
ENVIRONMENTAL BALANCE IN DESIGN AND CONSTRUCTION



# BALLEALLY LANDFILL, BALLEALLY, LUSK, CO. DUBLIN

## ANNUAL MONITORING REPORT:

## Report Period: January 2009 – December 2009

## WASTE LICENCE REF. NO. W0009-02

March 2010

Fingal County Council
Comhairle Contae Fhine Gall

FEHILY TIMONEY & COMPANY




# BALLEALLY LANDFILL,
# BALLEALLY, LUSK,
# CO. DUBLIN

## ANNUAL MONITORING REPORT:

## Report Period: January 2009 – December 2009

## WASTE LICENCE REF. NO. W0009-02

## COPY

March 2010

Fingal County Council
Comhairle Contae Fhine Gall

FEHILY TIMONEY & COMPANY

# BALLEALLY LANDFILL,
# BALLEALLY, LUSK,
# CO. DUBLIN

## ANNUAL MONITORING REPORT:

## Report Period: January 2009 – December 2009

## WASTE LICENCE REF. NO. W0009-02



User is Responsible for Checking the Revision Status of This Document

| Rev | Description | Prepared | Checked | Approved | Date: |
|---|---|---|---|---|---|
| 0 | Issue to Client | DD (FCC-ML)/MG | TR | | 29.03.2010 |

**Client:** Fingal County Council

**Keywords:** Annual Environmental Report, landfill environmental monitoring, landfill

**Abstract:** This report presents the Annual Environmental Report for Balleally landfill, Balleally, Lusk, Co. Dublin to the Environmental Protection Agency. The report covers the annual reporting period of 2009, in accordance with Waste Licence Reg. No. W0009-02.

## TABLE OF CONTENTS

PAGE

## TABLE OF CONTENTS

**PAGE**



## APPENDICES

## LIST OF FIGURES

**PAGE**



## LIST OF TABLES

**PAGE**

## LIST OF TABLES

**PAGE**

# 1. INTRODUCTION

In 2000 Fingal County Council (FCC) was granted a Waste Licence, Reg. 9-1 to continue operating Balleally Landfill. In July 2001 FCC applied for a review of this licence. On the 8th January 2003 the Environmental Protection Agency (EPA) issued FCC a second waste licence for Balleally Landfill: Waste Licence W0009-02. This licence supersedes the previous licence 9-1 and it permits the operation of a non-hazardous landfill. In accordance with the requirements of Condition 11.6 of the Waste Licence, an Annual Environmental Report (AER) for the facility must be submitted to the EPA.

This report was part written by both Fehily Timoney & Company (FTC) and FCC. FTC wrote the environmental monitoring section (sections 3.1 through section 3.6), while FCC wrote all other sections. The report was compiled by FTC on behalf of FCC.

## 1.1 Reporting Period

The reporting period for the AER is 1st January to 31st December 2009. This is the 10th AER for the facility as required by the waste licence. This AER applies to the licence W0009-02.

## 1.2 Facility Location

FCC has responsibility for the management and operation of the facility. The facility is located at:

Balleally Landfill,
Balleally Lane,
Lusk,
Co. Dublin
Tel. (01) 8071835 Fax. (01) 8431600

National Grid reference 322500 252200.

Drawing DE07-164-03-001-(B) included in Appendix I presents a map of the facility and the surrounding locations.



## 1.3 Environmental Policy for Balleally

- Comply with the terms of our waste licence and all other relevant legislation and codes of practice.
- Strive for continuous improvement in the running of the facility, in order to minimise the effects of the landfill on the environment.
- Create better awareness and training for all staff involved in the running of the landfill.
- Develop a good relationship with local residents around Balleally for the betterment of the surrounding area.

# 2. SITE DESCRIPTION

Balleally Landfill is situated in Lusk, Co. Dublin. It has been in operation since 1971. Waste activities at the facility include landfill, special handling, a construction and demolition (C&D) recycling facility (which ceased in August 2005 due to capping commitments) and a civic amenity site (which ceased in December 2008 due to capping / operational commitments).

Condition 4.2 of W0009-02 restricts waste filling activities to meet Figure 2 of the 'Landscape Master Plan'. The final height of the facility shall be as shown in Figure 2 of the 'Landscape Master Plan'. The final height of the facility peak shall not exceed 40 mOD Malin Head.

On January 8th 2003 FCC was licensed to carry out the following waste activities at Balleally Landfill, Lusk, Co. Dublin subject to twelve conditions.

## 2.1 Licensed waste activity at the facility

Licensed waste disposal activities, in accordance with the Third Schedule of the Waste Management Act, 1996.

Class 1: Deposit on, in or under land (including landfill).

Class 5 Specially engineered landfill, including placement into lined discrete cells, which are capped and isolated from one another and the environment.

Class 10 Release of waste into a water body (including a seabed insertion).

Class 12 Repackaging prior to submission to any activity referred to in a preceding paragraph of this Schedule.

Class 13 Storage prior to submission to any activity referred to in a preceding paragraph of this Schedule, other than temporary storage, pending collection, on the premises where the waste concerned is produced.

Licensed waste recovery activities, in accordance with the *Fourth Schedule* of the Waste Management Act, 1996.

Class 2: Recycling or reclamation of organic substances, which are not used as solvents (including composting and other biological transformation processes).

Class 3: Recycling or reclamation of metals and metal compounds.

Class 4: Recycling or reclamation of other inorganic metals.

Class 9: Use of any waste principally as a fuel or other means to generate energy.

Class 11: Use of waste obtained from any activity referred to in a preceding paragraph of this Schedule.

Class 13: Storage of waste intended for submission to any activity referred to in a preceding paragraph of this Schedule, other than temporary storage, pending collection, on the premises where such waste is produced.

## 2.2 Total Quantity of Waste Accepted & Deposited

Waste received at Balleally to be disposed of at the landfill is weighed at the weighbridge on entry. Construction and demolition (C&D) material is also weighed and then stockpiled or used immediately for use in Specified Engineering Works (SEW). The quantity and composition of waste received, disposed of and recovered during the reporting period is detailed in Table 2.1.

### Table 2.1: Quantity and composition of waste received at the facility 2009

| Location & Waste Type | Waste Deposited (tonnes) in 2005 | Waste Deposited (tonnes) in 2006 | Waste Deposited (tonnes) in 2007 | Waste Deposited (tonnes) in 2008 | Waste Deposited (tonnes) in 2009 |
|---|---|---|---|---|---|
| **Tipface** | | | | | |
| Household | 66,203 | 62,056 | 63,708 | 50,489 | 37,789 |
| Commercial/Trade | 49,195.57 | 63,819 | 61,773 | 46,248 | 54,093 |
| Sewage Sludge | 3,402.24 | 4,623 | 7,466 | 5,091 | 315 |
| Industrial Non-Hazardous Sludge | 6,635 | 6,825 | 7,061 | 6,660 | 6,363 |
| **Civic Amenity** | | | | | **CLOSED** |
| Household | 5,801 | 4,891 | 4,867 | 3,959 | |
| **Local Fly Tipped** | | | 62 | 10 | |
| **Total** | **131,236.81** | **142,214** | **144,937** | **112,457** | **98,560** |

Note:-Table does not include materials used in SEW.



## 2.3 Remaining landfill capacity

As part of the Waste Management Strategy for the Dublin Region an extension to the landfill facility was applied for by reviewing the then current licence W0009-02. This was granted on 8th January 2003 (W0009-02) and Priority Construction Ltd. under the supervision RPS-MCOS were appointed to construct 6 No. lined cells at Balleally to provide an additional capacity of 1.29 million m3. Filling of Cell 1 started on 1st April, 2004 – Table 2.2 for information on inputs to date.

Filling of:

- Cell 1 commenced – 1st April, 2004.
- Cell 2 commenced – 8th June, 2004.
- Cell 3 commenced-22nd June, 2005.
- Cell 4 commenced – 6th October, 2006.
- Cell 5 commenced – 23rd August, 2007.
- Cell 6 commenced – 15th December, 2008.

The remaining capacity in the landfill was surveyed in July 2009, Table 2.4. Remaining capacity at the end of 2009 is estimated in Table 2.5.

### Table 2.2: Total Void Space Remaining as Surveyed on July 2009

| Void Space | Source | Void Space *(tonnes)* |
|---|---|---|
| **Cells 5, 6 (including piggybacking).** | FCC | 160,000 |

### Table 2.3: Remaining Void Space at Beginning of January 2010

| Void Space | Waste Deposited *(tonnes)* | Remaining Void Space *(tonnes)* |
|---|---|---|
| July 2009 | 8,342 | 160,000 |
| Aug 2009 | 8,701 | 151,658 |
| Sept 2009 | 9,353 | 142,957 |
| Oct 2009 | 9.190 | 133,604 |
| Nov 2009 | 8,504 | 124,414 |
| Dec 2009 | 8,626 | 115,910 |
| | | 107,284 |

## 2.4 Local environmental conditions

Balleally landfill site covers 50 ha in total. The east face of the landfill is bordered by the Dublin-Belfast railway line and to the south by Rogerstown Estuary. See Drawing DE07-164-03-001-(B) included in Appendix I.

The former landfill facility was approx. 40ha. The extension to this facility to the north west of the site (OS National Grid Ref. 3225E 2522N) consists of a new engineered lined cell (approx. 10 Ha). The primary objective of its design is to prevent or reduce negative effects on the environment arising from landfilling of waste.

All waste is deposited in a limited working face, covered daily and surrounded by soil bunds. The entire site is surrounded by perimeter berms to reduce the visual impact and to create shelter to minimise the conditions that create windblown litter.

# 3. ENVIRONMENTAL MONITORING

All original monitoring results certificates issued by Alcontrol Laboratories Ltd., for surface water, groundwater, leachate and outfall monitoring results and from Southern Scientific Services Ltd., for dust and particulate monitoring have been already included and submitted to the EPA in the four quarterly reports submitted during the reporting period. The original results certificates are not included again in this report. This report only presents summary data.

## 3.1 Groundwater

This section of the Annual Environmental Report presents the groundwater monitoring results.

### 3.1.1 Monitoring Locations

Groundwater monitoring was carried out at the locations shown on Drawing DE07-164-03-001-(B), Appendix I. As part of a previous extension to the landfill a number of the boreholes stipulated in W0009-02 are no longer accessible. During July 2004 a revised monitoring schedule was agreed with the Environmental Protection Agency (EPA) on which the present monitoring is based. Details of the groundwater locations now monitored are presented in Table 3.1.

Monitoring location MB18 is located up-gradient, approximately 535 m north of the landfill on private agricultural land. Access to the monitoring location was not granted during the monitoring period.

**Table 3.1: Groundwater Monitoring Locations**

| Station | Classification | Easting | Northing |
|---|---|---|---|
| MB18 | Eastern Upgradient | 323 245 | 252 783 |
| RC3 | Western Upgradient | 321 906 | 252 729 |
| MB35 | Southwestern Downgradient | 322 029 | 251 906 |
| CD1 | Control Drain N/W of Cell 1 | 322 008 | 252 356 |



### 3.1.2 Location Description

*Borehole MB35*
This borehole is situated approximately 190 m south of the landfill on the edge of the Inner Rogerstown Estuary, downgradient of the landfill

*Location CD1*
The control drain sampling location CD1 is situated approximately 30 m south of Balleally Lane west of the landfill extension. This drain collects groundwater from underneath the newly constructed lined cells.

*MB18*
This is an upgradient private well of Rogerstown House which lies to the north east of the landfill site along the estuary.

*RC3*
This upgradient borehole is situated approximately 535 m north of the landfill on private agricultural land.

### 3.1.3 Monitoring Parameters

Groundwater levels were monitored and a visual assessment was performed on a monthly basis at all groundwater wells. Groundwater monitoring location CD1 is sampled monthly and analysed for quarterly groundwater parameters, listed in Table D.5.1 of the Waste Licence. MB35 and RC3 are sampled quarterly and analysed for quarterly groundwater parameters, listed in Table D.5.1 of the Waste Licence.

Annual groundwater monitoring was also undertaken for CD1, MB35 and RC3 and the results are presented in Table 3.2

### 3.1.4 Interpretation of Results

Table 3.2. presents a summary of the groundwater chemical analysis results.

The groundwater results have been compared to the relevant Interim Guideline Value (IGV) set out in the EPA report *'Towards Setting Guideline Values for the Protection of Groundwater in Ireland'.* It should be noted that the groundwater beneath the landfill is likely to be estuarine in nature and would not generally be considered to be potable water.

Monthly monitoring at CD1 shows that results remained constant apart from a spike in readings during August, which returned to more normal levels during September and October (Figure 3.1).

Quarterly monitoring at groundwater locations indicates that ammoniacal nitrogen levels are lower up gradient at RC3 than on-site at CD1 and down gradient at MB35, suggesting landfill impact downgradient (Figure 3.2).

The quarterly chloride (Figure 3.3) and electrical conductivity (Figure 3.4) plots follow a similar trend to each other. Results from both RC3 and CD1 are similar with elevated chloride and electrical conductivity results found in all samples at MB35.

Both chloride and electrical conductivity levels are lower up-gradient at RC3, increasing on-site at CD1 slightly and then greatly down-gradient at MB35. Apart from Quarter 4 all chloride results at RC3 are elevated above the IGV level (30 mg/l Cl), with all four quarterly results elevated above the IGV levels in both CD1 and MB35.

All electrical conductivity results from RC3 are under the IGV level (1 mS/cm) and apart from Quarter 4 all results for CD1 are elevated above the IGV level. All results for MB35 are elevated above the IGV level.

It is likely that this trend in chloride and electrical conductivity values are indicative of saline water intrusion at location MB35 due to its position in close proximity to the Rogerstown estuary. Saline intrusion may also be influencing CD1 and RC3, to a degree.

During annual monitoring in Quarter 3 elevated sulphate, potassium, manganese and barium levels were recorded at MB35 and CD1, similar to elevated trends from previous years. Elevated levels of manganese and barium were also found in RC3. It is possible that manganese and barium are constituents of the local geology. Potassium and sulphate can also be found in geological formations. Potassium is also known to be a constituent of many artificial fertilisers. Higher levels of potassium and sulphate have been found on-site at CD1 and down gradient at MB35 than were detected up-gradient at RC3.

## Table 3.2: Annual Groundwater Monitoring Results

| Sample Identity | Units | IGV | MB35 | | | | CD1 | | | | RC3 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Q 1 | Q 2 | Q 3 | Q 4 | Q 1 | Q 2 | Q 3 | Q 4 | Q 1 | Q 2 | Q 3 | Q 4 |
| **pH (Field)** | pH units | 6.5 - 9.5 | 7.36 | 7.37 | 7.35 | 7.12 | 11.86 | 7.85 | 7.35 | 8.79 | 7.81 | 7.89 | 7.7 | 7.87 |
| **Temp (Field)** | o C | 25 | 9.3 | 14.8 | 11.6 | 10.9 | 4.6 | 15.8 | 15.1 | 7.6 | 6.2 | 14.7 | 13.5 | 9.5 |
| **Ammoniacal Nitrogen as N** | mg/l | 0.12 | 6.1 | 4.87 | 5.1 | 4.84 | 0.8 | 0.792 | 2.12 | 1.11 | <0.2 | 0.333 | <0.2 | <0.2 |
| **Dissolved Oxygen (Field)** | mg/l | No abnormal change | 4.56 | 5.16 | 0.42 | 2.6 | 8.36 | 7.57 | 1.06 | 6.89 | 8.11 | 9.13 | 5.4 | 6.1 |
| **Chloride** | mg/l | 30 | 18000 | 14100 | 14400 | 14800 | 48 | 41.3 | 33.7 | 44.7 | 44 | 37 | 34.6 | 29.6 |
| **Electrical Conductivity (Field)** | mS/cm | | 41.6 | 40.5 | 25.4 | 42 | 1.756 | 1.116 | 1.011 | 0.87 | 0.92 | 0.805 | 0.45 | 0.699 |
| **Electrical Conductivity @ 20C (Laboratory)** | mS/cm | 1 | 41 | 34.2 | 35.6 | 37.7 | 1.158 | 1 | 1.49 | 1.69 | 0.88 | 0.698 | 0.785 | 0.618 |
| **Total Organic Carbon** | mg/l | No abnormal change | 4 | 6.54 | 4.82 | 6.98 | 11 | 9.1 | 11.4 | 12.7 | 3 | <3.00 | 4.56 | <3 |

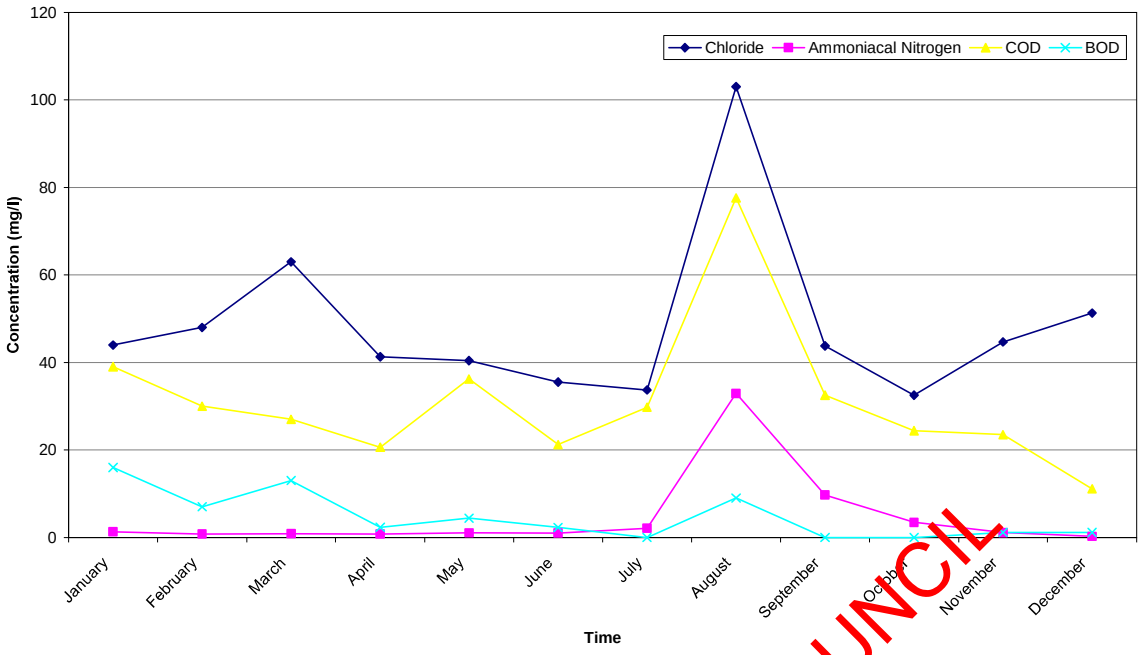


**Figure 3.1: CD1 Monthly Monitoring Results**



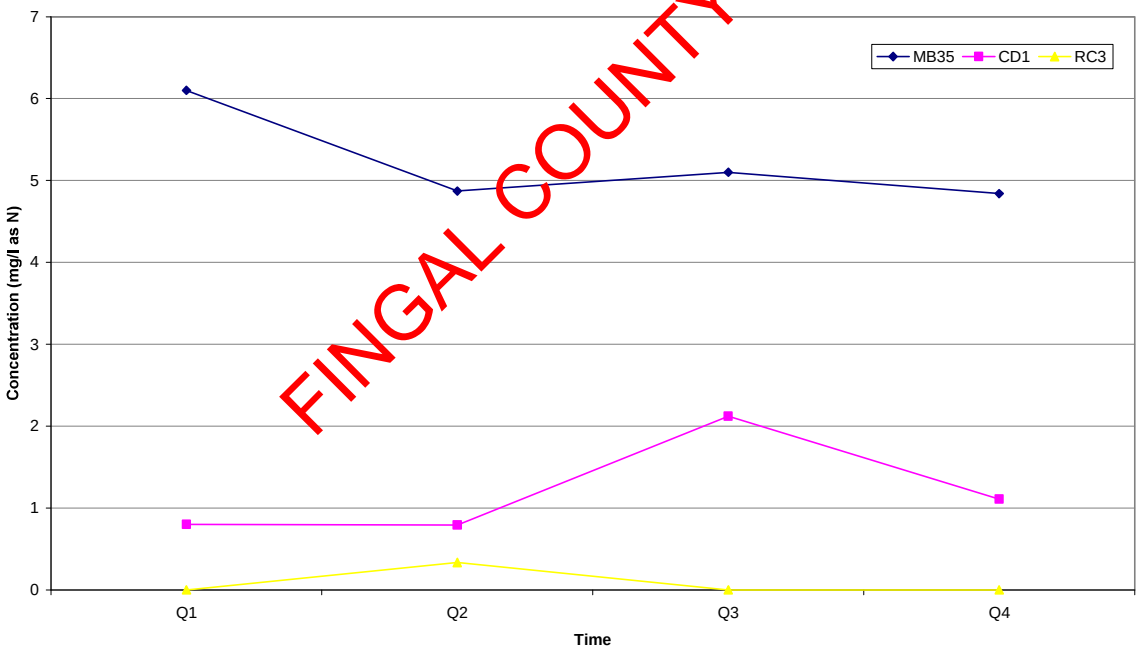


**Figure 3.2: Quarterly Ammoniacal Nitrogen Monitoring Results**

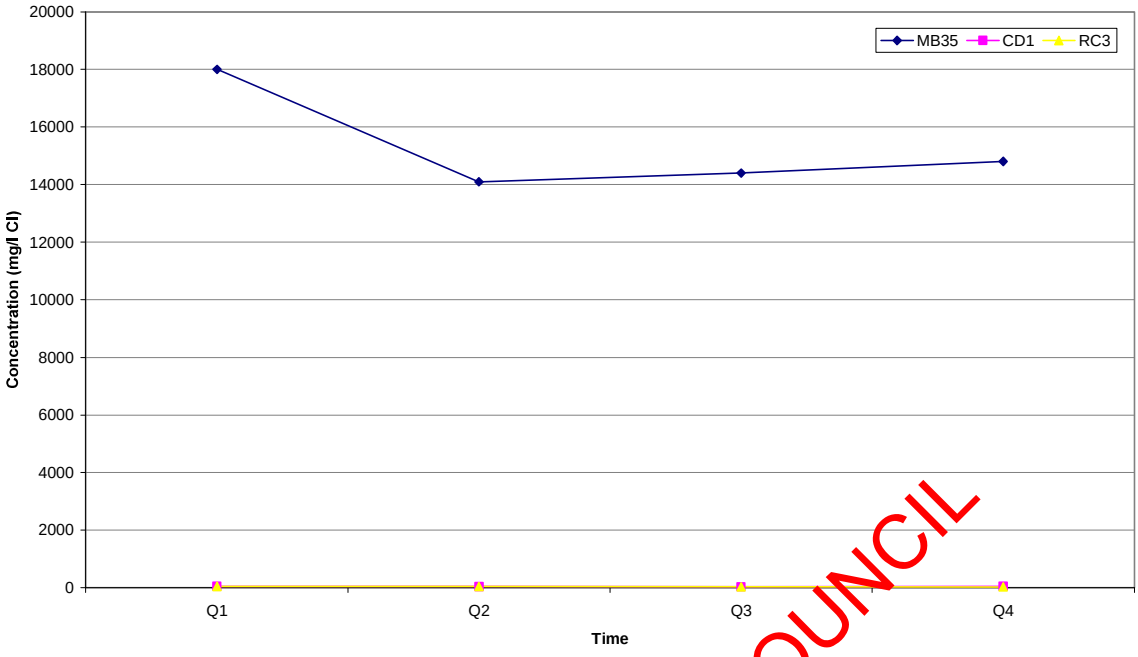


**Figure 3.3: Quarterly Chloride Monitoring Results**



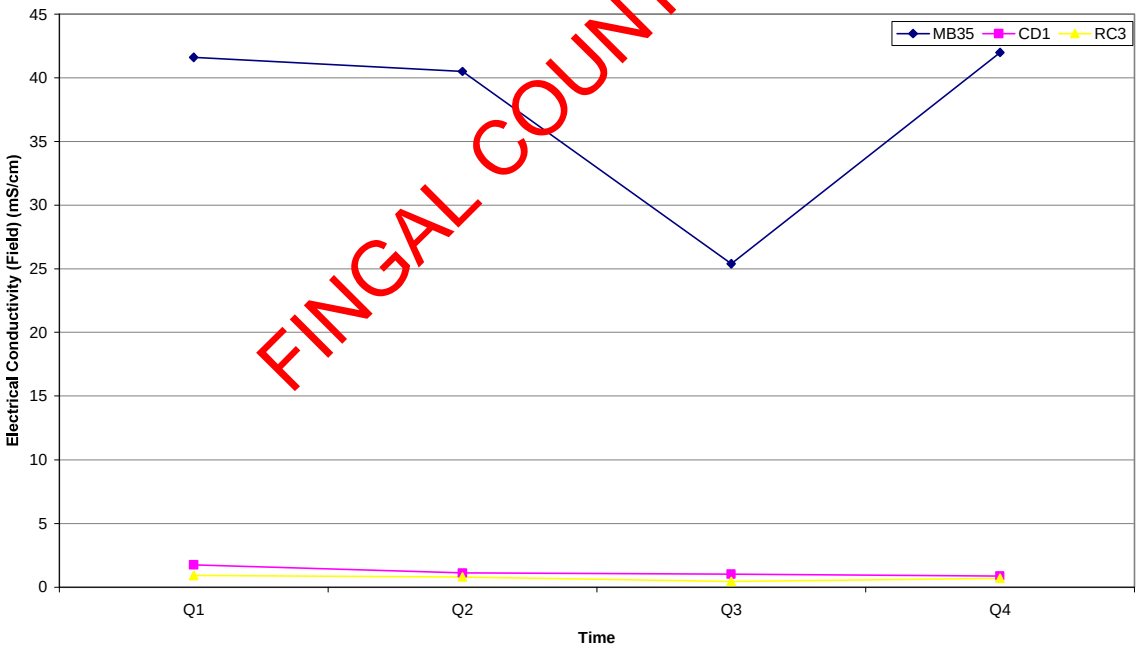


**Figure 3.4: Quarterly Electrical Conductivity Monitoring Results**

### 3.1.5 Conclusion

Groundwater results indicate that water quality is impacted by both the landfill (which is both a dilute and disperse land an engineered designed landfill) and the nearby estuary, in terms of salinity sources from the estuary. Quarterly monitoring at groundwater locations indicates that ammonical nitrogen levels are lower up gradient at RC3 than on-site at CD1 and down gradient at MB35, suggesting landfill impact down-gradient.

Groundwater results at MB35 showed impact from saline intrusion in chloride and electrical conductivity results, while saline intrusion may also be influencing CD1 and RC3, to a degree.

## 3.2 Surface water monitoring

This section of the Annual Environmental Report presents the surface water monitoring results.

### 3.2.1 Introduction

Schedule D of the waste licence requires the monitoring of surface. The surface water monitoring locations are predominately upstream of the landfill footprint

### 3.2.2 Monitoring Locations

The sample locations can be seen Drawing DE07-164-03-001-(B), Appendix I and are presented in Table 3.3.

**Table 3.3: Surface water monitoring locations**

| Monitoring ID | Easting | Northing |
|---|---|---|
| SWFD | 322 036 | 252 412 |
| SWV1 | 321 980.2 | 252 187.4 |
| S3 | 322 985 | 252 692 |
| S7 | 322 646 | 253 213 |
| SW20a | 322 897 | 252 687 |



*SWFD*
Discharges to an open drain immediately west of the entrance to the wastewater treatment plant.

*SWV1*
The surface water discharge at the Western Point Surface Water Outfall – The samples are collected in the open channel immediately upstream of the discharge pipe/cut-off flap.

*S3*
This sampling point is located on a stream to the north east edge of the landfill site prior to its discharge to the estuary.

*S7*
This sampling point is located upstream of the site on the stream to the north of the landfill site.

*SW20a*
This sampling point is located at a drainage ditch to the east of Rogerstown Lane, close to the north-eastern tip of the landfill, currently bunged.

### 3.2.3 Monitoring Parameters

Environmental samples taken at the site were submitted for analysis in accordance with Table D.5.1 of Waste Licence W0009-02. As required, a monthly visual assessment of all surface water monitoring locations was undertaken.

Chemical analysis of surface water monitoring point S3 is required monthly. It is analysed monthly for quarterly parameters, so that the surface water chemistry can be characterised. These parameters included pH, temperature, conductivity, Chemical Oxygen Demand (COD), ammoniacal nitrogen, Biochemical Oxygen Demand (BOD), total suspended solids, dissolved oxygen and chloride. Chemical analysis of all surface water sampling points is carried out on a quarterly basis for the parameters listed in Table D.5.1 of Waste Licence W0009-02.

### 3.2.4 Monitoring Results

The visual assessment results and the full surface water analysis datasets as issued by the Laboratory have been previously submitted in the individual quarterly reports during the reporting period.

A summary of the results is presented in Table 3.4. A summary of the monthly chloride, ammoniacal nitrogen, COD and BOD results for samples taken at S3 are shown in Figure 3.5. Quarterly results for all surface water monitoring locations are presented in Figure 3.6 to Figure 3.10.

### 3.2.5 Interpretation of Results

The surface water results have been compared to maximum admissible concentrations (MAC) as outlined in the Surface Water Regulations, 1989. It can be seen from the results that over the course of the year, several parameters were elevated above the regulations (Table 3.4).

These parameters examined were chosen because they are likely indicators of leachate impact, but they also may demonstrate impact by other sources, such as sewage or the nearby estuary.

For the monthly S3 sample analysis (Figure 3.5), variable COD results are observed, but these are still under the MAC levels (40 mg/l). BOD is also under the MAC (5 mg/l) during the reporting period. There is a slight variability also noted in the Chloride results, but these are still under the MAC (250 mg/l Cl).

Ammonical nitrogen levels are slightly elevated ranging between <0.2 mg/l to 2.67 mg/l during the reporting period, suggesting potential landfill impact.

Electrical conductivity levels remained under the MAC (1 mS/cm) at S3 and S7 during all monitoring events (Figure 3.6). Levels exceeding the MAC were recorded at SWV1, SWFD and SW20a. The results for SW20a peaked during Quarter 2, but showed a sustained improvement oven the next two quarters.
The levels in SWV1 (now bunged)and SWFD also show a general downward trend from Quarter 1 through to Quarter 4, despite a slight Quarter 4 increase in electrical conductivity levels at SWV1. i

While higher chloride levels were recorded in SWV1 (Quarter 1) and SW20a (Quarter 2-4), all results for the monitoring period are significantly under the MAC (250 mg/l Cl) (Figure 3.7). As with the electrical conductivity results, S3 and S7 present the lowest chloride results in all analysed samples.

Results elevated above the COD MAC (40 mg/l) were recorded in SWV1 and SW20a (Figure 3.8). The results were much greater in SW20a. Results for SWFD, S3 and S7 were all under the MAC for all samples analysed.

With the exception of one sample for SWV1 in Quarter 4 all BOD samples were under the MAC (5 mg/l) during the monitoring period (Figure 3.9).

With the exception of S7, which is located circa 700 m north of the site, all other monitoring locations have high ammoniacal nitrogen levels (Figure 3.10). While a spike in SW20a ammoniacal nitrogen results was recorded in Quarter 2 there was a sustained decrease in levels recorded during Quarter 3 and 4 (currently bunged). This is in contrast to the results for SWV1 where the results spiked in Quarter 4.

## Table 3.4: Surface water monitoring Results

| Parameter | Units | MAC | SWV1 | | | | SWFD | | | | S3 | | | | S7 | | | | SW20a | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 |
| **pH** | pH Units | 5.5 – 8.5[1] | 7.92 | 7.95 | 7.32 | 7.56 | 7.94 | 7.7 | 7.56 | 7.52 | 7.83 | 7.85 | 8.05 | 8.14 | 7.82 | 7.97 | 7.89 | 7.93 | 7.26 | 7.5 | 7.49 | 7.5 |
| **Temp** | °C | No abnormal change | 3.6 | 14.3 | 16.5 | 6.1 | 4.8 | 14.5 | 16.5 | 9.6 | 4.2 | 15.8 | 15.9 | 7.3 | 3.9 | 15 | 14.7 | 6.9 | 3.9 | 14.4 | 15.5 | 5.9 |
| **Ammoniacal Nitrogen as N** | mg/l | 0.23 | 1.6 | 4.58 | 3.93 | 21.9 | 0.3 | **<0.2** | 0.738 | **<0.2** | 0.3 | 1.34 | 0.683 | 0.259 | 0.2 | **<0.2** | **<0.2** | **<0.2** | 14.2 | 53.6 | 47.7 | 38.4 |
| **BOD Unfiltered** | mg/l | 5 | **<2** | 2.46 | <1 | 6.81 | 2 | **<1** | **<1** | 1.72 | 2 | 1.16 | **<1** | 2.36 | 4 | 1.46 | 2.3 | 2.3 | **<2** | 1.65 | 1.4 | 2.16 |
| **COD Unfiltered** | mg/l | 40 [1] | 20 | 46.4 | 32.9 | 51.7 | 23 | 18.8 | 22.7 | 16.3 | 37 | 25.6 | 16.5 | 14.6 | 39 | 25.4 | 26.1 | 16.1 | 31 | 78.9 | 300 | 67 |
| **Total Suspended Solids** | mg/l | 50 [2] | 11 | 42 | 2 | 8 | 36 | 13.3 | 7.5 | 11.5 | 80 | <6.0 | <6.00 | 11 | 52 | <6.0 | 4.5 | 12.5 | 40 | 11 | 916 | 12.5 |
| **Dissolved Oxygen** | mg/l | No abnormal change | 7.83 | 9.46 | 0.9 | 5.3 | 6.43 | 8.42 | 0.42 | 5.2 | 8.71 | 7.57 | 6.52 | 9.2 | 8.31 | 10.94 | 1.11 | 7.45 | 4.52 | 6.59 | 1.33 | 3 |
| **Chloride** | mg/l | 250 | 184 | 100 | 53.6 | 99.3 | 62 | 54.8 | 53.9 | 52.1 | 44 | 51.3 | 46.7 | 47.7 | 45 | 46.8 | 40 | 45 | 68 | 162 | 143 | 191 |
| **Electrical Conductivity (Field)** | | | | 1.284 | 0.745 | 1.581 | | 1.39 | 0.939 | 1.292 | | 1.116 | 0.464 | 0.756 | | 0.712 | 0.42 | 0.7 | | 2.2 | 1.029 | 1.726 |
| **Electrical Conductivity (Laboratory)** | mS/cm | 1 [1] | 1.492 | 1.14 | 1.1 | 1.4 | 1.403 | 1.22 | 1.35 | 1.14 | 0.469 | 0.718 | 0.76 | 0.669 | 0.455 | 0.663 | 0.703 | 0.623 | 1.088 | 2.03 | 1.9 | 1.69 |

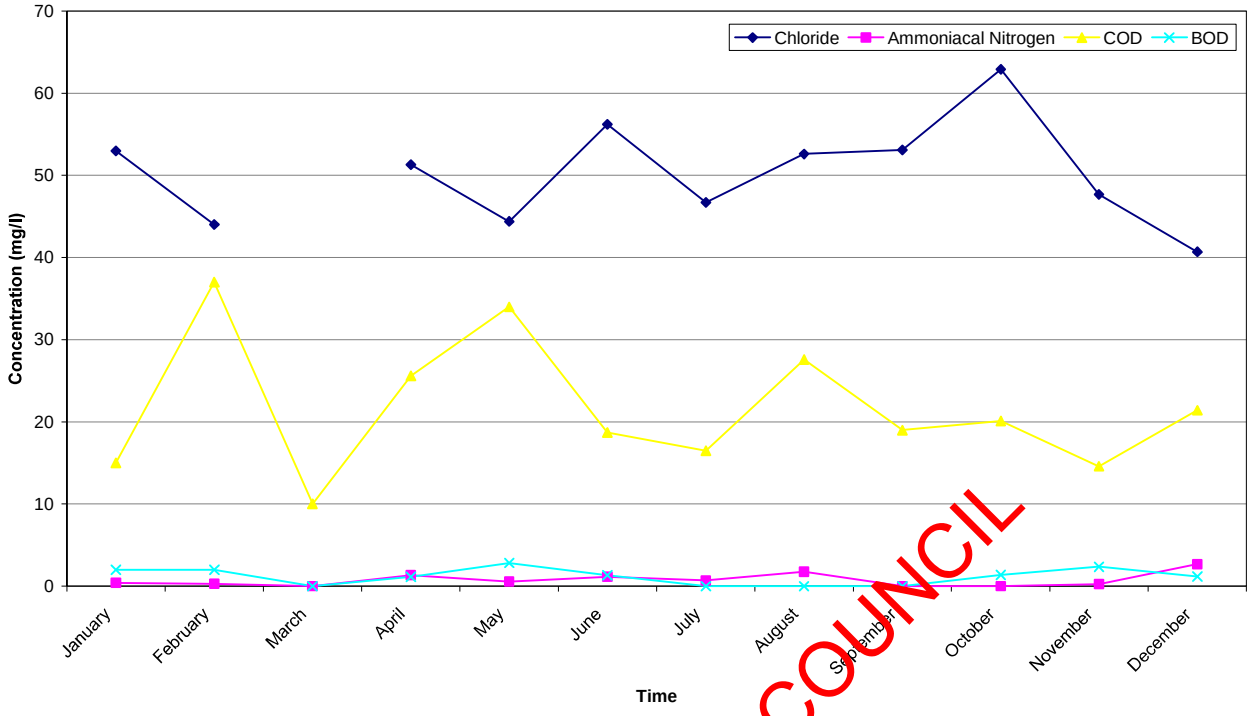


**Figure 3.5: Monthly Monitoring Results for S3**



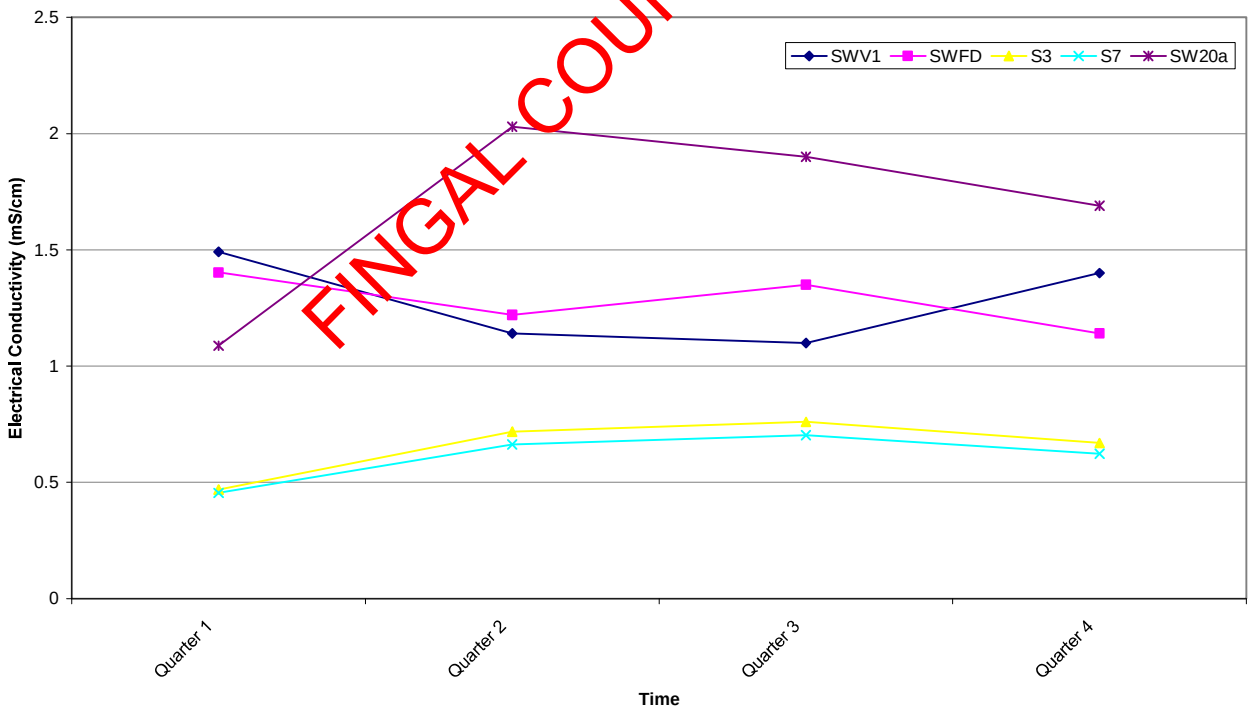


**Figure 3.6: Quarterly Surface water Electrical Conductivity Results**

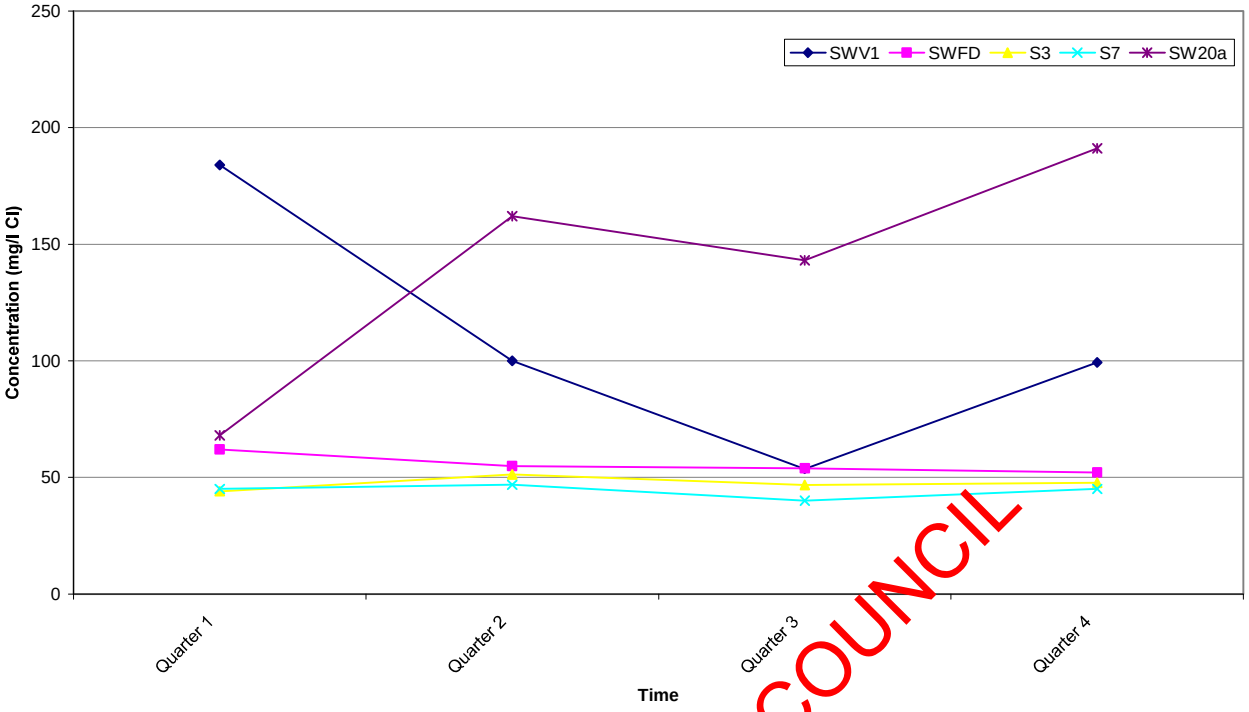


**Figure 3.7: Quarterly Surface water Chloride Results**



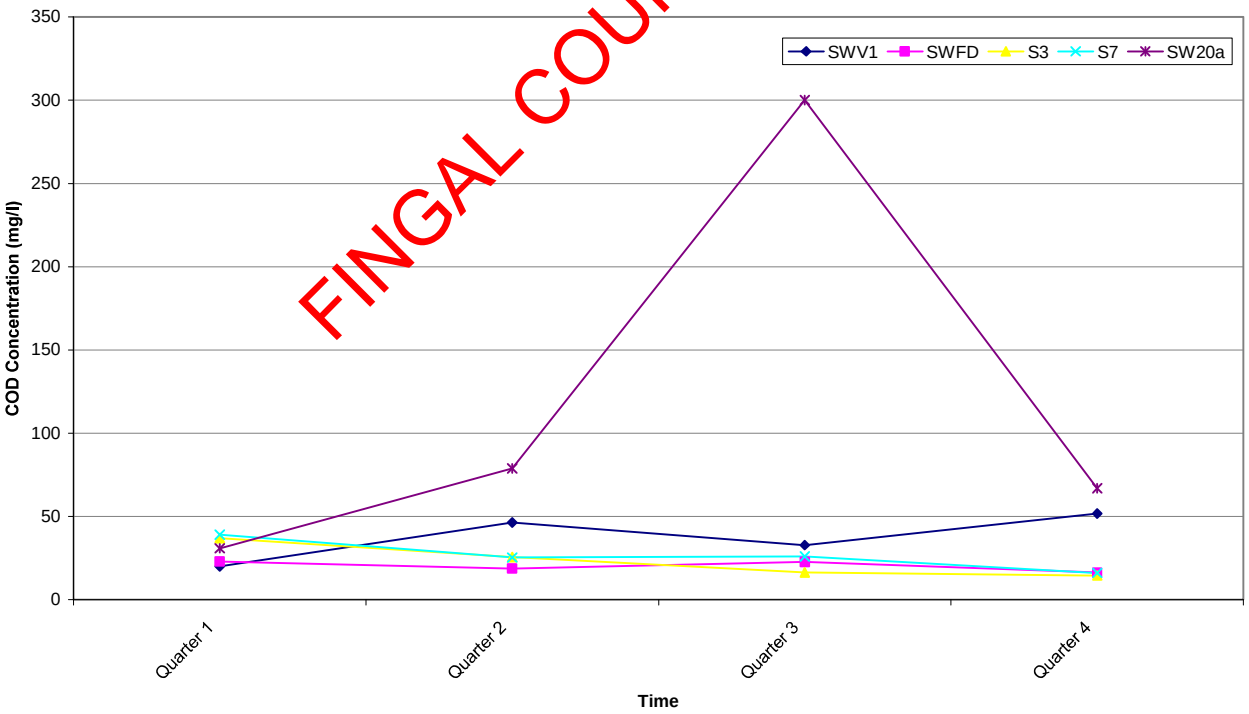


**Figure 3.8: Quarterly Surface water COD Results**

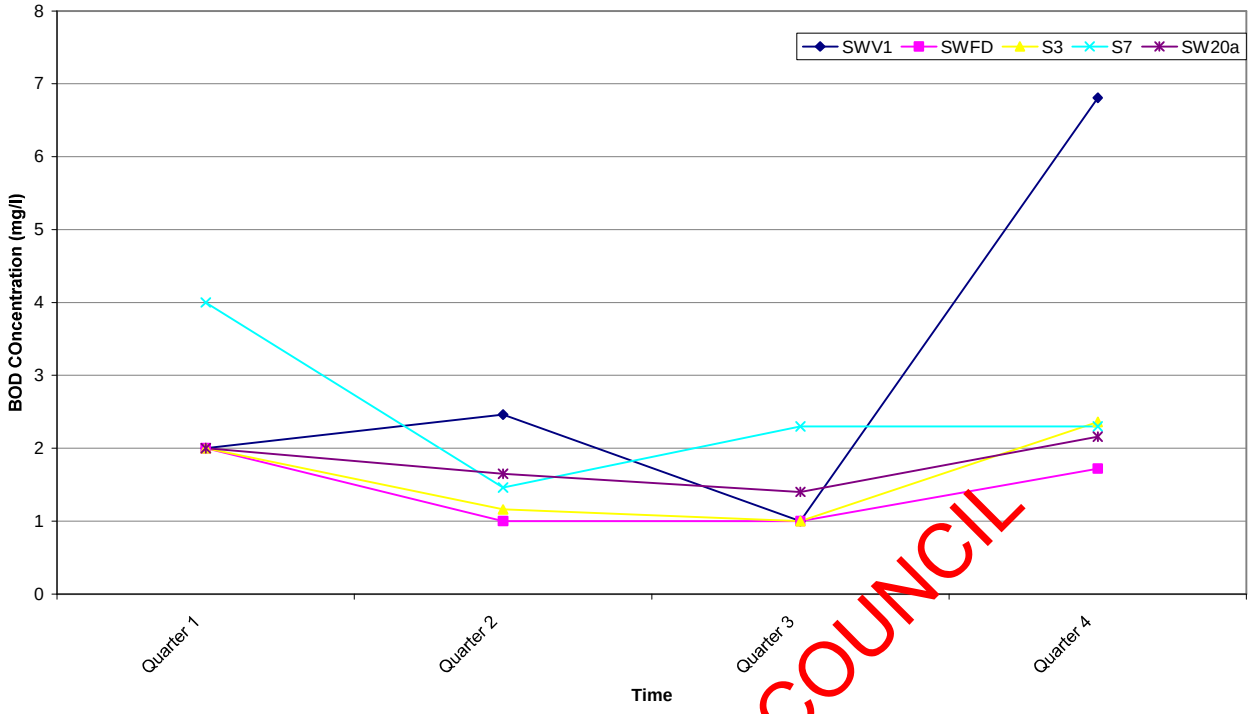


**Figure 3.9: Quarterly Surface water BOD results**



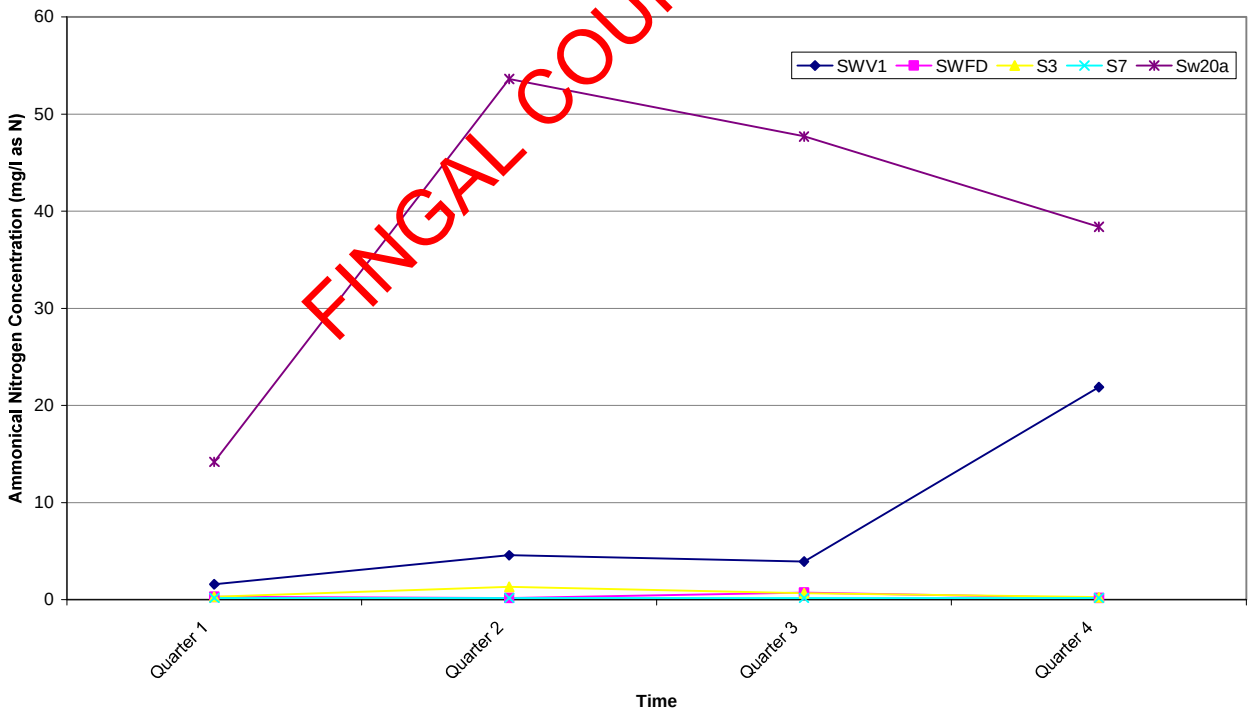


**Figure 3.10: Quarterly Surface water Ammoniacal Nitrogen results**

### 3.2.6 Surface Water Improvements

The ongoing capping programme and final restoration of the landfill will control and contain the breakouts which occasionally occur near the entrance. The shallow vertical barrier surrounding the facility will be completed at the entrance as part of the closure plan. This should help contain any contamination of surface water with leachate into the future.

Remedial works were undertaken during Quarter 2, 2009 to protect the surface water drain / ditch in the vicinity of SW20A. A 50 m length of the drain/ditch was excavated and cleaned prior to lining with low-permeability clay and a HDPE liner pinned and stabilised to the underlying clay bank. These two layers of impermeable material serve to minimise inputs into the drainage ditch.

The ditch adjacent to SW20a was regarded with stone fill, which allows the movement of water through the gravel. A manhole access point was built to facilitate visuals assessment and the required periodic environmental sampling.

There is no flow into the estuary from SW20a as the outfall point is bunged.

During the forthcoming monitoring period FCC propose to undertake an analysis of historic data relating to:

- Leachate pumping
- Weekly electroconductivity readings
- Rainfall
- Leachate levels in cells
- Groundwater at CD1

Should the analysis of this data present any correlations it may suggest the source of elevated electrical conductivity levels.

### 3.2.7 Conclusions

Surface water results indicate that water quality is impacted by both the landfill (which is both a dilute and disperse land an engineered designed landfill) and the nearby estuary, in terms of salinity sources from the estuary.

Some improvements in surface water quality have been noted through the monitoring period results over MAC levels are also noted. However, Ammoniacal nitrogen and BOD results have shown an improvement at SWV1 and S3.

Remedial works were undertaken during Quarter 2, 2009 to protect the surface water drain / ditch in the vicinity of SW20a. Environmental monitoring during the final quarter showed some initial signs of improvement to the surface water quality at SW20a and S3.



## 3.3 Leachate Monitoring

Leachate monitoring was carried out at the monitoring locations as defined in Schedule D of Waste Licence W0009-02 and shown on Figure DE07-164-03-001-(B), Appendix I.

Leachate monitoring locations L19 - L21 were removed during the on-going capping works occurring during the reporting period. Capping works have also been on-going along the southern boundary of the landfill and as a result a number of wells were noted to be destroyed or were inaccessible with the result that no sample was obtained for analysis, namely:- LMW2 (covered with soil), LMW8 (blocked on one occasion), LMW15 (destroyed), and LMW 16 (inaccessible due to height of casing). The status of leachate monitoring wells is summarised in Table 3.5.

A proposal will be submitted to the agency from FCC during the forthcoming monitoring and reporting period with the intention of upgrading and replacing a number of the leachate wells on-site.

### 3.3.1 Monitoring Parameters

Waste Licence W0009-02 requires that a visual assessment is undertaken and the leachate level in every second well is monitored and recorded monthly. Chemical analysis of leachate samples is taken annually.

### 3.3.2 Monitoring Results

Leachate level results are presented in Table 3.6 & 3.7 and in Figure 3.11. Annual leachate quality monitoring results are presented in Table 3.8.

## Table 3.5: Status of Leachate Monitoring wells

| Location | Description | Observation | Comments | Remediation & Monitoring potential |
|---|---|---|---|---|
| **LMW1** | Leachate/Gas well | No access - concrete culvert | Replacement well installed Q2 2008 (gas tap & bailer in place) | Accessible |
| **LMW2** | Leachate/Gas well | Missing | Removed during site landfill works | None |
| **LMW3** | Leachate/Gas well | No gas tap or bailer | Blockage or bend in pipe, possibly as a result of landfill settlement, will allow dip but will not take bailer. | Leachate level only |
| **LMW4** | Leachate/Gas well | Blocked. No gas tap or bailer | Blue pipe in wedged in standpipe resulting in blocking well. | Remove blue pipe and reassess |
| **LMW5** | Leachate/Gas well | Gas tap in place. No bailer | Blockage or bend in pipe, possibly as a result of landfill settlement, will allow dip but will not take bailer. | Leachate level only |
| **LMW6** | Leachate/Gas well | Gas tap & bailer in place | | Accessible |
| **LMW7** | Leachate/Gas well | Blocked | Replacement well installed Q2 2008 (gas tap & bailer in place) | Accessible |
| **LMW8** | Leachate/Gas well | Dry | Dips dry or blocked. Not enough liquid to sample in the past. | Leachate level only |
| **LMW9** | Leachate/Gas well | Gas tap & bailer in place | Replacement well installed Q2 2008 (gas tap & bailer in place) | Accessible |
| **LMW10** | Leachate/Gas well | Gas tap & bailer in place | | Accessible |
| **LMW11** | Leachate/Gas well | Gas tap & bailer in place | Gas tap cracked | Accessible |
| **LMW12** | Leachate/Gas well | Gas tap in place. No bailer | No steel well cover, just a standpipe. Blockage about 2m down preventing bailer going into the well | Leachate level only |
| **LMW13** | Leachate/Gas well | Gas tap & bailer in place | | Accessible |
| **LMW14** | Leachate/Gas well | Gas tap & bailer in place | | Accessible |
| **LMW15** | Leachate/Gas well | Missing | Removed during site landfill works | None |
| **LMW16** | Leachate/Gas well | Approximately 2 m extension to well | Inaccessible due to height | Make accessible and reassess |
| **LMW17** | Leachate/Gas well | Gas tap & bailer in place | | Accessible |
| **LMW18** | Leachate/Gas well | Gas tap & bailer in place | | Accessible |
| **L19** | Leachate/Gas well | Missing | Removed during site landfill works ("piggy-back" landfill) | Removed |
| **L20** | Leachate/Gas well | Missing | Removed during site landfill works ("piggy-back" landfill) | Removed |
| **L21** | Leachate/Gas well | Missing | Removed during site landfill works ("piggy-back" landfill) | Removed |
| **L22** | Leachate/Gas well | Missing | Removed during site landfill works ("piggy-back" landfill) | Removed |
| **L23** | Leachate/Gas well | Gas tap & bailer in place | | Accessible |
| **L24** | Leachate/Gas well | Gas tap & bailer in place | | Accessible |

## Table 3.6: Leachate Levels, 2008

| Monitoring Location | January | February | March | April | May | June | July | August | September | October | November | December |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Level of liquid in well (mOAD) *TOC - Dip (DTW mbTOC)* | | | | | | | | | | | |
| **Leachate/Gas** | | | | | | | | | | | | |
| **LMW1** | | | | 3.92 | 3.5 | 3.49 | 3.56 | 3.38 | 3.53 | 3.49 | 3.31 | 3.38 |
| **LMW2** | | | | | | | | | | | | |
| **LMW3** | | | 11.565 | | 5.685 | 5.615 | | 5.555 | 5.755 | | 7.26 | 5.585 |
| **LMW4** | 6.08 | 5.65 | 5.76 | 5.71 | 5.71 | 5.67 | 5.69 | 4.6 | 5.76 | 5.81 | 5.55 | 5.56 |
| **LMW5** | 6.44 | 6.05 | 6.15 | 6.1 | 6.11 | 6.06 | 6.11 | 5.99 | 6.11 | 6.13 | 5.87 | 5.9 |
| **LMW6** | 6.04 | 5.6 | 5.74 | 5.7 | 5.7 | 5.63 | 5.68 | 5.62 | 5.75 | 5.76 | 5.5 | 5.48 |
| **LMW7** | | | | 5.08 | 5.08 | 5.19 | 5.1 | 5.03 | 5.17 | 5.13 | 4.97 | 4.94 |
| **LMW8** | 4.67 | 4.14 | | | | | | | | | 4.89 | |
| **LMW9** | | | | 4.31 | 4.29 | 4.2 | 3.99 | 4.14 | 4.23 | 4.36 | 4.09 | 4.09 |
| **LMW10** | 3.24 | 3.58 | 3.52 | 3.46 | 3.39 | 3.25 | 3.13 | 3.08 | 3.35 | 3.33 | 3.23 | 3.19 |
| **LMW11** | 3.35 | 3.44 | 3.52 | 3.47 | 3.39 | 3.2 | 3.12 | 3.17 | 3.37 | 3.35 | 3.23 | 3.19 |
| **LMW12** | 3.45 | 3.47 | 3.56 | 3.51 | 3.44 | 3.23 | 3.16 | 3.22 | 3.44 | 3.39 | 3.27 | 3.23 |
| **LMW13** | 3.22 | 3.12 | 3.22 | 3.13 | 3.04 | 2.84 | 2.79 | 2.76 | 3.08 | 3.07 | 2.93 | 2.84 |
| **LMW14** | 3.77 | 3.6 | 3.88 | 3.79 | 3.71 | 3.45 | 3.4 | 3.29 | 3.61 | 3.7 | 3.41 | 3.37 |
| **LMW15** | | 5.83 | | | | | | | | | | |
| **LMW16** | 5.26 | 2.4 | | | | | | | | | | |
| **LMW17** | 4.38 | 4.46 | 2.5 | 4.45 | 4.38 | 4.16 | 4.58 | 4.1 | 4.4 | 4.38 | 4.22 | 4.18 |
| **LMW18** | 4.27 | 4.23 | 4.35 | 4.25 | 3.19 | 3.99 | 3.97 | 4.07 | 4.27 | 4.15 | 4.02 | 3.77 |
| **L19** | 14.56 | 13.81 | | | | | | | 11.14 | | | 5.65 |
| **L20** | 14.93 | 15.61 | | 11.58 | 10.41 | 10.41 | | | | | | |
| **L21** | | | | | | | | | | | | |
| **L22** | | | | | | | | | | | | |
| **L23** | 4.52 | 4.39 | 4.42 | 4.36 | 4.02 | 4.08 | 4.14 | 4.43 | 4.49 | 4.45 | 4.23 | 4.22 |
| **L24** | 4.42 | 4.36 | 4.41 | 4.36 | 4.28 | 4.09 | 4.05 | 4.24 | 4.36 | 4.31 | 4.15 | 4.13 |

Note - Leachate trigger level = 5.5 m AOD for LMW1- LMW18 inclusive
Highlighted cells = above leachate trigger level

## Table 3.7: Leachate Levels, 2009

| Monitoring Location | January | February | March | April | May | June | July | August | September | October | November | December |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Level of liquid in well (mOAD) | | | | | | | | | | | |
| **Leachate/Gas** | | | | | | | | | | | | |
| **LMW1** | 3.34 | 3.4 | 3.42 | | 4.04 | 3.24 | 3.43 | 3.47 | 2.82 | 2.84 | 2.88 | 2.72 |
| **LMW2** | | | | | | | | | | | | |
| **LMW3** | 5.545 | 5.785 | 5.335 | 5.495 | 5.375 | 6.045 | 6.245 | 6.425 | 6.22 | 5.87 | 6.31 | 6.07 |
| **LMW4** | 5.32 | 5.74 | 5.6 | 5.57 | | | | | | | | |
| **LMW5** | 5.86 | 6.02 | 5.84 | 5.88 | 5.8 | 5.73 | 5.86 | 5.[illegible] | 6.3 | 6.42 | 6.36 | 6.08 |
| **LMW6** | 5.5 | 5.65 | 5.48 | 5.38 | 5.46 | 6.35 | 5.44 | 5.57 | 5.96 | 6.11 | 6.09 | 5.63 |
| **LMW7** | 4.92 | 5.11 | 4.94 | 4.98 | 4.98 | 4.64 | 4.85 | 4.82 | 5.67 | 5.86 | 5.85 | |
| **LMW8** | 3.95 | | 4.37 | 4.46 | 7.41 | | | | | 5.03 | | |
| **LMW9** | 4.06 | 4.27 | 4.09 | | 4.03 | | 8.02 | 4.84 | 5.17 | 5.31 | 5.32 | 5.01 |
| **LMW10** | 3.27 | 3.26 | 3.18 | 3.1 | 3.07 | 2.49 | 2.61 | 2.55 | 2.97 | 3.7 | 3.92 | 4.12 |
| **LMW11** | 3.24 | 4.37 | 3.25 | 3.06 | 3.01 | 2.69 | 2.94 | 2.81 | 3.95 | 3.88 | 4.12 | 4.42 |
| **LMW12** | 3.27 | 3.41 | 3.24 | 3.17 | 3.12 | 3.93 | 4.09 | 3.93 | 3.91 | 3.88 | 4.04 | 4.05 |
| **LMW13** | 2.77 | 3.1 | 2.87 | 2.71 | 2.71 | 3.51 | 4.01 | 3.95 | 3.57 | 3.86 | 3.51 | 3.58 |
| **LMW14** | 3.3 | 3.58 | 3.42 | 3.31 | 3.32 | 3.07 | 3.42 | 3.61 | 4.66 | 4.7 | 4.74 | 4.14 |
| **LMW15** | | | | | | | | | | | | |
| **LMW16** | | | | | | | | | | | | |
| **LMW17** | 4.18 | 4.34 | 4.22 | 4.08 | 3.07 | 3.98 | 4.18 | 4.26 | 4.22 | 4.22 | 4.49 | 4.26 |
| **LMW18** | 4.03 | 4.22 | 3.87 | 3.91 | 4.02 | 3.79 | 4.12 | 4 | 4 | 3.97 | 4.4 | 4.07 |
| **L19** | | | | | | | | | | | | |
| **L20** | | | | | | | | | | | | |
| **L21** | | | | | | | | | | | | |
| **L22** | | | | | | | | | | | | |
| **L23** | 4.4 | 4.87 | 4.29 | 4.21 | 4.32 | 3.57 | 4.38 | 4.11 | 4.07 | 4.06 | 4.56 | 4.17 |
| **L24** | 4.12 | 4.31 | 4.13 | 4.05 | 4.08 | 4.4 | 3.24 | 4.22 | 3.89 | 5.1 | 2.01 | 4.24 |
| Note - Leachate trigger level = 5.5 m AOD for LMW1- LMW18 inclusive | | | | | | | | | | | | |
| Highlighted cells = above leachate trigger level | | | | | | | | | | | | |

### 3.3.3 Interpretation of leachate level Results

The leachate levels recorded during monthly monitoring for the 2008 reporting period are included in Table 3.6, while the same results for the 2009 reporting period are presented in Table 3.7.

Leachate levels were measured in the period May to December 2009 from ground level whereas previously they had been measured from the top of the standpipe. This resulted in a slight over estimation of the level of leachate in the cells, by including the height of the steel standpipe in the calculation of the level of leachate in the landfill. Corrected level of leachate figures for the 2009 period are presented in Table 3.7. The 2008 and 2009 leachate levels are presented in Figure 3.11.

A trigger level of 5.5 meters above ordnance datum (m AOD) for wells between LMW1 to LMW18 has been established, to indicate when there is too much liquid in the landfill. Leachate was recorded above the trigger level at a number of locations, highlighted in Table 3.7 and Figure 3.11.

From the results it can be seen that by the end of the reporting period (December 2009) all leachate wells were under the 5.0 m AOD trigger level apart from LMW3 and LMW5.

It is observed by site management that the leachate monitoring wells are set back from the vertical clay barrier by 18-20 m. The hydraulic gradient is likely to fall between the leachate monitoring wells and the vertical clay barrier. Consequently the levels at these wells may not reflect the leachate levels at the vertical clay barrier.

It is further observed by site management that P1a & P1b are fully open and thus the northern and southern leachate lines are fully open. Therefore leachate should not be building up in the body of the landfill.

Nevertheless, in accordance with the ERP trigger levels, visual assessments were conducted on these slopes and there is no evidence of leachate break-out. This would corroborate the comments outlined above.



### 3.3.4 Leachate Quality

This section presents a summary of the chemical results. The results for leachate monitoring presented in Table 3.8.

High levels of Ammoniacal Nitrogen, sodium, chloride and electrical conductivity, dominate the results from all leachate monitoring wells.

The pumping chamber receives leachate from a number of different locations on-site. As it collects leachate from a number of different areas over the site it is representative of general leachate quality over a greater time period than the individual grab samples from each of the leachate wells. The pumping chamber collects leachate from:

- Pipe1A – New cells
- Pipe 1B – Old northern boundary
- Pipe 1C – Southern boundary

The results of leachate sampled from the pumping chamber reflect the results obtained from the individual wells on the landfill.

It is noted that the results for the southern boundary are slightly more concentrated, than the results along the eastern boundary. In general, the reported concentrations for the leachate sample are consistent with the typical composition of leachate sampled from large landfills and in line with the levels presented in the Environmental Protection Agency (EPA) Landfill Manual on Landfill Site Design (2000).

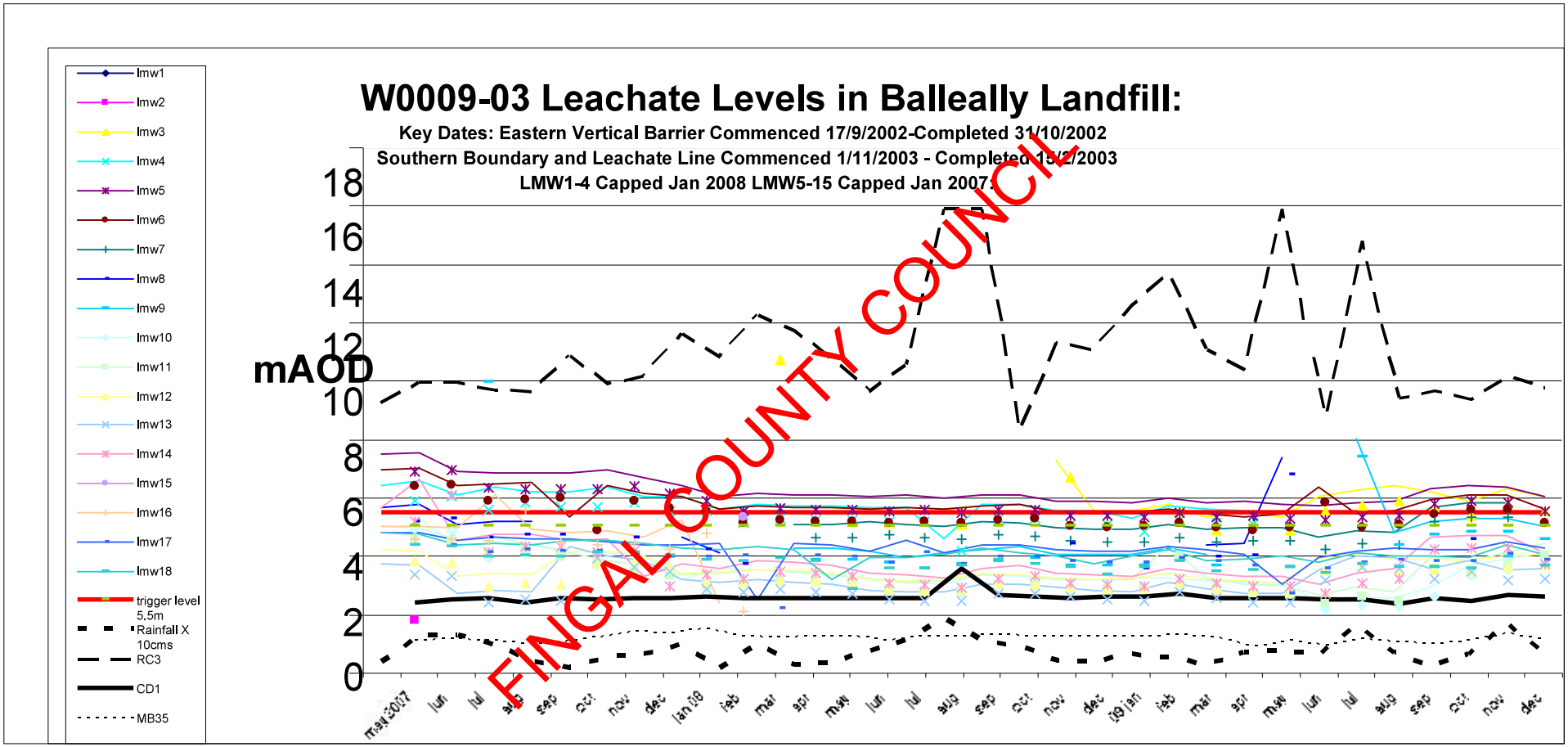


Figure 3.11: Monthly Level of Leachate in the landfill

## Table 3.8: Annual Leachate Monitoring Results

| Sample Identity | LMW1 | LMW6 | LMW7 | LMW9 | LMW 10 | LMW 11 | LMW 13 | LMW 14 | LMW 17 | LMW 18 | L23 | L24 | PIPE 1A | PIPE 1B | PIPE 1C |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ammoniacal Nitrogen as N (mg/l) | 467 | 92 | 158 | 622 | 421 | 360 | 25.4 | 175 | 112 | 284 | 27.1 | 102 | 1120 | 458 | 498 |
| BOD mg/l O | 63.3 | 30.3 | 13.3 | 7 | 35.5 | 24.3 | 3.35 | 4.45 | 6.89 | 1.89 | 9.98 | 10.5 | 486 | 17.5 | 15.3 |
| COD mg/l O | 2690 | 434 | 1790 | 828 | 882 | 570 | 85.8 | 346 | 191 | 362 | 111 | 161 | 2570 | 724 | 864 |
| Chloride (mg/l) | 1200 | 28.1 | 703 | 1040 | 1130 | 669 | 163 | 338 | 160 | 358 | 41.4 | 108 | 1500 | 891 | 1080 |
| Electrical Conductivity (at 20 deg.C) (Laboratory) (mS/cm) | 9.24 | 0.897 | 5.26 | 9.46 | 9.3 | 6.72 | 1.57 | 3.64 | 2.61 | 4.51 | 1.55 | 2.2 | 13.5 | 7.35 | 8.08 |
| Dissolved Boron low level (µg/l) | 2930 | <18 | 1520 | 4290 | 4010 | 2090 | 492 | 3200 | 852 | 1270 | 637 | 526 | 4870 | 2630 | 3060 |
| Dissolved Cadmium low level (µg/l) | <0.22 | <0.22 | <0.22 | <0.22 | <0.22 | <0.22 | <0.22 | <0.22 | <0.22 | <0.22 | <0.22 | <0.22 | 0.338 | <0.22 | <0.22 |
| Dissolved Calcium low level (mg/l) | 149 | 180 | 325 | 114 | 151 | 187 | 77 | 217 | 232 | 273 | 312 | 390 | 197 | 237 | 219 |
| (total) Chromium (Unfiltered) (µg/l) | 160 | 4 | 71.8 | 28.3 | 19.7 | 8.82 | 3.57 | 8.97 | 7.78 | 8.76 | <3 | 7.19 | 244 | 31.1 | 22.2 |
| Dissolved copper low levels (µg/l) | <1.6 | 2.17 | <1.6 | <1.6 | 2.07 | 1.72 | <1.6 | <1.6 | 1.68 | 2.15 | 2.47 | 1.74 | 5.09 | 2.46 | <1.6 |
| Dissolved iron low level (mg/l) | 2.23 | 0.547 | 1.02 | 0.704 | 0.953 | 1.04 | <0.019 | 0.279 | 25.8 | 15.4 | 17.7 | 9.32 | 2.16 | 1.06 | 1.86 |
| Dissolved lead low level (µg/l) | 1.8 | <0.4 | 0.496 | 1.29 | 0.809 | 0.438 | <0.4 | 0.512 | 0.996 | 1.1 | 0.861 | 0.967 | 9.2 | 1.38 | 0.672 |
| Dissolved magnesium low level (mg/l) | 117 | 8.38 | 82.5 | 107 | 160 | 141 | 25.1 | 72.4 | 52.7 | 65.3 | 29.4 | 45 | 110 | 95.2 | 107 |
| Dissolved manganese low levels (µg/l) | 401 | 1540 | 2540 | 589 | 363 | 958 | 685 | 265 | 2100 | 8170 | 1440 | 3490 | 1720 | 1740 | 1880 |
| Dissolved nickel low levels (µg/l) | 107 | 9.07 | 58 | 62.9 | 51.9 | 22.9 | 10.1 | 39.6 | 24.2 | 40.8 | 9.45 | 10.4 | 179 | 82.2 | 80 |
| Dissolved Potassium low level (mg/l) | 420 | 5.33 | 173 | 448 | 456 | 317 | 62.4 | 105 | 67.9 | 119 | 24.7 | 45.9 | 721 | 326 | 370 |
| Dissolved sodium low levels (mg/l) | 1190 | 21.4 | 510 | 979 | 1000 | 599 | 128 | 334 | 126 | 271 | 49.9 | 94.7 | 1530 | 765 | 884 |
| Dissolved zinc low levels (µg/l) | <5 | 11.3 | 10.2 | <5 | 38.7 | 10.2 | 12.5 | 5.64 | 75.2 | 35.2 | 20.3 | 9.01 | 130 | 7.46 | <5 |
| Total Cyanide (mg/l) | 0.056 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |
| Fluoride (mg/l) | 1.05 | <0.5 | 0.653 | 1.13 | 0.947 | 0.63 | <0.5 | <0.5 | <0.5 | 0.618 | <0.500 | <0.5 | 0.987 | 0.729 | 0.846 |
| Mercury Dissolved (µg/l) | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| Sulphate (soluble) (mg/l) | 54 | 102 | <3 | <3 | <3 | 108 | 14.3 | <3 | 5.3 | 50.3 | 199 | <3 | 40 | 227 | 260 |
| Phosphorus (Unfiltered) (µg/l) | 11200 | 457 | 5340 | 2680 | 2480 | 1910 | 393 | 847 | 862 | 1320 | 176 | 520 | 12300 | 2990 | 1830 |
| Phosphate (ortho as PO4) (mg/l) | 3.83 | <0.08 | <0.08 | <0.08 | 1.86 | 0.091 | <0.08 | <0.08 | <0.08 | <0.08 | <0.08 | <0.08 | 13.8 | <1.4 | <1.4 |
| Total Oxidised Nitrogen as N (mg/l) | <0.1 | <0.1 | <0.1 | <0.1 | 0.206 | <0.1 | 0.355 | <0.1 | 0.542 | 0.655 | <0.1 | <0.1 | <0.2 | <0.2 | <0.2 |

### 3.3.5 Volume of Leachate transported off-site for treatment:

A water balance for the reporting period has been prepared and is included as Table 3.9. The water balance calculation indicates that there was 39,547.06 $m^3$ of Leachate Produced at the Landfill.

Leachate tankered off-site was recorded at 53,707.50 $m^3$. The volume of leachate tankered off-site was greater than estimated in water balance calculation, but some contaminated surface water pumped to plant may account for this.

### 3.3.6 Leachate Treatment Plant

Operation of the leachate treatment plant was suspended during the reporting period. This suspension was put in place pending a review of the present Waste Licence for the site. The Waste licence review is seeking to remove Chemical Oxygen Demand (COD) as a leachate plant parameter and to raise the Emission Limit Value (ELV) levels for some of the other leachate treatment plant parameters.

In the interim period the leachate treatment plant operation will remain suspended and leachate will continue to be takered off-site.

## Table 3.9: Water Balance Calculation for Balleally Landfill 01/01/2009 – 31/12/2009

| Month | | Old landfill | | | | | | New Landfill | | | | | | Sewage Sludges | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | *mm* | *acres* | *m2* | *m2* | *%* | *m2* | *%* | *acres* | *m2* | *m2* | *m2* | *m2* | *tonnes* | *m3* | *Tonnes* | *m3/tonne* |
| Jan | 62.1 | 100 | 402,694 | 362,424.6 | 10 | 40,269.4 | 30 | 20 | 80,938 | 53,419.08 | 11,331.32 | 16,187.6 | 82.60 | 61.95 | 8,618.61 | 0.025 |
| Feb | 56.1 | 100 | 402,694 | 362,424.6 | 10 | 40,269.4 | 30 | 20 | 80,938 | 53,419.08 | 11,331.32 | 16,187.6 | 23.42 | 17.57 | 8,941.72 | 0.025 |
| Mar | 26.2 | 100 | 402,694 | 362,424.6 | 10 | 40,269.4 | 30 | 20 | 80,938 | 53,419.08 | 11,331.32 | 16,187.6 | 22.30 | 16.73 | 11,303.50 | 0.025 |
| Apr | 71.1 | 100 | 402,694 | 362,424.6 | 10 | 40,269.4 | 30 | 20 | 80,938 | 53,419.08 | 11,331.32 | 16,187.6 | 13.30 | 9.98 | 666.09 | 0.025 |
| May | 75.5 | 100 | 402,694 | 362,424.6 | 10 | 40,269.4 | 30 | 20 | 80,938 | 53,419.08 | 11,331.32 | 16,187.6 | 16.46 | 12.35 | 7,059.04 | 0.025 |
| Jun | 64.3 | 100 | 402,694 | 362,424.6 | 10 | 40,269.4 | 30 | 20 | 80,938 | 53,419.08 | 11,331.32 | 16,187.6 | 16.22 | 12.17 | 8,648.82 | 0.025 |
| July | 165.4 | 100 | 402,694 | 362,424.6 | 10 | 40,269.4 | 30 | 20 | 80,938 | 53,419.08 | 11,331.32 | 16,187.6 | 19.23 | 14.42 | 8,342.01 | 0.025 |
| Aug | 69.5 | 100 | 402,694 | 362,424.6 | 10 | 40,269.4 | 30 | 20 | 80,938 | 53,419.08 | 11,331.32 | 16,187.6 | 17.84 | 13.38 | 8,701.39 | 0.025 |
| Sept | 24.2 | 100 | 402,694 | 362,424.6 | 10 | 40,269.4 | 30 | 20 | 80,938 | 53,419.08 | 11,331.32 | 16,187.6 | 24.44 | 18.33 | 9,353.06 | 0.025 |
| Oct | 63 | 100 | 402,694 | 362,424.6 | 10 | 40,269.4 | 30 | 20 | 80,938 | 53,419.08 | 11,331.32 | 16,187.6 | 22.10 | 16.58 | 9,190.68 | 0.025 |
| Nov | 171.3 | 100 | 402,694 | 362,424.6 | 10 | 40,269.4 | 30 | 20 | 80,938 | 53,419.08 | 11,331.32 | 16,187.6 | 23.64 | 17.73 | 8,504.84 | 0.025 |
| Dec | 69.1 | 100 | 402,694 | 362,424.6 | 10 | 40,269.4 | 30 | 20 | 80,938 | 53,419.08 | 11,331.32 | 16,187.6 | 33.26 | 24.95 | 8,626.59 | 0.025 |
| **Total** | **917.8** | | | | | | | **20** | | | | | **314.81** | **236.1075** | **97956.35** | |

Old Landfill Capped + New Landfill Capped + Old Landfill Temp Cap + New Landfill Temp cap + Active Area + Liquid Waste - Liquid Absorbed

Leachate Produced Landfill = {(.9178 * 362424.6 *.1) + (.9178 * 53419.1*.1) + (.9178 * 40269.4 * .3) + (.9178 * 27518.9 * .3) + (.9178* 16187.6) + 236.1075}- {97596.35 *.025}

**Leachate Produced Landfill M3** **39,547.06**

Leachate Tankered Off-Site M3 53,707.50

## 3.4 Noise Monitoring

Noise surveys were undertaken during every quarter of the monitoring period (2009) in order to assess the existing noise emissions from the site and to establish the existing noise environment at potentially sensitive receptors near the site in accordance with Schedule D of Waste Licence W0009-02. Noise monitoring was carried out during daytime hours. The location of noise monitoring points can be seen in Figure DE07-164-03-001-(B), Appendix I and presented in Table 3.10.

Noise measurements were taken for 30 minutes at each location.

Noise emission limits are given in Table C.1 of the waste licence and are reproduced here in Table 3.11.

### Table 3.10: Noise Monitoring Locations

| Monitoring Location | Description | Northings | Eastings |
|---|---|---|---|
| NM1 | Situated adjacent to the north-eastern boundary of the site. | 321 919 | 252 357 |
| NM2 | Situated north east of the site boundary adjacent to Balleally Lane. | 321 779 | 252 415 |
| NM3 | Situated East of the landfill 120m along Balleally Lane. | 321 459 | 252 383 |
| NM4 | Situated north of the landfill along Rogerstown Lane. | 322 604 | 252 962 |
| NM5 | Situated north of the landfill along Rogerstown Lane. | 322 970 | 254 004 |

### Table 3.11: Noise Emission Limits

| Day dB(A) $L_{Aeq}$ (30 minutes) | Night dB(A) $L_{Aeq}$ (30 minutes) |
|---|---|
| 55 | 45 |



#### 3.4.1 Monitoring Results

A summary of the quarterly monitoring results are presented in Table 3.12 to Table 3.15.

### Table 3.12: Quarter 1 Noise Monitoring Results

| Location | Date | Time | Tonal | $L_{AeQ}$ | $L_{AF90}$ | $L_{AF10}$ | Comments |
|---|---|---|---|---|---|---|---|
| NM1 | 04/02/09 | 12.36 | 0 | **69** | 45 | 70 | The dominant noise source at this location was from No. 30 site vehicles and No. 6 cars driving along Balleally lane. Birdsong, the hum from on-site machinery, clanging from construction work and a local bird scarcer device all contributed to background noise. |
| NM2 | 04/02/09 | 13.09 | 0 | **70** | 40 | 64 | Similar to NM1, No. 19 site trucks were the dominant noise source. A bird scare device firing every 5-6 minutes contributed to background noise. Birdsong, trees rustling, hum from nearby machinery and fast flowing water form a nearby stream were the main contributors to background noise levels. |
| NM3 | 04/02/09 | 14.35 | 0 | **68** | 42 | 66 | The dominant noise source at this monitoring point was from No. 32 vehicles on Balleally Lane and the sound of vehicles passing over the speed ramps on the road. Background noise was comprised of birdsong, distant traffic from the M1 and the distant clanging of machinery from the landfill site. Dogs barking and a bird scare device randomly firing every 4-7 minutes also contributed to background levels. |
| NM4 | 04/02/09 | 11.54 | 0 | 54 | 42 | 53 | The dominant sound at this monitoring location was a nearby neighbour revving a quad bike. Background noise at this location included birdsong, seagulls and the distant noise from on-site machinery. This included reversing beacons and engine revving. No. 6 passing vehicles, no. 1 overhead airplanes, no. 2 passing trains and a neighbouring dog barking also contributed to background noise. |
| NM5 | 04/02/09 | 11.20 | 0 | 54 | 38 | 50 | The background noise source at this location has the lowest $L_{AF10}$ out of all noise monitoring points. This background noise was made up of birdsong, the distant hum of traffic from the M1 and a bird scare device. The dominant sources at this point include No. 5 passing cars, No. 2 overhead aeroplanes, No. 1 train passing and the distant revving of a motorbike during the monitoring period also influenced the dominant non-site related sound recorded at this monitoring point. |

### Table 3.13: Quarter 2 Noise Monitoring Results

| Location | Date | Time | Tonal | $L_{Aeq}$ | $L_{AF90}$ | $L_{AF10}$ | Comments |
|---|---|---|---|---|---|---|---|
| NM1 | 04/02/2009 | 12.36 | 0 | **70** | - | 69 | The dominant source of noise at this location was the No. 37 traffic movements along the road during the monitoring period. Birdsong, water movement in a near-by stream and a slight "hum" from site machinery all contributed to background noise levels at this location. No. 1 airplane passed over head during the monitoring period, while No. 2 road sweepers passed during the same time period. |
| NM2 | 04/02/2009 | 13.09 | 0 | **71** | 40 | 71 | The dominant source of noise at this location was the No. 38 traffic movements on the road during the monitoring period. Birdsong, rustling leaves, peoples voices and children playing and a dog barking all contributed to background noise levels. A car was in idle beside the noise meter for a short period during monitoring. A lawnmower was operating for 2 minutes during monitoring. |
| NM3 | 04/02/2009 | 14.35 | 5 | 62+5 = **67** | 36 | 57 | The dominant noise source at this location was the No. 25 traffic movements along the road. Birdsong and rustling leaves contributed to background noise levels. Traffic sound could also be heard in the distance. Bird scarier bangers and a helicopter overhead were also recorded during monitoring. |
| NM4 | 04/02/2009 | 11.54 | 5 | 60+5 = **65** | 45 | 54 | The dominant noise at this location is the "hum" of machinery working on-site, including intermittent reversing beacons. Birdsong, a distant bird scare device, rustling leaves and a radio from a neighbor's house contributed to the background noise levels at this location. No. 3 trains, No. 1 airplane and No. 7 road vehicles passed during the monitoring period. |
| NM5 | 04/02/2009 | 11.2 | 0 | 52 | 36 | 46 | The dominant noise at this location was the sound of traffic from the M1 and intermittent bangs from a bird scare device. Birdsong and slight rustling of leaves contributed to background noise levels. No. 2 airplanes passed overhead and No. 3 trains passed during the monitoring period. No. 3 cars passed on the road during the monitoring period. |

## Table 3.14: Quarter 3 Noise Monitoring Results

| Location | Date | Time | Tonal | $L_{Aeq}$ | $L_{AF90}$ | $L_{AF10}$ | Comments |
|---|---|---|---|---|---|---|---|
| NM1 | 2009 Jul 28 | 12:50:47 | 0 | **55** | 44 | 57 | The results were most influenced by the No. 20 passing vehicles recorded during the monitoring period on Balleally Lane, including a leachate tanker passing the monitoring location entering and exiting the site. Intermittent bird scare bangers and one over head plane were also recorded during the monitoring period. Site works and vehicle movements could be heard from this location. |
| NM2 | 2009 Jul 28 | 14:50:04 | 0 | **57** | 44 | 68 | Monitoring at this location was dominated by the No. 10 passing vehicles were recorded during the monitoring period (banging over the speed bumps on the road). Background noise was influenced by rustling leaves and birdsong. Two overflying planes were also recorded during the monitoring period, with birds-scare devices and drilling in near-by field also contributing to the background noise levels. |
| NM3 | 2009 Jul 28 | 14:11:33 | 0 | **60** | 35 | 61 | Monitoring results at this location were dominated by the No. 26 passing vehicles during the monitoring period (banging over the speed bumps on the road). 2 No. overhead planes were recorded during the monitoring period. Background noise was influenced by rustling leaves, birdsong and intermittent bird scare devices. A constant hum of machinery engines on-site could be heard during monitoring. |
| NM4 | 2009 Jul 28 | 14:11:33 | 1 | 55+ 5= **60** | 47 | 54 | Rural background sounds, with wind rustling leaves. No. 7 passing vehicles on Rogerstown Lane were recorded during the monitoring period. Intermittent bird scarcer bangers were also recorded. There were intermittent sounds from vehicles, horns and occasional reversing beacons from works on-site. No. 3 flying overhead helicopters were recorded during the monitoring period. Paused once to allow a van to pass. Agricultural activity (tractor) in market farm adjacent to monitoring location. Persistent birdsong and intermittent dogs barking contributed to background noise levels. Faint sounds could be heard from drilling works that were happening independent of site activity. |
| NM5 | 2009 Jul 28 | 13:37:26 | 0 | 53 | 46 | 55 | Rural background sounds, with intermittent traffic on Rogerstown Lane. Background noise levels were dominated by rustling of leaves in trees and birdsong. Background sounds of vehicle movements on the landfill and bird-scare devices. Three planes passed over head during the monitoring period. A truck sits in idle close to the noise meter for a short period during monitoring. |

### Table 3.15: Quarter 4 Noise Monitoring Results

| Location | Date | Time | Tonal | $L_{Aeq}$ | $L_{AF90}$ | $L_{AF10}$ | Comments |
|---|---|---|---|---|---|---|---|
| NM1 | 11-Dec-09 | 10:02:47 | 0 | 53 | 38 | 53 | Still conditions. Dominant noise from passing vehicles on Balleally Lane. No. 21 vehicle movements during the monitoring period. Background contributions from birdsong and intermittent dogs barking. Intermittent bird scare bangers and the sound of distant site works on-site also contributed to the background noise. |
| NM2 | 11-Dec-09 | 13:56:51 | 0 | **61** | 42 | 61 | Still conditions. Dominant noise from the No. 27 vehicle movements on Balleally Lane during the monitoring period. Trucks delivering material to the site were driving fast, even over the speed bumps, contributing to the overall noise levels. Background noise levels consisted of birdsong, the sound of site works in the distance and intermittent bird scare bangers. |
| NM3 | 11-Dec-09 | 13:19:24 | 0 | **60** | 43 | 59 | Dominant noise from the No. 36 vehicle movements on Balleally Lane during the monitoring period. Background noise consists of the sound of distant engines on-site including the sound of reversing beacons. No. 1 overhead plane was also recorded during the monitoring period. A very low breeze causing a slight rustling of trees also contributed to the background noise levels. |
| NM4 | 11-Dec-09 | 09:00:16 | 0 | 53 | 44 | 53 | Dominant noise from engines operating on-site including reversing beacons. Intermittent bangs also from site. No. 6 vehicle movements on Rogerstown Lane, No. 1 passing train and No. 1 overhead plane also contributed to the dominant noise. Background noise consists of intermittent birdsong and intermittent bird scare bangers. |
| NM5 | 11-Dec-09 | 08:24:27 | 0 | 48 | 42 | 49 | Dominant noise from works on-site, especially engine revving noise and reversing beacons. Background noise consists of slight breeze rustling in the hedgerows, birdsong and distant traffic sounds. No. 4 vehicle movements Rogerstown Lane, No. 2 passing trains, No 1 overhead plane and intermittent bird scare bangers contributed to the noise recorded. |

### 3.4.2 Assessment of Tonal Components

All measurements were subject to a one-third octave band analysis to identify tonal components within the noise measured. The raw results of this analysis have been presented in the quarterly reports submitted during the reporting period. Tonal noise was identified on a number of occasions and the reported $L_{Aeq}$ was adjusted by 5 dB in accordance with the EPA (2006) *Guidance Note for Noise in Relation to Scheduled Activities, 2nd Edition.*

### 3.4.3 Interpretation of Results

Noise emission limits are presented in Table 3.11 above. There were only seven instances during the year during noise monitoring periods which complied with the EPA limit of 55 dB (A) for daytime noise. During all four quarters NM5 was in compliance with the EPA limit.

Traffic movements on Balleally and Rogerstown lane are the main contributors to noise levels in the area, which includes noise from trucks travelling to and from the site. Noise from site does not have as much impact as traffic movements; however a great number of the traffic movements are related to vehicle movements to the site. An assessment of the $L_{A90}$ results shows the influence traffic movement had on the noise monitoring results, with $L_{A90}$ results ranging from 38 – 47 dB.

Bird scare bangers, train movement and over head airplanes also contribute to the dominant noise sources in the area.

## 3.5 Dust and $PM_{10}$ Monitoring

### 3.5.1 Dust Monitoring

Dust monitoring was carried out at 4 locations in accordance with Schedule D of the licence. The locations of these monitoring points are shown on Figure D807-164-03-001-(B), Appendix I and presented in Table 3.16

Bergerhoff style gauges were used to determine total dust deposition levels at the site. Four gauges were set up so that the dust jars were at a height of at least 1.5 m above the ground and the jars were set in place during the monthly monitoring events. The samples were submitted to Southern Scientific Ltd. for analysis of total dust contents.

**Table 3.16: Dust Monitoring Locations**

| Location | Easting | Northing |
|---|---|---|
| **DM1 (PM1)** | 321 874 | 252 321 |
| **DM2** | 321 927 | 252 482 |
| **DM3 (PM2)** | 322 038 | 252 484 |
| **DM4 (PM3)** | 322 728 | 252 671 |

Note = (PM Labels = PM10 monitoring locations)

### 3.5.2 Monitoring Results

Dust monitoring was undertaken twice during Quarter 3. As D3 was knocked over during sampling in July 2009, monitoring at this point was repeated in September. The final round of Dust monitoring was undertaken during December. The annual results for total dust deposition are presented in Table 3.17.

## Table 3.17: Dust Deposition Results (mg/m$^2$/day)

| Monitoring Locations | Jul-09 | | | Aug-09 | | | Sep-09 | | | Dec-09 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Organic Dust | Inorganic Dust | Total Dust | Organic Dust | Inorganic Dust | Total Dust | Organic Dust | Inorganic Dust | Total Dust | Organic Dust | Inorganic Dust | Total Dust |
| D1 | 73 | 98 | 171 | 115 | 87 | 205 | / | / | / | 77 | 67 | 144 |
| D2 | 327 | 160 | 487 | 25 | 0 | 25 | / | / | / | 123 | 100 | 223 |
| D3 | Knocked over * | | | 143 | 70 | 213 | 22 | 13 | 35 | 48 | 20 | 67 |
| D4 | 124 | 155 | 279 | 86 | 98 | 184 | / | / | / | 53 | 33 | 85 |

* = Sample D3 was knocked over during the sampling period and was being re-sampled.

### 3.5.3 Interpretation of Results

An organic and inorganic analysis of dust was performed in addition to the total dust deposition analysis to give a greater understanding of the results.

The results indicate that during July the results at D2 were over the licence limit of 350 mg/m$^3$/day. The organic split of the results is 327 mg/m$^3$/day, suggesting that the sample contained a large portion of organic particles or organic growth (algae), contributing to the over-all high result for the location rather than inorganic or inert material., which was unlikely to be attributable to landfill activities. All other results for July were under the limit.

A second round of dust monitoring was undertaken in August and the third round of dust monitoring was undertaken in December. All results for the August and December monitoring are under the licence limit of 350 mg/m$^3$/day.

### 3.5.4 $PM_{10}$ Monitoring

Monitoring of particulate matter ($PM_{10}$) levels was undertaken once for a 24 hour sampling period at 3 monitoring locations, namely PM1, PM2 and PM3 in accordance with Schedule D of the licence during the 2009 monitoring period. The locations of these monitoring points are shown on Figure DE07-164-03-001-(B), Appendix I and presented in Table 3.18.

### 3.5.5 Monitoring Results

The $PM_{10}$ monitoring results for the 2009 monitoring period are presented in Table 3.18.

**Table 3.18: $PM_{10}$ Results 2009**

| Sampling Point | Average Concentration Value ($\mu G/M^3$) |
|---|---|
| PM1 | 28.2 |
| PM2 | 13.1 |
| PM3 | 16.3 |



### 3.5.6 Interpretation of Results

There is no emission limit set for $PM_{10}$ in Schedule C of the licence but Condition 6.7 sets a trigger level of 50 µg/m3 for a daily sample.

The results in Table 3.18 show that the air quality is good at PM1 and the results are under the trigger level of 50 µg/m3 for a daily sample.

## 3.6 Landfill gas monitoring

The licence requires that the licensee conducts monthly monitoring in the gas boreholes/vents/wells in order to detect off-site gas migration. The location of the monitoring positions is shown on Figure DE07-164-03-001-(B), Appendix I.

The locations are presented in Table 3.19. In addition to the perimeter Landfill Gas Monitoring locations two leachate monitoring wells (chosen at random) from each of the southern and eastern boundaries LMW1-LMW18 and two manholes MHL33 and MHL40 (Table 3.20) along Balleally Lane were also monitored. LMW1 – LMW18 boreholes are located in front of the vertical barrier installed along these boundaries and are in the leachate that is collected at these points.

It should be noted that boreholes LMW1-18 are leachate sampling wells and not specifically designed for monitoring landfill gas. See Table 3.19, 3.20 and 3.21 for grid references.

## Table 3.19: Gas Monitoring Locations

| Borehole ID | Borehole Description | Easting | Northing | Depth of Borehole *(m)* | Top of casing level | Ground Level *(m O.D.)* | Sample |
|---|---|---|---|---|---|---|---|
| GA1 | Northern corner of Cell 1 | 321 767 | 252 159 | 6 | 4.155 | 4.0 | Perimeter Borehole |
| GA2 | Western corner of Cell 1 | 321 986 | 252 383 | 6 | 4.314 | 3.3 | Perimeter Borehole |
| GA3 | Northern boundary of Cell 2 | 322 070 | 252 414 | 10 | 7.076 | 7.5 | Perimeter Borehole |
| GA4 | Northern boundary of Cell 3 | 322 170 | 252 415 | 10 | 7.370 | 7.66 | Perimeter Borehole |
| GA5 | Northern boundary of Cell 4 | 322 291 | 252 440 | 15 | 12.287 | 14.3 | Perimeter Borehole |
| GA6 | Northern boundary of Cell 5 | 322 389 | 252 467 | 15 | 11.864 | 13.3 | Perimeter Borehole |
| GA7 | Northern boundary of Cell 6 | 322 490 | 252 498 | 10 | 10.749 | 9.57 | Perimeter Borehole |
| GA8 | Northern boundary beside exit to landfill | 322 614 | 252 542 | 6 | 5.503 | 4.981 | Perimeter Borehole |
| GA9 | North of cell 1 beside gate | 321 942 | 252 547 | - | - | - | Perimeter Borehole |
| GA10 | Residents land opposite gate | 321 942 | 252 393 | - | - | - | Outside Perimeter Borehole |
| GA11 | Lands opposite entrance/exit between cell 6 and LMW18 | 322 039 | 252 433 | - | - | - | Outside Perimeter Borehole |
| GA12 | Lands opposite entrance/exit | 322 669 | 252 575 | - | - | - | Outside Perimeter Borehole |
| GA13 | Lands opposite entrance/exit adjacent to SW20a | 322 848 | 252 666 | - | - | - | Outside Perimeter Borehole |

### Table 3.20: Gas Monitoring Locations (outside waste)

| Manhole ID | Manhole ID | Easting | Northing |
|---|---|---|---|
| MH L33 | Across from Cell 1 | 322 001 | 252 416 |
| MH L40 | Across from Cell 6 | 322 654 | 252 566 |

### Table 3.21: Leachate/Gas Monitoring Locations

| Borehole ID | Easting | Northing | Sample |
|---|---|---|---|
| LMW1 | 322 006 | 252 143 | Leachate/Gas |
| LMW2 | 322 077 | 252 115 | Leachate/Gas |
| LMW3 | 322 169 | 252 084 | Leachate/Gas |
| LMW4 | 322 271 | 252 053 | Leachate/Gas |
| LMW5 | 322 368 | 252 022 | Leachate/Gas |
| LMW6 | 322 461 | 251 991 | Leachate/Gas |
| LMW7 | 322 559 | 251 958 | Leachate/Gas |
| LMW8 | 322 651 | 251 933 | Leachate/Gas |
| LMW9 | 322 749 | 251 903 | Leachate/Gas |
| LMW10 | 322 844 | 251 877 | Leachate/Gas |
| LMW11 | 322 846 | 251 974 | Leachate/Gas |
| LMW12 | 322 853 | 252 074 | Leachate/Gas |
| LMW13 | 322 859 | 252 175 | Leachate/Gas |
| LMW14 | 322 863 | 252 274 | Leachate/Gas |
| LMW15 | 322 873 | 252 375 | Leachate/Gas |
| LMW16 | 322 880 | 252 473 | Leachate/Gas |
| LMW17 | 322 885 | 252 572 | Leachate/Gas |
| LMW18 | 322 890 | 252 657 | Leachate/Gas |



### 3.6.1 Monitoring Parameters

In accordance with Table D.2.1 of the Waste Licence, gas wells were monitored for Methane ($CH_4$), Carbon dioxide ($CO_2$), Oxygen ($O^2$) and atmospheric pressure. It should be noted that the boreholes along the estuary were designed and constructed to sample leachate and groundwater and not specifically landfill gas.

### 3.6.2 Monitoring Results

The Landfill Gas (LFG) monitoring results are summarised in Figure 3.12 and Figure 3.13. FCC have also monitored LFG levels at GA5 during the monitoring period. These results are presented in Table 3.22.

### 3.6.3 Interpretation of Results

$CH_4$ results for the 2009 monitoring period were generally below the 1% trigger level (Figure 3.12). However, results elevated above the trigger level at locations GA3, GA4 and GA5 and also at GA13 are noted. These locations are situated along the north and north-eastern corners of the landfill.

Throughout the monitoring period increasing levels of $CH_4$ was recorded at GA5. Towards the third and fourth quarter the levels of methane were also seen to increase occasionally in the adjacent wells, GA3 and GA4.

$CO_2$ results elevated above the 1.5% trigger level at sampling locations GA2, GA3, GA4, GA5, GA7, GA8, GA11 and GA13 in 2009 (Figure 3.13). $CO_2$ levels illustrate a similar trend to the results found last year. High concentrations of $CO_2$ can occur naturally at shallow depths of up to 2 m due to microbial activity associated with the roots of many types of vegetation.

### 3.6.4 Conclusion

In general, gas levels appear to be at their highest values during the third and fourth quarters of the monitoring period. This trend is similar to observations made on the previous monitoring periods.

During the monitoring period FCC took the proactive approach of monitoring LFG at on-site and off-site locations weekly and they are also monitoring GA5 and sensitive locations GA10 and GA11 more frequently (2 – 3 times per week). The results of this additional monitoring are retained by FCC on-site and any changes in the trends will be noted. This monitoring is in addition to the licence compliance monitoring being undertaken by FTC.

Additionally FCC are working with Bioverda who manage the landfill gas on-site to effectively balance the gas field and reduce the levels of methane noted in GA5. A number of additional in-waste landfill gas extraction wells have been drilled during Quarter 4 and became operational to increase the LFG abstraction for energy from the area of the landfill adjacent to GA5.

Monthly monitoring will be undertaken during the coming year as well as additional more frequent monitoring by FCC as required. Close attention will be paid to the trends to investigate the outcome of the mitigation measures implemented during Quarter 4.

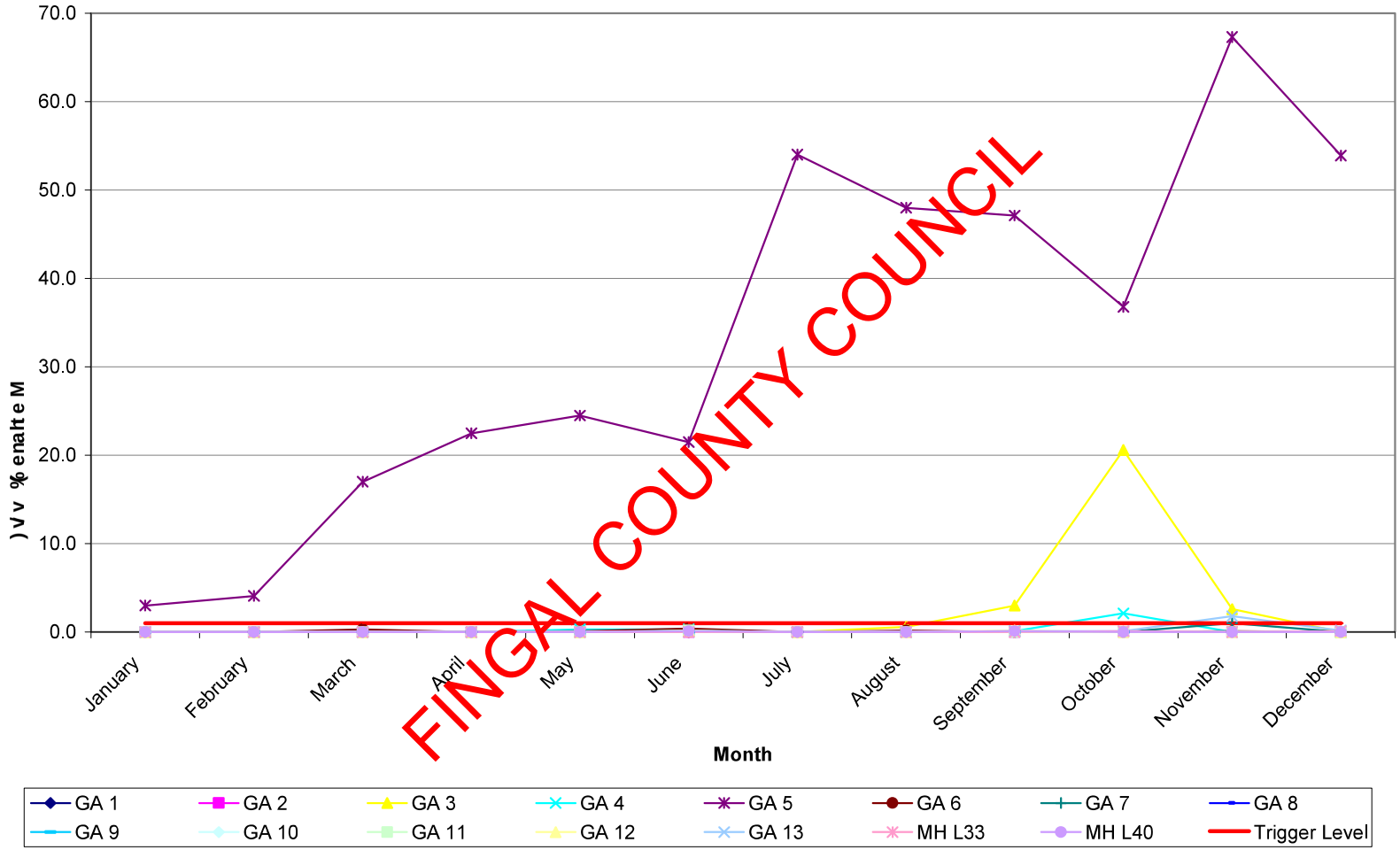




**Figure 3.12: Methane Readings at Perimeter Gas Wells**

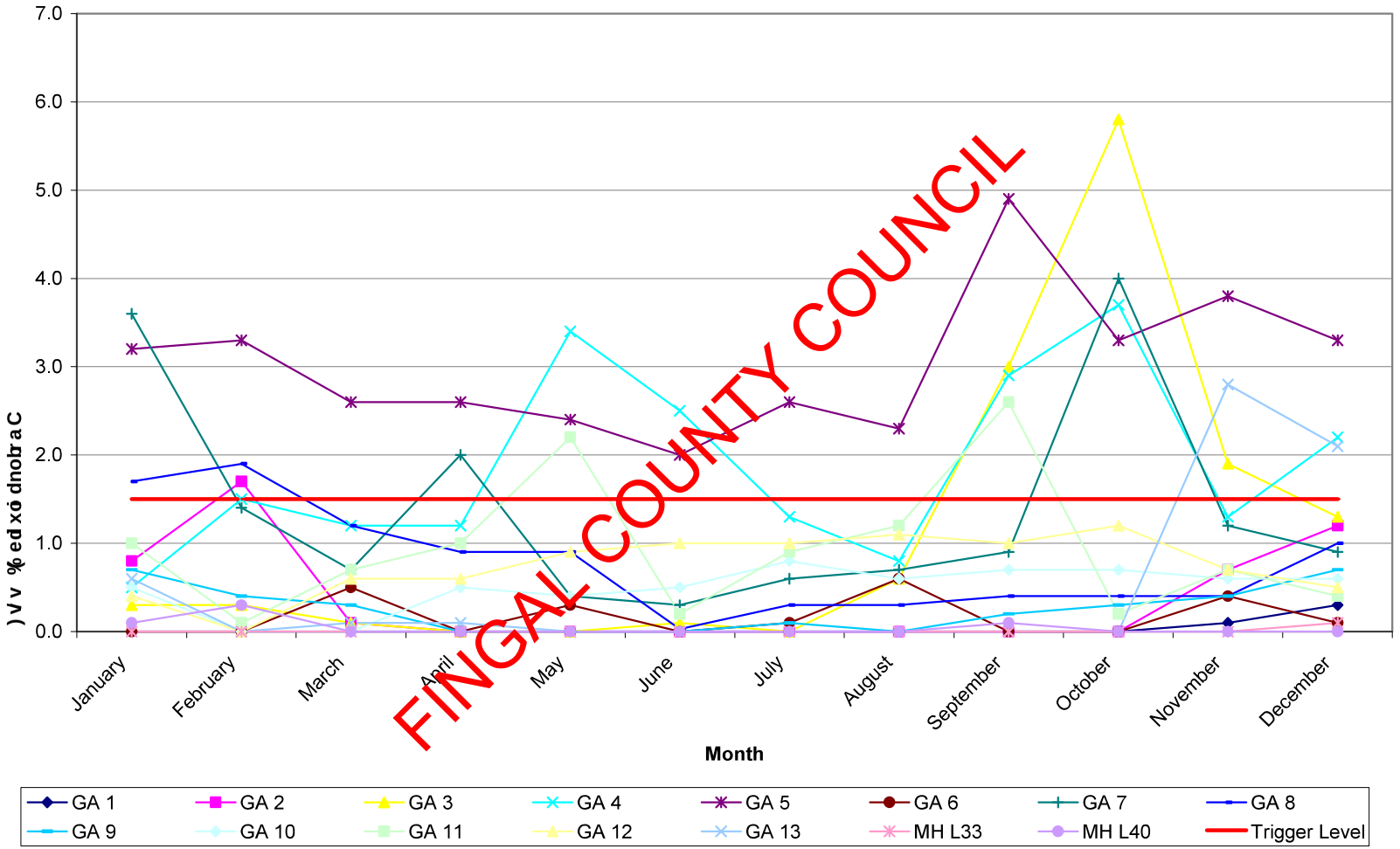




**Figure 3.13: Carbon Dioxide Readings at Perimeter Gas Wells**

## Table 3.22: FCC Flow Assessment at GA5

| GA5 | Date | Time | Tap before | Tap after | $CH_4$ %/v/v | $CO_2$ %/v/v | $O_2$ %/v/v | Flow m3/hr |
|---|---|---|---|---|---|---|---|---|
| | 01/09/2009 | | suction | suction | 17 | 1 | 14.7 | -0.00001 |
| | 03/09/2009 | | suction | suction | 33 | 14 | 5 | -0.01 |
| | 04/09/2009 | | suction | suction | 1.7 | 1.2 | 19.9 | -0.05 |
| | 09/09/2009 | | suction | suction | 0 | 0 | 21 | -0.06 |
| | 10/09/2009 | | suction | suction | 23 | 12 | 5.2 | -0.02 |
| | 11/09/2009 | | suction | suction | 26.5 | 3.8 | 0.9 | 0 |
| | 14/09/2009 | | suction | suction | 48 | 4.5 | 0 | 0 |
| | 17/09/2009 | | suction | suction | 35 | 6 | 0.5 | 0 |
| | 17/09/2009 | | suction | suction | 47.5 | 3.9 | 0 | -0.005 |
| | 18/09/2009 | | suction | suction | 47.5 | 3.9 | 0 | -0.06 |
| | 22/09/2009 | | suction | suction | 44 | 5.7 | 0.9 | 0 |
| | 23/09/2009 | | suction | suction | 42 | 3.5 | 0.4 | -0.06 |
| | 25/09/2009 | | suction | suction | 18 | 3.7 | 11.3 | -0.07 |
| | 29/09/2009 | | closed | closed | 35 | 3 | 0 | 0.03 |
| | 01/10/2009 | | closed | closed | 21 | 2.9 | 6.7 | minus off range |
| | 06/10/2009 | | closed | closed | 57 | 3 | 0 | 0.00006 |
| | 08/10/2009 | | closed | closed | 0 | 0 | 21 | minus off range |
| | 13/10/2009 | | closed | closed | 15.5 | 3.5 | 9.2 | 0.00007 |
| | 15/10/2009 | | closed | closed | 3.4 | 0.6 | 18.3 | -0.016 |
| | 16/10/2009 | | closed | closed | 0 | 0 | 20.9 | -0.00001 |
| | 23/10/2009 | | closed | closed | 12.5 | 1.2 | 14 | minus off range |
| | 27/10/2009 | | closed | closed | 39 | 4.2 | 2 | 0.00006 |
| | 29/10/2009 | | closed | closed | 37 | 4.2 | 2 | -0.00001 |
| | 03/11/2009 | | closed | closed | 35 | 3.6 | 3.2 | -0.000064 |
| | 05/11/2009 | | closed | closed | 47.5 | 3.5 | 2.4 | -0.00001 |
| | 10/11/2009 | | closed | closed | 40 | 11 | 0 | -0.000096 |
| | 12/11/2009 | | closed | closed | 59 | 3.6 | 0 | 0.000286 |
| | 18/11/2009 | | closed | closed | 48 | 3 | 2.6 | -0.00006 |
| | 19/11/2009 | | closed | closed | 69 | 3.5 | 0 | 0.000242 |
| | 01/12/2009 | | closed | closed | 47 | 3.6 | 0.2 | -0.00001 |
| | 03/12/2009 | | closed | closed | 66 | 3.5 | 0 | 0.09 |
| | 08/12/2009 | | closed | closed | 64 | 3.3 | 0.5 | 0.162 |
| | 09/12/2009 | | closed | closed | 52 | 3.1 | 3.4 | -0.06 |
| | 15/12/2009 | | closed | closed | 64 | 3.2 | 0 | 0.13 |
| | 16/12/2009 | | closed | closed | 63 | 3.6 | 0 | 0.103 |
| | 21/12/2009 | | closed | open | 66 | 3 | 0 | 0.21 |
| | 22/12/2009 | | open | open | 63 | 2.8 | 0 | 0.026 |
| | 23/12/2009 | | open | open | 64 | 2.8 | 0 | 0.018 |
| | 24/12/2009 | | open | closed | 64 | 3.1 | 0 | 0 |
| | 04/01/2010 | am | closed | open | 66 | 3 | 0 | 0.21 |
| | 04/01/2010 | pm | open | open | 63 | 3 | 0 | 0.138 |
| | 05/01/2010 | pm | open | open | 65 | 3 | 0 | 0.136 |
| | 06/01/2010 | am | open | closed | 0 | 0 | 21 | -0.06 |
| | 08/01/2010 | am | closed | open | 22 | 2.8 | 6.3 | minus off range |
| | 11/01/2010 | am | open | open | 61 | 3 | 0 | 0 |
| | 12/01/2010 | am | open | open | 69 | 3.1 | 0 | 0.179 |
| | 18/01/2010 | am | open | closed | 0 | 0 | 20.8 | -0.09 |
| | 20/01/2010 | am | closed | closed | 2.7 | 1.5 | 14 | -18.5 |
| | 25/01/2010 | am | closed | open | 3.5 | 0.8 | 17.3 | minus off range |
| | 26/01/2010 | pm | open | open | 0 | 0.3 | 20.6 | 0.019 |
| | 01/02/2010 | am | open | open | 16.5 | 1.8 | 15.3 | -0.08 |
| | 03/02/2010 | am | open | open | 33 | 2.9 | 6.9 | 0.109 |

### 3.6.5 Summary report on emissions

As per Schedule D.7.1 of Waste Licence W0009-02 the licensee is required to carry out annual environmental monitoring of the Gas Combustion Plant/Enclosed Flare. Odour monitoring Ireland personnel conducted the survey on the 7th and the 8th December 2009.

The monitoring included the gas composition in the flue outlets from the four generators and flare in order to meet the requirements of the waste licence. The monitoring for CO, $SO_2$, $NO_x$, and $O_2$ was carried out *in-situ* using an electrochemical analyser. Temperature, velocity and flow rate were also monitored *in-situ* using a thermocouple and a pilot tube and manometer respectively. Samples were collected for analysis to determine TA Luft Class I, II, III organic substances. In addition, samples were collected for the landfill gas delivery system and determined for chlorine, fluorine and sulphur content.

The compliance status of emissions from the five generators with respect to the Waste Licence Limit is summarised in Table 3.23.

**Table 3.23: Result of emissions testing of landfill gas plant 2009**

| Engine Number | Parameter | Compliance Status |
|---|---|---|
| **BY 01.** | FLOW | COMPLIES |
| | CO | COMPLIES |
| | NOx | COMPLIES |
| | TA LUFT CLASS I ORGANICS | COMPLIES |
| | TA LUFT CLASS II ORGANICS | COMPLIES |
| | TA LUFT CLASS III ORGANICS | COMPLIES |
| | HCl | COMPLIES |
| | HF | COMPLIES |
| | PARTICULATES | COMPLIES |
| **2.** | FLOW | COMPLIES |
| | CO | NON COMPLIANCE |
| | NOx | COMPLIES |
| | TA LUFT CLASS I ORGANICS | COMPLIES |
| | TA LUFT CLASS II ORGANICS | COMPLIES |
| | TA LUFT CLASS III ORGANICS | COMPLIES |
| | HCl | COMPLIES |
| | HF | COMPLIES |
| | PARTICULATES | COMPLIES |
| **3.** | FLOW | COMPLIES |
| | CO | NON COMPLIANCE |
| | NOx | COMPLIES |
| | TA LUFT CLASS I ORGANICS | COMPLIES |
| | TA LUFT CLASS II ORGANICS | COMPLIES |
| | TA LUFT CLASS III ORGANICS | COMPLIES |
| | HCl | COMPLIES |
| | HF | COMPLIES |
| | PARTICULATES | COMPLIES |
| **5.** | FLOW | COMPLIES |
| | CO | NON COMPLIANCE |
| | NOx | COMPLIES |
| | TA LUFT CLASS I ORGANICS | COMPLIES |
| | TA LUFT CLASS II ORGANICS | COMPLIES |
| | TA LUFT CLASS III ORGANICS | COMPLIES |
| | HCl | COMPLIES |

| Engine Number | Parameter | Compliance Status |
|---|---|---|
| | HF | COMPLIES |
| | PARTICULATES | COMPLIES |
| **FLARE** | FLOW | COMPLIES |
| | CO | COMPLIES |
| | NOx | COMPLIES |
| | TA LUFT CLASS I ORGANICS | COMPLIES |
| | TA LUFT CLASS II ORGANICS | COMPLIES |
| | TA LUFT CLASS III ORGANICS | COMPLIES |
| | HCl | COMPLIES |
| | HF | COMPLIES |

$NO_x$ as $NO_2$, particulates, Total Non Methane Volatile Organic Compounds, Hydrochloric acid and Hydrogen fluoride were low in the gas utilisation engines and within Emission Limit Values set out in Schedule C.5 of the Waste Licence.

CO emission concentration values were above the 650 mg/$Nm^3$ Emission Limit Value established for Waste Licence W0009-02 at BY02, 03 & 05. These gas utilisation engines were below the Emission Limit Value (1400mg/$m^{3)}$ set for Carbon monoxide in other licences, e.g. W0127-01.

## 3.7 Meteorological Monitoring

Condition 8 and Schedule D.6 of Waste Licence W0009-02 require daily monitoring of precipitation volume, temperature (max. /min.), wind force and direction, and atmospheric pressure.

It has been previously reported (AER, 2007), that there were a series of ongoing problems with the operation of the meteorological instrumentation and equipment on-site and the retrieval of recorded information. Attempts to resolve the issues with the company have proved difficult. A consultant was engaged with a view to commissioning a new system. They recommended relocating the weather station approximately 200 m SW of existing station. The weather recording equipment has been ordered and procured. The civil engineering works were completed, the weather station was assembled and operational from April, 2009.

As a full year's data are not available from the site station, a summary of the meteorological data recorded at Dublin Airport is included for the period. Dublin Airport is situated 10 km southwest of Balleally landfill and the weather station is used by Met Éireann for official statistics. The package used by them was developed in-house and maintained by their own staff.

June had the highest maximum mean monthly temperatures. Rainfall was most prevalent during July and November when highest volumes of rainfall were registered. The site was predominantly affected by south westerly winds.

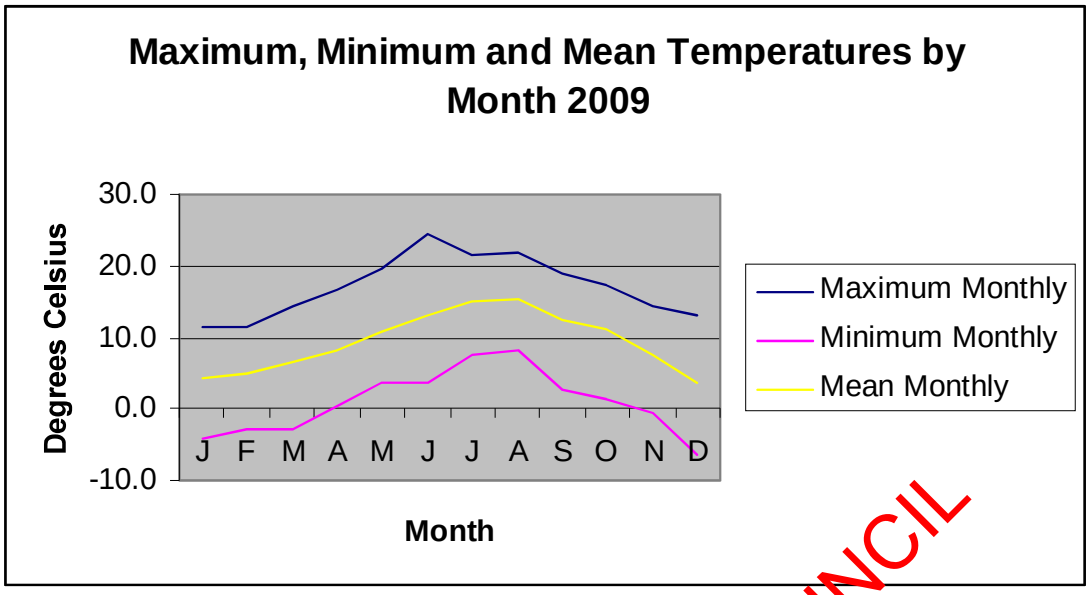


**Figure 3.14: Maximum, Minimum & Mean Temperatures by Month 2009**



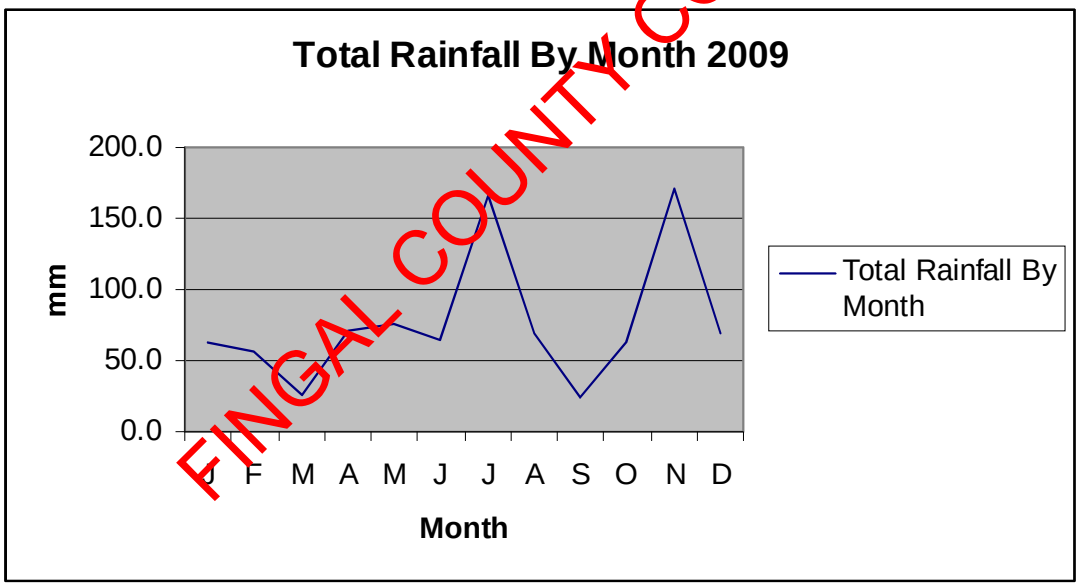


**Figure 3.15: Total Precipitation Volume by Month 2009**

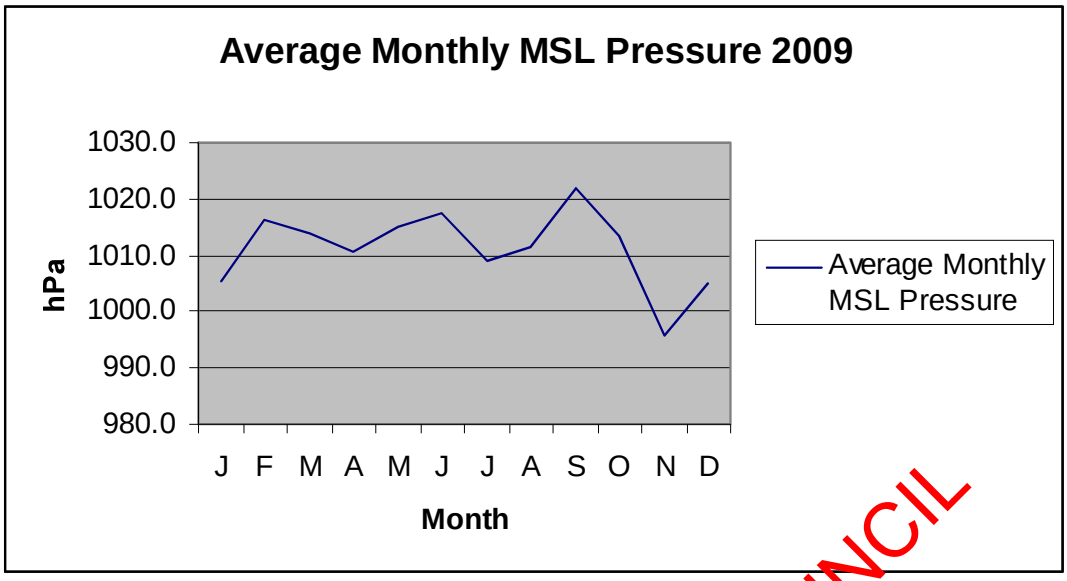


**Figure 3.16: Average Daily Atmospheric Pressure by Month 2009**

**Table 3.24: Average Daily Wind Speed, Min/Max, by Month 2009**

| Month | Mean Speed (knots) |
|---|---|
| Jan | 12.0 |
| Feb | 10.4 |
| Mar | 12.6 |
| Apr | 9.6 |
| May | 12.2 |
| Jun | 9.0 |
| Jul | 10.0 |
| Aug | 11.1 |
| Sept | 10.1 |
| Oct | 10.2 |
| Nov | 14.3 |
| Dec | 11.3 |

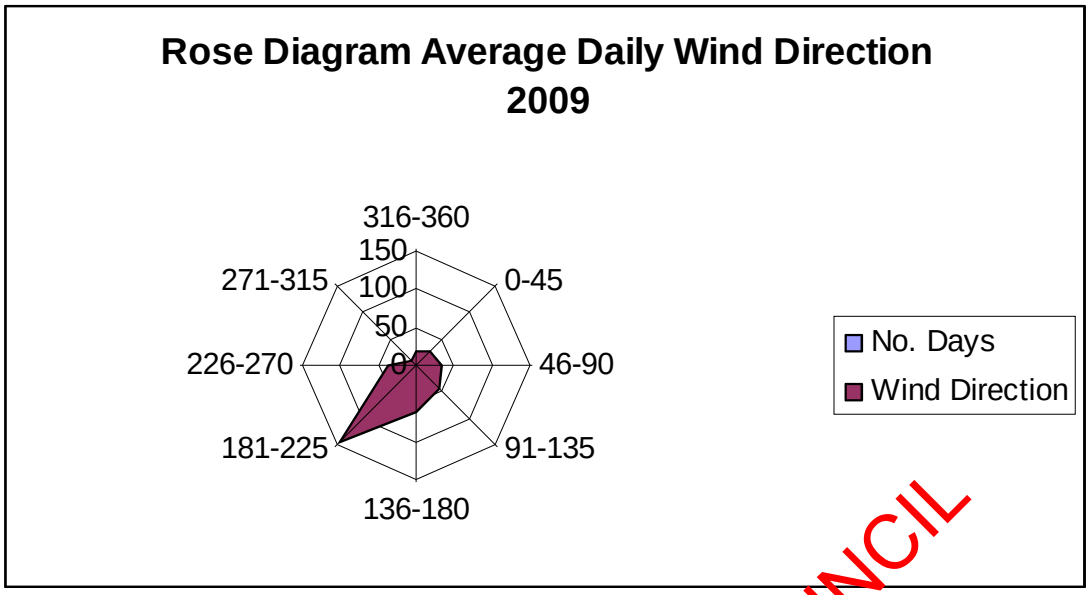


**Figure 3.17: Average Daily Wind Direction 2009**

The winds are predominantly South Westerly in direction.

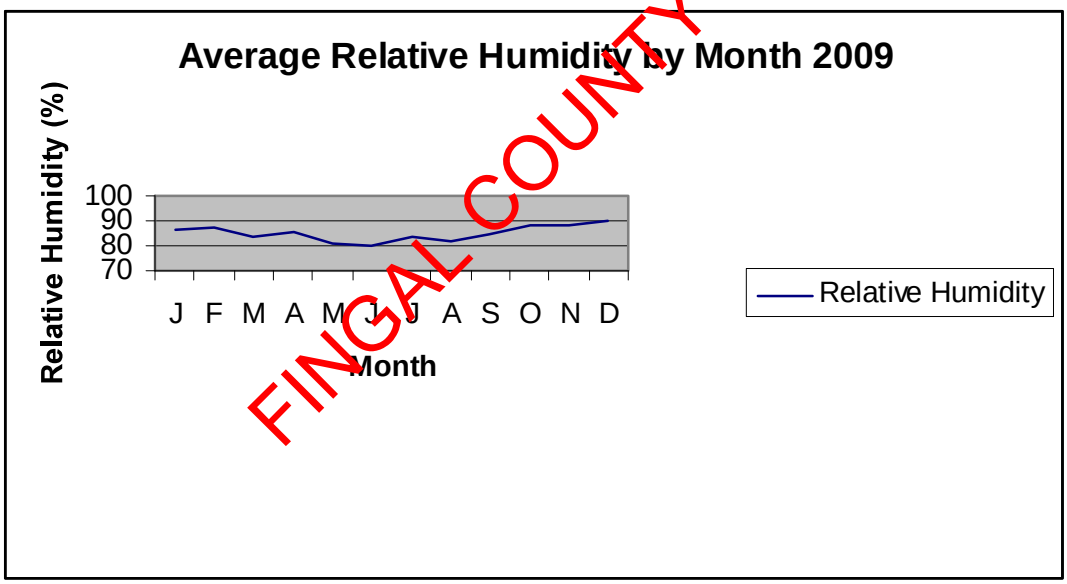


**Figure 3.18: Average Daily Relative Humidity by Month 2009**

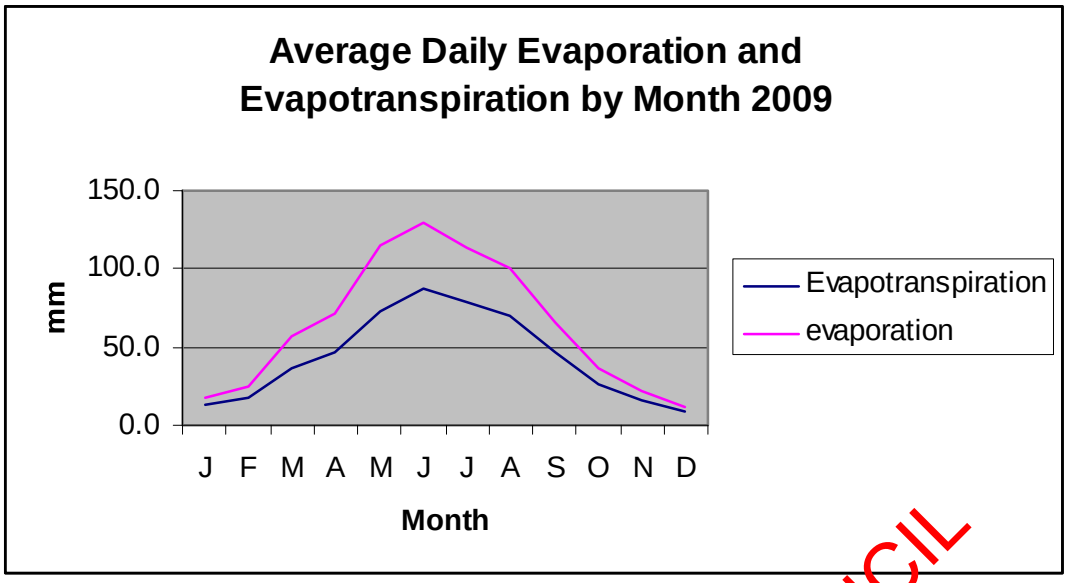


**Figure 3.19: Average Daily Evaporation & Potential Evapotranspiration By Month 2009**



## 3.8 Resource Consumption

Resources consumed at Balleally Landfill include diesel fuel, electricity, hydraulic oil and lubricating oil. Table 3.25 presents a summary of the quantities of each used on-site for the period of this report. Electricity consumed on-site (Table 3.26)was used for the purpose of heating, lighting, the operation of office equipment and the leachate treatment plant. The largest consumer of electricity is the leachate treatment plant which was not in operation during 2009 – which accounts for the drop in electricity consumption in 2009.

Diesel consumption in 2009 was similar to 2008.

**Table 3.25: Summary of resources used On-site 2009**

| Resource | FCC | BPS |
|---|---|---|
| Electricity | 184,317 KWh | 1,245,000 KWh |
| Diesel | 221,972 litres | 0 litres |
| Petrol | 181.84 litres | 0 litres |
| Lube Oil | 1000 litres (Estimate) | 38,930 |
| Water | 8485 m3 | |

### Table 3.26: Electricity consumption on-site for January - December 2009

| Year | Site 900109623 | Site 901532286 | Leachate Treatment Plant 902446909 | KWHr Total |
|---|---|---|---|---|
| 2009 | Ceased | 82,950* | 101,367* | 184,317* |
| 2008 | 1,832* | 91,350* | 202,739* | 295,921* |
| 2007 | 1,726* | 84,900* | 202,669* | 289,295* |
| 2006 | 2,109* | 97,600* | 73,420* | 173,129* |
| 2005 | 1,033* | 115,050* | N/R | 115,050* |
| 2004 | NR | 66,250* | N/R | 66,250* |
| 2003 | NR | NR | N/R | 89,155 @ |
| 2002 | NR | NR | N/R | 76,529 @ |
| 2001 | NR | NR | N/R | 55,453 @ |
| 2000 | NR | NR | N/R | 49,016 @ |

- * Data derived from ESB Energy Extra Website for three accounts registered to Balleally.
- N/R: Accounts not set up at these times.
- @ Data sourced from AER 2006.



Note:

1) There was a significant increase in electricity consumption in the period 2006 – 2008, from previous years as can be observed from Table 3.25. This is attributable to the operation of the new on-site leachate treatment plant, which has the capacity to treat 150m$^3$/day. The decrease in 2009 is attributable to the fact the leachate treatment plant was not in operation.

2) The electricity consumption has increased consecutively since the year 2000 with the exception of 2004 and 2009.

### 3.8.1 Resource Use and Energy Efficiency Audit

On 28th October, 2005 the EPA issued a technical amendment (B) inserting a new Condition 2.5. This condition requires FCC to carry out an energy efficiency audit. The audit must:

i) identify all opportunities for energy use reduction and efficiency;
ii) be carried out in accordance with the guidance published by the EPA – "Guidance Note on Energy Efficiency Auditing", and
iii) be repeated at intervals required by the Agency.

The recommendations from this audit should be incorporated in the Schedule of Environmental Objectives and Targets under Condition 2.3. Opportunities for reducing water consumption and identifying recycling and reuse initiatives will be investigated and an assessment of the efficiency of use of raw materials in all processes will be carried out.

### 3.8.2 Energy Efficiency Audit

The best practice Specific Energy Consumption (SEC) sometimes called the Energy Performance Indicator (EPI), of the sector and of any significant processes is determined where possible. The site SEC's are then compared to the best and the average practice. Any discrepancies were investigated during the 2006 energy audit.

The energy audit identified the site SEC. This may be used as a benchmark to identify the success or otherwise of the implementation of the recommendations.

### 3.8.3 Implication of Audit Findings

No SEC data could be found for comparable industry sectors and thus no comparison of the site's SEC with others could be made.

The energy audit identified a number of recommendations that could be implemented. Implementation of these will result in a reduction of energy cost and green house gas emissions. However in comparison to other industrial sites the energy consumed at Balleally Landfill is very low, especially when it is considered that FCC do not directly control the diesel used by the hired heavy plant vehicles. As the energy consumption at Balleally is so low, it is proposed that it may not be necessary for FCC to have further energy audits conducted at the site.

## 3.9 Landfill Gas Utilisation

Landfill gas is actively extracted by means of a series of wells and a collection pipe network in the waste body. The gas is pumped through two main lines to the site utilisation plant. The utilisation plant comprises of five generators grouped into two operating units AER1 and AER3 as shown in the schematic diagram of the plant in Appendix I. To achieve maximum design power output from the station the inlet gas must contain 50% methane and the minimum available gas volume must be 3,340 $m^3$/hr. At present the 50% methane gas concentration is achieved, but the gas volume is not measured at the landfill.

The power station/utilisation plant operators, Bioverda Power Systems Limited, regulate the inflow of gas to the station in order to achieve the 50% Methane target. The total power output from the station for the period is shown in Tables 3.27 & 3.28.

Utilisation was reduced during the period 2004-2006 due to the re-location of the plant and repairs needed to the main gas collection pipe. Field reconfigurations were also required due to the advancing capping programme. During 2007, 24 new gas wells were installed in cells 1 & 2. An increase in the gas extraction network occurred in 2008 with the emplacement of an additional 10 new gas wells in cells 1-3. Three "rising landfill gas extraction wells" were placed in the active tipping area (Cell 5) during 2008. Additional 14 wells placed in cell 5 during 2009. The success of these measures has resulted in a consistent increase in electricity production from gas extraction from 2006 through to 2008 (Table 3.16 & 3.17).

There has been a slight decrease in landfill gas utilisation in 2009 over 2008. A number of factors are thought to have contributed to this. One of the engines have been removed from Balleally to be located at another site. The total volume of waste entering the landfill is decreasing year on year since2002. Additionally with the roll-out of the brown bin service in the Fingal area and the diversion of biodegradable waste from landfill this is resulting in a subsequent decrease in the biodegradable element of waste entering Balleally.

Currently sufficient gas is being extracted to run 4 engines.

**Table 3.27: Electricity Output (MWhr) from the On-site Power Station at Balleally Landfill per year 2003-2009**

| YEAR | ELECTRICITY OUTPUT (MWhr) |
|---|---|
| 2003 | 30,194 |
| 2004 | 21,636 |
| 2005 | 21,234* |
| 2006 | 20,529* |
| 2007 | 23,762 |
| 2008 | 27,117 |
| 2009 | 25,429 |

* Corrected data for 2005-2006 reported by Bioverda Power Systems.

**Table 3.28: Electricity Output (MW) from the On-site Power Station at Balleally Landfill 2009**

| Month | Combined AER1 & AER3 (MWhrs) |
|---|---|
| January | 2338 |
| February | 2146 |
| March | 2331 |
| April | 2211 |
| May | 2276 |
| June | 2120 |
| July | 2161 |
| August | 2130 |
| September | 1940 |
| October | 2006 |
| November | 1827 |
| December | 1943 |
| **Total** | **25429** |



## 3.10 Review of Nuisance Controls

Condition 7 of Waste Licence W0009-02 requires that vermin, birds, flies, mud, dust, litter and odours do not give rise to nuisance at the facility or in the immediate area of the facility. To this end a review of the nuisance controls was initiated.

The Nuisance which gives rise to greatest number of complaints is odour. FCC received two complaints from local residents regarding odour emanating from the landfill site on 5th January and 20th February. This is significantly down from the fourteen complaints received in 2008. All complaints were responded to as soon as possible after the time they were reported. Odour monitoring Ireland visited the site twice during 2008 and once during 2009 and they made many recommendations for odour / surface emission control (EPA Refs. W0009-02/gen43mh & W0009-02 / ak60em).

Many of these recommendations have been implemented to date in an effort to further improve odour control and may have contributed to the reduction in odour complaints.

Where these complaints or weekly nuisance inspections reveal odours associated with landfill activities landfill management take corrective action. Expert advice was sought previously on the installation of effective odour control. The company chosen goes by the name of *Mist-Air* and they are based in the United Kingdom.

Mist Air odour neutraliser is an alternative gas cleaning technology that achieves the transfer from odorous gases to a non-odorous liquid. This is achieved by mixing the contaminated air efficiently with the absorbent mist at the optimum ratio of volume to surface area causing a rapid transfer of the odorous gases into the liquid phase, thereby preventing a smell. The neutraliser is totally biodegradable, together with the many odorous causing pollutants and is safe for animals, humans and plants life. It absorbs Ammonia, Alcohol's, Hydrogen Sulphides, Sulphur Dioxide, Ethyl Mercaptans, Amines and many more gases.

The misting system is a base unit housed in a free-standing lockable steel cabinet that provides all the power for the system. A reinforced circulation hose is then fed from the base unit to the various circuits required from around the site.

The static manifolds are fitted with stainless steel atomising jets. These are mounted around the site at 7 meter centres. The system is currently installed around the active Cell 5. The static manifolds were attached to their own independent poles during late 2005. This is a change in practice based on the idea that if they have their own fixed position then they do not have to be continually moved with the litter netting as the active cell changes levels as filling progresses. This should mean less maintenance and air blocks, which will improve the effectiveness of the system's performance.

Since the construction of the speed ramps along Balleally Lane, there has been an increase in the amount of mud deposited on the road. FCC reviewed the road-sweeping programme and had a few trial runs with a footpath-cleansing vehicle and various road sweepers. FCC sends a road sweeper up Balleally Lane daily which sweeps Balleally Lane and within the Landfill from the wheelwash. Additionally FCC have a tractor mounted sweeper which is used on-site.



### 3.10.1 Review of Bird Control January to December 2009

Bird Control Ireland Ltd visited Balleally Landfill site for the purpose of Bird Control between January - December 2009.

During this time site was visited once/twice per month on some occasions and a jointly operated programme was run. The objective of the programme at Balleally was to reduce the amount of scavenging birds on-site to a minimum.

During each visit to site Bird Control Ireland staff undertook efforts to reinforce the daily bird control activities. These included:

- Flying of Falcons and Hawks
- Use of species specific distress calls
- Use of shotgun and Bird scaring pistol
- Flying of various kites ( visual deterrents)

Site staff at Balleally Landfill were responsible for the daily deployment of equipment daily and for keeping record of activities on-site. These record sheets (*visit logs*) were retained in the Bird Control Manual.

Corvids and Gulls were the most common pest bird on-site throughout 2009. These pest birds were moved off site with distress calls and visual deterrents. No gulls were harmed.

Hard and cold weather in January showed increased numbers of scavenging birds on-site. Birds were not permitted to land and were pushed off on each occasion using distress calls, visual deterrents and pyrotechnics. Harassment proved successful as birds numbers reduced on-site. New distress call system (*one shot*) was delivered to site in June.

August and September saw a reduction in the number of birds due to agricultural activities in the area.

Throughout the year Bird Control Ireland Ltd undertook management activities

- Liaison with site management
- Variation of bird control activities on-site to achieve best results
- Equipment maintenance and report faults etc.
- Maintenance of site bird control manual and visit log

The Balleally project has achieved a measure of success for a low level programme. Using site equipment birds can be moved on easily.

Bird distress calls were noted to be effective at moving pest birds off site however the one shot system was moved on-site during the year. The benefit of this move is to represent a "new" call in respect of birds. This proved successful

In conclusion:

- Birds did attempt raids each month but were cleared using the range of techniques and equipment available.
- Corvids and Gulls are the most persistent bird that attempt to raid Balleally Landfill on occasions, usually during times of inclement weather.

Bird Control Ireland Ltd are pleased with the results achieved at Balleally Landfill Site during 2009 and this level of control is to be expected to remain as the current programme continues.

# 4. SITE DEVELOPMENT WORKS

Details of the equipment and plant on-site in Balleally is presented in Table 4.1.

## Table 4.1: Equipment and Plant list at Balleally Landfill 2009

| Type of Item | Item | Quantity | Resource Used |
|---|---|---|---|
| Transport | 02 D 76790 Isuzu 4X4 * | 1 | Diesel |
| | 04 D 68456 Ford Fiesta Van* | 1 | Diesel |
| | 03 D 4835 Isuzu 4X4* | 1 | Diesel |
| | 06 D 77339 VW Twin Cab Pick Up* | 1 | Diesel |
| Plant | 04 D 64948 John Deere 4X4 Tractor* | 1 | Diesel |
| | 07 D 7332 Same Tractor* | 1 | Diesel |
| | 02 D 5577 Renault 4 axle skip lifter* | 1 | Diesel |
| Heavy Plant | Hanimag Compactor | 1 | Diesel |
| | Kamatsu 65px dozer* | 2 | Diesel |
| | Cat 130 mini Excavator* | 1 | Diesel |
| | Cat excavator 330* | 1 | Diesel |
| | 30 Ton Vibrating Roller* | 1 | Diesel |
| | Kobelco 355 Excavator* | 1 | Diesel |
| | Diesel H/P power washer and Bowser* | 1 | Diesel |
| | 10 KVA 3 Phase Generator* | 2 | Petrol |
| Auxiliary Plant | Wacker Plate* | 1 | |
| | CONSAW* | 1 | Petrol |
| | 6 inch pump* | 1 | Diesel |
| | 6.5 KVA diesel generator* | 1 | Petrol |
| Equipment | Extrusion welder* | 1 | |
| | Ingersoll-Rand mobile lighting set* | 1 | |
| | Wedger Seam Welder* | 1 | |
| | Lyster heater / welder* | 1 | |
| Survey | Sokkisna level and tripod* | 1 | |
| | Sokkisna theodolite & Tripod* | 1 | |
| | NIKON auto level* | 1 | |
| | Garmen GPS* | 1 | |
| | GMI gas monitor* | 1 | |
| | Multi 340I meter* | 1 | |
| | GMI FI 2000* | 1 | |
| | 30 Metre steel Tape* | 1 | |
| | Solinist 30m dip meter* | 1 | |
| | Psion organiser* | 1 | |
| | Various P.C.s and printers* | 1 | |

GCL – Geosynthetic Clay Liner

## 4.1 Works carried out during the Reporting period 2009

The ongoing capping programme and final restoration of the landfill will control and contain the breakouts which occasionally occur near the entrance. The shallow vertical barrier surrounding the facility will be completed at the entrance as part of the closure plan. This should help contain any contamination of surface water with leachate into the future.

Remedial works were undertaken during Quarter 2, 2009 to protect the surface water drain / ditch in the vicinity of SW20A. A 50 m length of the drain/ditch was excavated and cleaned prior to lining with low-permeability clay and a HDPE liner pinned and stabilised to the underlying clay bank. These two layers of impermeable material serve to minimise inputs into the drainage ditch.

The ditch adjacent to SW20a was regarded with stone fill, which allows the movement of water through the gravel. A manhole access point was built to facilitate visuals assessment and the required periodic environmental sampling.

There is no flow into the estuary from SW20a as the outfall point is bunged.

During the forthcoming monitoring period FCC propose to undertake an analysis of historic data relating to:

- Leachate pumping
- Weekly Electronductivity readings
- Rainfall
- Leachate levels in Cells
- Groundwater in CD1

Should the analysis of this data present any correlations it may suggest the source of elevated electrical conductivity levels in surface waters.



### 4.1.1 Installation of New Landfill Gas Management Infrastructure

14 No. 125mm diameter gas extraction wells were drilled during Quarter 4 2009 across Cell 5. The exact locations were selected after consultation with FCC and Bioverda. The spacing of the gas extraction system is approximately 45 m between each well on each line. The depth of each of the extraction wells is no deeper that 2 m above the base of the lined landfill at the point of each gas well. The wells were connected to the utilisation plant. The CQA document for these wells is available for inspection at the facility offices.

**Table 4.2: Work carried out during 2009**

| Objective/ Target | Description | Timescale |
|---|---|---|
| **Objective 1** | **To minimise environmental impact on the immediate environment** | |
| Target 1 | **To remediate banks around existing and new boreholes and up update TOC readings**<br><br>Some TOC's resurveyed and all relabelled *in-situ* | Commenced & Ongoing |
| Target 2 | **To review and extend gas abstraction network in newly capped areas**<br><br>Significant new areas harnessed 20 new wells on Top Lobe. 14 new auger wells cells 4&5 Ten new rising wells in cells 5 & 6 | Commenced & Ongoing |
| Target 3 | **To start the installation of concrete paving around LTP**<br><br>Partial Completion 2008 | Commenced & Ongoing |
| Target 4 | **Complete Commissioning of Leachate Treatment Plant & Centrifuge** | Commenced & Ongoing |

| Objective/ Target | Description | Timescale |
|---|---|---|
| | All parameters in compliance except for COD. Application for Licence Review (W0009-04) to remove COD as an ELV parameter | |
| Target 5 | **Complete capping of phases 3 and 11.**<br><br>Phase 3 complete. Cells 1-5 capped within Phase 11 | Commenced & Ongoing |
| Target 6 | **Determine manual procedure for checking leachate levels in the cells**<br><br>Placed second level detector (pressure transducer) in cells | Complete |
| Target 7 | **Install leachate borehole(s) near SVB at western end of site & Repair Leachate Monitoring Boreholes at NE section of Site**<br><br>Installed leachate borehole(s) near SVB at western end of site & Repair Leachate Monitoring Boreholes at NE section of Site | Complete |
| **Objective 2** | **Restoration of the facility** | |
| Target 1 | **Installation of final capping layer**<br><br>Phases 2 & 3 Complete. Cells 1-5 capped within Phase 11 | Commenced & Ongoing |
| Target 2 | **Prepare capped areas for landscaping**<br><br>Phases 2 & 3 Complete. Cells 1-4 capped within Phase 11. | Commenced & Ongoing |
| Target 3 | **Prepare Landscaping Plan for implementation in 2009-2010 to include planting of northern boundary adjacent to gas plant area, Balleally Lane / Landfill northern boundary (after final capping installed) and capped southern and eastern boundaries up to 27m contour line**<br><br>Grass seeding of capped areas ongoing. No other planting this year. Liaison with Parks Department ongoing. Proposal sent to EPA re Planting Programme along Southern, Western and Northern Slopes. Agreement Secured with NPWS for these proposals | Commenced & Ongoing |
| Target 4 | **Examine the completion of a shallow vertical barrier at the northern boundary for implementation during restoration of site**<br><br>No Progress to report | Commenced & Ongoing |
| Target 5 | **Demobilisation of Civic Amenity Area**<br><br>Civic Amenity Demobilised | Complete |
| Target 6 | Seal leachate risers in pump chambers and apply negative pressure | Complete |
| Target 7 | To provide for Leachate Recirculation in Cells 5 & 6 | Commenced & Ongoing |
| Target 8 | To Prepare grade and place liner for second lift Piggybacking above the haul road Cells 4-6 | Commenced & Ongoing |
| Target 9 | To commence mitigation measures to deal with surface water contamination at SW20a. | Commenced & Ongoing |

| Objective/ Target | Description | Timescale |
|---|---|---|
| Target 10 | Install Weather Station | Complete |

## Table 4.3: Works to be carried out during 2010

| Objective/ Target | Description | Timescale |
|---|---|---|
| **Objective 1** | **To minimise environmental impact on the immediate environment** | |
| Target 1 | Repair or replace leachate monitoring boreholes around landfill perimeter. | Feb-Dec 2010 |
| Target 2 | To review and extend gas abstraction network during 2010 in recently capped areas of new cells (5-6) | Feb-Dec 2010 |
| Target 4 | To provide for Leachate Recirculation in Cells 5 & 6 | Feb-Dec 2010 |
| Target 5 | To progress the installation of concrete paving around Leachate Treatment Plant (LTP) | Feb-Sept 2010 |
| Target 6 | Complete Licence Review to remove COD as treatment ELV for treated leachate discharge to estuary | Feb-Sept 2010 |
| Target 7 | To Commence Capping of northern flanks of cells 5& 6 and tie into base anchor trench. To commence capping of former Civic Amenity Area | Commenced & Ongoing |
| Target 8 | To Prepare grade and place liner for second lift Piggybacking above the haul road Cells 4-6 | Commenced & Ongoing |
| Target 9 | To complete mitigation measures to deal with surface water contamination at SW20a | March-Dec 2010 |
| Target 10 | To investigate mitigation measures for the prevention of leachate breakout along the southern boundary of the landfill | March – Dec 2010 |
| **Objective 3** | **Restoration of the facility** | |
| Target 1 | Commence Capping of northern flanks of cells 5 & 6 and tie into base anchor trench. To Commence Capping of old civic amenity area. | March – Dec 2010 |
| Target 2 | Prepare capped areas for landscaping | March – Dec 2010 |
| Target 3 | **Prepare Landscaping Plan for implementation in 2010 to include planting of northern boundary adjacent to gas plant area, Balleally Lane / Landfill northern boundary (after final capping installed) and capped southern and eastern boundaries up to 27m contour line**<br><br>Grass seeding of capped areas ongoing. No other planting this year. Liaison with Parks Department ongoing. Proposal sent to EPA re Planting Programme along Southern, Western and Northern Slopes. Agreement Secured with NPWS for these proposals | March – Dec 2010 |

| Objective/ Target | Description | Timescale |
|---|---|---|
| Target 4 | Examine the completion of a shallow vertical barrier at the northern boundary for implementation during restoration of site | March – Dec 2011 |
| **Target 5** | To Prepare Plan for the demobilisation of existing facility offices to a new location | March – Dec 2010 |
| **Target 6** | Address Flooding Issue at Entrance | March – Dec 2010 |
| **Target 7** | Address Contamination Issue at SWV1 | March – Dec 2010 |
| **Target 8** | Repair Leachate Monitoring Levels SCADA system | March – Dec 2010 |

## 4.2 Progress on-site restoration

The Restoration and Aftercare Plan for the landfill was submitted in July 2003 as per Condition 4.1. This plan sets out a framework to successfully restore Balleally Landfill to a condition suitable for use as an amenity for the general public. The plan has been prepared in accordance with the EPA Landfill manual 'Landfill Restoration and Aftercare' (1999), the Council Directive (1999/31/EC) on the Landfill of Waste and Waste Licence W0009-02. Restoration is being undertaken at Balleally Landfill using a phased approach due to the size of the site and seasonal constraints. On completion of restoration in each phase, the aftercare plan to establish and maintain the after use of the site shall be implemented.

Capping of the site is undertaken as per Condition 4.3. The geotextile alternative was investigated and agreed in early 2004 with the EPA. This decreased the number of vehicle movements required for importing soil for the final cap.

Figure 4.1 indicates the agreed phases for the capping and restoration of Balleally Landfill. The phasing provides for the restoration of the original landfill initially, and then the landfill extension area. The total area for capping is 45.9 Hectares (113.42 Acres).

Between 2004 and December 2008, 36.25 Hectares (89.57 Acres) were capped. During 2009, an additional 1.28 Hectares (ha) (3.16 Acres) were capped. Along with the "Old Landfill", Cells 1, 2, 3, 4 and the majority of 5 of the new landfill, are now capped, see Figure 4 .1. A total of 37.53 Hectares (92.73663 Acres) is now capped, this equates to 81.76% of the entire landfill area capped. The remaining capping areas are the new cells 5&6 (4.6ha approximately) and Old Landfill (3.7ha approx).

A proposal was sent to *The Agency* (Ref: FCC-W0009-02-020) on 22/9/2008 to provide for a second lift "piggybacking" between "new cells" and Top Lobe of the old landfill. This proposal would give a void space of 176,000 tonnes. This proposal was agreed to, subject to conditions, by *The Agency*, (Ref: W0009-02 / ak61em) and an additional 1.6 ha of the landfill was lined for the reception of waste.



### 4.2.1 Inert waste to be used for cover/restoration material at the facility

An estimate of soils required for the final capping of the landfill is as follows:

Expected subsoil tonnages for restoration = 1,180,000 tonnes
Expected topsoil tonnages for restoration = 580,000 tonnes

This estimate does not take into account any soil requirements for levelling off the contours prior to the placement of the final capping. However, it is expected that material on the landfill site (berms etc.) will be used which will limit the importation of soil/clay.

Onion skin method of filling takes place at the tipface at Balleally Landfill as described in the EPA Landfill Operational Practices manual. As a result of this method at the end of each day the tipface is completely covered with clay and other such inert material. This reduces the possibility of windblown litter and provides reasonable surface quality for vehicle access the next day for tipping.

This mixed cover material provides drainage, shape and surface stability to the landfill, which is essential, when the final restoration measures above are initiated.

A filling plan has been prepared for the extension area in 2006 to ensure the integration of waste filling activities with the phased restoration of the site under condition 5.2 of the Waste Licence W0009-02.

A revised filling plan was submitted to and approved by the EPA before entering Cell 5; the revised plan took into consideration the EPA Circular Letter to all landfills, dated 20th June 2007.

The total area of the site is 124 Acres. The Licence area is 124 Acres.

See below statistics of capping programmed:

Start Date of Capping Programme: May 2004
Progress as of 18th December 2009: Approximately 92.73 Acres (37.53ha)

**The final capping profile is made up of:**

1. Topsoil layer of 300 mm thickness.
2. Subsoil layer of 700 mm thickness.
3. Geocomposite Drainage Layer (GDL).
4. Geosynthetic Clay Liner (GCL) / LLDPE membrane liner on New Cells.
5. Geocomposite Gas Collection (GGCL).



## 4.3 Annual topographic survey

In accordance with Condition 8.5.1 of WL W0009-02 a Topographical Survey was undertaken in Balleally Landfill in September 2009 and submitted to The Agency (Ref: FCC-W0009-02-2009-027).

## 4.4 Slope stability

As required under Licence Condition 8.8.1 a slope stability survey was undertaken in Balleally Landfill during October 2009 and submitted to The Agency (Ref: FCC-W0009-02-2009-029).

Amongst the conclusions in the survey report is the statement that, "*The accessible slopes at Balleally Landfill are considered by BMA to be, in general, in good condition.*"

The following recommendations were made:

"…….
*Temporary slopes exist, pending regarding, within the site at relatively steep angles but only minor evidence of slope instability or distress of these slopes was noted during the site visit. Monitoring should be undertaken regularly in these areas and the slopes reprofiled as soon as possible……..*

*Vegetation of any un-vegetated, permanent slopes should be carried out as soon as possible……*

*The minor slope stability issues identified in this report should be addressed as soon as possible".*

These recommendations have been communicated to site management and will be implemented.

*"Consideration should be given to the establishment of specific monitoring points along the southern slope for measurement during the annual topographic survey."*

This recommendation will be discussed with Topographic Survey Company with a view to incorporating it into annual topographic survey.

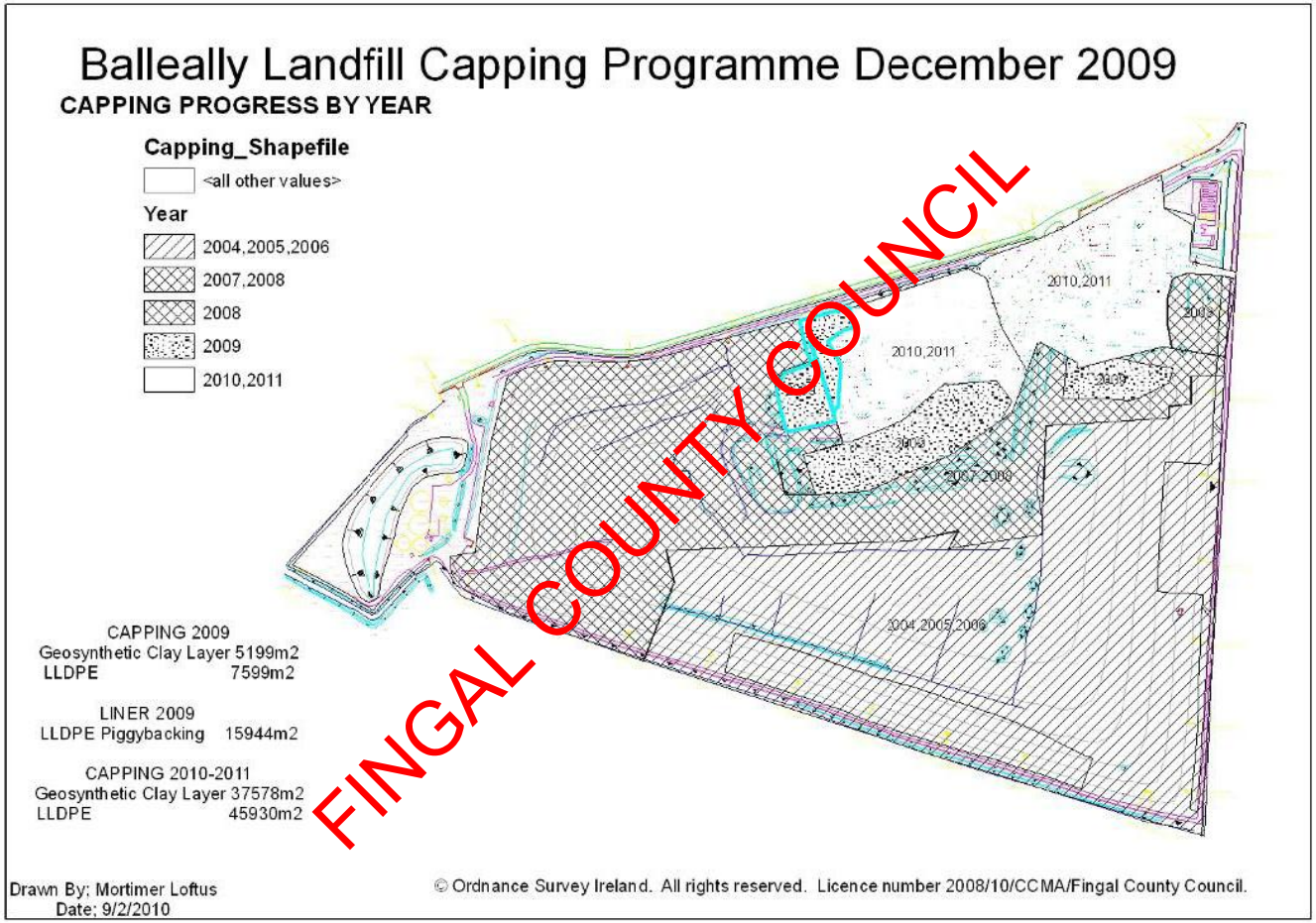




**Figure 4.1: Balleally Landfill Capping Program December 2009**

# 5. WASTE RECEIVED AND CONSIGNED FROM THE FACILITY

## 5.1 Waste acceptance and handling

### 5.1.1 Waste reception

During operational hours, a qualified person in charge of the landfill is always present on-site. A new weighbridge system was installed at Balleally Landfill by Precia Molen Irl. Limited. It consists of two Precia Molen VS300CS surface Mounted Weighbridges linked to a GeneSYS PC-based Weighbridge Management System. The GeneSYS Windows – based software, which forms the basis of the PC based system stores all relevant data in database form from which cross-referenced reports can be generated as required by landfill management and the accounts department.

The system has been in operation since the 25th of May 2005 and consists of two weighbridges, one "in" and one "out". These are linked to a computerised system. An automatic barrier system is proposed to be linked to the computerised system. This will consist of one barrier to prevent the lorry being driven off the weighbridge prematurely and another to prevent the ensuing lorry from getting too close to the weighbridge. The capacity of both weighbridges is 50,000/60,000Kg and the deck size is 18m x 3.6m.

Extensive protection against lightening is included as standard, this includes earthing bonds for each loadcell and a central earth for the entire weighbridge.

Written records of loads arriving on-site are maintained. These include the date, weight (tonnes), origin (producer/collector), description of waste (EWC code), the carriers name, vehicle registration and special handling/pre-approval permit number (where applicable) is recorded. The initial point of inspection is the weighbridge and the name of the operator is recorded electronically by the GeneSYS system as the person checking the load in the first instance. Written operational procedures for waste acceptance are available and used for training staff on-site.

The weighbridge is located a few hundreds yards north of the administration building where a service hatch permits communication with the driver and inspection of documentation accompanying the waste consignment (Waste Acceptance Form A, B or C, Permit (if applicable). The site reception area is laid out in a one-way system, which assists the through flow of vehicles. No vehicles deemed unfit to use the site roads are allowed access. Rejected loads are recorded as per Condition 10.2 (i) of the Waste Licence 9-2 detailing the date and type of waste rejected and the facility to which they were directed.

All vehicles arriving on-site must be appropriately covered to ensure the transport of the waste does not adversely affect the environment. Warnings will be given to the driver where necessary and if the instruction is ignored the company involved will be contacted and the load rejected.

Acceptance of waste is as per Schedule A of the Waste Licence Reg. No. 9-2 Waste Acceptance policy agreed by EPA as per condition 5.2.3 and Condition 1.6 of the licence.

Wastes not acceptable are liquid wastes, animal wastes, construction and demolition wastes, whole used tyres and hazardous wastes. Difficult wastes that require special handling can only be accepted if the Environmental Services Department of the Council has given prior authorisation at County Hall, Swords. Authorisation is by means of a valid permit (which expires one month after the date of stamping by the Environmental Services Department) and details the waste type, quantity and any special instructions required by site personnel.

Following acceptance of the load the weighbridge operator directs traffic to the relevant working area for the waste type where a banksman in charge of traffic will give further instructions to drivers.

### 5.1.2 Waste inspection

If the weighbridge operator is unhappy with the documentation, nature and/or source of a load presented for disposal or if the carrier's permit is invalid, he will contact the Site Manager and may instruct the vehicle to park (in a holding area) while the legal status of the permit, or the origin, description and nature of the load is confirmed.

A visual inspection can be performed at the weighbridge, if possible. Alternatively, the load can be tipped adjacent to the relevant tipping face and inspected by the designated waste inspector. Where a breach of the law is suspected, the EPA and the Gardaí will be informed.

Where a breach of the waste acceptance policy is suspected the load can be diverted to the Waste Inspection Area/Quarantine Area for further inspection.

In addition to these inspections, checking and confirmation of suspect loads, random checks are also carried out on regular site traffic.

Non-municipal type waste is not accepted on-site unless the Environmental Services Department has given prior approval at County Hall, Swords by means of a pre-approval permit.

FCC personnel responsible for checking the documentation accompanying vehicles must be capable of:

- understanding the waste acceptance criteria for the site in terms of licence requirements, and site management policies,
- understanding the basic underlying reasons for the acceptance criteria for the site,
- understanding the information which should be provided on the documentation accompanying loads,
- identifying non-conformity,
- Following specific procedures in the event that either the documentation is incorrect or the load does not comply with the relevant acceptance criteria.

Where inspection of a load is not possible at the site reception area (e.g. sealed containers), then the waste is deposited on the ground close to the working face. This permits inspection of the load prior to blading and burial. If a non-conformity is discovered or suspected, the waste is isolated and placed back in the transporting container or suitable alternative and removed to the Quarantine area pending management investigation. If the non-compliance is confirmed and deposit on the site not possible, then the load is returned to the carrier, and the producer and authorities informed. Written records of the incident are recorded at the Weighbridge in the Rejects Book. Loads held on-site overnight are recorded in the Quarantine Register.

### 5.1.3 Inspection/Quarantine Area

An inspection area is provided as per condition 3.7 of the Waste Licence W0009-02. Any waste not conforming with schedule A and/or agreed Waste Acceptance Policy as per condition 5.2.3 will be rejected and removed off-site or placed in the quarantine area. Random loads and suspect loads will be diverted to the Inspection area for spot checks.

## Table 5.1: Quantity & Type of Waste Deposited in Balleally Landfill in 2003-2009 & Waste Licence Limit for Waste Licence W0009-02

| Waste Type | Licence Limit *(tonnes)* | Deposited in 2003 *(tonnes)* | Deposited in 2004 *(tonnes)* | Deposited in 2005 *(tonnes)* | Deposited in 2006 *(tonnes)* | Deposited in 2007 *(tonnes)* | Deposited in 2008 *(tonnes)* | Deposited in 2009 *(tonnes)* |
|---|---|---|---|---|---|---|---|---|
| Household | 152,500 | 61,201.52 | 65,814.99<br>(+ 6,099.56 C.A)<br>71,914.55 | 66,203<br>(+ 5,801 C.A)<br>72,004 | 62056<br>(+4,891 C.A.)<br>66,947 | 63,708<br>(+4,867 C.A.)<br>+62 F.T.<br>68,637 | 50,489<br>(+ 3,959 C.A.)<br>+10 F.T.<br>54,458 | 37,789 |
| Commercial | 200,000 | 150,454.96 | 119,890.35 | 49,195.57 | 63,819 | 61,773 | 46,248 | 54,093 |
| Sewage Sludge | 30,000 | 4,494 | 5,104.58 | 3,402.24 | 4,623 | 7,466 | 5,091 | 315 |
| Industrial Non-Hazardous Sludge | 6,000 | 5,749 | 5,992.8 | 6,635 | 6,825 | 7,061 | 6,660 | 6,363 |
| **Total** | **388,500** | **221,899.48** | **202,902.28** | **131,236.81** | **142,214** | **144,937** | **112,457** | **98,560** |

C.A – Civic Amenity

Note: As can be seen from the above figures during 2005-2008, the industrial non-hazardous sludge from Leixlip waste water treatment plant exceeded the licence limit of 6,000 tonnes. This is attributable to the expansion of the plant due to an increase in demand for potable water and subsequently an increase in production. Sewage sludge is from Barnageera Sewage Treatment Works which accounted for increases in this waste stream during 2007, no longer comes to Balleally Landfill.

Waste received at Balleally to be disposed of at the landfill is weighed at the weighbridge on entry. A waste acceptance policy has been prepared as per Condition 5.2. This enables the recording of waste into and out of the facility as per Condition 10.2 and 10.5.

## 5.2 Quarantine register

Vehicles are taken into quarantine at Balleally Landfill for inspection under the Operation Bruscar Scheme.

### 5.2.1 Operation Bruscar Introduction:

On Saturday, 16th November 2002 a joint operation between guards and authorised persons under the Waste Management Act, 1996 commenced. This operation was codenamed "Operation Bruscar".

The authorised persons involved identified vehicles that were transporting waste and requested the guard to stop the identified vehicle. The waste on the vehicle was examined and the driver was questioned with regards to the origin and eventual destination of the waste. If, in the opinion of the authorised person, it was necessary to prevent environmental pollution, the vehicle containing the waste was impounded.

All impounded vehicles were taken to the quarantine area at Balleally landfill, where they were detained. This made it possible to further inspect and in detail examine the waste on the impounded vehicles.

Examination of waste is necessary to gather evidence for possible prosecution and to classify and identify the waste to safely dispose of it at a facility that is licensed to accept it.

Three operations were done during November and December 2002 and 41 were executed in 2003. 39 of these vehicles have been impounded to date, 25 of them in 2003.

There were only 7 vehicles impounded in 2004 and 3 vehicles impounded during the reporting period of 2005. This was owing to the temporary closure of the quarantine area in order to facilitate the excavation of the new cell number 6 in July 2004. A replacement quarantine area was built in 2005 but utilisation of this area has not been possible due to outstanding construction issues. All vehicles impounded are recorded in the Balleally Landfill Quarantine Register. FCC has also agreed to accept vehicles from similar operations from Meath County Council waste officials when required.



*2006*

There were seven vehicles impounded in the quarantine area during 2006. All vehicles impounded are recorded in the Balleally Landfill Quarantine Register. FCC has also agreed to accept vehicles from similar operations from Meath County Council waste officials when required.

*2007*

There were six vehicles impounded in the quarantine area during 2007. All vehicles impounded are recorded in the Balleally Landfill Quarantine Register. FCC has also agreed to accept vehicles from similar operations from Meath County Council waste officials when required.

*2008*

No vehicles were impounded in the quarantine area during 2008.

*2009*

No vehicles were impounded in the quarantine area during 2009.

## 5.3 Discussion of Fingal County Council's waste consigned to Balleally Landfill

- **Domestic Waste:** Domestic waste is household refuse that was collected by FCC refuse freighters from the doorstep of private households. The waste is presented to the Council in a wheelie bin.
- **Road Sweepers:** Road sweepers are lorry type machines that are employed by the Council to sweep channels and kerbing and to remove grit and litter from the road surface.
- **Roads:** The Roads Department carry out repairs to footpaths and roads in the county. The waste material arising from these activities is used in the landfill for berk and internal road construction.
- **Parks:** The Parks Department not only tend to trees, shrubs and plants but also conduct repairs to buildings and structures of a historical nature and clear litter and rubbish from open spaces. Residual materials from these activities were deposited to the landfill. Waste from road cleansing and landscaping also arise from this department. It should be noted that no green waste was disposed of to the facility by this department.
- **Drainage:** Sewage sludge consigned to the facility for the period was classified as drainage as it originated in the Drainage Department. This was the only sewage sludge consigned to the facility.
- **Environment:** Material from the Environment Department originates from activities such as beach cleaning, cemetery management and clean-ups.
- **Cleansing:** The Litter Management Section collects material such as litter bin contents and fly-tipped waste which is consigned to the landfill.
- **Leixlip Waterworks:** Leixlip Waterworks is a potable water treatment plant. A by-product of the treatment process is a non-hazardous sludge cake as well as some screenings.
- **Waterworks:** Waste generated by the operation of the Water and Drainage Division that would include cleanings and inert material arising from the laying of pipes.
- **HQ:** A small quantity of waste produced in the headquarters of FCC was disposed of at the facility.

# 6. ENVIRONMENTAL INCIDENTS AND COMPLAINTS

## 6.1 Reported incidents

Table 6.1 gives a summary of reported incidents during 2009. More details are available at the facility office.

### Table 6.1: Reported Incidents during the Reporting Period 2009

| Incident Number | Date of Incident | Nature of Incident |
|---|---|---|
| 1 | 24/8/2009 | Landfill Gas: Emission Limit Value Exceeded at Monitoring Well-GA5. |
| 2 | 25/8/2009 | Landfill Gas: Emission Limit Value Exceeded at Monitoring Well-GA5. |
| 3 | 27/8/2009 | Landfill Gas: Emission Limit Value Exceeded at Monitoring Well-GA5. |
| 4 | 1/9/2009 | Landfill Gas: Emission Limit Value Exceeded at Monitoring Well-GA5. |
| 5 | 11/9/2009 | Landfill Gas: Emission Limit Value Exceeded at Monitoring Well-GA5. |
| 6 | 14/9/2009 | Landfill Gas: Emission Limit Value Exceeded at Monitoring Well- GA5. |
| 7 | 18/9/2009 | Landfill Gas: Emission Limit Value Exceeded at Monitoring Wells-GA3& GA5. |
| 8 | 21/9/2009 | Landfill Gas: Emission Limit Value Exceeded at Monitoring Well- GA5. |
| 9 | 30/9/2009 | Landfill Gas: Emission Limit Value Exceeded at Monitoring Wells- GA3 & GA5. |
| 10 | 7/10/2009 | Landfill Gas: Emission Limit Value Exceeded at Monitoring Well- GA5. |
| 11 | 14/10/2009 | Landfill Gas: Emission Limit Value Exceeded at Monitoring Wells- GA3&GA5. |
| 12 | 23/10/2009 | Landfill Gas: Emission Limit Value Exceeded at Monitoring Wells- GA3, GA4 & GA5. |
| 13 | 27/10/2009 | Landfill Gas: Emission Limit Value Exceeded at Monitoring Wells- GA3, GA4 & GA5. |
| 14 | 3/11/2009 | Landfill Gas: Emission Limit Value Exceeded at Monitoring Wells- GA3&GA5. |
| 15 | 11/11/2009 | Landfill Gas: Emission Limit Value Exceeded at Monitoring Wells- GA3&GA5. |
| 16 | 19/11/2009 | Landfill Gas: Emission Limit Value Exceeded at Monitoring Well-GA5. |
| 17 | 27/11/2009 | Landfill Gas: Emission Limit Value Exceeded at Monitoring Wells- GA3, GA5, GA7 & GA13. |
| 18 | 1/12/2009 | Landfill Gas: Emission Limit Value Exceeded at Monitoring Wells- GA3&GA5. |
| 19 | 8/12/2009 | Landfill Gas: Emission Limit Value Exceeded at Monitoring Wells- GA3&GA5. |
| 20 | 11/12/2009 | Landfill Gas: Emission Limit Value Exceeded at Monitoring Well- GA5. |
| 21 | 16/12/2009 | Landfill Gas: Emission Limit Value Exceeded at Monitoring Well-GA5. |
| 22 | 21/12/2009 | Landfill Gas: Emission Limit Value Exceeded at Monitoring Well-GA5. |

## 6.2 Complaints Summary

A summary of complaints for the reporting period is shown in Table 6.2. The complaints register is available for further inspection at the site office. There were a total of 2 complaints received at the facility for the reporting period-compared to fourteen complaints in 2008. They both relate to odour. All complaints were responded to as soon as possible after the time they were reported. Odour monitoring Ireland visited the site twice during 2008 and once during 2009 and made many recommendations for odour / surface emission control (EPA Refs. W0009-02/gen43mh & W0009-02 / ak60em). Many of these recommendations have been implemented to date which may account for the reduction in the number of complaints received.

### Table 6.2: Complaints received for the reporting period 2009

| Date of Complaint | Nature of Complaint | Complaint | Corrective Action |
|---|---|---|---|
| 5/1/2009 | Odour | Odour at Dwelling – Balleally Lane / Lusk Road Junction | Investigation |
| 11/2/2009 | Odour | Odour at Dwelling-Lusk Area | Investigation |

# 7. ENVIRONMENTAL MANAGEMENT PROGRAM

## 7.1 Environmental Objectives and targets for 2010

See section 4.2 for environmental objectives and targets.

## 7.2 Summary of written procedures

There were no new written procedures during the reporting period.

## 7.3 Communications program for public information

The Communications Programme for FCC contains information on Balleally Landfill. The information can roughly be divided into two areas. Background information prior to granting of waste licence, and information concerning the waste licence (W009-02). There is also a register of correspondence to and from the Agency, along with the various correspondences relevant to the Licence. This information is updated on a continuous basis.

**Environmental Information can be viewed at the following locations:**

- At the **Council's Headquarters** between 9.30 a.m. and 12.45 p.m. and 2.00 p.m. and 4.00 p.m. Monday to Friday (excluding public holidays), unless otherwise arranged by prior appointment.
- Permanent facilities for viewing information including a computer to be provided at Balleally Landfill.
- At **Balleally Landfill** by prior appointment with the Landfill Manager.
- A register of information will be made available on www.fingalcoco.ie. A Link to the EPA's website will also be added to the site.

### 7.3.1 Site Visits

- Site visits to **Balleally Landfill** can be arranged by writing to the Senior Landfill Manager requesting the date and time of the proposed visit and indicating the number of visitors and the purpose of such a visit and whether any presentation is required. The use of cameras and video equipment during the visit must be agreed in advance with FCC.
- Such requests will be accommodated where possible.

### 7.3.2 Balleally Landfill Liaison Committee

- All information relating to the restoration and aftercare of Balleally Landfill is presented to the Liaison Committee for comment and adoption.
- The members of the committee are:

Mr. Brian Arnold - REACT
Mr. John Barrett, and Ms. Rena Condrot - Balleally Residents and Farmers Association
Mr. Des Martin, and Mr. Ben Colgan - RAGE
Cllr. May McKeon (Chairperson), Cllr. Anne Devitt, Cllr. Tom Kelleher, Cllr. Joe Corr - Public Representatives. Following local elections and voting onto steering committees Cllr. Tom Kelleher & Cllr. Joe Corr were replaced by Cllr Ken Farrell and Cllr. Gerry McGuire.

Mr. John Daly, Mr Martin Kiely and Mr. Mortimer Loftus. - FCC.

The Committee met six times during 2009. Agenda were set and minutes kept.

## Table 7.1: Reports & Information Available for Public Inspection 1993-2009

| Information Available | Report Date |
|---|---|
| Balleally Landfill Preliminary Technical Report & Scoping Study | September 1993 |
| Balleally Landfill Study, Improvement of Balleally Landfill Site & Lusk Sewage Outfall, Inception Report | October 1996 |
| Balleally Landfill Study, Improvement of Balleally Landfill Site & Lusk Sewage Outfall, Safety & Environment Assessment Report | January 1997 |
| Balleally Landfill Study, Improvement of Balleally Landfill Site & Lusk Sewage Outfall, Preliminary Report on Recycling of Construction/ Demolition Waste | January 1997 |
| Environmental Impact Statement for Balleally Landfill and Rush/Lusk Wastewater Treatment Plant, Volumes 1 - 8 | September 1997 |
| Waste Licence Application, Application Form | October 1997 |
| Waste Licence Application, Monitoring Data | October 1997 |
| Balleally Landfill Report on Interpretation of Baseline Monitoring Programme | November 1998 |
| Waste Licence Request for Additional Information<br>Waste Licence Request for Additional Information Article 6(1) | February 1998<br>September 1998 |
| Waste Licence 9 – 1, Issued by the EPA | 16th February 1996 |
| Report on Short Term Options at Balleally Landfill | July 1999 |
| Waste Management Plan for the Dublin Region, Accepted by FCC | 10th May 1999 |
| Dublin Landfill Site Selection, Phase 1 Report<br>Report on Short Term Options at Balleally Landfill<br>Report on Short Term Options (capacity) at Balleally Landfill | July 1999<br>July 1999<br>Aug. 2000 |
| Construction & Demolition Waste Recycling Project, Contracts Documents | |
| Hydrology Study at Balleally Landfill | March 1993 |
| Groundwater Quality at Balleally Landfill | June 2000 |
| Groundwater Quality at Balleally Landfill | December 2000 |
| Construction & Demolition Waste Recycling Project, Contract Documents | April 2001 |
| Ground & Surface Water Quality at Balleally Landfill | April 2001 |
| Proposal for Leachate Management at Balleally Landfill in Response to Condition 4.17 of Waste Licence 9-1 | July 2001 |
| Environmental Monitoring at Balleally Landfill | July 2001 |
| Noise Monitoring at Balleally Landfill | August 2001 |
| Environmental Monitoring at Balleally Landfill | October 2001 |
| Environmental Monitoring at Balleally Landfill | Jan 2002 |
| Bird counts from Rogerstown Estuary | 1995 2001 |
| Environmental Monitoring at Balleally Landfill | April 2002 |
| Balleally Landfill Vertical Barrier - Specified Engineering Works/ Tenders | May 2002 |
| Environmental Monitoring at Balleally Landfill | July 2002 |
| Annual Environmental Report 2000 | |
| Annual Environmental Report 2001 | Nov 2002 |
| Balleally Landfill/ Short Term Extension Program - updated tender Jan 2003 | Jan 2003 |
| Annual Environmental Report 2002 / 9-1 | February 2003 |
| Environmental Monitoring at Balleally Landfill Nov - Dec 2002<br>Environmental Monitoring at Balleally Landfill Jan 2003 | February 2003 |
| Ecological Monitoring of Rogerstown Estuary May & July 2002 | February 2003 |
| Study of Scavenging Birds at Balleally Landfill December 2002 | February 2003 |
| Ecological Monitoring of Rogerstown Estuary Oct & Nov 2002 | February 2003 |
| Dust Monitoring Locations April 2003 | July 2003 |

| Information Available | Report Date |
|---|---|
| Environmental Monitoring April 2003 | July 2003 |
| Revised Restoration and Aftercare Plan Balleally landfill July 2003 | July 2003 |
| Slope Stability Assessment for Balleally Landfill July 2003 | July 2003 |
| Environmental Monitoring at Balleally July 2003 | July 2003 |
| Environmental Monitoring at Balleally July 2003 C001983/4 | July 2003 |
| Rogerstown Estuary Final Report June 2003 | June 2003 |
| Environmental Monitoring at Balleally July 2003 C002631/1 | October 2003 |
| Construction Quality Assurance Report/Schedule B | September 2003 |
| Environmental Monitoring Report Balleally Dec 2003 (including Appendices) | December 2003 |
| Balleally Landfill AER 2003 | February 2004 |
| Environmental Monitoring Report January 2004 | April 2004 |
| Environmental Monitoring Report March 2004 | March 2004 |
| December '03 Environmental Noise Report | July 2004 |
| Quarterly Monitoring Report Q2 June 2004 | August 2004 |
| Construction Quality Assurance Report/Schedule B | August 2004 |
| Quarterly Monitoring Report Q3 October 2004 | October 2004 |
| Quarterly Monitoring Report Q4 December 2004 | January 2005 |
| Annual Environmental Report 2004 | February 2005 |
| Quarterly Monitoring Report Q1 January 2005 | April 2005 |
| Quarterly Monitoring Report Q2 & Noise monitoring report Q2 April 2005 | July 2005 |
| Quarterly Monitoring Report Q3 July 2005 | October 2005 |
| Quarterly Monitoring Report Q4 October 2005 | January 2006 |
| Annual Environmental Report 2005 | January 2006 |
| Environmental Management Plan 2005 | February 2006 |
| Quarterly Monitoring Report and Noise Survey Q1 2006 | April 2006 |
| Quarterly Monitoring Report and Noise Survey Q2 2006 | July 2006 |
| Quarterly Monitoring Report and Noise Survey Q3 2006 | September 2006 |
| Resource Use and Energy Efficiency Audit | October 2006 |
| Quarterly Monitoring Report Q4 2006 | January 2007 |
| Noise Survey Q4 2006 | January 2007 |
| 2006 Annual Emissions Survey H2S Gas Plant | January 2007 |
| Annual Environmental Report 2006 | January 2007 |
| Quarterly Monitoring Report and Noise Survey Q1 2007 | April 2007 |
| Quarterly Monitoring Report Q2 2007 | July 2007 |
| Noise Survey Q2 2007 | July 2007 |
| Quarterly Monitoring Report and Noise Survey Q3 2007 | October 2007 |
| Flooding Report | November 2007 |
| Slope Stability Survey Report | December 2007 |
| Quarterly Monitoring Report and Noise Survey Q4 2007 | January 2008 |
| Annual Environmental Report 2007 | January 2008 |
| Quarterly Monitoring Report Q1 2008 | April 2008 |
| Quarterly Monitoring Report Q2 2008 | July 2008 |
| Rogerstown Estuary Treated Leachate Discharge Modelling Report. | October 2008 |
| Slope Stability Survey | November 2008 |
| Landfill Gas Trace Element Analysis Report | November 2008 |
| Biological Monitoring Report | November 2008 |

| Information Available | Report Date |
|---|---|
| 2008 Annual Emissions Survey IPS Gas Plant | January 2009 |
| Quarterly Monitoring Report and Noise Survey Q4 2008 | January 2009 |
| Annual Environmental Report 2008 | January 2009 |
| Quarterly Monitoring Report Q1 2009 | April 2009 |
| Quarterly Monitoring Report Q2 2009 | July 2009 |
| Slope Stability Survey | November 2009 |
| 2009 Annual Emissions Survey IPS Gas Plant | January 2010 |
| **Map Information Available** | **Report Date** |
| Re-location C&D at Balleally | March 2003 |
| Wall & Railing along landfill at Balleally | April 2003 |
| C&D Waste Recovery Area, Balleally | June 2003 |
| Topographical Survey for Balleally June 2003 | June 2003 |
| Re-location of Gas Compound at Balleally / 4 Drawings | July 2003 |
| Proposed gas extraction pipe to new gas plant | November 2003 |
| Monitoring Map (J1/DG0008) For Balleally | December 2003 |
| Balleally Leachate Treatment Plant Process & Instrumentation Drawing | July 2004 |
| Balleally Leachate Treatment Plant Site Plan Layout | July 2004 |
| Topographical Survey for Balleally Landfill June 2004 | August 2004 |
| Revised Monitoring Drawing | October 2004 |
| Installation of new landfill gas management infrastructure. | February 2005 |
| Topographical Survey | October2005 |
| Topographical Survey | August 2006 |
| Provision of Public Car Park and Walkway | February 2007 |
| New IPS Gas Wells | February 2007 |
| Phase 2 Piggybacking | April &July 2007 |
| Joining of existing two vertical barrier walls | June 2007 |
| Installation of New Landfill Gas Management Infrastructure | July 2007 |
| Topographical Survey | December 2007 |
| Updated as built drawings for surface water / leachate infrastructure | October 2008 |
| Topographic Survey | October 2008 |
| Topographic Survey | October 2009 |
| Landfill Gas Infrastructure | October 2009 |

## 7.4 Finical provision

Condition 12.2 of the licence requires the establishment of a fund to implement the Restoration and Aftercare Plan (submitted as per Condition 4.1 in July 2003).

FCC received a letter from The Agency during 2008 regarding Environmental Liability Risk Assessment (ELRA), Residuals Management Plans (RMP), Closure Remediation and Aftercare Plans (CRAMP) and Financial Provision (FP).

In order to assist The Agency in their assessment on the uptake of Environmental Liability Risk Assessment (ELRA), Residuals Management Plans (RMP), Closure Remediation and Aftercare Plans (CRAMP) and Financial Provision (FP), the following information was submitted to The Agency in relation to Balleally Landfill.

- Balleally Risk Categorisation as derived using the system set out in The Agency's Guidance Document.

This specific exercise has not been carried out to date. However on looking at the guidance document it appears similar to the "Methodology for Determining Enforcement Category of Licences". This exercise gave Balleally an A1 enforcement category which would probably equate to a Risk Category 3 classification.

- The facility's RMP/CRAMP was submitted to The Agency on 4/7/2003. It was agreed by The Agency during 2003. The RMP / CRAMP have not yet been fully costed.
- FCC's position to date with regard to financial provision currently in place for Balleally has been stated as follows; "In accordance with Condition 12.2 of the Waste Licence, FCC shall establish and maintain a fund or other form of approved security, that is adequate to assure the financial capability of implementing the Restoration and Aftercare Plan as agreed with "*The Agency*"." Financial provision is made on an annual basis at FCC budgeting meetings. Details of Financial Provision were furnished to The Agency on 25/1/2010 in correspondence Ref: FCC-W0009-02-2010-03.

As the CRAMP/RMP predates the Guidance Document (2006), there are some differences in content and methodology. The contents of the CRAMP/RMP broadly reflect the suggested contents in the guidance document. It is also worth stating that *The Agency* approved of the CRAMP/RMP at the time of submission. The financial provision is considered adequate.



## 7.5 Management Structure

The facility is owned and operated by FCC. The Environmental Services Department of FCC manage the landfill facility. Some changes in the management structure occurred during 2009. A description of the current management structure is detailed in Appendix II.

# Appendix I

Drawings







| ID | Easting | Northing |
|---|---|---|
| GA1 | 321767 | 252159 |
| GA2 | 321986 | 252383 |
| GA3 | 322070 | 252383 |
| GA4 | 322170 | 252415 |
| GA5 | 322291 | 252440 |
| GA6 | 322389 | 252467 |
| GA7 | 322490 | 252498 |
| GA8 | 322614 | 252542 |
| GA9 | 321942 | 252347 |
| GA10 | 321942 | 252393 |
| GA11 | 322039 | 252433 |
| GA12 | 322669 | 252575 |
| GA13 | 322848 | 252666 |
| MH L33 | 322001 | 252416 |
| MH L40 | 322654 | 252566 |
| | | |
| P1 | 321983 | 252190 |
| LMW1 | 322006 | 252143 |
| LMW2 | 322077 | 252115 |
| LMW3 | 322169 | 252084 |
| LMW4 | 322271 | 252053 |
| LMW5 | 322368 | 252022 |
| LMW6 | 322461 | 251991 |
| LMW7 | 322559 | 251958 |
| LMW8 | 322651 | 251933 |
| LMW9 | 322749 | 251903 |
| LMW10 | 322844 | 251877 |
| LMW11 | 322846 | 251974 |
| LMW12 | 322853 | 252074 |
| LMW13 | 322859 | 252175 |
| LMW14 | 322863 | 252274 |
| LMW15 | 322873 | 252375 |
| LMW16 | 322880 | 252473 |
| LMW17 | 322885 | 252572 |
| LMW18 | 322890 | 252657 |
| L19 | 322203 | 252227 |
| L20 | 322240 | 252235 |
| L21 | 322281 | 252272 |
| L22 | 322388 | 252283 |
| L23 | 322862 | 252640 |
| L24 | 322887 | 252648 |
| LTP M1 | 321984 | 252199 |
| LTP M2 | 321952 | 252247 |

| ID | Easting | Northing |
|---|---|---|
| NM1 | 321919 | 252357 |
| NM2 | 321779 | 252415 |
| NM3 | 321459 | 252383 |
| NM4 | 322604 | 252962 |
| NM5 | 322970 | 254004 |
| | | |
| OF1 | 322862 | 251849 |
| OF2 | 322755 | 251876 |
| OF3 | 322506 | 251953 |
| OF4 | 322276 | 252028 |
| | | |
| MB 18 | 323344 | 252832 |
| MB 35 | 322029 | 251906 |
| RC 3 | 321906 | 252729 |
| CD 1 | 322006 | 252356 |
| | | |
| SWV 1 | 321980 | 252187 |
| SWFD | 321952 | 252366 |
| S3 | 322966 | 252678 |
| S7 | 322607 | 253279 |
| SW20a | 322878 | 252676 |
| | | |
| DM1/PM1 | 321874 | 252321 |
| DM2 | 321927 | 252482 |
| DM3/PM2 | 322038 | 252484 |
| DM4/PM3 | 322728 | 252671 |



N

KEY

- NSL1 Noise Monitoring Location
- AD1 Dust Monitoring Location
- OF1 Outfall Location
- 3d Groundwater Monitoring Location
- SW1 Surface Water Monitoring
- MG1 Gas Well Monitoring Locations
- LM1 Leachate Monitoring Locations

| Rev | By | Chk | Date | Description |
|---|---|---|---|---|
| C | DB | NT | 10.01.08 | ISSUE FOR INFORMATION |
| B | DB | MM | 05.07.07 | ISSUE FOR INFORMATION |

Name of Client: Fingal County Council

Name of Job
ENVIRONMENTAL MONITORING
BALLEALLY

Title of Drawing
ENVIRONMENTAL MONITORING LOCATIONS

Scales Used
1:2500 A1 / 1:5000 A3

Dwg. No. DE07-164-03-001 Rev. B

FEHILY TIMONEY & COMPANY
CONSULTANTS IN ENGINEERING & ENVIRONMENTAL SCIENCES
Core House, Pouladuff Rd, Cork, Ireland.
T:+353-21-4964133, F:+353-21-4964464
Mill House, Ashtown Gate, Navan Rd, Dublin 15, Ireland.
T:+353-1-6583500, F:+353-1-6583501
W: www.fehilytimoney.ie, E: info@ftco.ie

# Appendix II

Management structure



## Balleally Landfill – Waste Licence W0009-02:
## Condition 2.2.1. Management Structure – 23rd March 2009

| TITLE | NAME | BASE | DUTIES AND RESPONSIBILITIES | QUALIFICATIONS | EXPERIENCE |
|---|---|---|---|---|---|
| Senior Engineer, Environment | Mr. J. Daly | HQ | Responsible for Waste Management Enforcement and Waste Infrastructure. | B.E. (Civil Engineering), 1986. M.Sc. Environmental Engineering, 1993. MIEI. | 15 years Water Service and Waste Management experience. 14 years LA experience. |
| Senior Executive Engineer, Environment | Mr. M. Kiely | HQ | Responsible for Waste Infrastructure within the Environment Department. | B.E. (Civil Engineering) 1977, F.Á.S. Waste Management Training Course. | Approx.30 years LA experience including 18 years Waste Management experience. Joined the Environmental Services Department of FCC in Jul 2001. |
| Landfill Management, Executive Engineer, | Mr. Aidan Murphy | HQ & Balleally Landfill | Landfill Management. Supervision of external contracts. Liaison with consultants and contractors for development works and capping program. | B.E. (Mechanical Engineering), EurIng, MIEI, Chartered Engineer. F.Á.S. Waste Management Training Course. F.Á.S. Managing Safely in Construction Training Course. | 10 years Engineer Officer, Defence Forces, 6 Years Project Management Construction Industry. Joined the Environmental Services Department in July 2004. |
| Landfill Management, A/ Executive Scientist, | Dr. Mortimer Loftus | Balleally Landfill & HQ | Landfill Management. Management of Waste Licence Compliance. Supervision of scientific monitoring, reporting and liaison with the Environmental Protection Agency. | Ph.D. Ecology, B.Sc. Environmental Science, Dip Environmental Impact Assessment Management, Dip Environmental Management, F.Á.S. Waste Management Training Course. F.Á.S. Managing Safely in Construction Training Course. | 1996-2004 Soil Research and Mapping in Teagasc. Joined the Environmental Services Department in July 2004. |
| Landfill Foreman | Mr. John Lacey | Balleally Landfill | Deputy in the absence of the Landfill Manager, Waste Acceptance Manager, safety inspections and day to day supervision of staff. | Completed courses in Health and Safety (NIFAST), Manual Handling, Evasive Driving & Trenching. Also Fire Warden and Supervisors courses. | Over 30 years Local Authority Service. Assistant Foreman in Dunsink Landfill for 12 years before being appointed Foreman for Balleally Landfill in 1998. |
| A/Assistant Foreman | Mr. Mick Harford | Balleally Landfill | Assistant to Landfill Foreman, task management of site operatives for general works and capping program. | A/Assistant Foreman. | Working at Balleally Landfill Site since 1986. |

# AER Returns Worksheet

Version 1.1.10

| | |
|---|---|
| **REFERENCE YEAR** | 2009 |

**1. FACILITY IDENTIFICATION**

| | |
|---|---|
| Parent Company Name | Fingal County Council |
| Facility Name | Balleally Landfill |
| PRTR Identification Number | W0009 |
| Licence Number | W0009-02 |

Waste or IPPC Classes of Activity

| No. | class_name |
|---|---|
| 3.5 | Specially engineered landfill, including placement into lined discrete cells which are capped and isolated from one another and the environment. |
| 3.1 | Deposit on, in or under land (including landfill). |
| 3.10 | Release of waste into a water body (including a seabed insertion). |
| 3.12 | Repackaging prior to submission to any activity referred to in a preceding paragraph of this Schedule. |
| 3.13 | Storage prior to submission to any activity referred to in a preceding paragraph of this Schedule, other than temporary storage, pending collection, on the premises where the waste concerned is produced. |
| 3.2 | Land treatment, including biodegradation of liquid or sludge discards in soils. |
| 3.4 | Surface impoundment, including placement of liquid or sludge discards into pits, ponds or lagoons. |
| 4.10 | The treatment of any waste on land with a consequential benefit for an agricultural activity or ecological system. |
| 4.11 | Use of waste obtained from any activity referred to in a preceding paragraph of this Schedule. |
| 4.12 | Exchange of waste for submission to any activity referred to in a preceding paragraph of this Schedule. |
| 4.13 | Storage of waste intended for submission to any activity referred to in a preceding paragraph of this Schedule, other than temporary storage, pending collection, on the premises where such waste is produced. |
| 4.2 | Recycling or reclamation of organic substances which are not used as solvents (including composting and other biological transformation processes). |
| 4.3 | Recycling or reclamation of metals and metal compounds. |
| 4.4 | Recycling or reclamation of other inorganic materials. |
| 4.9 | Use of any waste principally as a fuel or other means to generate energy. |

| | |
|---|---|
| Address 1 | Balleally |
| Address 2 | Lusk |
| Address 3 | Co. Dublin |
| Address 4 | |
| | |
| | |
| Country | Ireland |
| Coordinates of Location | -6.15456 53.5062 |
| River Basin District | IEEA |
| NACE Code | 3821 |
| Main Economic Activity | Treatment and disposal of non-hazardous waste |
| **AER Returns Contact Name** | John Daly |
| **AER Returns Contact Email Address** | mortimer.loftus@fingalcoco.ie |
| **AER Returns Contact Position** | Senior Engineer |
| **AER Returns Contact Telephone Number** | 01 8906261/ 01 8731415 |
| **AER Returns Contact Mobile Phone Number** | |
| **AER Returns Contact Fax Number** | |
| **Production Volume** | 0.0 |
| **Production Volume Units** | |
| **Number of Installations** | 0 |
| **Number of Operating Hours in Year** | 0 |
| **Number of Employees** | 0 |
| **User Feedback/Comments** | |
| **Web Address** | |



**2. PRTR CLASS ACTIVITIES**

| Activity Number | Activity Name |
|---|---|
| 5(d) | Landfills |
| 5(c) | Installations for the disposal of non-hazardous waste |
| 5(d) | Landfills |
| 50.1 | General |

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

| | |
|---|---|
| Is it applicable? | No |
| Have you been granted an exemption ? | No |
| If applicable which activity class applies (as per Schedule 2 of the regulations) ? | |
| Is the reduction scheme compliance route being used ? | |

## 4.1 RELEASES TO AIR

### SECTION A : SECTOR SPECIFIC PRTR POLLUTANTS

| RELEASES TO AIR | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| POLLUTANT | | METHOD | | | Flare | BY01 | BY02 | BY03 | BY04 | QUANTITY | | |
| | | | Method Used | | | | | | | | | |
| No. Annex II | Name | M/C/E | Method Code | Designation or Description | Emission Point 1 | Emission Point 2 | Emission Point 3 | Emission Point 4 | Emission Point 5 | T (Total) KG/Year | A (Accidental) KG/Year | F (Fugitive) KG/Year |
| 01 | Methane (CH4) | M | alt | Testo 350/454 MXL Flue Gas Analyser | 93.0 | 16976.0 | 14996.0 | 12646.0 | 16177.0 | 3061375.62 | 0.0 | 3000487.62 |
| 02 | Carbon monoxide (CO) | M | alt | Testo 350/454 MXL Flue Gas Analyser | 26.0 | 23396.0 | 23777.0 | 9462.0 | 12458.0 | 69119.0 | 0.0 | 0.0 |
| 05 | Nitrous oxide (N2O) | M | alt | Testo 350/454 MXL Flue Gas Analyser | 941.0 | 11797.0 | 9915.0 | 8963.0 | 9087.0 | 40703.0 | 0.0 | 0.0 |
| 07 | Non-methane volatile organic compounds (NMVOC) | M | SCC | Portable Signal 3030PM FID calibrated with Propane in accordance with EN1526:2002 non-methane hydrocarbon cutter | 941.0 | 131.0 | 1[illegible].0 | 185.0 | 205.0 | 1612.0 | 0.0 | 0.0 |
| 11 | Sulphur oxides (SOx/SO2) | M | alt | Testo 350/454 MXL Flue Gas Analyser | 1666.0 | 2120.0 | 2[illegible]9.0 | 1741.0 | 1831.0 | 9657.0 | 0.0 | 0.0 |
| 03 | Carbon dioxide (CO2) | C | SCC | GASSIM | 49105.0 | 8958726.0 | 79[illegible]021.0 | 6677200.0 | 8541599.0 | 32144651.0 | 0.0 | 0.0 |

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

### SECTION B : REMAINING PRTR POLLUTANTS

| RELEASES TO AIR | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| POLLUTANT | | METHOD | | | Flare | BY01 | BY02 | BY03 | BY04 | | QUANTITY | |
| | | | Method Used | | | | | | | | | |
| No. Annex II | Name | M/C/E | Method Code | Designation or Description | Emission Point 1 | Emission Point 2 | Emission Point 3 | Emission Point 4 | Emission Point 5 | Emission Point 6 | T (Total) KG/Year | A (Accidental) KG/Year | F (Fugitive) KG/Year |
| 15 | Chlorofluorocarbons (CFCs) | M | SCC | Impinger train containing 0.1 molar sodium hydroxide and deionised water solution in accordance with EN1911 and EPA 26A | 0.1[illegible]904874 | 26.436569789 | 23.365521339 | 19.703946576 | 25.205657422 | 0.0 | 94.8566 | 0.0 | 0.0 |
| 14 | Hydrochlorofluorocarbons (HCFCs) | M | SCC | Impinger train containing 0.1 molar sodium hydroxide and deionised water solution in accordance with EN191[illegible] and EPA 26A | 0.148498209 | 27.092141069 | 23.944937082 | 20.192562973 | 25.830704666 | 0.0 | 97.208844 | 0.0 | 0.0 |

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

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

| RELEASES TO AIR | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| POLLUTANT | | METHOD | | | Flare | BY01 | BY02 | BY03 | BY04 | QUANTITY | | |
| | | | Method Used | | | | | | | | | |
| Pollutant No. | Name | M/C/E | Method Code | Designation or Description | Emission Point 1 | Emission Point 2 | Emission Point 3 | Emission Point 4 | Emission Point 5 | T (Total) KG/Year | A (Accidental) KG/Year | F (Fugitive) KG/Year |
| 244 | Total Particulates | M | SCC | Particulate Matter Measured in accordance with EN13284-1 | 0.0 | 1583.0 | 1389.0 | 1348.0 | 1352.0 | 5672.0 | 0.0 | 0.0 |

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

### Additional Data Requested from Landfill operators

**For the purposes of the National Inventory on Greenhouse Gases, landfill operators are requested to provide summary data on landfill gas (Methane) flared or utilised on their facilities to accompany the figures for total methane generated. Operators should only report their Net methane (CH4) emission to the environment under T(total) KG/yr for Section A: Sector specific PRTR pollutants above. Please complete the table below:**

**Landfill:** Balleally Landfill

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

| | T (Total) kg/Year | Method Used: M/C/E | Method Used: Method Code | Method Used: Designation or Description | Facility Total Capacity m3 per hour | |
|---|---|---|---|---|---|---|
| Total estimated methane generation (as per site model) | 7537104.0 | C | SCC | GASSIM | N/A | |
| Methane flared | 0.0 | C | SCC | GASSIM | 0.0 | (Total Flaring Capacity) |
| Methane utilised in engine/s | 4597504.38 | M | OTH | FROM BPS POWER GENE | 0.0 | (Total Utilising Capacity) |
| Net methane emission (as reported in Section A above) | 3000487.62 | C | SCC | GASSIM | N/A | |

## 4.3 RELEASES TO WASTEWATER OR SEWER

### SECTION A : PRTR POLLUTANTS

**OFFSITE TRANSFER OF POLLUTANTS DESTINED FOR WASTE-WATER TREATMENT OR SEWER**

| POLLUTANT | | METHOD | | | QUANTITY | | | |
|---|---|---|---|---|---|---|---|---|
| | | | Method Used | | Leachate Tankered Offsite | | | |
| No. Annex II | Name | M/C/E | Method Code | Designation or Description | Emission Point 1 | T (Total) KG/Year | A (Accidental) KG/Year | F (Fugitive) KG/Year |
| 79 | Chlorides (as Cl) | M | ALT | TM184 - ISO17025 Accredited | 62139.5775 | 62139.5775 | 0.0 | 0.0 |
| 19 | Chromium and compounds (as Cr) | M | ALT | ICP-MS. TM191 - ISO17025 Accredited | 5.32241325 | 5.32241325 | 0.0 | 0.0 |
| 20 | Copper and compounds (as Cu) | M | ALT | TM152 - ISO17025 Accredited | 0.202745813 | 0.202745813 | 0.0 | 0.0 |
| 82 | Cyanides (as total CN) | M | ALT | TM227 - ISO17025 Accredited | 10.7415 | 10.7415 | 0.0 | 0.0 |
| 83 | Fluorides (as total F) | M | ALT | TM104 - ISO17025 Accredited | 45.866205 | 45.866205 | 0.0 | 0.0 |
| 23 | Lead and compounds (as Pb) | M | ALT | ICP-MS. TM152 - ISO17025 Accredited | 0.20143893 | 0.20143893 | 0.0 | 0.0 |
| 21 | Mercury and compounds (as Hg) | M | ALT | TM183 - ISO17025 Accredited | 0.000537075 | 0.000537075 | 0.0 | 0.0 |
| 24 | Zinc and compounds (as Zn) | M | ALT | TM152 - ISO17025 Accredited | 2.55039015 | 2.55039015 | 0.0 | 0.0 |
| 18 | Cadmium and compounds (as Cd) | M | ALT | ICP-MS. TM152 - ISO17025 Accredited | 0.018153135 | 0.018153135 | 0.0 | 0.0 |
| 22 | Nickel and compounds (as Ni) | M | ALT | ICP-MS. TM152 - ISO17025 Accredited | 6.108333 | 6.108333 | 0.0 | 0.0 |
| 13 | Total phosphorus | M | ALT | ICP-MS. TM191 - ISO17025 Accredited | 306.4908 | 306.4908 | 0.0 | 0.0 |

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

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

**OFFSITE TRANSFER OF POLLUTANTS DESTINED FOR WASTE-WATER TREATMENT OR SEWER**

| POLLUTANT | | METHOD | | | QUANTITY | | | |
|---|---|---|---|---|---|---|---|---|
| | | | Method Used | | Leachate Tankered Offsite | | | |
| Pollutant No. | Name | M/C/E | Method Code | Designation or Description | Emission Point 1 | T (Total) KG/Year | A (Accidental) KG/Year | F (Fugitive) KG/Year |
| 238 | Ammonia (as N) | M | ALT | TM099 - ISO17025 Accredited | 37165.59 | 37165.59 | 0.0 | 0.0 |
| 303 | BOD | M | ALT | TM045 - ISO17025 Accredited | 9287.817 | 0.0 | 0.0 | 0.0 |
| 306 | COD | M | ALT | TM107 - ISO17025 Accredited | 74438.595 | 0.0 | 0.0 | 0.0 |
| 305 | Calcium | M | ALT | iCap-OES. TN228 | 11690.3325 | 0.0 | 0.0 | 0.0 |
| 320 | Magnesium | M | ALT | iCap-OES. TN228 | 5589.1605 | 0.0 | 0.0 | 0.0 |
| 321 | Manganese (as Mn) | M | ALT | ICP-MS. TM152 - ISO17025 Accredited | 95.59935 | 95.59935 | 0.0 | 0.0 |
| 357 | Iron | M | ALT | iCap-OES. TN228 | 90.9447 | 0.0 | 0.0 | 0.0 |
| 338 | Potassium | M | ALT | iCap-OES. TN228 | 25367.8425 | 0.0 | 0.0 | 0.0 |
| 341 | Sodium | M | ALT | iCap-OES. TN228 | 56912.0475 | 0.0 | 0.0 | 0.0 |
| 343 | Sulphate | M | ALT | TM184 - ISO17025 Accredited | 9434.6175 | 0.0 | 0.0 | 0.0 |
| 332 | Ortho-phosphate (as PO4) | M | ALT | TM184 - ISO17025 Accredited | 297.1815 | 297.1815 | 0.0 | 0.0 |

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

| Transfer Destination | European Waste Code | Hazardous | Quantity (Tonnes per Year) | Description of Waste | Waste Treatment Operation | Method Used | | Location of Treatment | Haz Waste : Name and Licence/Permit No of Next Destination Facility Non Haz Waste: Name and Licence/Permit No of Recover/Disposer | Haz Waste : Address of Next Destination Facility Non Haz Waste: Address of Recover/Disposer | Name and License / Permit No. and Address of Final Recoverer / Disposer (HAZARDOUS WASTE ONLY) | Actual Address of Final Destination i.e. Final Recovery / Disposal Site (HAZARDOUS WASTE ONLY) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | M/C/E | Method Used | | | | | |
| Within the Country | 20 03 01 | No | 37789.0 | Household MSW | D1 | M | Weighed | Onsite in Ireland | Balleally Landfill,W0009-02 | Fingal County Council Balleally Landfill,Balleally Lane,Lusk,Co. Dublin,Ireland | | |
| Within the Country | 20 03 01 | No | 54093.0 | Commercial/Trade MSW | D1 | M | Weighed | Onsite in Ireland | Balleally Landfill,W0009-02 | Fingal County Council Balleally Landfill,Balleally Lane,Lusk,Co. Dublin,Ireland | | |
| Within the Country | 20 03 06 | No | 315.0 | Sewage slugdes | D1 | M | Weighed | Onsite in Ireland | Balleally Landfill,W0009-02 | Fingal County Council Balleally Landfill,Balleally Lane,Lusk,Co. Dublin,Ireland | | |
| Within the Country | 19 08 99 | No | 6363.0 | Industrial Non-Hazardous Sludge | D1 | M | Weighed | Onsite in Ireland | Balleally Landfill,W0009-02 | Fingal County Council Balleally Landfill,Balleally Lane,Lusk,Co. Dublin,Ireland | | |

* Select a row by double-clicking the Description of Waste then click the delete button