i>20</i>	<i>14</i>	0.05	0.025	0.000625	<i>0.00742</i>	<i>2.74</i>	<i>2.24</i>	<i>2 min Purge</i>
				0.05	0.025	0.000625				
				0.05	0.025	0.000625				
				0.05	0.025	0.000625				
				0.05	0.025	0.000625				

APPENDIX 5 – CHAIN OF CUSTODY/SAMPLE SUBMISSION



Environmental Laboratory Services Ltd
 From 2018/01/01
 Station, Llanwrin Park,
 Bickton,
 Cornwall
 PL20 9JH

SAMPLE SUBMISSION FORM

DETAILS TO APPEAR ON ANALYSIS REPORT

Contact Name: Sharon Leach
 Address: Baylors

CONTRACT DETAILS

ELS Quote No: 405
NOTE: To reduce potential for error this field must be completed
 On a separate sheet for different Quote Numbers

Customer Name: Baylors
 PO Number: 3994
NOTE: Use a separate sheet for different PO Numbers
 For all customers a PO Number must be provided with the samples

Results Due (Tick): No Due 1hr 2hrs 4hrs 1day 2days 3days

NOTE: Standard lead times 10 working days and 15 working days for test with control.
 Deviations should be agreed in advance and may incur an extra charge

SAMPLE DETAILS

Number	Sample Reference	Tests Requested	Number of bottles submitted	Sample Type
	<small>NOTE: Whatever appears in this section, is the ONLY detail that will appear on the analysis report (Do not write the required detail on the bottles as it is too easily not clear)</small>	<small>NOTE: To reduce potential for error please complete this field clearly indicating per analytical sheet attached or list the specific tests below</small>		<small>Drinking Water (DW), Ground Water (GW), Surface Water (SW), Waste Water (WW), Sludge, Soil/Silt, Sewer, Air</small>
6	MW 3	see an	full kit	GW
7	MW 4	11	11	11
8	MW 9	4	4	4
9	MW 10	4	4	4
10		4	4	4

ONLY FIVE SAMPLES ALLOWED PER SUBMISSION SHEET

ADDITIONAL INFORMATION AND SIGNATURES

To be filled by the person submitting samples

Signature: [Signature] Phone No: 0146 927000
 Date: 17/10/10
 No. samples submitted: 9 No. of pages: 2 of 4
 Additional info: [Blank]

To be filled by ELS Ltd

Signature: [Signature]
 Date: 18.10 Time: [Blank]
 Condition: Satisfactory Unsatisfactory - See notes above
 Additional info: rw

NOTES FOR CUSTOMER

1. Please try to save this information about to your desktop.
2. This form is designed to allow key details to be reproduced and retained as necessary
3. Failure to submit the form with samples may lead to errors which may be outside the control of ELS Ltd.
- 4
- 5

NOTES FOR ELS LTD

1. If the customer details are not on the system or if the name and address differ greatly with that on the system consult the Customer Service Agent
2. Always ensure the "Customer Name" above is used on the report if this field is blank use the default name on the system
3. Click "Print" when samples have been received from County Councils without PO Numbers
4. Grouping in samples with different PO Numbers on different reports
5. Do not enter sample details in black capitalizing sample ref. ACORN DRINKING WATER should read Acorn Drinking Water

Environmental Laboratory Services Ltd
 Access Business Centre,
 Millers Dale, Millers Dale,
 Macclesfield,
 Cheshire,
 M13 9PL
 01625 595111

SAMPLE SUBMISSION FORM

3993

DETAILS TO APPEAR ON ANALYSIS REPORT

Contract Name: Boylan Engineering

Address: Boylan Engineering
Millers Dale
Macclesfield

Customer Name: Boylan Engineering

PO Number: _____
These separate sheets for different PO Numbers

NOTE: For all containers a PO Number must be provided with the samples

CONTRACT DETAILS

ELS Quote No: 1105

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

Results Due (Week): Week 1 Week 2 Week 3

Week 4 Week 5 Week 6

NOTE: Standard lead time is 10 working days and 14 working days for test submittal.
 Deviations should be agreed in advance and may incur an extra charge

SAMPLE DETAILS

Sample No.	Sample Reference	Tests Requested	Number of bottles submitted	Sample Type
	NOTE: Whatever appears in this section, is the ONLY detail that will appear on the analysis report (Do not write the required detail on the bottles as it is normally not clear)	NOTE: To reduce potential for error please complete this field clearly indicating per quote per sheet attached or for the specific tests below		Drinking Water (DW), Ground Water (GW), Surface Water (SW), Waste Water (WW), Sludge, Sediment, Solvent, Air
1	16 S	total see on	four WTE	DW
2	16 D	total "	"	DW
3	17 S	total "	"	DW
4	17 D	total "	"	DW
5	18	total "	"	DW

ONLY FIVE SAMPLES ALLOWED PER SUBMISSION SHEET

ADDITIONAL INFORMATION AND SIGNATURES

To be filled in by customer submitting samples

Signature: [Signature] Phone No: 01625 263000

Date: 17/10/12

No. samples submitted: 9 No. of pages: _____

Additional Detail any: _____

To be filled in by ELS Ltd

Signature: _____

Date: 18/10 Time: _____

Condition: Satisfactory Unsatisfactory - See notes above

Additional Info: DW

NOTES FOR CUSTOMER

- Print from browser this submission sheet to your desktop
- This form is designed to allow key details to be typed over if read as necessary
- Failure to submit the form with samples may lead to errors which may be outside the control of ELS Ltd

NOTES FOR ELS LTD

- If the customer details are not on the system or if the name and address differ greatly with that on the system consult the Customer Service Agent
- Always ensure the "Contract Name" always is used on the report if that field is blank use the default name on the system
- Check "No Res" where samples have been received from County Councils without PO Numbers
- Always tag samples with different PO Numbers on different requests
- Do not enter sample details in block capital eg sample ref ACORN DRINKING WATER should read Acorn Drinking Water

Environmental Laboratory Services Ltd
 10000 Parkway, Clonsilla,
 Mullingar, Co. Wick,
 Ireland
 01-823-64111

SAMPLE SUBMISSION FORM

DETAILS TO APPEAR ON ANALYSIS REPORT

Customer Name: Bryan Healy
 Address: Boylan Eng
Mullingh
Cowood

Customer Name: 3995
 PO Number: Boylan Eng
 NOTE: Use a separate sheet for **DIFFERENT** PO Numbers
 For all customers a PO Number must be provided with the samples

CONTRACT DETAILS

ELS Quote No: 605
 NOTE: To receive payment for work this form must be completed
 on a separate sheet for different Quote Numbers.

Results Due (Y/N): Yes No Yes No Yes No

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

Sample Number	Sample Reference	Tests Requested	Number of bottles submitted	Sample Type
	NOTE: Where no appears in this section, in the QSL, detail that will appear on the analysis report (Do not write the required detail on the bottles as it is not easily set clear)	NOTE: To receive payment for work please complete this detail showing indicating per quote per sheet attached or list the specific tests below		Drinking Water (DW), Ground Water (GW), Surface Water (SW), Waste Water (WW), Sludge, Sediment, Soil, Air
1	GW1	see QN	Field Kit	DW
2	GW2	"	"	"
3				
4				
5				

ONLY FIVE SAMPLES ALLOWED PER SUBMISSION SHEET

ADDITIONAL INFORMATION AND SIGNATURES

Signature: Bryan Healy Date: 17/10/12
 Phone No: 0182 9276000
 No. samples submitted: 2 No. of pages: 3 of 4
 Additional Info:

Signature: [Signature] Date: 18/10/12
 Customer: Boylan Eng Satisfactory: Dissatisfactory:
 Additional Info: FW

NOTES FOR CUSTOMER

1. Fill in, to give this submission sheet to your clerk
2. This form is designed to allow key details to be typed, set out and re-used as necessary
3. Failure to submit the form with samples may lead to errors which may be outside the control of ELS Ltd
- 4.
- 5.

NOTES FOR FIELD USE

1. If the customer details are not on the system or if the name and address differ greatly with that on the system contact the Customer Service Agent
2. Always ensure the "Customer Name" shown is used on the report, if that fails to be done the default name on the system
3. Click "Pe Rig" where samples have been received from County Councils without PO Numbers
4. Always log in samples with different PO Numbers on different reports
5. Do not enter sample details in block capitals eg sample of ACORN DRINKING WATER should read Acorn Drinking Water.



Environmental Laboratory Services Ltd
 Acre Business Centre
 Main Industrial Park
 Darbrook
 Leam
 Tel: 01453641

SAMPLE SUBMISSION FORM

3996

DETAILS TO APPEAR ON ANALYSIS REPORT

Contact Name: George Westing
 Address: Boyle Ave
Mullagh
County

Customer Name: George Westing
 PO Number:

NOTE: This is required for different PO Numbers
 For all instances a PO Number must be provided with the samples

CONTRACT DETAILS

ELS Quote No: 4005

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

Results Due (Tick) Review Print Done
 Print Done Done

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

SAMPLE DETAILS

Number	Sample Reference	Units Requested	Number of bottles submitted	Sample Type
	NOTE: Whatever appears in this section, is the QSN & should also will appear on the analysis report. (Do not write the required detail on the form as it is already set there)	NOTE: To reduce potential for error please complete this field clearly including per centager sheet attached or use the specific formulation		Drinking Water (DW), Ground Water (GW), Surface Water (SW), Waste Water (WW), Sludge, SOLID, Substrat, Air
1	mw 7	See QN	full kit	leachate
2	mw 8	u	u	u
3				
4				
5				

ONLY FIVE SAMPLES ALLOWED PER SUBMISSION SHEET

ADDITIONAL INFORMATION AND SIGNATURES

To be filled by client for submitted samples

Signature: [Signature] Phone No: 01453 927800
 Date: 17/10/12
 No. samples submitted: 2 No. of pages: 4 of 4
 Additional Info:

To be filled by ELS Ltd

Signature: [Signature]
 Date: 18/10/12
 Condition: Satisfactory Unsatisfactory (see notes above)
 Additional Info: EW

NOTES FOR CUSTOMER

1. Fill this in save this information sheet to your desktop
2. This form is designed to allow key details to be typed, saved and reused as necessary
3. Failure to submit the form with samples may lead to errors which may be outside the control of ELS Ltd
- 4
- 5

NOTES FOR ELS LTD

1. If the customer details are not on the system or if the name and address differ greatly with that on the system email the Customer Services Agent
2. Always ensure the "Customer Name" above is used on the report if that field is blank use the default name on the system
3. Click "Full Kit" where samples have been received from County Councils without PO Numbers
4. Always tag in samples with different PO Numbers on different reports
5. Do not enter sample details in block capitals or sample of AIR OR DRINKING WATER should read Access Drinking Water

APPENDIX 6 – CALIBRATION CERTIFICATE-GA 2000



Calibration Certificate

Issued by	Environmental monitoring	Certificate number	1125
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Instrument	GA2000	Calibrated by	AT
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Serial no	531	Ambient temp	17
Service done	09/11/11	Ambient pressure	1001
Calibration date	02/02/2012	Calibration due	02 Feb 2013
Job number	NA	Linearity check	n/a
Logger	Pass	Battery	Pass
Filter	pass	Overall result	pass

Test Method

The instrument was calibrated by applying a know concentration of gas at a set flow rate and pressure. The results are recorded on this sheet **after** adjustment and a constant reading is obtained. The results are compared to that of a reference certified set of gases

Test reference	Cert tracability	Instrument reading	pass/fail
CO2	5.0%	4.7%	pass
O2	17.8%	17.9%	pass
CH4	2.5%	2.3%	pass
CO	199ppm	197ppm	pass
H2S	5ppm	5.0ppm	pass

Address

environmental monitoring
Unit 9a
Lake District Business Park
Mint Bridge Road
Kendal
Cumbria
Tel 01782 435100
email : environmonitoring@btconnect.co.uk

APPENDIX D

Declaration



Cavan County Council

Comhairle Chontae an Chabháin

Teach Na Cúirte, An Cabháin
Courthouse, Cavan



CHAMBERS IRELAND
COUNTY/CITY COUNCIL
OF THE YEAR 2011



Declaration

Ballyjamesduff Landfill WL0093/1

Cavan County Council hereby certifies that the content of the full pdf. AER W0093-012012AER.pdf uploaded to the EPA website is a true copy of the original AER.

Signed Sinead Fox Dated 15/3/13

Sinead Fox
Landfill Operations Manager
Cavan County Council