COMHAIRLE CHONDAE AN CABHÁIN

Cavan County Council

Annual Environmental Report 2011

Bailieborough Landfill WL0091-1

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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

Bailieborough Landfill has been operated as waste disposal facility by Cavan County Council since the late 1960s. The landfill is located on the outskirts of the town of Bailieborough, (c. 1 km from town centre), in the town land of Tanderagee, which was a commercially exploited bog. 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. The total area of the site comprises 2.23 hectares.

A Waste Licence for the facility was issued by the EPA on 22nd February 2002, when the site officially closed and was thereafter remediated. Condition 11.6 of Waste Licence Ref. 91-1 requires the submission of an Annual Environmental Report (AER) for Bailieborough Landfill facility. This document is produced in order to comply with requirements of Condition 11.6.

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 purpose of this AER is 01st January 2011 - 31st December 2011.

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.

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 late 2009 when advised by the Agency.

5.1 Surface Water

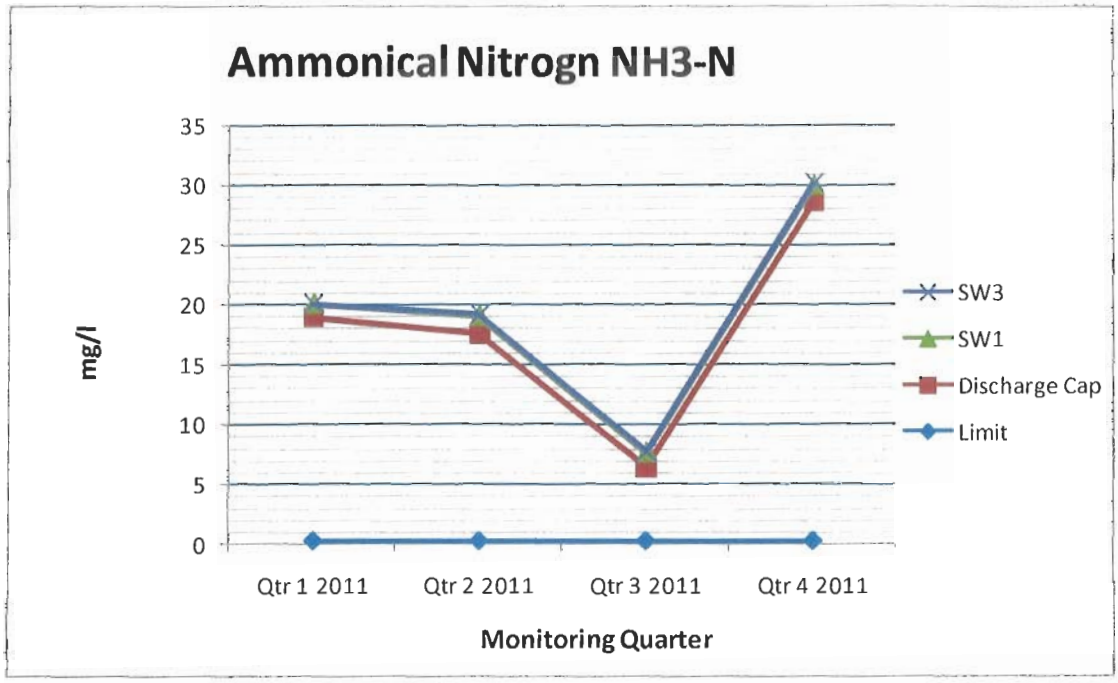
All monitoring locations are detailed in the site map which is presented in Appendix B.

As table 4.1 shows there was a high Ammonia, COD, Iron and Manganese levels recorded in the samples taken at the discharge cap, SW1 and SW3. SW 1 is located downstream of the landfill while SW3 is located further downstream at the new monitoring location SW3 "Chapel Lough".

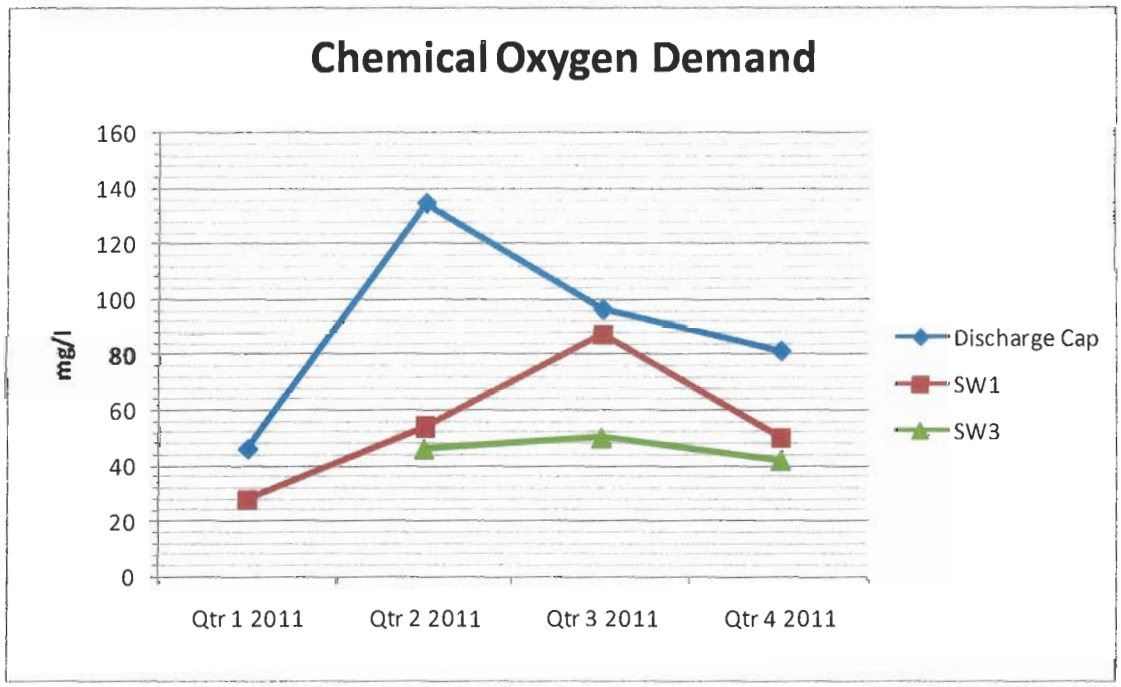
Table 5.1 Surface water summary results

	Parameter	Ammonia	COD	Fe	Mn
	Units	mg/l N	mg/l	mg/l	mg/l
Discharge Cap	Qtr 4 2011	28.31	81	1.384	1.19
	Qtr 3 2011	6.243	96	2.678	1.297
	Qtr 2 2011	17.36	134	20.42	1.00
	Qtr 1 2011	18.70	46	8.08	0.61
SW1	Qtr 4 2011	1.514	50	0.7538	0.3174
	Qtr 3 2011	1.199	87	1.708	1.207
	Qtr 2 2011	1.475	54	1.84	0.9223
	Qtr 1 2011	1.158	28	-	-
SW3	Qtr 4 2011	0.175	42	0.3624	0.4106
	Qtr 3 2011	0.038	50	0.7586	0.4152
	Qtr 2 2011	0.159	46	2.24	1.72
	Qtr 4 2010	-	-	-	-
EQS for Surface Waters		0.2		1	0.3

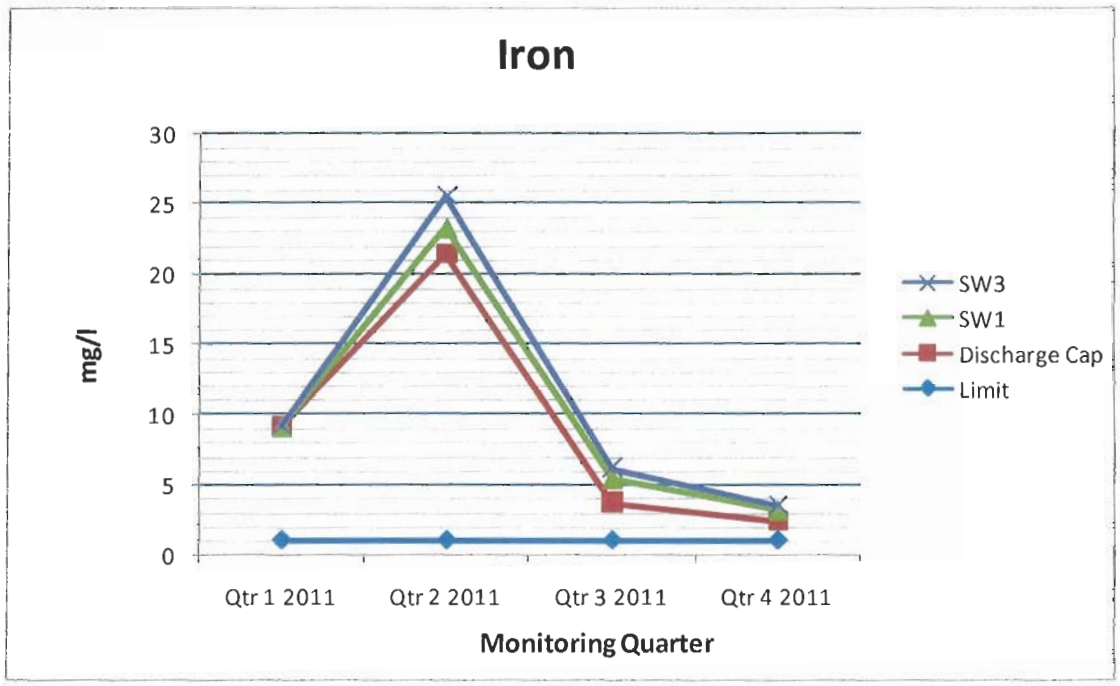
Graph 5.1 Surface water- Ammonical Nitrogen



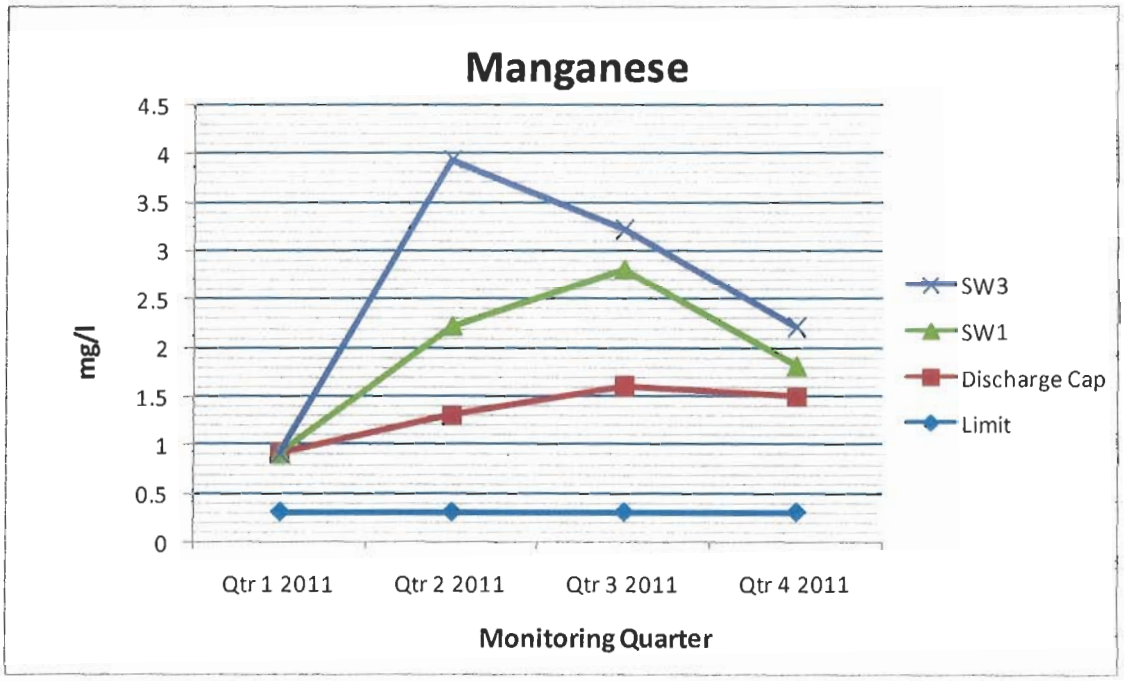
Graph 5.2 Surface water- Chemical Oxygen Demand



Graph 5.3 Surface water- Iron



Graph 5.4 Surface water- Manganese



Elevated levels of Iron and Manganese can be attributed to the natural composition of the underlying geology however it is not uncommon to encounter high levels of both parameters in the vicinity of landfills. The elevated level of Ammonia in Cap discharge sample during quarter 4 is attributed to the sample being taken from a stagnant pool directly beneath the discharge pipe on the day of monitoring. A sample was taken from the pool on this occasion as the discharge pipe was dry. All future samples will be taken from the discharge pipe when a sample is available.

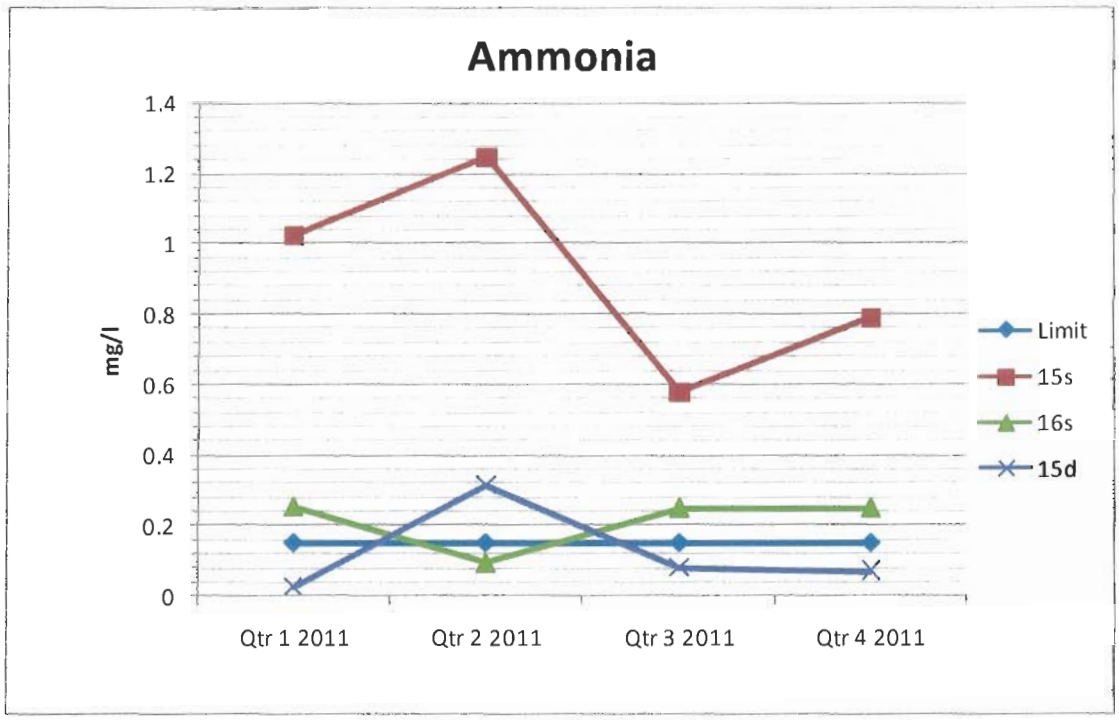
5.2 Groundwater

The following table details all reoccurring exceedances at groundwater wells during 2011. Results in Hatched Red indicate where the interim guide value has been exceeded when compared to limits stipulated by the Environmental Protection Agency.

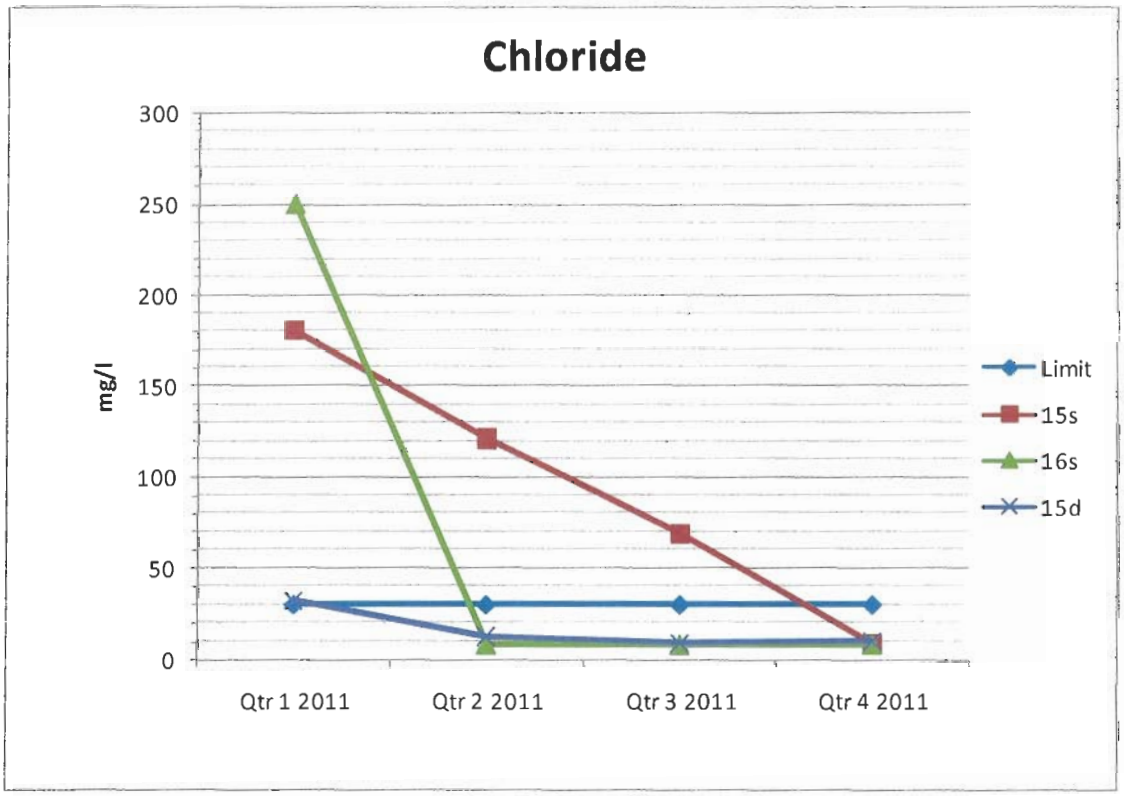
Table 5.2 Groundwater Summary Results

	Parameter	Ammonia	Cl	Fe	Mn
	Units	mg/l N	mg/l	mg/l	mg/l
WELL 10 D	Qtr 4 2011	0.036	7	<0.02	0.0152
	Qtr 3 2011	0.029	6	0.0343	0.0828
	Qtr 2 2011	0.013	5.7	<0.005	0.0631
	Qtr 1 2011	<0.007	67.5	0	0.092
WELL 10 S	Qtr 4 2011	0.027	15.2	<0.02	<0.001
	Qtr 3 2011	0.04	14.5	0.02	0.0765
	Qtr 2 2011	0.027	15.9	<0.005	<0.001
	Qtr 1 2011	<0.007	26.7	1.229	0.989
WELL 15 D	Qtr 4 2011	0.071	9.7	<0.02	0.1835
	Qtr 3 2011	0.081	9.1	0.0372	0.1562
	Qtr 2 2011	0.314	12.7	1.395	0.3981
	Qtr 1 2011	0.026	32.0	1.755	0.299
WELL 15 S	Qtr 4 2011	0.788	9.3	10.39	0.5348
	Qtr 3 2011	0.576	69.1	10.4	0.3666
	Qtr 2 2011	1.244	121.1	0.1129	0.5393
	Qtr 1 2011	1.020	180.1	80.230	1.117
WELL 16 D	Qtr 4 2011	0.076	10.9	0.154	0.6501
	Qtr 3 2011	0.033	9.7	0.4167	0.6013
	Qtr 2 2011	0.089	10.7	<0.005	0.605
	Qtr 1 2011	0.073	29.7	2.124	0.712
WELL 16 S	Qtr 4 2011	0.248	8.6	0.0316	0.4758
	Qtr 3 2011	0.248	8.4	1.516	0.3429
	Qtr 2 2011	0.094	8.5	0.66	0.35
	Qtr 1 2011	0.251	249.4	16.260	0.542
Interim Guide Value		0.15	30	0.2	0.05

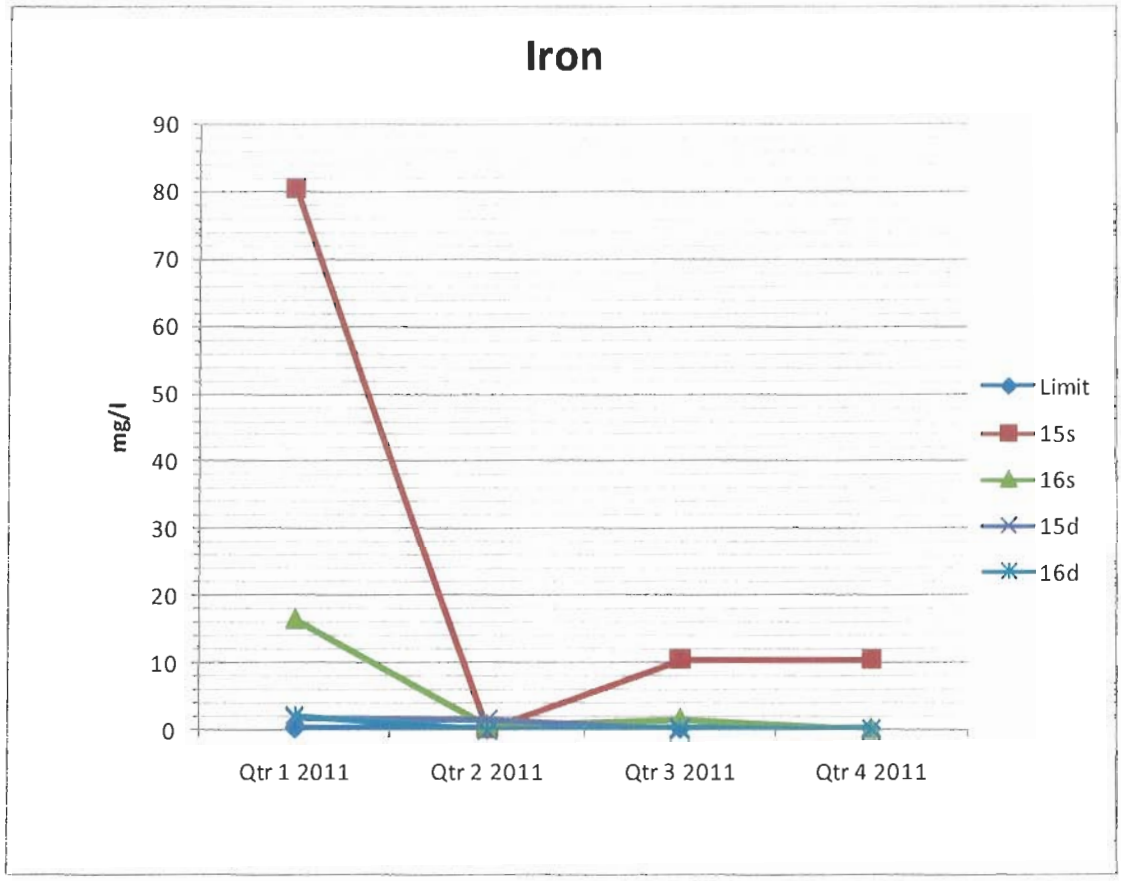
Graph 5.5 Ground water- Ammonia



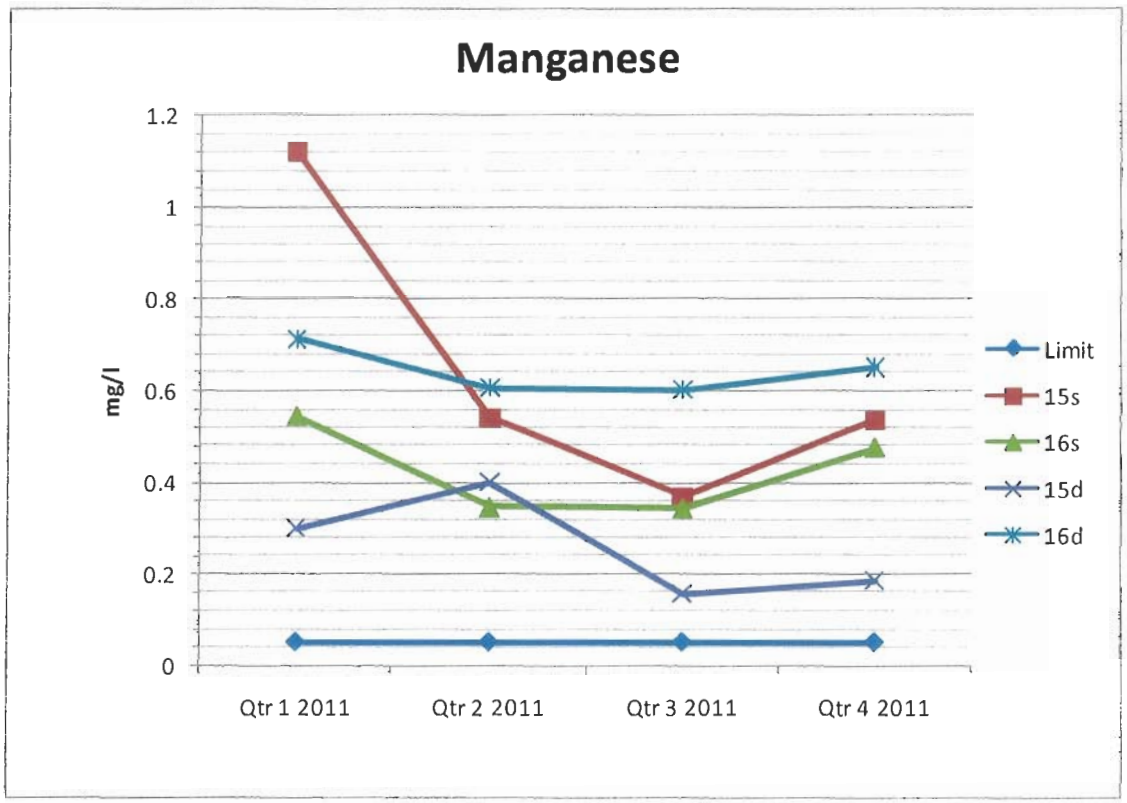
Graph 5.6 Groundwater- Chloride



Graph 5.7 Groundwater-Iron



Graph 5.8 Groundwater-Manganese



As detailed in the above graphs, there were numerous ground water exceedances in the vicinity of this landfill during 2011.

Exceedances occurred in the following parameters:

- Ammonia: Elevated levels of this parameter were prevalent during 2011. Elevated levels of ammonia are strongly associated with pollution form waste water treatment systems and so contamination of these wells by the landfill cannot be definitively concluded.
- 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: This parameter is a gives a strong indication of contamination from a landfill source.
- Manganese: Elevated levels of Manganese can be associated with landfill contamination but can also be attributed to the natural composition of the underlying soils.

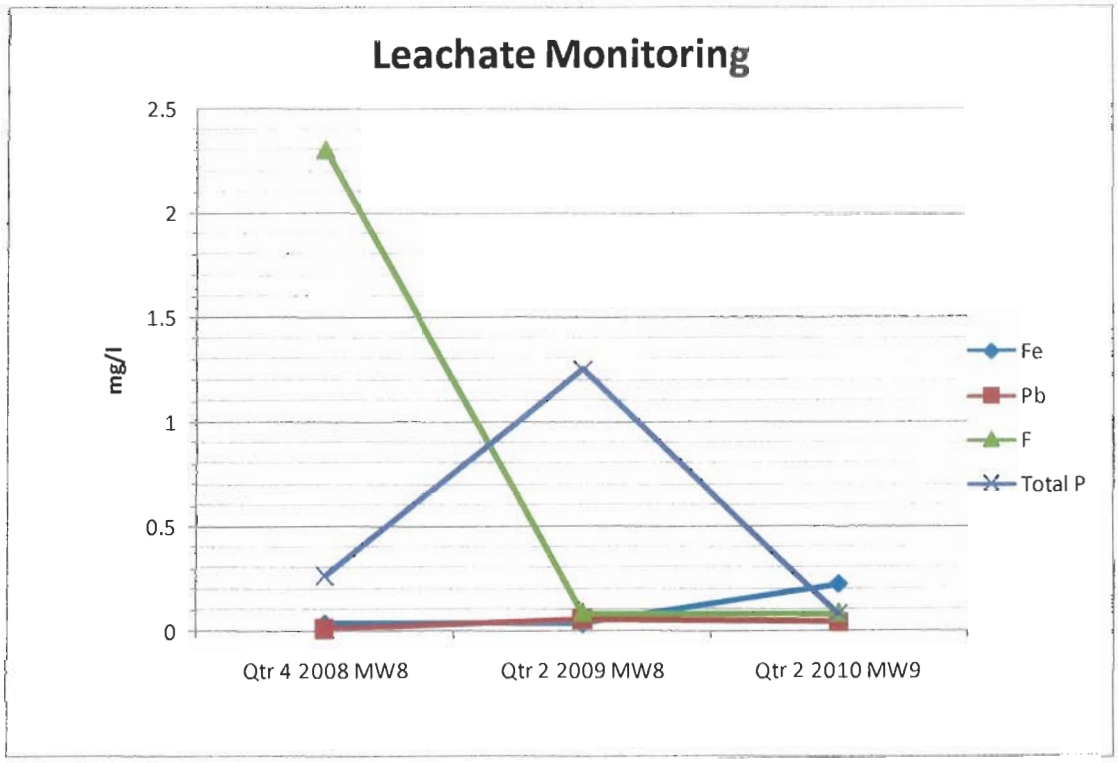
5.3 Leachate Monitoring

Leachate monitoring is carried out annually in accordance with the licence. A leachate sample from this landfill was unattainable during 2011 due to the wells being dry. Previous results are displayed below. A sample of leachate could not be obtained from either well during 2011 due to the wells being dry however a sample of leachate was obtained form well MW8 in Quarter 1 2012 and will be reported n the 2012 AER.

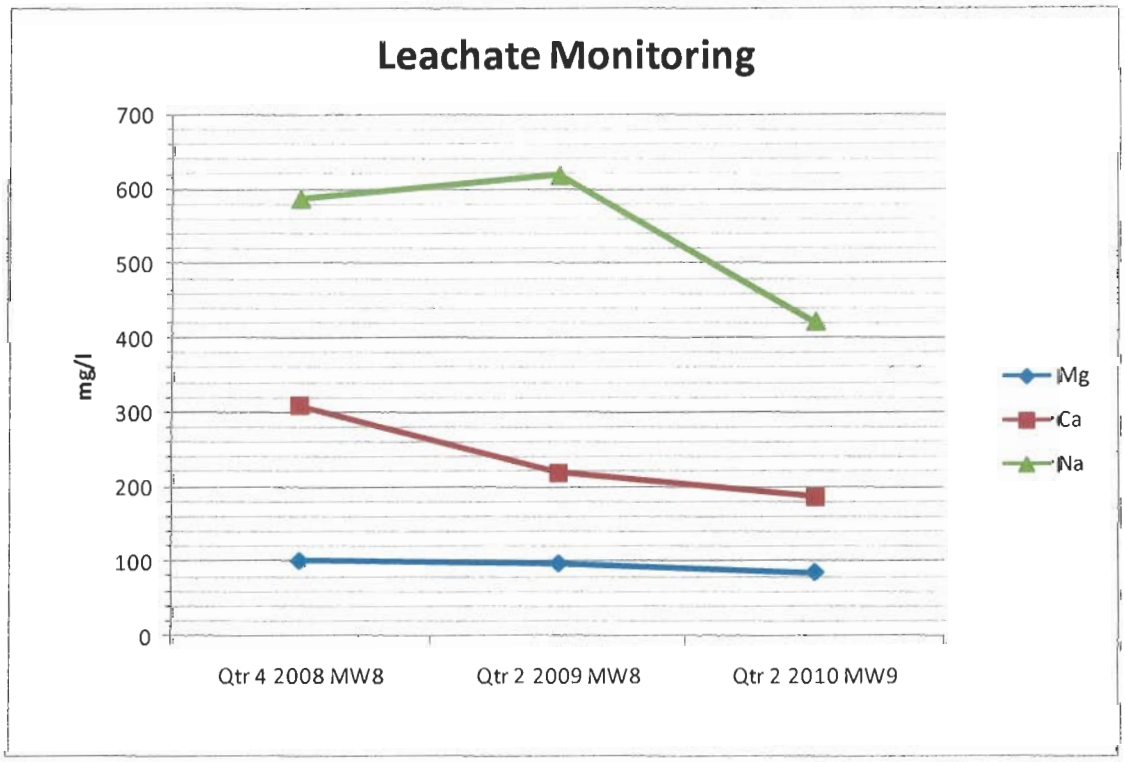
Table 5.3 Leachate Summary Results

	Parameter	Na	Fe	Pb	Ca	Mg	F	Total Phosphorus
	Units	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l P
WELL MW 8	2011	-	-	-	-	-	-	-
	Qtr 2 2010	-	-	-	-	-	-	-
	Qtr 2 2009	617.5	0.03	0.053	218.2	97.43	0.08	1.25
	Qtr 4 2008	586	0.03	0.006	307.5	101	2.3	0.26
WELL MW 9	2011	-	-	-	-	-	-	-
	Qtr 2 2010	421	0.221	0.04	187.4	85.1	<0.08	0.08
	Qtr 2 2009	-	-	-	-	-	-	-
	Qtr 4 2008	-	-	-	-	-	-	-
Interim Guide Values		150	0.2	0.01	200	50	1	

Graph 5.9a Leachate Monitoring



Graph 5.9b Leachate Monitoring



5.4 Gas Emissions

Landfill gas monitoring is conducted at nine sampling locations. These locations are both within and outside the landfill mass. The following table details all exceedances during 2011.

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		1% v/v	1.5 % v/v	%	PPM	mb
Client Ref	Qtr	-	-	-	-	-
MW 1	Qtr 4 2011	0.1	0.0	20.5	0.1	992
	Qtr 3 2011	0.2	0.3	21.7	0	999
	Qtr 2 2011	0.0	0.1	20.33	0	998
	Qtr 1 2011	0.0	0.1	20.37	0	1003
MW 2	Qtr 4 2011	0.1	0.0	20.5	0.1	992
	Qtr 3 2011	0.1	0.1	21.8	0	1000
	Qtr 2 2011	0.6	2.1	19.1	0	998
	Qtr 1 2011	0.4	1.7	19.7	0	1003
MW 3	Qtr 4 2011	0.1	0.2	21.0	0.1	992
	Qtr 3 2011	9.8	7.4	16.4	0	1000
	Qtr 2 2011	1.8	2.5	18.5	0	998
	Qtr 1 2011	1.9	2.4	18.94	0	1003
MW 6	Qtr 4 2011	0.1	0.0	20.5	0.1	992
	Qtr 3 2011	0.0	0.4	21.9	0	1001
	Qtr 2 2011	0.0	0.4	19.7	0	998
	Qtr 1 2011	0.0	0.5	19.74	0	1003
MW 7	Qtr 4 2011	0.4	1.2	21.8	0.0	992
	Qtr 3 2011	0.4	1.1	21.6	0	1000
	Qtr 2 2011	0.4	1.3	19.5	0	998
	Qtr 1 2011	0.4	1.5	19.05	0	1003
MW 8	Qtr 4 2011	16.9	16.2	8.6	18.1	992
	Qtr 3 2011	22.8	16.6	11.3	0	999
	Qtr 2 2011	14.7	10.9	12.8	0	998
	Qtr 1 2011	14.3	9.8	12.94	0	1003
MW 9	Qtr 4 2011	3.5	4.3	17.5	3.9	993
	Qtr 3 2011	5.0	3.2	18.9	0	1000
	Qtr 2 2011	1.7	2.7	18.5	0	999
	Qtr 1 2011	1.6	2.2	18.71	0	1002
MW 10S	Qtr 42011	0.1	0.0	20.7	0.1	995
	Qtr 3 2011	0.0	0.0	22	0	1001
	Qtr 2 2011	0.0	1.1	18.2	0	998
	Qtr 1 2011	0.0	0.7	18.34	0	1002
MW 10D	Qtr 4 2011	0.1	0.1	20.9	0.1	994
	Qtr 3 2011	0.0	0.0	22.1	0	1001
	Qtr 2 2011	0.0	1.0	16.7	0	999
	Qtr 1 2011	0.0	0.9	17.07	0	1002
	Limit	**1**	**1.5**			

Exceedance

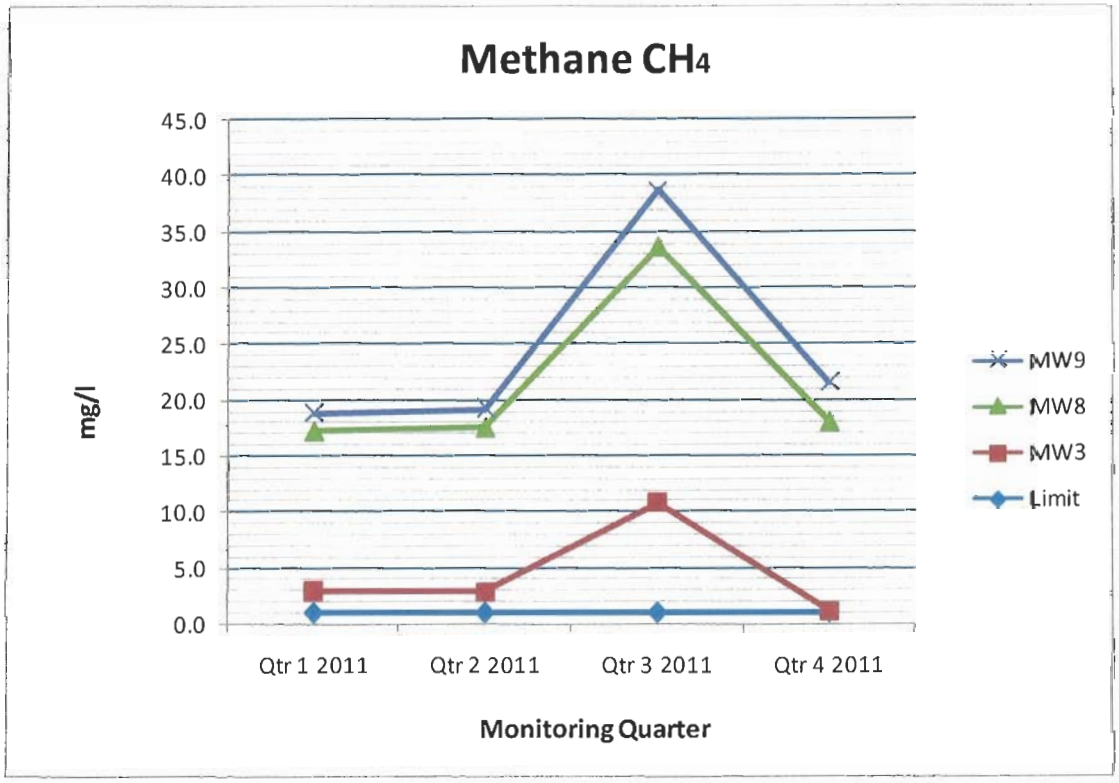
NOTES

1 Instrument Serial No: GA 07721

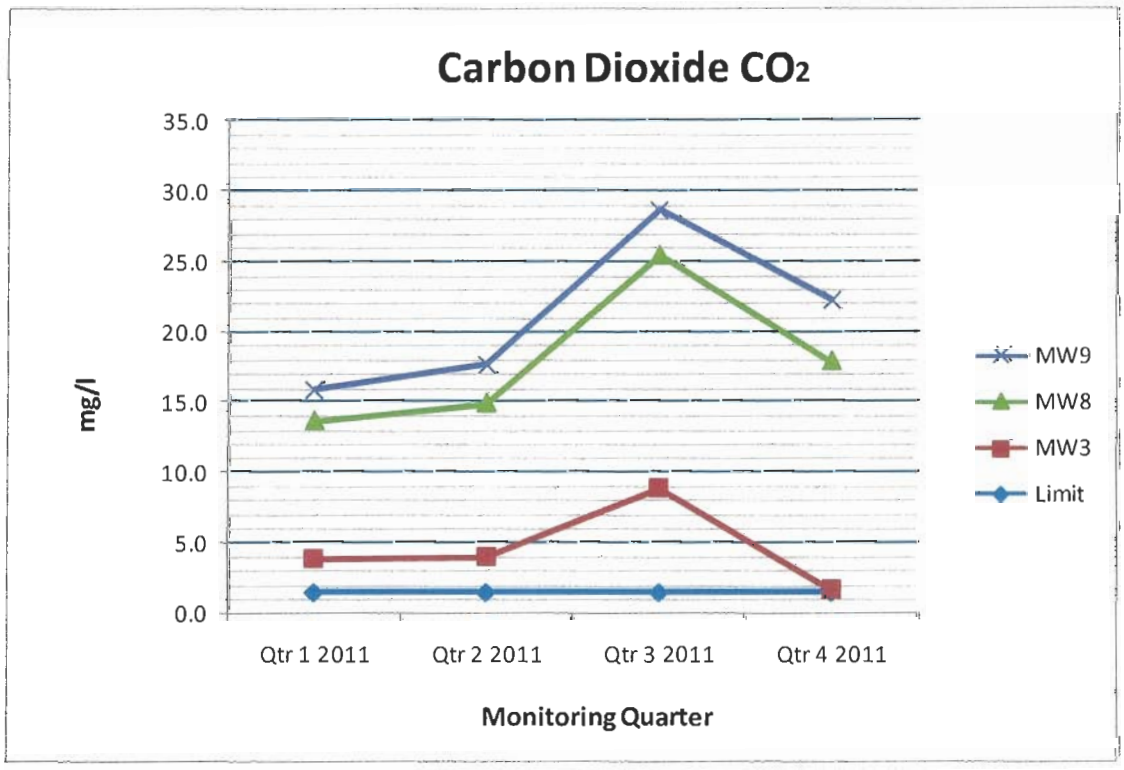
2 Limit: Schedule C2, Licence

The following graphs show gas monitoring results for 2011. These wells are located inside the waste mass.

Graph 6.0



Graph 6.1



Gas Monitoring on the site reveals typical low levels of Methane & Carbon Dioxide and higher levels of Oxygen. Minor elevations occurred in MW2, MW3, MW7, MW8 & MW9 - all located in the centre of the waste body. There was no gas migration recorded in monitoring wells outside of the waste body.. The results are typical of a closed landfill.

6.0 SUMMARY OF RESULTS & INTERPRETATION OF ENVIRONMENTAL MONITORING

Included in Appendix C is a copy of the 4th quarter 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 note however that there are signs of impact in the downstream samples and will endeavour to monitor and record as per the licence. The EPA instructed Cavan County Council in late 2010 to appoint an experienced hydro-geologist to study groundwater flows and levels in the landfill area. The results of this study were submitted to the agency in the 2010 AER.

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 THE FACILITY

The site is fully restored and the cap intact. There was some horse grazing on the site in the early summer months. Gorse overgrowth has become prolific on the cap. Gorse was removed in early 2011 and regrowth will be monitored in 2012.

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

Please refer to the Annual PRTR Report included in Appendix A which deals with the landfill gas emissions calculated using GASSIM.

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

There was no change to or development of any procedures undertaken by the licensee or monitoring contractor in 2011. The environmental monitoring contractor 'Boylan Engineering' adhere to all standard practices for environmental monitoring.

11.0 REPORTED INCIDENTS & COMPLAINTS SUMMARY

There were no incidences in the reporting period 2011. There were no complaints received by the EPA or the Local Authority regarding this facility in the reporting period 2011.

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 in the control of landfill gas, the FAS Waste Management Training Course and carries a Safe Pass.

Table 13.1 Management Structure 2011

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 2011/ 2012:

John Brannigan
Senior Executive Officer
Waste Management Section
Cavan County Council
Farnham Street,
Cavan

14.0 FINANCIAL PROVISION

Provision will be made in Cavan County Council Official Estimates for Charges as required under Condition 12 of Waste Licence Ref. 91-1.

15.0 ANY OTHER ITEMS AS SPECIFIED BY THE AGENCY

As requested by the Agency 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, Gas Emissions Survey

Environmental Protection Agency

Guidance to completing the PRTR workbook

AER Returns Workbook

Version 1.1.13

REFERENCE YEAR	2011

1. FACILITY IDENTIFICATION

Parent Company Name	Cavan County Council
Facility Name	Bailieborough Landfill
PRTR Identification Number	W0091
Licence Number	W0091-01

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	Tanderagee
Address 2	Bailieborough
Address 3	Co Cavan
Address 4	
	Cavan
Country	Ireland
Coordinates of Location	-6.97327 53.9092
River Basin District	IEEA
NACE Code	3821
Main Economic Activity	Treatment and disposal of non-hazardous waste
AER Returns Contact Name	Sinead Fox
AER Returns Contact Email Address	sfox@cavancoco.ie
AER Returns Contact Position	Landfill Operations Manager
AER Returns Contact Telephone Number	049-4378418
AER Returns Contact Mobile Phone Number	087 980 8507
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	
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 ?	

4.1 RELEASES TO AIR

Link to previous years emissions data

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
01	Methane (CH4)	C	MAB	GASSIM	0.0	70100.0	0.0	70100.0
03	Carbon dioxide (CO2)	C	MAB	GASSIM	0.0	197000.0	0.0	197000.0

* 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:
Please enter summary data on the quantities of methane flared and / or utilised

Bailieborough Landfill

	T (Total) kg/Year	M/C/E	Method Used: Method Code	Method Used: Designation or Description	Facility Total Capacity m3 per hour	
Total estimated methane generation (as per site model)	70100.0	C	MAB	GASSIM	N/A	
Methane flared	0.0				0.0	(Total Flaring Capacity)
Methane utilised in engine/s	0.0				0.0	(Total Utilising Capacity)
Net methane emission (as reported in Section A above)	70100.0	C	MAB	GASSIM	N/A	

Environmental Protection Agency

A survey of landfill sites to determine the quantity of methane flared and or recovered in utilisation plants for 2011

Please choose from the drop down menu the license number for your site	W0091
Please choose from the drop down menu the name of the landfill site	Ballieborough Landfill
Please enter the number of flares operational at your site in 2011	Select
Please enter the number of engines operational at your site in 2011	Select
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 31/03/2012

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 uptodate information on methane flaring and recovery in utilisation plants at landfills 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_2010) to:
LFGProject@epa.ie

Appendix B

Site Map

Site: Bailieborough Landfill (WL0091-01)
Subject: Monitoring Wells

Monitoring Wells	Sample Type	Installation Method	Cover Level (OD Malin)	Depth (mTOC)	Depth (mTOC)	Current Status	National Grid Coordinates
MW1	Leachate	Driven	151.506	3.05	148.456	Existing	N296071.98 E287504.68
MW2	Leachate	Driven	152.718	2.8	149.918	Existing	N296018.08 E287540.57
MW3	Leachate	Driven	159.274	3.6	155.674	Existing	N295972.19 E287549.66
MW4	Leachate	Driven	156.929	4.3	152.629	Existing	N295983.10 E287503.76
MW5	Gas	Driven	149.698	3.6	146.098	Existing	N295889.63 E287584.62
MW6	Leachate	Driven	150.73	3.2	147.53	Existing	N296082.66 E287461.47
MW7	Gas	Driven	151.5			Existing / Original	N296111.34 E287488.17
MW8	Leachate	Driven	160.744	3.95	156.794	Existing	N296014.48 E287517.14
MW9	Leachate	Driven	157.936	4.4	153.536	Existing	N296037.63 E287468.87
MW10S	Groundwater	Rotaryhammer	154.76	6.45	148.31	Existing / Original	N296038.12 E287547.64
MW10D	Groundwater	Rotaryhammer	154.76	25.3	129.46	Existing Original U/S	N296038.12 E287547.64
MW11S	Groundwater	Rotaryhammer	N/A	4.5		Destroyed	N/A
MW11D	Groundwater	Rotaryhammer	N/A	26		Destroyed	N/A
MW12S	Groundwater	Rotaryhammer	N/A	5.5		Destroyed	N/A
MW12D	Groundwater	Rotaryhammer	N/A	30.5		Destroyed	N/A
MW13	Leachate	Driven	154.613	4.6	150.013	Existing	N295899.47 E287543.88
MW14	Leachate	Driven	153.567	4.6	148.967	Existing	N295899.97 E287584.62
MW15D	Groundwater	Rotaryhammer	150.393	25	125.393	New D/S	N296092.30 E287344.88
MW15S	Groundwater	Rotaryhammer	150.356	5	145.356	New	N296097.38 E287348.38
MW16D	Groundwater	Rotaryhammer	152.632	27	125.532	New D/S	N295885.69 E287200.97
MW16S	Groundwater	Rotaryhammer	152.596	5	147.596	New	N295888.86 E287202.87
SW1	Grab						
SW2	Grab						

Client: CAVAN COUNTY COUNCIL
THE COURTHOUSE
CAVAN

Project: BAILIEBOROUGH LANDFILL (WL91-01)

Drawing Title: MONITORING WELL LOCATIONS

Project No. C007214 | Type ST | Drawing No. SK01 | Revision -

Appendix C

Quarter 4 Monitoring Report

Boylan engineering

ENVIRONMENTAL MONITORING REPORT FOR BAILIEBOROUGH LANDFILL W0091-01

Client: **Cavan County Council**

Site Location: **Tanderagee, Bailieborough**

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

Produced by: Brona Keating, BSc Hons (Environmental Science & Tech.)

Approved by: _____ **Date: 07th** December 2011

Cathal Boylan, BEng, CEng, MIEI
CHARTERED ENGINEER

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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 Bailieborough Landfill (W0091-01), Tandragee, Co Cavan for quarter four 2011.

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

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List of Tables

Appendix

1. INTRODUCTION

Bailieborough landfill is situated approximately 1 kilometre from Bailieborough town centre in the townland of Tandergee. The site which comprises some 2.23 hectares was originally peat land which was stripped for commercial purposes. The site was then operated as a traditional landfill until its closure in 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, surface water, leachate and landfill gas sampling programme conducted on site and also summarises findings and analytical results for quarter four 2011.

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, 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.

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 was conducted by Boylan Engineering to ensure accurate groundwater, surface water and leachate monitoring:

- ISO 5667: Guidance on sampling of groundwater's was adhered to.
- Prior to sampling, the depth of water in groundwater wells was measured by dipping. Individual dipping meters for Ground water and Leachate are used on all occasions to avoid cross contamination. Dipping the wells before sampling allows for calculation of the volume of water in the well. This data was recorded on the field sheet for volume calculation which is presented in appendix 4.
- Once the volume was calculated the boreholes were purged three times their volume before sampling.
- Sampled was conducted using a Waterra inertial lift pump and associated tubing pumping water directly from the borehole to the appropriate sampling bottles.
- Designated tubing was used at each location.
- Surface water samples were taken by grab sample using a Telescoup and Pendulum beaker.
- Having obtained a representative sample the following parameters were 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 were 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 were 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 was employed by Brona Keating of Boylan Engineering to ensure accurate monitoring:

- EPA, Landfill Manual, landfill monitoring 2nd Edition was adhered to.
- Prior to sampling, a dip meter was used to measure water levels, if present, in the wells.
- GA 2000 landfill gas analyser was used to measure the gas levels.
- The analyser was purged and connected to the sealed well monitoring nozzle.
- The monitoring nozzle was turned to the open position and the analyser measured the gas levels at 60 second intervals for 10 minutes. The analyser was allowed to run for this period of time to allow for a representative average to be obtained.
- All data was recorded on the Gas Analysis field sheet.
- The instrument was removed after 10 minutes and the monitoring nozzle returned to the closed position.
- The GA2000 was switched off between each monitoring location so as to allow the instrument to purge.
- This process was repeated at each monitoring location.
- Data for the GA 2000 was downloaded in the Boylan Engineering office.

2.4 Monitoring Locations

Monitoring Well	Sampling Type	Cover Level (TOC)	Depth (mTOC)	National Grid CoOrdinaes
MW1	Gas	151.55	3.05	N296071.96 E267506.68
MW2	Gas	152.72	2.8	N296018.08 E267540.57
MW3	Gas	159.27	3.6	N295972.19 E267549.66
MW6	Gas	150.73	3.2	N296082.66 E267451.47
MW8	Gas & Leachate	160.74	3.95	N296014.48 E267517.14
MW9	Gas & Leachate	157.94	4.4	N296037.63 E267458.87
MW10S	Gas & GW	154.76	6.45	N296038.12 E267458.87
MW10D	Gas & GW	154.76	25.3	N296038.12 E267458.87
MW15S	GW	150.36	5	N296097.36 E267343.36
MW15D	GW	150.39	25	N296092.30 E267344.88
MW16S	GW	152.6	5	N295888.86 E267202.87
MW16D	GW	152.53	27	N295885.59 E267200.97
SW1	SW			
SW3	SW			
CAP Discharge	Discharge			
Borora River	Decommissioned			

2.5 Weather Report

REPORTS FROM BALLYHAISE (A)							
Date	Rainfall	Max	Min	Grass Min Temp	Mean Wind Speed	Gusts	Sunshine
	(mm)	Temp	Temp	(°C)	(knots)	(if >= 34 knots)	(hours)
		(°C)	(°C)				
16/11/2011	5.6	11.5	6	1.3	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 2011

Report Number 54800
Monitoring Date: 16/11/2011

Method		Site Tests	Site Tests	Site Tests	Site Tests	Site Tests	Site Tests	TOC	Ammonia	AQ2-UP1	Titralab		AQ2-UP2		DO	Metals-Dissolved			
Method Number		Site Tests	Site Tests	Site Tests	Site Tests	Site Tests	Site Tests	EW123	EW003	EW154M	EW138	EW139	EW015	EW015	EW043	EM130			
Parameter		Sample temperature - (to be done onsite)	Cond	pH	DO	Water Level from TOC	Visual Inspection	TOC	Ammonia	TON (as N)(calc)	pH	Cond	Cl	SO4	DO	Fe	Mn	K	Na
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	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l
Limit of Detection		-	-	-	-	-	-	0.25	0.007	0.138	0.3	25	2.6	1.0	1.0	0.005	0.001	0.2	0.5
Date Testing Initiated		17.11.11						17.11.11			17.11.11		17.11.11		17.11.11	17.11.11			
ELS Ref	Client Ref																		
54800/001	MW 10S	10.5	334	7.3	9.71	5.8	Clear	1.78	0.027	<0.138	7.2	318	15.2	11.8	9.7	<0.02	<0.001	2.3	17.5
54800/002	MW 10D	10.5	435	7.7	7.62	6.78	Clear	1.2	0.036	<0.138	7.7	420	7	55.7	7.6	<0.02	0.0152	2.4	36.5
54800/003	MW 15S	11.1	298	6.2	6.23	1.66	Heavy Silt	12.82	0.788	0.153	6.0	204	9.3	43.1	6.1	10.39	0.5348	4.1	11
54800/004	MW 15D	10.5	322	7.8	7.35	1.74	Clear	0.84	0.071	<0.138	7.5	308	9.7	17.3	7.3	<0.02	0.1835	2.6	12.5
54800/005	MW 16S	10.4	282	6.9	7.62	1.48	Heavy Silt	2.67	0.248	<0.138	6.7	268	8.6	19.5	7.6	0.0316	0.4758	3.8	9.9
54800/006	MW 16D	10.2	289	7.2	7.7	1.24	Clear	1.47	0.076	0.937	7.1	274	10.9	17.5	7.6	0.154	0.6501	2	17.7
IGV			1000	≥6.5 and ≤9.5				NAC	0.15		≥6.5 and ≤9.5	1000	30	200	NAC	0.2	0.05	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

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

3.2 Surface Water

Table 2.0 4th Quarter Surface water monitoring 2011

Report Number 54802
Monitoring Date 16/11/2011

Method		Site Tests	Site Tests	Site Tests	Site Tests	Site Tests	AQ2	Titralab		5-Day	HACH	AQ2			Inolab	ICPMS			
Method Number		Site Tests	Site Tests	Site Tests	Site Tests	Site Tests	EW003	EW138	EW139	EW001	EW094	EW015	EW015	EW007	EW043	EM130			
Parameter		Sample temperature (to be done onsite)	Cond	pH	DO	Visual Inspection	Ammonia	pH	Cond	BOD	COD	Cl	SO4	Ortho-Phosphate (MRP)	DO	Fe	Mn	K	Na
Units		Deg C	us/cm	pH units	mg/l	-	mg/l N	pH Units	us/cm	mg/l	mg/l	mg/l	mg/l	mg/l P	mg/l	mg/l	mg/l	mg/l	mg/l
Limit of Detection		-	-	-	-	-	0.007	0.3	25	1	8	2.6	1.0	0.009	1.0	0.005	0.0	0.2	0.5
Date Testing Initiated		17.11.11					17.11.11	17.11.11		17.11.11	17.11.11	17.11.11			17.11.11	17.11.11			
ELS Ref	Client Ref																		
54802/001	SW1	9.7	349	7.12	7.1	Clear	1.514	7.00	336	<1.0	50	18.6	28.8	0.021	6.9	0.7538	0.3174	8.1	16.3
54802/002	SW3	9.6	340	7.23	9.1	Clear	0.175	7.10	324	<1.0	42	17.3	40.8	0.01	9.0	0.3624	0.4106	6.7	16.6
54802/003	Discharge Cap	9.9	911	7.05	6.4	Clear	28.31	7.00	807	<1.0	81	37.9	10.2	0.032	6.2	1.384	1.19	25	34.8
S.I No. 294/1989							0.2	≥5.5 and ≤8.5	1000	5	40	250	200			0.2	0.05		

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

There are no leachate results to display this quarter due to all leachate wells within the waste mass being dry.

3.4 Landfill Gas Summery

Table 3.0 4th Quarter Landfill Gas monitoring 2011

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
Date Testing		16/11	16/11	16/11	16/11	16/11
GA 2000 Ref	Client Ref					
7	MW 1	0.1	0.0	20.5	0.1	992
8	MW 2	0.1	0.0	20.5	0.1	992
4	MW 3	0.1	0.2	21.0	0.1	992
7	MW 6	0.1	0.0	20.5	0.1	992
9	MW 7	0.4	1.2	21.8	0.0	992
3	MW 8	3.5	4.3	17.5	3.9	993
5	MW 9	16.9	16.2	8.6	18.1	992
1	MW 10 S	0.1	0.0	20.7	0.1	995
2	MW 10 D	0.1	0.1	20.9	0.1	994
	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 16th November 2011. Results in Hatched Red indicate where the interim guide value has been exceeded. Results from the fourth quarter 2011 show that there were exceedances at various ground water monitoring locations for parameters; Ammonia, Iron and Manganese. Previous results detailed in the historical data show that exceedances for Ammonia, Iron and Manganese are on par with previous monitoring events. Sample MW 15S which is located along side the Virginia Bailieborough Road was in exceedance of the pH parameter. The sample had a pH of 6.2 both on site and 6.0 in the laboratory and is on par with the previous monitoring event.

Elevated Iron levels can be an indication of contamination. However, 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 and Manganese 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 licence 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 the Discharge Cap, SW1 (downstream of landfill) and at SW3 which is a new location at Chapel Lough as agreed with the EPA on the 04th April 2011, letter reference: W0091-01/ap05em. Monitoring of SW2 The Borora River has been discontinued as of Quarter 2 as per instruction of the EPA.

With regard to all surface water samples, results in hatched red indicate that limits were exceeded for the following parameters: Ammonia, Iron, Manganese and COD. Previous results detailed in the historical data show that exceedances for Ammonia, Iron and Manganese are on par with previous monitoring events.
The results obtained from the Cap Discharge sample showed an elevated level of Ammonia. Although this result is on par with previous samples taken from the pipe itself, the exceedance on this occasion may have been attributed to the sample being obtained from a pool beneath the pipe which may have been stagnant. The sample was taken from this location as there was no discharge from the pipe.
Historical results for comparison purposes are presented in tabular and graphic form in Appendix 1.

4.3 Leachate

Leachate samples could not be attained on the day of monitoring due to all leachate wells within the waste mass being dry.

4.4 Landfill Gas

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

Results obtained from monitoring during quarter four, 2011 show that the levels of gas are relatively consistent with previous results and as these wells are within the waste mass they are not observed as being exceedances.

5.0 CONCLUSION

5.1 Environmental Monitoring

The results obtained from environmental monitoring are relatively consistent with previous monitoring events. The levels of exceeded parameters do not show any signs of dramatic exceedences therefore there is no evidence of any major negative environmental impact associated with this landfill.

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 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 1st Quarter of 2012.

APPENDIX 1 HISTORICAL DATA

Groundwater

	Parameter	TOC	Ammonia	TON	pH	Cond	Cl	SO4	DO	Fe	Mn	K	Na
	Units	mg/l	mg/l N	mg/l N	pH Units	us/cm	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l
WELL 10 D	Qtr 4 2011	1.2	0.036	<0.138	7.7	420	7	55.7	7.6	<0.02	0.0152	2.4	36.5
	Qtr 3 2011	0.9	0.029	<0.138	7.8	411	6	58.1	3.6	0.0343	0.0828	3.2	43.5
	Qtr 2 2011	1.6	0.013	<0.138	7.9	409	5.7	55	3.1	<0.005	0.0631	3.5	39.7
	Qtr 1 2011	1.18	<0.007	0.25	8.0	404	67.5	67.5	5.9	0	0.092	1.4	31.1
WELL 10 S	Qtr 4 2011	1.78	0.027	<0.138	7.2	318	15.2	11.8	9.7	<0.02	<0.001	2.3	17.5
	Qtr 3 2011	1.33	0.04	<0.138	6.9	302	14.5	14.6	8.5	0.02	0.0765	2.8	21.5
	Qtr 2 2011	6.44	0.027	<0.138	7.1	302	15.9	14.4	7.5	<0.005	<0.001	2.9	17.8
	Qtr 1 2011	1.63	<0.007	0.25	6.9	318	26.7	26.7	5.8	1.229	0.989	1.1	14.7
WELL 15 D	Qtr 4 2011	0.84	0.071	<0.138	7.5	308	9.7	17.3	7.3	<0.02	0.1835	2.6	12.5
	Qtr 3 2011	1.5	0.081	<0.138	7.8	287	9.1	22.5	7.7	0.0372	0.1562	2.9	12
	Qtr 2 2011	8.89	0.314	<0.138	8	304	12.7	21.2	6.2	1.395	0.3981	4	13.4
	Qtr 1 2011	0.71	0.026	0.22	8.2	296	32.0	32.0	8.5	1.755	0.299	2.3	10.6
WELL 15 S	Qtr 4 2011	12.82	0.788	0.153	6.0	204	9.3	43.1	6.1	10.39	0.5348	4.1	11
	Qtr 3 2011	13.57	0.576	0.429	6.4	448	69.1	163	3.6	10.4	0.3666	5.8	74.6
	Qtr 2 2011	11.59	1.244	0.207	6	374	121.1	384.1	3.3	0.1129	0.5393	3.9	45.4
	Qtr 1 2011	13.47	1.020	0.44	6.0	190	180.1	180.0	1.0	80.230	1.117	1.6	8.5
WELL 16 D	Qtr 4 2011	1.47	0.076	0.937	7.1	274	10.9	17.5	7.6	0.154	0.6501	2	17.7
	Qtr 3 2011	0.64	0.033	<0.138	7.3	258	9.7	22.5	8	0.4167	0.6013	2	17.1
	Qtr 2 2011	0.99	0.089	0.183	7.3	241	10.7	20.6	6.3	<0.005	0.605	2.4	14.8
	Qtr 1 2011	1.54	0.073	0.30	7.4	263	29.7	29.7	7.1	2.124	0.712	1.0	14.0
WELL 16 S	Qtr 4 2011	2.67	0.248	<0.138	6.7	268	8.6	19.5	7.6	0.0316	0.4758	3.8	9.9
	Qtr 3 2011	2.25	0.248	<0.138	6.6	242	8.4	31.4	7.6	1.516	0.3429	2.3	9.5
	Qtr 2 2011	3.7	0.094	<0.138	7.6	250	8.5	30.3	8.5	0.66	0.35	1.6	9.7
	Qtr 1 2011	2.91	0.251	0.33	6.7	246	249.4	249.4	3.4	16.260	0.542	1.2	8.0
Interim Guide Value		NAC	0.15	NAC	≥6.5 &≤9.5	1000	30	200	NAC	0.2	0.05	5	150

Surface water

	Parameter	Ammonia	pH	Cond	BOD	COD	Cl	SO4	Ortho-Phosphate (MRP)	DO	Fe	Mn	K	Na
	Units	mg/l N	pH Units	us/cm	mg/l	mg/l	mg/l	mg/l	mg/l P	mg/l	mg/l	mg/l	mg/l	mg/l
Discharge Cap	Qtr 4 2011	28.31	7	807	<1.0	81	37.9	10.2	0.032	6.2	1.384	1.19	25	34.8
	Qtr 3 2011	6.243	7.1	442	2	96	27.9	8.2	0.043	8.6	2.678	1.297	14.5	22.7
	Qtr 2 2011	17.36	7.0	773	<1.0	134	44.8	21.0	-	8.0	20.42	1.00	27.7	45.2
	Qtr 1 2011	18.70	7.0	593	2	46	39.6	38.7	0.05	8.1	8.08	0.61	14.9	21.6
SW1	Qtr 4 2011	1.514	7	336	<1.0	50	18.6	28.8	0.021	6.9	0.7538	0.3174	8.1	16.3
	Qtr 3 2011	1.199	7	386	<1.0	87	32	10.1	0.062	7	1.708	1.207	10.5	24.2
	Qtr 2 2011	1.475	7	371	8	54	29	4.5	0.25	2.9	1.84	0.9223	6.8	19.7
	Qtr 1 2011	1.158	7.0	312	<1	28	25.1	-	-	7.6	-	-	-	-
SW3	Qtr 4 2011	0.175	7.1	324	<1.0	42	17.3	40.8	0.01	9	0.3624	0.4106	6.7	16.6
	Qtr 3 2011	0.038	7.3	358	<1.0	50	22.2	30.4	0.026	9.5	0.7586	0.4152	6.7	18.5
	Qtr 2 2011	0.159	7.3	299	<1.0	46	14.0	37.4		8.1	2.24	1.72	3.9	14.2
	Qtr 4 2010	-	-	-	-	-	-	-	-	-	-	-	-	-
EQS for Surface Waters		0.2	≥5.5 and ≤8.5	1000			250	200		NAC	1	0.3		

Landfill Gas

Method		GA 2000	GA 2000	GA 2000	GA 2000	GA 2000
Parameter		CH_4	CO_2	O_2	H_2S	Barometric Pressure
Units		1% v/v	1.5 % v/v	%	PPM	mb
Client Ref	Qtr	-	-	-	-	-
MW 1	Qtr 4 2011	0.1	0.0	20.5	0.1	992
	Qtr 3 2011	0.2	0.3	21.7	0	999
	Qtr 2 2011	0.0	0.1	20.33	0	998
	Qtr 1 2011	0.0	0.1	20.37	0	1003
MW 2	Qtr 4 2011	0.1	0.0	20.5	0.1	992
	Qtr 3 2011	0.1	0.1	21.8	0	1000
	Qtr 2 2011	0.6	2.1	19.1	0	998
	Qtr 1 2011	0.4	1.7	19.7	0	1003
MW 3	Qtr 4 2011	0.1	0.2	21.0	0.1	992
	Qtr 3 2011	9.8	7.4	16.4	0	1000
	Qtr 2 2011	1.8	2.5	18.5	0	998
	Qtr 1 2011	1.9	2.4	18.94	0	1003
MW 6	Qtr 4 2011	0.1	0.0	20.5	0.1	992
	Qtr 3 2011	0.0	0.4	21.9	0	1001
	Qtr 2 2011	0.0	0.4	19.7	0	998
	Qtr 1 2011	0.0	0.5	19.74	0	1003
MW 7	Qtr 4 2011	0.4	1.2	21.8	0.0	992
	Qtr 3 2011	0.4	1.1	21.6	0	1000
	Qtr 2 2011	0.4	1.3	19.5	0	998
	Qtr 1 2011	0.4	1.5	19.05	0	1003
MW 8	Qtr 4 2011	16.9	16.2	8.6	18.1	992
	Qtr 3 2011	22.8	16.6	11.3	0	999
	Qtr 2 2011	14.7	10.9	12.8	0	998
	Qtr 1 2011	14.3	9.8	12.94	0	1003
MW 9	Qtr 4 2011	3.5	4.3	17.5	3.9	993
	Qtr 3 2011	5.0	3.2	18.9	0	1000
	Qtr 2 2011	1.7	2.7	18.5	0	999
	Qtr 1 2011	1.6	2.2	18.71	0	1002
MW 10S	Qtr 42011	0.1	0.0	20.7	0.1	995
	Qtr 3 2011	0.0	0.0	22	0	1001
	Qtr 2 2011	0.0	1.1	18.2	0	998
	Qtr 1 2011	0.0	0.7	18.34	0	1002
MW 10D	Qtr 4 2011	0.1	0.1	20.9	0.1	994
	Qtr 3 2011	0.0	0.0	22.1	0	1001
	Qtr 2 2011	0.0	1.0	16.7	0	999
	Qtr 1 2011	0.0	0.9	17.07	0	1002
	Limit	**1**	**1.5**			

Exceedance

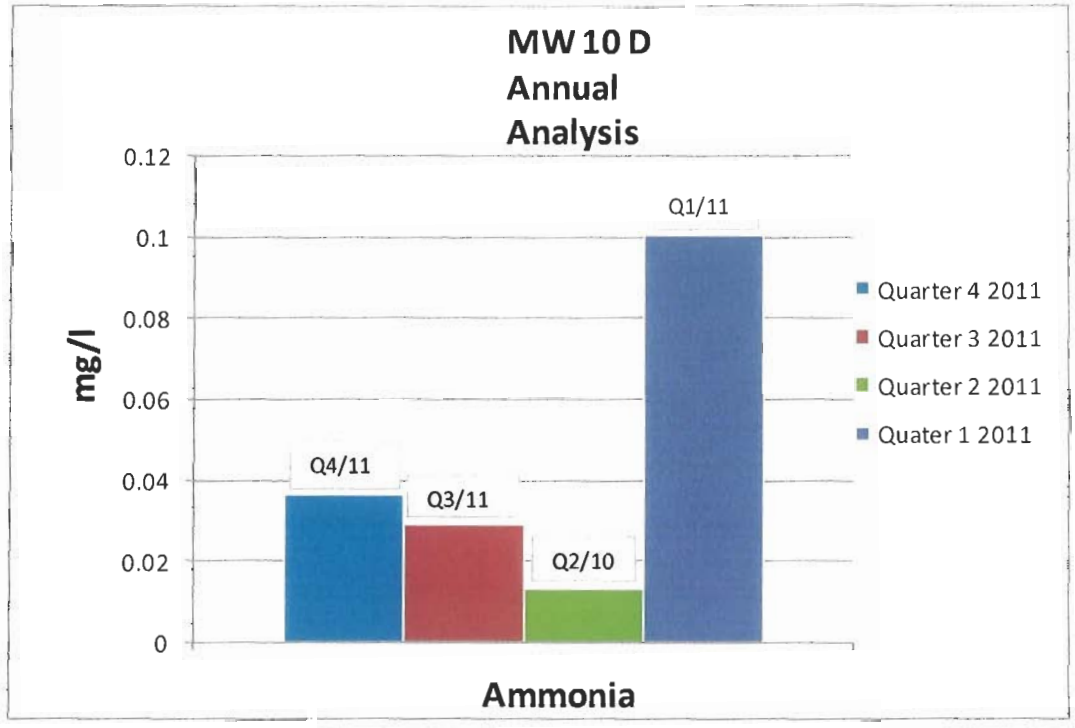
NOTES

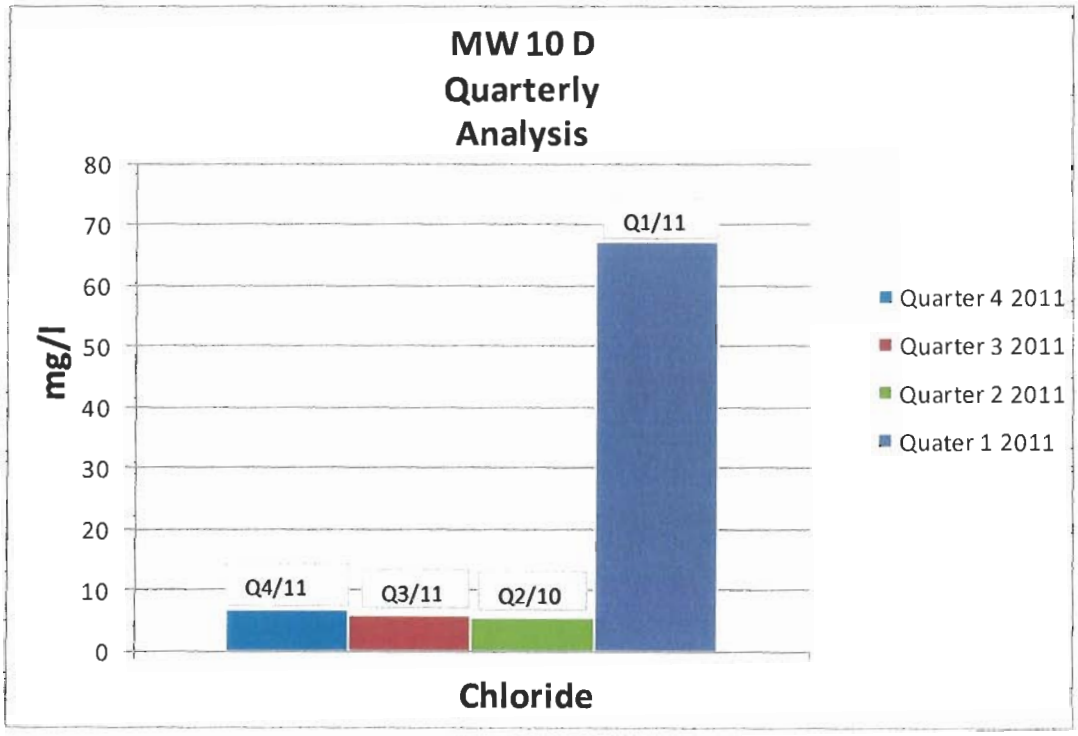
1 Instrument Serial No: GA 07721

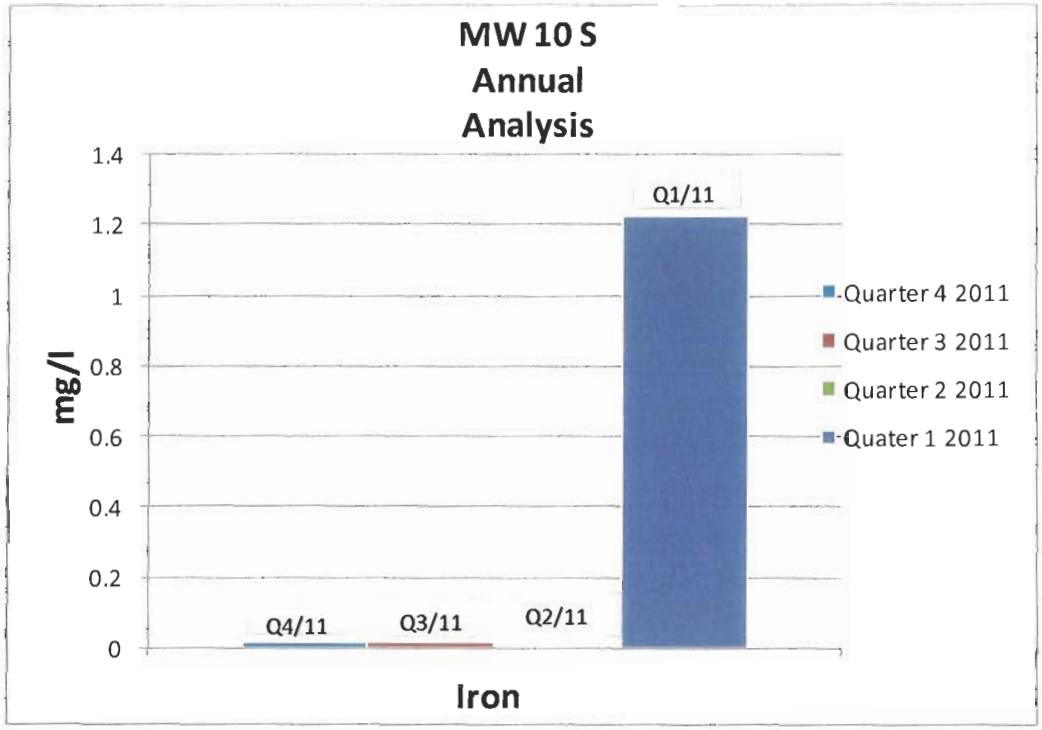
2 Limit: Schedule C2, Licence

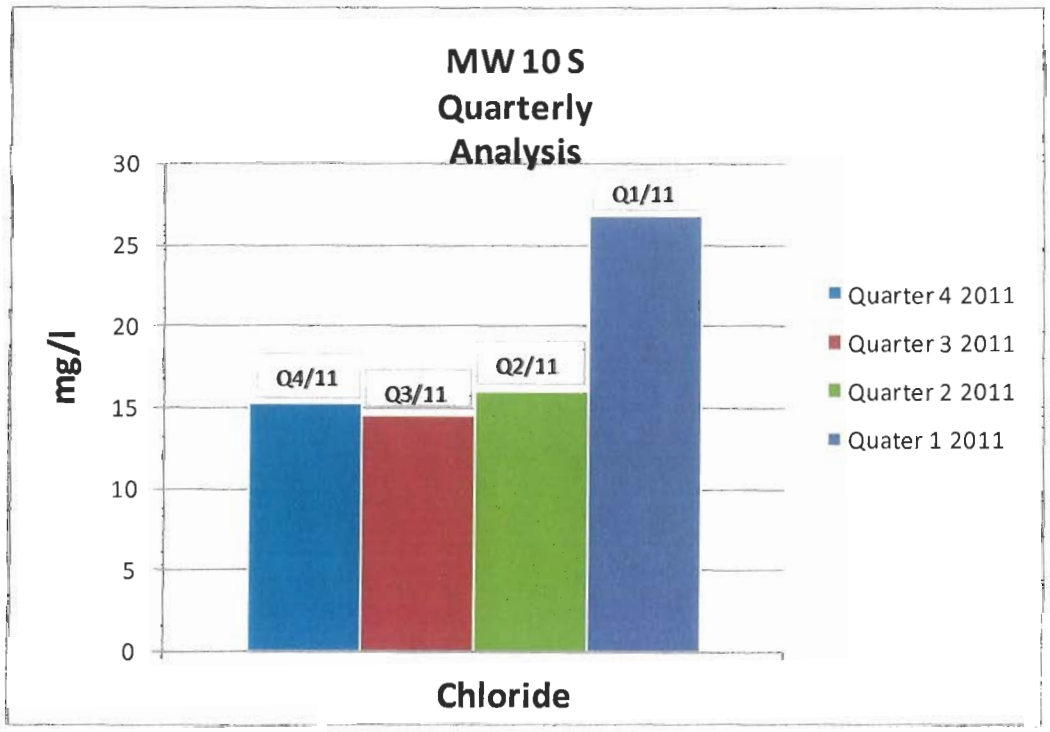
HISTORICAL DATA

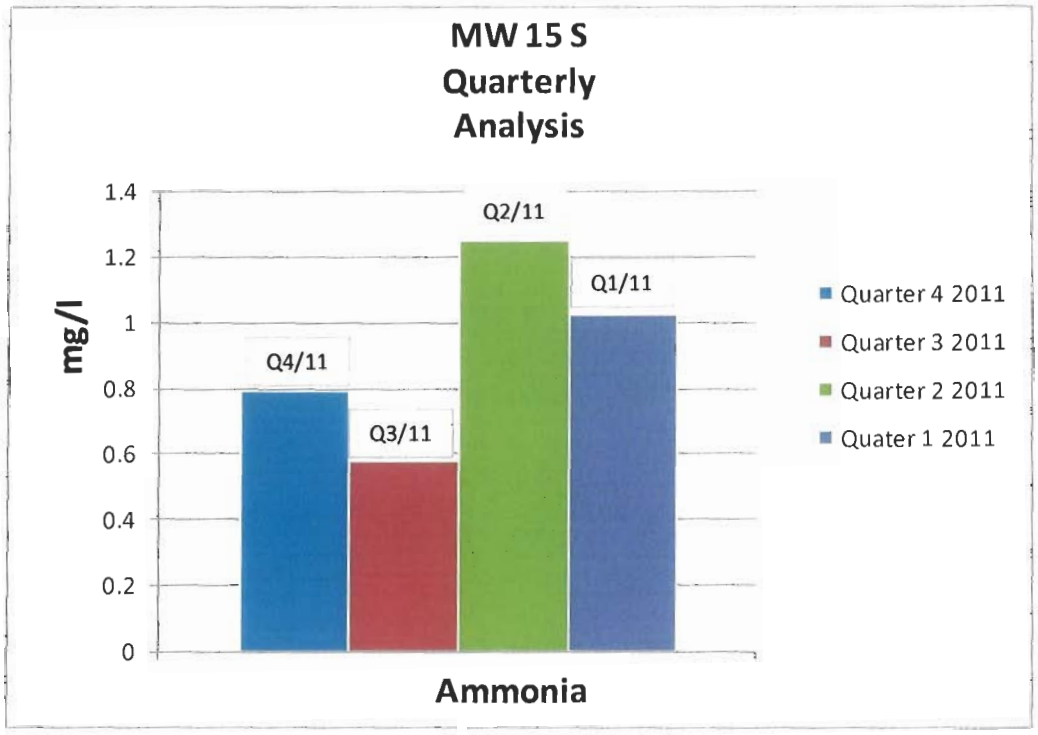
Groundwater

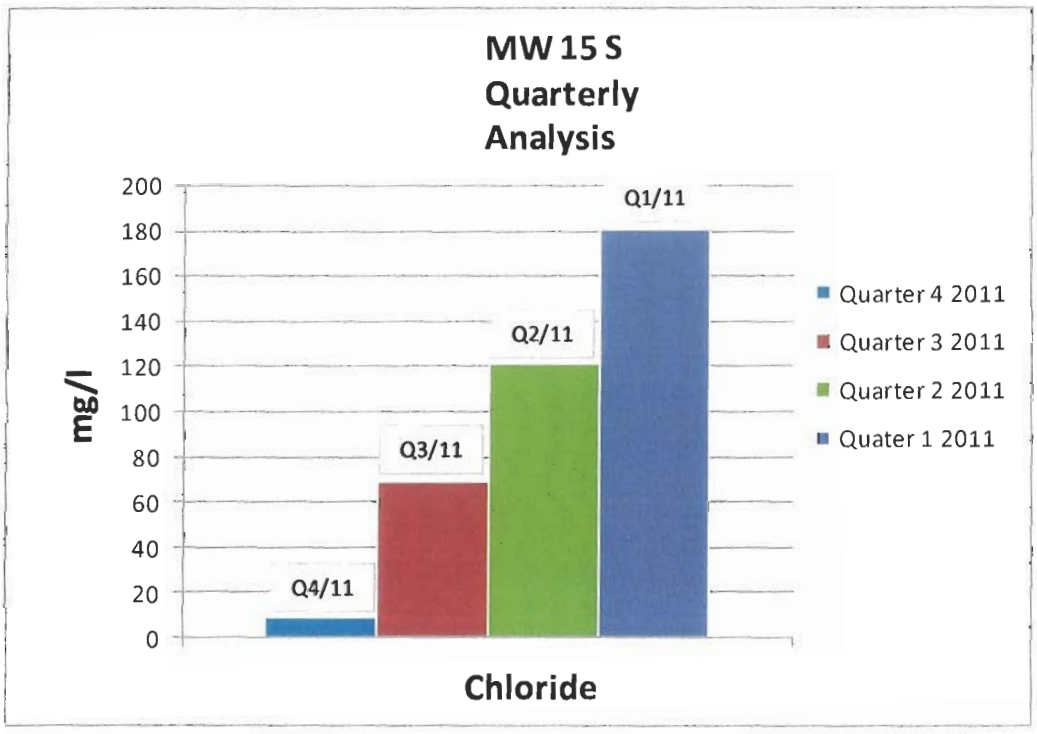


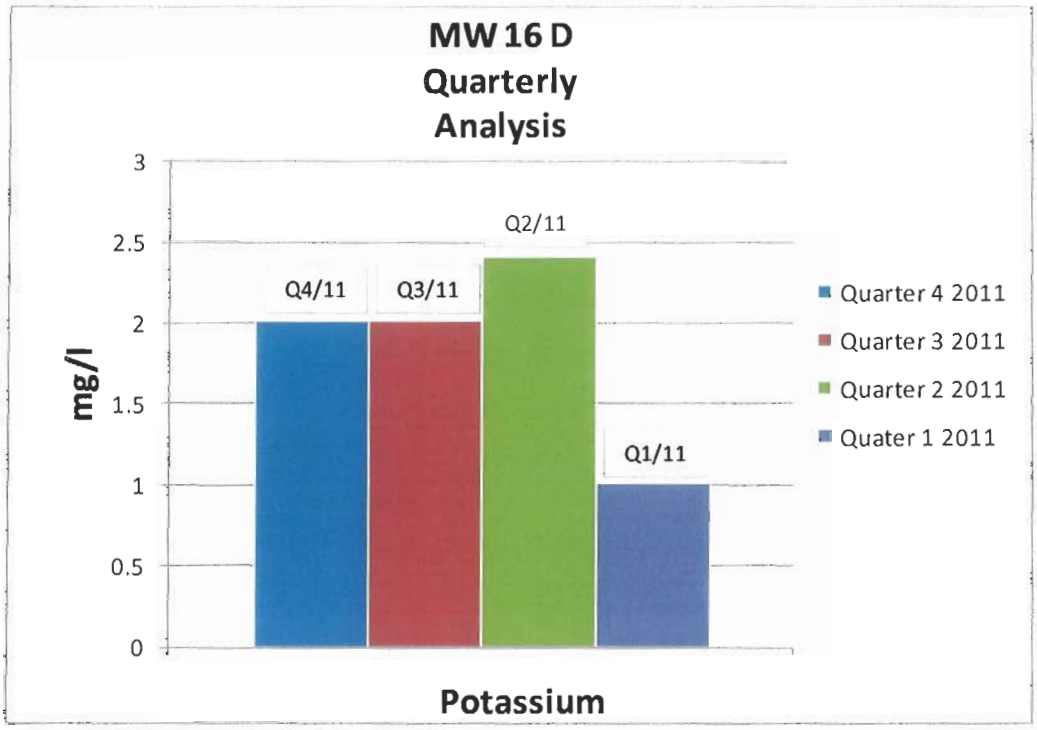


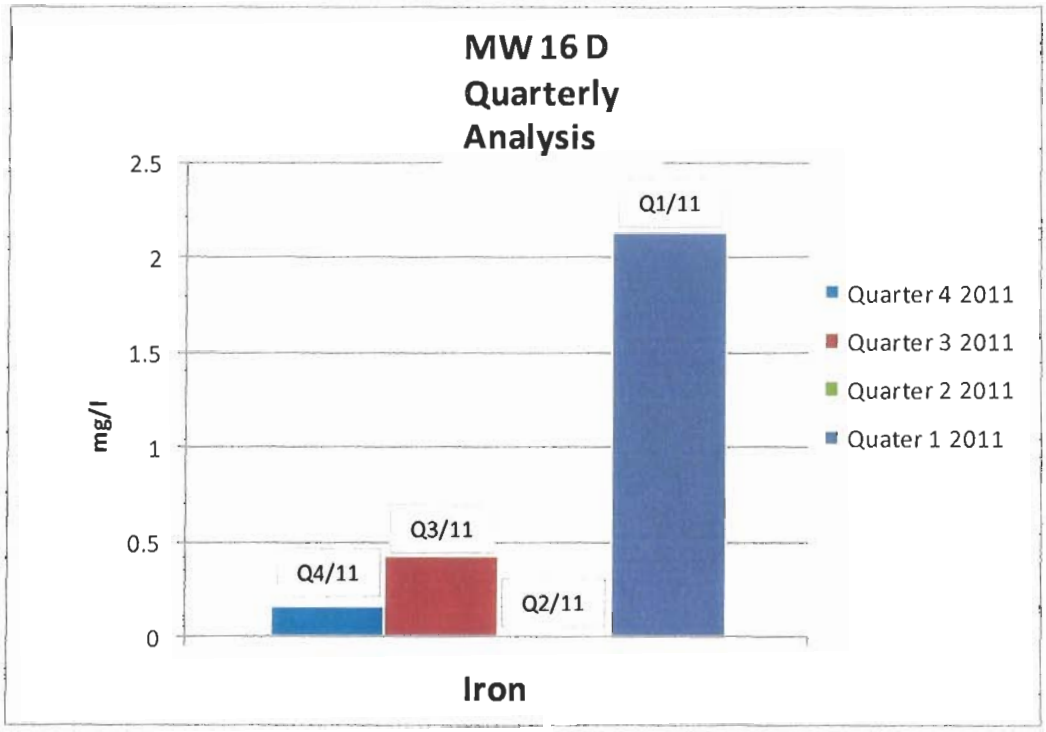

MW 10 S
Annual
Analysis
1.4
1.2
1
0.8
0.6
0.4
0.2
0
mg/l
Q1/11
Q4/11
Q3/11
Q2/11
Quarter 4 2011
Quarter 3 2011
Quarter 2 2011
Quater 1 2011
Iron

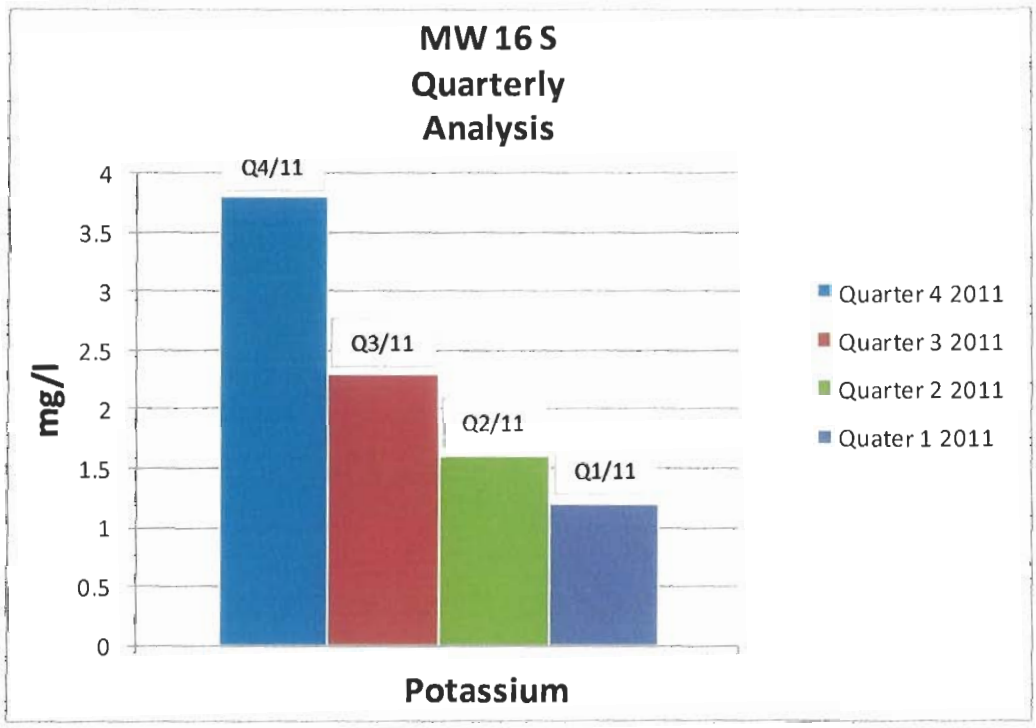

MW 10 S
Quarterly
Analysis
30
25
20
15
10
5
0
mg/l
Q1/11
Q4/11
Q3/11
Q2/11
Quarter 4 2011
Quarter 3 2011
Quarter 2 2011
Quater 1 2011
Chloride

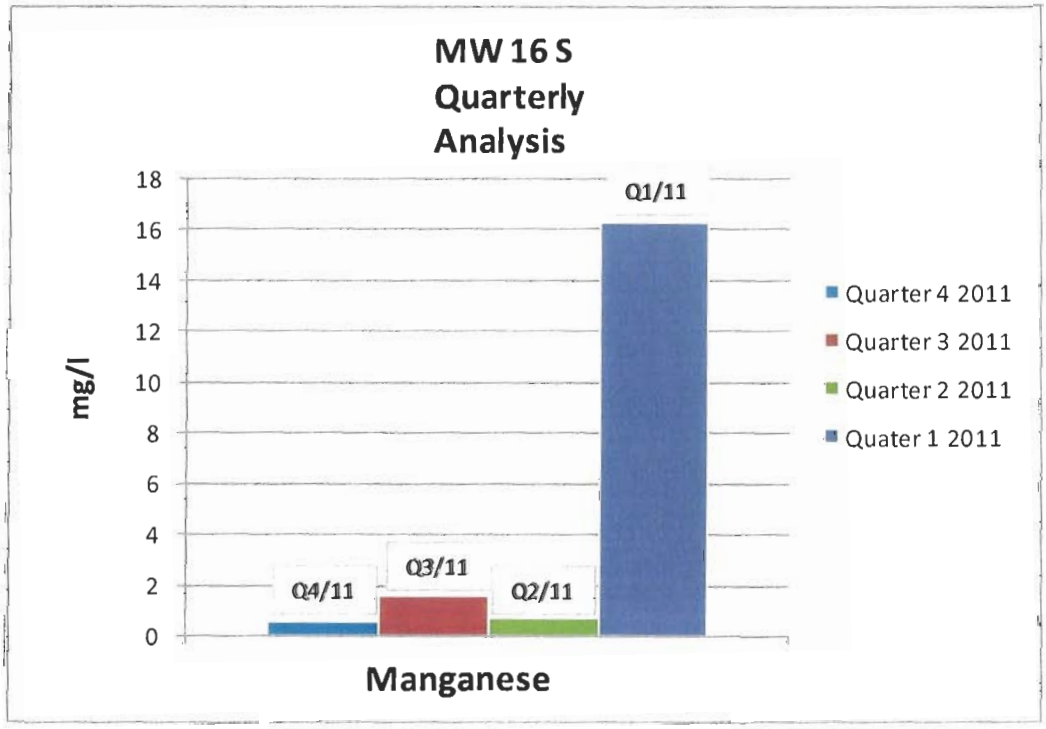

MW 15 S
Quarterly
Analysis
1.4
1.2
1
0.8
0.6
0.4
0.2
0
mg/l
Q4/11
Q3/11
Q2/11
Q1/11
Quarter 4 2011
Quarter 3 2011
Quarter 2 2011
Quater 1 2011
Ammonia


MW 15 S
Quarterly
Analysis
200
180
160
140
120
100
80
60
40
20
0
mg/l
Q4/11
Q3/11
Q2/11
Q1/11
Quarter 4 2011
Quarter 3 2011
Quarter 2 2011
Quater 1 2011
Chloride

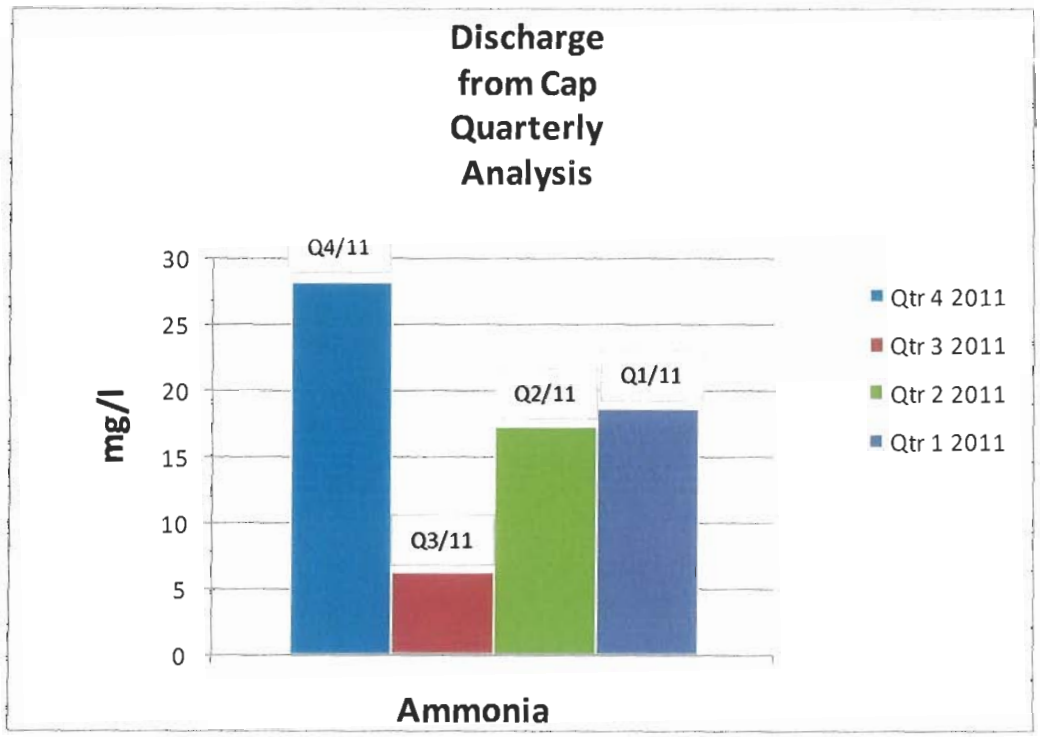

MW 16 D
Quarterly
Analysis
3
2.5
2
1.5
1
0.5
0
mg/l
Q4/11
Q3/11
Q2/11
Q1/11
Quarter 4 2011
Quarter 3 2011
Quarter 2 2011
Quater 1 2011
Potassium

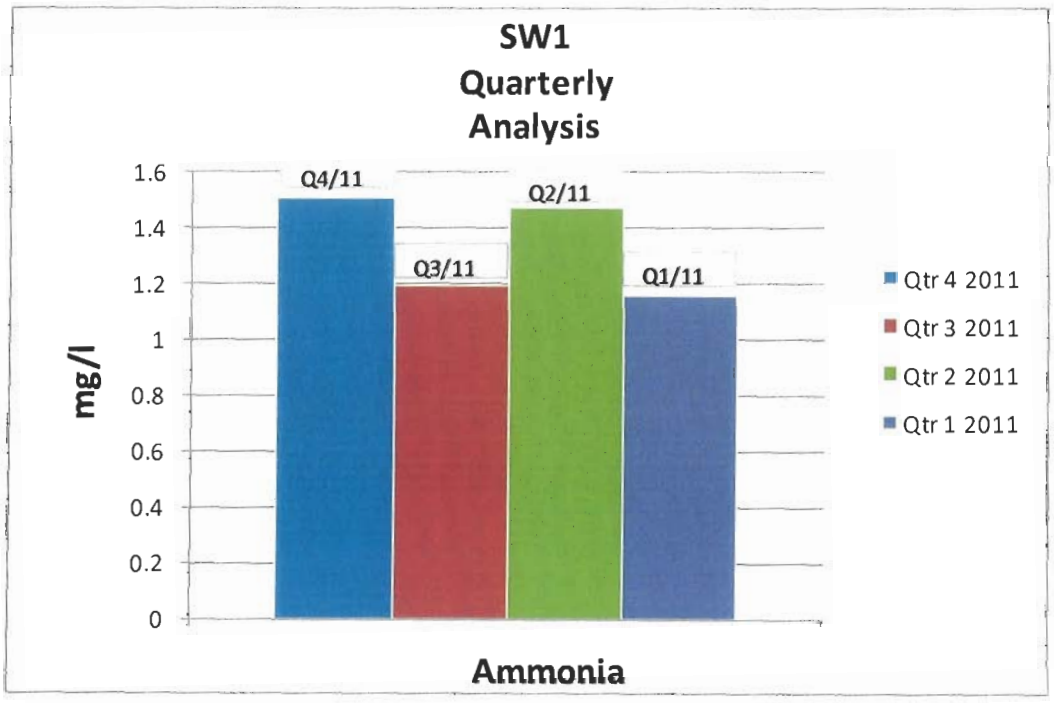

MW 16 D
Quarterly
Analysis
2.5
2
1.5
1
0.5
0
mg/l
Q4/11
Q3/11
Q2/11
Q1/11
Quarter 4 2011
Quarter 3 2011
Quarter 2 2011
Quater 1 2011
Iron


MW 16 S
Quarterly
Analysis
mg/l
4
3.5
3
2.5
2
1.5
1
0.5
0
Q4/11
Q3/11
Q2/11
Q1/11
Quarter 4 2011
Quarter 3 2011
Quarter 2 2011
Quater 1 2011
Potassium

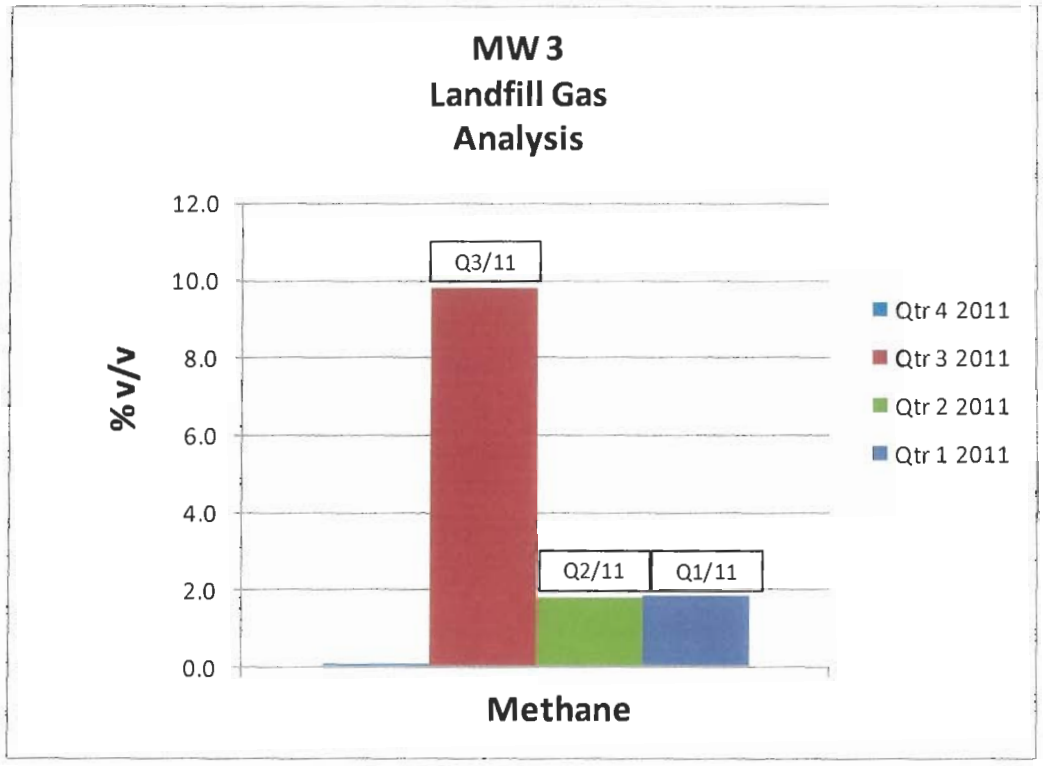

MW 16 S
Quarterly
Analysis
mg/l
18
16
14
12
10
8
6
4
2
0
Q4/11
Q3/11
Q2/11
Q1/11
Quarter 4 2011
Quarter 3 2011
Quarter 2 2011
Quater 1 2011
Manganese

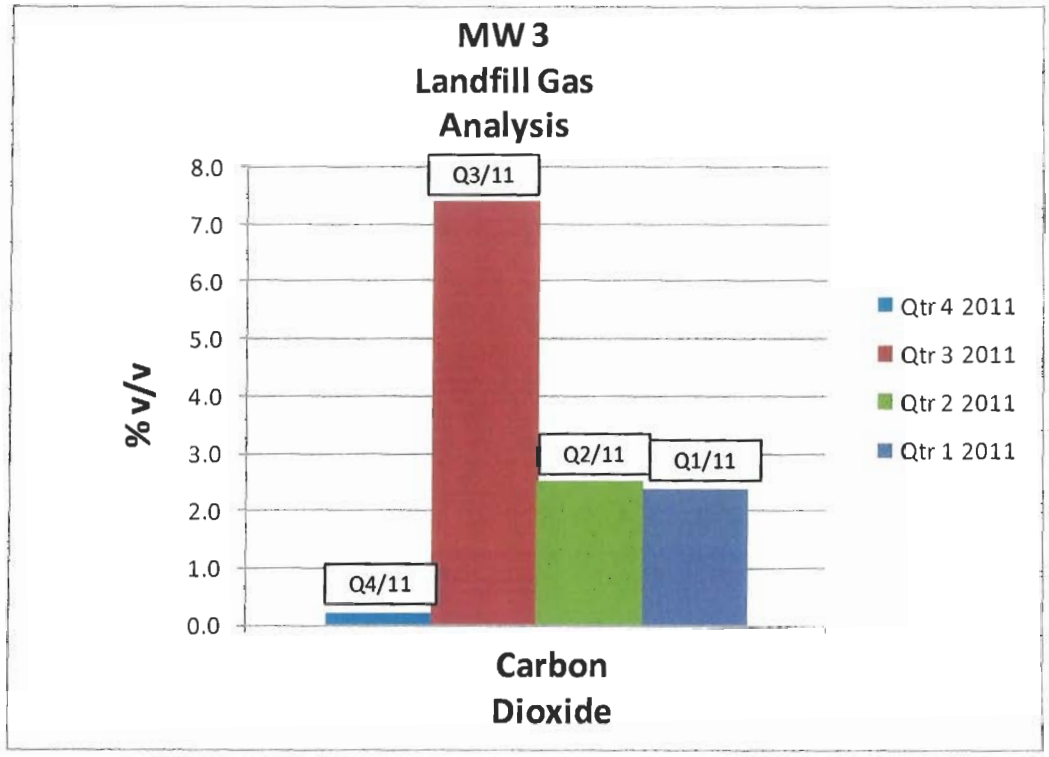
Surface water

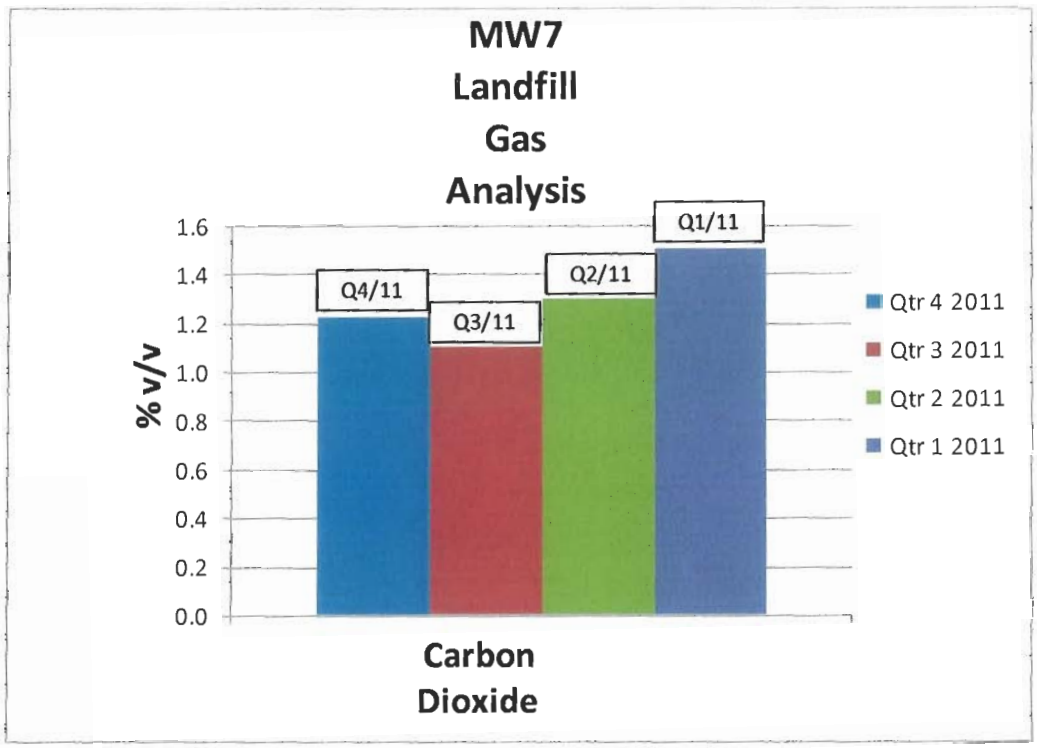


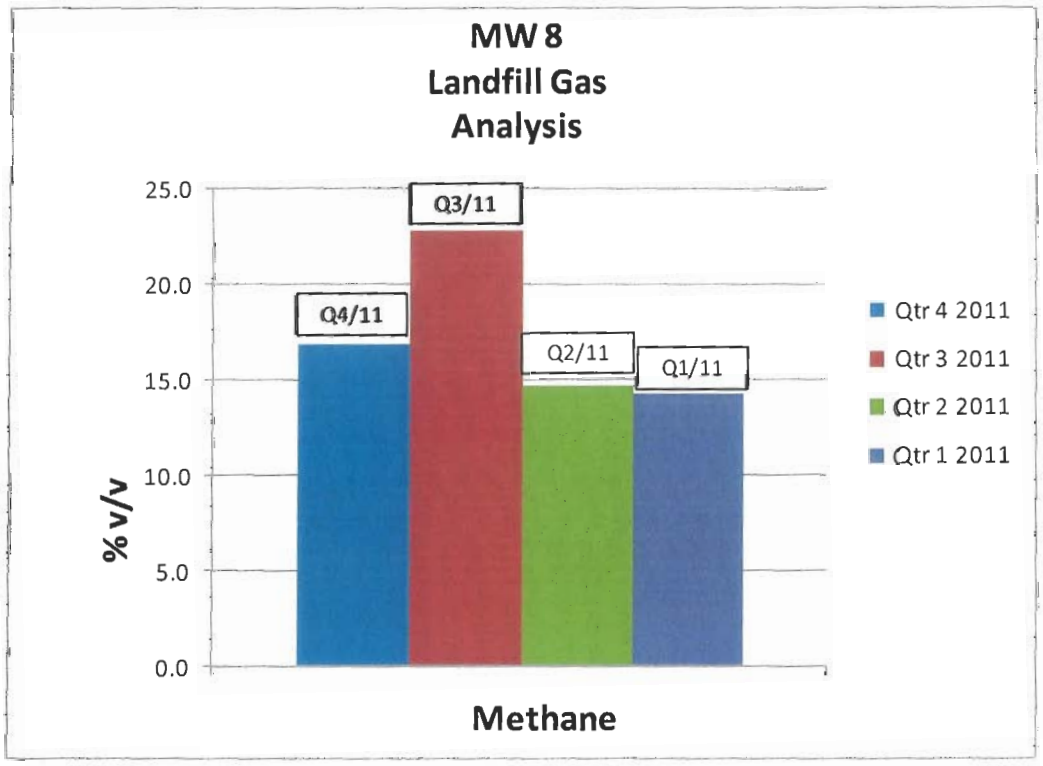


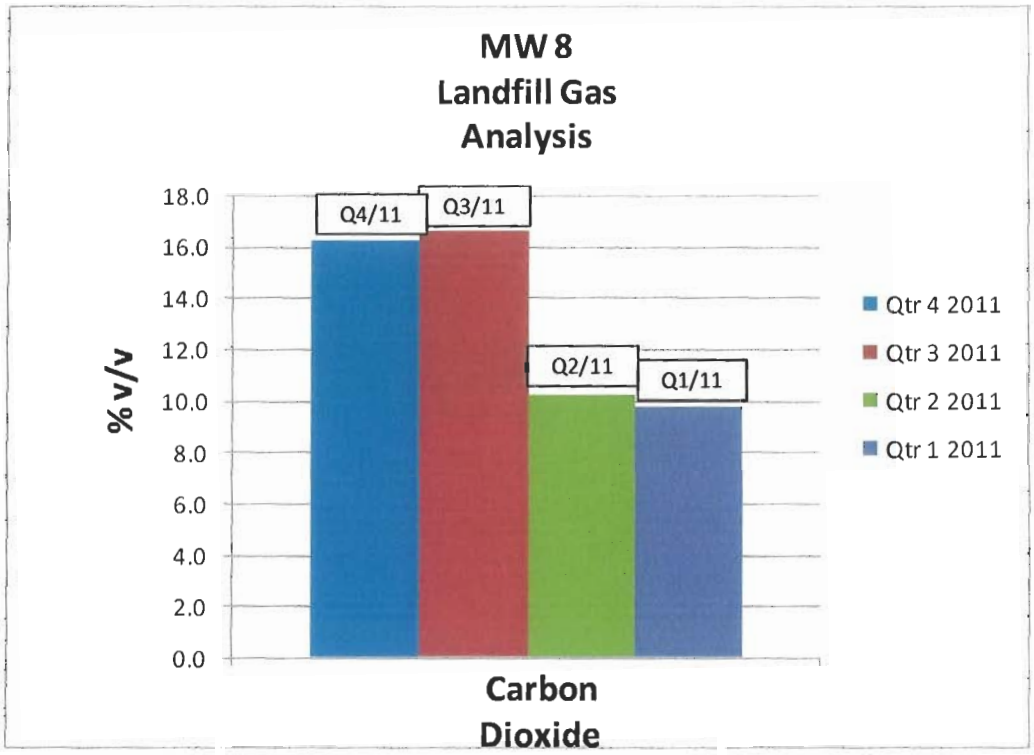
Landfill Gas

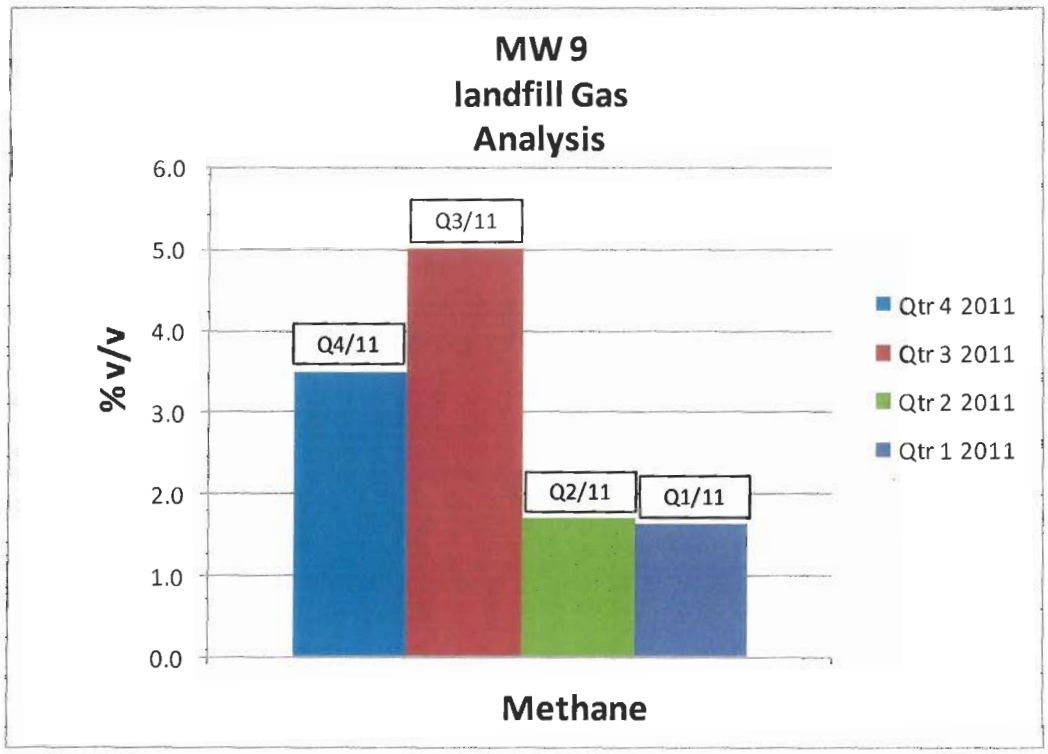


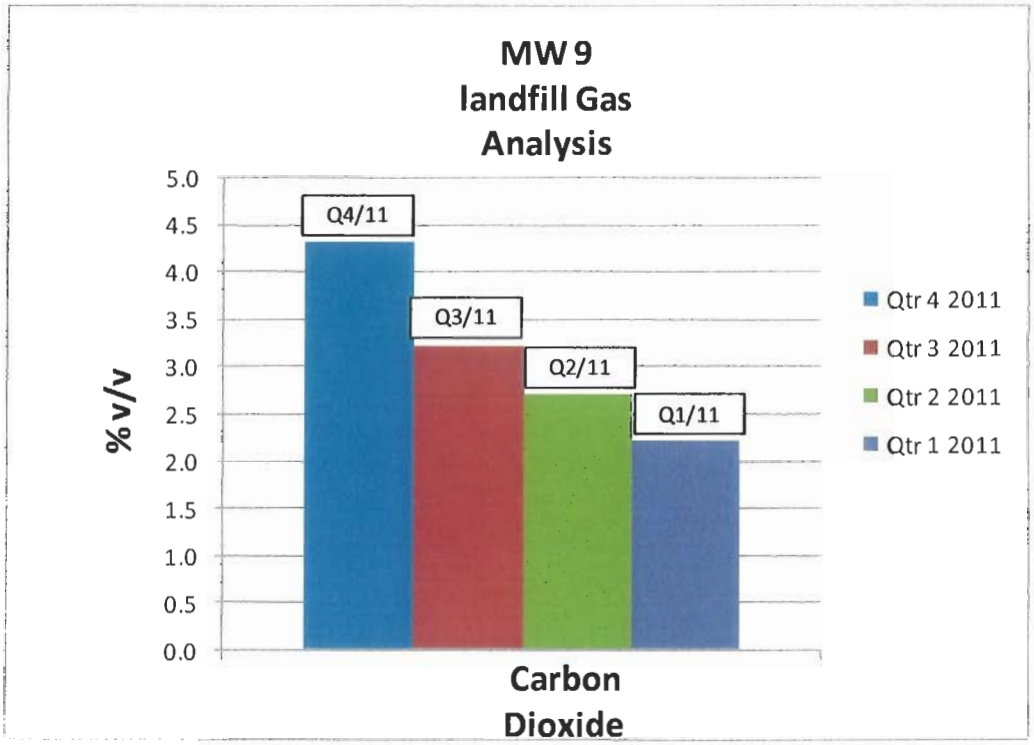



MW7
Landfill
Gas
Analysis
1.6
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
% v/v
Q4/11
Q3/11
Q2/11
Q1/11
Qtr 4 2011
Qtr 3 2011
Qtr 2 2011
Qtr 1 2011
Carbon
Dioxide


MW 8
Landfill Gas
Analysis
25.0
20.0
15.0
10.0
5.0
0.0
% v/v
Q4/11
Q3/11
Q2/11
Q1/11
Qtr 4 2011
Qtr 3 2011
Qtr 2 2011
Qtr 1 2011
Methane


MW 8
Landfill Gas
Analysis
18.0
16.0
14.0
12.0
10.0
8.0
6.0
4.0
2.0
0.0
% v/v
Q4/11
Q3/11
Q2/11
Q1/11
Qtr 4 2011
Qtr 3 2011
Qtr 2 2011
Qtr 1 2011
Carbon
Dioxide


MW 9
landfill Gas
Analysis
6.0
5.0
4.0
3.0
2.0
1.0
0.0
% v/v
Q4/11
Q3/11
Q2/11
Q1/11
Qtr 4 2011
Qtr 3 2011
Qtr 2 2011
Qtr 1 2011
Methane


MW 9
landfill Gas
Analysis
% v/v
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
Q4/11
Q3/11
Q2/11
Q1/11
Qtr 4 2011
Qtr 3 2011
Qtr 2 2011
Qtr 1 2011
Carbon
Dioxide

APPENDIX 2- LANDFILL GAS BREAKDOWN

MW 1

Date/Time	CH4 (%)	CO2 (%)	O2 (%)	H2S (PPM)	Barometric Pressure (mb)
16/11/2011 14:30	0.1	0.1	20.6	0.0	992
16/11/2011 14:31	0.1	0.0	20.5	0.0	992
16/11/2011 14:32	0.1	0.0	20.5	0.0	992
16/11/2011 14:33	0.1	0.1	20.5	0.0	992
16/11/2011 14:34	0.1	0.1	20.5	0.0	992
16/11/2011 14:35	0.1	0.1	20.5	0.0	992
16/11/2011 14:36	0.1	0.1	20.6	0.0	992
16/11/2011 14:37	0.1	0.0	20.5	0.0	992
16/11/2011 14:38	0.1	0.0	20.5	0.0	992
16/11/2011 14:39	0.1	0.0	20.6	0.0	992
16/11/2011 14:40	0.1	0.0	20.6	0.0	992

MW 2

Date/Time	CH4 (%)	CO2 (%)	O2 (%)	H2S (PPM)	Barometric Pressure (mb)
16/11/2011 14:44	0.1	0.0	20.5	0.0	993
16/11/2011 14:45	0.1	0.0	20.1	0.0	993
16/11/2011 14:46	0.1	0.0	20.1	0.0	993
16/11/2011 14:47	0.1	0.1	20.1	0.0	993
16/11/2011 14:48	0.1	0.1	20.4	0.0	993
16/11/2011 14:49	0.1	0.0	20.7	0.0	993
16/11/2011 14:50	0.1	0.1	20.8	0.0	993
16/11/2011 14:51	0.1	0.1	20.9	0.0	993
16/11/2011 14:52	0.1	0.1	20.5	0.0	993
16/11/2011 14:53	0.1	0.0	20.6	0.0	993
16/11/2011 14:54	0.1	0.0	20.5	0.0	993

MW 3

Date/Time	CH4 (%)	CO2 (%)	O2 (%)	H2S (PPM)	Barometric Pressure (mb)
16/11/2011 11:23	0.1	0.0	21.2	0.0	992
16/11/2011 11:24	0.1	0.1	21.0	0.0	992
16/11/2011 11:25	0.1	0.1	21.1	0.0	992
16/11/2011 11:26	0.1	0.2	21.1	0.0	992
16/11/2011 11:27	0.1	0.2	21.0	0.0	992
16/11/2011 11:28	0.1	0.2	21.0	0.0	992
16/11/2011 11:29	0.1	0.2	21.0	0.0	992
16/11/2011 11:30	0.1	0.3	20.9	0.0	992
16/11/2011 11:31	0.1	0.3	21.0	0.0	992
16/11/2011 11:32	0.1	0.3	20.9	0.0	992
16/11/2011 11:33	0.1	0.3	20.9	0.0	992

MW 6

Date/Time	CH4 (%)	CO2 (%)	O2 (%)	H2S (PPM)	Barometric Pressure (mb)
16/11/2011 12:00	0.4	0.6	20.5	0.0	993
16/11/2011 12:01	0.2	0.2	21.0	0.0	993
16/11/2011 12:02	0.2	0.1	21.1	0.0	993
16/11/2011 12:03	0.1	0.1	21.2	0.0	993
16/11/2011 12:04	0.1	0.0	21.2	0.0	993
16/11/2011 12:05	0.1	0.0	21.2	0.0	993
16/11/2011 12:06	0.1	0.0	21.2	0.0	993
16/11/2011 12:07	0.1	0.0	21.2	0.0	993
16/11/2011 12:08	0.1	0.0	21.2	0.0	993
16/11/2011 12:09	0.1	0.0	21.2	0.0	993
16/11/2011 12:10	0.1	0.0	21.2	0.0	993

MW 7

Date/Time	CH4 (%)	CO2 (%)	O2 (%)	H2S (PPM)	Barometric Pressure (mb)
16/11/2011 14:59	0.1	1	20.8	0	992
16/11/2011 15:00	0.1	1.2	21.8	0	992
16/11/2011 15:01	0.5	1.2	21.8	0	992
16/11/2011 15:02	0.5	1.2	21.8	0	992
16/11/2011 15:03	0.6	1.2	21.8	0	992
16/11/2011 15:04	0.6	1.2	21.8	0	992
16/11/2011 15:05	0.6	1.2	22.3	0	992
16/11/2011 15:06	0.5	1.2	21.9	0	992
16/11/2011 15:07	0.5	1.2	22	0	992
16/11/2011 15:08	0.4	1.6	21.9	0	992

MW 8

Date/Time	CH4 (%)	CO2 (%)	O2 (%)	H2S (PPM)	Barometric Pressure (mb)
16/11/2011 10:46	4.1	5.4	16.7	0.0	993
16/11/2011 10:47	4.2	5.3	16.7	0.0	993
16/11/2011 10:48	3.8	4.8	17.1	0.0	993
16/11/2011 10:49	3.6	4.5	17.3	0.0	993
16/11/2011 10:50	3.5	4.2	17.6	0.0	993
16/11/2011 10:51	3.4	4.0	17.7	0.0	993
16/11/2011 10:52	3.3	4.0	17.7	0.0	993
16/11/2011 10:53	3.2	3.8	17.9	0.0	993
16/11/2011 10:54	3.1	3.7	18.0	0.0	993
16/11/2011 10:55	3.1	3.7	18.1	0.0	993
16/11/2011 10:56	3.0	3.6	18.1	0.0	993

MW 9

Date/Time	CH4 (%)	CO2 (%)	O2 (%)	H2S (PPM)	Barometric Pressure (mb)
16/11/2011 12:17	12.5	11.5	12.8	0.0	992
16/11/2011 12:18	14.4	13.4	11.1	0.0	992
16/11/2011 12:19	13.5	13.2	11.8	0.0	992
16/11/2011 12:20	18.3	16.3	6.6	0.0	992
16/11/2011 12:21	15.3	14.0	10.5	0.0	992
16/11/2011 12:22	15.4	14.4	10.5	0.0	992
16/11/2011 12:23	17.4	16.7	8.9	0.0	992
16/11/2011 12:24	18.4	18.2	6.5	0.0	992
16/11/2011 12:25	21.2	21.2	5.1	0.0	992
16/11/2011 12:26	18.4	18.6	6.2	0.0	992
16/11/2011 12:27	20.8	20.7	5.0	0.0	992

MW 10S

Date/Time	CH4 (%)	CO2 (%)	O2 (%)	H2S (PPM)	Barometric Pressure (mb)
16/11/2011 09:49	0.0	0.1	20.4	0.0	995
16/11/2011 09:50	0.1	0.0	20.6	0.0	995
16/11/2011 09:51	0.1	0.0	20.6	0.0	995
16/11/2011 09:52	0.1	0.0	20.6	0.0	995
16/11/2011 09:53	0.1	0.0	20.6	0.0	995
16/11/2011 09:54	0.1	0.0	20.7	0.0	995
16/11/2011 09:55	0.1	0.0	20.7	0.0	995
16/11/2011 09:56	0.1	0.0	20.7	0.0	995
16/11/2011 09:57	0.1	0.0	20.7	0.0	995
16/11/2011 09:58	0.1	0.0	20.8	0.0	995
16/11/2011 09:59	0.1	0.0	20.8	0.0	995

MW 10D

Date/Time	CH4 (%)	CO2 (%)	O2 (%)	H2S (PPM)	Barometric Pressure (mb)
16/11/2011 10:17	0.1	0.3	20.3	0.0	994
16/11/2011 10:18	0.1	0.2	20.6	0.0	994
16/11/2011 10:19	0.1	0.2	20.7	0.0	994
16/11/2011 10:20	0.1	0.1	20.9	0.0	994
16/11/2011 10:21	0.1	0.1	20.9	0.0	994
16/11/2011 10:22	0.1	0.1	21.0	0.0	994
16/11/2011 10:23	0.1	0.1	21.0	0.0	994
16/11/2011 10:24	0.1	0.1	21.0	0.0	994
16/11/2011 10:25	0.1	0.1	21.1	0.0	994
16/11/2011 10:26	0.1	0.1	21.2	0.0	994
16/11/2011 10:27	0.1	0.0	21.2	0.0	994

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
Flouride 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

Miscellaneous (P,G,S)
Bromate 1 to 50µg/l BRO3 (EW137)
Colour 2.5-50mg/l PtCCo (EW022)
Conductivity 132-6000 us/cm EW139
Dissolved Oxygen 1 to 20 mg/l (EW043)
Sulphate 1-250mg/l SO4(EW015)
Suspended Solids 5-1000mg/l (EW013)
Total Dissolved Solids 1-1000mg/l (EW046)
Total Hardness 3-330mg/l CaCO3 (EM089)
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 - 4000µg/l
Iron 5.0 - 500µg/l
Lead 0.3 - 30µg/l
Magnesium 0.3 – 20mg/l
Manganese 1.0 - 100µg/l
Mercury 0.02 - 2µg/l
Molybdenum 1.0 - 100µg/l
Nickel 0.5 - 50µg/l
Potassium 0.2 – 20mg/l
Selenium 0.2 - 20µg/l
Sodium 0.5 – 50mg/l
Strontium 1.0 - 100µg/l
Tin 1.0 - 100µg/l
Vanadium 1.0 - 100µg/l
Zinc 1.0 - 100µg/l

SI439 Potable Water VOCs & THM
EO025 (P,G,S)
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)
Bromomethane 0.5 - 35 µg/l
Ethyl Ether/Diethyl Ether0.5 - 35 µg/l
11 Dichloroethene0.5 - 35 µg/l
Iodomethane/Methyl Iodide 0.5 - 35 µg/l
Carbon Disulphide 0.5 - 35 µg/l
Allyl Chloride0.5 - 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
Hexachlorobutadiene0.5 - 35 µg/l
Trans-1,2 Dichloroethene0.5 - 35 µg/l
MIBE0.5 - 35 µg/l
11 Dichloroethane0.5 - 35 µg/l
12 Dichloropropane0.5 - 35 µg/l
Cis-12 Dichloroethene0.5 - 35 µg/l
Methyl Acrylate5.0 - 35 µg/l
Bromochloromethane0.5 - 35 µg/l
Tetrahydrofuran5.0 - 35 µg/l
111 Trichloroethane0.5 - 35 µg/l
1-Chloropentane0.5 - 35 µg/l
Carbon Tetrachloride0.5 - 35 µg/l
11 Dichloropropene0.5 - 35 µg/l
12 Dichloropropane0.5 - 35 µg/l
Dibromomethane0.5 - 35 µg/l
Methyl Methacrylate0.5 - 35 µg/l
13 Dichloropropene, cis2.0 - 35 µg/l
MIBK/4 Methyl 2 Pentanone 2.0 - 35 µg/l
Toluene0.5 - 35 µg/l
13 Dichloropropene,trans2.0 - 35 µg/l
Ethyl Methacrylate2.0 - 35 µg/l
112 Trichloroethane0.5 - 35 µg/l
13 Dichloropropane0.5 - 35 µg/l
2 Hexanone1.0 - 35 µg/l
12 Dibromoethane0.5 - 35 µg/l
Chlorobenzene0.5 - 35 µg/l
1112 Tetrachloroethane2.0 - 35 µg/l
Ethyl Benzene0.5 - 35 µg/l
m & p Xylene0.5 - 35 µg/l
O Xylene0.5 - 35 µg/l
Styrene2.0 - 35 µg/l
Isopropyl Benzene0.5 - 35 µg/l
Bromobenzene0.5 - 35 µg/l
1122 Tetrachloroethane0.5 - 35 µg/l
123 Trichloropropane2.0 - 35 µg/l
Propyl Benzene0.5 - 35 µg/l
2-Chlorotoluene0.5 - 35 µg/l
4 Chlorotoluene0.5 - 35 µg/l
135 Trimethylbenzene0.5 - 35 µg/l
Tert Butyl Benzene0.5 - 35 µg/l
124 Trimethylbenzene0.5 - 35 µg/l
Sec Butyl Benzene0.5 - 35 µg/l
13 Dichlorobenzene0.5 - 35 µg/l
P Isopropyltoluene0.5 - 35 µg/l
14 Dichlorobenzene0.5 - 35 µg/l
12 Dichlorobenzene0.5 - 35 µg/l
N Butyl Benzene0.5 - 35 µg/l
Hexachloroethane5.0 - 35 µg/l
12 Dibromo 3Chloropropane 2.0 - 35 µg/l
124 Trichlorobenzene0.5 - 35 µg/l
123 Trichlorobenzene0.5 - 35 µg/l

PAH EO129 (P,G,S)
Range 0.01 - 9.2 ug/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 - 9.2 ug/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 - 9.2 ug/l
Fenphos OP
Methyl Parathion OP
Parathion OP
Thionazin OP

Organochlorine Pesticides (P,G,S)
Range 0.01 - 9.2 ug/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

APPENDIX 4 – FIELD SHEETS

ON SITE SAMPLING FORM

Facility Name: Bailieborough

Waste Licence No: W0091

Report To: Cavan CC

Sampling Date: 16/11/11

Sample Type (GW, SW ,Leachate) All

Personnel: Brian Keating

Weather: Dry

Other Remarks:

GPS:

Sample Ref No	Sample Type	Time	DO Level ppm	Elec Cond us	pH pH units	Temp °C	Instrument
MW 16D	GW	10:15	7.70	289	7.21	10.2	Hanna
MW 16S	GW	10:30	7.62	282	6.87	10.4	"
MW 15D	GW	11:05	7.35	322	7.75	10.5	"
MW 15S	GW	11:15	6.23	298	6.18	11.1	"
MW 10S	GW	11:45	9.71	334	7.31	10.5	"
MW 10D	GW	11:35	7.62	455	7.72	10.5	"
CAP	SW	12:25	6.40	911	7.05	9.9	"
SW1	SW	12:55	7.10	349	7.12	9.7	"
SW3	SW	14:55	9.10	340	7.23	9.6	"

COMMENTS:

No discharge from CAP, sample taken from pooled discharge at pipe. Possibly stagnant.

Cavan County Council Groundwater & Leachate Sampling Ref:

Site Reference: Ballybaggagh (Landfill) **Permit No.** W0091 **Date:** 16/11/11 **Personnel:** Joe Keating

Sample Ref (Shallow /Deep)	Depth of Well (m) A	Depth of water below Ground Level (m) B	Depth of Water column (m) A-B= h	Diameter of Well (m) C	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 (m3 x 1000)	Volume of water to purge (Litres x 3)	Time to Purge (mins)
MW 16 D	27	1.24	25.76	0.05	0.025	0.000625	0.050554	50.554	151.662	26 min
MW 16 S	5	1.68	3.32	0.05	0025	0.000625	0.006908	6.908	20.724	4 min
MW 15 S	5	1.66	3.34	0.05	0025	0.000625	0.006547	6.547	19.66	4 min
MW 5 D	25	1.74	22.26	0.05	0025	0.000625	0.043685	43.6857	131.055	22 min

Cavan County Council Groundwater & Leachate Sampling Ref:

Site Reference: Baileborough Landfill **Permit No.** WW0091 **Date:** 11/11/11 **Personnel:** Brian Boylan

Sample Ref (Shallow /Deep)	Depth of Well (m) A	Depth of water below Ground Level (m) B	Depth of Water column (m) A-B= h	Diameter of Well (m) C	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 (m3 x 1000)	Volume of water to purge (Litres x 3)	Time to Purge (mins)
MW 10S	6.45	5.8	0.65	0.05	0.025	0.000625	0.001276	1.276	3.8268	1 min
MW 10D	75.3	6.78	18.52	0.05	0.025	0.000625	0.036574	36.345	109.036	70 min

Landfill Gas Monitoring Form

Facility Name: Ballivaraugh **Waste Licence No:** WO091	**Facility Address:** Tandragee, Ballivaraugh, Co Cavan
Licensee: Cavan CC	
Date of Licensing: 2003	**Date of sampling:** 16/11/11
Instrument Used: GA 2000	**Date next full calibration:** 2012 **Last field calibration: (inc date & gases)** 2011
Monitoring Personnel: B Keating	**Weather:** Dry

Results

Station Number	Time	GA2000 ID	CH_4	CO_2	O_2	CO	H_2S	Barometric Pressure (mbar)	Comments
MW 10S	09:45		0.0	0.1	20.4	/	/	995	
MW 10D	10:17		0.1	0.3	20.3	/	/	994	
MW 8	10:46		6.1	5.4	16.7	/	/	993	
MW 3	11:23		0.1	0.0	21.2	/	/	992	
MW 4	12:00		0.4	0.6	20.5	/	/	993	
MW 9	12:17		12.5	11.5	12.8	/	/	992	
MW 6	16:06		0.1	0.1	20.5	/	/	992	
MW 1	16:30		0.1	0.1	20.5	/	/	993	
MW 2	16:44		0.1	0.1	20.6	/	/	992	
MW 7	16:49		0.1	1.0	20.8	/	/	992	
						/	/		

General Comments:

Boylan civil engineering

CAVAN COUNTY COUNCIL
CLOSED LANDFILL MONITORING INTEGRITY FORM

SITE [illegible] DATE 16/11/11 PERSONNEL [illegible]

ITEM	CONDITION			COMMENTS
	GOOD	NEEDS MAINTENANCE	N/A	
GROUNDWATER MONITORING WELLS				leachate wells within mass clay
-Labeled	✓			
-Well cap integrity	✓			
-Water drainage	✓			
-Locks	✓			
LANDFILL GAS VENTS				Cap on vent near MW4 is missing
-Riser condition	✓			
-Concrete collar condition	✓			
-Screen condition	✓			
LANDFILL GAS MONITORING WELLS				locks installed by Boylan Eng during Q3 2011
-Labeled	✓			
-Well cap integrity	✓			
-Water drainage	✓			
-Traffic protection	✓			
-Concrete collar condition	✓			
-Screen Condition	✓			
-Locks	✓			
SURFACE WATER MONITORING LOCATIONS				Access to this location is poor
-Access				
-Disturbance				

APPENDIX 5 – CHAIN OF CUSTODY/SAMPLE SUBMISSION

Boore

els 2081

SAMPLE SUBMISSION FORM

DETAILS TO APPEAR ON ANALYSIS REPORT

Contact Name: Brian Keohane
Address: Boylan Eng, Main St Mullagh, Cavan

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

CONTRACT DETAILS

ELS Quote No: BN 407
NOTE: To reduce potential for error this field must be completed. Use a separate sheet for different Quote Numbers.

Results Due (Tick): ✓
NOTE: Standard lead time is 10 working days [illegible]

SAMPLE DETAILS

Number	Sample Reference	Tests Requested	Number of bottles submitted	Sample Type
	NOTE: Whatever appears in this section is the ONLY details that will appear on the analysis report [illegible]	NOTE: To reduce potential for error please complete this field clearly [illegible]		Drinking Water (DW), Ground Water (GW), Surface Water (SW), Waste Water (WW), Sludge, Soil [illegible]
1	MW 10S	see GW	full kit	GW
2	MW 10D	"	"	"
3	MW 15S	"	"	"
4	MW 15D	"	"	"
5	MW 16S	"	"	"

ONLY FIVE SAMPLES ALLOWED PER SUBMISSION SHEET

All GW samples to be filtered for metals before analysis

ADDITIONAL INFORMATION AND SIGNATURES

To be filled by the person submitting samples
Signature: [signature]
Phone No: 046 9286000
Date: 16/11/[illegible]
No. samples submitted: 9
No. of pages: 1 of 3
Additional Info (if any):

To be filled by ELS Ltd
Signature: [signature]
Date: 17.11
Time:
Condition: Satisfactory / Unsatisfactory - See notes above
Additional Info: C

NOTES FOR CUSTOMER

1. Feel free to save this submission sheet to your desktop
2. This form is designed to allow key details to be typed in 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 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 "Contact Name" above is used on the report, if this field is blank use the default name on the system
3. Click "Po Req" 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 ref GORTEEN DRINKING WATER should read Gorteen Drinking Water

els

2082

Environmental Laboratory Services Ltd
Acorn Business Campus
Mahon Industrial Park
Blackrock
Cork
Tel: 021 4536141

SAMPLE SUBMISSION FORM

DETAILS TO APPEAR ON ANALYSIS REPORT

Contact Name: Brona Keeter
Address: Boylan Eng, Main St Mullagh, Cavan

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

CONTRACT DETAILS

ELS Quote No.: QN 407
NOTE: To reduce potential for error this field must be completed. Use a separate sheet for different Quote Numbers

Results Due (Tick): ✓
NOTE: Standard lead time is 10 working days and 15 working days for test subcontract. Deviations should be agreed in advance and may incur an extra charge

SAMPLE DETAILS

Number	Sample Reference 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)	Tests Requested NOTE: To reduce potential for error please complete this field clearly indicating per quote, per sheet attached or list the specific tests below	Number of bottles submitted	Sample Type Drinking Water (DW), Ground Water (GW), Surface Water (SW), Waste Water (WW), Sludge, Soil/Silt, Solvent, Air
6	MW 16 D	See QN	full Kit	GW
2				
3	All Ground water samples to be			
4	filtered for metals before analysis			
5				

37802

ONLY FIVE SAMPLES ALLOWED PER SUBMISSION SHEET

ADDITIONAL INFORMATION AND SIGNATURES

To be filled by the person submitting samples:
Signature: B. Keeter
Phone No.: 046 9286000
Date: 16/11/11
No. samples submitted: 9
No. of pages: 2 of 3
Additional Info (If any):

To be filled by ELS Ltd:
Signature:
Date: 17.11
Time:
Condition: Satisfactory / Unsatisfactory - See notes above
Additional Info.: F

NOTES FOR CUSTOMER

1. Feel free to save this submission sheet to your desktop
2. This form is designed to allow key details to be typed, saved 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 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 "Contact Name" above is used on the report, if that field is blank use the default name on the system
3. Click "Po Req" 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 ref ACORN DRINKING WATER should read Acorn Drinking Water

Boylan engineering

els 2083

Environmental Laboratory Services Ltd.

SAMPLE SUBMISSION FORM

DETAILS TO APPEAR ON ANALYSIS REPORT

Contact Name: Bronagh Keating
Address: Boylan Eng, Main St, Mullagh, Cavan

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

CONTRACT DETAILS

ELS Quote No: QW 407
NOTE: To reduce potential for error this field must be completed. Use a separate sheet for different Quote Numbers.

Results Due (Tick): ✓

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

SAMPLE DETAILS

Number	Sample Reference (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))	Tests Requested (NOTE: To reduce potential for error please complete this field clearly indicating per quote, per sheet attached or list the specific tests below)	Number of bottles submitted	Sample Type (Drinking Water (DW), Ground Water (GW), Surface Water (SW), Waste Water (WW), Sludge, Soil, Silt, Solvent, Air)
1	SW 1	see QW	full kit	SW
2	SW3	"	"	"
3	CAP	"	"	"
4				
5				

ONLY FIVE SAMPLES ALLOWED PER SUBMISSION SHEET

578802

ADDITIONAL INFORMATION AND SIGNATURES

To be filled by the person submitting samples:
Signature: B. Keating Phone No.: 046 9286000
Date: 16/11/11
No. samples submitted: 9 No. of pages: 3 of 3
Additional Info (if any):

To be filled by ELS Ltd:
Signature:
Date: 17.11 Time:
Condition: Satisfactory / Unsatisfactory - See notes above
Additional Info: F

NOTES FOR CUSTOMER

1. Feel free to save this submission sheet to your desktop
2. This form is designed to allow key details to be typed, saved 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 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 "Contact Name" above is used on the report, if that field is blank use the default name on the system
3. Click "Po Req" 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 ref ACORN DRINKING WATER should read Acorn Drinking Water

APPENDIX 6 – CALIBRATION CERTIFICATE-GA2000

Calibration Certificate

Issued by	Environmental monitoring	**Certificate number**	1048
Instrument	GA2000 for Boylan	**Calibrated by**	AJ
Serial no	GA 07721 (asset 505)	**Ambient temp**	21
Service done	18/01/11	**Ambient pressure**	1007
Service interval	365 days	**Calibration due**	18th Jan 2012
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%	5.0%	pass
O2	17.8%	17.8%	pass
CH4	1.8%	1.8%	pass
CO	199ppm	201ppm	pass
H2S	5ppm	5ppm	pass

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

Appendix D

Declaration of True Copy

Cavan County Council

Comhairle Chontae an Chabháin

Teach Na Cúirte
An Cabháin

Courthouse
Cavan

Declaration

Bailieborough Landfill AER W0091-01

Cavan County Council hereby certifies that the content of the full pdf. AER W0091-012011AER.pdf uploaded to the EPA website is a true copy of the original AER.

Signed Sinead Fox Dated 26/March 2012

Sinead Fox
Landfill Operations Manager
Cavan County Council

Tá fáilte romhat gnó a dhéanamh as Gaeilge
Tel/Guthán: 049 437 8300
Fax/Facs: 049 436 1565

Email/Ríomhphost: info@cavancoco.ie eolas@cavancoco.ie
Web/Láithreán Gréasáin: www.cavancoco.ie