



***RAFFEEN CIVIC SITE AND LANDFILL  
CORK COUNTY COUNCIL,  
RAFFEEN,  
MONKSTOWN,  
CO. CORK***

***ANNUAL ENVIRONMENTAL REPORT  
2011***

***WASTE LICENCE NO. W0023-1***



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## **ANNUAL ENVIRONMENTAL REPORT & ENVIRONMENTAL MANAGEMENT PROGRAMME REPORT**

### **1.0 INTRODUCTION**

#### **1.1 Background**

Raffeen Landfill site is operated by Cork County Council under Waste Licence W0023-01. This waste licence register number was assigned by the Agency in July 2006 and replaces the old numbering format (23-1). The landfill is situated approximately 10 km south east of Cork City and approximately 2km south west of Monkstown. (National Grid Reference 1751E 0654N). The site is located adjacent to Monkstown Creek and the southern boundary of the site is located 100m to the north of the edge of the Cork Harbour Estuary. The landfilling of waste at the site took place between 1979 and October, 2001. The civic amenity centre has been open to the public for recycling and disposal since late January 2005. This report covers the period from 1<sup>st</sup> January, 2011 to 31<sup>st</sup> of December, 2011.

The site occupies an area of 7.25 hectares and is located in the centre of a narrow, steep sided valley to the west of a quarry. Quarrying was carried out prior to the commencement of landfilling operations at the site. The landfilling of waste has taken place and resulted in the formation of a steep sided valley.

Due to the considerable overlap between the required content of both the AER and the EMP reports, as outlined by the Agency in the “Draft Guidance On Environmental Management Systems & Reporting to the Agency” and the content specified in Schedule A and B of the Waste Licence, the two reports have been combined to form this (one) submission. The guidance notes indicate that the Environmental Management Programme Report is a sub section of the Annual Environmental Report.

## 1.2 Management and Staffing Structure of the Facility

The site is operated by Cork County Council, County Hall, Cork and is under the overall operational control of Mr. Liam Singleton, Senior Engineer, Cork County Council. Mr. Jerome O'Brien, Senior Executive Engineer is responsible for landfill operation and aftercare in South Cork, while Mr. Enda Kiernan, Executive Engineer is responsible for the management of the Raffeen landfill and Civic Amenity.

Ms. Lisa Collins is Manager of Raffeen Civic Amenity Site and is responsible for the day to day supervision and management. Mr. Jerome O'Brien and Mr. Enda Kiernan act as Assistant Facility Managers and provide holiday, sick cover, etc., in Ms. Collins' absence. Table 1.1 shows the management structure at Raffeen Landfill during 2010.

**Table 1.1: Management Structure**

Position	Employee Contact Details
Senior Engineer Mr. Liam Singleton  Executive Engineer – Civic Amenity Site Mr. Enda Kiernan  Deputy Managers:  Mr. Jerome O'Brien Mr. Enda Kiernan	Cork County Council, County Hall, Carrigrohane, Cork.  Telephone No: 021 4276891 Fax No: 021 4859786/7
Manager Raffeen CA Site, Ms. Lisa Collins  Manager Raffeen Landfill, Mr. Jerome O'Brien	Cork County Council, Raffeen Recycling Centre & Landfill Site, Raffeen, Kerrycurrihy, Monkstown, Co. Cork  Tel No: 021 4842082 / 4859350 Fax No: 021 4859787  Out of Hours Emergency Contact Tel No.: 021 4271551

Three General Operatives are employed at the civic amenity centre. The General Operatives are responsible for the implementation of the waste acceptance procedures at the site, inspection of all loads arriving at the civic amenity centre and ensuring materials are placed in the correct receptacles. One general operative is based in the reception building/weighbridge adjacent to the site entrance during site opening hours.

Table 1.2 shows the operational staff currently employed at Raffeen Civic Amenity Centre. Any changes to this structure will be submitted by the Facility Manager for agreement to the EPA as per Condition 2.6.1 of Waste Licence Reg. No. W0023-01.

**Table 1.2: Operational Staff (Currently on Site)**

<b>Employee</b>	<b>Position</b>	<b>Duties and Responsibilities</b>
Mr. John Hallihan	General Operative	Inspect all loads arriving at civic amenity centre.
Mr. William Mc Cormack	General Operative	Ensure materials are placed in correct receptacles.
Mr. Conor Galvin	General Operative	One General Operative is situated in the reception building/weighbridge adjacent to the site entrance during site opening hours.

## **2.0 WASTE MANAGEMENT ACTIVITIES AT THE FACILITY**

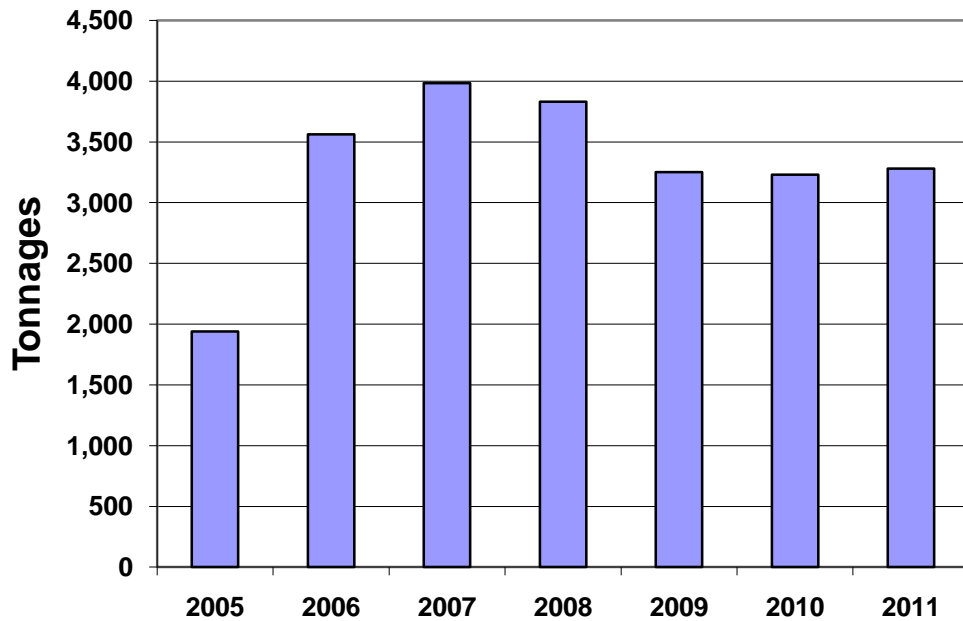
### **2.1 Waste Quantities and Composition**

The landfilling of waste is reported to have taken place at Raffeen Landfill site over its operational life up to October 2001 when the landfill closed and ceased accepting waste. The works associated with the capping and restoration of site was completed in Quarter 3, 2007. It is estimated that a total of 580,300 tonnes of waste have been landfilled at the site.

The civic amenity centre has been open to the public since late January 2005. The civic amenity centre accepts the following materials from the public:-

- Paper, newsprint, magazines
- Cardboard and Tetra Paks
- Glass bottles and flat glass
- Food tins
- Beverage/drink cans
- Plastic bottles
- Timber
- Green waste
- Scrap metal
- Aerosols
- Paint
- Textiles/reusable clothes
- Waste cooking oil
- Waste engine oil
- Empty gas bottles
- Lead acid, fence, and household batteries
- Fluorescent tubes and energy saving light bulbs and filament bulbs
- Waste electrical and electronic items including fridges and freezers
- Mobile phones
- Household construction and demolition waste (from April 2007 only rubble and ceramics are accepted).
- Printer cartridges

The quantities of materials (tonnes) collected for recycling during 2011 are outlined in Table 2.1. A total of 3,281.22 tonnes of materials were collected for recycling during 2011. Figure 2.1 compares previous years.



**Figure 2.1: Tonnes of Recyclables Accepted at Raffeen CAS**

Residual waste from domestic sources is also collected at the Raffeen Civic Amenity Centre. A total of 1636.67 tonnes of residual domestic waste was collected and disposed of in 2011. This compares with:

- 1580.36 tonnes in 2010
- 1,709.36 tonnes in 2009
- 2,036.00 tonnes in 2008
- 2,154.00 tonnes in 2007
- 1,573.00 tonnes in 2006
- 1,717.00 tonnes in 2005

For the majority of the year all this material was disposed of at Youghal Landfill. In July 2010, as part of the implementation of the EU Landfill Directive, bagged waste from the facility was sent to the Greenstar facility in Glanmire in order to pre-treat the waste prior to disposal at landfill. A total of 788.55 tonnes were sent to this facility in 2011. Street sweepings from litter bin collections, fly tipping and other works carried out by the Carrigaline Area Office and the cleaning of bring sites amounted to a further 204.5 tonnes.

	January	February	March	April	May	June	July	August	September	October	November	December
Beverage Cans	0.22	0.28	0.24	0.22	0.18	0.3	0.26	0.2	0.36	0.08	0.2	0.16
Cardboard	10.88	5.84	12.34	9.9	8.34	10.24	10.82	7.42	7.38	7.04	8.72	8.44
DIY Waste	41.66	38	68.98	82.84	59.9	62.66	96.6	103.9	65.08	116.76	59.3	42.68
Fluorescent Tubes	0	0	0	0.06	0	0	0	0	0.12	0	0	0
Food Tins	0.74	0.34	0.52	0.6	0.54	0.48	0.44	0.46	0.58	0.24	0.46	0.42
Glass Bottles	6.72	6.18	7.96	4.86	7.18	2.62	11.3	7.22	6.46	2.52	6.46	6.24
Green Waste	32.68	23.44	89.12	113.08	105.9	111.02	130.1	105.42	75.32	45.4	51.92	39.14
Household Batteries	0.18	0	0	0.38	0	0	0	0	0.732	0	0.43	0.08
Lead Acid Batteries	1.03	0	0	0	0	0	0	0	0	0	0.34	0.16
Paint	0.7	1.2	2.58	1.48	3.04	1.42	3	2.38	2.6	1.32	1.12	1
Paper	12.72	13.14	7.5	14.24	6.22	16.22	15.54	7.8	15.42	11.36	5.54	14.36
Plastic Bottles	2.46	2.5	2.74	2.68	2.9	2.9	2.62	3.02	2.82	2.44	2.82	2.58
Plate Glass	5.12	3.94	0	0	7.04	0	5.72	4.16	0	4.48	3.24	0
Plaster Board	0	8.5	0	7.74	0	0	7.6	6.08	0	5.04	5.16	0
Polystyrene	0.44	0.48	0.44	0.48	0.22	0.62	0.28	0.6	0.18	0.28	0	0
Scrap Metal	11.38	11.68	19.68	22.18	17.8	19.76	16.28	15.84	15.94	11.38	11.14	7.9
Textiles	2.02	0.94	1.84	1.92	2.06	1.26	2.78	2.24	1.64	1.78	1.26	0.96
Timber	40.12	30.58	50.4	51.66	53.82	51.98	39.58	50.52	42.24	39.12	44.68	38.78
Waste Cooking Oil	0	0	0	0	0	0	0	0	0	0	0	0
Waste Engine Oil	1.02	0	0	1.24	0	1.24	0.72	0	1.12	0	0.8	0
Waste Engine Oil Contain & Filters	0	0	0	0	0	0	0	0	0	0	0	0
WEEE	31.72	26.28	32.76	30.56	19.5	32.39	23.68	19.04	26.06	24.7	24.46	20.46
<b>Totals</b>	<b>201.81</b>	<b>173.32</b>	<b>297.1</b>	<b>346.12</b>	<b>294.64</b>	<b>315.11</b>	<b>367.32</b>	<b>336.3</b>	<b>264.052</b>	<b>273.94</b>	<b>228.05</b>	<b>183.36</b>

**Table 2.1 – Raffeen Civic Amenity Centre Recycling Records 2011**



### **3.0 SITE DEVELOPMENT WORKS**

The following subsections describe the current and proposed future works at the site. The contract for the final restoration of the site commenced in May 2005 and was completed as stated previously, in Quarter 3, 2007. This contract involved the installation of the final capping, the gas abstraction system and the leachate abstraction system.

Development works on site were not carried out during 2011

#### **3.1 Leachate Management Infrastructure**

During 2011 leachate was tankered from Raffeen Landfill to Carrigtohill Waste Water Treatment Plant. The total quantities removed from site were 201.20 tons. The table below shows the tonnage per month of leachate tankered from the site in 2011.

Month	Tonnage
Feb	163.7
Dec	37.5
Total	201.2

#### **3.3 Landfill Gas Management Infrastructure**

The installation of the active gas abstraction system has been completed since 2007 as part of the Final Restoration Contract. The system comprises of gas abstraction wells within the waste body, condensate removal traps, gas abstraction wellheads and gas collection pipework. The permanent gas collection pipework is located within the subsoil layer of the final capping. The gas abstraction wells are composed of 300mm diameter boreholes. The installation of the gas abstraction wells was undertaken by a specialist sub contractor.

All gas abstraction boreholes (50 No. in total of which 10 No. are combined leachate and gas abstraction boreholes, and as shown on Drawing No. 02) were in place by late August 2006 with additional boreholes requested by the EPA in the central area of the landfill.

The flare compound was completed in June 2007 and is located in the area to the north of the Civic Amenity Centre west of the Loftus Quarry. This location was selected in order to locate the flare compound as far as possible from existing houses in the area and in as low-lying an area of the site as possible to facilitate condensate

removal. Within the Flare Compound, a partial vacuum shall induce a pressure gradient towards the abstraction wells and control the lateral movement of gas. An electrically driven centrifugal blower shall induce this vacuum. The extracted gas is flared to control emissions to atmosphere of methane and volatile organic compounds.

Gas pumping trials were carried out during the summer of 2007. The outcome of the trials determined that a 150cum/hr enclosed flare would be required for the site. The flare was delivered to site in April 2008 and commissioned by July 1st 2008. AFS serviced the flare and carried out maintenance throughout 2011.

### **3.5 Access Roads and Paths**

The gas flare compound is located on the northern boundary of the civic amenity centre. Access to the gas flare compound is from the civic amenity centre. As part of the Final Restoration Contract, pedestrian pathways have been incorporated to provide access around the site to the environmental monitoring points.

### **3.6 Road Resurfacing**

The road outside the facility was resurfaced during mid May 2008. Site traffic markings were re-lined in early 2010. This ensured that the public and collection vehicles are not using the same exit.

### **3.7 Slides on the Compost Skip Railings**

'Slides' were re-ordered in late 2011 to replace flaps on the bins to facilitate easier emptying of bags into the skip for the public.

### **3.8 Stream Diversion**

Surface water from a quarry immediately to the east of the landfill had been entering the site. The quarry owner diverted this discharge to prevent it entering the landfill site during January 2008. Within the site the upper end of the stream diversion was relined to prevent surface water entering the body of the landfill.

## 4.0 EMISSIONS

### 4.1 Management of Emissions

Cork County Council is committed to ensuring that any emissions from the previous deposition of waste at Raffeen Landfill Site, and related activities will not result in the contravention of any relevant standard, including any standard for an environmental medium or any relevant emission limit value, prescribed under any other enactment.

Cork County Council is committed that the restoration of Raffeen Landfill and the operation of the civic amenity centre shall be carried on in accordance with such conditions as may be attached to the licence and will not cause environmental pollution.

Cork County Council shall use the best available technology to prevent or eliminate or, where that is not practicable, to limit, abate or reduce an emission from the activity concerned.

The environmental monitoring programme at the facility during the reporting period included monitoring of landfill gas, leachate levels and composition, groundwater, and surface water. The monitoring frequencies required by the Waste Licence and subsequent correspondence with the EPA are outlined in Table 4.1. The potential emissions from the site include dust, leachate and landfill gas are discussed in the following sections.

**Table 4.1: Summary of Required Monitoring Frequencies**

Parameter	No. of Locations	Monitoring Frequency
Groundwater Quality	6	Monthly, Quarterly & Annual
Surface Water Quality	5	Quarterly & Annual
Surface Water Inspection	4	Weekly
Leachate Composition	5	Quarterly & Annual
Landfill Gas Composition	6	Monthly
Landfill Gas Site Office	1	Continuously
Gas Monitoring Points	4	Weekly
Leachate Levels	5	Weekly
Groundwater Levels	7	Monthly
Dust Monitoring	3	3 times a year
Noise Monitoring	7	Annual

An Oliver IGD Tocsin 700 Gas Monitor was installed in the offices to continually monitor levels of methane, carbon dioxide and oxygen. This is serviced by CEMS 6

## 4.2 Dust

The dust deposition limit is 350 mg/m<sup>2</sup>/day for a 30 day composite sample. Dust monitoring was carried out at three locations points (D1 – D3) at the site boundaries of the landfill site during 2011. The monitoring results were well within the emission limits value of 350mg/m<sup>2</sup>/day permitted in the waste licence for the facility. Approval has been obtained from the Agency to cease dust monitoring at the facility from 2012 onwards as the landfill restoration is now complete

A wheel wash was installed in the Civic amenity centre to reduce the quantity of mud and debris taken off site and therefore reducing the generation of dust emissions on the adjacent public road. During 2011 the facility manager organised for road sweeping to be undertaken as necessary by Cork County Council personnel from the machinery yard.

## 4.3 Noise

A noise survey was carried at the landfill in accordance with the requirements of Schedule E and Table E.3.2, Schedule F.1 on the 13<sup>th</sup> of October 2011. All locations were within the limits as set out in the Waste Licence. The report by the DixonBrosnan Ltd is contained in the appendices.

## 4.4 Odour

### 4.4.1 Odour

Potential for odour emissions has significantly reduced since municipal waste is no longer landfilled at the site. It is still accepted but placed in either a closed container (hopper with compactor attached), or in an open skip. There is potential for odours arising from this open skip, but this has not occurred as the open skips containing municipal waste are removed for landfilling almost every day.

The installation of an active gas abstraction system and flare controls the volume of gas being produced at the site and reduces the potential for malodours occurring from gas venting. The gas flare was installed in April 2008 and commissioned by July 2008. The permanent flare was operational during 2011.

A weekly inspection of the Civic Amenity Centre is conducted. Odours were not found to be a nuisance during any of the site inspections of the civic amenity centre during the reporting period. Collection bins and skips in the civic amenity centre will be washed to prevent the generation of malodours should it be required.

## **4.5 Landfill Gas**

### **4.5.1 Landfill Gas Monitoring**

Monitoring of the composition of landfill gas was undertaken at eleven gas monitoring locations within and in the vicinity of the landfill site during the reporting period. The current monitoring points are G & L1, G & L3, G & L4, GM 6, GM 7, GM 9, G & L11, G & L12, GM11A, GM12A and GM13A, T1 and T2 and the site office.

Monitoring is undertaken on a monthly frequency at six of the monitoring boreholes; G & L1, G & L3, G & L4, GM6 (G & L6), G & L11 (GW4) and G & L12 (GW6). At the request of the EPA monitoring is undertaken on a weekly frequency at the site office and at monitoring locations GM7 (G & L7), GM9, (G & L9), GM 11A, GM12A and GM13A T1 and T2. Monitoring was discontinued at GM10 on the 22nd of October 2007 as the three monitoring points GM11A, GM12A and GM13A installed in April 2007 are sufficient to monitor gas migration to the south of the landfill.

An Oliver IGD Tocsin 700 Gas Monitor continually monitors gas levels in the site office. In the event of monitoring indicating that the concentration of methane exceeds 1% v/v or the concentration of carbon dioxide exceeds 1.5%. The Facility Manager will inform the licensing authority immediately. No methane has been detected within the site office to date and carbon dioxide levels are well within acceptable levels.

### **4.5.2 Landfill Gas Flare**

The permanent gas flare was in operation during 2011. The average percentage for methane, oxygen and carbon dioxide gas burned on the site were of the order of 27.77%, 0.87% and 22.43% respectively. Gas field balancing is carried out on site when required. The gas is collected from 20 wells in the lined area of the landfill and 8 wells in the unlined area of the landfill. The results are relayed to a PC in the main office building. The total landfill gas results Raffeen Landfill for 2011 were 284,650cu.m.

## **4.6.0 Groundwater Monitoring**

### **4.6.1 Scope of works**

There are six groundwater monitoring boreholes at Raffeen Landfill Site to date (GW1, GW2, GW3, GW5, GW7 and GW8). GW3 and GW7 are damaged and not in use. No access is permitted to GW1 by the property owner. Detailed recording of results are found in the quarterly reports for 2011.



#### **4.6.2 Groundwater metal concentrations monitoring**

Monitoring of the ground water at the various locations indicates that the level of metals tends to be within the IGV for groundwater. Historically iron and manganese concentrations have been above the IGV, results from 2011 annual monitoring schedule indicate that they are within the limits.

Total chromium concentrations ranged from 0.004 to 0.007 mg/l. All ground water sites are within the interim guideline value of 0.03 mg/l.

Cadmium concentrations at all the monitoring locations are within the IGV value of 0.005mg/l, results issued are detection limit values as the concentrations present were lower than the method detection limit. These results are similar to 2010 cadmium.

Cyanide concentrations are recorded as <0.05 mg/l for all sites. Indicating they are within the drinking water directive limit of 0.05 mg/l and corresponding IGV limit of 0.01 mg/l. Results indicate that cyanide levels for the site are within limits.

Monitoring from 2011 illustrate that mercury levels are within the target IGV value of 0.001 mg/l. These results are similar to 2010 mercury results.

Iron and manganese concentrations are within the IGV values for groundwater. Historically the levels for these metals were elevated due to the topography of the site. Iron results were recorded as <0.019 mg/l for all sites. This indicates that all sites up gradient and down gradient of the landfill are within the IGV value for iron (0.02 mg/l).

Results for lead concentrations are below the IGV value of 0.01 mg/l, up gradient and down gradient of the landfill site. .

### **4.7.0 Surface water**

#### **4.7.1 Scope of work**

There are seven surface water monitoring locations for the landfill site at Raffeen, and monitoring was carried out at all the locations as per license requirements. Monitoring locations SW4 are located up gradient of the site, while SW2, SW2A,

SW3 and SW2B are all located down gradient of the landfill site. SW 5 known as the new culvert collects surface water runoff from the capping.

Results have been compared to the environmental quality standards (EQS) set for surface water by the EPA in the publication “Towards Setting Guideline Values for “The Protection of Groundwater in Ireland”.

The monitoring to date indicates that the landfill site is not significantly impacting on the surface water quality in the vicinity of the site. The water quality data for 2011 is similar to that recorded previously. Detailed recording of results are found in the quarterly reports for 2011.

The monitoring locations SW2, SW2A, SW2B and SW3 are located down gradient of the site within Monkstown Creek. This is a tidal estuary and for this reason the water chemistry of the samples taken from these locations can be influenced by the incoming sea water. No access is permitted to SW1 by the property owner.

#### **4.7.2 Surface water analysis results**

Monitoring at the down gradient locations SW2, SW2A, SW2B and SW3 illustrates variations in the concentration of ammoniacal nitrogen. Locations SW2 and SW2B had the highest concentrations present; this is in keeping with trends from 2009 and 2010.

Results from BOD monitoring indicate similar trends to 2010. SW 2 continues to have the greatest concentration of BOD present of all surface water monitoring locations. Analysis of COD data indicates a similar trend in levels as BOD.

Cadmium, chromium, iron, zinc, lead, copper and mercury results were within the IGV for surface water. Manganese results for SW2, SW2B, and SW3 were above the IGV limit of 0.3 mg/l. This is similar to previous results.

### **4.8.0 Leachate monitoring**

#### **4.8.1 Scope of work**

There are three combined leachate monitoring boreholes located within the site these being; G & L1, G & L3 and G & L4. In 2006 the existing monitoring locations G & L11 (GW4) and G & L12 (GW6) were included as leachate monitoring locations.

There was no access to monitoring location G & L2 or G & L5 during the reporting period as these monitoring installations were damaged by construction activities taking place at the site during 2005. It will not be necessary to replace these two leachate monitoring boreholes as monitoring locations G & L11 (GW4) and G & L12 (GW6) monitor the leachate composition within the waste body.

Monitoring of the leachate composition is undertaken on a quarterly and annual basis.

#### **4.8.2 Leachate monitoring**

There has been no significant change in the composition of the leachate at the site. The highest strength leachate is seen at monitoring location G & L3 as reflected in the analytical data.

The monitoring of the composition of the leachate at the site indicates that the leachate is of a lower strength than the values typically quoted in literature. Many of the parameters are within the standards set for drinking water. This is considered to be due to the high proportion of construction and demolition waste which has been landfilled at the site. The leachate composition is not considered to be significantly impacting on the environment in the vicinity of the site. The surface water and groundwater are naturally discharging to the estuary where significant dilution is available. Monitoring of the surface water quality in the vicinity of the site indicates that significant pollution is not occurring at the site. Detailed recording of results are in the quarterly reports.

### **Topographical Survey**

A topographical survey was carried out in July 2010 by Focus Surveys Ltd. An original and three copies have been sent to the Agency, previously, as required under the licence.

### **Leachate Generation**

Raffeen Landfill is an unlined site. The leachate abstraction system has been installed as part of the Final Restoration Contract. The discharge of leachate from the waste body is taking place to the groundwater and / or the surface water in the vicinity of the site. Both the surface water and groundwater are discharging to the Cork Harbour estuary immediately down gradient of the landfill where significant dilution is available.

The water balance method has been used to predict the likely annual leachate generation rates at the landfill site in order to estimate the potential leachate emissions from the facility. This method is based on the use of a mathematical equation which provides a conservative estimate which caters for worst case scenarios. The method used for the Raffeen Landfill Site is based on the equation developed by Ehrig (Quality and Quantity of Sanitary Landfill Leachate, 1983).

The equation is as follows;  $L_0 = [(ER.a) + LW + IR] - [aW]$

Where:-

$L_0$  : Free Leachate Produced

ER: Effective Rainfall (net precipitation after loss by evaporation).

a: Area of Cell(s)  
 LW: Liquid Waste  
 IR: Infiltration from restored areas  
 aW: Absorptive capacity of waste  
 a<sub>R</sub>: Restored Area

The results of the leachate generation estimates are summarised in Table 4.4 with the calculations provided in Table 4.5. Data from Rossmore CA Site for 2011 has been used in the estimates as this is one of the closest meteorological stations to the site. Effective rainfall corresponds to the amount of total rainfall minus evapotranspiration. Monthly rainfall figures from the weather station at Rossmore CA Site for 2011 are shown in Table 4.4. Potential evapotranspiration data from Rossmore CA Site for 2011 was obtained (Table 4.4).

The water balance method assumes that the infiltration on an uncapped cell which is open for a full year is taken as being 100% of the effective rainfall on the site. As outlined in the EPA Landfill Site Design Manual in areas that have been temporarily capped / restored an infiltration rate of 25 – 30% of the annual rainfall is recommended while in restored areas infiltration would be between 2 – 10%. Since 100% of the final capping has been installed at the site an infiltration rate of 2% and 25% of the annual rainfall was used for the restored area to provide an estimate of the quantity of the leachate being generated at the site. This method does not take into account the steep nature of the site (up to 1:2.5) in the leachate generation calculations. The water balance for the site has been calculated based on the assumptions outlined below.

**Table 4.4: Water Balance Data 2011**

	Average Rainfall cork airport	2011 rainfall cork airport	potential Evapotranspi ration data 2011	25% of rainfall	Leachate generation-2% final capped
January	148.3	74.5	17.83	18.85	27.379625
February	115.9	129	26.46	28.6	41.5415
March	97.1	32.3	35.17	5.65	8.206625
April	70.2	42.7	50.41	4.1	5.95525
May	84.1	122.7	66.72	20.4	29.631
June	67.7	88.7	65.84	28.65	41.614125
July	65.4	39.2	71.19	9.9	14.37975
August	89.9	55	65.00	16.5	23.96625
September	97.4	115.6	9.61	12.65	18.374125
October	125.8	91.7	19.75	20.1	29.19525
November	108.7	148.7	30.30	39.1	56.79275
December	136.5	82.6	26.40	19.65	28.541625
<b>Total</b>	<b>1207</b>	<b>1022.7</b>	<b>484.67</b>	<b>224.15</b>	<b>325.58</b>

The rainfall data during the reporting period has been compared to the monthly

average rainfall figures for the period 1961 to 1990. The monthly rainfall figure for Cork Airport for 2011 has been compared to these monthly average figures. The highest rainfall for 2011 occurred in November followed by February and September. March had the least amount of rainfall in the 2011.

## **Leachate Emissions**

Leachate generation at Raffeen Landfill is estimated at 325.58m<sup>3</sup>/annum. The maximum monthly leachate generation is estimated to have occurred during the start of 2011. As indicated by the monitoring of the leachate composition since 2000 the leachate at Raffeen is of low strength when compared to the values typically quoted for leachate composition. The environmental monitoring programme at the site indicated no impact of leachate in the groundwater quality in the vicinity of the landfill



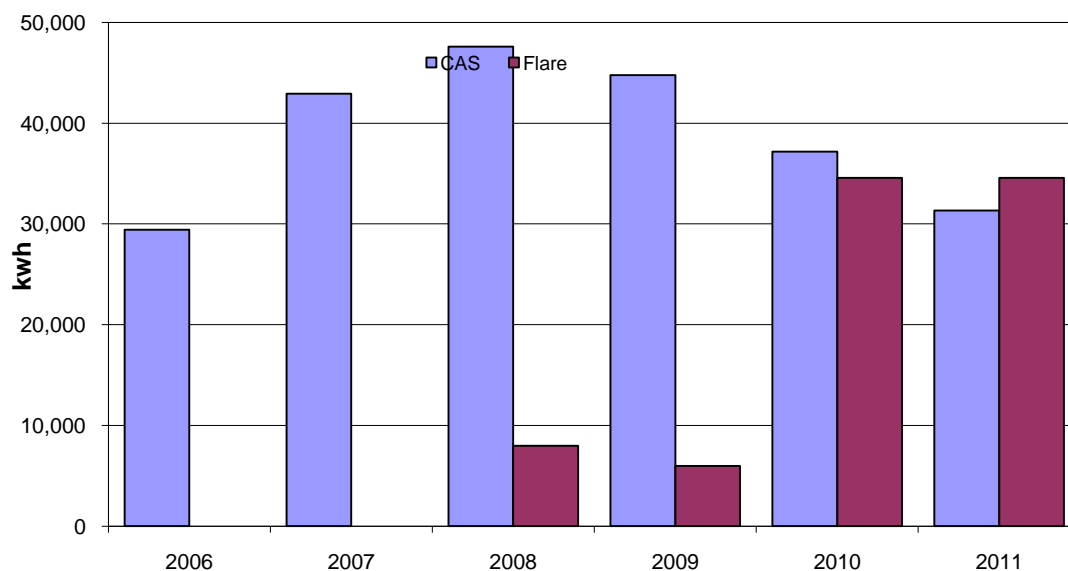


## 5.0 ENERGY CONSUMPTION/GENERATION

### 5.1 Resource and Energy Consumption Summary

The landfilling of waste has ceased at the site and therefore fuel is no longer used by site machinery. Records indicate that the ESB usage at the landfill site office during the year amounted to 64, 943kW hours in 2011. Usage trends are shown in Figure 5.1 below.

Figure 5.1: Energy Usage at Raffeen Landfill & Civic Amenity Site



A permanent flare was also installed in 2008 and was commissioned at the end of June. The energy usage for this is accounted for on a separate connection. In total 31,336 kW hrs were used to run this flare in 2011.

The packing of the skips carried out by JCB used an estimated total of 6,000 litres in 2011.

All electricity at Raffeen is provided by Energia and is “green” electricity i.e. it is carbon free and there is no carbon tax is payable.

## **6.0 ENVIRONMENTAL INCIDENTS AND COMPLAINTS**

Condition 3 of the Waste Licence requires that the licensee shall make written records of environmental incidents and complaints.

### **6.1 Incidents & Complaints**

There were no complaints or incidents in 2011.

### **6.2 Review of Nuisance Controls**

#### **6.2.1 Litter Abatement Measures**

Routine litter patrols are carried out on the instruction of the Facility Manager to ensure that any loose litter is collected. Litter patrols include the area of the civic amenity centre as well as all fences and the public road along the site boundary. The effectiveness of the litter control techniques are assessed weekly and documented in the weekly site inspection record sheet.

All contractors transporting materials offsite for recycling from the civic amenity centre are required to ensure that when transporting and discharging these loads that litter generation is kept to an absolute minimum. All vehicles are required to be totally sealed or covered with a net or tarpaulin to ensure that materials are not blown from the vehicles.

#### **6.2.2 Birds**

Municipal waste is no longer accepted for landfilling at the Raffeen waste facility. However, it is accepted into skips at the Civic Amenity Centre for transport to an alternative landfill. Waste is now being transported to Youghal Landfill or to Greenstar for segregation and pre-treatment prior to landfilling. Waste accepted from street sweepings has decreased.

To mitigate the impact of birds perching on skips of street sweepings when there is no human activity in that area the skips were previously retrofitted with a roll-over tarpaulin cover. They are easily used and can be operated by one person. They are opened by Council workers when depositing residual waste and closed immediately afterwards.

#### **6.2.3 Vermin and Flying Insects**

The situation is continuously monitored by the Facility Manager and preventative baiting is undertaken by a specialist contractor on a regular basis. A comprehensive pest control programme is in place on site and on occasions, particularly coming into the winter, when vermin tend to migrate to warmer locations the pest control company lay extra bait where needed.

Flies do not pose a problem at the Raffeen Civic Amenity Centre. Residual (municipal) waste bins are emptied frequently at Youghal landfill and the Greenstar facility. Wasps however, do occasionally cause problems during the summer, Wasp ‘catchers’ and spray were purchased to minimise the impact on visitors to the site.

#### **6.2.4 Fires**

The burning of waste or other material is not permitted at the facility. In the event that a fire breaks out on the site, it will be treated as an emergency and dealt with immediately, in accordance with the Emergency Response Procedure for dealing with fires.

#### **6.2.5 Odour Control**

The landfilling of waste no longer presents a potential to generate odours. Other potential odours include odours from gas production from the waste body of the landfill. However, the gas management system and permanent flaring has been installed and commissioned since July 2008, and odours have not been a problem from the waste body.

The operation of the civic amenity centre also has the potential to generate odours. Odours may occur from putrescible waste in skips; however residual (municipal) waste bins are emptied frequently at Youghal and Greenstar Ltd. Should it be required collection bins and skips in the civic amenity centre shall be washed to prevent the generation of malodours. Weekly inspections of the site have shown odour has not been a nuisance. Odour, where detected has been from farming activities in the area.

#### **6.2.6 Dust Control**

During 2011 the Facility Manager organised for road sweeping to be undertaken as necessary. The Facility Manager ensures that effective dust control measures are implemented on site.

## **7.0 ENVIRONMENTAL MANAGEMENT PROGRAMME REPORT**

In accordance with Condition 2 (Management of the Facility) of the Waste Licence (68-2), Cork County Council (CCC) is required to establish and maintain a documented Environmental Management System (EMS) for the facility.

### **7.1 Objectives and Targets**

The purpose of this section is to determine what progress has been made towards achieving the objectives and targets proposed during the previous year, and how the objectives will continue to be met and improved upon in the forthcoming year. It also outlines any new objectives proposed for the forthcoming year.

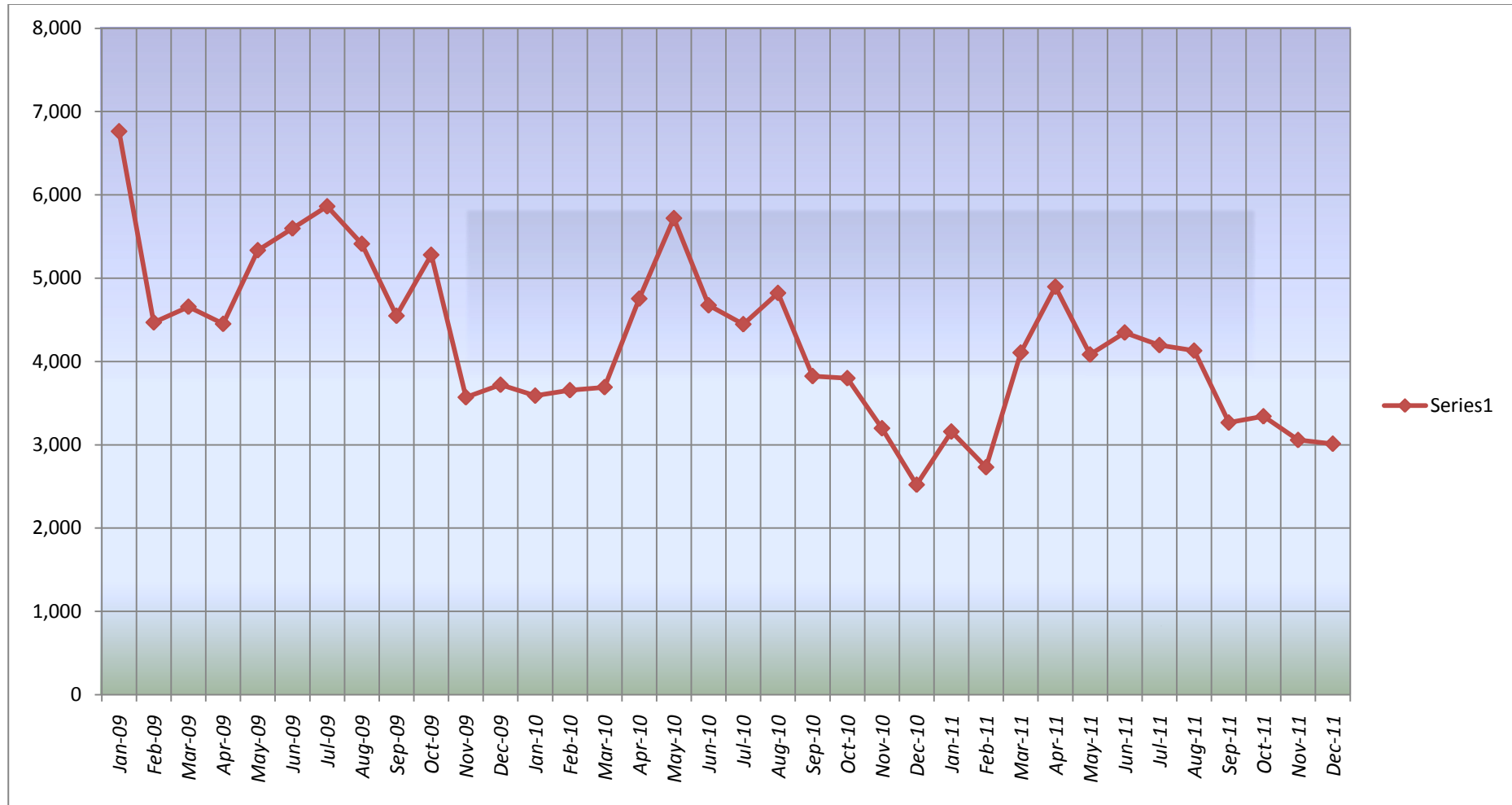
#### **Objective 1: Establish an environmental awareness programme on site targeting the further development of recycling.**

The civic amenity centre opened in late January 2005 and since then has increased recycling awareness in the area to the extent that the number of users at the site has been increasing steadily over the years. User numbers (or vehicles counted entering the site) dropped in 2011 compared to 2010; this may be as a result of the current economic climate and the fact that people are storing their recyclables for longer periods of time resulting in fewer trips to the site.

In 2011 over 45,493 vehicles were logged as entering the facility with the intention to recycle or dispose of material. This is a reduction on the numbers for 2010 (50,424 vehicles) 2009 (60,001 vehicles). Usage has decreased on everyday of the week. Saturdays have also shown a decrease in numbers (based on averages), when compared to previous years.



**Figure 7.1: Monthly User Numbers at Raffeen CA 2009-2011**



General Operatives are updated continuously on recycling information relative to the operation of the site. Leaflets on the facility, what it accepts and how to present it at the site and on other recycling and environmental matters are available upon request at the site office. Numerous telephone queries are responded to on a daily basis advising people on the best way to present their materials at the site or sometimes a more suitable location.

The Facility Manager provides information on recycling and has completed the FÁS Waste Management Training Course. Any deputy/assistant Facility manager will also undergo this training. All general operatives have completed the FÁS Waste Operator Training Course.

Leaflets have been sent to each household in the cork county through An Post during 2011 detailing the materials accepted at each recycling site in Cork County.

The responsibility of achieving these targets lie with the Facility Manager, Deputies/ Assistants and the General Operatives employed at the site.

**Objective 2: Cork County Council propose to continue investigating new materials and markets for collected recyclable material at the civic amenity centre.**

Cork County Council provides collection facilities for the recycling of a wide range of goods. Materials currently collected at the civic amenity/ recycling centre are listed in Section 2.1 Waste Quantities and Composition. All aspects including costs of recycling versus landfilling and the impacts of certain materials in landfill (e.g. paints, aerosols, engine oil, containers, and polystyrene) must be carefully considered for the future operations of the site.

**Objective 3: Cork County Council to examine the viability of inviting local school groups or other interested parties to the site.**

A number of groups and individuals are interested in recycling and seen the activities at a working site. The national school in Belgooly Co. Cork visited the site in May 2011 and highlighted what they learned from the visit on their website and in the reports submitted after the visit. Internal staff from the Councils Contact Centre visited the site in May & June 2011, in order to get a better understanding of the site and how it operates. So as they can deal with customer queries in a more informed manner.

It is intended to continue these informative site visits as there has been very good feedback in the past from students and teachers. It is the responsibility of the Facility Manager to ensure this occurs.

**Objective 4: Cork County Council to investigate the possibility of providing nesting boxes and the establishment of bird hides.**

Tree and shrub planting commenced on February 8<sup>th</sup> 2008 and were completed by mid April 2008. A suitable amount of time must be given for the establishment of

vegetation, after which a suitable programme for the installation of nesting boxes will be investigated.

### **Objective 5: Implementation of Landscape Proposal**

The target of final restoration was achieved during 2008. The installation of the final capping was completed during summer 2007. Grass seeding operations took place between September and October 2007 and tree and shrub planting commenced February 2008. Landscaping works were completed by mid April 2008.

The implementation of the landscape proposals satisfies the following objectives:-

- Re-establishes native woodlands and scrub habitats that reflect the character of existing habitats and provides a wildlife corridor between existing fragmented habitats.
- Creates a diverse range of habitats including aquatic, marsh, meadow, hedgerow, scrub and woodland.
- Ensures that all adverse visual impacts affecting local properties and the landscape in general are effectively mitigated against.
- Provides an attractive setting to the recycling facility.
- Provides a planting specification that shall minimize long-term maintenance.

### **Objective 6: Maintain monitoring programme**

The environmental monitoring programme has been in operation at the site since before the waste licence was issued. The programme meets the requirements of the waste licence and was expanded in 2006 in response to requests made by the Agency. The monitoring programme continued at current frequencies during 2011. It is proposed that a submission shall be made to the Agency outlining the proposed revised monitoring frequencies during the aftercare period during 2012.

### **Objective 7: Full review of all procedures and forms**

Procedures at the site were reviewed during 2011; it will be completed in 2012. This is the responsibility of the Facility Manager and General Operatives.

## **7.2 Summary of Procedures Associated with the Facility**

There have been no new procedures developed at the site during the reporting period.

## **7.3 Financial Provisions**

Cork County Council is committed to protecting the environment and will ensure the provision of the necessary funds to meet any financial commitments or liabilities incurred by the carrying out of the disposal activities relating to the Raffeen Landfill. These commitments include compliance with the waste management licence (No. W0023-01) and restoration and aftercare of the site as specified in Condition 8 of the licence.

Under Section 38 of the Waste Management Act, 1996, Cork County Council “shall provide and operate, or arrange of, such facilities as may be necessary for the recovery and disposal of household waste arising within the functional area”. Compliance with section 38 and all other relevant sections of the waste management act, 1996 is a statutory obligation of Cork County Council. Cork County Council annually in the preparation of the “Book of Estimates” and the passing of these estimates shall make provision for any capital works and maintenance works required to fulfil conditions of the waste licence for the Raffeen Landfill.

In 2011 budget funding of approximately €135,000 was made available for operational / maintenance costs of the landfill, and approximately €520,000 for the operation and maintenance of the Civic Amenity Site.

## **8.0 ENERGY AUDIT**

In October 2007 an energy audit was carried out by the Energy Section of Cork County Council. A data logger recorded energy usage over a number of weeks. This identified lighting of the site as being the main usage of electricity on site contributing to 73% of energy costs. The audit identified an approximate daytime usage of 1.5 kW/hr compared to 8kW/hr at night. A night meter was installed in early November 2007 at Raffeen to bring costs down.

A further audit was undertaken in December 2008. A data logger recorded energy usage over a number of weeks. This identified lighting of the site as being the main usage of electricity on site. Operation of the Civic Amenity Site uses approximately 1.2 kW with occasional jumps of 7 - 12 kW during the day. However at night, with external lighting, usage averages at 8kW.

There is a night meter in use at Raffeen to reduce cost. However, it is recommended that motion sensors for the lighting be introduced to further reduce usage. This is currently under investigation by Cork County Council.



# **Appendices & Attachments**

**AER -2011**

**Appendix 1**

**ANNUAL NOISE SURVEY  
RAFFEEN CIVIC AMENITY AND  
LANDFILL SITE  
2011**

# DixonBrosnan

noise ecology water  
dixonbrosnan.com

Project 2011 annual environmental noise survey at Raffeen Landfill Site, Raffeen, Monkstown, Co. Cork				
Client Cork County Council				
Project no	No pages	Client reference	©DixonBrosnan 2011	
1151	9	W0023-01	v251011	
<p>DixonBrosnan Shronagreehy Kealkil Bantry Co Cork          Tel 086 813 1195   damian@dixonbrosnan.com            www.dixonbrosnan.com</p>				
Report no	Date	Edit	Prepared by	Chkd
1151.2.1	26.10.11	Release 1	Damian Brosnan	CD
<p>This report and its contents are copyright of DixonBrosnan. It may not be reproduced without permission. The report is to be used only for its intended purpose. The report is confidential to the client, and is personal and non-assignable. No liability is admitted to third parties. Do you <i>really</i> need a printed copy of this report?</p>				

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Appendix 2: Monitoring stations	5
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Appendix 4: Noise data	7
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## 1 Introduction

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1.1 DixonBrosnan noise consultants were instructed by Cork County Council to carry out the 2011 annual environmental noise survey at their Raffeen Landfill Site (RLS) facility at Raffeen, Monkstown, Co. Cork. The survey is a requirement of waste licence W0023-01 issued by the Environmental Protection Agency in respect of the facility. Several noise conditions attached to the licence are presented in **appendix 1**.

1.2 The noise survey was undertaken on Thursday 13.10.11 at seven offsite monitoring stations specified in the licence, and shown in **appendix 2**. Survey methodology, equipment specifications and weather conditions are outlined in **appendix 3**. As the facility does not operate at night, the survey was confined to daytime hours.

1.3 The RLS civic amenity area near the site entrance was open to users throughout the survey. Noise emissions arose from user waste disposal activities and from vehicle movements through the facility gate. Emissions also arose occasionally from waste management operations undertaken in the vicinity of the civic amenity area. No noise emissions arose from the onsite gas flare plant. There were no noise sources deeper within the landfill site, which is no longer in use.

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## 2 Results

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2.1 Recorded noise data are presented in **appendix 4**, and frequency spectra in **appendix 5**. No emissions were audible from the RLS facility at six of the seven monitoring stations. Background noise levels (as  $L_{AF90\ 30\ min}$ ) were 42 dB or less at these stations. It follows that RLS emissions were significantly lower than the 55 dB daytime limit specified in licence W0023-01.

2.2 The proximity of N2 to the RLS entrance resulted in site emissions becoming audible at this station. However, as at all other stations, road traffic noise remained dominant, resulting in an  $L_{Aeq\ 30\ min}$  level of 55 dB. The contribution specifically attributable to the RLS facility at N2 was estimated at 30-35 dB, thus lower than the 55 dB daytime noise limit, and lower than measured previously due to the absence of emissions from the onsite gas flare plant located near N2. It should be noted that there are no noise sensitive locations in the vicinity of station N2.

2.3 No audible tones or impulses were noted at any of the stations, and no tones were detected by third octave band analysis.

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## 3 Conclusions

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3.1 RLS noise emissions were not audible at six of the seven measurement stations. Site emissions were therefore significantly lower than the 55 dB daytime noise limit set out in the licence.

3.2 Vehicle movements through the site entrance, and waste disposal activities at the onsite civic amenity area, gave rise to an estimated noise contribution of 30-35 dB at N2, the only station where site emissions were audible. This level was lower than the 55 dB daytime noise limit. There are no sensitive receptors in the vicinity of N2.

3.3 No audible tones or impulses were noted in site emissions at the measurement stations.

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## Appendix 1: W0023-01 noise conditions

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### E.3 Noise

Noise monitoring locations shall be those as set out in Table E.3.1 and Drawing No. A1/3 Rev. A of the application.

Table E.3.1 Noise Monitoring Locations

STATION	
N1	N5
N2	N6
N3	N7
N4	

Table E.3.2 Noise Monitoring Frequency and Technique

Parameter	Monitoring Frequency	Analysis Method/Technique
L(A) <sub>EQ</sub> [30 minutes]	Annual	Standard <sup>Note 1</sup>
L(A) <sub>10</sub> [30 minutes]	Annual	Standard <sup>Note 1</sup>
L(A) <sub>90</sub> [30 minutes]	Annual	Standard <sup>Note 1</sup>
Frequency Analysis(1/3 Octave band analysis)	Annual	Standard <sup>Note 1</sup>

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

**F.1 Noise Emissions:** (Measured at the monitoring points indicated in Table E.3.1).

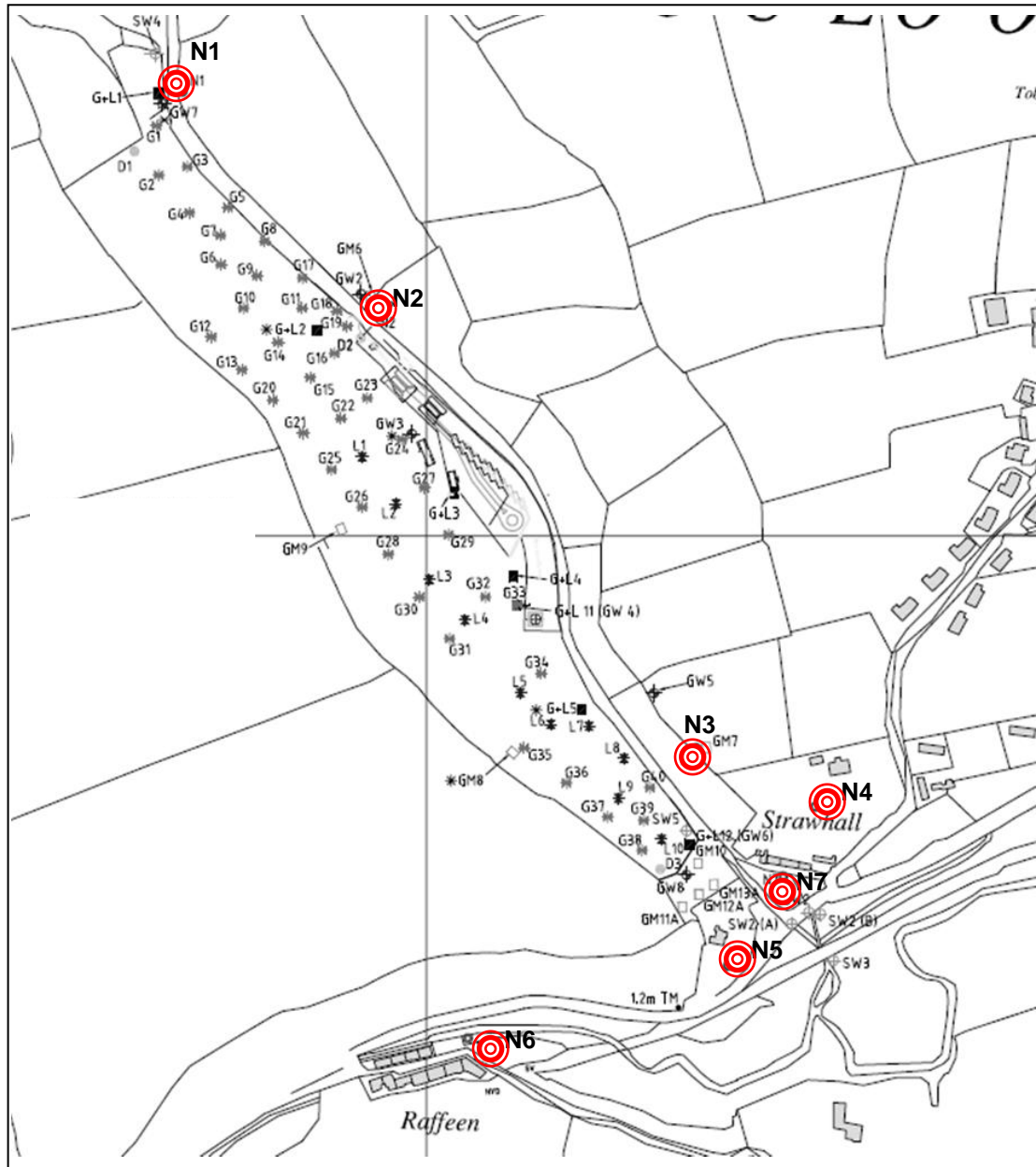
Day dB(A) L <sub>Aeq</sub> (30 minutes)	Night dB(A) L <sub>Aeq</sub> (30 minutes)
55	45

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**Appendix 2: Monitoring stations**

**N0**

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### Appendix 3: Survey details

File	Project ref.	1151
	Location	Raffeen landfill site Monkstown
	Stations	N1 N2 N3 N4 N5 N6 N7
	Purpose	2011 annual waste licence compliance survey
	Comment	Civic amenity area in use, main landfill area closed
Event	Date	13.10.11
	Day	Thursday
	Time	1130-1600
	Operator	Damian Brosnan BSc MIOA MEnvSc
Conditions	Cloud cover	Gradually increasing to 100 %
	Precipitation	0 mm
	Temperature	15-17 °C
Wind	Direction	S
	Speed	Breeze gradually developing, 0-2 m/s
	Measurement	Anemo anemometer 2 m above ground level
Sound level meter	Instrument	Bruel & Kjaer Type 2250
	Instrument serial no.	2506594
	Microphone serial no.	2529531
	Application	BZ7224 Version 2.5
	Bandwidth	Broadband
	Max input level	141.16 dB
	Broadband weightings	Time: Fast      Frequency: AC
	Spectrum weightings	Time: Fast      Frequency: Z
	Windscreen correction	UA-1650
	Sound Field correction	Free-field
	UKAS calibration	09.12.09
	UKAS calibration certificate	Available on request
	Onsite calibration	Time
Calibration type		External
Sensitivity		47.81 mV/Pa
Post measurement check		93.9 dB
Onsite calibrator	Instrument	Bruel & Kjaer Type 4231
	Instrument serial no.	2342544
	UKAS calibration	13.10.10
	UKAS calibration certificate	Available on request
Methodology	Standard	ISO 1996 Acoustics: Description and measurement of environmental noise - Part 1 (2003) & Part 2 (2007)
	Exceptions	-



	Intervals	30 min
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#### Appendix 4: Noise data

Survey date: 13.10.11

Station	Time	L <sub>Aeq</sub> 30 min dB	L <sub>AF10</sub> 30 min dB	L <sub>AF90</sub> 30 min dB	Specific level* dB	Noise audible
N1	1450-1520	53	53	29	<29	No facility emissions audible. Intermittent traffic on public road dominant when present. Sporadic noise emissions audible from commercial premises to N. Birdsong/calls and aircraft.
N2	1526-1556	55	56	27	30-35	Sporadic emissions audible from facility, arising from user waste disposal activities and user's vehicles through entrance. Emissions audible at low level, and not significant. Intermittent traffic on public road dominant when present. Bird song/calls and aircraft.
N3	1401-1431	59	53	33	<33	No facility emissions audible. Intermittent traffic on public road dominant when present. Traffic movements also audible to S. Bird song/calls and aircraft. Distant grass mower audible to S.
N4	1212-1242	45	47	40	<40	No facility emissions audible. Grass mower on golf course to S continuously audible at low level. Frequent traffic movements on roads below N4 almost continuously audible, including N28 traffic to S. Bird song/calls and aircraft. Dog barking repeatedly audible to S in distance.
N5	1249-1319	58	62	42	<42	No facility emissions audible. Grass mower on golf course to S continuously audible at low level, becoming dominant at times between local traffic movements. Frequent local road traffic almost continuously audible on approaches. N28 traffic to S also slightly audible. Bird song/calls and aircraft.
N6	1136-1206	52	56	37	<37	No facility emissions audible. Frequent road traffic on local roads dominant, and audible on approaches. No other noise audible apart from bird song/calls and aircraft.

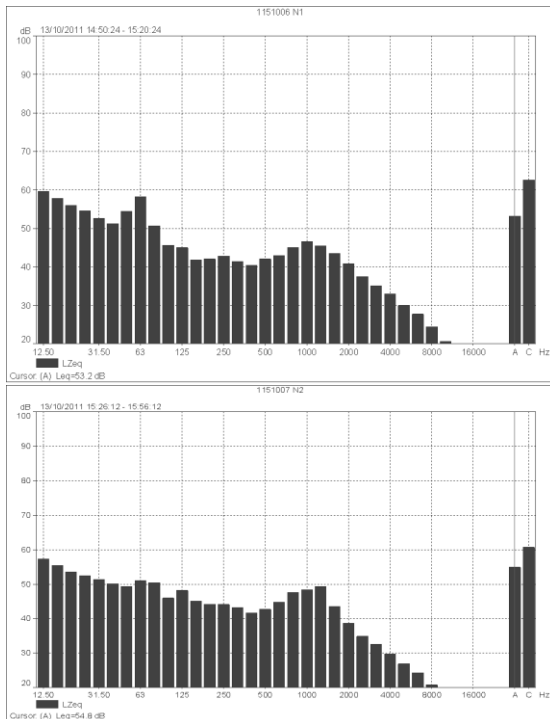
N7	1326-1356	54	56	41	<41	No facility emissions audible. Grass mower on golf course to S continuously audible at low level. Frequent local road traffic almost continuously audible on approaches. Water flow audible continuously in nearby drain. Bird song/calls and aircraft.
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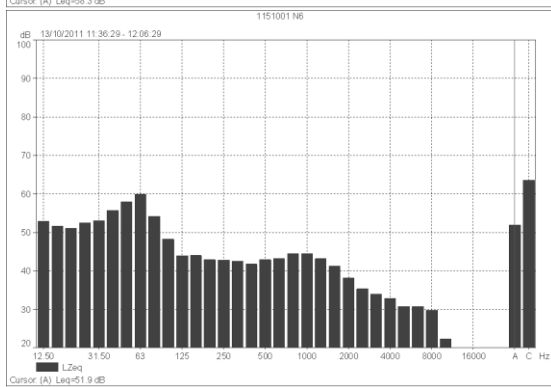
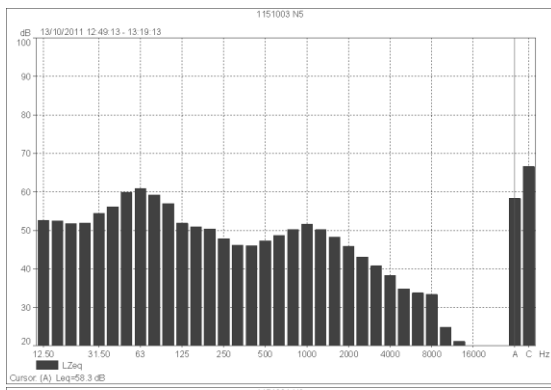
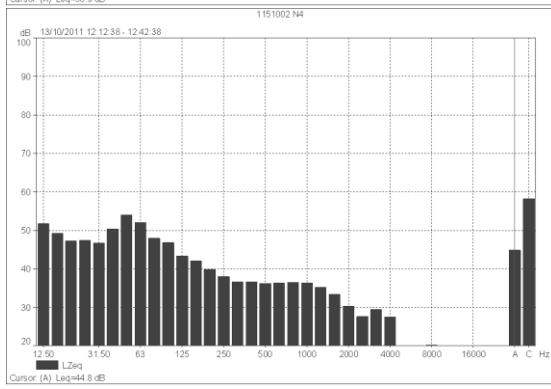
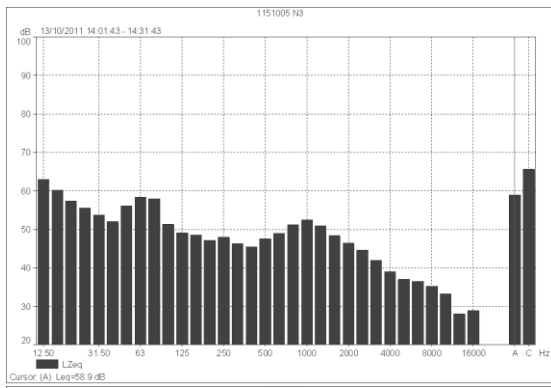
\*Specific level: Sound pressure level contribution considered attributable to facility, determined using real time assessment, field notes, time history profiles, statistical analysis, frequency spectra, near field correction if applicable, and other parameters.

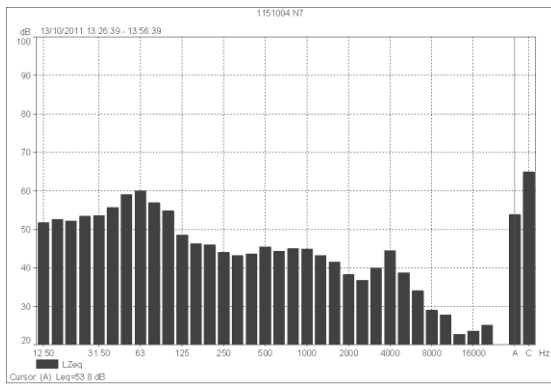
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## Appendix 5: Frequency spectra

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## Appendix 6: Glossary

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Ambient	Total noise environment at a location, including all sounds present.
A-weighting	Weighting or adjustment applied to sound level to approximate non-linear frequency response of human ear. Denoted by suffix A in parameters such as $L_{Aeq T}$ , $L_{AF10 T}$ , etc.
Background level of time interval T.	$L_{AF90 T}$ . A-weighted sound pressure level of residual noise exceeded for 90 %
Decibel	Shortened to dB. Unit of noise measurement scale. Based on logarithmic scale so cannot be simply added or subtracted. 3 dB difference is smallest change perceptible to human ear. 10 dB difference is perceived as doubling or halving of sound level. <b>Throughout this report noise levels are presented as decibels relative to 20 <math>\mu</math>Pa.</b> Examples of decibel levels are as follows: 20 dB: very quiet room; 30-35 dB: night-time rural environment; 55-65 dB: conversation; 80 dB: busy pub; 100 dB: nightclub.
Fast response	0.125 seconds response time of sound level meter to changing noise levels. Denoted by suffix F in parameters such as $L_{AF10 T}$ , $L_{AF90 T}$ , etc.
Frequency	Number of cycles per second of a sound or vibration wave. Low frequency noise may be perceived as hum, while whine represents higher frequency. Range of human hearing approaches 20-20,000 Hertz.
Hertz	Shortened to Hz. Unit of frequency measurement.
Impulse	Noise which is of short duration, typically less than one second, sound pressure level of which is significantly higher than background.
Interval T, etc.	Time period T over which noise monitoring is conducted. Denoted by T in $L_{Aeq T}$ , $L_{AF90 T}$
$L_{Aeq T}$	Equivalent continuous sound level during interval T, effectively representing average A-weighted noise level.
$L_{AF}$	Sound pressure level averaged over one second, and changing each second in fluctuating noise environment.
$L_{AF10 T}$ noise.	Sound pressure level exceeded for 10% of interval T, usually used to quantify traffic noise.
$L_{AF90 T}$	Sound pressure level exceeded for 90% of interval T, usually used to quantify background noise. May also be used to describe noise level from continuous steady or almost-steady source, particularly where local noise environment fluctuates.
$L_{Req T}$	Rating noise level, derived from $L_{Aeq T}$ plus specified adjustments for tonal and impulsive characteristics. Equivalent to $L_{Ar T}$ used by EPA.
Near field	Noise levels recorded near walls or other surfaces, artificially increased due to reflections. Levels near walls may be increased by up to 3 dB, and up to 6 dB near corners. Free field conditions may be achieved by maintaining separation distance of at least 3.5 m from walls.
Noise sensitive location	Any dwelling house, hotel or hostel, health building, educational establishment, place of worship or entertainment, or any other facility or area of high amenity which for its proper enjoyment requires absence of noise at nuisance levels.

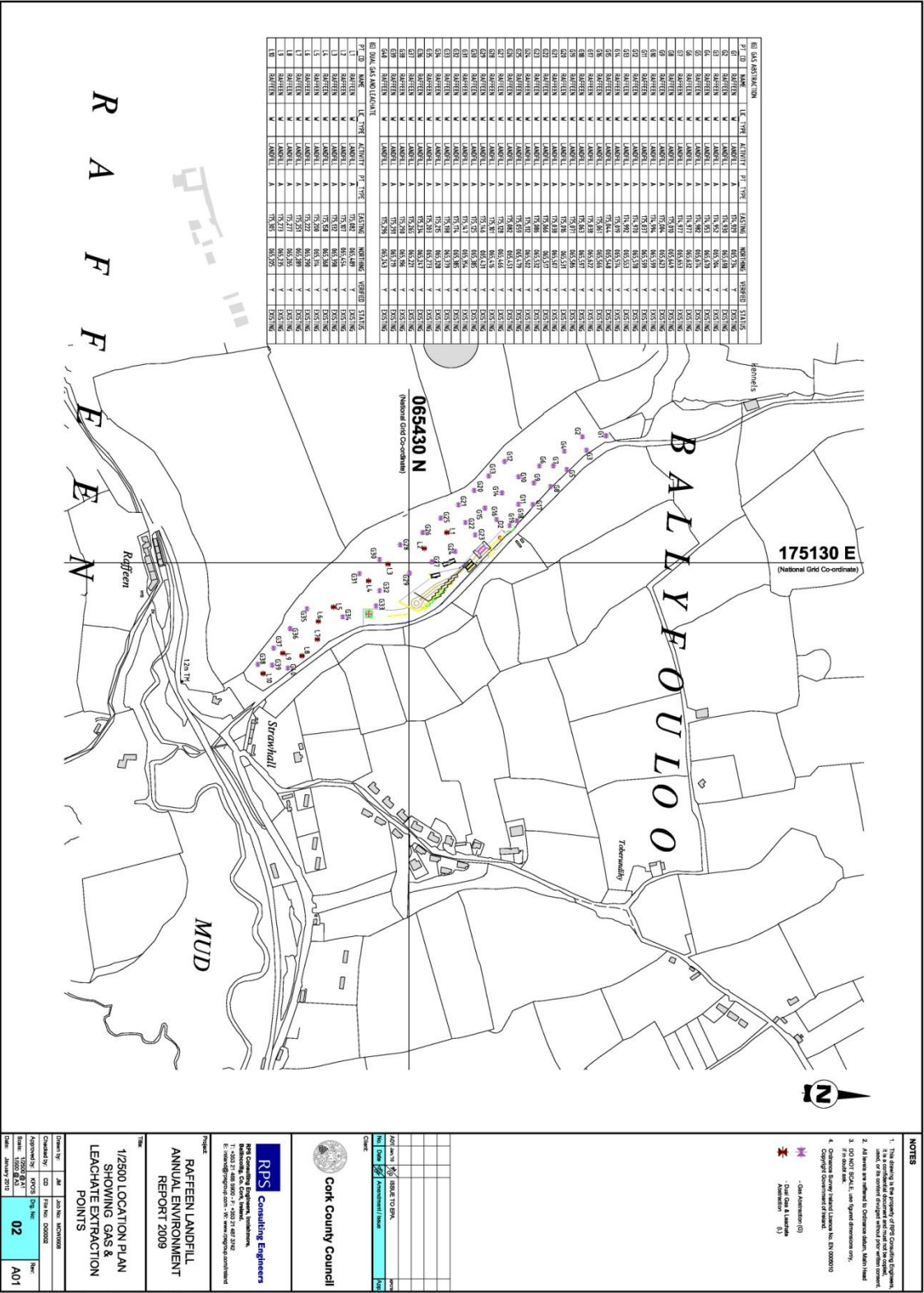
1/3 octave band	Frequency spectrum may be divided into octave bands. Upper limit of each octave is twice lower limit. Each octave may be subdivided into thirds, allowing greater analysis of tones.
Residual level ambient.	Noise level remaining when specific source is absent or does not contribute to ambient.
Specific level	Sound pressure level contribution arising from specific noise source, measured directly or by estimation or calculation.
Tone	Character of noise caused by dominance of one or more frequencies which may result in increased noise nuisance.
Z-weighting	Standard weighting applied by sound level meters to represent linear scale.

# Attachments

- Drawing 01 - Location Plan Showing Environmental Monitoring Points
  
- Drawing 02 – Location Plan Showing Gas & Leachate Extraction Points
  
- Drawing 03 – Site Plan Showing Final Capping Levels and Details







PT ID	NAME	LC TYPE	ACTIVITY	PT TYPE	EASTING	NORTHING	VERTICAL	STATUS
G01	SHAFELLEN	M	LAM001	A	176,502	662,526	Y	1/25/19/06
G02	SHAFELLEN	M	LAM001	A	176,502	662,526	Y	1/25/19/06
G03	SHAFELLEN	M	LAM001	A	176,502	662,526	Y	1/25/19/06
G04	SHAFELLEN	M	LAM001	A	176,502	662,526	Y	1/25/19/06
G05	SHAFELLEN	M	LAM001	A	176,502	662,526	Y	1/25/19/06
G06	SHAFELLEN	M	LAM001	A	176,502	662,526	Y	1/25/19/06
G07	SHAFELLEN	M	LAM001	A	176,502	662,526	Y	1/25/19/06
G08	SHAFELLEN	M	LAM001	A	176,502	662,526	Y	1/25/19/06
G09	SHAFELLEN	M	LAM001	A	176,502	662,526	Y	1/25/19/06
G10	SHAFELLEN	M	LAM001	A	176,502	662,526	Y	1/25/19/06
G11	SHAFELLEN	M	LAM001	A	176,502	662,526	Y	1/25/19/06
G12	SHAFELLEN	M	LAM001	A	176,502	662,526	Y	1/25/19/06
G13	SHAFELLEN	M	LAM001	A	176,502	662,526	Y	1/25/19/06
G14	SHAFELLEN	M	LAM001	A	176,502	662,526	Y	1/25/19/06
G15	SHAFELLEN	M	LAM001	A	176,502	662,526	Y	1/25/19/06
G16	SHAFELLEN	M	LAM001	A	176,502	662,526	Y	1/25/19/06
G17	SHAFELLEN	M	LAM001	A	176,502	662,526	Y	1/25/19/06
G18	SHAFELLEN	M	LAM001	A	176,502	662,526	Y	1/25/19/06
G19	SHAFELLEN	M	LAM001	A	176,502	662,526	Y	1/25/19/06
G20	SHAFELLEN	M	LAM001	A	176,502	662,526	Y	1/25/19/06
G21	SHAFELLEN	M	LAM001	A	176,502	662,526	Y	1/25/19/06
G22	SHAFELLEN	M	LAM001	A	176,502	662,526	Y	1/25/19/06
G23	SHAFELLEN	M	LAM001	A	176,502	662,526	Y	1/25/19/06
G24	SHAFELLEN	M	LAM001	A	176,502	662,526	Y	1/25/19/06
L01	SHAFELLEN	M	LAM001	A	176,502	662,526	Y	1/25/19/06
L02	SHAFELLEN	M	LAM001	A	176,502	662,526	Y	1/25/19/06
L03	SHAFELLEN	M	LAM001	A	176,502	662,526	Y	1/25/19/06
L04	SHAFELLEN	M	LAM001	A	176,502	662,526	Y	1/25/19/06
L05	SHAFELLEN	M	LAM001	A	176,502	662,526	Y	1/25/19/06
L06	SHAFELLEN	M	LAM001	A	176,502	662,526	Y	1/25/19/06
L07	SHAFELLEN	M	LAM001	A	176,502	662,526	Y	1/25/19/06
L08	SHAFELLEN	M	LAM001	A	176,502	662,526	Y	1/25/19/06
L09	SHAFELLEN	M	LAM001	A	176,502	662,526	Y	1/25/19/06
L10	SHAFELLEN	M	LAM001	A	176,502	662,526	Y	1/25/19/06

**NOTES**

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**Cork County Council**  
 Project: RAFFEE LANDFILL ANNUAL ENVIRONMENT REPORT 2009

Title: 1/2500 LOCATION PLAN SHOWING GAS & LEACHATE EXTRACTION POINTS

Checked by:	AM	Date:	10/03/2010
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