COMHAIRLE CHONDAE AN CABHÁIN

Cavan County Council

Annual Environmental Report 2009

Ballyjamesduff Landfill WL 93-1

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Contents Page

List of Tables

List of Graphs

Page

List of Photographs

List of Appendices

Ballyjamesduff Landfill WL93-01

Annual Environmental Report 2009

1. Introduction & Site History

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 are 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 January 1st 2009 to December 31st 2009.

The site at Ballyjamesduff was closed in early March 2002. Prior to closing the site a temporary cap was placed on site.

This AER has been prepared in accordance with the conditions of the Waste Licence and the EPA "Draft Guidance on Environmental Management Systems and Reporting to the Agency, 1999".

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

1. Reporting Period

The reporting period for the purposes of this AER is 1st January 2009 to 31st December 2009.

2. Waste Activities carried out at the facility

There were no waste activities carried out at the facility.

3. Quantity & Composition of waste received, disposed of and recovered during the reporting period and each previous year

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

4. Summary Report on Emissions

The summary of emissions is detailed in the PRTR Report which accompanies 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. Following a recent review of the monitoring of the site Cavan County Council now carries out the full scope of sampling as required by the Licence.

4.1 Emissions to Water

Leachate Levels

As shown in the table 4.1 below and the attached Annual Report Chemical Oxygen Demand (COD) and Biological Oxygen Demand (BOD) Ratio results show expected values and are typical of a mature to medium aged landfill which is the case. The leachate was elevated in ammonia and organic content.

Table 4.1 Leachate BOD:COD Ratio

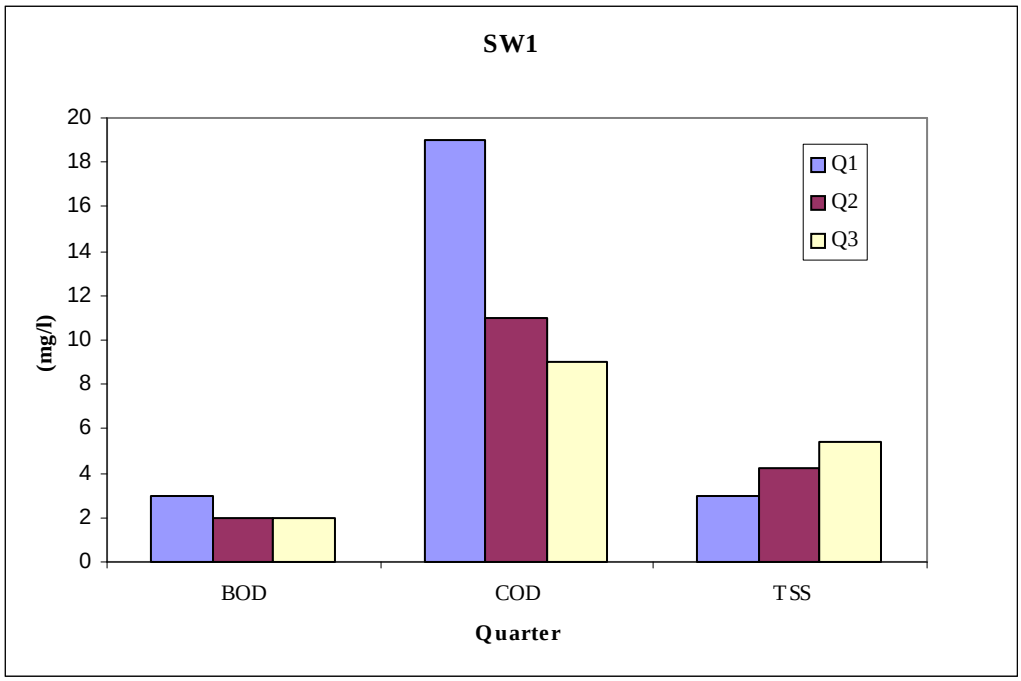
Leachate Location	**Sampling Quarter**	**BOD**	**COD**	**Ratio**
MW7	Q1	4	24	0.17
MW7	Q2	8	32	0.25
MW7	Q3	11	41	0.27

Surface Water

Two surface waters points were sampled in the vicinity of the landfill. These have been assessed against the surface water limits as outlined in the European Communities (Quality of Surface water intended for the abstraction of drinking water) Regulations, 1989.

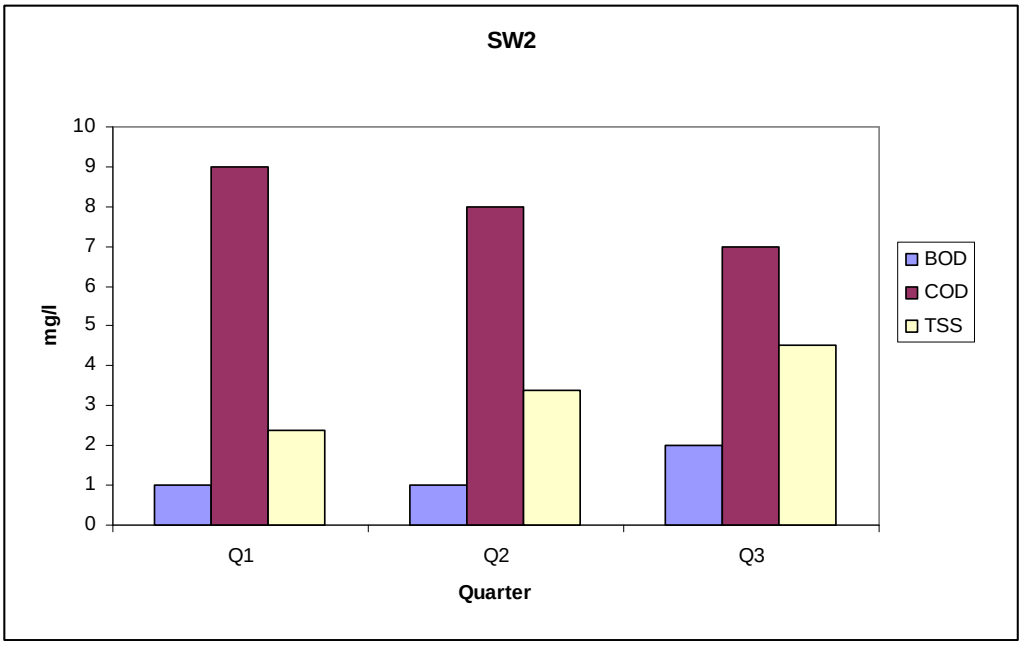
Location SW1 is classed as a category A1 and no change was noted. Location SW2 is classed as a category A1 and no change was noted. No surface water sample was taken from the discharge from the final cap but this has since been added into the monitoring schedule.

Graph 4.1 SW1 Results



Results from location SW2 downstream of the landfill are represented in Graph 4.2 below. COD results appear to be elevated with a downward trend.

Graph 4.2 SW2 Results



Overall the quality of all surface waters taken in 2009 were of good quality all below the A1 limits as outlined in S.I No.294/1989 for quality of surface water intended for the abstraction of drinking water.

Groundwater

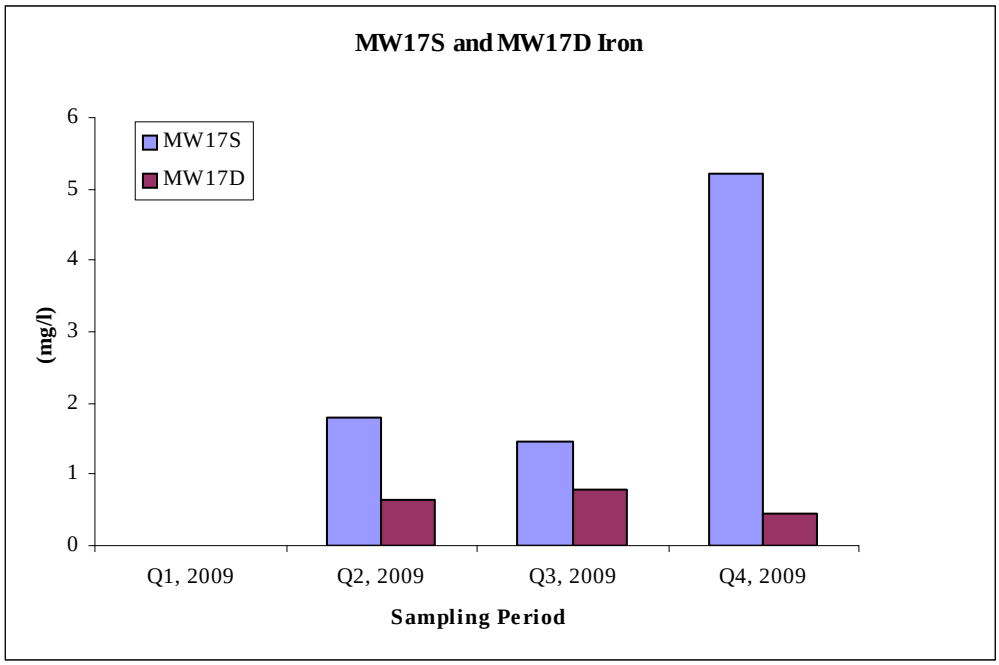
Overall groundwater quality is good with the exception of elevated Iron levels in some samples. This is commonly associated with samples taken from landfills or in the vicinity of landfills.

MW17S for Quarter 4 exceeded the interim guideline values for the protection of groundwater in Ireland for iron, potassium, total and faecal coliforms. When compared to S.I No.278 of 2007, the drinking water standard, the results for Potassium at 16.54mg/l, Iron at 5.204mg/l and the result for faecal coliforms was measured at 40 and total coliforms results shown at 435 - are all in exceedence. The total coliform bacteria results are trending downwards along while all others are stable. The effects of potassium in drinking water is negligible to cause any health problem.

MW17D for Quarter 4 exceeded the interim guideline values for the protection of groundwater in Ireland for iron at 0.449 mg/l, total and faecal coliforms at 1733 and 4 cfu/100mls respectively. Phenol was also elevated at 0.007 mg/l. These parameters

have consistently been above the guideline values. The level of iron is trending downwards along with the readings observed for ammonia in the deeper of the two wells as shown in graph 4.2 below.

Graph 4.2 Groundwater Results- Iron



4.2 Emissions to Air

The emission limits for landfill gas are outlined in Section C.2 of WL 91-1. These are outlined in the table.

Table 4.2 Landfill Gas Concentration Limits

Methane	Carbon Dioxide
20% LEL (1%v/v)	1.5% v/v

Elevated Decomposition gases have been found at Landfill Gas Monitoring Point MW2. This is located in the waste body and the results are to be expected and are typical.

In Quarter 4 no exceedence for carbon dioxide or methane were found at the other available locations indicating that landfill gas is not migrating to the boundary of the landfill.

In summary the results indicate stability in landfill gas for the area and do not show any rapid decline in quality of any excessive breaches outside of the waste body. In Q4, 2009 no exceedences for carbon dioxide or methane were found at the other available locations.

5. Summary of results and interpretation of environmental monitoring

Included in this report is a copy of the annual monitoring results as reported by BHP Laboratories for and on behalf of Cavan County Council. Interpretation of the results are included the report. 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.

Outside of slight elevations in some parameters, there is no evidence of any negative environmental impact associated with this closed landfill. Parameters were generally found to be similar to the previous quarterly monitoring events in 2009.

6. Resource and 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.

7. Report on Restoration of the facility

The site is fully restored and the cap intact. There were additional Groundwater Monitoring wells drilled offsite this year to replace wells that were lost since the site restoration. The newly drilled wells replace those that were lost due to road works.

Table 7.1 Well Drilling Details

Newly Drilled Wells 2009	Upstream	16S, 16D
	Downstream	17S, 17D & 18D

(S = shallow, D = deep)

- Newly drilled roadside boreholes were named, surveyed and elevations recorded, given additional protection and permanent signage erected – see photo below 7.1

Photo 7.1

- Borehole Logs for the newly drilled wells were submitted to the Agency
- Documentation showing the direction of groundwater flow was presented to the Agency
- The direction of surface water flow was reported to the Agency
- Information on Groundwater flows was re-submitted to the Agency

8. Estimated annual and 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. The report shows that there were 53400kgs of Methane Gas produced from the site in 2009.

9. Full title and written summary of any procedures developed by the licensee in the year which relates to the facility operation.

As there are no known nuisances associated with this site there is 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 about the facility. However if any nuisances arise at the facility the licensee will deal with them using appropriate measures and procedures.

10. Reported Incidences and Complaints summaries

There were no incidences in the reporting period 2009. There were no complaints received by the EPA or the Local Authority regarding this facility in the reporting period 2009.

11. Review of Nuisance Controls

As there are no known nuisances associated with this site there is 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. However if any nuisance arises at the facility the licensee will take the appropriate measures and procedures

12. 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 and carries a Safe Pass.

Management Structure 2009-2010 – as presented in Table 12.1 below

Table 12.1

Title	Name	Duties
Director of Services, Environment	Eoin Doyle	To oversee and assign responsibilities to staff regarding landfill
A/Senior Executive Officer	Padraig McGivney	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 2010:

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

13. 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.

14. Any other items specified by the Agency

As requested by the Agency we have included in Appendix B a colour A3 copy of the most recent Map of the site showing all Monitoring locations.

Appendix A

PRTR Emissions Report

AER Returns Worksheet

Version 1.1.10

REFERENCE YEAR	2009

1. FACILITY IDENTIFICATION

Parent Company Name	Cavan County Council
Facility Name	Ballyjamesduff Landfill
PRTR Identification Number	W0033
Licence Number	W0033-01

Waste or IPPC Classes of Activity

No.	class_name
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.
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	
Country	Ireland
Coordinates of Location	-7.20004 53.8687
River Basin District	IEGBNISH
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	049-4378440
AER Returns Contact Mobile Phone Number	087 988 0587
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(a)	Installations for the recovery or disposal of hazardous waste
50.1	General

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

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

SECTION A : SECTOR SPECIFIC PRTR POLLUTANTS

RELEASES TO AIR								
POLLUTANT		METHOD			ADD EMISSION POINT	QUANTITY		
			Method Used					
No. Annex II	Name	M/C/E	Method Code	Designation or Description	Emission Point 1	T (Total) KG/Year	A (Accidental) KG/Year	F (Fugitive) KG/Year
03	Carbon dioxide (CO2)	C	MAB	GASSIM	0.0	149000.0	0.0	149000.0
01	Methane (CH4)	C	MAB	GASSIM	0.0	53400.0	0.0	53400.0

ADD NEW ROW | DELETE ROW * | * 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								
POLLUTANT		METHOD			ADD EMISSION POINT	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

ADD NEW ROW | DELETE ROW * | * 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								
POLLUTANT		METHOD			ADD EMISSION POINT	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

ADD NEW ROW | DELETE ROW * | * 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: Method Code	Method Used: Designation or Description	Facility Total Capacity m3 per hour	
Total estimated methane generation (as per site model)	53400.0	C	GASSIM	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)	0.0				N/A	

4.2 RELEASES TO WATERS

SECTION A : SECTOR SPECIFIC PRTR POLLUTANTS

Data on ambient monitoring of storm/surface water or groundwater, conducted as part of your licence requirements, should NOT be submitted under AER / PRTR Reporting

RELEASES TO WATERS								
POLLUTANT					ADD EMISSION POINT	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

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

SECTION B : REMAINING PRTR POLLUTANTS

RELEASES TO WATERS								
POLLUTANT					ADD EMISSION POINT	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

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

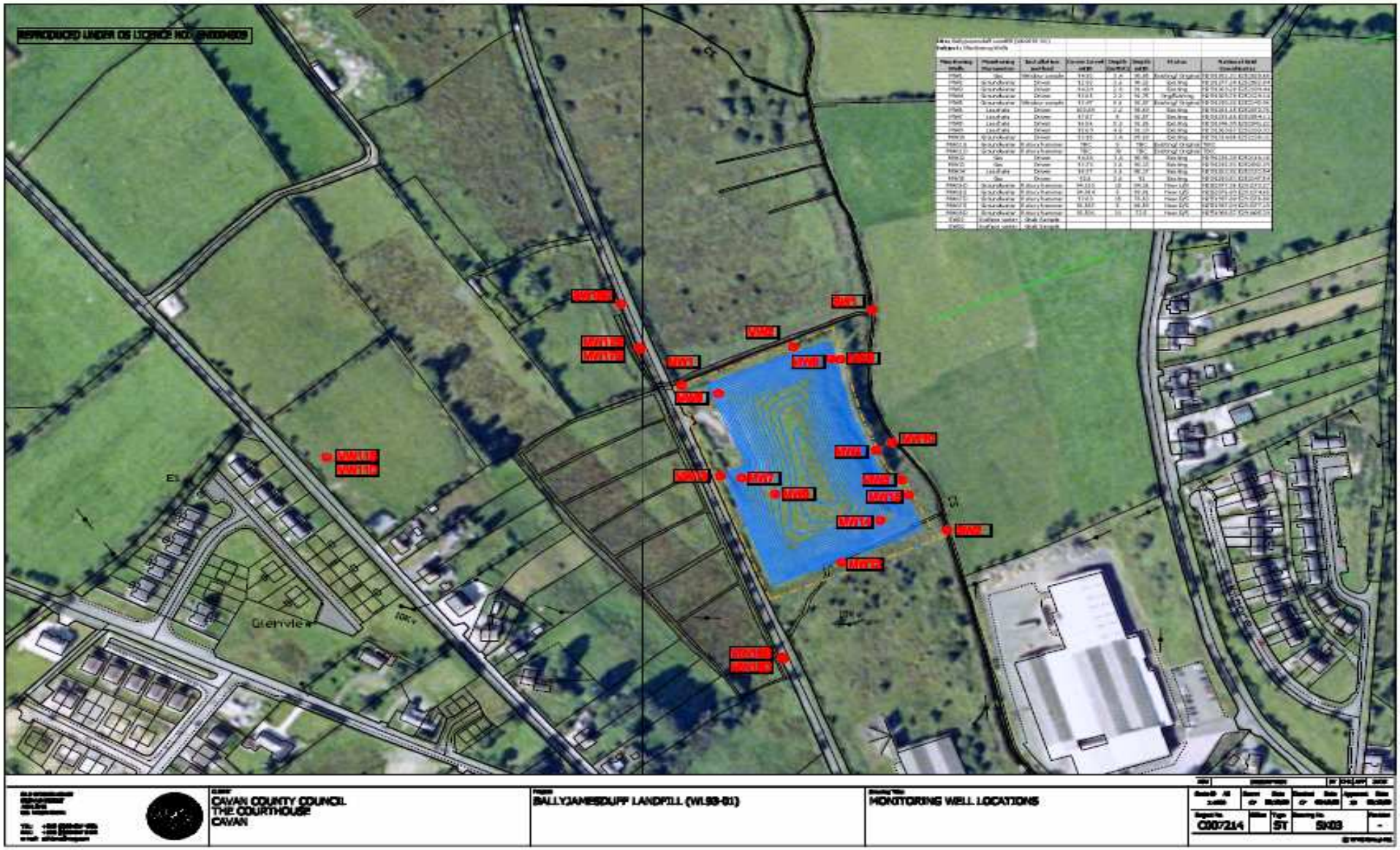
SECTION C : REMAINING POLLUTANT EMISSIONS (as required in your Licence)

RELEASES TO WATERS								
POLLUTANT					ADD EMISSION POINT	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

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

Appendix B

Site Monitoring Locations Map


REPRODUCED UNDER OS LICENCE NO. EN0006609
CAVAN COUNTY COUNCIL
THE COURTHOUSE
CAVAN
BALLYJAMESDUFF LANDFILL (W.93-01)
MONITORING WELL LOCATIONS
C007214
ST
SK03

Appendix C
Annual Monitoring Report

BHP/CEM/23

Analysing
Testing
Consulting
Calibrating

TEST REPORT

BHP
New Road
Thomondgate
Limerick
Ireland
Tel +353 61 455399
Fax + 353 61 455447
E Mail
bhpcem2@bhp.ie

Client: Cavan Co. Co

BHP Ref No.: 86093-95-97

Order No.:

Date Received: 23rd April 2009

Date Completed: 22nd May 2009

Test Specification: Nil

Item: Ballyjamesduff Landfill Site

Annual Report covering groundwater, surfacewater and leachate monitoring at Ballyjamesduff Landfill

Cavan County Council
Courthouse
Cavan Town
Co. Cavan

FTAO: Sinead Fox

For and on behalf of BHP Ltd.

Pat O'Sullivan
Date Issued: 16th July 2009

Report on Ballyjamesduff Landfill for the annual parameters for 2009

Table of Contents

1.0 Introduction :

BHP were contracted by Cavan County Council to carry out environmental monitoring at Ballyjamesduff Landfill site which is located outside Ballyjamesduff town, Co.Cavan. This landfill is no longer operational and is operated under waste license no. 93-1, which was issued to Cavan Co. Co. by the EPA.

This report covers surfacewater, groundwater and leachate monitoring at Ballyjamesduff for the annual monitoring event of 2009 for the available sampling locations.

2.0 Sampling :

This monitoring is a continuation of an established monitoring program at Ballyjamesduff Landfill. As such, the borehole locations are as on previously drafted site maps. A site map is attached in the appendices showing the borehole locations. BHP sampled at 7 boreholes. Their individual references are as shown in table 1.

Table 1 : Borehole reference points and levels.

Borehole reference	Static water level (m)
MW11S	2.25
MW11D	11.36
MW16S	1.31
MW16D	0.31
MW17S	Full
MW17D	Full
MW18	Full

Locations for surface waters and landfill gas are also shown in the map.
In order to ensure correct groundwater monitoring, the following steps were taken.

1. Chemical analysis according to standard testing methods (As shown in table 2).
2. Appropriate on-site sampling techniques were utilised.
    - ISO 5667 ; 'Guidance on sampling of groundwaters' was followed which is appropriate for the objective of monitoring groundwater quality.
    - A Waterra inertial lift pump was utilised which is designed for borehole monitoring in that at no time does the pump come in contact with the water sample. By utilising dedicated hosing at each borehole and new sample containers then any possibility of cross-contamination is eliminated.
    - In order to achieve representative sampling, the method used needs to be capable of withdrawing samples whose composition reflects that of the sub-strata (and not that of stagnant water in the standpipe). In order to achieve this, each borehole is purged of several times its volume before any sample is taken. This is estimated on-site using an electronic dip-meter to measure depth of water and then calculating volume of water present (after measuring radius of borehole).

3. Having taken a representative sample, several analysis parameters are time sensitive and therefore need to be measured on-site i.e. pH, temperature, conductivity and dissolved oxygen. All meters are calibrated before each site-visit.
    - pH and temperature are measured using a Hanna HI 9023 C portable pH meter and thermocouple. The pH meter automatically compensates for temperature variations
    - Dissolved oxygen is measured using a Hanna HI 9142 portable oxygen meter.
    - Conductivity is measured using a Hanna HI 9033 multi-range conductivity meter.

4. BHP operates a chain of custody system. The sample site-sheet / chain of custody form can be found in Appendix B.
5. All samples received by the Laboratory were stored between 0 and 4^{o}C. Subsequent analysis of all samples was carried out in accordance with Standard Methods for the examination of water and wastewater, 20th Edition, 1998, published by the American public health association.
   The methods and limits of detection are listed in the results section.

Parameters for Laboratory Analysis

PARAMETER	Standard Method Reference *** APHA-AWWA-WEF 20th
pH	4500-H^+B
Temperature	2550B
Conductivity	2510B
COD	5220D
Colour	2120B
Turbidity	2130B
Total Suspended Solids	2540D
Alkalinity	2320B
Ammonia	4500-NH_3-D
TOC	5310A
Total Hardness	2340B
Calcium	3120B
Chloride	4110B
Fluoride	4110B
Nitrate	4110B
Magnesium	3120B
Potassium	3120B
Sodium	3120B
Sulphate	4110B
Phosphate	4110B
Iron	3120B
Aluminium	3120B
SiO_2	3120B
Boron	3120B
Barium	3120B
Cadmium	3120B
Chromium	3120B
Copper	3120B
Lead	3120B
Manganese	3120B
Mercury	3112B
Nickel	3120B
Arsenic	3120B
Zinc	3120B
Tin	3120B
Antimony	3120B
Selenium	3120B
Cobalt	3120B
Beryllium	3120B
Silver	3120B

Table 2 : Table of chemical testing methods adopted by BHP Laboratories

*** APHA = American Public Health Association
AWWA = American Water Works Association

WEF = Water Environment Federation

3.0 Quality Assurance :

The Chemical and Environmental Monitoring laboratory (CEM) operates a rigorous approach to quality assurance. The central elements of the quality control system are outlined.

a) Chain of Custody and Client Instruction

Every sample received at BHP laboratories is inspected by the laboratory manager Pat O'Sullivan or by laboratory administrator, Mary Hehir.

A client instruction is required to start analysis.

All samples are then given a unique BHP reference number before storage between 0 and 4^{o}C.

b) Training and Competence

All analysts conducting work at BHP are fully trained. Training involves demonstration of accuracy and precision of analysis. All analysts are subject to periodic reviews in their training. All training is fully documented and retrievable.

c) Validation

BHP procedures are subjected to a rigorous validation which includes the following;

- Evaluation of instrument detection limits and limits of detection.
- Evaluation of operator characteristics including bias, precision and uncertainty of measurement.
- Demonstration of Linearity.
- Evaluation of the standard error on the mean and evaluation of any systematic biases.
- Evaluation of total uncertainty and uncertainty budgets.
- Evaluation of the uncertainty in measurement at a regulatory limit.
- Demonstration of repeatability.
- Evaluation of Matrix effects.

d) Quality Control (Skewhart) Charts

Analysis in the CEM laboratory is monitored using control charts. Each analysis will have at least 3 charts monitoring;

- Certified Reference Material recovery
- Precision of analysis
- Accuracy of analysis

Batchs of analyses are rejected if any of the control charts indicate a loss in control.

e) Interlaboratory Testing

The CEM laboratory are members of the W.R.C Aquacheck Scheme. The Laboratory also participates in the Environmental Protection Agency's Intercalibration Programme and is listed on the Agency's Register of Quality Approved Testing Laboratories.

The Laboratory participates on a bi-annual basis in the British Gas Interlaboratory Proficiency Schemes for the analysis of contaminated soils and waters.

4.0 Results :

The results are presented in the following tables

Chemical Analysis Report for Ballyjamesduff Landfill Site

Client: Cavan Co. Co., Courthouse, Cavan, Co. Cavan.

Site Address: Bailieborough, Co.Cavan

(Sheet 1 of 2) **Monitoring Point / Grid Reference:_____MW 11S _____**

Ground Water Monitoring

Parameter BHP Reference	**Results (mg/l)**				**Sampling method (grab, drift etc.)**	**Normal Analytical Range or Limit of detection (LOD)**	**Analysis method / technique**
	08/10/940	09/04/754					
	Date	**Date**	**Date**	**Date**			
	4th Qtr 08	2nd Qtr 09					
pH	6.46	6.58			Grab	0 -14	Electrochemical
Temperature ^{o}C	9.2	8.9			Grab	$^{-}5^{o}C$ to $100^{o}C$	Electronic Thermocouple
Electrical Conductivity ECuScm^{-1}	447	521			Grab	1.0uScm^{-1}	Electrochemical
Ammonical Nitrogen NH_3-N	0.01	0.04			Grab	0.01 mg/l	Photometric
Dissolved Oxygen (% Sat. 0_2)	58.8	65.4			Grab	1.2 % Saturation 0_2	Electrochemical
Total Oxidised Nitrogen TON	0.27	0.47			Grab	0.10 mg/l	Calculated from IC
Total Alkalinity (as $CaCO_3$)	206	227			Grab	1 mg/l	Titration
Total Organic Carbon TOC	2.6	3.8			Grab	0.4	Persulphate Oxidation
Total Cyanide Cn	<0.001	0.002			Grab	0.001 mg/l	Colourimetrically
Residue on Evaporation	355.3	368			Grab	1 mg/l	Evaporation
Boron B	<0.05	0.107			Grab	0.05 mg/l	ICP
Chloride Cl	20.84	21.8			Grab	0.22 mg/l	IC
Nitrite NO_2	<0.1	<0.1			Grab	0.10 mg/l	IC
Water Level	2.00	2.25			Grab	M	Dip Meter
Nitrate NO_3	1.2	2.1			Grab	0.10 mg/l	IC
Sulphate SO_4	16.34	37.1			Grab	0.20 mg/l	IC
Total Coliforms	2810	1542			Grab	1 to 2419 cfu/100ml	Quanti Cult
Faecal Coliforms	None Found	None Found			Grab	1 to 2419 cfu/100ml	Quanti Cult

Chemical Analysis Report for Ballyjamesduff Landfill Site

Client: Cavan Co. Co., Courthouse, Cavan, Co. Cavan.

Site Address: Bailieborough, Co.Cavan

(Sheet 2 of 2) **Monitoring Point / Grid Reference:_____MW 11S _____**

Ground Water Monitoring

Parameter BHP Reference	**Results (mg/l)** 08/10/940 **Date** 4th Qtr 08	09/04/754 **Date** 2nd Qtr 09	**Date**	**Date**	**Sampling method (grab, drift etc.)**	**Normal Analytical Range or Limit of detection (LOD)**	**Analysis method / technique**
Calcium Ca	50.06	41.33			Grab	0.01 mg/l	ICP
Cadmium Cd	<0.0035	<0.0035			Grab	0.0035 mg/l	ICP
Total Chromium Cr	<0.01	<0.01			Grab	0.01 mg/l	ICP
Copper Cu	<0.015	<0.015			Grab	0.015 mg/l	ICP
Iron Fe	<0.03	<0.03			Grab	0.03 mg/l	ICP
Lead Pb	0.006	0.007			Grab	0.001 mg/l	ICP
Magnesium Mg	12.95	13.74			Grab	0.01 mg/l	ICP
Manganese Mn	<0.014	<0.014			Grab	0.014 mg/l	ICP
Potassium K	2.5	2.22			Grab	0.10 mg/l	ICP
Sodium Na	19.02	21.42			Grab	0.03 mg/l	ICP
Zinc Zn	<0.011	<0.011			Grab	0.011 mg/l	ICP
Mercury Hg	<0.0005	<0.0005			Grab	0.0005 mg/l	AAS
Phenol	<0.001	0.001			Grab	0.001 mg/l	Photometric
Total Phosphorous P	0.11	<0.01			Grab	0.01 mg/l	Photometric
Fluoride F	0.21	0.26			Grab	0.08 mg/l	IC
List I Organics *	<0.01	<0.01			Grab	0.01 mg/l	GC - MS
List II Organics *	<0.01	<0.01			Grab	0.01 mg/l	GC - MS
Odour	None	None			Grab	-	Olefactory
Visual Inspection	Straw, turbid	Straw, turbid			Grab	-	Visual

Signed for and on behalf of BHP Laboratories Ltd.

Chemical Analysis Report for Ballyjamesduff Landfill Site

Client: Cavan Co. Co., Courthouse, Cavan, Co. Cavan.

Site Address: Bailieborough, Co.Cavan

(Sheet 1 of 2) **Monitoring Point / Grid Reference:_____MW 11D _____**

Ground Water Monitoring

Parameter BHP Reference	**Results (mg/l)** 08/10/941 **Date** 4th Qtr 08	09/04/753 **Date** 2nd Qtr 09	**Date**	**Date**	**Sampling method (grab, drift etc.)**	**Normal Analytical Range or Limit of detection (LOD)**	**Analysis method / technique**
pH	7.65	7.48			Grab	0 -14	Electrochemical
Temperature ^{o}C	9	11.1			Grab	$^{-}5^{o}C$ to $100^{o}C$	Electronic Thermocouple
Electrical Conductivity ECuScm^{-1}	411	408			Grab	1.0uScm^{-1}	Electrochemical
Ammonical Nitrogen NH_3-N	0.02	0.08			Grab	0.01 mg/l	Photometric
Dissolved Oxygen (% Sat. 0_2)	96.5	95.8			Grab	1.2 % Saturation 0_2	Electrochemical
Total Oxidised Nitrogen TON	0.2	0.35			Grab	0.10 mg/l	Calculated from IC
Total Alkalinity (as $CaCO_3$)	217	215			Grab	1 mg/l	Titration
Total Organic Carbon TOC	4.6	5.2			Grab	0.4	Persulphate Oxidation
Total Cyanide Cn	0.004	0.003			Grab	0.001 mg/l	Colourimetrically
Residue on Evaporation	393	342			Grab	1 mg/l	Evaporation
Boron B	0.296	0.094			Grab	0.05 mg/l	ICP
Chloride Cl	12	15.4			Grab	0.22 mg/l	IC
Nitrite NO_2	<0.1	<0.1			Grab	0.10 mg/l	IC
Water Level	10.6	11.36			Grab	M	Dip Meter
Nitrate NO_3	0.9	1.54			Grab	0.10 mg/l	IC
Sulphate SO_4	15.41	22.1			Grab	0.20 mg/l	IC
Total Coliforms	84	65			Grab	1 to 2419 cfu/100ml	Quanti Cult
Faecal Coliforms	None Found	None Found			Grab	1 to 2419 cfu/100ml	Quanti Cult

Chemical Analysis Report for Ballyjamesduff Landfill Site

Client: Cavan Co. Co., Courthouse, Cavan, Co. Cavan.

Site Address: Bailieborough, Co.Cavan

(Sheet 2 of 2) **Monitoring Point / Grid Reference:_____MW 11D _____**

Ground Water Monitoring

Parameter BHP Reference	**Results (mg/l)** 08/10/941 **Date** 4th Qtr 08	09/04/753 **Date** 2nd Qtr 09	**Date**	**Date**	**Sampling method (grab, drift etc.)**	**Normal Analytical Range or Limit of detection (LOD)**	**Analysis method / technique**
Calcium Ca	70.06	37.8			Grab	0.01 mg/l	ICP
Cadmium Cd	<0.0035	<0.0035			Grab	0.0035 mg/l	ICP
Total Chromium Cr	<0.01	<0.01			Grab	0.01 mg/l	ICP
Copper Cu	<0.015	<0.015			Grab	0.015 mg/l	ICP
Iron Fe	<0.03	0.124			Grab	0.03 mg/l	ICP
Lead Pb	0.006	<0.002			Grab	0.002 mg/l	ICP
Magnesium Mg	9.66	8.81			Grab	0.01 mg/l	ICP
Manganese Mn	<0.014	<0.014			Grab	0.014 mg/l	ICP
Potassium K	1.42	1.86			Grab	0.10 mg/l	ICP
Sodium Na	17.96	20.12			Grab	0.03 mg/l	ICP
Zinc Zn	<0.011	<0.011			Grab	0.011 mg/l	ICP
Mercury Hg	<0.0005	<0.0005			Grab	0.0005 mg/l	AAS
Phenol	0.01	0.008			Grab	0.001 mg/l	Photometric
Total Phosphorous P	0.62	0.16			Grab	0.01 mg/l	Photometric
Fluoride F	0.23	0.25			Grab	0.08 mg/l	IC
List I Organics *	<0.01	<0.01			Grab	0.01 mg/l	GC - MS
List II Organics *	<0.01	<0.01			Grab	0.01 mg/l	GC - MS
Odour	None	None			Grab	-	Olefactory
Visual Inspection	Straw, Turbid	Straw, Turbid			Grab	-	Visual

Chemical Analysis Report for Ballyjamesduff Landfill Site

Client: Cavan Co. Co., Courthouse, Cavan, Co. Cavan.

Site Address: Bailieborough, Co.Cavan

(Sheet 1 of 2) **Monitoring Point / Grid Reference:_____MW 16S _____**

Ground Water Monitoring

Parameter BHP Reference	**Results (mg/l)**				**Sampling method (grab, drift etc.)**	**Normal Analytical Range or Limit of detection (LOD)**	**Analysis method / technique**
		09/04/749					
	Date	**Date**	**Date**	**Date**			
		2nd Qtr 09					
pH		7.31			Grab	0 -14	Electrochemical
Temperature ^oC		9.6			Grab	$^-5^oC$ to 100^oC	Electronic Thermocouple
Electrical Conductivity ECuScm^{-1}		411			Grab	1.0uScm^{-1}	Electrochemical
Ammonical Nitrogen NH_3-N		0.12			Grab	0.01 mg/l	Photometric
Dissolved Oxygen (% Sat. 0_2)		94.8			Grab	1.2 % Saturation 0_2	Electrochemical
Total Oxidised Nitrogen TON		0.48			Grab	0.10 mg/l	Calculated from IC
Total Alkalinity (as $CaCO_3$)		279			Grab	1 mg/l	Titration
Total Organic Carbon TOC		4.1			Grab	0.4	Persulphate Oxidation
Total Cyanide Cn		0.001			Grab	0.001 mg/l	Colourimetrically
Residue on Evaporation		502			Grab	1 mg/l	Evaporation
Boron B		0.307			Grab	0.05 mg/l	ICP
Chloride Cl		21.1			Grab	0.22 mg/l	IC
Nitrite NO_2		<0.1			Grab	0.10 mg/l	IC
Water Level		1.31			Grab	M	Dip Meter
Nitrate NO_3		2.12			Grab	0.10 mg/l	IC
Sulphate SO_4		21.1			Grab	0.20 mg/l	IC
Total Coliforms		8			Grab	1 to 2419 cfu/100ml	Quanti Cult
Faecal Coliforms		None Found			Grab	1 to 2419 cfu/100ml	Quanti Cult

Chemical Analysis Report for Ballyjamesduff Landfill Site

Client: Cavan Co. Co., Courthouse, Cavan, Co. Cavan.

Site Address: Bailieborough, Co.Cavan

(Sheet 2 of 2) **Monitoring Point / Grid Reference:_____MW 16S _____**

Ground Water Monitoring

Parameter BHP Reference	**Results (mg/l)**				**Sampling method (grab, drift etc.)**	**Normal Analytical Range or Limit of detection (LOD)**	**Analysis method / technique**
		09/04/749					
	Date	**Date**	**Date**	**Date**			
		2nd Qtr 09					
Calcium Ca		51			Grab	0.01 mg/l	ICP
Cadmium Cd		<0.0035			Grab	0.0035 mg/l	ICP
Total Chromium Cr		<0.01			Grab	0.01 mg/l	ICP
Copper Cu		<0.015			Grab	0.015 mg/l	ICP
Iron Fe		0.089			Grab	0.03 mg/l	ICP
Lead Pb		<0.002			Grab	0.002 mg/l	ICP
Magnesium Mg		22.71			Grab	0.01 mg/l	ICP
Manganese Mn		0.479			Grab	0.014 mg/l	ICP
Potassium K		2.12			Grab	0.10 mg/l	ICP
Sodium Na		23.45			Grab	0.03 mg/l	ICP
Zinc Zn		<0.011			Grab	0.011 mg/l	ICP
Mercury Hg		<0.0005			Grab	0.0005 mg/l	AAS
Phenol		0.009			Grab	0.001 mg/l	Photometric
Total Phosphorous P		0.32			Grab	0.01 mg/l	Photometric
Fluoride F		<0.08			Grab	0.08 mg/l	IC
List I Organics *		<0.01			Grab	0.01 mg/l	GC - MS
List II Organics *		<0.01			Grab	0.01 mg/l	GC - MS
Odour		None			Grab	-	Olefactory
Visual Inspection		Straw, Turbid			Grab	-	Visual

Signed for and on behalf of BHP Laboratories Ltd.

Chemical Analysis Report for Ballyjamesduff Landfill Site

Client: Cavan Co. Co., Courthouse, Cavan, Co. Cavan.

Site Address: Bailieborough, Co.Cavan

(Sheet 1 of 2) **Monitoring Point / Grid Reference:_____MW 16D _____**

Ground Water Monitoring

Parameter BHP Reference	**Results (mg/l)**				**Sampling method (grab, drift etc.)**	**Normal Analytical Range or Limit of detection (LOD)**	**Analysis method / technique**
		09/04/748					
	Date	**Date**	**Date**	**Date**			
		2nd Qtr 09					
pH		7.14			Grab	0 -14	Electrochemical
Temperature ^{o}C		11.5			Grab	$^{-}5^{o}C$ to $100^{o}C$	Electronic Thermocouple
Electrical Conductivity ECuScm^{-1}		394			Grab	1.0uScm^{-1}	Electrochemical
Ammonical Nitrogen NH_3-N		0.08			Grab	0.01 mg/l	Photometric
Dissolved Oxygen (% Sat. 0_2)		91.8			Grab	1.2 % Saturation 0_2	Electrochemical
Total Oxidised Nitrogen TON		0.35			Grab	0.10 mg/l	Calculated from IC
Total Alkalinity (as $CaCO_3$)		230			Grab	1 mg/l	Titration
Total Organic Carbon TOC		1.4			Grab	0.4	Persulphate Oxidation
Total Cyanide Cn		0.002			Grab	0.001 mg/l	Colourimetrically
Residue on Evaporation		450			Grab	1 mg/l	Evaporation
Boron B		0.358			Grab	0.05 mg/l	ICP
Chloride Cl		25.8			Grab	0.22 mg/l	IC
Nitrite NO_2		<0.1			Grab	0.10 mg/l	IC
Water Level		0.31			Grab	M	Dip Meter
Nitrate NO_3		1.54			Grab	0.10 mg/l	IC
Sulphate SO_4		32.3			Grab	0.20 mg/l	IC

Total Coliforms		67			Grab	1 to 2419 cfu/100ml	Quanti Cult
Faecal Coliforms		None Found			Grab	1 to 2419 cfu/100ml	Quanti Cult

Signed for and on behalf of BHP Laboratories Ltd.

Chemical Analysis Report for Ballyjamesduff Landfill Site

Client: Cavan Co. Co., Courthouse, Cavan, Co. Cavan.

Site Address: Bailieborough, Co.Cavan

(Sheet 2 of 2) **Monitoring Point / Grid Reference:_____MW 16D _____**

Ground Water Monitoring

Parameter	**Results (mg/l)**				**Sampling method (grab, drift etc.)**	**Normal Analytical Range or Limit of detection (LOD)**	**Analysis method / technique**
BHP Reference		09/04/748					
	Date	**Date**	**Date**	**Date**			
		2nd Qtr 09					
Calcium Ca		44.7			Grab	0.01 mg/l	ICP
Cadmium Cd		<0.0035			Grab	0.0035 mg/l	ICP
Total Chromium Cr		<0.01			Grab	0.01 mg/l	ICP
Copper Cu		<0.015			Grab	0.015 mg/l	ICP
Iron Fe		0.124			Grab	0.03 mg/l	ICP
Lead Pb		<0.002			Grab	0.002 mg/l	ICP
Magnesium Mg		11.42			Grab	0.01 mg/l	ICP
Manganese Mn		0.057			Grab	0.014 mg/l	ICP
Potassium K		1.86			Grab	0.10 mg/l	ICP
Sodium Na		19.87			Grab	0.03 mg/l	ICP
Zinc Zn		<0.011			Grab	0.011 mg/l	ICP
Mercury Hg		<0.0005			Grab	0.0005 mg/l	AAS
Phenol		0.004			Grab	0.001 mg/l	Photometric
Total Phosphorous P		0.22			Grab	0.01 mg/l	Photometric
Fluoride F		<0.08			Grab	0.08 mg/l	IC

List I Organics *		<0.01			Grab	0.01 mg/l	GC - MS
List II Organics *		<0.01			Grab	0.01 mg/l	GC - MS
Odour		None			Grab	-	Olefactory
Visual Inspection		Straw, Turbid			Grab	-	Visual

Signed for and on behalf of BHP Laboratories Ltd.

Chemical Analysis Report for Ballyjamesduff Landfill Site

Client: Cavan Co. Co., Courthouse, Cavan, Co. Cavan.

Site Address: Bailieborough, Co.Cavan

(Sheet 1 of 2) **Monitoring Point / Grid Reference:_____MW 17S _____**

Ground Water Monitoring

Parameter BHP Reference	**Results (mg/l)**				**Sampling method (grab, drift etc.)**	**Normal Analytical Range or Limit of detection (LOD)**	**Analysis method / technique**
		09/04/750					
	Date	**Date**	**Date**	**Date**			
		2nd Qtr 09					
pH		6.99			Grab	0 -14	Electrochemical
Temperature ^{o}C		11.8			Grab	$^{-}5^{o}C$ to $100^{o}C$	Electronic Thermocouple
Electrical Conductivity ECuScm^{-1}		404			Grab	1.0uScm^{-1}	Electrochemical
Ammonical Nitrogen NH_3-N		0.12			Grab	0.01 mg/l	Photometric
Dissolved Oxygen (% Sat. 0_2)		94.1			Grab	1.2 % Saturation 0_2	Electrochemical
Total Oxidised Nitrogen TON		0.7			Grab	0.10 mg/l	Calculated from IC
Total Alkalinity (as $CaCO_3$)		183			Grab	1 mg/l	Titration
Total Organic Carbon TOC		2.9			Grab	0.4	Persulphate Oxidation
Total Cyanide Cn		0.001			Grab	0.001 mg/l	Colourimetrically
Residue on Evaporation		300			Grab	1 mg/l	Evaporation
Boron B		0.087			Grab	0.05 mg/l	ICP
Chloride Cl		22.1			Grab	0.22 mg/l	IC
Nitrite NO_2		<0.1			Grab	0.10 mg/l	IC

Water Level		Full			Grab	M	Dip Meter
Nitrate NO_3		3.12			Grab	0.10 mg/l	IC
Sulphate SO_4		64.8			Grab	0.20 mg/l	IC
Total Coliforms		13			Grab	1 to 2419 cfu/100ml	Quanti Cult
Faecal Coliforms		2			Grab	1 to 2419 cfu/100ml	Quanti Cult

Signed for and on behalf of BHP Laboratories Ltd.

Chemical Analysis Report for Ballyjamesduff Landfill Site

Client: Cavan Co. Co., Courthouse, Cavan, Co. Cavan.

Site Address: Bailieborough, Co.Cavan

(Sheet 2 of 2) **Monitoring Point / Grid Reference:_____MW 17S _____**

Ground Water Monitoring

Parameter BHP Reference	**Results (mg/l)**				**Sampling method (grab, drift etc.)**	**Normal Analytical Range or Limit of detection (LOD)**	**Analysis method / technique**
		09/04/750					
	Date	**Date**	**Date**	**Date**			
		2nd Qtr 09					
Calcium Ca		45.09			Grab	0.01 mg/l	ICP
Cadmium Cd		<0.0035			Grab	0.0035 mg/l	ICP
Total Chromium Cr		<0.01			Grab	0.01 mg/l	ICP
Copper Cu		<0.015			Grab	0.015 mg/l	ICP
Iron Fe		0.078			Grab	0.03 mg/l	ICP
Lead Pb		<0.002			Grab	0.002 mg/l	ICP
Magnesium Mg		8.45			Grab	0.01 mg/l	ICP
Manganese Mn		0.024			Grab	0.014 mg/l	ICP
Potassium K		2.02			Grab	0.10 mg/l	ICP
Sodium Na		20.14			Grab	0.03 mg/l	ICP
Zinc Zn		<0.011			Grab	0.011 mg/l	ICP
Mercury Hg		<0.0005			Grab	0.0005 mg/l	AAS
Phenol		0.002			Grab	0.001 mg/l	Photometric

Total Phosphorous P		0.02			Grab	0.01 mg/l	Photometric
Fluoride F		<0.08			Grab	0.08 mg/l	IC
List I Organics *		<0.01			Grab	0.01 mg/l	GC - MS
List II Organics *		<0.01			Grab	0.01 mg/l	GC - MS
Odour		None			Grab	-	Olefactory
Visual Inspection		Straw, Turbid			Grab	-	Visual

Chemical Analysis Report for Ballyjamesduff Landfill Site

Client: Cavan Co. Co., Courthouse, Cavan, Co. Cavan.

Site Address: Bailieborough, Co.Cavan

(Sheet 1 of 2) **Monitoring Point / Grid Reference:_____MW 17D _____** **Ground Water Monitoring**

Parameter BHP Reference	**Results (mg/l)**				**Sampling method (grab, drift etc.)**	**Normal Analytical Range or Limit of detection (LOD)**	**Analysis method / technique**
		09/04/751					
	Date	**Date**	**Date**	**Date**			
		2nd Qtr 09					
pH		7.08			Grab	0 -14	Electrochemical
Temperature ^{o}C		12.9			Grab	$^{-}5^{o}C$ to $100^{o}C$	Electronic Thermocouple
Electrical Conductivity ECuScm^{-1}		387			Grab	1.0uScm^{-1}	Electrochemical
Ammonical Nitrogen NH_3-N		0.05			Grab	0.01 mg/l	Photometric
Dissolved Oxygen (% Sat. 0_2)		90.5			Grab	1.2 % Saturation 0_2	Electrochemical
Total Oxidised Nitrogen TON		0.44			Grab	0.10 mg/l	Calculated from IC
Total Alkalinity (as $CaCO_3$)		231			Grab	1 mg/l	Titration
Total Organic Carbon TOC		10.5			Grab	0.4	Persulphate Oxidation
Total Cyanide Cn		0.002			Grab	0.001 mg/l	Colourimetrically
Residue on Evaporation		1506			Grab	1 mg/l	Evaporation
Boron B		0.219			Grab	0.05 mg/l	ICP

Chloride Cl		256.1			Grab	0.22 mg/l	IC
Nitrite NO_2		<0.1			Grab	0.10 mg/l	IC
Water Level		Full			Grab	M	Dip Meter
Nitrate NO_3		1.98			Grab	0.10 mg/l	IC
Sulphate SO_4		63.2			Grab	0.20 mg/l	IC
Total Coliforms		2358			Grab	1 to 2419 cfu/100ml	Quanti Cult
Faecal Coliforms		125			Grab	1 to 2419 cfu/100ml	Quanti Cult

Signed for and on behalf of BHP Laboratories Ltd.

Chemical Analysis Report for Ballyjamesduff Landfill Site

Client: Cavan Co. Co., Courthouse, Cavan, Co. Cavan.

Site Address: Bailieborough, Co.Cavan

(Sheet 2 of 2) **Monitoring Point / Grid Reference:_____MW 17D _____** Ground Water Monitoring

Parameter	**Results (mg/l)**				**Sampling method (grab, drift etc.)**	**Normal Analytical Range or Limit of detection (LOD)**	**Analysis method / technique**
BHP Reference		09/04/751					
	Date	**Date**	**Date**	**Date**			
		2nd Qtr 09					
Calcium Ca		203			Grab	0.01 mg/l	ICP
Cadmium Cd		<0.0035			Grab	0.0035 mg/l	ICP
Total Chromium Cr		0.184			Grab	0.01 mg/l	ICP
Copper Cu		0.142			Grab	0.015 mg/l	ICP
Iron Fe		0.568			Grab	0.03 mg/l	ICP
Lead Pb		<0.002			Grab	0.002 mg/l	ICP
Magnesium Mg		160			Grab	0.01 mg/l	ICP
Manganese Mn		0.048			Grab	0.014 mg/l	ICP
Potassium K		15.24			Grab	0.10 mg/l	ICP
Sodium Na		78.9			Grab	0.03 mg/l	ICP
Zinc Zn		<0.011			Grab	0.011 mg/l	ICP
Mercury Hg		<0.0005			Grab	0.0005 mg/l	AAS
Phenol		0.012			Grab	0.001 mg/l	Photometric
Total Phosphorous P		0.09			Grab	0.01 mg/l	Photometric
Fluoride F		0.17			Grab	0.08 mg/l	IC
List I Organics *		<0.01			Grab	0.01 mg/l	GC - MS
List II Organics *		<0.01			Grab	0.01 mg/l	GC - MS
Odour		None			Grab	-	Olefactory
Visual Inspection		Turbid			Grab	-	Visual

Signed for and on behalf of BHP Laboratories Ltd.

Chemical Analysis Report for Ballyjamesduff Landfill Site

Client: Cavan Co. Co., Courthouse, Cavan, Co. Cavan.

Site Address: Bailieborough, Co.Cavan

(Sheet 1 of 2) **Monitoring Point / Grid Reference:_____MW 18D _____** Ground Water Monitoring

Parameter	**Results (mg/l)**				**Sampling method (grab, drift etc.)**	**Normal Analytical Range or Limit of detection (LOD)**	**Analysis method / technique**
BHP Reference		09/04/752					
	Date	**Date**	**Date**	**Date**			
		2nd Qtr 09					
pH		7.02			Grab	0 -14	Electrochemical
Temperature °C		10.6			Grab	-5°C to 100°C	Electronic Thermocouple
Electrical Conductivity ECuScm^{-1}		412			Grab	1.0uScm^{-1}	Electrochemical
Ammonical Nitrogen NH_3-N		0.08			Grab	0.01 mg/l	Photometric
Dissolved Oxygen (% Sat. 0_2)		95.4			Grab	1.2 % Saturation 0_2	Electrochemical
Total Oxidised Nitrogen TON		0.19			Grab	0.10 mg/l	Calculated from IC
Total Alkalinity (as $CaCO_3$)		233			Grab	1 mg/l	Titration
Total Organic Carbon TOC		5.1			Grab	0.4	Persulphate Oxidation
Total Cyanide Cn		0.001			Grab	0.001 mg/l	Colourimetrically
Residue on Evaporation		294			Grab	1 mg/l	Evaporation
Boron B		0.083			Grab	0.05 mg/l	ICP
Chloride Cl		42.1			Grab	0.22 mg/l	IC
Nitrite NO_2		<0.1			Grab	0.10 mg/l	IC
Water Level		Full			Grab	M	Dip Meter
Nitrate NO_3		0.86			Grab	0.10 mg/l	IC
Sulphate SO_4		41.6			Grab	0.20 mg/l	IC
Total Coliforms		68			Grab	1 to 2419 cfu/100ml	Quanti Cult
Faecal Coliforms		1			Grab	1 to 2419 cfu/100ml	Quanti Cult

Signed for and on behalf of BHP Laboratories Ltd.

Chemical Analysis Report for Ballyjamesduff Landfill Site

Client: Cavan Co. Co., Courthouse, Cavan, Co. Cavan.

Site Address: Bailieborough, Co.Cavan

(Sheet 2 of 2) **Monitoring Point / Grid Reference:_____MW 18D _____** Ground Water Monitoring

Parameter	**Results (mg/l)**				**Sampling method (grab, drift etc.)**	**Normal Analytical Range or Limit of detection (LOD)**	**Analysis method / technique**
BHP Reference		09/04/752					
	Date	**Date**	**Date**	**Date**			
		2nd Qtr 09					
Calcium Ca		43.41			Grab	0.01 mg/l	ICP
Cadmium Cd		<0.0035			Grab	0.0035 mg/l	ICP
Total Chromium Cr		<0.01			Grab	0.01 mg/l	ICP
Copper Cu		<0.015			Grab	0.015 mg/l	ICP
Iron Fe		0.087			Grab	0.03 mg/l	ICP
Lead Pb		<0.002			Grab	0.002 mg/l	ICP
Magnesium Mg		10.78			Grab	0.01 mg/l	ICP
Manganese Mn		0.062			Grab	0.014 mg/l	ICP
Potassium K		8.12			Grab	0.10 mg/l	ICP
Sodium Na		21.4			Grab	0.03 mg/l	ICP
Zinc Zn		<0.011			Grab	0.011 mg/l	ICP
Mercury Hg		<0.0005			Grab	0.0005 mg/l	AAS
Phenol		0.008			Grab	0.001 mg/l	Photometric
Total Phosphorous P		0.22			Grab	0.01 mg/l	Photometric
Fluoride F		0.19			Grab	0.08 mg/l	IC
List I Organics *		<0.01			Grab	0.01 mg/l	GC - MS
List II Organics *		<0.01			Grab	0.01 mg/l	GC - MS
Odour		None			Grab	-	Olefactory
Visual Inspection		Straw, Turbid			Grab	-	Visual

Signed for and on behalf of BHP Laboratories Ltd.

Chemical Analysis Report for Ballyjamesduff Landfill Site

Client: Cavan Co. Co., Courthouse, Cavan, Co. Cavan.

Site Address: Bailieborough, Co.Cavan

(Sheet 1 of 1) **Monitoring Point / Grid Reference:** MW 7 Leachate Monitoring

Parameter	**Results (mg/l)**				**Sampling method (grab, drift etc.)**	**Normal Analytical Range or Limit of detection (LOD)**	**Analysis method / technique**
BHP Reference	08/10/944	09/04/756					
	Date	**Date**	**Date**	**Date**			
	4th Qtr 08	2nd Qtr 09					
Boron B	0.277	0.313			Grab	0.05 mg/l	ICP
Calcium Ca	127.7	135.6			Grab	0.01 mg/l	ICP
Cadmium Cd	<0.0035	<0.0035			Grab	0.0035 mg/l	ICP
Total Chromium Cr	<0.01	0.012			Grab	0.01 mg/l	ICP
Copper Cu	<0.015	0.021			Grab	0.015 mg/l	ICP
Total Cyanide Cn	0.09	0.011			Grab	0.001 mg/l	Colourimetrically
Fluoride F	<0.08	0.25			Grab	0.08 mg/l	IC
Iron Fe	3.509	3.856			Grab	0.03 mg/l	ICP
Lead Pb	0.009	0.011			Grab	0.001 mg/l	ICP
Magnesium Mg	17.19	18.96			Grab	0.01 mg/l	ICP
Manganese Mn	0.092	0.124			Grab	0.014 mg/l	ICP
Mercury Hg	<0.0005	<0.0005			Grab	0.0005 mg/l	AAS
Sulphate SO_4	<0.2	1.8			Grab	0.20 mg/l	IC
Potassium K	7.14	11.56			Grab	0.10 mg/l	ICP
Sodium Na	12.61	25.62			Grab	0.03 mg/l	ICP
Total Phosphorous P	19.5	14.2			Grab	0.01 mg/l	Photometric
Zinc Zn	<0.011	<0.011			Grab	0.011 mg/l	ICP
Total Coliforms	281	3540			Grab	1 to 2419 cfu/100ml	Quanti Cult
Faecal Coliforms	10	152			Grab	1 to 2419 cfu/100ml	Quanti Cult

Signed for and on behalf of BHP Laboratories Ltd.

Chemical Analysis Report for Ballyjamesduff Landfill Site

Client: Cavan Co. Co., Courthouse, Cavan, Co. Cavan.

Site Address: Ballyjamesduff, Co.Cavan

(Sheet 1 of 2) **Monitoring Point / Grid Reference:** SW 1 Surface Water Monitoring

Parameter	Results (mg/l)				Sampling method (grab, drift etc.)	Normal Analytical Range or Limit of detection (LOD)	Analysis method / technique
BHP Reference	08/10/942	09/04/759					
	Date	Date	Date	Date			
	4th Qtr 08	2nd Qtr 09					
pH	6.59	7.43			Grab	0 -14	Electrochemical
Temperature °C	4.5	12.7			Grab	-5°C to 100°C	Electronic Thermocouple
Electrical Conductivity ECuScm^{-1}	182.5	259			Grab	1.0uScm^{-1}	Electrochemical
Ammonical Nitrogen NH_3-N	0.03	0.23			Grab	0.01 mg/l	Photometric
Chemical Oxygen Demand	31	25			Grab	1 mg/l	Photometric
Biochemical Oxygen Demand	4	3			Grab	1 mg/l	Electrochemical
Dissolved Oxygen (% Sat. 0_2)	99.6	97.7			Grab	1.2 % Saturation 0_2	Electrochemical
Total Oxidised Nitrogen TON	0.26	0.52			Grab	0.10 mg/l	Calculated from IC
Total Alkalinity (as $CaCO_3$)	60	88			Grab	1 mg/l	Titration
Total Suspended Solids	<1	5.6			Grab	1 mg/l	Gravimetric
Chloride Cl	12.23	15.93			Grab	0.22 mg/l	IC
Nitrite NO_2	<0.1	<0.1			Grab	0.10 mg/l	IC
Nitrate NO_3	1.14	2.29			Grab	0.10 mg/l	IC
Sulphate SO_4	11.63	18.51			Grab	0.20 mg/l	IC

Signed for and on behalf of BHP Laboratories Ltd.

Chemical Analysis Report for Ballyjamesduff Landfill Site

Client: Cavan Co. Co., Courthouse, Cavan, Co. Cavan.

Site Address: Ballyjamesduff, Co.Cavan

(Sheet 2 of 2) **Monitoring Point / Grid Reference:** SW1 Surface Water Monitoring

Parameter	Results (mg/l)				Sampling method (grab, drift etc.)	Normal Analytical Range or Limit of detection (LOD)	Analysis method / technique
BHP Reference	08/10/942	09/04/759					
	Date	Date	Date	Date			
	4th Qtr 08	2nd Qtr 09					
Calcium Ca	19.73	20.98			Grab	0.01 mg/l	ICP
Cadmium Cd	<0.0035	<0.0035			Grab	0.0035 mg/l	ICP
Total Chromium Cr	<0.01	<0.01			Grab	0.01 mg/l	ICP
Copper Cu	<0.015	<0.015			Grab	0.015 mg/l	ICP
Iron Fe	0.037	0.267			Grab	0.03 mg/l	ICP
Lead Pb	0.006	0.005			Grab	0.002 mg/l	ICP
Magnesium Mg	3.14	2.9			Grab	0.01 mg/l	ICP
Manganese Mn	<0.014	<0.014			Grab	0.014 mg/l	ICP
Potassium K	2.61	1.77			Grab	0.10 mg/l	ICP
Sodium Na	9.41	7.74			Grab	0.03 mg/l	ICP
Zinc Zn	<0.011	<0.011			Grab	0.011 mg/l	ICP
Mercury Hg	<0.0005	<0.0005			Grab	0.0005 mg/l	AAS
OrthoPhosphate P	0.06	<0.01			Grab	0.01 mg/l	Photometric
Odour	None	None			Grab	-	Olefactory
Visual Inspection	Yellow, Turbid				Grab	-	Visual

Signed for and on behalf of BHP Laboratories Ltd.

Chemical Analysis Report for Ballyjamesduff Landfill Site

Client: Cavan Co. Co., Courthouse, Cavan, Co. Cavan.

Site Address: Ballyjamesduff, Co.Cavan

(Sheet 1 of 2) **Monitoring Point / Grid Reference:** SW 2 Surface Water Monitoring

Parameter	Results (mg/l)				Sampling method (grab, drift etc.)	Normal Analytical Range or Limit of detection (LOD)	Analysis method / technique
BHP Reference	08/10/943	09/04/760					
	Date	Date	Date	Date			
	4th Qtr 08	2nd Qtr 09					
pH	7.23	7.49			Grab	0 -14	Electrochemical
Temperature ^{o}C	4.5	12.5			Grab	$-5^{o}C$ to $100^{o}C$	Electronic Thermocouple
Electrical Conductivity ECuScm^{-1}	199	261			Grab	1.0uScm^{-1}	Electrochemical
Ammonical Nitrogen NH_3-N	0.04	0.26			Grab	0.01 mg/l	Photometric
Chemical Oxygen Demand	21	18			Grab	1 mg/l	Photometric
Biochemical Oxygen Demand	3	2			Grab	1 mg/l	Electrochemical
Dissolved Oxygen (% Sat. 0_2)	99.1	97.9			Grab	1.2 % Saturation 0_2	Electrochemical
Total Oxidised Nitrogen TON	0.24	0.43			Grab	0.10 mg/l	Calculated from IC
Total Alkalinity (as $CaCO_3$)	60	84			Grab	1 mg/l	Titration
Total Suspended Solids	<1	4.5			Grab	1 mg/l	Gravimetric
Chloride Cl	12.86	14.2			Grab	0.22 mg/l	IC
Nitrite NO_2	<0.1	<0.1			Grab	0.10 mg/l	IC
Nitrate NO_3	1.08	1.93			Grab	0.10 mg/l	IC
Sulphate SO_4	25.16	16.92			Grab	0.20 mg/l	IC

Signed for and on behalf of BHP Laboratories Ltd.

Chemical Analysis Report for Ballyjamesduff Landfill Site

Client: Cavan Co. Co., Courthouse, Cavan, Co. Cavan.

Site Address: Ballyjamesduff, Co.Cavan

(Sheet 2 of 2) **Monitoring Point / Grid Reference:_____SW 2 _____** Suface Water Monitoring

Parameter	**Results (mg/l)**				**Sampling method (grab, drift etc.)**	**Normal Analytical Range or Limit of detection (LOD)**	**Analysis method / technique**
BHP Reference	08/10/943	09/04/760					
	Date	**Date**	**Date**	**Date**			
	4th Qtr 08	2nd Qtr 09					
Calcium Ca	19.75	22.7			Grab	0.01 mg/l	ICP
Cadmium Cd	<0.0035	<0.0035			Grab	0.0035 mg/l	ICP
Total Chromium Cr	<0.01	<0.01			Grab	0.01 mg/l	ICP
Copper Cu	<0.015	0.015			Grab	0.015 mg/l	ICP
Iron Fe	0.035	0.197			Grab	0.03 mg/l	ICP
Lead Pb	0.006	0.003			Grab	0.002 mg/l	ICP
Magnesium Mg	3.22	3.12			Grab	0.01 mg/l	ICP
Manganese Mn	<0.014	<0.014			Grab	0.014 mg/l	ICP
Potassium K	2.77	1.81			Grab	0.10 mg/l	ICP
Sodium Na	6.63	7.93			Grab	0.03 mg/l	ICP
Zinc Zn	<0.011	<0.011			Grab	0.011 mg/l	ICP
Mercury Hg	<0.0005	<0.0005			Grab	0.0005 mg/l	AAS
OrthoPhosphate P	0.05	0.08			Grab	0.01 mg/l	Photometric
Odour	None	None			Grab	-	Olefactory
Visual Inspection	Yellow, Turbid				Grab	-	Visual

Signed for and on behalf of BHP Laboratories Ltd.

5.0 Discussion/Interpretation

5.1 Groundwaters

The locations of the various groundwater monitoring locations are shown in Appendix B. The results of the chemical and microbiological analysis conducted on the groundwaters are presented in Section 5.

MW11S and MW11D are located on the Cavan road directly east of the site, approximately 200 meters from the old site office. MW 11S and MW11D had good water quality. Coliform bacteria were found at both locations. No synthetic hydrocarbons were observed in the annual analysis.

MW16S and MW16D had low levels of coliforms present. Both were low in heavy metal and no synthetic hydrocarbons were observed in the annual analysis.

MW17S and MW17D had low levels of coliforms present. Both were low in heavy metal and no synthetic hydrocarbons were observed in the annual analysis.

In summary, however the quality of the groundwater is of a relatively uncontaminated nature and similar to results seen in previous reports.

5.2 Surface Waters

2 surfacewaters were examined. These were taken from the stream that runs along the western edge of the landfill site. SW1 located upstream of the site has a slight turbidity and a straw colour as did SW2, located downstream. This does indicate that the landfill is not having a contribution to the discolouration of the water downstream of the site. All parameters monitored were satisfactory and typical.

5.3 Leachate

Leachate consists of water that has become contaminated by wastes as it passes through a waste disposal site. It contains waste constituents that are soluble, not retained by soil, and not degraded chemically or biochemically. Some potentially harmful leachate constituents are products of chemical or biochemical transformations of wastes. If this leachate is allowed to migrate from the site, it may pose a threat to surrounding surface and ground waters.

Leachate composition within any landfill is unique. The characteristics of the leachate will depend on the waste types being deposited. The principal factors which can influence the generation of leachate include.

a) Waste composition
b) Phase of waste decomposition
c) Waste density
d) Meteorological conditions
e) Depth of landfill
f) Moisture content
g) Rate of water movement

The chemical composition of leachate will vary depending on the age of the landfill.

Analytical Interpretation:

The biological qualities of leachate will vary with time and can be monitored from assessing the BOD : COD ratio. The results for the leachate is presented in the table.

Leachate I.D	BOD	COD	Ratio
MW7	8	32	0.25

Ratios in the range of 0.4 to 0.6 are indicative that the organic matter in the leachate is readily degradable (young/medium aged landfill). When a BOD:COD ratio is typically in the range 0.05 to 0.2, this suggests a mature landfill.

The results for this monitoring period indicate that the leachate is typical of a mature landfill. The sample had a low level of heavy metal and microbiological contamination and is typical of leachate from a closed landfill.

Appendix D

Declaration of True Copy

Cavan County Council

Comhairle Chontae an Chabháin

Courthouse
Teach Na Cúirte
Cavan
An Cabháin

Telephone Numbers

Central Council
049 437 8300

Motor Tax
049 437 8430

Planning
049 437 8600

Corporate Services
049 437 8601

Johnston Central Library
049 437 8500

Finance Department
049 437 8300

Roads
049 437 8300

Housing
049 437 8300

Community & Enterprise
049 437 8602

Water Services
049 437 8300

Email: info@cavancoco.ie
Fax: 049 436 1565
Web: www.cavancoco.ie

Declaration

Cavan County Council hereby certifies that the content of the full pdf AER W0093-012009AER.pdf uploaded to the EPA website is a true copy of the original AER.

Signed Sinead Fox. Dated 9/4/10.

Sinead Fox
Landfill Operations Manager
Cavan County Council