

**ANNUAL
ENVIRONMENTAL
REPORT
2010**

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: Gráinne Whelan,
Environmental Scientist,
Environment Department
Limerick City Council
City Hall
Limerick

1.0 REPORTING PERIOD

The period of reporting for this Report is from January 2010 to December 2010.

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 being undertaken:

- **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 involves 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 will have the objective of integrating the restored site into its surroundings and to leave finally an area which is of benefit to the people of Limerick. New wetlands areas will be constructed and existing wetlands will be enhanced.

The work involves a significant amount of earthworks in the capping of the landfill mass. As well as the landfill gas and leachate collection & treatment systems there will be a new control building together with a compound, fencing and an access road to the Longpavement Road. It will also involve the construction of pipelines, rising mains, manholes, a pumping station with associated mechanical and electrical aspects of the above elements. All these works were in progress throughout 2009 and 2010.

3.0 WASTE ACTIVITIES CARRIED OUT AT THE FACILITY

No material was imported on to the site during 2010. The main items of work undertaken during the reporting period were:

1. Completion of surface water and foul drainage, electrical and other services. Complete new entrance, compound and jeep track.
2. Completion of control building.
3. Commissioning of mechanical and electrical installations, CCTV, gas flare and methane stripper.
4. Landscaping

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/ PM₁₀ 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 4.3 Noise 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 ^{Note 5}	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
NO _x	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. Exceedances in CO₂ (4.4% to 26.4%) and CH₄ (16.5% to 76.9%) were detected in both of these gas wells 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 CH₄ was detected in any of the perimeter boreholes during the monitoring period. CO₂ exceedances were detected on a number of occasions ranging from 1.8% to 5.7%.

4.2 Dust Control - PM₁₀ Monitoring

Dust monitoring was carried out at least three times in 2010 as per Schedule D.3 of the Waste Licence. Results are presented in Appendix C. No exceedances were observed at the available locations as the landfill has been recapped and vegetative cover has become established.

PM₁₀ monitoring was carried out quarterly. Results are presented in Appendix C. The concentrations of particulate matter are below stage 1 limit values of (50µm/m³). Monitoring was changed from walk over surveys to 8-hour surveys at each location in mid 2008 in consultation with the EPA.

4.3 Noise Monitoring

The landfill at Longpavement has been closed for the acceptance of waste since 2002 so the only noise on site is restoration/low level construction noise. Monitoring was carried out bi-annually. Results are presented in Appendix D. Under Licence No. 76-1 noise emission limits are as follows:

- Day – 55 dB (A) L_{Aeq} (30 minutes)
- Night – 45 dB (A) L_{Aeq} (15 minutes)

Exceedances occurred at monitoring location N2 which was due to the proximity of this location to the level crossing on the longpavement road. The noise consisted of heavy traffic and passing trains. No landfill activity was audible outside of restoration activity.

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. Surface water sampling results are shown in Appendix E and F of this Report. The annual surface water biological assessment is shown in Appendix G.

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. Results for groundwater monitoring at the facility are tabulated in Appendix E and F of this Report.

4.6 Leachate

There are 7 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 L05 to L07 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 E and F 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 continually 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 on site Leachate Treatment Plant

The construction of the on-site leachate treatment plant has not yet commenced.

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

5.1 Leachate Abstraction Wells

An existing network of 32 No. leachate wells are present on the site

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

Extensive leveling and grading of the landfill was carried out during 2008. Appendix A of this Report shows details of the topographical survey carried out.

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).

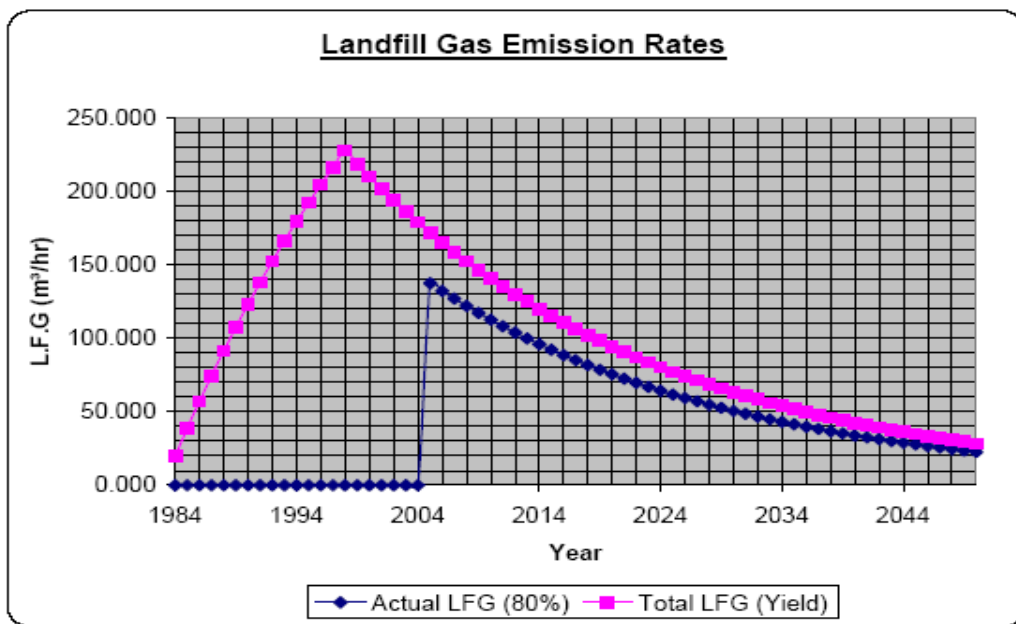


Figure 7.1: Projected Landfill Gas Emission Rates

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. 137m³/hr is theoretically available for extraction. It is estimated that gas production is on a downward cycle decreasing to 92m³/hr in 2015 and approx. 75m³/hr in 2020.

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

The objective for the previous year has been achieved through the appointment of contractors and the commencement of restoration works on site which commenced in September 2006.

The main items of work undertaken during the reporting period were:

1. Completion of surface water and foul drainage, electrical and other services. Complete new entrance, compound and jeep track.
2. Completion of control building.
3. Commissioning of mechanical and electrical installations, CCTV, gas flare and methane stripper.
4. Landscaping

9.0 SCHEDULE OF ENVIRONMENT OBJECTIVES & TARGETS FOR THE FORTHCOMING YEAR

The Design Report submitted to the EPA in April 2005 and the subsequent Design Report Addendum clarifying a number of issues submitted in July 2005 outline the rehabilitation proposals for the landfill. Following approval from the EPA of the rehabilitation proposals the detailed design and contract documents were prepared and details of Specified Engineering Works were submitted for approval. 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 2010 to the December 2010.

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 2010. Dust monitoring Reports are presented in Appendix C.

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 €4.25m. 75% of the 2008 expenditure is grant aided by the Department of the Environment Heritage and Local Government. A grant application is being made for similar financial assistance in 2009. The remaining 25% is funded by Limerick City Councils internal capital fund. The SEE in environment oversees any works at

Longpavement. A programme for public information prepared by Limerick city Council is in place.