ANNUAL ENVIRONMENTAL REPORT

2012

Waste Licence Registration No.:	**W0076-1**
Licencee:	**Limerick City Council**
Location of Activity:	**Longpavement Landfill** **Longpavement** **Limerick**
Attention:	**Ms Maria Lenihan** **Office Environmental Enforcement** **Environmental Protection Agency** **Regional Inspectorate,** **Inniscarra** **Co. Cork**
Submitted by:	**Ursula Ahern** **Environment Department** **Limerick City Council** **City Hall** **Limerick**

1.0 REPORTING PERIOD

The period of reporting for this Report is from January 2012 to December 2012.

2.0 REPORT ON RESTORATION OF COMPLETED CELLS / PHASES

In February 2006 Tobin Consulting, Civil and Structural Engineers, acting on behalf of Limerick City Council tendered the following contract: "**Longpavement Landfill Restoration Capping of Waste Body, including Gas Collection, Leachate Collection, Methane Stripping and Civil Engineering Works".**

McSweeney Building & Civil Engineering Ltd won the tender and was appointed in July 2006 and the following site works are now complete:

- **Landfill Gas:** The collection and flaring of landfill gases being generated by the decomposition of the material contained within the landfill mass.
- **Leachate:** The collection and treatment of leachate generated throughout the site.
- **The permanent capping of the landfill:** This involved covering the landfill with a synthetic sealing material and soils to prevent rainwater seeping into the landfill.
- **Reshaping and profiling** of the landfill mass, associated civil engineering works and landscaping. The landscape design now integrates the restored site into its surroundings and the area is now an amenity for the people of Limerick. New wetlands areas have been constructed which enhances existing wetlands.

The work involved a significant amount of earthworks in the capping of the landfill mass. As well as the landfill gas and leachate collection & treatment systems there is a new control building together with a compound, fencing and an access road to the Longpavement Road. It also involved the construction of pipelines, rising mains, manholes, a pumping station with associated mechanical and electrical aspects of the above elements.

3.0 WASTE ACTIVITIES CARRIED OUT AT THE FACILITY

No material was imported on to the site in 2012. All works on the site are now complete

4.0 SUMMARY OF RESULTS & INTERPRETATION OF ENVIRONMENTAL MONITORING

Drawing No. 2307-1004, contained in Appendix A of this Report, shows the locations of all the monitoring points at the Longpavement landfill facility. Monitoring was carried out by BHP Laboratories Ltd as part of compliance with EPA waste licence 76-1.

Tables 4.1 to 4.8 below indicate the parameters and frequencies to be monitored in accordance with the EPA licence 76-1.

Table 4.1 Landfill Gas Monitoring and Parameters

Parameter	Monitoring Frequency			Analysis Method[Note 1]/ Technique[Note 2]
	Perimeter Boreholes Note 3	Other Boreholes/ Vents/Wells	Site Office	
Methane (CH_4) % v/v	Weekly	Monthly	Weekly	Infrared analyser/flame ionisation detector
Carbon dioxide (CO_2)%v/v	Weekly	Monthly	Weekly	Infrared analyser/ flame ionisation detector
Oxygen(O_2) %v/v	Weekly	Monthly	Weekly	Electrochemical cell
Atmospheric Pressure	Weekly	Monthly	Weekly	Standard
Temperature	Weekly	Monthly	Weekly	Standard

Note 1: All monitoring equipment used should be intrinsically safe.
Note 2: Or other methods agreed in advance with the Agency.
Note 3: Weekly for first two months upon installation and monthly thereafter.

Table 4.2 Dust/ PM_{10} Monitoring Frequency

Parameter ($mg/m^2/day$)	Monitoring Frequency	Analysis Method/Technique
Dust	Three times a year [Note 2]	Standard Method [Note 1]
PM_{10}	Quarterly	See [Note 3]

Note 1: Standard method VDI2119 (Measurement of Dustfall, Determination of Dustfall using Bergerhoff Instrument (Standard Method) German Engineering Institute). Any modifications to eliminate interference due to algae growth in the gauge should be reported to the Agency.
Note 2: Twice during the period May to September.
Note 3: As described in prEN12341 or an equivalent agreed with the Agency.

Table 4.3Noise Monitoring Frequency

Parameter	Monitoring Frequency	Analysis Method/Technique
$L(A)_{EQ}$ [30 minutes]	Bi-Annual	Standard [Note 1]
$L(A)_{10}$ [30 minutes]	Bi-Annual	Standard [Note 1]
$L(A)_{90}$ [30 minutes]	Bi-Annual	Standard [Note 1]
Frequency Analysis(1/3 Octave band analysis)	Bi-Annual	Standard [Note 1]

Note 1: "International Standards Organisation. ISO 1996. Acoustics - description and Measurement of Environmental noise. Parts 1, 2 and 3."

Table 4.4 Surface Water, Groundwater & Leachate – Parameters/Frequency

Parameter [Note 1]	SURFACE WATER [Note 2] Monitoring Frequency	GROUNDWATER Monitoring Frequency	LEACHATE [Note 3] Monitoring Frequency
Visual Inspection/Odour [Note 2]	Weekly	Quarterly	Quarterly
Groundwater Level	Not Applicable	Monthly	Not Applicable
Leachate Level	Not Applicable	Not Applicable	Continuous
Ammoniacal Nitrogen	Quarterly	Quarterly	Annually
BOD	Quarterly	Not Applicable	Annually
COD	Quarterly	Not Applicable	Annually
Chloride	Quarterly	Quarterly	Annually
Dissolved Oxygen	Quarterly	Quarterly	Not Applicable
Electrical Conductivity	Quarterly	Quarterly	Annually
pH	Quarterly	Quarterly	Annually
Total Suspended Solids	Quarterly	Not Applicable	Not Applicable
Temperature	Quarterly	Quarterly	Quarterly
Metals / Non Metals [Note 3]	Annually	Annually	Annually
Cyanide (Total)	Not Applicable	Annually	Annually
Fluoride	Not Applicable	Annually	Annually
List I/II Organic Substances [Note 4]	Once off [Note 5]	Annually [Note5]	Once off [Note 5]
Mercury	Annually	Annually	Annually
Sulphate	Annually	Annually	Annually
Total Alkalinity	Annually	Annually	Not applicable
Total P/Orthophosphate	Annually	Annually	Annually
Total Oxidised Nitrogen	Annually	Annually	Annually
Total Organic Carbon	Not Applicable	Quarterly	Not Applicable
Residue on evaporation	Not Applicable	Annually	Not Applicable
Biological Assessment	Annually [Note 6]	Not Applicable	Not Applicable

Note 1: All the analysis shall be carried out by a competent laboratory using standard and internationally accepted procedures.
Note 2: Where there is evident gross contamination of leachate, additional samples should be analysed.
Note 3: Metals and elements to be analysed by AA/ICP should include as a minimum: boron, cadmium, calcium, chromium (total), copper, iron, lead, magnesium, manganese, nickel, potassium, sodium and zinc.
Note 4: Samples screened for the presence of organic compounds using Gas Chromatography / Mass Spectrometry (GC/MS) or other appropriate techniques and using the list I/II Substances from EU Directive 76/464/EEC and 80/68/EEC as a guideline. Recommended analytical techniques include: volatiles (US Environmental Protection Agency method 524 or equivalent), semi-volatiles (USEPA method 525 or equivalent, and pesticides (USEPA method 608 or equivalent).
Note 5: 2 surface water locations, 3 groundwater locations and 2 leachate locations to be agreed with the Agency for these parameters.
Note 6: Appropriate biological methods (such as EPA Q-Rating System) to be used for the assessment of rivers and streams.

Table 4.5 Meteorological Monitoring

To be obtained from Shannon Airport or an agreed location.

Parameter	Monitoring Frequency	Analysis Method/Technique
Precipitation Volume	Daily	Standard
Temperature (min/max.)	Daily	Standard
Wind Force and Direction	Daily	Standard
Evaporation	Daily	Standard
Evapotranspiration Note 1	Daily	Standard
Humidity	Daily	Standard
Atmospheric Pressure Note 1	Daily	Standard

Note 1: Monitoring frequency for these parameters may be decreased with the agreement of the Agency.

Table 4.6 Landfill Gas Combustion Plant/ Enclosed Flare Parameters

Parameter	Flare (enclosed) Monitoring Frequency	Utilisation Plant Monitoring Frequency	Analysis Method[Note1]/Technique[Note2]
Inlet			
Methane (CH_4) % v/v	Continuous	Weekly	Infrared analyser/flame ionisation detector/thermal conductivity
Carbon dioxide (CO_2)%v/v	Continuous	Weekly	Infrared analyser/ thermal conductivity
Oxygen (O_2) %v/v	Continuous	Weekly	Electrochemical/thermal conductivity
Total Sulphur	Annually	Annually	Ion chromatography
Total Chlorine	Annually	Annually	Ion chromatography
Total Fluorine	Annually	Annually	Ion Selective Electrode
Process Parameters			
Combustion Temperature	Continuous	Quarterly	Temperature Probe/datalogger
Outlet			
CO	Continuous	Continuous	Flue gas analyser/datalogger
NOx	Annually	Annually	Flue gas analyser
SO_2	Annually	Annually	Flue gas analyser

Parameter	Flare (enclosed) Monitoring Frequency	Utilisation Plant Monitoring Frequency	Analysis Method[Note1]/Technique[Note2]
Particulates	Not applicable	Annually	Isokinetic/Gravimetric
TA Luft Class I, II, III organics	Not applicable	Annually	Adsorption/Desorption /GC/GCMS [Note 3]
TOC	Annually	Not applicable	Flame ionisation
Hydrochloric acid	Annually	Annually	Impinger / Ion Chromatography
Hydrogen fluoride	Annually	Annually	Impinger / Ion Chromatography

Note 1: All monitoring equipment used should be intrinsically safe.
Note 2: Or other methods agreed in advance with the Agency.
Note 3: Test methods should be capable of detecting acetonitrile, dichloromethane, tetrachlorethylene and vinyl chloride as a minimum.

Table 4.7 Monitoring of Emissions to Sewer

Parameter	Monitoring Frequency	Analysis Method/Technique [Note 1]
Methane	Continuous	Dissolved Methane Probe /Headspace methane monitor

Note 1: To be agreed in advance with the Agency.

Table 4.8 Monitoring of Emissions from On-Site Leachate Treatment Plant

Parameter	Monitoring Frequency	Analysis Method/Technique [Note 1]
Flow	Continuous	Flow meter / recorder
pH	Continuous	pH meter / recorder
Biochemical Oxygen Demand	Twice Weekly	Standard Method [Note 2]
Chemical Oxygen Demand	Weekly	Standard Method [Note 2]
Total Nitrogen	Twice Weekly	Standard Method [Note 2]
Total P (as P)	Monthly	Standard Method [Note 2]
Suspended Solids	Weekly	Gravimetric

4.1 Landfill Gas

In accordance with licence 76-1 requirements, landfill gas has been monitored on a monthly basis since February 2003. There are thirteen gas wells located in the vicinity of the landfill overall; eleven perimeter gas wells and two located within the waste mass of the pre-1984 landfill. Results of the monthly monitoring are included in Appendix B of this Report.

4.1.1 Landfill Gas Wells

Two landfill gas wells are monitored on the pre-1984 landfill site, LG13 and LG14. These two wells were drilled directly into the main waste pile. Gas well LG14 could not be monitored throughout 2012 for various reasons. Exceedances in CO_2 (20.1% to 31.9%) and CH_4 (68.6% to 85.1%) were detected in gas well LG13 throughout the year.

4.1.2 Perimeter Gas Wells

There are eleven gas-monitoring points installed at perimeter locations in the vicinity of the landfill. These were installed to determine the degree, if any, of subsurface landfill gas migration. Nine of these wells were located in Moyross between the landfill and local housing estates. No exceedance in CH_4 was detected in any of the perimeter boreholes during the monitoring period. CO_2 exceedances were detected on a number of occasions ranging from 1.6% to 9.4%.

4.2 Dust Control - PM_{10} Monitoring

As the landfill is now closed no dust monitoring was carried out in 2012.
No PM_{10} monitoring was carried out as the landfill is closed and has ceased operations.

4.3 Noise Monitoring

The landfill at Longpavement has been closed for the acceptance of waste since 2002 and as restoration activity ceased in 2010, no noise monitoring was conducted in 2012.

4.4 Surface Water

Surface water sampling was carried out at 7 No. locations in the vicinity of the landfill boundary (SW-01, SW-02, SW-03. SW-04, SW-05, SW-06 and SW-07), refer to Drawing No 2307-1004 contained in Appendix A of this Report for exact locations. The quality of surface waters has been assessed against specific Environmental Quality Standards (EQS) listed in relevant legislation. Surface water limit concentrations have been evaluated against A1 – A3 quality standards in the surface water regulations 1989 and European Communities Environmental Objectives (Surface water) Regulations S.I No 272 of 2009. Surface water sampling results are shown in Appendix C and D of this Report.

4.5 Groundwater

There are 6 No. Groundwater monitoring wells at the Longpavement landfill facility, GW-01, GW-02, GW-03, GW-04, GW-05 and GW-06 as shown on Drawing No. 2307/1004 contained in Appendix A of this Report. Groundwater quality has been monitored on a quarterly and annual basis and assessed to European Communities Environmental Objectives (Groundwater) Regulations S.I No 9 of 2010.. Results for groundwater monitoring at the facility are tabulated in Appendix C and D of this Report.

4.6 Leachate

There are 13 No. Leachate monitoring wells at the Longpavement landfill facility, which are currently 100mm in diameter. All available wells were sampled. These wells have been identified as L01 to L011, and are located on the landfill as shown on Drawing No. 2307-1004, contained in Appendix A of this Report. Results for Leachate monitoring at the facility are tabulated in Appendix C and D of this Report.

4.7 Meteorological Monitoring

Meteorological monitoring data for Shannon Airport is available can be submitted to the Agency if required.

4.8 Landfill Gas Combustion Plant/Enclosed Flare Monitoring

The commissioning of the Landfill gas flare took place in June 2010 and is continuingly in operation.

4.9 Monitoring of Emissions to Sewer

There are no emissions to sewer from the facility. However all emissions to sewer will be monitored when the treated leachate will be discharged from the treatment plant.

4.10 Monitoring of Emissions from onsite Leachate Treatment Plant

The construction of the on-site leachate treatment plant is now complete.

5.0 VOLUME OF LEACHATE PRODUCED & VOLUME OF LEACHATE TRANSPORTED / DISCHARGED OFF-SITE

5.1 Leachate Abstraction Wells

An existing network of 7 No. leachate abstraction wells are present on the site. 3 wells at the post 1984 and 4 wells on the pre-1984 site.

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

N/A

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

The installation of a landfill gas flare will form part of the rehabilitation proposals. It is proposed to install a permanent gas collection and treatment system at the site. A series of vertical gas extraction wells are being installed to actively extract gas from the waste body. A horizontal gas drainage/equalizing layer consisting of a synthetic material will be placed underneath the final cap.

A computer model was used to estimate the landfill gas production and extraction rates for the Longpavement landfill site. Full details of the computer model are given in Section 3.2.5 of the Longpavement Landfill Rehabilitation Design Report (April 2005) and the Design Report Addendum (July 2005).

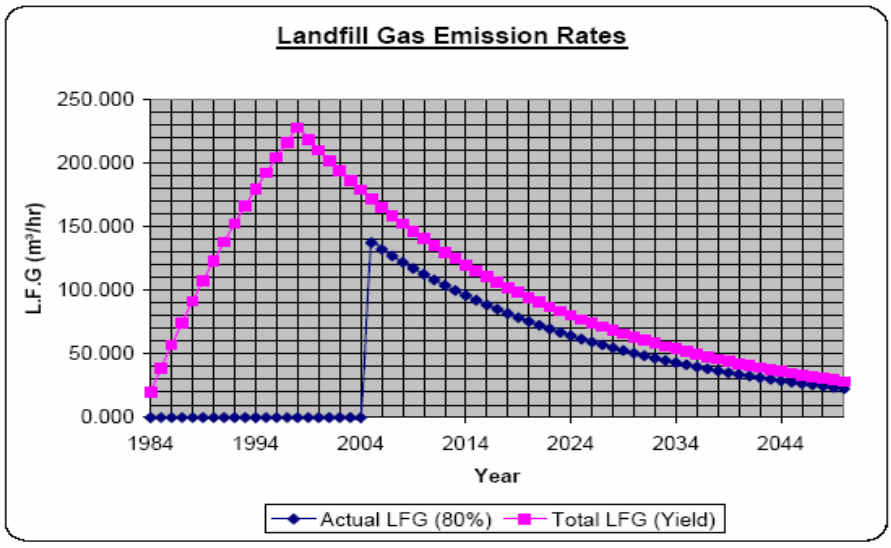


Figure 7.1: Projected Landfill Gas Emission Rates

The results of the model are presented in Figure 7.1 This model shows that in the course of the lifetime of the site that landfill gas production peaked in 1988 and that approx. 137m^3/hr is theoretically available for extraction. It is estimated that gas production is on a downward cycle decreasing to 92m^3/hr in 2015 and approx. 75m^3/hr in 2020.

8.0 REPORT ON THE PROGRESS TOWARDS ACHIEVEMENT OF THE ENVIRONMENTAL OBJECTIVES & TARGETS CONTAINED IN PREVIOUS YEAR'S REPORT

All works are now complete on site. All equipment and systems on site were maintained.

9.0 SCHEDULE OF ENVIRONMENT OBJECTIVES & TARGETS FOR THE FORTHCOMING YEAR

The objective for the coming year includes:

1. Maintenance of gas flare System
2. Maintenance of Leachate Collection System

10.0 REPORTED INCIDENTS & COMPLAINT SUMMARIES

No complaints were received during the period from January 2012 to the December 2012.

11.0 REVIEW OF NUISANCE CONTROLS

As the site is now rehabilitated No nuisances are present on site.

11.1 Pest Control

Pest control is carried out regularly.

11.2 Litter Control

Litter is not an issue on the rehabilitated site.

11.3 Dust Control

No material was imported on to the site during 2012.

11.4 Bird Control

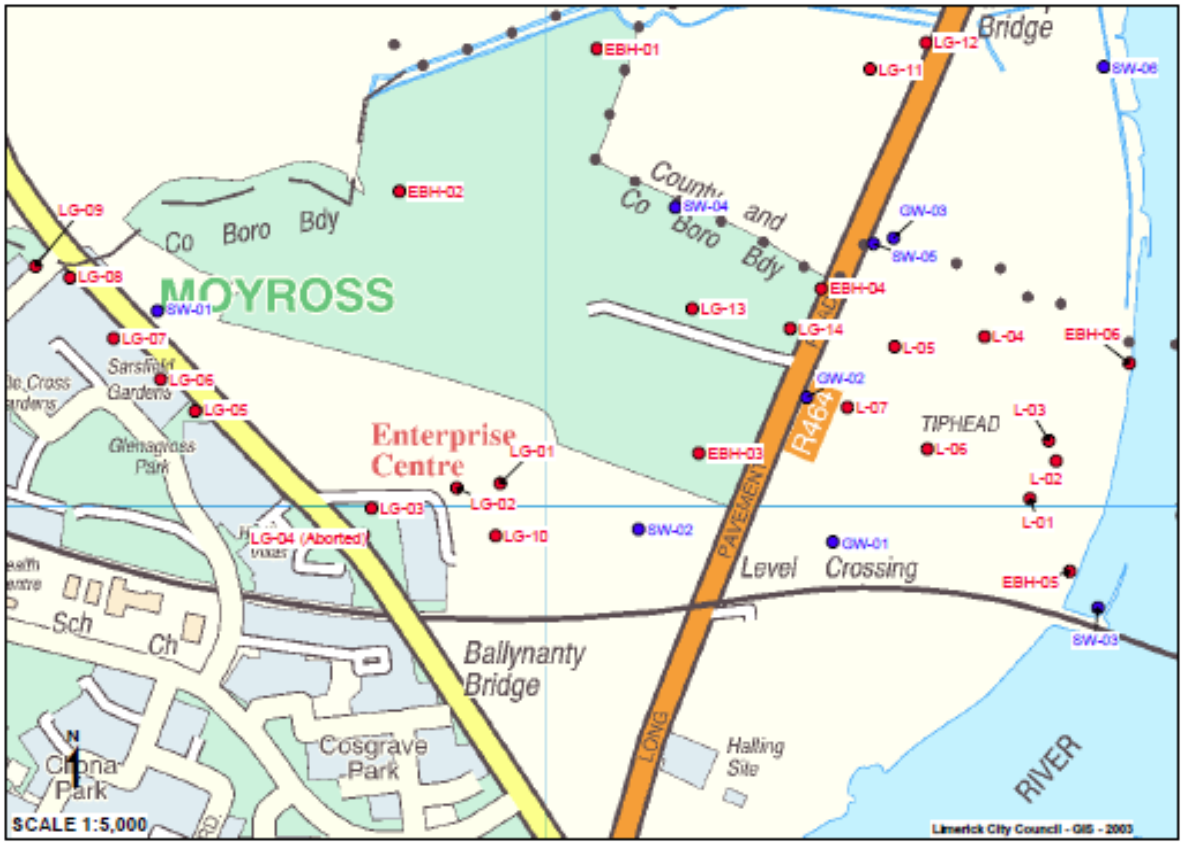
There is no evidence of bird nuisance at the landfill site. The site has closed for the acceptance of waste since March 1998.

12.0 REPORTS ON FINANCIAL PROVISION MADE UNDER THIS LICENCE, MANAGEMENT & STAFFING STRUCTURE OF THE FACILITY, & A PROGRAMME FOR PUBLIC INFORMATION

The contract value for the restoration works is €5.3m. 75% of the 2008 expenditure is grant aided by the Department of the Environment Heritage and Local Government. The remaining 25% is funded by Limerick City Councils internal capital fund. An on-going maintenance budget of €80,000 to €90,000 per annum is also in place. The SEE in environment oversees any works at Longpavement. A programme for public information prepared by Limerick City Council is in place.

Appendix A

Site map showing sampling locations



Appendix B

Monthly Gas Monitoring Results

Landfill Gas Monitoring Results – Longpavement Landfill 2012															
Date	**Operator**	**Gas**	**LG 01**	**LG 02**	**LG 03**	**LG 05**	**LG 06**	**LG 07**	**LG 08**	**LG 09**	**LG 10**	**LG 11**	**LG 12**	**LG 13**	**LG 14**
27/01/12	C.Kelly	CH_4, CO_2, O_2 Air Pressure	F	F	0.0 4.5 12.5 1021	0.0 0.0 19.1 1022	0.0 2.4 14.7 1022	0.0 1.6 17.3 1021	0.0 0.1 18.9 1021	C	C	F	F	68.6 20.7 0.6 1022	F
22/02/12	C.Kelly	CH_4, CO_2, O_2 Air Pressure	0.0 0.0 18.9 1014	F	0.0 3.3 13.2 1013	0.0 0.1 18.3 1014	0.0 3.0 15.7 1014	0.0 1.2 17.3 1014	0.0 0.1 18.3 1014	C	C	0.0 0.1 18.3 1014	0.0 0.1 18.7 1014	78.5 21.9 0.6 1014	F
21/03/12	C.Kelly	CH_4, CO_2, O_2 Air Pressure	0.0 0.0 19.1 1029	F	0.0 0.3 17.3 1030	0.0 0.3 18.0 1003	F	0.0 1.2 17.3 1029	0.0 0.2 18.0 1029	C	C	0.0 0.1 18.5 1030	0.0 0.1 18.5 1003	79.9 21.3 0.7 1030	F
24/04/12	C.Kelly	CH_4, CO_2, O_2 Air Pressure	0.0 0.0 19.5 993	F	0.0 0.1 18.2 994	0.0 0.2 18.7 994	F	0.0 0.9 17.9 994	0.0 0.2 18.1 994	C	C	0.0 0.1 18.6 994	0.0 0.2 18.8 994	77.9 24.1 0.6 998	F
21/05/12	C.Kelly	CH_4, CO_2, O_2 Air Pressure	0.0 0.1 20.3 1009	0.0 0.7 17.6 1009	0.0 0.8 18.24 1009	0.0 0.1 20.6 1009	0.0 1.1 18.6 1009	0.0 1.1 19.6 1009	0.0 1.2 18.3 1009	C	C	VB	VB	70.8 26.7 0.2 1009	VB
19/06/12	C.Kelly	CH_4, CO_2, O_2 Air Pressure	0.0 0.3 17.4 1016	0.0 0.6 17.6 1016	0.0 0.8 18.2 1016	0.0 0.1 20.2 1016	0.0 1.2 17.9 1016	0.0 1.2 19.1 1016	0.0 1.3 18.7 1016	C	C	VB	VB	72.5 26.9 0.2 1016	VB
12/07/12	D.Condon	CH_4, CO_2, O_2 Air Pressure	0.0 0.2 17.8 1003	0.0 0.2 20.0 1003	0.0 0.6 18.4 1003	0.0 0.3 20.6 1003	0.0 1.1 18.1 1003	0.0 1.3 19.0 1003	0.0 1.4 18.5 1003	C	C	0.0 0.9 19.7 1003	VB	72.6 29.3 0.2 1003	VB

Landfill Gas Monitoring Results – Longpavement Landfill 2012 Contd.														
Date	**Operator**	**Gas**	**LG 01**	**LG 02**	**LG 03**	**LG 05**	**LG 06**	**LG 07**	**LG 08**	**LG 09**	**LG 10**	**LG 11**	**LG 12**	**LG 13**	**LG 14**
14/08/12	D.Condon	CH_4, CO_2, O_2 Air Pressure	0.0 0.2 17.9 996	0.1 0.0 19.9 1006	0.0 0.3 18.9 1005	0.1 0.0 20.1 996	0.0 0.6 18.9 997	0.1 1.1 17.8 996	0.2 1.0 19.0 996	C	C	0.0 0.5 19.9 1006	VB	70.2 29.5 0.6 1006	VB
24/09/12	D.Condon	CH_4, CO_2, O_2 Air Pressure	0.2 0.1 19.9 994	F	0.2 0.8 18.2 994	0.2 0.2 20.6 994	0.2 1.2 18.1 9974	0.1 1.1 17.8 996	0.2 1.3 18.2 994	C	C	0.0 0.6 19.2 994	VB	72.4 31.9 0.1 994	VB
15/10/12	D.Condon	CH_4, CO_2, O_2 Air Pressure	0.3 0.2 19.8 996	0.2 0.3 18.2 996	F	VB	0.3 0.9 18.1 996	0.3 1.4 18.1 996	0.3 1.34 18.23 996	C	C	0.0 0.4 19.2 996	VB	74.6 29.2 0.1 996	VB
14/11/12	D.Condon	CH_4, CO_2, O_2 Air Pressure	0.3 0.3 16.3 1021	F	0.3 8.0 2.3 1021	0.2 0.1 20.5 1021	0.2 6.8 10.0 1021	0.2 5.9 12.0 1021	0.2 0.8 19.3 1021	C	C	No Flow	C	78.7 24.7 0.2 1021	C
07/12/12	D.Condon	CH_4, CO_2, O_2 Air Pressure	0.3 0.1 19.2 1010	0.3 6.9 5.9 1010	0.3 9.4 3.0 1010	0.3 0.2 20.8 1010	0.3 3.4 15.5 1010	0.3 2.5 17.0 1010	0.4 1.9 18.2 1010	C	C	*0.6* *0.1* *2.8* *1010*	C	85.1 20.1 0.0 1010	C

LG 13 & LG 14 in waste body
F - Flooded
C - Covered
VB - Valve Blocked

Appendix C

Annual SurfaceWater, Ground Water and Leachate Monitoring Results

BHP/CEM/23

Analysing
Testing
Consulting
Calibrating

TEST REPORT

Client:
Limerick City Council
City Hall
Limerick

BHP Ref No.: 104044-46
Order No.:
Date Received: 21st May 2012
Date Completed: 25th June 2012
Test Specification: Nil

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

Item: Longpavement Landfill Site

Annual Report covering groundwater, surfacewater and leachate monitoring at Longpavement Landfill (Monitoring Period 2012)

Limerick City Council
City Hall
Limerick City

FTAO: Grainne Whelan

Report on Longpavement Landfill for Annual Parameters, 2012

For and on behalf of BHP Ltd.

Pat O'Sullivan
Date Issued: 03rd July 2012

Table of Contents

1.0 Introduction :

BHP were contracted by Limerick City Council to carry out environmental monitoring at Longpavement Landfill site which is located adjacent to the Longpavement road, Limerick City. This landfill is no longer operational and is currently undergoing remediation and final capping works. The facility is operated under waste license no. 76-1, which was issued to Limerick City Council on the 1st February 2008 by the EPA.

This report covers surfacewater, groundwater and leachate monitoring at Longpavement for the annual monitoring event of 2012. Details on the unavailability of sampling points may be found in the site sheet in Appendix A.

2.0 Sampling :

This monitoring is a continuation of an established monitoring program at Longpavement 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 6 available boreholes. Their individual references are as shown in table 1.

Borehole reference	Static water level (m)
GW-06 (S)	Not available
GW-06 (D)	Not available
GW-03 (S)	Dry
GW-03 (D)	2.30
GW-02 (S)	1.27
GW-02 (D)	1.50
GW-01 (S)	Dry
GW-01 (D)	2.60
GW-05 (S)	Not available
GW-05 (D)	3.60
GW-04 (D)	2.82

Table 1 : Borehole reference points and levels.

Locations for surfacewaters and leachate wells 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 three 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°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 Edition
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°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 Longpavement Landfill Site

Client: Limerick City Council, City Hall, Limerick

Site Address: Longpavement, Limerick City

(Sheet 1 of 2) **Monitoring Point / Grid Reference:** GW 01 (shallow) **Ground Water Monitoring**

Parameter	Results (mg/l)		European Communities (drinking water) Regulations S.I No.278 (2007)	Sampling method (grab, drift etc.)	Normal Analytical Range or Limit of detection (LOD)	Analysis method / technique
BHP Reference	98914.2	104044.1				
	Date	Date				
	2nd Qtr 11	2nd Qtr 12				
Boron B	<0.005	Dry	1.0	Grab	0.005 mg/l	ICP
Cadmium Cd	<0.001	n/a	0.005	Grab	0.001 mg/l	AAS
Calcium Ca	140.02	n/a	-	Grab	0.01 mg/l	ICP
Total Chromium Cr	0.004	n/a	0.05	Grab	0.001 mg/l	AAS
Copper Cu	0.017	n/a	2.0	Grab	0.001 mg/l	AAS
Iron Fe	2.382	n/a	0.2	Grab	0.001 mg/l	AAS
Lead Pb	0.001	n/a	0.025	Grab	0.001 mg/l	AAS
Magnesium Mg	18.46	n/a	-	Grab	0.01 mg/l	ICP
Manganese Mn	1.398	n/a	0.05	Grab	0.001 mg/l	AAS
Nickel Ni	0.035	n/a	0.02	Grab	0.001 mg/l	AAS
Potassium K	45.83	n/a	-	Grab	0.10 mg/l	ICP
Sodium Na	9.67	n/a	200	Grab	0.03 mg/l	ICP
Zinc Zn	0.012	n/a	-	Grab	0.001 mg/l	AAS
Total Cyanide CN	0.008	n/a	0.05	Grab	0.01 mg/l	Photometric
Fluoride F	0.08	n/a		Grab	0.08 mg/l	IC
Mercury Hg	<0.0002	n/a	0.001	Grab	0.0002 mg/l	ICP
List I Organic Substances*	<0.01	n/a	-	Grab	0.01 ug/l	GC-MS
List II Organic Substances*	<0.01	n/a	-	Grab	0.01 ug/l	GC-MS

Signed for and on behalf of BHP Laboratories Ltd.

Chemical Analysis Report for Longpavement Landfill Site

Client: Limerick City Council, City Hall, Limerick

Site Address: Longpavement, Limerick City

(Sheet 2 of 2) **Monitoring Point / Grid Reference:** _____GW 01 (shallow) _____ **Ground Water Monitoring**

Parameter BHP Reference	Results (mg/l) 98914.2 Date 2nd Qtr 11	 98914.2 Date 2nd Qtr 11	European Communities (drinking water) Regulations S.I No.278 (2007)	Sampling method (grab, drift etc.)	Normal Analytical Range or Limit of detection (LOD)	Analysis method / technique
Sulphate SO_4	24.6	Dry	250	Grab	0.20 mg/l	IC
Total Alkalinity (as $CaCO_3$)	320	n/a		Grab	1 mg/l	Titration
OrthoPhosphate (as P)	0.42	n/a	-	Grab	0.01 mg/l	Photometric
Nitrite NO_2	<0.1	n/a	0.5	Grab	0.10 mg/l	IC
Nitrate NO_3	18.2	n/a	50	Grab	0.10 mg/l	IC
Total Oxidised Nitrogen TON(as N)	4.09	n/a	-	Grab	0.10 mg/l	Calculated from IC
Residue on Evaporation	27922	n/a	-	Grab	1 mg/l	Gravimetry

Signed for and on behalf of BHP Laboratories Ltd.

Chemical Analysis Report for Longpavement Landfill Site

Client: Limerick City Council, City Hall, Limerick

Site Address: Longpavement, Limerick City

(Sheet 1 of 2) **Monitoring Point / Grid Reference:** _____GW 01 (deep) _____ **Ground Water Monitoring**

Parameter	Results (mg/l)		European Communities (drinking water) Regulations S.I No.278 (2007)	Sampling method (grab, drift etc.)	Normal Analytical Range or Limit of detection (LOD)	Analysis method / technique
BHP Reference	98914.2	104044.2				
	Date	Date				
	2nd Qtr 11	2nd Qtr 12				
Boron B	<0.005	<0.005	1.0	Grab	0.005 mg/l	ICP
Cadmium Cd	<0.001	<0.001	0.005	Grab	0.001 mg/l	AAS
Calcium Ca	141.15	161.1	-	Grab	0.01 mg/l	ICP
Total Chromium Cr	<0.001	<0.001	0.05	Grab	0.001 mg/l	AAS
Copper Cu	0.007	0.386	2.0	Grab	0.001 mg/l	AAS
Iron Fe	0.374	0.288	0.2	Grab	0.001 mg/l	AAS
Lead Pb	<0.001	<0.001	0.025	Grab	0.001 mg/l	AAS
Magnesium Mg	18.47	17.74	-	Grab	0.01 mg/l	ICP
Manganese Mn	0.332	0.386	0.05	Grab	0.001 mg/l	AAS
Nickel Ni	0.036	<0.001	0.02	Grab	0.001 mg/l	AAS
Potassium K	44.85	48.84	-	Grab	0.10 mg/l	ICP
Sodium Na	10.77	70.06	200	Grab	0.03 mg/l	ICP
Zinc Zn	0.011	0.26	-	Grab	0.001 mg/l	AAS
Total Cyanide CN	0.001	0.009	0.05	Grab	0.01 mg/l	Photometric
Fluoride F	<0.08	0.1		Grab	0.08 mg/l	IC
Mercury Hg	<0.0002	<0.0002	0.001	Grab	0.0002 mg/l	ICP
List I Organic Substances*	<0.01	<0.01	-	Grab	0.01 ug/l	GC-MS
List II Organic Substances*	<0.01	<0.01	-	Grab	0.01 ug/l	GC-MS

Signed for and on behalf of BHP Laboratories Ltd.

Chemical Analysis Report for Longpavement Landfill Site

Client: Limerick City Council, City Hall, Limerick

Site Address: Longpavement, Limerick City

(Sheet 2 of 2) **Monitoring Point / Grid Reference:_____GW 01 (deep) _____** **Ground Water Monitoring**

Parameter BHP Reference	Results (mg/l) 98914.2 Date 2nd Qtr 11	 104044.2 Date 2nd Qtr 12	European Communities (drinking water) Regulations S.I No.278 (2007)	Sampling method (grab, drift etc.)	Normal Analytical Range or Limit of detection (LOD)	Analysis method / technique
Sulphate SO_4	28.1	189.9	250	Grab	0.20 mg/l	IC
Total Alkalinity (as $CaCO_3$)	630	240		Grab	1 mg/l	Titration
OrthoPhosphate (as P)	0.18	0.18	-	Grab	0.01 mg/l	Photometric
Nitrite NO_2	<0.1	<0.1	0.5	Grab	0.10 mg/l	IC
Nitrate NO_3	11.4	0.2	50	Grab	0.10 mg/l	IC
Total Oxidised Nitrogen TON(as N)	2.56	0.05	-	Grab	0.10 mg/l	Calculated from IC
Residue on Evaporation	252	291	-	Grab	1 mg/l	Gravimetry

Signed for and on behalf of BHP Laboratories Ltd.

Chemical Analysis Report for Longpavement Landfill Site

Client: Limerick City Council, City Hall, Limerick

Site Address: Longpavement, Limerick City

(Sheet 1 of 2) **Monitoring Point / Grid Reference:** GW 02 (shallow) **Ground Water Monitoring**

Parameter	Results (mg/l)		European Communities (drinking water) Regulations S.I No.278 (2007)	Sampling method (grab, drift etc.)	Normal Analytical Range or Limit of detection (LOD)	Analysis method / technique
BHP Reference	98914.3	104044.3				
	Date	Date				
	2nd Qtr 11	2nd Qtr 12				
Boron B	<0.005	<0.005	1.0	Grab	0.005 mg/l	ICP
Cadmium Cd	<0.001	<0.001	0.005	Grab	0.001 mg/l	AAS
Calcium Ca	137	160.8	-	Grab	0.01 mg/l	ICP
Total Chromium Cr	0.006	<0.001	0.05	Grab	0.001 mg/l	AAS
Copper Cu	0.014	0.03	2.0	Grab	0.001 mg/l	AAS
Iron Fe	3.119	1.731	0.2	Grab	0.001 mg/l	AAS
Lead Pb	<0.001	<0.001	0.025	Grab	0.001 mg/l	AAS
Magnesium Mg	18.42	17.64	-	Grab	0.01 mg/l	ICP
Manganese Mn	0.144	2.203	0.05	Grab	0.001 mg/l	AAS
Nickel Ni	0.015	<0.001	0.02	Grab	0.001 mg/l	AAS
Potassium K	46.15	61.19	-	Grab	0.10 mg/l	ICP
Sodium Na	8.88	67.56	200	Grab	0.03 mg/l	ICP
Zinc Zn	0.011	0.009	-	Grab	0.001 mg/l	AAS
Total Cyanide CN	0.035	0.017	0.05	Grab	0.01 mg/l	Photometric
Fluoride F	0.1	0.16		Grab	0.08 mg/l	IC
Mercury Hg	<0.0002	<0.0002	0.001	Grab	0.0002 mg/l	ICP
List I Organic Substances*	<0.01	<0.01	-	Grab	0.01 ug/l	GC-MS
List II Organic Substances*	<0.01	<0.01	-	Grab	0.01 ug/l	GC-MS

Signed for and on behalf of BHP Laboratories Ltd.

Chemical Analysis Report for Longpavement Landfill Site

Client: Limerick City Council, City Hall, Limerick

Site Address: Longpavement, Limerick City

(Sheet 2 of 2) **Monitoring Point / Grid Reference:** GW 02 (shallow) **Ground Water Monitoring**

Parameter	Results (mg/l)		European Communities (drinking water) Regulations S.I No.278 (2007)	Sampling method (grab, drift etc.)	Normal Analytical Range or Limit of detection (LOD)	Analysis method / technique
BHP Reference	98914.3	104044.3				
	Date	Date				
	2nd Qtr 11	2nd Qtr 12				
Sulphate SO_4	30.3	1001	250	Grab	0.20 mg/l	IC
Total Alkalinity (as $CaCO_3$)	130	160		Grab	1 mg/l	Titration
OrthoPhosphate (as P)	2.82	0.2	-	Grab	0.01 mg/l	Photometric
Nitrite NO_2	<0.1	<0.1	0.5	Grab	0.10 mg/l	IC
Nitrate NO_3	16.7	<0.1	50	Grab	0.10 mg/l	IC
Total Oxidised Nitrogen TON(as N)	3.76	<0.1	-	Grab	0.10 mg/l	Calculated from IC
Residue on Evaporation	17039	551	-	Grab	1 mg/l	Gravimetry

Signed for and on behalf of BHP Laboratories Ltd.

Chemical Analysis Report for Longpavement Landfill Site

Client: Limerick City Council, City Hall, Limerick

Site Address: Longpavement, Limerick City

(Sheet 1 of 2) **Monitoring Point / Grid Reference:** _____GW 02 (deep) _____ **Ground Water Monitoring**

Parameter	Results (mg/l)		European Communities (drinking water) Regulations S.I No.278 (2007)	Sampling method (grab, drift etc.)	Normal Analytical Range or Limit of detection (LOD)	Analysis method / technique
BHP Reference	98914.4	104044.4				
	Date	Date				
	2nd Qtr 11	2nd Qtr 12				
Boron B	<0.005	<0.005	1.0	Grab	0.005 mg/l	ICP
Cadmium Cd	<0.001	<0.001	0.005	Grab	0.001 mg/l	AAS
Calcium Ca	141.98	161	-	Grab	0.01 mg/l	ICP
Total Chromium Cr	0.002	<0.001	0.05	Grab	0.001 mg/l	AAS
Copper Cu	<0.001	0.027	2.0	Grab	0.001 mg/l	AAS
Iron Fe	1.768	0.311	0.2	Grab	0.001 mg/l	AAS
Lead Pb	<0.001	<0.001	0.025	Grab	0.001 mg/l	AAS
Magnesium Mg	18.44	17.82	-	Grab	0.01 mg/l	ICP
Manganese Mn	0.117	0.811	0.05	Grab	0.001 mg/l	AAS
Nickel Ni	0.018	<0.001	0.02	Grab	0.001 mg/l	AAS
Potassium K	37.61	24.06	-	Grab	0.10 mg/l	ICP
Sodium Na	10.88	69.97	200	Grab	0.03 mg/l	ICP
Zinc Zn	0.007	0.009	-	Grab	0.001 mg/l	AAS
Total Cyanide CN	0.002	0.021	0.05	Grab	0.01 mg/l	Photometric
Fluoride F	<0.08	0.11		Grab	0.08 mg/l	IC
Mercury Hg	<0.0002	<0.0002	0.001	Grab	0.0002 mg/l	ICP
List I Organic Substances*	<0.01	<0.01	-	Grab	0.01 ug/l	GC-MS
List II Organic Substances*	<0.01	<0.01	-	Grab	0.01 ug/l	GC-MS

Signed for and on behalf of BHP Laboratories Ltd.

Chemical Analysis Report for Longpavement Landfill Site

Client: Limerick City Council, City Hall, Limerick

Site Address: Longpavement, Limerick City

(Sheet 2 of 2) **Monitoring Point / Grid Reference:_____GW 02 (deep) _____** **Ground Water Monitoring**

Parameter BHP Reference	Results (mg/l) 98914.4 Date 2nd Qtr 11	 104044.4 Date 2nd Qtr 12	European Communities (drinking water) Regulations S.I No.278 (2007)	Sampling method (grab, drift etc.)	Normal Analytical Range or Limit of detection (LOD)	Analysis method / technique
Sulphate SO_4	47.9	107.5	250	Grab	0.20 mg/l	IC
Total Alkalinity (as $CaCO_3$)	150	290		Grab	1 mg/l	Titration
OrthoPhosphate (as P)	0.35	0.15	-	Grab	0.01 mg/l	Photometric
Nitrite NO_2	<0.10	<0.10	0.5	Grab	0.10 mg/l	IC
Nitrate NO_3	22.1	0.25	50	Grab	0.10 mg/l	IC
Total Oxidised Nitrogen TON(as N)	4.97	0.06	-	Grab	0.10 mg/l	Calculated from IC
Residue on Evaporation	316	262	-	Grab	1 mg/l	Gravimetry

Signed for and on behalf of BHP Laboratories Ltd.

Chemical Analysis Report for Longpavement Landfill Site

Client: Limerick City Council, City Hall, Limerick

Site Address: Longpavement, Limerick City

(Sheet 1 of 2) **Monitoring Point / Grid Reference:** _____GW 03 (deep) _____ **Ground Water Monitoring**

Parameter	Results (mg/l)		European Communities (drinking water) Regulations S.I No.278 (2007)	Sampling method (grab, drift etc.)	Normal Analytical Range or Limit of detection (LOD)	Analysis method / technique
BHP Reference	98914.5	104044.5				
	Date	Date				
	2nd Qtr 11	2nd Qtr 12				
Boron B	<0.005	<0.005	1.0	Grab	0.005 mg/l	ICP
Cadmium Cd	<0.001	<0.001	0.005	Grab	0.001 mg/l	AAS
Calcium Ca	141.29	120.7	-	Grab	0.01 mg/l	ICP
Total Chromium Cr	0.008	<0.001	0.05	Grab	0.001 mg/l	AAS
Copper Cu	0.012	0.001	2.0	Grab	0.001 mg/l	AAS
Iron Fe	14.314	0.225	0.2	Grab	0.001 mg/l	AAS
Lead Pb	<0.001	<0.001	0.025	Grab	0.001 mg/l	AAS
Magnesium Mg	16.49	15.18	-	Grab	0.01 mg/l	ICP
Manganese Mn	1.834	1.317	0.05	Grab	0.001 mg/l	AAS
Nickel Ni	0.008	<0.001	0.02	Grab	0.001 mg/l	AAS
Potassium K	3.01	12.67	-	Grab	0.10 mg/l	ICP
Sodium Na	21.91	53.03	200	Grab	0.03 mg/l	ICP
Zinc Zn	0.019	0.01	-	Grab	0.001 mg/l	AAS
Total Cyanide CN	0.049	0.009	0.05	Grab	0.01 mg/l	Photometric
Fluoride F	0.08	0.23		Grab	0.08 mg/l	IC
Mercury Hg	<0.0002	<0.0002	0.001	Grab	0.0002 mg/l	ICP
List I Organic Substances*	<0.01	<0.01	-	Grab	0.01 ug/l	GC-MS
List II Organic Substances*	<0.01	<0.01	-	Grab	0.01 ug/l	GC-MS

Signed for and on behalf of BHP Laboratories Ltd.

Chemical Analysis Report for Longpavement Landfill Site

Client: Limerick City Council, City Hall, Limerick

Site Address: Longpavement, Limerick City

(Sheet 2 of 2) **Monitoring Point / Grid Reference:_____GW 03 (deep) _____** **Ground Water Monitoring**

Parameter BHP Reference	Results (mg/l) 98914.5 Date 2nd Qtr 11	 104044.5 Date 2nd Qtr 12	European Communities (drinking water) Regulations S.I No.278 (2007)	Sampling method (grab, drift etc.)	Normal Analytical Range or Limit of detection (LOD)	Analysis method / technique
Sulphate SO_4	24.6	41.51	250	Grab	0.20 mg/l	IC
Total Alkalinity (as $CaCO_3$)	700	450		Grab	1 mg/l	Titration
OrthoPhosphate (as P)	0.37	0.09	-	Grab	0.01 mg/l	Photometric
Nitrite NO_2	<0.10	<0.10	0.5	Grab	0.10 mg/l	IC
Nitrate NO_3	19.4	1.6	50	Grab	0.10 mg/l	IC
Total Oxidised Nitrogen TON(as N)	4.36	0.36	-	Grab	0.10 mg/l	Calculated from IC
Residue on Evaporation	1109	95	-	Grab	1 mg/l	Gravimetry

Signed for and on behalf of BHP Laboratories Ltd.

Chemical Analysis Report for Longpavement Landfill Site

Client: Limerick City Council, City Hall, Limerick

Site Address: Longpavement, Limerick City

(Sheet 1 of 2) **Monitoring Point / Grid Reference:** GW 04 (shallow) **Ground Water Monitoring**

Parameter	Results (mg/l)		European Communities (drinking water) Regulations S.I No.278 (2007)	Sampling method (grab, drift etc.)	Normal Analytical Range or Limit of detection (LOD)	Analysis method / technique
BHP Reference	98914.6	104044.6				
	Date	Date				
	2nd Qrt 11	2nd Qrt 12				
Boron B	<0.005	<0.005	1.0	Grab	0.005 mg/l	ICP
Cadmium Cd	<0.001	<0.001	0.005	Grab	0.001 mg/l	AAS
Calcium Ca	133.59	118.2	-	Grab	0.01 mg/l	ICP
Total Chromium Cr	<0.001	<0.001	0.05	Grab	0.001 mg/l	AAS
Copper Cu	0.009	0.012	2.0	Grab	0.001 mg/l	AAS
Iron Fe	2.249	0.066	0.2	Grab	0.001 mg/l	AAS
Lead Pb	<0.001	<0.001	0.025	Grab	0.001 mg/l	AAS
Magnesium Mg	18.42	10.83	-	Grab	0.01 mg/l	ICP
Manganese Mn	3.837	0.631	0.05	Grab	0.001 mg/l	AAS
Nickel Ni	0.076	<0.001	0.02	Grab	0.001 mg/l	AAS
Potassium K	18.42	10.02	-	Grab	0.10 mg/l	ICP
Sodium Na	12.49	46.71	200	Grab	0.03 mg/l	ICP
Zinc Zn	0.017	0.016	-	Grab	0.001 mg/l	AAS
Total Cyanide CN	0.005	0.009	0.05	Grab	0.01 mg/l	Photometric
Fluoride F	0.09	0.31		Grab	0.08 mg/l	IC
Mercury Hg	<0.0002	<0.0002	0.001	Grab	0.0002 mg/l	ICP
List I Organic Substances*	<0.01	<0.01	-	Grab	0.01 ug/l	GC-MS
List II Organic Substances*	<0.01	<0.01	-	Grab	0.01 ug/l	GC-MS

Signed for and on behalf of BHP Laboratories Ltd.

Chemical Analysis Report for Longpavement Landfill Site

Client: Limerick City Council, City Hall, Limerick

Site Address: Longpavement, Limerick City

(Sheet 2 of 2) **Monitoring Point / Grid Reference:** GW 04 (shallow) **Ground Water Monitoring**

Parameter	Results (mg/l)		European Communities (drinking water) Regulations S.I No.278 (2007)	Sampling method (grab, drift etc.)	Normal Analytical Range or Limit of detection (LOD)	Analysis method / technique
BHP Reference	98914.6	104044.6				
	Date	Date				
	2nd Qrt 11	2nd Qrt 12				
Sulphate SO_4	31.9	45.71	250	Grab	0.20 mg/l	IC
Total Alkalinity (as $CaCO_3$)	740	120		Grab	1 mg/l	Titration
OrthoPhosphate (as P)	0.13	0.08	-	Grab	0.01 mg/l	Photometric
Nitrite NO_2	<0.1	<0.1	0.5	Grab	0.10 mg/l	IC
Nitrate NO_3	20.8	3.36	50	Grab	0.10 mg/l	IC
Total Oxidised Nitrogen TON(as N)	4.68	0.76	-	Grab	0.10 mg/l	Calculated from IC
Residue on Evaporation	266	93	-	Grab	1 mg/l	Gravimetry

Signed for and on behalf of BHP Laboratories Ltd.

Chemical Analysis Report for Longpavement Landfill Site

Client: Limerick City Council, City Hall, Limerick

Site Address: Longpavement, Limerick City

(Sheet 1 of 2) **Monitoring Point / Grid Reference:** GW 05 (shallow) **Ground Water Monitoring**

Parameter	Results (mg/l)		European Communities (drinking water) Regulations S.I No.278 (2007)	Sampling method (grab, drift etc.)	Normal Analytical Range or Limit of detection (LOD)	Analysis method / technique
BHP Reference	98914.7	104044.7				
	Date	Date				
	2nd Qtr 11	2nd Qtr 12				
Boron B	<0.005	<0.005	1.0	Grab	0.005 mg/l	ICP
Cadmium Cd	<0.001	<0.001	0.005	Grab	0.001 mg/l	AAS
Calcium Ca	130.99	160.4	-	Grab	0.01 mg/l	ICP
Total Chromium Cr	<0.001	<0.001	0.05	Grab	0.001 mg/l	AAS
Copper Cu	0.01	0.009	2.0	Grab	0.001 mg/l	AAS
Iron Fe	78.04	30.39	0.2	Grab	0.001 mg/l	AAS
Lead Pb	0.002	<0.001	0.025	Grab	0.001 mg/l	AAS
Magnesium Mg	18.44	14.83	-	Grab	0.01 mg/l	ICP
Manganese Mn	4.105	2.338	0.05	Grab	0.001 mg/l	AAS
Nickel Ni	0.008	<0.001	0.02	Grab	0.001 mg/l	AAS
Potassium K	8.34	14.24	-	Grab	0.10 mg/l	ICP
Sodium Na	12.71	68.61	200	Grab	0.03 mg/l	ICP
Zinc Zn	0.027	0.046	-	Grab	0.001 mg/l	AAS
Total Cyanide CN	0.014	0.01	0.05	Grab	0.01 mg/l	Photometric
Fluoride F	0.12	0.21		Grab	0.08 mg/l	IC
Mercury Hg	<0.0002	<0.0002	0.001	Grab	0.0002 mg/l	ICP
List I Organic Substances*	<0.01	<0.01	-	Grab	0.01 ug/l	GC-MS
List II Organic Substances*	<0.01	<0.01	-	Grab	0.01 ug/l	GC-MS

Signed for and on behalf of BHP Laboratories Ltd.

Chemical Analysis Report for Longpavement Landfill Site

Client: Limerick City Council, City Hall, Limerick

Site Address: Longpavement, Limerick City

(Sheet 2 of 2) **Monitoring Point / Grid Reference:** _____GW 05 (shallow) _____ **Ground Water Monitoring**

Parameter	Results (mg/l)		European Communities (drinking water) Regulations S.I No.278 (2007)	Sampling method (grab, drift etc.)	Normal Analytical Range or Limit of detection (LOD)	Analysis method / technique
BHP Reference	98914.7	104044.7				
	Date	Date				
	2nd Qtr 11	2nd Qtr 12				
Sulphate SO_4	36.7	21.44	250	Grab	0.20 mg/l	IC
Total Alkalinity (as $CaCO_3$)	750	190		Grab	1 mg/l	Titration
OrthoPhosphate (as P)	0.58	0.13	-	Grab	0.01 mg/l	Photometric
Nitrite NO_2	<0.1	<0.1	0.5	Grab	0.10 mg/l	IC
Nitrate NO_3	36.7	3.77	50	Grab	0.10 mg/l	IC
Total Oxidised Nitrogen TON(as N)	8.26	0.85	-	Grab	0.10 mg/l	Calculated from IC
Residue on Evaporation	783	336	-	Grab	1 mg/l	Gravimetry

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Chemical Analysis Report for Longpavement Landfill Site

Client: Limerick City Council, City Hall, Limerick

Site Address: Longpavement, Limerick City

(Sheet 1 of 2) **Monitoring Point / Grid Reference:** SW 01 **Surface Water Monitoring**

Parameter	Results (mg/l)		European Communities (surface water) Regulations S.I No.294 (1989) A1 water	Sampling method (grab, drift etc.)	Normal Analytical Range or Limit of detection (LOD)	Analysis method / technique
BHP Reference	98915.1	104045.1				
	Date	Date				
	2nd Qtr 11	2nd Qtr 12				
Boron B	<0.005	<0.005	2.0	Grab	0.005 mg/l	ICP
Cadmium Cd	<0.001	<0.001	0.005	Grab	0.001 mg/l	AAS
Calcium Ca	129.07	88.91	-	Grab	0.01 mg/l	ICP
Total Chromium Cr	<0.001	<0.001	0.05	Grab	0.001 mg/l	AAS
Copper Cu	0.012	0.005	0.05	Grab	0.001 mg/l	AAS
Iron Fe	1.242	0.169	0.2	Grab	0.001 mg/l	AAS
Lead Pb	<0.001	<0.001	0.05	Grab	0.001 mg/l	AAS
Magnesium Mg	8.852	6.84	-	Grab	0.01 mg/l	ICP
Manganese Mn	0.165	0.103	0.05	Grab	0.001 mg/l	AAS
Nickel Ni	<0.001	<0.001	-	Grab	0.001 mg/l	AAS
Potassium K	0.85	5.65	-	Grab	0.10 mg/l	ICP
Sodium Na	23.31	17.33	-	Grab	0.03 mg/l	ICP
Zinc Zn	0.002	0.021	3.0	Grab	0.001 mg/l	AAS
Mercury Hg	<0.0002	<0.0002	0.001	Grab	0.0002 mg/l	ICP

Signed for and on behalf of BHP Laboratories Ltd.

Chemical Analysis Report for Longpavement Landfill Site

Client: Limerick City Council, City Hall, Limerick

Site Address: Longpavement, Limerick City

(Sheet 2 of 2) **Monitoring Point / Grid Reference:_____SW 01 _____** **Surface Water Monitoring**

Parameter	**Results (mg/l)**		**European Communities (surface water) Regulations S.I No.294 (1989) A1 water**	**Sampling method (grab, drift etc.)**	**Normal Analytical Range or Limit of detection (LOD)**	**Analysis method / technique**
BHP Reference	98915.1	104045.1				
	Date	**Date**				
	2nd Qtr 11	2nd Qtr 12				
Sulphate SO_4	26.9	46.42	200	Grab	0.20 mg/l	IC
Total Alkalinity (as $CaCO_3$)	320	160	-	Grab	1 mg/l	Titration
OrthoPhosphate (as P)	0.12	0.24	0.22	Grab	0.01 mg/l	Photometric
Nitrite NO_2	<0.10	<0.10	-	Grab	0.10 mg/l	IC
Nitrate NO_3	20.4	0.6	50	Grab	0.10 mg/l	IC
Total Oxidised Nitrogen TON(as N)	4.59	0.14	-	Grab	0.10 mg/l	Calculated from IC

Signed for and on behalf of BHP Laboratories Ltd.

Chemical Analysis Report for Longpavement Landfill Site

Client: Limerick City Council, City Hall, Limerick

Site Address: Longpavement, Limerick City

(Sheet 1 of 2) **Monitoring Point / Grid Reference:** SW 02 **Surface Water Monitoring**

Parameter	Results (mg/l)		European Communities (surface water) Regulations S.I No.294 (1989) A1 water	Sampling method (grab, drift etc.)	Normal Analytical Range or Limit of detection (LOD)	Analysis method / technique
BHP Reference	98915.2	104045.2				
	Date	Date				
	2nd Qtr 11	2nd Qtr 12				
Boron B	<0.005	<0.005	2.0	Grab	0.005 mg/l	ICP
Cadmium Cd	<0.001	<0.001	0.005	Grab	0.001 mg/l	AAS
Calcium Ca	84.92	64.43	-	Grab	0.01 mg/l	ICP
Total Chromium Cr	<0.001	<0.001	0.05	Grab	0.001 mg/l	AAS
Copper Cu	<0.001	<0.001	0.05	Grab	0.001 mg/l	AAS
Iron Fe	0.422	0.085	0.2	Grab	0.001 mg/l	AAS
Lead Pb	<0.001	<0.001	0.05	Grab	0.001 mg/l	AAS
Magnesium Mg	7.09	5.16	-	Grab	0.01 mg/l	ICP
Manganese Mn	0.02	0.014	0.05	Grab	0.001 mg/l	AAS
Nickel Ni	<0.001	<0.001	-	Grab	0.001 mg/l	AAS
Potassium K	1.09	4.21	-	Grab	0.10 mg/l	ICP
Sodium Na	23.5	10.01	-	Grab	0.03 mg/l	ICP
Zinc Zn	0.001	0.009	3.0	Grab	0.001 mg/l	AAS
Mercury Hg	<0.0002	<0.0002	0.001	Grab	0.0002 mg/l	ICP

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Chemical Analysis Report for Longpavement Landfill Site

Client: Limerick City Council, City Hall, Limerick

Site Address: Longpavement, Limerick City

(Sheet 2 of 2) **Monitoring Point / Grid Reference:_____SW 02 _____** **Surface Water Monitoring**

Parameter	**Results (mg/l)**		**European Communities (surface water) Regulations S.I No.294 (1989) A1 water**	**Sampling method (grab, drift etc.)**	**Normal Analytical Range or Limit of detection (LOD)**	**Analysis method / technique**
BHP Reference	98915.2	104045.2				
	Date	**Date**				
	2nd Qtr 11	2nd Qtr 12				
Sulphate SO_4	30.1	78.17	200	Grab	0.20 mg/l	IC
Total Alkalinity (as $CaCO_3$)	140	170	-	Grab	1 mg/l	Titration
OrthoPhosphate (as P)	0.03	0.08	0.22	Grab	0.01 mg/l	Photometric
Nitrite NO_2	<0.10	<0.10	-	Grab	0.10 mg/l	IC
Nitrate NO_3	18.9	0.3	50	Grab	0.10 mg/l	IC
Total Oxidised Nitrogen TON(as N)	4.25	0.07	-	Grab	0.10 mg/l	Calculated from IC

Signed for and on behalf of BHP Laboratories Ltd.

Chemical Analysis Report for Longpavement Landfill Site

Client: Limerick City Council, City Hall, Limerick

Site Address: Longpavement, Limerick City

(Sheet 1 of 2) **Monitoring Point / Grid Reference:** SW 03 **Surface Water Monitoring**

Parameter	Results (mg/l)		European Communities (surface water) Regulations S.I No.294 (1989) A1 water	Sampling method (grab, drift etc.)	Normal Analytical Range or Limit of detection (LOD)	Analysis method / technique
BHP Reference	98915.2	104045.3				
	Date	Date				
	2nd Qtr 11	2nd Qtr 12				
Boron B	<0.005	<0.005	2.0	Grab	0.005 mg/l	ICP
Cadmium Cd	<0.001	<0.001	0.005	Grab	0.001 mg/l	AAS
Calcium Ca	76.49	58.29	-	Grab	0.01 mg/l	ICP
Total Chromium Cr	<0.001	<0.001	0.05	Grab	0.001 mg/l	AAS
Copper Cu	0.017	<0.001	0.05	Grab	0.001 mg/l	AAS
Iron Fe	0.173	0.009	0.2	Grab	0.001 mg/l	AAS
Lead Pb	<0.001	<0.001	0.05	Grab	0.001 mg/l	AAS
Magnesium Mg	6.57	4.54	-	Grab	0.01 mg/l	ICP
Manganese Mn	0.032	<0.001	0.05	Grab	0.001 mg/l	AAS
Nickel Ni	<0.001	<0.001	-	Grab	0.001 mg/l	AAS
Potassium K	0.54	3.71	-	Grab	0.10 mg/l	ICP
Sodium Na	23.02	7.72	-	Grab	0.03 mg/l	ICP
Zinc Zn	0.002	<0.001	3.0	Grab	0.001 mg/l	AAS
Mercury Hg	<0.0002	<0.0002	0.001	Grab	0.0002 mg/l	ICP

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Chemical Analysis Report for Longpavement Landfill Site

Client: Limerick City Council, City Hall, Limerick

Site Address: Longpavement, Limerick City

(Sheet 2 of 2) **Monitoring Point / Grid Reference:** SW 03 **Surface Water Monitoring**

Parameter BHP Reference	Results (mg/l) 98915.2 Date 2nd Qtr 11	 104045.3 Date 2nd Qtr 12	European Communities (surface water) Regulations S.I No.294 (1989) A1 water	Sampling method (grab, drift etc.)	Normal Analytical Range or Limit of detection (LOD)	Analysis method / technique
Sulphate SO_4	28.7	12.63	200	Grab	0.20 mg/l	IC
Total Alkalinity (as $CaCO_3$)	230	210	-	Grab	1 mg/l	Titration
OrthoPhosphate (as P)	0.07	0.08	0.22	Grab	0.01 mg/l	Photometric
Nitrite NO_2	<0.10	<0.10	-	Grab	0.10 mg/l	IC
Nitrate NO_3	21.3	3.1	50	Grab	0.10 mg/l	IC
Total Oxidised Nitrogen TON(as N)	4.79	0.7	-	Grab	0.10 mg/l	Calculated from IC

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Chemical Analysis Report for Longpavement Landfill Site

Client: Limerick City Council, City Hall, Limerick

Site Address: Longpavement, Limerick City

(Sheet 1 of 2) **Monitoring Point / Grid Reference:** SW 04 **Surface Water Monitoring**

Parameter	Results (mg/l)		European Communities (surface water) Regulations S.I No.294 (1989) A1 water	Sampling method (grab, drift etc.)	Normal Analytical Range or Limit of detection (LOD)	Analysis method / technique
BHP Reference	98915.4	104045.4				
	Date	Date				
	2nd Qtr 11	2nd Qtr 12				
Boron B	<0.005	<0.005	2.0	Grab	0.005 mg/l	ICP
Cadmium Cd	<0.001	<0.001	0.005	Grab	0.001 mg/l	AAS
Calcium Ca	100.04	87.08	-	Grab	0.01 mg/l	ICP
Total Chromium Cr	<0.001	<0.001	0.05	Grab	0.001 mg/l	AAS
Copper Cu	0.011	<0.001	0.05	Grab	0.001 mg/l	AAS
Iron Fe	0.51	0.561	0.2	Grab	0.001 mg/l	AAS
Lead Pb	<0.001	<0.001	0.05	Grab	0.001 mg/l	AAS
Magnesium Mg	10.04	11.06	-	Grab	0.01 mg/l	ICP
Manganese Mn	0.134	0.287	0.05	Grab	0.001 mg/l	AAS
Nickel Ni	<0.001	<0.001	-	Grab	0.001 mg/l	AAS
Potassium K	3.93	6.18	-	Grab	0.10 mg/l	ICP
Sodium Na	23.36	32.99	-	Grab	0.03 mg/l	ICP
Zinc Zn	0.001	0.006	3.0	Grab	0.001 mg/l	AAS
Mercury Hg	<0.0002	<0.0002	0.001	Grab	0.0002 mg/l	ICP

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Chemical Analysis Report for Longpavement Landfill Site

Client: Limerick City Council, City Hall, Limerick

Site Address: Longpavement, Limerick City

(Sheet 2 of 2) **Monitoring Point / Grid Reference:_____SW 04 _____** **Surface Water Monitoring**

Parameter	**Results (mg/l)**		**European Communities (surface water) Regulations S.I No.294 (1989) A1 water**	**Sampling method (grab, drift etc.)**	**Normal Analytical Range or Limit of detection (LOD)**	**Analysis method / technique**
BHP Reference	98915.4	104045.4				
	Date	**Date**				
	2nd Qtr 11	2nd Qtr 12				
Sulphate SO_4	20.4	6.3	200	Grab	0.20 mg/l	IC
Total Alkalinity (as $CaCO_3$)	260	290	-	Grab	1 mg/l	Titration
OrthoPhosphate (as P)	0.06	0.18	0.22	Grab	0.01 mg/l	Photometric
Nitrite NO_2	<0.10	<0.10	-	Grab	0.10 mg/l	IC
Nitrate NO_3	16.7	0.3	50	Grab	0.10 mg/l	IC
Total Oxidised Nitrogen TON(as N)	3.75	0.07	-	Grab	0.10 mg/l	Calculated from IC

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Chemical Analysis Report for Longpavement Landfill Site

Client: Limerick City Council, City Hall, Limerick

Site Address: Longpavement, Limerick City

(Sheet 1 of 2) **Monitoring Point / Grid Reference:** SW 05 **Surface Water Monitoring**

Parameter	Results (mg/l)		European Communities (surface water) Regulations S.I No.294 (1989) A1 water	Sampling method (grab, drift etc.)	Normal Analytical Range or Limit of detection (LOD)	Analysis method / technique
BHP Reference	98915.5	104045.5				
	Date	Date				
	2nd Qtr 11	2nd Qtr 12				
Boron B	<0.005	<0.005	2.0	Grab	0.005 mg/l	ICP
Cadmium Cd	<0.001	<0.001	0.005	Grab	0.001 mg/l	AAS
Calcium Ca	99.35	83.93	-	Grab	0.01 mg/l	ICP
Total Chromium Cr	<0.001	<0.001	0.05	Grab	0.001 mg/l	AAS
Copper Cu	<0.001	<0.001	0.05	Grab	0.001 mg/l	AAS
Iron Fe	0.624	0.732	0.2	Grab	0.001 mg/l	AAS
Lead Pb	<0.001	<0.001	0.05	Grab	0.001 mg/l	AAS
Magnesium Mg	9.36	10.66	-	Grab	0.01 mg/l	ICP
Manganese Mn	0.139	0.081	0.05	Grab	0.001 mg/l	AAS
Nickel Ni	<0.001	<0.001	-	Grab	0.001 mg/l	AAS
Potassium K	4.58	6.09	-	Grab	0.10 mg/l	ICP
Sodium Na	22.72	33.38	-	Grab	0.03 mg/l	ICP
Zinc Zn	0.001	0.003	3.0	Grab	0.001 mg/l	AAS
Mercury Hg	<0.0002	<0.0002	0.001	Grab	0.0002 mg/l	ICP

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Chemical Analysis Report for Longpavement Landfill Site

Client: Limerick City Council, City Hall, Limerick

Site Address: Longpavement, Limerick City

(Sheet 2 of 2) **Monitoring Point / Grid Reference:** SW 05 **Surface Water Monitoring**

Parameter	Results (mg/l)		European Communities (surface water) Regulations S.I No.294 (1989) A1 water	Sampling method (grab, drift etc.)	Normal Analytical Range or Limit of detection (LOD)	Analysis method / technique
BHP Reference	98915.5	104045.5				
	Date	Date				
	2nd Qtr 11	2nd Qtr 12				
Sulphate SO_4	22.8	10.11	200	Grab	0.20 mg/l	IC
Total Alkalinity (as $CaCO_3$)	290	110	-	Grab	1 mg/l	Titration
OrthoPhosphate (as P)	0.08	0.18	0.22	Grab	0.01 mg/l	Photometric
Nitrite NO_2	<0.10	<0.10	-	Grab	0.10 mg/l	IC
Nitrate NO_3	17.4	3.38	50	Grab	0.10 mg/l	IC
Total Oxidised Nitrogen TON(as N)	3.92	0.76	-	Grab	0.10 mg/l	Calculated from IC

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Chemical Analysis Report for Longpavement Landfill Site

Client: Limerick City Council, City Hall, Limerick

Site Address: Longpavement, Limerick City

(Sheet 1 of 2) **Monitoring Point / Grid Reference:** SW 06 **Surface Water Monitoring**

Parameter	Results (mg/l)		European Communities (surface water) Regulations S.I No.294 (1989) A1 water	Sampling method (grab, drift etc.)	Normal Analytical Range or Limit of detection (LOD)	Analysis method / technique
BHP Reference	98915.6	104045.6				
	Date	Date				
	2nd Qtr 11	2nd Qtr 12				
Boron B	<0.005	<0.005	2.0	Grab	0.005 mg/l	ICP
Cadmium Cd	<0.001	<0.001	0.005	Grab	0.001 mg/l	AAS
Calcium Ca	81.51	59.73	-	Grab	0.01 mg/l	ICP
Total Chromium Cr	<0.001	<0.001	0.05	Grab	0.001 mg/l	AAS
Copper Cu	<0.001	<0.001	0.05	Grab	0.001 mg/l	AAS
Iron Fe	0.081	0.015	0.2	Grab	0.001 mg/l	AAS
Lead Pb	<0.001	<0.001	0.05	Grab	0.001 mg/l	AAS
Magnesium Mg	6.31	4.69	-	Grab	0.01 mg/l	ICP
Manganese Mn	0.016	<0.001	0.05	Grab	0.001 mg/l	AAS
Nickel Ni	<0.001	<0.001	-	Grab	0.001 mg/l	AAS
Potassium K	0.39	3.91	-	Grab	0.10 mg/l	ICP
Sodium Na	22.81	9.17	-	Grab	0.03 mg/l	ICP
Zinc Zn	<0.001	<0.001	3.0	Grab	0.001 mg/l	AAS
Mercury Hg	<0.0002	<0.0002	0.001	Grab	0.0002 mg/l	ICP

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Chemical Analysis Report for Longpavement Landfill Site

Client: Limerick City Council, City Hall, Limerick

Site Address: Longpavement, Limerick City

(Sheet 2 of 2) **Monitoring Point / Grid Reference:_____SW 06 _____** **Surface Water Monitoring**

Parameter	**Results (mg/l)**		**European Communities (surface water) Regulations S.I No.294 (1989) A1 water**	**Sampling method (grab, drift etc.)**	**Normal Analytical Range or Limit of detection (LOD)**	**Analysis method / technique**
BHP Reference	98915.6	104045.6				
	Date	**Date**				
	2nd Qtr 11	2nd Qtr 12				
Sulphate SO_4	24.6	10.06	200	Grab	0.20 mg/l	IC
Total Alkalinity (as $CaCO_3$)	200	80	-	Grab	1 mg/l	Titration
OrthoPhosphate (as P)	0.14	0.18	0.22	Grab	0.01 mg/l	Photometric
Nitrite NO_2	<0.10	<0.10	-	Grab	0.10 mg/l	IC
Nitrate NO_3	19.1	3.45	50	Grab	0.10 mg/l	IC
Total Oxidised Nitrogen TON(as N)	4.29	0.77	-	Grab	0.10 mg/l	Calculated from IC

Signed for and on behalf of BHP Laboratories Ltd.

Chemical Analysis Report for Longpavement Landfill Site

Client: Limerick City Council, City Hall, Limerick

Site Address: Longpavement, Limerick City

(Sheet 1 of 2) **Monitoring Point / Grid Reference:** _____L-01 _____ **Leachate Monitoring**

Parameter	Results (mg/l)			Sampling method (grab, drift etc.)	Normal Analytical Range or Limit of detection (LOD)	Analysis method / technique
BHP Reference	99760.1B	104046.1				
	Date	Date				
	3rd Qtr 11	2nd Qtr 12				
Boron B	<0.005	<0.005		Grab	0.005 mg/l	ICP
Cadmium Cd	<0.001	<0.001		Grab	0.001 mg/l	AAS
Calcium Ca	2.49	131.01		Grab	0.01 mg/l	ICP
Total Chromium Cr	0.003	0.001		Grab	0.001 mg/l	AAS
Copper Cu	<0.001	0.008		Grab	0.001 mg/l	AAS
Iron Fe	0.23	0.747		Grab	0.001 mg/l	AAS
Lead Pb	<0.001	<0.001		Grab	0.001 mg/l	AAS
Magnesium Mg	3.75	17.54		Grab	0.01 mg/l	ICP
Manganese Mn	0.14	0.854		Grab	0.001 mg/l	AAS
Nickel Ni	13.84	<0.001		Grab	0.001 mg/l	AAS
Potassium K	15.98	246.88		Grab	0.10 mg/l	ICP
Sodium Na	45.2	56.67		Grab	0.03 mg/l	ICP
Zinc Zn	0.006	0.016		Grab	0.001 mg/l	AAS
Total Cyanide CN	0.026	0.08		Grab	0.01 mg/l	Photometric
Fluoride F	0.11	0.97		Grab	0.08 mg/l	IC
Mercury Hg	<0.0002	<0.0002		Grab	0.0002 mg/l	ICP

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Chemical Analysis Report for Longpavement Landfill Site

Client: Limerick City Council, City Hall, Limerick

Site Address: Longpavement, Limerick City

(Sheet 2 of 2) **Monitoring Point / Grid Reference:** L-01 **Leachate Monitoring**

Parameter	Results (mg/l)			Sampling method (grab, drift etc.)	Normal Analytical Range or Limit of detection (LOD)	Analysis method / technique
BHP Reference	99760.1B	104046.1				
	Date	Date				
	3rd Qtr 11	2nd Qtr 12				
Sulphate SO_4	66.1	184.6		Grab	0.20 mg/l	IC
OrthoPhosphate (as P)	0.21	1.62		Grab	0.01 mg/l	Photometric
Nitrite NO_2	<0.1	<0.1		Grab	0.10 mg/l	IC
Nitrate NO_3	28.6	2.2		Grab	0.10 mg/l	IC
Total Oxidised Nitrogen TON(as N)	6.43	0.5		Grab	0.10 mg/l	Calculated from IC
Ammonical Nitrogen NH_3-N	3.53	5.2		Grab	0.01 mg/l	Photometric
BOD	264	267		Grab	1 mg/l	Electrochemical
COD	645	775		Grab	1 mg/l	Photometric
Chloride Cl	39.1	1468		Grab	0.22 mg/l	IC
pH	7.12	7.07		Grab	0 -14	Electrochemical
Electrical Conductivity ECuScm^{-1}	860	9270		Grab	1.0uScm^{-1}	Electrochemical

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Chemical Analysis Report for Longpavement Landfill Site

Client: Limerick City Council, City Hall, Limerick

Site Address: Longpavement, Limerick City

(Sheet 1 of 2) **Monitoring Point / Grid Reference:** L-02 **Leachate Monitoring**

Parameter	Results (mg/l)			Sampling method (grab, drift etc.)	Normal Analytical Range or Limit of detection (LOD)	Analysis method / technique
BHP Reference	99760.2B	104046.2				
	Date	Date				
	3rd Qtr 11	2nd Qtr 12				
Boron B	<0.005	<0.005		Grab	0.005 mg/l	ICP
Cadmium Cd	<0.001	<0.001		Grab	0.001 mg/l	AAS
Calcium Ca	1.81	59.05		Grab	0.01 mg/l	ICP
Total Chromium Cr	<0.001	<0.001		Grab	0.001 mg/l	AAS
Copper Cu	<0.001	<0.001		Grab	0.001 mg/l	AAS
Iron Fe	0.095	0.555		Grab	0.001 mg/l	AAS
Lead Pb	<0.001	<0.001		Grab	0.001 mg/l	AAS
Magnesium Mg	5.31	17.46		Grab	0.01 mg/l	ICP
Manganese Mn	0.029	0.316		Grab	0.001 mg/l	AAS
Nickel Ni	<0.001	<0.001		Grab	0.001 mg/l	AAS
Potassium K	16.46	262.99		Grab	0.10 mg/l	ICP
Sodium Na	54.2	39.49		Grab	0.03 mg/l	ICP
Zinc Zn	0.005	0.022		Grab	0.001 mg/l	AAS
Total Cyanide CN	0.021	0.042		Grab	0.01 mg/l	Photometric
Fluoride F	0.08	0.46		Grab	0.08 mg/l	IC
Mercury Hg	<0.0002	<0.0002		Grab	0.0002 mg/l	ICP

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Chemical Analysis Report for Longpavement Landfill Site

Client: Limerick City Council, City Hall, Limerick

Site Address: Longpavement, Limerick City

(Sheet 2 of 2) **Monitoring Point / Grid Reference:** L-02 **Leachate Monitoring**

Parameter	Results (mg/l)			Sampling method (grab, drift etc.)	Normal Analytical Range or Limit of detection (LOD)	Analysis method / technique
BHP Reference	99760.2B	104046.2				
	Date	Date				
	3rd Qtr 11	2nd Qtr 12				
Sulphate SO_4	72.4	38.14		Grab	0.20 mg/l	IC
OrthoPhosphate (as P)	0.16	1.75		Grab	0.01 mg/l	Photometric
Nitrite NO_2	<0.1	<0.1		Grab	0.10 mg/l	IC
Nitrate NO_3	39.4	2.27		Grab	0.10 mg/l	IC
Total Oxidised Nitrogen TON(as N)	8.87	0.51		Grab	0.10 mg/l	Calculated from IC
Ammonical Nitrogen NH_3-N	3.57	0.87		Grab	0.01 mg/l	Photometric
BOD	105	110		Grab	1 mg/l	Electrochemical
COD	604	566		Grab	1 mg/l	Photometric
Chloride Cl	46.7	1677		Grab	0.22 mg/l	IC
pH	7.08	7.16		Grab	0 -14	Electrochemical
Electrical Conductivity ECuScm^{-1}	1011	10950		Grab	1.0uScm^{-1}	Electrochemical

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Chemical Analysis Report for Longpavement Landfill Site

Client: Limerick City Council, City Hall, Limerick

Site Address: Longpavement, Limerick City

(Sheet 1 of 2) **Monitoring Point / Grid Reference:** _____L-03 _____ **Leachate Monitoring**

Parameter	Results (mg/l)			Sampling method (grab, drift etc.)	Normal Analytical Range or Limit of detection (LOD)	Analysis method / technique
BHP Reference	99760.3B	104046.3				
	Date	Date				
	3rd Qtr 11	2nd Qtr 12				
Boron B	1.287	0.121		Grab	0.005 mg/l	ICP
Cadmium Cd	0.012	<0.001		Grab	0.001 mg/l	AAS
Calcium Ca	5.23	14.85		Grab	0.01 mg/l	ICP
Total Chromium Cr	<0.001	<0.001		Grab	0.001 mg/l	AAS
Copper Cu	<0.001	<0.001		Grab	0.001 mg/l	AAS
Iron Fe	0.395	1.421		Grab	0.001 mg/l	AAS
Lead Pb	<0.001	<0.001		Grab	0.001 mg/l	AAS
Magnesium Mg	1.287	17.53		Grab	0.01 mg/l	ICP
Manganese Mn	0.147	0.042		Grab	0.001 mg/l	AAS
Nickel Ni	0.001	<0.001		Grab	0.001 mg/l	AAS
Potassium K	1.29	211.9		Grab	0.10 mg/l	ICP
Sodium Na	7.21	64.55		Grab	0.03 mg/l	ICP
Zinc Zn	0.012	0.012		Grab	0.001 mg/l	AAS
Total Cyanide CN	0.017	0.11		Grab	0.01 mg/l	Photometric
Fluoride F	<0.08	0.31		Grab	0.08 mg/l	IC
Mercury Hg	<0.0002	<0.0002		Grab	0.0002 mg/l	ICP

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BHP Chemical Analysis Report for Longpavement Landfill Site

Client: Limerick City Council, City Hall, Limerick

Site Address: Longpavement, Limerick City

(Sheet 2 of 2) **Monitoring Point / Grid Reference:** L-03 **Leachate Monitoring**

Parameter	Results (mg/l)			Sampling method (grab, drift etc.)	Normal Analytical Range or Limit of detection (LOD)	Analysis method / technique
BHP Reference	99760.3B	104046.3				
	Date	Date				
	3rd Qtr 11	2nd Qtr 12				
Sulphate SO_4	59.8	20.1		Grab	0.20 mg/l	IC
OrthoPhosphate (as P)	0.39	0.64		Grab	0.01 mg/l	Photometric
Nitrite NO_2	<0.1	0.3		Grab	0.10 mg/l	IC
Nitrate NO_3	30.1	2.25		Grab	0.10 mg/l	IC
Total Oxidised Nitrogen TON(as N)	6.77	0.6		Grab	0.10 mg/l	Calculated from IC
Ammonical Nitrogen NH_3-N	3.6	5.12		Grab	0.01 mg/l	Photometric
BOD	101	247		Grab	1 mg/l	Electrochemical
COD	2017	716		Grab	1 mg/l	Photometric
Chloride Cl	52.9	893		Grab	0.22 mg/l	IC
pH	7.06	7.1		Grab	0 -14	Electrochemical
Electrical Conductivity ECuScm^{-1}	1220	7690		Grab	1.0uScm^{-1}	Electrochemical

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Chemical Analysis Report for Longpavement Landfill Site

Client: Limerick City Council, City Hall, Limerick

Site Address: Longpavement, Limerick City

(Sheet 1 of 2) **Monitoring Point / Grid Reference:** _____L-04 _____ **Leachate Monitoring**

Parameter	Results (mg/l)			Sampling method (grab, drift etc.)	Normal Analytical Range or Limit of detection (LOD)	Analysis method / technique
BHP Reference	99799.1	104046.4				
	Date	Date				
	3rd Qtr 11	2nd Qtr 12				
Boron B	<0.005	<0.005		Grab	0.005 mg/l	ICP
Cadmium Cd	<0.001	<0.001		Grab	0.001 mg/l	AAS
Calcium Ca	6.24	32.91		Grab	0.01 mg/l	ICP
Total Chromium Cr	0.002	<0.001		Grab	0.001 mg/l	AAS
Copper Cu	<0.001	<0.001		Grab	0.001 mg/l	AAS
Iron Fe	0.945	0.723		Grab	0.001 mg/l	AAS
Lead Pb	<0.001	<0.001		Grab	0.001 mg/l	AAS
Magnesium Mg	15.17	17.77		Grab	0.01 mg/l	ICP
Manganese Mn	0.31	0.242		Grab	0.001 mg/l	AAS
Nickel Ni	<0.001	<0.001		Grab	0.001 mg/l	AAS
Potassium K	39.73	11.33		Grab	0.10 mg/l	ICP
Sodium Na	10.41	62.98		Grab	0.03 mg/l	ICP
Zinc Zn	0.015	0.035		Grab	0.001 mg/l	AAS
Total Cyanide CN	0.012	0.059		Grab	0.01 mg/l	Photometric
Fluoride F	0.1	0.43		Grab	0.08 mg/l	IC
Mercury Hg	<0.0002	<0.0002		Grab	0.0002 mg/l	ICP

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Chemical Analysis Report for Longpavement Landfill Site

Client: Limerick City Council, City Hall, Limerick

Site Address: Longpavement, Limerick City

(Sheet 2 of 2) **Monitoring Point / Grid Reference:** L-04 **Leachate Monitoring**

Parameter	Results (mg/l)			Sampling method (grab, drift etc.)	Normal Analytical Range or Limit of detection (LOD)	Analysis method / technique
BHP Reference	99799.1	104046.4				
	Date	Date				
	3rd Qtr 11	2nd Qtr 12				
Sulphate SO_4	56.99	66.71		Grab	0.20 mg/l	IC
OrthoPhosphate (as P)	0.11	0.29		Grab	0.01 mg/l	Photometric
Nitrite NO_2	<0.1	<0.1		Grab	0.10 mg/l	IC
Nitrate NO_3	14.9	2.67		Grab	0.10 mg/l	IC
Total Oxidised Nitrogen TON(as N)	3.35	0.6		Grab	0.10 mg/l	Calculated from IC
Ammonical Nitrogen NH_3-N	5.36	5.16		Grab	0.01 mg/l	Photometric
BOD	35	41		Grab	1 mg/l	Electrochemical
COD	97	115		Grab	1 mg/l	Photometric
Chloride Cl	44.9	88.2		Grab	0.22 mg/l	IC
pH	7.14	6.6		Grab	0 -14	Electrochemical
Electrical Conductivity ECuScm^{-1}	1094	1980		Grab	1.0uScm^{-1}	Electrochemical

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Chemical Analysis Report for Longpavement Landfill Site

Client: Limerick City Council, City Hall, Limerick

Site Address: Longpavement, Limerick City

(Sheet 1 of 2) **Monitoring Point / Grid Reference:** _____L-05 _____ **Leachate Monitoring**

Parameter	Results (mg/l)			Sampling method (grab, drift etc.)	Normal Analytical Range or Limit of detection (LOD)	Analysis method / technique
BHP Reference	99799.2	104046.5				
	Date	Date				
	3rd Qtr 11	2nd Qtr 12				
Boron B	<0.005	<0.005		Grab	0.005 mg/l	ICP
Cadmium Cd	<0.001	<0.001		Grab	0.001 mg/l	AAS
Calcium Ca	3.1	121.46		Grab	0.01 mg/l	ICP
Total Chromium Cr	0.001	<0.001		Grab	0.001 mg/l	AAS
Copper Cu	<0.001	<0.001		Grab	0.001 mg/l	AAS
Iron Fe	1.052	8.55		Grab	0.001 mg/l	AAS
Lead Pb	<0.001	<0.001		Grab	0.001 mg/l	AAS
Magnesium Mg	4.48	17.77		Grab	0.01 mg/l	ICP
Manganese Mn	0.33	0.474		Grab	0.001 mg/l	AAS
Nickel Ni	<0.001	<0.001		Grab	0.001 mg/l	AAS
Potassium K	40.54	14.94		Grab	0.10 mg/l	ICP
Sodium Na	30.57	70.03		Grab	0.03 mg/l	ICP
Zinc Zn	0.004	0.027		Grab	0.001 mg/l	AAS
Total Cyanide CN	0.022	0.055		Grab	0.01 mg/l	Photometric
Fluoride F	<0.08	0.27		Grab	0.08 mg/l	IC
Mercury Hg	<0.0002	<0.0002		Grab	0.0002 mg/l	ICP

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Chemical Analysis Report for Longpavement Landfill Site

Client: Limerick City Council, City Hall, Limerick

Site Address: Longpavement, Limerick City

(Sheet 2 of 2) **Monitoring Point / Grid Reference:** L-05 **Leachate Monitoring**

Parameter	Results (mg/l)			Sampling method (grab, drift etc.)	Normal Analytical Range or Limit of detection (LOD)	Analysis method / technique
BHP Reference	99799.2	104046.5				
	Date	Date				
	3rd Qtr 11	2nd Qtr 12				
Sulphate SO_4	40.8	87.5		Grab	0.20 mg/l	IC
OrthoPhosphate (as P)	0.28	0.49		Grab	0.01 mg/l	Photometric
Nitrite NO_2	<0.1	<0.1		Grab	0.10 mg/l	IC
Nitrate NO_3	21.3	0.43		Grab	0.10 mg/l	IC
Total Oxidised Nitrogen TON(as N)	4.79	0.1		Grab	0.10 mg/l	Calculated from IC
Ammonical Nitrogen NH_3-N	5.39	5.2		Grab	0.01 mg/l	Photometric
BOD	4	201		Grab	1 mg/l	Electrochemical
COD	15	583		Grab	1 mg/l	Photometric
Chloride Cl	30.1	211.6		Grab	0.22 mg/l	IC
pH	7.21	6.57		Grab	0 -14	Electrochemical
Electrical Conductivity ECuScm^{-1}	1161	2390		Grab	1.0uScm^{-1}	Electrochemical

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Chemical Analysis Report for Longpavement Landfill Site

Client: Limerick City Council, City Hall, Limerick

Site Address: Longpavement, Limerick City

(Sheet 1 of 2) **Monitoring Point / Grid Reference:** _____L-06 _____ **Leachate Monitoring**

Parameter	Results (mg/l)			Sampling method (grab, drift etc.)	Normal Analytical Range or Limit of detection (LOD)	Analysis method / technique
BHP Reference	99799.3	104046.6				
	Date	Date				
	3rd Qtr 11	2nd Qtr 12				
Boron B	<0.005	<0.005		Grab	0.005 mg/l	ICP
Cadmium Cd	<0.001	<0.001		Grab	0.001 mg/l	AAS
Calcium Ca	10.69	134.4		Grab	0.01 mg/l	ICP
Total Chromium Cr	0.002	<0.001		Grab	0.001 mg/l	AAS
Copper Cu	<0.001	0.418		Grab	0.001 mg/l	AAS
Iron Fe	0.304	37.264		Grab	0.001 mg/l	AAS
Lead Pb	<0.001	<0.001		Grab	0.001 mg/l	AAS
Magnesium Mg	9.23	12.85		Grab	0.01 mg/l	ICP
Manganese Mn	0.112	0.57		Grab	0.001 mg/l	AAS
Nickel Ni	<0.001	<0.001		Grab	0.001 mg/l	AAS
Potassium K	10.56	15.32		Grab	0.10 mg/l	ICP
Sodium Na	29.91	70.52		Grab	0.03 mg/l	ICP
Zinc Zn	0.003	0.024		Grab	0.001 mg/l	AAS
Total Cyanide CN	0.018	0.135		Grab	0.01 mg/l	Photometric
Fluoride F	0.16	0.24		Grab	0.08 mg/l	IC
Mercury Hg	<0.0002	<0.0002		Grab	0.0002 mg/l	ICP

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Chemical Analysis Report for Longpavement Landfill Site

Client: Limerick City Council, City Hall, Limerick

Site Address: Longpavement, Limerick City

(Sheet 2 of 2) **Monitoring Point / Grid Reference:** L-06 **Leachate Monitoring**

Parameter	Results (mg/l)			Sampling method (grab, drift etc.)	Normal Analytical Range or Limit of detection (LOD)	Analysis method / technique
BHP Reference	99799.3	104046.6				
	Date	Date				
	3rd Qtr 11	2nd Qtr 12				
Sulphate SO_4	36.4	17.26		Grab	0.20 mg/l	IC
OrthoPhosphate (as P)	0.36	0.43		Grab	0.01 mg/l	Photometric
Nitrite NO_2	<0.1	<0.1		Grab	0.10 mg/l	IC
Nitrate NO_3	16.7	0.6		Grab	0.10 mg/l	IC
Total Oxidised Nitrogen TON(as N)	3.76	0.14		Grab	0.10 mg/l	Calculated from IC
Ammonical Nitrogen NH_3-N	5.12	5.16		Grab	0.01 mg/l	Photometric
BOD	4	42		Grab	1 mg/l	Electrochemical
COD	90	140		Grab	1 mg/l	Photometric
Chloride Cl	32.6	173.8		Grab	0.22 mg/l	IC
pH	7.11	6.81		Grab	0 -14	Electrochemical
Electrical Conductivity ECuScm^{-1}	1247	1942		Grab	1.0uScm^{-1}	Electrochemical

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Chemical Analysis Report for Longpavement Landfill Site

Client: Limerick City Council, City Hall, Limerick

Site Address: Longpavement, Limerick City

(Sheet 1 of 2) **Monitoring Point / Grid Reference:** L-07 **Leachate Monitoring**

Parameter	Results (mg/l)			Sampling method (grab, drift etc.)	Normal Analytical Range or Limit of detection (LOD)	Analysis method / technique
BHP Reference	99799.4	104046.7				
	Date	Date				
	3rd Qtr 11	2nd Qtr 12				
Boron B	<0.005	<0.005		Grab	0.005 mg/l	ICP
Cadmium Cd	<0.001	<0.001		Grab	0.001 mg/l	AAS
Calcium Ca	2.12	95.39		Grab	0.01 mg/l	ICP
Total Chromium Cr	0.001	<0.001		Grab	0.001 mg/l	AAS
Copper Cu	<0.001	<0.001		Grab	0.001 mg/l	AAS
Iron Fe	0.132	0.042		Grab	0.001 mg/l	AAS
Lead Pb	<0.001	<0.001		Grab	0.001 mg/l	AAS
Magnesium Mg	0.99	7.44		Grab	0.01 mg/l	ICP
Manganese Mn	<0.001	0.113		Grab	0.001 mg/l	AAS
Nickel Ni	<0.001	<0.001		Grab	0.001 mg/l	AAS
Potassium K	20.44	7.22		Grab	0.10 mg/l	ICP
Sodium Na	30.42	19.84		Grab	0.03 mg/l	ICP
Zinc Zn	0.011	0.018		Grab	0.001 mg/l	AAS
Total Cyanide CN	0.011	0.021		Grab	0.01 mg/l	Photometric
Fluoride F	<0.08	0.13		Grab	0.08 mg/l	IC
Mercury Hg	<0.0002	<0.0002		Grab	0.0002 mg/l	ICP

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Chemical Analysis Report for Longpavement Landfill Site

Client: Limerick City Council, City Hall, Limerick

Site Address: Longpavement, Limerick City

(Sheet 2 of 2) **Monitoring Point / Grid Reference:** L-07 **Leachate Monitoring**

Parameter	Results (mg/l)			Sampling method (grab, drift etc.)	Normal Analytical Range or Limit of detection (LOD)	Analysis method / technique
BHP Reference	99799.4	104046.7				
	Date	Date				
	3rd Qtr 11	2nd Qtr 12				
Sulphate SO_4	44.9	26.42		Grab	0.20 mg/l	IC
OrthoPhosphate (as P)	0.42	0.1		Grab	0.01 mg/l	Photometric
Nitrite NO_2	<0.1	<0.1		Grab	0.10 mg/l	IC
Nitrate NO_3	13.4	17.03		Grab	0.10 mg/l	IC
Total Oxidised Nitrogen TON(as N)	3.02	3.83		Grab	0.10 mg/l	Calculated from IC
Ammonical Nitrogen NH_3-N	5.16	3.64		Grab	0.01 mg/l	Photometric
BOD	1	<1		Grab	1 mg/l	Electrochemical
COD	5	1		Grab	1 mg/l	Photometric
Chloride Cl	34.3	26.11		Grab	0.22 mg/l	IC
pH	7.08	7.01		Grab	0 -14	Electrochemical
Electrical Conductivity ECuScm^{-1}	1139	784		Grab	1.0uScm^{-1}	Electrochemical

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Chemical Analysis Report for Longpavement Landfill Site

Client: Limerick City Council, City Hall, Limerick

Site Address: Longpavement, Limerick City

(Sheet 1 of 2) **Monitoring Point / Grid Reference:** _____L-08 _____ **Leachate Monitoring**

Parameter	Results (mg/l)			Sampling method (grab, drift etc.)	Normal Analytical Range or Limit of detection (LOD)	Analysis method / technique
BHP Reference	99760.4B	104046.8				
	Date	Date				
	3rd Qtr 11	2nd Qtr 12				
Boron B	<0.005	<0.005		Grab	0.005 mg/l	ICP
Cadmium Cd	<0.001	<0.001		Grab	0.001 mg/l	AAS
Calcium Ca	1.12	27.66		Grab	0.01 mg/l	ICP
Total Chromium Cr	0.006	<0.001		Grab	0.001 mg/l	AAS
Copper Cu	<0.001	0.016		Grab	0.001 mg/l	AAS
Iron Fe	0.297	0.948		Grab	0.001 mg/l	AAS
Lead Pb	<0.001	<0.001		Grab	0.001 mg/l	AAS
Magnesium Mg	1.349	17.61		Grab	0.01 mg/l	ICP
Manganese Mn	0.11	0.468		Grab	0.001 mg/l	AAS
Nickel Ni	0.002	<0.001		Grab	0.001 mg/l	AAS
Potassium K	7.88	177.26		Grab	0.10 mg/l	ICP
Sodium Na	17.04	65.86		Grab	0.03 mg/l	ICP
Zinc Zn	0.013	0.014		Grab	0.001 mg/l	AAS
Total Cyanide CN	0.032	0.201		Grab	0.01 mg/l	Photometric
Fluoride F	<0.08	0.36		Grab	0.08 mg/l	IC
Mercury Hg	<0.0002	<0.0002		Grab	0.0002 mg/l	ICP

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Chemical Analysis Report for Longpavement Landfill Site

Client: Limerick City Council, City Hall, Limerick

Site Address: Longpavement, Limerick City

(Sheet 2 of 2) **Monitoring Point / Grid Reference:_____L-08 _____** **Leachate Monitoring**

Parameter	Results (mg/l)			Sampling method (grab, drift etc.)	Normal Analytical Range or Limit of detection (LOD)	Analysis method / technique
BHP Reference	99760.4B	104046.8				
	Date	Date				
	3rd Qtr 11	2nd Qtr 12				
Sulphate SO_4	48.7	20.57		Grab	0.20 mg/l	IC
OrthoPhosphate (as P)	0.46	0.09		Grab	0.01 mg/l	Photometric
Nitrite NO_2	<0.1	<0.1		Grab	0.10 mg/l	IC
Nitrate NO_3	32.7	3.77		Grab	0.10 mg/l	IC
Total Oxidised Nitrogen TON(as N)	7.36	0.85		Grab	0.10 mg/l	Calculated from IC
Ammonical Nitrogen NH_3-N	3.12	1.21		Grab	0.01 mg/l	Photometric
BOD	95	156		Grab	1 mg/l	Electrochemical
COD	1151	447		Grab	1 mg/l	Photometric
Chloride Cl	30.1	873.7		Grab	0.22 mg/l	IC
pH	7.04	6.92		Grab	0 -14	Electrochemical
Electrical Conductivity ECuScm^{-1}	1360	7110		Grab	1.0uScm^{-1}	Electrochemical

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Chemical Analysis Report for Longpavement Landfill Site

Client: Limerick City Council, City Hall, Limerick

Site Address: Longpavement, Limerick City

(Sheet 1 of 2) **Monitoring Point / Grid Reference:** _____L-09 _____ **Leachate Monitoring**

Parameter	Results (mg/l)			Sampling method (grab, drift etc.)	Normal Analytical Range or Limit of detection (LOD)	Analysis method / technique
BHP Reference	99760.5B	104046.9				
	Date	Date				
	3rd Qtr 11	2nd Qtr 12				
Boron B	<0.005	<0.005		Grab	0.005 mg/l	ICP
Cadmium Cd	<0.001	<0.001		Grab	0.001 mg/l	AAS
Calcium Ca	2.12	23.46		Grab	0.01 mg/l	ICP
Total Chromium Cr	0.004	<0.001		Grab	0.001 mg/l	AAS
Copper Cu	<0.001	0.119		Grab	0.001 mg/l	AAS
Iron Fe	0.404	1.37		Grab	0.001 mg/l	AAS
Lead Pb	<0.001	<0.001		Grab	0.001 mg/l	AAS
Magnesium Mg	1.585	17.67		Grab	0.01 mg/l	ICP
Manganese Mn	0.212	0.12		Grab	0.001 mg/l	AAS
Nickel Ni	<0.001	<0.001		Grab	0.001 mg/l	AAS
Potassium K	10.85	153.9		Grab	0.10 mg/l	ICP
Sodium Na	17.35	68.24		Grab	0.03 mg/l	ICP
Zinc Zn	0.011	0.01		Grab	0.001 mg/l	AAS
Total Cyanide CN	0.018	0.026		Grab	0.01 mg/l	Photometric
Fluoride F	0.09	0.31		Grab	0.08 mg/l	IC
Mercury Hg	<0.0002	<0.0002		Grab	0.0002 mg/l	ICP

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Chemical Analysis Report for Longpavement Landfill Site

Client: Limerick City Council, City Hall, Limerick

Site Address: Longpavement, Limerick City

(Sheet 2 of 2) **Monitoring Point / Grid Reference:** L-09 **Leachate Monitoring**

Parameter	Results (mg/l)			Sampling method (grab, drift etc.)	Normal Analytical Range or Limit of detection (LOD)	Analysis method / technique
BHP Reference	99760.5B	104046.9				
	Date	Date				
	3rd Qtr 11	2nd Qtr 12				
Sulphate SO_4	60.9	26.25		Grab	0.20 mg/l	IC
OrthoPhosphate (as P)	0.28	0.35		Grab	0.01 mg/l	Photometric
Nitrite NO_2	<0.1	<0.1		Grab	0.10 mg/l	IC
Nitrate NO_3	34.3	2.52		Grab	0.10 mg/l	IC
Total Oxidised Nitrogen TON(as N)	7.71	0.57		Grab	0.10 mg/l	Calculated from IC
Ammonical Nitrogen NH_3-N	1.51	1.88		Grab	0.01 mg/l	Photometric
BOD	106	192		Grab	1 mg/l	Electrochemical
COD	144	575		Grab	1 mg/l	Photometric
Chloride Cl	34.3	640.5		Grab	0.22 mg/l	IC
pH	7.12	7.12		Grab	0 -14	Electrochemical
Electrical Conductivity ECuScm^{-1}	1240	7010		Grab	1.0uScm^{-1}	Electrochemical

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Chemical Analysis Report for Longpavement Landfill Site

Client: Limerick City Council, City Hall, Limerick

Site Address: Longpavement, Limerick City

(Sheet 1 of 2) **Monitoring Point / Grid Reference:** _____L-10 _____ **Leachate Monitoring**

Parameter	Results (mg/l)			Sampling method (grab, drift etc.)	Normal Analytical Range or Limit of detection (LOD)	Analysis method / technique
BHP Reference	99760.6B	104046.10				
	Date	Date				
	3rd Qtr 11	2nd Qtr 12				
Boron B	<0.005	<0.005		Grab	0.005 mg/l	ICP
Cadmium Cd	<0.001	<0.001		Grab	0.001 mg/l	AAS
Calcium Ca	4.51	73.85		Grab	0.01 mg/l	ICP
Total Chromium Cr	0.005	<0.001		Grab	0.001 mg/l	AAS
Copper Cu	<0.001	1.246		Grab	0.001 mg/l	AAS
Iron Fe	0.448	0.887		Grab	0.001 mg/l	AAS
Lead Pb	<0.001	<0.001		Grab	0.001 mg/l	AAS
Magnesium Mg	1.982	17.59		Grab	0.01 mg/l	ICP
Manganese Mn	0.237	0.417		Grab	0.001 mg/l	AAS
Nickel Ni	<0.001	<0.001		Grab	0.001 mg/l	AAS
Potassium K	10.96	200.16		Grab	0.10 mg/l	ICP
Sodium Na	15.28	65.66		Grab	0.03 mg/l	ICP
Zinc Zn	0.008	0.027		Grab	0.001 mg/l	AAS
Total Cyanide CN	0.025	0.032		Grab	0.01 mg/l	Photometric
Fluoride F	<0.08	0.34		Grab	0.08 mg/l	IC
Mercury Hg	<0.0002	<0.0002		Grab	0.0002 mg/l	ICP

Signed for and on behalf of BHP Laboratories Ltd.

Chemical Analysis Report for Longpavement Landfill Site

Client: Limerick City Council, City Hall, Limerick

Site Address: Longpavement, Limerick City

(Sheet 2 of 2) **Monitoring Point / Grid Reference:** L-10 **Leachate Monitoring**

Parameter	Results (mg/l)			Sampling method (grab, drift etc.)	Normal Analytical Range or Limit of detection (LOD)	Analysis method / technique
BHP Reference	99760.6B	104046.10				
	Date	Date				
	3rd Qtr 11	2nd Qtr 12				
Sulphate SO_4	51.3	34.68		Grab	0.20 mg/l	IC
OrthoPhosphate (as P)	0.32	0.19		Grab	0.01 mg/l	Photometric
Nitrite NO_2	<0.1	<0.1		Grab	0.10 mg/l	IC
Nitrate NO_3	27.1	2.36		Grab	0.10 mg/l	IC
Total Oxidised Nitrogen TON(as N)	6.1	0.53		Grab	0.10 mg/l	Calculated from IC
Ammonical Nitrogen NH_3-N	3.65	5.14		Grab	0.01 mg/l	Photometric
BOD	112	146		Grab	1 mg/l	Electrochemical
COD	258	360		Grab	1 mg/l	Photometric
Chloride Cl	40.9	846.9		Grab	0.22 mg/l	IC
pH	7.26	7.07		Grab	0 -14	Electrochemical
Electrical Conductivity ECuScm^{-1}	1181	6960		Grab	1.0uScm^{-1}	Electrochemical

Signed for and on behalf of BHP Laboratories Ltd.

Chemical Analysis Report for Longpavement Landfill Site

Client: Limerick City Council, City Hall, Limerick

Site Address: Longpavement, Limerick City

(Sheet 1 of 2) **Monitoring Point / Grid Reference:** _____L-11 _____ **Leachate Monitoring**

Parameter	Results (mg/l)			Sampling method (grab, drift etc.)	Normal Analytical Range or Limit of detection (LOD)	Analysis method / technique
BHP Reference	99760.7B	104046.11				
	Date	Date				
	3rd Qtr 11	2nd Qtr 12				
Boron B	<0.005	<0.005		Grab	0.005 mg/l	ICP
Cadmium Cd	<0.001	<0.001		Grab	0.001 mg/l	AAS
Calcium Ca	4.78	61.15		Grab	0.01 mg/l	ICP
Total Chromium Cr	0.011	<0.001		Grab	0.001 mg/l	AAS
Copper Cu	<0.001	0.057		Grab	0.001 mg/l	AAS
Iron Fe	0.533	2.155		Grab	0.001 mg/l	AAS
Lead Pb	<0.001	<0.001		Grab	0.001 mg/l	AAS
Magnesium Mg	13.96	17.64		Grab	0.01 mg/l	ICP
Manganese Mn	0.246	0.305		Grab	0.001 mg/l	AAS
Nickel Ni	0.004	<0.001		Grab	0.001 mg/l	AAS
Potassium K	14.07	295.9		Grab	0.10 mg/l	ICP
Sodium Na	11.5	60.38		Grab	0.03 mg/l	ICP
Zinc Zn	0.018	0.037		Grab	0.001 mg/l	AAS
Total Cyanide CN	0.02	0.09		Grab	0.01 mg/l	Photometric
Fluoride F	<0.08	0.39		Grab	0.08 mg/l	IC
Mercury Hg	<0.0002	<0.0002		Grab	0.0002 mg/l	ICP

Signed for and on behalf of BHP Laboratories Ltd.

Chemical Analysis Report for Longpavement Landfill Site

Client: Limerick City Council, City Hall, Limerick

Site Address: Longpavement, Limerick City

(Sheet 2 of 2) **Monitoring Point / Grid Reference:** L-11 **Leachate Monitoring**

Parameter	Results (mg/l)			Sampling method (grab, drift etc.)	Normal Analytical Range or Limit of detection (LOD)	Analysis method / technique
BHP Reference	99760.7B	104046.11				
	Date	Date				
	3rd Qtr 11	2nd Qtr 12				
Sulphate SO_4	48.1	21.73		Grab	0.20 mg/l	IC
OrthoPhosphate (as P)	0.49	0.55		Grab	0.01 mg/l	Photometric
Nitrite NO_2	<0.1	<0.1		Grab	0.10 mg/l	IC
Nitrate NO_3	22.8	3.86		Grab	0.10 mg/l	IC
Total Oxidised Nitrogen TON(as N)	5.13	0.86		Grab	0.10 mg/l	Calculated from IC
Ammonical Nitrogen NH_3-N	3.81	2.41		Grab	0.01 mg/l	Photometric
BOD	108	489		Grab	1 mg/l	Electrochemical
COD	1201	1397		Grab	1 mg/l	Photometric
Chloride Cl	36.7	1408		Grab	0.22 mg/l	IC
pH	7.08	7.11		Grab	0 -14	Electrochemical
Electrical Conductivity ECuScm^{-1}	1239	11190		Grab	1.0uScm^{-1}	Electrochemical

Signed for and on behalf of BHP Laboratories Ltd.

Chemical Analysis Report for Longpavement Landfill Site

Client: Limerick City Council, City Hall, Limerick

Site Address: Longpavement, Limerick City

(Sheet 1 of 2) **Monitoring Point / Grid Reference:**_____**Leachate Tank** _____ **Leachate Monitoring**

Parameter	**Results (mg/l)**			**Sampling method (grab, drift etc.)**	**Normal Analytical Range or Limit of detection (LOD)**	**Analysis method / technique**
BHP Reference	99760.8B	104046.12				
	Date	**Date**				
	3rd Qtr 11	2nd Qtr 12				
Boron B	<0.005	<0.005		Grab	0.005 mg/l	ICP
Cadmium Cd	0.032	0.02		Grab	0.001 mg/l	AAS
Calcium Ca	7.12	112.55		Grab	0.01 mg/l	ICP
Total Chromium Cr	0.002	<0.001		Grab	0.001 mg/l	AAS
Copper Cu	<0.001	<0.001		Grab	0.001 mg/l	AAS
Iron Fe	0.299	0.129		Grab	0.001 mg/l	AAS
Lead Pb	<0.001	<0.001		Grab	0.001 mg/l	AAS
Magnesium Mg	5.28	17.76		Grab	0.01 mg/l	ICP
Manganese Mn	0.11	0.363		Grab	0.001 mg/l	AAS
Nickel Ni	<0.001	<0.001		Grab	0.001 mg/l	AAS
Potassium K	33.54	69.35		Grab	0.10 mg/l	ICP
Sodium Na	34.74	68.36		Grab	0.03 mg/l	ICP
Zinc Zn	0.03	0.02		Grab	0.001 mg/l	AAS
Total Cyanide CN	0.012	0.118		Grab	0.01 mg/l	Photometric
Fluoride F	0.17	0.12		Grab	0.08 mg/l	IC
Mercury Hg	<0.0002	<0.0002		Grab	0.0002 mg/l	ICP

Signed for and on behalf of BHP Laboratories Ltd.

BHP Chemical Analysis Report for Longpavement Landfill Site

Client: Limerick City Council, City Hall, Limerick

Site Address: Longpavement, Limerick City

(Sheet 2 of 2) **Monitoring Point / Grid Reference:**_____**Leachate Tank** _____ **Leachate Monitoring**

Parameter	**Results (mg/l)**			**Sampling method (grab, drift etc.)**	**Normal Analytical Range or Limit of detection (LOD)**	**Analysis method / technique**
BHP Reference	99760.8B	104046.12				
	Date	**Date**				
	3rd Qtr 11	2nd Qtr 12				
Sulphate SO_4	66.3	13.58		Grab	0.20 mg/l	IC
OrthoPhosphate (as P)	0.52	0.16		Grab	0.01 mg/l	Photometric
Nitrite NO_2	<0.1	<0.1		Grab	0.10 mg/l	IC
Nitrate NO_3	26.4	0.97		Grab	0.10 mg/l	IC
Total Oxidised Nitrogen TON(as N)	5.94	0.22		Grab	0.10 mg/l	Calculated from IC
Ammonical Nitrogen NH_3-N	5.1	5.16		Grab	0.01 mg/l	Photometric
BOD	109	31		Grab	1 mg/l	Electrochemical
COD	400	84		Grab	1 mg/l	Photometric
Chloride Cl	28.9	130.7		Grab	0.22 mg/l	IC
pH	7.01	7.11		Grab	0 -14	Electrochemical
Electrical Conductivity ECuScm^{-1}	1160	2510		Grab	1.0uScm^{-1}	Electrochemical

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Chemical Analysis Report for Longpavement Landfill Site

Client: Limerick City Council, City Hall, Limerick

Site Address: Longpavement, Limerick City

(Sheet 1 of 2) **Monitoring Point / Grid Reference:**_____**Leachate Sump** _____ **Leachate Monitoring**

Parameter	**Results (mg/l)**			**Sampling method (grab, drift etc.)**	**Normal Analytical Range or Limit of detection (LOD)**	**Analysis method / technique**
BHP Reference	99760.9B	104046.13				
	Date	**Date**				
	3rd Qtr 11	2nd Qtr 12				
Boron B	<0.005	<0.005		Grab	0.005 mg/l	ICP
Cadmium Cd	<0.001	<0.001		Grab	0.001 mg/l	AAS
Calcium Ca	4.12	105.33		Grab	0.01 mg/l	ICP
Total Chromium Cr	0.001	<0.001		Grab	0.001 mg/l	AAS
Copper Cu	<0.001	<0.001		Grab	0.001 mg/l	AAS
Iron Fe	0.029	0.019		Grab	0.001 mg/l	AAS
Lead Pb	<0.001	<0.001		Grab	0.001 mg/l	AAS
Magnesium Mg	5.28	17.82		Grab	0.01 mg/l	ICP
Manganese Mn	<0.001	0.217		Grab	0.001 mg/l	AAS
Nickel Ni	<0.001	<0.001		Grab	0.001 mg/l	AAS
Potassium K	33.59	11.93		Grab	0.10 mg/l	ICP
Sodium Na	34.96	67.42		Grab	0.03 mg/l	ICP
Zinc Zn	<0.001	0.01		Grab	0.001 mg/l	AAS
Total Cyanide CN	0.008	0.02		Grab	0.01 mg/l	Photometric
Fluoride F	<0.08	0.115		Grab	0.08 mg/l	IC
Mercury Hg	<0.0002	<0.0002		Grab	0.0002 mg/l	ICP

Signed for and on behalf of BHP Laboratories Ltd.

Chemical Analysis Report for Longpavement Landfill Site

Client: Limerick City Council, City Hall, Limerick

Site Address: Longpavement, Limerick City

(Sheet 2 of 2) **Monitoring Point / Grid Reference:**_____**Leachate Sump** _____ **Leachate Monitoring**

Parameter	**Results (mg/l)**			**Sampling method (grab, drift etc.)**	**Normal Analytical Range or Limit of detection (LOD)**	**Analysis method / technique**
BHP Reference	99760.9B	104046.13				
	Date	**Date**				
	3rd Qtr 11	2nd Qtr 12				
Sulphate SO_4	60.1	14.92		Grab	0.20 mg/l	IC
OrthoPhosphate (as P)	0.11	0.17		Grab	0.01 mg/l	Photometric
Nitrite NO_2	<0.1	<0.1		Grab	0.10 mg/l	IC
Nitrate NO_3	30.1	3.24		Grab	0.10 mg/l	IC
Total Oxidised Nitrogen TON(as N)	6.77	0.73		Grab	0.10 mg/l	Calculated from IC
Ammonical Nitrogen NH_3-N	5.16	5.14		Grab	0.01 mg/l	Photometric
BOD	1	8		Grab	1 mg/l	Electrochemical
COD	4	20		Grab	1 mg/l	Photometric
Chloride Cl	22.4	103.6		Grab	0.22 mg/l	IC
pH	7.09	7.09		Grab	0 -14	Electrochemical
Electrical Conductivity ECuScm^{-1}	1240	1996		Grab	1.0uScm^{-1}	Electrochemical

Signed for and on behalf of BHP Laboratories Ltd.

Appendix D

Quarterly SurfaceWater, Ground Water and Leachate Monitoring Results 2012

Chemical Analysis Report for Longpavement Landfill Site

Client: Limerick City Council, City Hall, Limerick

Site Address: Longpavement, Limerick City

(Sheet 1 of 1) **Monitoring Point / Grid Reference:** _____GW 01 (shallow) _____ **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	101325.1	102636.1	104041.1	104402.1			
	Date	Date	Date	Date			
	4th Qrt '11	1st Qrt '12	2nd Qrt '12	3rd Qrt '12			
Odour	None	None	Dry	None	Grab	-	Olefactory
Visual Inspection	Turbid/Brown	Turbid/Brown	Dry	Turbid/Black	Grab	-	Visual
Water Level	2.3	2.46	Dry	2.44	Grab	M	Dip Meter
Ammonical Nitrogen NH_3-N	0.48	0.27	Dry	5.12	Grab	0.01 mg/l	Photometric
Chloride Cl	31	56.2	Dry	61.3	Grab	0.22 mg/l	IC
Dissolved Oxygen (% Sat. 0_2)	81.4	84.6	Dry	66.9	Grab	1.2 % Saturation 0_2	Electrochemical
Electrical Conductivity ECuScm^{-1}	4160	4200	Dry	4330	Grab	1.0uScm^{-1}	Electrochemical
pH	7.27	7.37	Dry	7.12	Grab	0 -14	Electrochemical
Temperature °C	13.4	12.3	Dry	15.8	Grab	-5°C to 100°C	Electronic Thermocouple
Total Organic Carbon TOC	21	19.6	Dry	14	Grab	0.4	Persulphate Oxidation

Signed for and on behalf of BHP Laboratories Ltd.

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Chemical Analysis Report for Longpavement Landfill Site

Client: Limerick City Council, City Hall, Limerick

Site Address: Longpavement, Limerick City

(Sheet 1 of 1) **Monitoring Point / Grid Reference:**_____GW 01 (deep) _____ **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	101325.2	102636.2	104041.2	104402.2			
	Date	Date	Date	Date			
	4th Qrt '11	1st Qrt '12	2nd Qrt '12	3rd Qrt '12			
Odour	None	None	None	None	Grab	-	Olefactory
Visual Inspection	Turbid/Brown	Turbid/Brown	Turbid/Brown	Turbid/Yellow	Grab	-	Visual
Water Level	2.6	2.4	2.6	2.52	Grab	M	Dip Meter
Ammonical Nitrogen NH_3-N	5.38	5.14	6.26	2.84	Grab	0.01 mg/l	Photometric
Chloride Cl	39.7	95.9	226.1	32.9	Grab	0.22 mg/l	IC
Dissolved Oxygen (% Sat. 0_2)	80.9	81.9	9.6	74.6	Grab	1.2 % Saturation 0_2	Electrochemical
Electrical Conductivity ECuScm^{-1}	3150	2920	2670	2750	Grab	1.0uScm^{-1}	Electrochemical
pH	7.08	6.95	6.9	6.98	Grab	0 -14	Electrochemical
Temperature °C	13.3	11.5	11.2	14.1	Grab	-5°C to 100°C	Electronic Thermocouple
Total Organic Carbon TOC	16	20.1	36	12	Grab	0.4	Persulphate Oxidation

Signed for and on behalf of BHP Laboratories Ltd.

Chemical Analysis Report for Longpavement Landfill Site

Client: Limerick City Council, City Hall, Limerick

Site Address: Longpavement, Limerick City

(Sheet 1 of 1) **Monitoring Point / Grid Reference:**_____**GW 02 (shallow)** _____ **Ground Water Monitoring**

Parameter BHP Reference	**Results (mg/l)** Date 4th Qrt '11 101325.3	Date 1st Qrt '12 102636.3	Date 2nd Qrt '12 104041.3	Date 3rd Qrt '12 105402.3	**Sampling method (grab, drift etc.)**	**Normal Analytical Range or Limit of detection (LOD)**	**Analysis method / technique**
Odour	None	None	None	None	Grab	-	Olefactory
Visual Inspection	Turbid/Brown	Turbid/Brown	Turbid/Brown	Turbid/Brown	Grab	-	Visual
Water Level	1.25	1.24	1.27	1.30	Grab	M	Dip Meter
Ammonical Nitrogen NH_3-N	0.42	4.26	4.13	0.86	Grab	0.01 mg/l	Photometric
Chloride Cl	191	162	649	28	Grab	0.22 mg/l	IC
Dissolved Oxygen (% Sat. 0_2)	82.6	69.7	42.1	70.1	Grab	1.2 % Saturation 0_2	Electrochemical
Electrical Conductivity ECuScm^{-1}	3240	3600	3900	4130	Grab	1.0uScm^{-1}	Electrochemical
pH	8.07	7.75	7.19	7.94	Grab	0 -14	Electrochemical
Temperature °C	13.5	12.3	11.5	15.3	Grab	-5°C to 100°C	Electronic Thermocouple
Total Organic Carbon TOC	18	20.1	54	18	Grab	0.4	Persulphate Oxidation

Signed for and on behalf of BHP Laboratories Ltd.

Chemical Analysis Report for Longpavement Landfill Site

Client: Limerick City Council, City Hall, Limerick

Site Address: Longpavement, Limerick City

(Sheet 1 of 1) **Monitoring Point / Grid Reference:** _____GW 02 (deep) _____ **Ground Water Monitoring**

Parameter BHP Reference	Results (mg/l) Date 3rd Qrt '11 99758.4	Date 4th Qrt '11 101325.4	Date 1st Qrt '12 102636.4	Date 2nd Qrt '12 104041.4	Date 3rd Qrt '12 105402.4	Sampling method (grab, drift etc.)	Normal Analytical Range or Limit of detection (LOD)	Analysis method / technique
Odour	None	None	None	None	None	Grab	-	Olefactory
Visual Inspection	Turbid/Straw	Turbid/Straw	Turbid/Straw	Turbid/Straw	Turbid/Brown	Grab	-	Visual
Water Level	4.61	1.73	1.33	1.50	1.84	Grab	M	Dip Meter
Ammonical Nitrogen NH_3-N	4.59	5.29	4.18	5.01	1.12	Grab	0.01 mg/l	Photometric
Chloride Cl	30.6	41	225	189	88	Grab	0.22 mg/l	IC
Dissolved Oxygen (% Sat. 0_2)	91.4	83.1	80.1	14.4	69.8	Grab	1.2 % Saturation 0_2	Electrochemical
Electrical Conductivity ECuScm^{-1}	1181	2620	2550	2340	2470	Grab	1.0uScm^{-1}	Electrochemical
pH	7.18	7.25	7.06	6.87	7.00	Grab	0 -14	Electrochemical
Temperature °C	12.5	13.7	11.8	11.7	14.4	Grab	-5°C to 100°C	Electronic Thermocouple
Total Organic Carbon TOC	24	10	20.4	27	22	Grab	0.4	Persulphate Oxidation

Signed for and on behalf of BHP Laboratories Ltd.

Chemical Analysis Report for Longpavement Landfill Site

Client: Limerick City Council, City Hall, Limerick

Site Address: Longpavement, Limerick City

(Sheet 1 of 1) **Monitoring Point / Grid Reference:** GW 04 **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	Date	Date	Date	Date			
	4th Qrt '11	1st Qrt '12	2nd Qrt '12	3rd Qrt '12			
	101325.5	102636.5	104041.5	105402.5			
Odour	None	None	None	None	Grab	-	Olefactory
Visual Inspection	Brown/Turbid	Brown/Turbid	Brown/Turbid	Brown/Turbid	Grab	-	Visual
Water Level	2.64	2.46	2.82	2.92	Grab	M	Dip Meter
Ammonical Nitrogen NH_3-N	2.96	0.37	0.82	1.86	Grab	0.01 mg/l	Photometric
Chloride Cl	107	88.7	95.5	99.5	Grab	0.22 mg/l	IC
Dissolved Oxygen (% Sat. 0_2)	80.9	92.7	56.5	58.6	Grab	1.2 % Saturation 0_2	Electrochemical
Electrical Conductivity ECuScm^{-1}	1212	1016	886	1114	Grab	1.0uScm^{-1}	Electrochemical
pH	6.8	6.58	6.69	6.57	Grab	0 -14	Electrochemical
Temperature °C	14.4	11.9	11.2	14.2	Grab	-5°C to 100°C	Electronic Thermocouple
Total Organic Carbon TOC	17	20.2	64	8	Grab	0.4	Persulphate Oxidation

Signed for and on behalf of BHP Laboratories Ltd.

Chemical Analysis Report for Longpavement Landfill Site

Client: Limerick City Council, City Hall, Limerick

Site Address: Longpavement, Limerick City

(Sheet 1 of 1) **Monitoring Point / Grid Reference:** _____GW 05 (deep) _____ **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	101325.6	102636.6	104041.6	105402.6			
	Date	Date	Date	Date			
	4th Qrt '11	1st Qrt '12	2nd Qrt '12	3rd Qrt '12			
Odour	none	none	Present	Present	Grab	-	Olefactory
Visual Inspection	Turbid/Brown	Turbid/Brown	Turbid/Brown	Turbid/Brown	Grab	-	Visual
Water Level	3.26	3.22	3.60	3.68	Grab	M	Dip Meter
Ammonical Nitrogen NH_3-N	5.6	5.94	7.63	1.92	Grab	0.01 mg/l	Photometric
Chloride Cl	68.7	388.2	412.4	146.3	Grab	0.22 mg/l	IC
Dissolved Oxygen (% Sat. 0_2)	88.4	60.1	7.7	58.7	Grab	1.2 % Saturation 0_2	Electrochemical
Electrical Conductivity ECuScm^{-1}	2830	2980	2660	1370	Grab	1.0uScm^{-1}	Electrochemical
pH	6.65	6.18	6.29	6.36	Grab	0 -14	Electrochemical
Temperature °C	13.9	11.6	11.7	14.3	Grab	-5°C to 100°C	Electronic Thermocouple
Total Organic Carbon TOC	32	20.6	76	14	Grab	0.4	Persulphate Oxidation

Signed for and on behalf of BHP Laboratories Ltd.

Chemical Analysis Report for Longpavement Landfill Site

Client: Limerick City Council, City Hall, Limerick

Site Address: Longpavement, Limerick City

(Sheet 1 of 1) **Monitoring Point / Grid Reference:** _____GW 03 (shallow) _____ **Ground Water Monitoring**

Parameter	Results				Sampling method (grab, drift etc.)	Normal Analytical Range or Limit of detection (LOD)	Analysis method / technique
BHP Reference	101325.7	102636.7	104041.7	105402.7			
	Date	Date	Date	Date			
	4th Qrt '11	1st Qrt '12	2nd Qrt '12	3rd Qrt '12			
Odour	none	none	Dry	none	Grab	-	Olefactory
Visual Inspection	Turbid/Brown	Turbid/Straw	Dry	Turbid/Black	Grab	-	Visual
Water Level	1.7	1.73	Dry	1.84	Grab	M	Dip Meter
Ammonical Nitrogen NH_3-N	1.84	0.3	Dry	2.96	Grab	0.01 mg/l	Photometric
Chloride Cl	36.4	41.8	Dry	7.3	Grab	0.22 mg/l	IC
Dissolved Oxygen (% Sat. 0_2)	76.4	94.6	Dry	55.1	Grab	1.2 % Saturation 0_2	Electrochemical
Electrical Conductivity ECuScm^{-1}	1115	983	Dry	1213	Grab	1.0uScm^{-1}	Electrochemical
pH	7.01	6.69	Dry	7.10	Grab	0 -14	Electrochemical
Temperature °C	14	13.1	Dry	15.8	Grab	-5°C to 100°C	Electronic Thermocouple
Total Organic Carbon TOC	6	20.4	Dry	16	Grab	0.4	Persulphate Oxidation

Signed for and on behalf of BHP Laboratories Ltd.

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Chemical Analysis Report for Longpavement Landfill Site

Client: Limerick City Council, City Hall, Limerick

Site Address: Longpavement, Limerick City

(Sheet 1 of 1) **Monitoring Point / Grid Reference:** _____GW 03 (deep) _____ **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	101330	102636.8	104041.8	105402.8			
	Date	Date	Date	Date			
	4th Qrt '11	1st Qrt '12	2nd Qrt '12	3rd Qrt '12			
Odour	none	none	none	none	Grab	-	Olefactory
Visual Inspection	Turbid/Brown	Turbid/Brown	Turbid/Brown	Turbid/Brown	Grab	-	Visual
Water Level	1.7	1.46	2.3	1.85	Grab	M	Dip Meter
Ammonical Nitrogen NH_3-N	2.98	0.9	1.95	1.12	Grab	0.01 mg/l	Photometric
Chloride Cl	11.5	11.4	11	12.6	Grab	0.22 mg/l	IC
Dissolved Oxygen (% Sat. 0_2)	80.7	72.4	18.4	60.9	Grab	1.2 % Saturation 0_2	Electrochemical
Electrical Conductivity ECuScm^{-1}	1119	1075	1024	1058	Grab	1.0uScm^{-1}	Electrochemical
pH	6.98	6.67	6.64	6.71	Grab	0 -14	Electrochemical
Temperature °C	14	12	11.2	13.9	Grab	-5°C to 100°C	Electronic Thermocouple
Total Organic Carbon TOC	12	19.7	61	11	Grab	0.4	Persulphate Oxidation

Signed for and on behalf of BHP Laboratories Ltd.

Chemical Analysis Report for Longpavement Landfill Site

Client: Limerick City Council, City Hall, Limerick

Site Address: Longpavement, Limerick City

(Sheet 1 of 1) **Monitoring Point / Grid Reference:** _____SW 01 _____ **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	101326.1	102639.1	104042.1	105403.1			
	Date	Date	Date	Date			
	4th Qrt '11	1st Qrt '12	2nd Qrt '12	3rd Qrt '12			
Odour	none	none	none	none	Grab	-	Olefactory
Visual Inspection	Turbid/Straw	Clear	Turbid/Brown	Turbid/Black	Grab	-	Visual
Ammonical Nitrogen NH_3-N	0.22	0.21	0.43	2.94	Grab	0.01 mg/l	Photometric
BOD	3	2	2	121	Grab	1 mg/l	Electrochemical
COD	37	24	11	692	Grab	1 mg/l	Photometric
Chloride Cl	5.4	25.7	21.5	23.2	Grab	0.22 mg/l	IC
Dissolved Oxygen (% Sat. 0_2)	90.1	90.7	50.7	50.3	Grab	1.2 % Saturation 0_2	Electrochemical
Electrical Conductivity ECuScm^{-1}	528	559	679	773	Grab	1.0uScm^{-1}	Electrochemical
pH	7.45	7.11	7.04	6.85	Grab	0 -14	Electrochemical
Total Suspended Solids	40	13	112	968	Grab	0.22 mg/l	Gravimetry
Temperature °C	11.3	10.6	11.7	n/a	Grab	-5°C to 100°C	Electronic Thermocouple

Signed for and on behalf of BHP Laboratories Ltd.

Chemical Analysis Report for Longpavement Landfill Site

Client: Limerick City Council, City Hall, Limerick

Site Address: Longpavement, Limerick City

(Sheet 1 of 1) **Monitoring Point / Grid Reference:** _____SW 02 _____ **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	101326.2	102639.2	104042.2	105403.2			
	Date	Date	Date	Date			
	4th Qrt '11	1st Qrt '12	2nd Qrt '12	3rd Qrt '12			
Odour	none	none	none	none	Grab	-	Olefactory
Visual Inspection	Clear	Clear	Turbid	Turbid	Grab	-	Visual
Ammonical Nitrogen NH_3-N	0.24	0.11	0.38	<0.01	Grab	0.01 mg/l	Photometric
BOD	2	1	<1	<1	Grab	1 mg/l	Electrochemical
COD	11	16	1	1	Grab	1 mg/l	Photometric
Chloride Cl	22.1	17.6	17.48	18.51	Grab	0.22 mg/l	IC
Dissolved Oxygen (% Sat. 0_2)	96.7	94.1	80	86.8	Grab	1.2 % Saturation 0_2	Electrochemical
Electrical Conductivity ECuScm^{-1}	534	584	435	512	Grab	1.0uScm^{-1}	Electrochemical
pH	7.59	7.39	7.5	7.32	Grab	0 -14	Electrochemical
Total Suspended Solids	1	16	24	3	Grab	0.22 mg/l	Gravimetry
Temperature °C	11.2	11.1	16.5	17.9	Grab	-5°C to 100°C	Electronic Thermocouple

Signed for and on behalf of BHP Laboratories Ltd.

Chemical Analysis Report for Longpavement Landfill Site

Client: Limerick City Council, City Hall, Limerick

Site Address: Longpavement, Limerick City

(Sheet 1 of 1) **Monitoring Point / Grid Reference:** _____SW 03 _____ **Surface Water Monitoring**

Parameter	Results				Sampling method (grab, drift etc.)	Normal Analytical Range or Limit of detection (LOD)	Analysis method / technique
BHP Reference	101326.3	102639.3	104042.3	105403.3			
	Date	Date	Date	Date			
	4th Qrt '11	1st Qrt '12	2nd Qrt '12	3rd Qrt '12			
Odour	none	none	none	none	Grab	-	Olefactory
Visual Inspection	Turbid/Straw	Clear	Turbid/Straw	Turbid	Grab	-	Visual
Ammonical Nitrogen NH_3-N	0.26	0.26	0.41	<0.01	Grab	0.01 mg/l	Photometric
BOD	2	2	<1	4	Grab	1 mg/l	Electrochemical
COD	23	27	2	17	Grab	1 mg/l	Photometric
Chloride Cl	14.5	15.5	14.2	15.0	Grab	0.22 mg/l	IC
Dissolved Oxygen (% Sat. 0_2)	92.4	92.6	95.2	88.9	Grab	1.2 % Saturation 0_2	Electrochemical
Electrical Conductivity ECuScm^{-1}	428	447	400	420	Grab	1.0uScm^{-1}	Electrochemical
pH	7.97	7.63	7.96	7.92	Grab	0 -14	Electrochemical
Total Suspended Solids	3	16	20	<1	Grab	0.22 mg/l	Gravimetry
Temperature °C	11.4	12.2	12.2	17.9	Grab	-5°C to 100°C	Electronic Thermocouple

Signed for and on behalf of BHP Laboratories Ltd.

Chemical Analysis Report for Longpavement Landfill Site

Client: Limerick City Council, City Hall, Limerick

Site Address: Longpavement, Limerick City

(Sheet 1 of 1) **Monitoring Point / Grid Reference:** _____SW 04 _____ **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	101326.4	102639.4	104042.4	105403.4			
	Date	Date	Date	Date			
	4th Qrt '11	1st Qrt '12	2nd Qrt '12	3rd Qrt '12			
Odour	none	none	none	none	Grab	-	Olefactory
Visual Inspection	Turbid/Straw	Turbid/Straw	Turbid/Straw	Turbid/Straw	Grab	-	Visual
Ammonical Nitrogen NH_3-N	1.33	4.89	6.19	1.91	Grab	0.01 mg/l	Photometric
BOD	3	5	3	21	Grab	1 mg/l	Electrochemical
COD	27	35	12	73	Grab	1 mg/l	Photometric
Chloride Cl	25.7	30.4	54.8	40.8	Grab	0.22 mg/l	IC
Dissolved Oxygen (% Sat. 0_2)	84.3	93.7	62.4	77.8	Grab	1.2 % Saturation 0_2	Electrochemical
Electrical Conductivity ECuScm^{-1}	539	714	933	868	Grab	1.0uScm^{-1}	Electrochemical
pH	7.27	7.06	7.05	7.03	Grab	0 -14	Electrochemical
Total Suspended Solids	47	28	30	77	Grab	0.22 mg/l	Gravimetry
Temperature °C	11.3	10.9	12.9	17.5	Grab	-5°C to 100°C	Electronic Thermocouple

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Chemical Analysis Report for Longpavement Landfill Site

Client: Limerick City Council, City Hall, Limerick

Site Address: Longpavement, Limerick City

(Sheet 1 of 1) **Monitoring Point / Grid Reference:** _____SW 05 _____ **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	101326.5	102639.5	104042.5	105403.5			
	Date	Date	Date	Date			
	4th Qrt '11	1st Qrt '12	2nd Qrt '12	3rd Qrt '12			
Odour	none	none	none	none	Grab	-	Olefactory
Visual Inspection	Clear	Clear	Turbid	Turbid	Grab	-	Visual
Ammonical Nitrogen NH_3-N	2.46	4.85	6.42	1.72	Grab	0.01 mg/l	Photometric
BOD	3	3	2	2	Grab	1 mg/l	Electrochemical
COD	28	30	8	9	Grab	1 mg/l	Photometric
Chloride Cl	26.7	26.4	60.1	45.9	Grab	0.22 mg/l	IC
Dissolved Oxygen (% Sat. 0_2)	96.9	92.4	57	76.4	Grab	1.2 % Saturation 0_2	Electrochemical
Electrical Conductivity ECuScm^{-1}	560	629	928	1020	Grab	1.0uScm^{-1}	Electrochemical
pH	7.35	7.01	6.97	6.97	Grab	0 -14	Electrochemical
Total Suspended Solids	3	17	30	45	Grab	0.22 mg/l	Gravimetry
Temperature °C	11.7	11.1	12.7	16.8	Grab	-5°C to 100°C	Electronic Thermocouple

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Chemical Analysis Report for Longpavement Landfill Site

Client: Limerick City Council, City Hall, Limerick

Site Address: Longpavement, Limerick City

(Sheet 1 of 1) **Monitoring Point / Grid Reference:** _____SW 06 _____ **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	101326.6	102639.6	104042.6	105403.6			
	Date	Date	Date	Date			
	4th Qrt '11	1st Qrt '12	2nd Qrt '12	3rd Qrt '12			
Odour	none	none	none	none	Grab	-	Olefactory
Visual Inspection	Clear	Clear	Clear	Turbid	Grab	-	Visual
Ammonical Nitrogen NH_3-N	0.02	0.05	0.04	<0.01	Grab	0.01 mg/l	Photometric
BOD	2	2	<1	3	Grab	1 mg/l	Electrochemical
COD	48	28	1	48	Grab	1 mg/l	Photometric
Chloride Cl	20.1	15.3	13.4	14.7	Grab	0.22 mg/l	IC
Dissolved Oxygen (% Sat. 0_2)	98.4	90.8	90.7	84.9	Grab	1.2 % Saturation 0_2	Electrochemical
Electrical Conductivity ECuScm^{-1}	447	439	409	434	Grab	1.0uScm^{-1}	Electrochemical
pH	7.79	7.48	7.78	7.99	Grab	0 -14	Electrochemical
Total Suspended Solids	5	12	<1	<1	Grab	0.22 mg/l	Gravimetry
Temperature °C	11.1	11.3	11.8	17.5	Grab	-5°C to 100°C	Electronic Thermocouple

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Chemical Analysis Report for Longpavement Landfill Site

Client: Limerick City Council, City Hall, Limerick

Site Address: Longpavement, Limerick City

(Sheet 1 of 1) **Monitoring Point / Grid Reference:** _____SW 07 _____ **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	101326.7	102639.7	104042.7	105403.7			
	Date	Date	Date	Date			
	4th Qrt '11	1st Qrt '12	2nd Qrt '12	3rd Qrt '12			
Odour	none	none	none	none	Grab	-	Olefactory
Visual Inspection	Clear	Clear	Turbid/Straw	Turbid	Grab	-	Visual
Ammonical Nitrogen NH_3-N	2.82	4.74	4.81	<0.01	Grab	0.01 mg/l	Photometric
BOD	3	4	1	4	Grab	1 mg/l	Electrochemical
COD	21	31	11	31	Grab	1 mg/l	Photometric
Chloride Cl	24.3	24.7	24.8	23.5	Grab	0.22 mg/l	IC
Dissolved Oxygen (% Sat. 0_2)	94.3	93.6	78.3	86.7	Grab	1.2 % Saturation 0_2	Electrochemical
Electrical Conductivity ECuScm^{-1}	774	731	686	735	Grab	1.0uScm^{-1}	Electrochemical
pH	7.49	7.04	7.22	7.45	Grab	0 -14	Electrochemical
Total Suspended Solids	20	17	14	15	Grab	0.22 mg/l	Gravimetry
Temperature °C	10.9	11.6	11.3	16.2	Grab	-5°C to 100°C	Electronic Thermocouple

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Chemical Analysis Report for Longpavement Landfill Site

Client: Limerick City Council, City Hall, Limerick

Site Address: Longpavement, Limerick City

(Sheet 1 of 1) **Monitoring Point / Grid Reference:** _____L-01 _____ **Leachate Monitoring**

Parameter	Results (mg/l)				Sampling method (grab, drift etc.)	Normal Analytical Range or Limit of detection (LOD)	Analysis method / technique
BHP Reference	101327.1	102637.1	104043.1	105404.1			
	Date	**Date**	**Date**	**Date**			
	4th Qrt '11	1st Qrt '12	2nd Qrt '12	3rd Qrt '12			
Odour	None	None	None	None	Grab	-	Olefactory
Visual Inspection	Turbid/Black	Turbid/Black	Turbid/Black	Turbid/Black	Grab	-	Visual
Temperature °C	14.7	14.5	16.5	18.6	Grab	-5°C to 100°C	Electronic Thermocouple

Signed for and on behalf of BHP Laboratories Ltd.

Chemical Analysis Report for Longpavement Landfill Site

Client: Limerick City Council, City Hall, Limerick

Site Address: Longpavement, Limerick City

(Sheet 1 of 1) **Monitoring Point / Grid Reference:** _____L-02 _____ **Leachate Monitoring**

Parameter	Results (mg/l)				Sampling method (grab, drift etc.)	Normal Analytical Range or Limit of detection (LOD)	Analysis method / technique
BHP Reference	101327.2	102637.2	104043.2	105404.2			
	Date	**Date**	**Date**	**Date**			
	4th Qrt '11	1st Qrt '12	2nd Qrt '12	3rd Qrt '12			
Odour	None	None	None	None	Grab	-	Olefactory
Visual Inspection	Turbid/Black	Turbid/Black	Turbid/Black	Turbid/Black	Grab	-	Visual
Temperature °C	15	14.7	17.2	17.7	Grab	-5°C to 100°C	Electronic Thermocouple

Signed for and on behalf of BHP Laboratories Ltd.

Chemical Analysis Report for Longpavement Landfill Site

Client: Limerick City Council, City Hall, Limerick

Site Address: Longpavement, Limerick City

(Sheet 1 of 1) **Monitoring Point / Grid Reference:** _____L-03 _____ **Leachate Monitoring**

Parameter	Results (mg/l)				Sampling method (grab, drift etc.)	Normal Analytical Range or Limit of detection (LOD)	Analysis method / technique
BHP Reference	101327.3	102637.3	104043.3	105404.3			
	Date	Date	Date	Date			
	4th Qrt '11	1st Qrt '12	2nd Qrt '12	3rd Qrt '12			
Odour	None	None	None	None	Grab	-	Olefactory
Visual Inspection	Turbid/Black	Turbid/Black	Turbid/Black	Turbid/Black	Grab	-	Visual
Temperature °C	13.5	14.1	16.9	18.4	Grab	-5°C to 100°C	Electronic Thermocouple

Signed for and on behalf of BHP Laboratories Ltd.

Chemical Analysis Report for Longpavement Landfill Site

Client: Limerick City Council, City Hall, Limerick

Site Address: Longpavement, Limerick City

(Sheet 1 of 1) **Monitoring Point / Grid Reference:** _____L-04 _____ **Leachate Monitoring**

Parameter	**Results (mg/l)**				**Sampling method (grab, drift etc.)**	**Normal Analytical Range or Limit of detection (LOD)**	**Analysis method / technique**
BHP Reference	101327.4	102637.4	104043.4	105404.4			
	Date	**Date**	**Date**	**Date**			
	4th Qrt '11	1st Qrt '12	2nd Qrt '12	3rd Qrt '12			
Odour	None	None	None	None	Grab	-	Olefactory
Visual Inspection	Turbid/Brown	Turbid/Brown	Turbid/Brown	Turbid/Brown	Grab	-	Visual
Temperature °C	13.5	12.2	17.6	16.4	Grab	-5°C to 100°C	Electronic Thermocouple

Signed for and on behalf of BHP Laboratories Ltd.

Chemical Analysis Report for Longpavement Landfill Site

Client: Limerick City Council, City Hall, Limerick

Site Address: Longpavement, Limerick City

(Sheet 1 of 1) **Monitoring Point / Grid Reference:** _____L-05 _____ **Leachate Monitoring**

Parameter	Results (mg/l)				Sampling method (grab, drift etc.)	Normal Analytical Range or Limit of detection (LOD)	Analysis method / technique
BHP Reference	101327.5	102637.5	104043.5	105404.5			
	Date	Date	Date	Date			
	4th Qrt '11	1st Qrt '12	2nd Qrt '12	3rd Qrt '12			
Odour	None	None	None	None	Grab	-	Olefactory
Visual Inspection	Turbid/Brown	Turbid/Brown	Turbid/Brown	Turbid/Brown	Grab	-	Visual
Temperature °C	13.1	11.5	16.8	13.5	Grab	-5°C to 100°C	Electronic Thermocouple

Signed for and on behalf of BHP Laboratories Ltd.

Chemical Analysis Report for Longpavement Landfill Site

Client: Limerick City Council, City Hall, Limerick

Site Address: Longpavement, Limerick City

(Sheet 1 of 1) **Monitoring Point / Grid Reference:** _____L-06 _____ **Leachate Monitoring**

Parameter	**Results (mg/l)**				**Sampling method (grab, drift etc.)**	**Normal Analytical Range or Limit of detection (LOD)**	**Analysis method / technique**
BHP Reference	99796.3	101327.6	102637.6	105404.6			
	Date	**Date**	**Date**	**Date**			
	3rd Qrt '11	4th Qrt '11	1st Qrt '12	3rd Qrt '12			
Odour	None	None	None	None	Grab	-	Olefactory
Visual Inspection	Turbid/Brown	Turbid/Brown	Turbid/Brown	Turbid/Brown	Grab	-	Visual
Temperature °C	16.1	13.1	11.3	15.4	Grab	-5°C to 100°C	Electronic Thermocouple

Signed for and on behalf of BHP Laboratories Ltd.

Chemical Analysis Report for Longpavement Landfill Site

Client: Limerick City Council, City Hall, Limerick

Site Address: Longpavement, Limerick City

(Sheet 1 of 1) **Monitoring Point / Grid Reference:** _____L-07 _____ **Leachate Monitoring**

Parameter	Results (mg/l)				Sampling method (grab, drift etc.)	Normal Analytical Range or Limit of detection (LOD)	Analysis method / technique
BHP Reference	101327.7	102637.7	104043.7	105404.7			
	Date	Date	Date	Date			
	4th Qrt '11	1st Qrt '12	2nd Qrt '12	3rd Qrt '12			
Odour	None	None	None	None	Grab	-	Olefactory
Visual Inspection	Turbid/Brown	Turbid/Brown	Turbid/Brown	Turbid/Brown	Grab	-	Visual
Temperature °C	13.5	11.5	16.2	16.8	Grab	-5°C to 100°C	Electronic Thermocouple

Signed for and on behalf of BHP Laboratories Ltd.

Chemical Analysis Report for Longpavement Landfill Site

Client: Limerick City Council, City Hall, Limerick

Site Address: Longpavement, Limerick City

(Sheet 1 of 1) **Monitoring Point / Grid Reference:** _____L-08 _____ **Leachate Monitoring**

Parameter	**Results (mg/l)**				**Sampling method (grab, drift etc.)**	**Normal Analytical Range or Limit of detection (LOD)**	**Analysis method / technique**
BHP Reference	101327.8	102637.8	104043.8	105404.8			
	Date	**Date**	**Date**	**Date**			
	4th Qrt '11	1st Qrt '12	2nd Qrt '12	3rd Qrt '12			
Odour	None	None	None	None	Grab	-	Olefactory
Visual Inspection	Turbid/Black	Turbid/Black	Turbid/Black	Turbid/Black	Grab	-	Visual
Temperature °C	13.2	12.7	16.5	14.7	Grab	-5°C to 100°C	Electronic Thermocouple

Signed for and on behalf of BHP Laboratories Ltd.

Chemical Analysis Report for Longpavement Landfill Site

Client: Limerick City Council, City Hall, Limerick

Site Address: Longpavement, Limerick City

(Sheet 1 of 1) **Monitoring Point / Grid Reference:** _____L-09 _____ **Leachate Monitoring**

Parameter	Results (mg/l)				Sampling method (grab, drift etc.)	Normal Analytical Range or Limit of detection (LOD)	Analysis method / technique
BHP Reference	101327.9	102637.9	104043.9	105404.9			
	Date	Date	Date	Date			
	4th Qrt '11	1st Qrt '12	2nd Qrt '12	3rd Qrt '12			
Odour	None	None	None	None	Grab	-	Olefactory
Visual Inspection	Turbid/Black	Turbid/Black	Turbid/Black	Turbid/Black	Grab	-	Visual
Temperature °C	15.2	14	17.4	19.6	Grab	-5°C to 100°C	Electronic Thermocouple

Signed for and on behalf of BHP Laboratories Ltd.

Chemical Analysis Report for Longpavement Landfill Site

Client: Limerick City Council, City Hall, Limerick

Site Address: Longpavement, Limerick City

(Sheet 1 of 1) **Monitoring Point / Grid Reference:** _____L-10 _____ **Leachate Monitoring**

Parameter	Results (mg/l)				Sampling method (grab, drift etc.)	Normal Analytical Range or Limit of detection (LOD)	Analysis method / technique
BHP Reference	101327.10	102637.10	104043.10	105404.10			
	Date	Date	Date	Date			
	4th Qrt '11	1st Qrt '12	2nd Qrt '12	3rd Qrt '12			
Odour	None	None	None	None	Grab	-	Olefactory
Visual Inspection	Turbid/Black	Turbid/Black	Turbid/Black	Turbid/Black	Grab	-	Visual
Temperature °C	15.4	14.4	18.1	19.7	Grab	-5°C to 100°C	Electronic Thermocouple

Signed for and on behalf of BHP Laboratories Ltd.

Chemical Analysis Report for Longpavement Landfill Site

Client: Limerick City Council, City Hall, Limerick

Site Address: Longpavement, Limerick City

(Sheet 1 of 1) **Monitoring Point / Grid Reference:** _____L-11 _____ **Leachate Monitoring**

Parameter	Results (mg/l)				Sampling method (grab, drift etc.)	Normal Analytical Range or Limit of detection (LOD)	Analysis method / technique
BHP Reference	101327.11	102637.11	104043.11	105404.11			
	Date	Date	Date	Date			
	4th Qrt '11	1st Qrt '12	2nd Qrt '12	3rd Qrt '12			
Odour	None	None	None	None	Grab	-	Olefactory
Visual Inspection	Turbid/Black	Turbid/Black	Turbid/Black	Turbid/Black	Grab	-	Visual
Temperature °C	15	15.4	17.4	18.1	Grab	-5°C to 100°C	Electronic Thermocouple

Signed for and on behalf of BHP Laboratories Ltd.

REFERENCE YEAR	2012

1. FACILITY IDENTIFICATION

Parent Company Name	Limerick City Council
Facility Name	Langpavement
PRTR Identification Number	W0076
Licence Number	W0076-01

Waste or IPPC Class of Activity

No.	class_name
4.4	Recycling or reclamation of other inorganic materials.
3.4	Surface impoundment, including placement of liquid or sludge discards into a pit, pond or lagoon.
3.7	**********
4.1	Solvent reclamation or regeneration.
4.9	Use of any waste principally as a fuel or other means to generate energy.

Address 1	Manahraher
Address 2	Limerick
Address 3	
Address 4	
	Limerick
Country	Ireland
Coordinates of Location	-8.633552,6832
River Basin District	IEGBNISH
NACE Code	3832
Main Economic Activity	Recovery of sorted materials
AER Returns Contact Name	Urzula Ahern
ER Returns Contact Email Address	uahern@limerickcity.ie
AER Returns Contact Position	Urzula Ahern
eturns Contact Telephone Number	061496592
rns Contact Mobile Phone Number	0879795576
AER Returns Contact Fax Number	
Production Volume	0.0
Production Volume Units	
Number of Installations	0
lumber of Operating Hours in Year	0
Number of Employees	1
User Feedback/Comments	
Web Address	

2. PRTR CLASS ACTIVITIES

Activity Number	Activity Name
50.1	General
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?	
Have you been granted an exemption?	
If applicable which activity class applies (as per Schedule 2 of the regulations)?	

Client:

Site Addre

(Sheet 1 of

Parameter	
BHP Refere	
Odour	
Visual Insp	
Temperatur	

Signed for

Deleted:

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	Point 1	Emission Point 2	Point 3	KG/Year	KG/Year
01	Methane (CH4)	C	OTH	US-EPA Land GEM	415169.0	0.0	0.0	415169.0	0.0
03	Carbon dioxide (CO2)	C	OTH	US-EPA Land GEM	153573.0	0.0	0.0	153573.0	0.0

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	Point 1	T (Total) KG/Year	(Accidenta	KG/Year
					0.0	0.0	0.0	0.0

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 (Accidenta	F (Fugitive) KG/Year
					0.0	0.0	0.0	0.0

Additional Data Requested from Landfill operators

operators are requested to provide summary data on landfill gas (Methane)

Landfill: Longpavement

Please enter summary data on the quantities of methane flared and / or utilised			Method Used			
	T (Total) kg/Year	M/C/E	Method Code	Designation or Description	Facility Total Capacity	
Total estimated methane generation (as per site model)	536112.0	C	OTH	US-EPA Land Gem	N/A	
Methane flared	120943.0	C	OTH	Open Flare	150.0	(Total Flaring Capacity)