

**Annual Environmental Report, 2009 for  
Marrakesh Ltd., Kilmurry South Landfill,  
Waste Licence W0048-01**

March 2010

**Marrakesh Ltd.**

Kilmurry,  
Kilmacanogue,  
Co. Wicklow.

MA0105/AER09

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## Executive Summary

1. In accordance with Waste Licence Register No. W0048-01, Marrakesh Ltd. is required to submit an AER (Annual Environmental Report) to the EPA (Environmental Protection Agency) for their facility at Kilmurry South, Kilmacanogue, Co. Wicklow. Patel Tonra Ltd. was commissioned to prepare the report on behalf of Marrakesh Ltd.
2. Marrakesh Ltd. aims to provide a recovery and recycling option for the Construction/Demolition sector, whilst conserving landfill void space for those inert materials that are difficult or impractical to recycle.
3. Almost 47,000 tonnes of inert material was accepted at the facility during 2009.
4. There was no deposition of materials on land at the site during 2009. All materials accepted at the site were subsequently sold/removed for off-site use (with the exception of a quantity of materials stored on-site from year-to-year, pending sale).
5. Materials accepted at the facility are restricted to Construction & Demolition-type wastes. Materials are subject to screening, sorting and grading at the Marrakesh facility, as appropriate.
6. This report includes an overview of the environmental monitoring carried out throughout 2009. The results of sampling show that Marrakesh Ltd. are generally in compliance with limits for groundwater, surface water, landfill gas, noise and dust. Any instance of non-conformance is detailed and explained in Chapter 3.

## **1.0 Introduction**

The Annual Environmental Report (AER) for Kilmurry South landfill includes the information specified in Schedule A of Waste Licence W0048-01 - *Content of Annual Environmental Report* and in accordance with the EPA publication *Integrated Pollution Control Licensing – Guidance Note for: Annual Environmental Report*.

### **1.1 Waste Licence Register Number**

The Waste Licence register number is W0048-01.

### **1.2 Name of Operator, Name and Address of Facility**

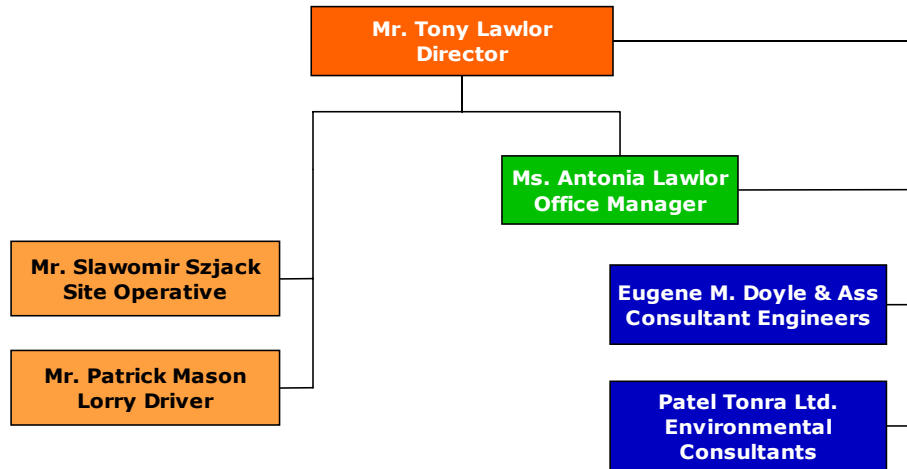
Marrakesh Ltd.,  
Kilmurry South Landfill,  
Kilmurry,  
Kilmacanogue,  
Bray,  
Co. Wicklow.

### **1.3 Reporting Period**

1<sup>st</sup> January, 2009 to 31<sup>st</sup> December, 2009.

### 1.4 Management Structure

The following is the Management Structure for Marrakesh Ltd. during 2009.



## 2.0 Site Description

### 2.1 Waste Activities carried out at the Facility

In accordance with Waste Licence W0048-01 and the Third Schedule of the Waste Management Act, 1996, the following waste activities are licensed at Kilmurry South Landfill:

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

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

In accordance with Waste Licence W0048-01 and the Fourth Schedule of the Waste Management Act, 1996, the following waste recovery activities are licensed at Kilmurry South Landfill:

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

*Class 4:* Recycling or reclamation of other inorganic materials.

*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 a waste is produced.

### 2.2 Total Quantities of Waste Accepted and Recovered

The tonnage of materials received at the site between January 2009 and December 2009 is calculated from weighbridge records to have been 46,946 tonnes. The tonnage of waste recovered and removed off-site for the year was 38,610 tonnes, which represents a recycling rate of 82%. Please see **Tables 2.1 to 2.3** overleaf.

### 2.3 Composition of Wastes Entering and Exiting the Site

The composition of materials received at the Kilmurry South Landfill is restricted to those inert materials set out in Table F.2 of Waste Licence W0048-01. The tonnages for each material type entering and exiting the site are shown in Tables 2.1 and 2.2. A summary of each material type entering the site annually between 2002 and 2009 is shown in Table 2.3.

**Table 2.1: Material Types and Volumes Entering the Site, 2009**

Material Type	EWC Code	Tonnes Accepted, 2009
Soil & Stones	17 05 04	13,254
Concrete	17 01 01	27,933
Bituminous Mixtures	17 03 02	4,446
Mixed C&D Waste <sup>1</sup>	17 09 04	1,313
		46,946

**Table 2.2: Material Types and Volumes Exiting the Site, 2009**

Material Type	Tonnes Removed Off-site, 2009
Soil & Stones	7,147
Concrete	24,205
Bituminous Mixtures	3,881
Bulk Stone	3,254
Sand	123
	38,610

<sup>1</sup> Mostly bulk stone, with approx. 2% sand mix, by weight



Table 2.3: Material Types and Volumes Accepted at the Site, 2002-2009

Material Type	EWC Code	Tonnes 2002	Tonnes 2003	Tonnes 2004 <sup>2</sup>	Tonnes 2005	Tonnes 2006	Tonnes 2007	Tonnes 2008	Tonnes 2009
Soil & Stones	17 05 04	12,864	7,477	29,173	27,521	40,964	31,189	24,130	13,254
Concrete	17 01 01	6,077	13,125	34,598	41,909	49,635	44,421	45,479	27,933
Bituminous Mixtures	17 03 02	0	1,377	3,426	5,151	5,286	1,992	8,445	4,446
Stone	17 05 04	0	275	-	1,913	3,527	-	-	-
Sand	01 01 02	0	0	52	99	0	-	187	-
Tiles and Ceramics	17 01 03	0	0	0.4	58	0	-	0	-
Mixed C&D Waste	17 09 04	-	-	-	-	-	4,062	3,544	1,313
<b>Total Tonnage of Inert Material Entering Marrakesh site per year</b>		<b>18,941</b>	<b>22,254</b>	<b>67,249</b>	<b>76,651</b>	<b>99,412</b>	<b>81,664</b>	<b>81,785</b>	<b>46,946</b>
<b>Total, 2002 – 2009</b>		<b>494,902</b>							

Note: All tonnages have been obtained from Marrakesh weighbridge records

<sup>2</sup> Waste Data for 2004 contains data from November 2003 – December 2004

## 2.4 Composition of Wastes Removed Off-site

General waste from the site is removed off-site by permitted waste collectors to approved waste facilities. The quantity of waste removed during 2009 was 162.2 tonnes; this is outlined in **Table 2.4** below.

**Table 2.4: Composition of Wastes Removed off Site, Jan – Dec 2009**

Waste Type	Weight (tonnes)
General Waste	103.22
Scrap Metal	58.98
<b>Total</b>	<b>162.2</b>

## 2.5 Calculated Remaining Void Capacity of the Site

### Year in which final capacity is expected to be reached; Site Survey Showing Existing Levels at End of Reporting Period

Of the 46,946 tonnes total material entering the site in 2009, 82% was recycled, sold and removed off-site. The remaining material is being retained on site for processing and sale in 2010 (8,336 tonnes). No landfilling was conducted during 2009; therefore site levels were expected to remain the same as those measured previously. Thus it was considered unnecessary to carry out a topographical survey at the site.

Marrakesh Ltd. intends to continue to maximise recycling insofar as possible, thereby minimising landfilling in line with national legislation, policy and targets.

## 2.6 Methods of Deposition of Waste

The landfill facility is used only for the disposal and recovery of inert construction/demolition waste, although during the reporting period, no disposal was carried out.

Inert waste material is brought to the site in trucks from construction/demolition sites or soil removal operations. The trucks deposit the material. Good quality material is removed from the waste stream and segregated for recycling.

The company targets 100% recovery. In 2009, an 82% recycling rate was achieved based on tonnages of materials received and materials recycled and reused.

## 3.0 Emissions & Environmental Monitoring

### 3.1 Summary Report on Emissions & Results of Environmental Monitoring

<i>Landfill Gas</i>	Methane, carbon dioxide, oxygen, atmospheric pressure and temperature were monitored once during 2009 in boreholes and site buildings (Schedule D.1). As per Schedule E.2, the limits for methane and carbon dioxide outside the body of waste are 1% $\text{v/v}$ and 1.5% $\text{v/v}$ , respectively.
<i>Surface Water</i>	Surface water monitoring was carried out once during 2009 for the parameters set out in Schedule D of the licence.
<i>Groundwater</i>	Groundwater analysis was carried out once in 2009 in 6 borehole locations and 2 private wells as set out in Schedule D.4.2 of the licence.
<i>Dust</i>	The level of environmental dust deposition was monitored during June-July 2009 at two pre-determined locations and compared against the limit in Schedule E.3 of 350 $\text{mg/m}^2/\text{day}$ .
<i>Noise</i>	In accordance with Schedules D.3, noise levels were monitored on an annual basis at 3 locations and compared against the daytime limits outlined in Schedule E.1 of the Waste Licence.

The EPA was contacted in writing on the 10<sup>th</sup> of February 2004 (REF 48-1/JR/100204), 10<sup>th</sup> February 2005 (REF 48-1/VSP/100205) and 1<sup>st</sup> November 2005 (REF MA0105/LOD 01.11.05) regarding a proposed reduction in the monitoring programme. When a response to this submission was not received during Quarter 3, 2004, the EPA were contacted, they verbally instructed Marrakesh Ltd to cease monitoring until they received further notification from them. In the absence of any formal written correspondence from the Agency to date, monitoring has been conducted on an annual basis from 2005-2009.

The locations of all monitoring points at Kilmurry South Landfill are shown in Figure 1 at the end of this document. Landfill gas results, surface water, groundwater and drinking water analysis are discussed in the following sections. Results were submitted to the EPA in July and August 2009.

### 3.2 Landfill Gas Monitoring

Landfill gas is one of the main potential hazards from the landfilling of waste materials. It is produced by the microbial decomposition of organic material (a naturally-occurring phenomenon which ensures the breakdown of organic matter) within the landfill. The two main gases that are sampled at the Marrakesh site are methane (CH<sub>4</sub>) and carbon dioxide (CO<sub>2</sub>). Methane is a gas that has a flammable range of 5-15% by volume in air, which is sometimes referred to as the Lower Explosive Level (LEL).

The risk of landfill gas production at the Marrakesh facility is minimal due to the inert nature of the waste materials accepted at the site.

#### Landfill Gas Monitoring Locations

Ten locations (boreholes/buildings) were monitored in June 2009 for landfill gas, as prescribed under Schedule D.1 of the Waste Licence. Gas monitoring locations are listed in **Table 3.1**.

**Table 3.1: Landfill Gas Monitoring Locations**

Monitoring Location	Location	Grid Ref
BH-1	West of site up-slope from landfill	E324788, N212771
BH-2	Eastern area of site down-slope from landfill	E325058, N212630
BH-3	Eastern area of site down-slope from landfill	E325075, N212737
BH-5	Located on phase 2 of the landfill (Leachate borehole)	E324975, N212629
BH-7	Adjacent to BH-03 – down-slope	E325051, N212638
BH-8	Adjacent to BH-02 – down-slope	E325067, N212744
BH-9	Adjacent to house – north of landfill	E324913, N212914
Workshop	North of landfill	E324865, N212830
Toilet/ Outhouse	North of landfill	E324855, N212821
Site Office	North of landfill	E324861, N212875

### Landfill Gas in Boreholes

The measurements of landfill gas monitored in the boreholes were within licence limits for methane (CH<sub>4</sub>); see **Table 3.2** below.

**Table 3.2: Methane Results for Boreholes, 2004-2009**

Borehole	CH <sub>4</sub> Level (% v/v)						EPA Limit
	Q2, 2009	Q4, 2008	Q3, 2007	Q2, 2006	Q2, 2005	Q2, 2004	
BH-1	0	0	0	0	0	0	1.0
BH-2	0	0	0	0	0	0	1.0
BH-3	0	0	0	0	0	0	1.0
BH-5	0	0.4	0	0	0	0	1.0
BH-7	0	0	0	0	0	0	1.0
BH-8	0	0	0	0	0	0	1.0
BH-9	0	0	0	0	0	0	1.0

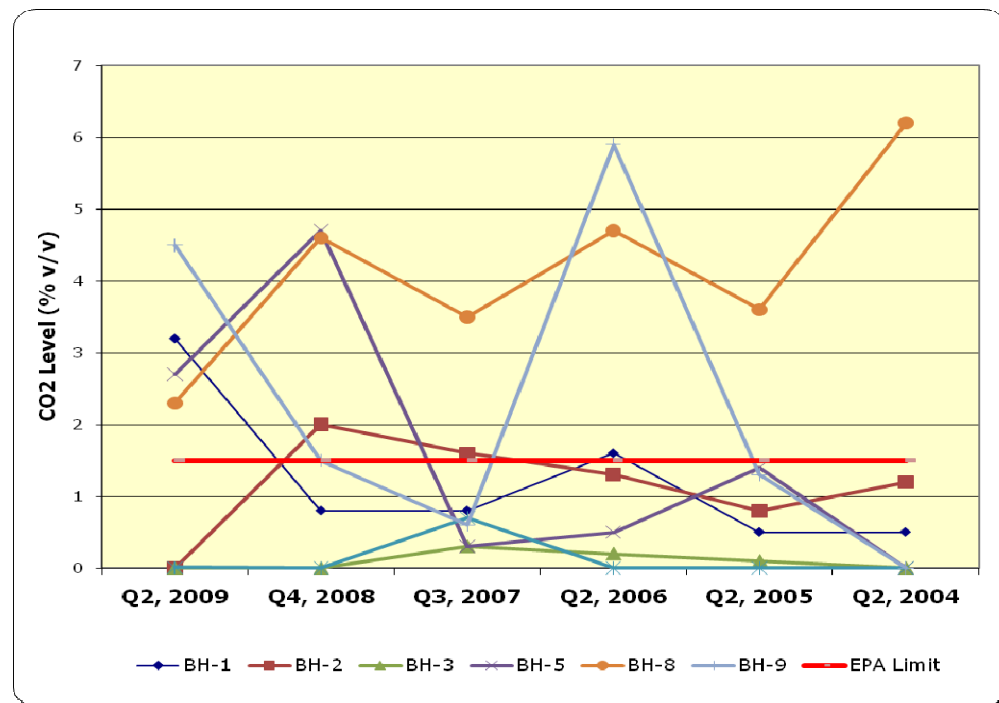
The levels of CO<sub>2</sub> measured in site boreholes at Kilmurry Landfill are presented in **Table 3.3**, and are graphically represented in **Figure 3.1** for the period 2004 to 2009. Carbon dioxide levels exceeded the licence limits during gas monitoring carried out in June 2009 at BH-1, BH-5, BH-8 and BH-9. This is in line with previous monitoring results for CO<sub>2</sub> as shown in Table 3.3.

The CO<sub>2</sub> measurements in excess of the limits were found in the absence of CH<sub>4</sub> and are therefore thought to be attributable to aerobic microbial activity in the boreholes, which produce CO<sub>2</sub> as a by-product of respiration.

Table 3.3: Carbon Dioxide Results for Boreholes, 2004-2009

Borehole	CO <sub>2</sub> Level (% v/v)						EPA Limit
	Q2, 2009	Q4, 2008	Q3, 2007	Q2, 2006	Q2, 2005	Q2, 2004	
BH-1	3.2	0.8	0.8	1.6	0.5	0.5	1.5
BH-2	0	2.0	1.6	1.3	0.8	1.2	1.5
BH-3	0	0.0	0.3	0.2	0.1	0	1.5
BH-5	2.7	4.7	0.3	0.5	1.4	0	1.5
BH-7	0.01	0.0	0.7	0.0	0.0	0	1.5
BH-8	2.3	4.6	3.5	4.7	3.6	6.2	1.5
BH-9	4.5	1.5	0.6	5.9	1.3	0	1.5

Figure 3.1: Carbon Dioxide Levels Measured in Site Boreholes, 2004-2009



### Landfill Gas Monitoring in Buildings

Landfill gas was monitored in the on-site buildings during June 2009. The buildings in which landfill gas was measured are listed in **Table 3.4**. All measurements taken in the buildings for CH<sub>4</sub> and CO<sub>2</sub> were 0% v/v, thus were in compliance with licence requirements.

**Table 3.4: Methane and CO<sub>2</sub> Monitoring Results for Site Office Buildings, Quarter 2, 2009**

Parameter	Toilet	Workshop	Site Office	Drain	EPA Limit
Methane, % v/v	0.0	0.0	0.0	0.0	1.0%
Carbon Dioxide, % v/v	0.0	0.0	0.0	0.0	1.5%

### 3.3 Surface Water Monitoring

Surface water is monitored on an annual basis for a range of parameters according to Waste Licence, Table D.4.4. Surface water monitoring was carried out during Quarter 2, 2009.

#### Surface Water Monitoring Locations

Surface water monitoring locations are listed in **Table 3.5** below.

**Table 3.5: Surface Water Monitoring Locations**

Surface Water Monitoring Ref.	Location
SW-1	North of landfill, adjacent to house, ca. 100m upstream from site entrance
SW-2	West of landfill, down-slope
SW-3	Surface water channel – eastern area of site down-slope from landfill

### Surface Water Chemical Analysis

Surface water analytical results were compared against the Salmonid Water Regulations, S.I. No. 293 of 1988 – The European Communities (Quality of Salmonid Waters) Regulations and the Surface Water Regulations, S.I. No. 294 of 1989 – The European Communities (Quality of Surface Water Intended for the Abstraction of Drinking Water) Regulations.

Results of surface water monitoring conducted during Q2, 2009 are presented in **Tables 3.6**. SW-1 was found to be dry at the time of sampling. The results obtained for SW-2 indicated pH exceeded the limit set down by the Surface Water Regulations, 1989 and the Salmonid Water Regulations, 1988. This was attributed to soil and rock conditions through which the stream passes. Other results obtained showed that it was in compliance with Class A3 Waters set by the Surface Water Regulations, 1989.

**Table 3.6: Surface Water Monitoring Results SW-2**

Parameter	Surface Water Regs (A1)	Surface Water Regs (A3)	Salmonid Water Regs	2009 SW2	2008 SW2	2007 SW2	2006 SW2	2005 SW2
BOD <sup>1</sup> (mg/l O <sub>2</sub> )	5	7	≤5	<1.0	<2	<2	<2	<2
COD <sup>2</sup> (mg/l O <sub>2</sub> )	-	40	-	<7.0	<15	<15	<15	<15
Chloride (mg/l)	250	250	-	11.4	12	9	11	12
DO <sup>3</sup> (mg/l)	-	-	-	7.8	6.89	5.4	6.1	6.6
Conductivity (mS/cm)	1.0	1.0	-	0.82	0.81	0.074	0.599	0.095
pH	5.5 – 8.5	5.5 – 9.0	6 – 9	9.24	9.57	7.08	6.2	7.20
TSS <sup>4</sup> (mg/l)	50	-	25	4	<10	<10	<10	241
Calcium (mg/l)	-	-	-	1.64	2.55	100.1	4.1	3.066
Sulphate (mg/l)	200	200	-	4.5	9	6	5	17
Sodium (mg/l)	-	-	-	7.72	6.6	7.5	7.5	7.4

<sup>1</sup> BOD = Biological Oxygen Demand

<sup>2</sup> COD = Chemical Oxygen Demand

<sup>3</sup> DO = Dissolved Oxygen

<sup>4</sup> TSS = Total Suspended Solids



### 3.4 Groundwater Monitoring

Groundwater levels and analysis for the parameters outlined in Table D.4.4 of the Waste Licence are monitored on an annual basis. Groundwater monitoring was carried out during Quarter 2, 2009.

#### Groundwater Monitoring Locations

**Table 3.7** indicates the location of groundwater monitoring boreholes and private wells.

**Table 3.7: Groundwater Monitoring Locations**

Borehole /Well ID	Location	Grid Ref
BH-1*	West of site up-slope from landfill	E324788, N212771
BH-2	Eastern area of site down-slope from landfill	E325058, N212630
BH-3	Eastern area of site down-slope from landfill	E325075, N212737
BH-5*	Located on phase 2 of the landfill (Leachate borehole)	E324975, N212629
BH-6	West of site up-gradient from landfill	E324597, N212619
BH-7	Eastern area of site down-slope from landfill (adjacent to BH-3)	E325051, N212638
BH-8	Eastern area of site down-slope from landfill (adjacent to BH-2)	E325067, N212744
PW-2	Jones Water Supply (East of Site)	E325376, N212938
PW-3	Murphy Water Supply (East of Site)	E325246, N212792
PW-4**	Hollingsworth Water Supply (East of Site)	E325117, N213066

\* BH-1 & BH-5 were found to be dry and no sample was obtainable

\*\*Please note that PW-4 (Hollingsworth Water Supply, east of site) was removed from sampling round in 2008 as this household connected to mains drinking water

#### Groundwater Chemical Analysis

The analysis of all groundwater samples taken as part of the Kilmurry South Landfill waste licence compliance have been assessed in relation to the EC Drinking Water Directive 98/83/EC. Results are presented in **Tables 3.8 to 3.15**; non-conformances are highlighted in red.

Table 3.8: Groundwater Monitoring Results at BH-1 during Q2, 2009 (Dry)

Parameter	Units	Drinking Water Limit	Q3, 2009	Q3, 2008	Q3, 2007	Q2, 2006	Q2, 2005
Potassium	mg/l	N/A	Dry	Dry	Dry	Dry	0.6
Sodium	mg/l	200	Dry	Dry	Dry	Dry	6.9
Calcium	mg/l	N/A	Dry	Dry	Dry	Dry	5.904
Chloride	mg/l	250	Dry	Dry	Dry	Dry	11
Sulphate	mg/l	250	Dry	Dry	Dry	Dry	21
Total Oxidised Nitrogen	mg/l	N/A	Dry	Dry	Dry	Dry	0.9
Conductivity	mS/cm	2.5	Dry	Dry	Dry	Dry	0.102
pH	pH units	6.5 - 9.5	Dry	Dry	Dry	Dry	6.66
Ammoniacal Nitrogen	mg/l	0.39	Dry	Dry	Dry	Dry	<0.2
Faecal Coliforms	cfus/100ml	0	Dry	Dry	Dry	Dry	<1
Total Coliforms	cfus/100ml	0	Dry	Dry	Dry	Dry	<1
Water Level	m below ToC	-	Dry	Dry	Dry	Dry	2.01

Table 3.9: Groundwater Monitoring Results at BH-2 during Q2, 2009

Parameter	Units	Drinking Water Limit	Q2, 2009	Q3, 2008	Q3, 2007	Q2, 2006	Q2, 2005
Potassium	mg/l	N/A	<2.3	0.3	0.7	0.7	0.6
Sodium	mg/l	200	13.3	6.1	12.5	12.5	11
Calcium	mg/l	N/A	118	118	103	122	104
Chloride	mg/l	250	23	18	14	17	19
Sulphate	mg/l	250	68	42	44	40	52
Total Oxidised Nitrogen	mg/l	N/A	1.6	2.0	0.4	1.3	1.2
Conductivity	mS/cm	2.5	2.5	0.526	0.666	0.574	0.721
pH	pH units	6.5 – 9.5	6.85	7.12	7.1	7.45	7.71
Ammoniacal Nitrogen	mg/l	0.39	<0.2	<0.2	<0.2	0.6	<0.2
Faecal Coliforms	cfus/100ml	0	0	3	<1	<1	3
Total Coliforms	cfus/100ml	0	0	39	128	<1	3
Water Level	m below ToC	-	2.28	2.93	3.24	4.93	-

Table 3.10: Groundwater Monitoring Results at BH-3 during Q2, 2009

Parameter	Units	Drinking Water Limit	Q2, 2009	Q3, 2008	Q3, 2007	Q2, 2006	Q2, 2005
Potassium	mg/l	N/A	<2.3	0.5	1	0.7	0.8
Sodium	mg/l	200	15	12.8	16	16	14
Calcium	mg/l	N/A	11	116	110	131	115
Chloride	mg/l	250	18	20	17	15	17
Sulphate	mg/l	250	69	91	115	94	98
Total Oxidised Nitrogen	mg/l	N/A	1.1	1.5	0.7	2.7	1.4
Conductivity	mS/cm	2.5	0.640	0.582	0.682	0.629	0.837
pH	pH units	6.5 – 9.5	6.72	7.01	7.52	7.37	7.87
Ammoniacal Nitrogen	mg/l	0.39	<0.2	<0.2	<0.2	2.3	<0.2
Faecal Coliforms	cfus/100ml	0	0	3	<1	<1	<1
Total Coliforms	cfus/100ml	0	0	200	163	48	25
Water Level	m below ToC	-	6.0	5.20	5.59	5.94	5.94

Table 3.11: Groundwater Monitoring Results at BH-6 during Q2, 2009

Parameter	Units	Drinking Water Limit	Q2, 2009	Q3, 2008	Q3, 2007	Q2, 2006	Q2, 2005
Potassium	mg/l	N/A	<2.3	0.8	0.9	0.7	0.6
Sodium	mg/l	200	9	8	9	9	11
Calcium	mg/l	N/A	3.7	4.1	35	4	2.0
Chloride	mg/l	250	13	14	11	12	14
Sulphate	mg/l	250	8	10	8	8	18
Total Oxidised Nitrogen	mg/l	N/A	2.9	4.9	2.3	3.2	1.7
Conductivity	mS/cm	2.5	0.101	0.0935	0.108	0.833	0.106
pH	pH units	6.5 – 9.5	6.2	6.22	5.59	5.88	6.07
Ammoniacal Nitrogen	mg/l	0.39	<0.2	<0.2	<0.2	1.2	<0.2
Faecal Coliforms	cfus/100ml	0	0	22	<1	<1	<1
Total Coliforms	cfus/100ml	0	15	34	9	2	<1
Water Level	m below ToC	-	6.8	6.58	6.62	6.35	6.73

Table 3.12: Groundwater Monitoring Results at BH-7 during Q2, 2009

Parameter	Units	Drinking Water Limit	Q2, 2009	Q3, 2008	Q3, 2007	Q2, 2006	Q2, 2005
Potassium	mg/l	N/A	<2.3	0.6	0.8	0.5	0.4
Sodium	mg/l	200	21	14	17	16	16
Calcium	mg/l	N/A	216	184	112	155	123
Chloride	mg/l	250	250	21	24	27	28
Sulphate	mg/l	250	192	182	89	87	85
Total Oxidised Nitrogen	mg/l	N/A	<0.3	<0.3	1.3	1.6	0.6
Conductivity	mS/cm	2.5	0.101	0.844	0.742	0.710	0.864
pH	pH units	6.5 – 9.5	6.32	6.21	7.2	7.07	7.43
Ammoniacal Nitrogen	mg/l	0.39	0.75	<0.2	<0.2	0.5	<0.2
Faecal Coliforms	cfus/100ml	0	NS	8	<1	<1	<1
Total Coliforms	cfus/100ml	0	NS	23	130	2	12
Water Level	m below ToC	-	4.14	2.55	2.05	7.07	2.08

Table 3.13: Groundwater Monitoring Results at BH-8 during Q2, 2009

Parameter	Units	Drinking Water Limit	Q2, 2009	Q3, 2008	Q3, 2007	Q2, 2006	Q2, 2005
Potassium	mg/l	N/A	<2.3	0.7	1.3	0.5	0.6
Sodium	mg/l	200	11.7	9.8	26.5	8.5	32
Calcium	mg/l	N/A	11.9	123.7	118	203	189.7
Chloride	mg/l	250	18	25	21	23	16
Sulphate	mg/l	250	37	71	238	213	259
Total Oxidised Nitrogen	mg/l	N/A	1.0	2.4	<0.3	0.6	<0.3
Conductivity	mS/cm	2.5	0.637	0.570	1.031	0.930	1.518
pH	pH units	6.5 – 9.5	6.85	6.79	7.46	7.17	7.58
Ammoniacal Nitrogen	mg/l	0.39	<0.2	<0.2	<0.2	3.5	<0.2
Faecal Coliforms	cfus/100ml	0	0	19	NDP	<1	Insufficient Sample
Total Coliforms	cfus/100ml	0	0	42	NDP	22	Insufficient Sample
Water Level	m below ToC	-	3.08	1.86	3.38	7.17	3.09

**Table 3.14: Groundwater Monitoring Results at PW-2 (Jones) during Q2, 2009**

Parameter	Units	Drinking Water Limit	Q2, 2009	Q3, 2008	Q3, 2007	Q2, 2006	Q2, 2005
Potassium	mg/l	N/A	No access	1.2	2.3	2.2	1.8
Sodium	mg/l	200	No access	6.8	10.0	9	10
Calcium	mg/l	N/A	No access	314.6	71	60	64.04
Chloride	mg/l	250	No access	12	13	12	15
Sulphate	mg/l	250	No access	11	21	18	16
Total Oxidised Nitrogen	mg/l	N/A	No access	0.7	1.4	1.2	1.2
Conductivity	mS/cm	2.5	No access	0.181	0.364	0.310	0.457
pH	pH units	6.5 – 9.5	No access	7.34	7.23	7.35	8.09
Ammoniacal Nitrogen	mg/l	0.39	No access	<0.2	<0.2	<0.2	<0.2
Faecal Coliforms	cfus/100ml	0	No access	1	<1	<1	<1
Total Coliforms	cfus/100ml	0	No access	48	4	11	<1



**Table 3.15: Groundwater Monitoring Results at PW-3 (Murphy) during Q2, 2009**

Parameter	Units	Drinking Water Limit	Q2, 2009	Q3, 2008	Q3, 2007	Q2, 2006	Q2, 2005
Potassium	mg/l	N/A	<2.3	0.8	1.0	0.9	0.8
Sodium	mg/l	200	89	13	15	14	7
Calcium	mg/l	N/A	<0.01	205.8	95	44	68.4
Chloride	mg/l	250	11	17	13	16	17
Sulphate	mg/l	250	5	13	13	16	13
Total Oxidised Nitrogen	mg/l	N/A	1.1	0.8	0.6	1.6	1.4
Conductivity	mS/cm	2.5	0.367	0.296	0.358	0.342	0.417
pH	pH units	6.5 – 9.5	7.6	7.21	7.79	7.93	7.89
Ammoniacal Nitrogen	mg/l	0.39	<0.2	<0.2	<0.2	4.8	<0.2
Faecal Coliforms	cfus/100ml	0	0	10	72	<1	<1
Total Coliforms	cfus/100ml	0	0	100	158	38	9

**Groundwater Non-Conformances****pH**

pH was slightly lower than the Drinking Water limit in BH-6 and BH-7. The pH values are low historically in BH-6. BH-7 has also been slightly acidic during previous monitoring. It is considered that the water that passes through peaty upland in this part of the site, may contribute to the low values observed.

**Coliforms**

Total coliforms exceeded the Drinking Water limit in BH-6. The level of coliforms found in the BH-6 is likely to be associated with soil origins, and are non-faecal in type (faecal coliforms were zero).

**Ammoniacal Nitrogen**

Ammoniacal Nitrogen exceeded the Drinking water Directive limit of 0.39 mg/l-N in BH-7 (0.75 mg/l-N). Ammoniacal Nitrogen is generally present in natural waters, though in very small amounts, as a result of microbiological activity, which causes the reduction of nitrogen-containing compounds.

### 3.5 Dust Monitoring

Dust was measured using a Bergerhoff dust gauge, which was exposed over a 30-day period to collect bulk dust deposition. The method employed is based on the German Standard Method VDI 2119 and collects total particulate matter. The gauge consists of a gauge bottle supported on a stand of approximately 1.5 metres high (Plate 3.2). The gauges were located at two positions as outlined in **Table 3.16**.

The apparatus consists of a collection vessel with an open mouth of 90mm diameter with a collection sample bottle of 1.5 litres volume (**Plate 3.1**). It was set up in the areas outlined in Schedule D of the waste licence. The gauges were left for a period of 30 days. When the sample period had elapsed the sample bottles were checked for the presence of any unusual deposits such as leaves or insects and these were removed before analysis of the samples took place.

The samples collected were then transferred to a laboratory for gravimetric (weight) analysis to determine the concentration of deposited material in each gauge bottle.



**Plate 3.1: Dust Bottle**

The dust bottle used as part of the Bergerhoff Dust Deposition Gauge; note the neck of the dust bottle has a diameter of 90 mm.



**Plate 3.2: Bergerhoff Dust Gauge**

The Bergerhoff Dust Gauge apparatus as used to measure the level of dust deposition.

### Dust Monitoring Locations

Dust monitoring locations, in accordance with Table D.2.1 of the Waste Licence, are listed in **Table 3.16** below.

**Table 3.16: Dust Monitoring Locations**

Monitoring Location	Location	Grid Ref
DS-1	Southern boundary	E324849, N212646
DS-3	South-eastern boundary	E325058, N212630

### Dust Monitoring Results

A dust deposition survey was carried out at the site over a 30-day period between 25<sup>th</sup> June and 24<sup>th</sup> July 2009. It was previously agreed by the EPA that dust monitoring at the site could be reduced to once during the licence year and at two monitoring locations DS-1 and DS-3. The results for the dust deposition monitoring are given in **Table 3.17** below.

Results from the survey showed that dust deposition concentrations measured at DS-1 and at DS-3 were significantly below the licence limit of 350 mg/m<sup>2</sup>/day.

**Table 3.17: Results of Dust Deposition sampling at Marrakesh Site in 2009**

Location	Dust (mg/m <sup>2</sup> /day)						EPA Licence Limit
	2009	2008	2007	2006	2005	2004	
DS-1	29	176	83	65	79	95	350
DS-3	57	N/A*	187	65	257	457	350

\*During 2008 DS-3 was rendered an invalid sample due to damage sustained to the dust gauge during the monitoring period.

### 3.6 Noise Monitoring

Noise levels are monitored to determine the impact of site operations on noise sensitive receptors.

#### Noise Monitoring Locations

Noise monitoring locations are listed in **Table 3.18**.

**Table 3.18: Noise Monitoring Locations**

Monitoring Location	Location	Grid Ref
NSL1	North-western boundary	E324675, N212744
NSL2	Northeast of landfill	E325075, N212931
NSL3	East of landfill	E325258, N212652

#### Noise Monitoring Results

An environmental noise survey conducted at Kilmurry South Landfill on the 24<sup>th</sup> of July 2009 concluded that the site does not contribute significantly to environmental noise conditions at the locations assessed. The noise measurements taken during site operational hours at the three pre-determined monitoring positions confirmed that noise emissions from the Kilmurry South landfill site are at or below the EPA guidance values for  $L_{Aeq}$  of 55 dB(A) for daytime noise levels at noise sensitive locations. Results of the noise survey are presented in **Table 3.19**.

**Table 3.19: Daytime Noise Readings at Kilmurry South Landfill**

Location	Noise Level ( $L_{Aeq}$ dB(A))				EPA Limit
	2009	2008	2007	2006	
NSL1	50	48	52	45	55
NSL2	48	50	55	45	55
NSL3	43	52	55	51	55

The limits for  $L_{Aeq}$  as set down in schedule E.1 of the waste licence is 55 dB(A) for daytime readings. The  $L_{Aeq}$  is the measurement of steady continuous sound which has been corrected to allow for the non linearity of human hearing.

All readings were at or below the limits set in Schedule E.1. The highest noise levels recorded was at NSL1, measuring 50 dB(A). Site plant was intermittently audible at these locations; however the main noise source was traffic movement on the N11 main road.

There are no night-time operations at the Marrakesh facility.

### 3.7 Meteorological Monitoring

Meteorological data was obtained from the meteorological station situated at Dublin Airport, the parameters obtained were: precipitation, temperature (average), wind speed and direction, relative humidity and atmospheric pressure (as per Schedule D.5). **Figures 3.2 to 3.5** represent temperature, precipitation and atmospheric pressure throughout the reporting period.

Figure 3.2: Rainfall, 2009

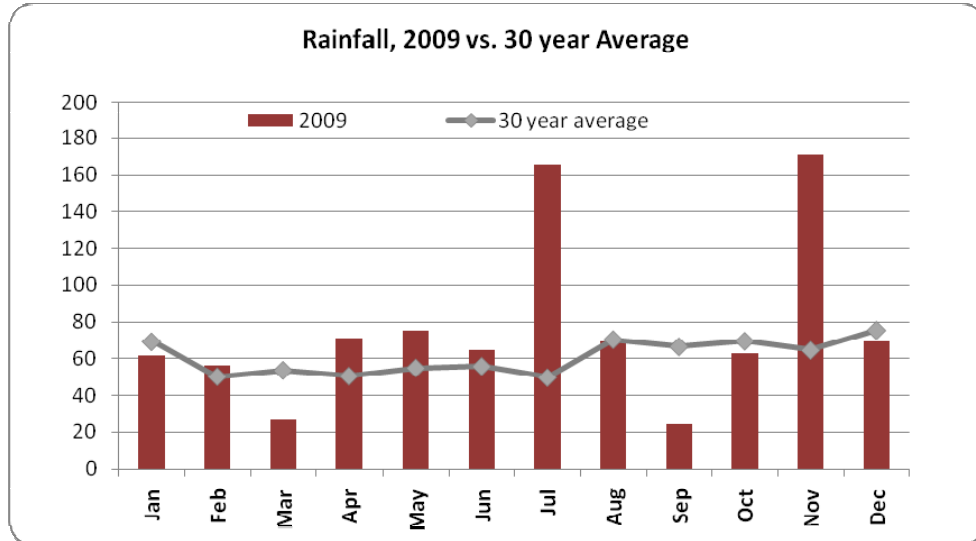


Figure 3.3: Average Minimum and Maximum Temperatures, 2009

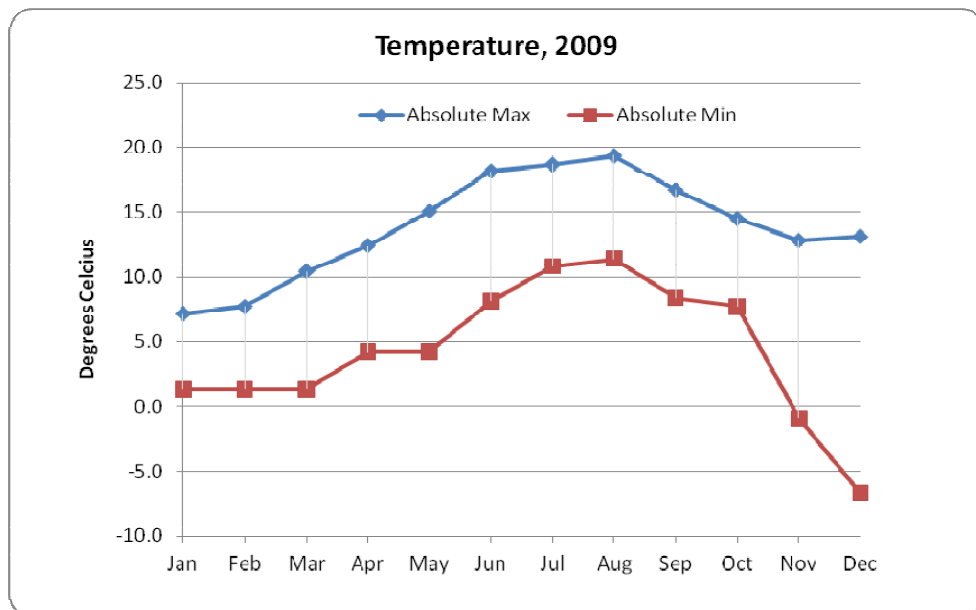


Figure 3.4: Mean Sea Pressure, 2009

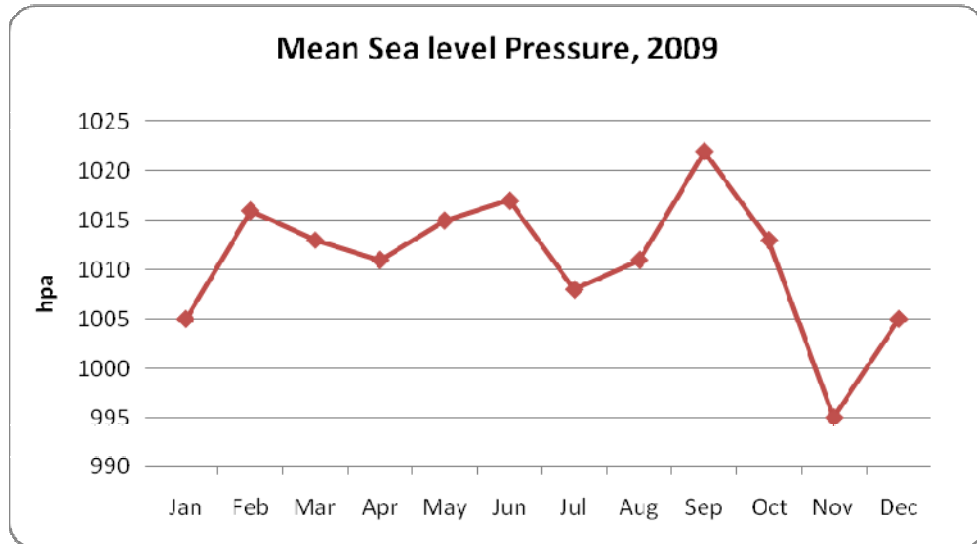
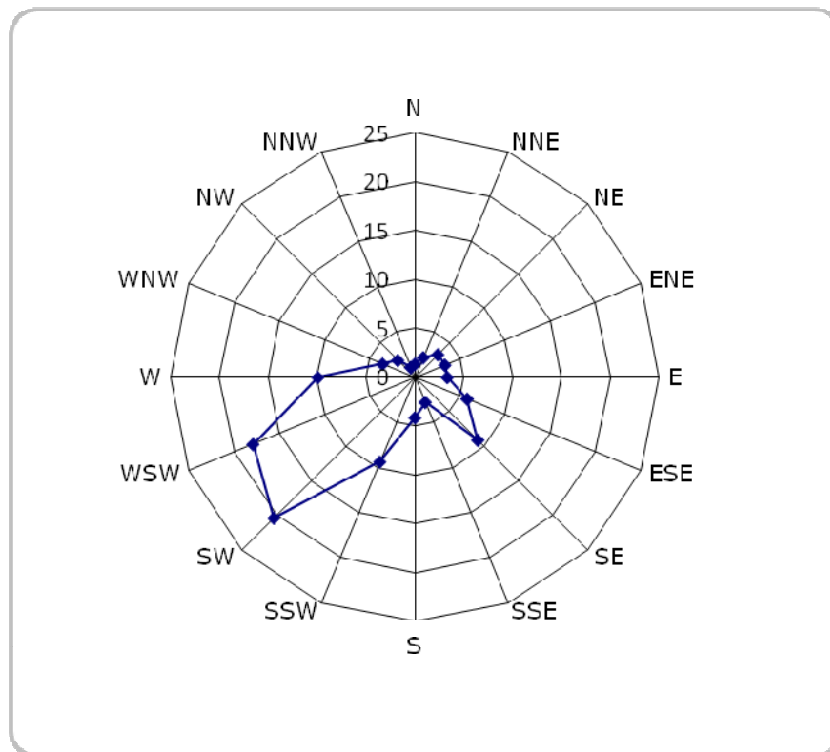


Figure 3.5: Wind Rose, 2009



### 3.8 Resource and Energy Consumption Summary

#### **Electricity**

Based on ESB bills, the estimated energy consumption for the period January 2009 to December 2009 was 4,290 kWh.

#### **Fuel**

Based on delivery dockets, the total diesel usage at the site between January 2009 and December 2009 was estimated at 31,090 litres.



## 4.0 Site Development Works

### 4.1 Development Works Undertaken During the Reporting Period

No major infrastructural projects were undertaken during 2009.

### 4.2 Site Stability and Site Survey

No landfilling has been conducted at the facility since the last site survey was submitted to the Agency, therefore there were no changes in levels. A slope stability review was completed and submitted to the Agency in April 2007, again no changes to slopes/levels have occurred since that time.

### 4.3 Progress on Restoration of Completed Phases

#### **Proposed Restoration of the Site and Timescale of such Development**

Due to the high level of recycling carried out on site, the two phases at the Marrakesh site have not yet been completed. The restoration of the completed phases will only be carried out when the required levels have been reached.

The restoration and aftercare of the facility shall be carried out in accordance with EPA guidance.

## 5.0 Environmental Incidents and Complaints

### 5.1 Environmental Incidents

*Table 5.1: Reported Incidents, January 2009 to December 2009*

Date	Incident				Likely Cause
	Parameter	Monitoring Location	Level Detected	Limit	
26/08/09	Chromium (µg)	BH-7	121	50	Chromium is naturally occurring in ore. Chromium has not been exceeded previously at this monitoring point or at any other monitoring point at the facility.
26/08/09	Manganese (µg)	BH-7	1810	50	Manganese is a widely distributed constituent of ores, soils, groundwater and rocks. There is no particular health/sanitary significance. The main issues that arise as a result of manganese are aesthetic.
26/08/09	pH	BH-6	6.32	6.5-9.5	pH values at BH-6 and BH-7 indicate slightly acidic conditions. This trend is apparent in BH-6 from historic results. It is considered likely that acidic peaty soil is contributing to pH readings here.
		BH-7	6.2		
26/08/09	Ammoniacal Nitrogen (mg/l)	BH-7	0.75	0.39	Ammoniacal Nitrogen is generally present in natural waters, though in very small amounts, as a result of microbiological activity, which causes the reduction of nitrogen-containing compounds.

Date	Incident				Likely Cause
	Parameter	Monitoring Location	Level Detected	Limit	
26/08/09	Total Coliforms (cfus/100ml)	BH-6	15	0	The level of coliforms found in the BH-6 is likely to be associated with soil origins, and are non-faecal in type (faecal coliforms were zero).
26/06/09	CO <sub>2</sub>	BH-1	3.2%	1.5%	Readings of a similar level have been detected consistently during previous sampling rounds. This is thought to be associated with aerobic microbial activity at these locations.
		BH-5	2.7%		
		BH-8	2.3%		
		BH-9	4.5%		

## 5.2 Complaints Received

An anonymous complaint was received by the Agency on 24<sup>th</sup> July 2009. The complaint was in relation to noise, excessive dust produced on site and acceptance of asbestos waste. The complaint was investigated in accordance with Condition 3.12 of Waste Licence W0048-01 and a response issued to the Agency on 30<sup>th</sup> July 2009. The response to the complaint is summarised below.

- Noise surveys were carried out on the day of the complaint and all noise levels were within the Licence limits.
- Dust Monitoring was carried out between 25<sup>th</sup> June 2009 and 24<sup>th</sup> July 2009 in accordance with Table D.2.1 of Waste Licence W0048-01. The results showed that the dust levels at Marrakesh Ltd. fell within the limits set down by the licence Waste Licence W0048-01.
- No asbestos waste was accepted, nor has been accepted in the past, at the facility.

## 6.0 Environmental Management Programme

### 6.1 Environmental Objectives and Targets, 2009

Progress on the schedule of objectives and targets for 2009 is summarised in Table 6.1 below.

**Table 6.1: Objectives & Targets 2009**

Objective / Target	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Progress
Prepare a Schedule of Environmental Monitoring		⊙											✓
Submit AER to the Agency			⊙										✓
Check monitoring infrastructure and replace as required						⊙							✓
Carry out daily meteorological monitoring	⊙	⊙	⊙	⊙	⊙	⊙	⊙	⊙	⊙	⊙	⊙	⊙	✓
Carry out litter and nuisance checks	⊙	⊙	⊙	⊙	⊙	⊙	⊙	⊙	⊙	⊙	⊙	⊙	✓
Carry out septic tank inspections	⊙	⊙	⊙	⊙	⊙	⊙	⊙	⊙	⊙	⊙	⊙	⊙	✓
Review site files and ensure that they are up to date		⊙		⊙		⊙		⊙		⊙		⊙	✓
Review any complaints received and ensure that they are dealt with adequately						⊙						⊙	✓
Ensure that adequate measures are taken to control the generation of dust during dry periods.	⊙	⊙	⊙	⊙	⊙	⊙	⊙	⊙	⊙	⊙	⊙	⊙	✓
Maintenance of site roads				⊙									✓
Establish appropriate and designated metal storage area		⊙											✓
Check tare weights of all incoming vehicles on a six-monthly basis					⊙						⊙		✓

**KEY:** ✓ = achieved in 2009; \* = carried forward to 2010; ! = not achieved; ⊙ = target date

## 6.2 Environmental Objectives & Targets 2010

Objectives and targets for 2010 are outlined in Table 6.2 below.

**Table 6.2: Objectives & Targets 2010**

Objective / Target	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Prepare a Schedule of Environmental Monitoring		⊙										
Submit AER to the Agency			⊙									
Check monitoring infrastructure and replace as required						⊙						
Carry out daily meteorological monitoring	⊙	⊙	⊙	⊙	⊙	⊙	⊙	⊙	⊙	⊙	⊙	⊙
Carry out litter and nuisance checks	⊙	⊙	⊙	⊙	⊙	⊙	⊙	⊙	⊙	⊙	⊙	⊙
Carry out septic tank inspections	⊙	⊙	⊙	⊙	⊙	⊙	⊙	⊙	⊙	⊙	⊙	⊙
Review site files and ensure that they are up to date		⊙		⊙		⊙		⊙		⊙		⊙
Review any complaints received and ensure that they are dealt with adequately						⊙						⊙
Ensure that adequate measures are taken to control the generation of dust during dry periods	⊙	⊙	⊙	⊙	⊙	⊙	⊙	⊙	⊙	⊙	⊙	⊙
Maintenance of site roads				⊙								
Check tare weights of all incoming vehicles on a six-monthly basis					⊙						⊙	
KEY: ⊙ = Targets to be completed during 2010												

## 6.3 Tank, Pipeline and Bund Testing

No tank, pipeline or bund testing has been conducted during the reporting period. All old fuel tanks that were on site have been removed and replaced with double skinned tanks located in a metal container for protection.

## 6.4 Review of Nuisance Controls

The facility has not recorded any environmental nuisances. Roads in the vicinity of the site are serviced by a facility roadsweeper and the installation of a wheel cleaner further reduces any potential mud generation on roads. Vermin, birds, flies and odours have not caused a nuisance at the facility.

## 6.5 Public Information

Marrakesh Ltd. regularly communicates with site neighbours and site records are available for inspection with prior appointment. Residents are notified if there any exceedances of Drinking Water guideline limit values in their wells.

## 6.6 Procedures Developed

No new procedures were developed in 2009.

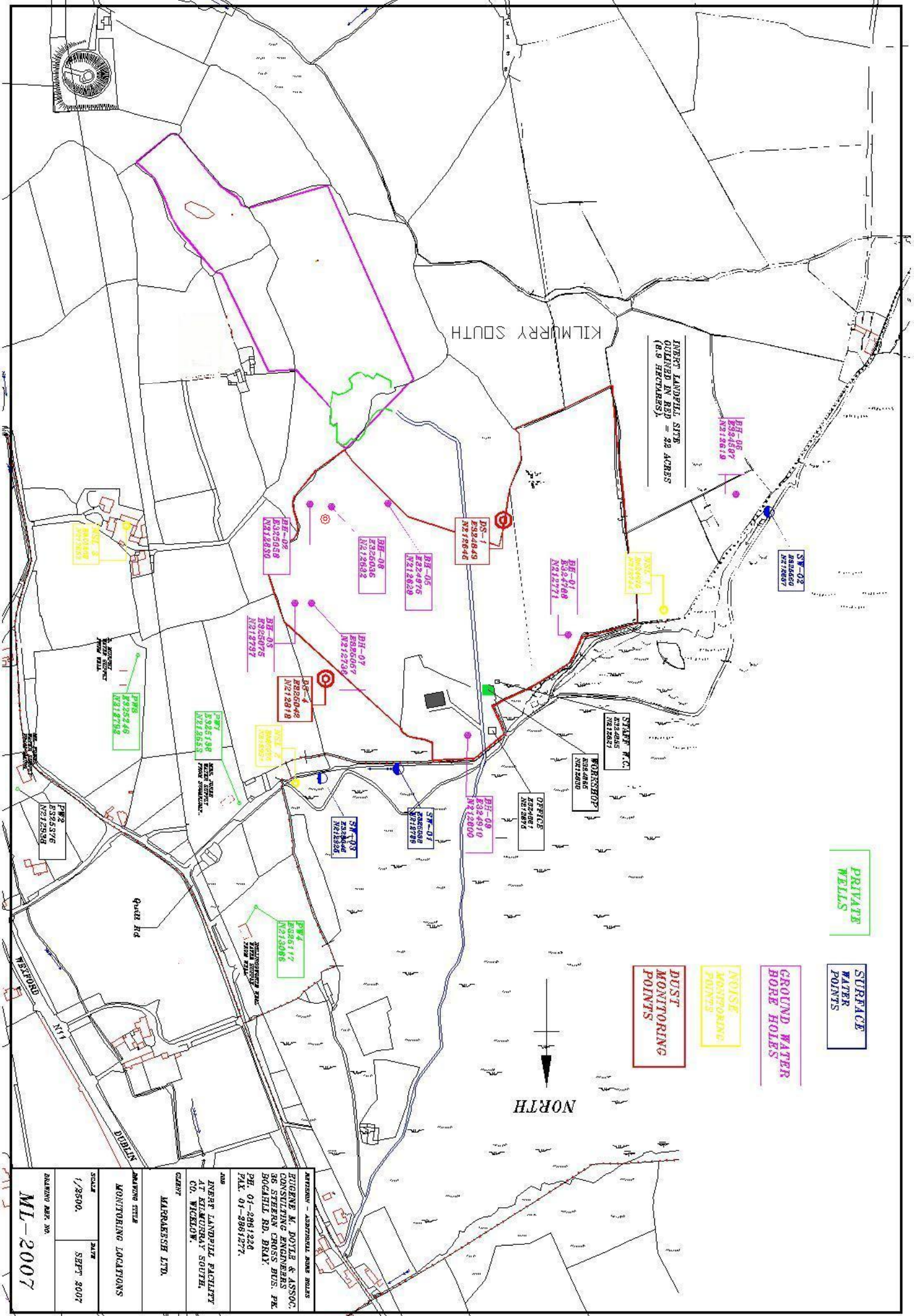
## 6.7 Off-site Waste Disposal Facilities

During 2009 the following facilities were used for the off-site removal of wastes and materials (See Table 6.3). All facilities were agreed in advance with the Agency.

**Table 6.3: Off-site Disposal Facilities, 2009**

Waste Company	Waste Facility Permit/Licence No.
<b>Greenstar</b>	W0053-03
<b>Veolia</b>	W0039-02
<b>Multi Metals</b>	WFP/WW/09001401
<b>Enva Environmental</b>	EPA W0184-01
<b>Leon Recycling Ltd</b>	WFP/WW/09/0061/02
<b>King Tree Service Ltd.</b>	EPA W0218-01
<b>Marrakesh Ltd</b>	WP 255
<b>Antonia Lawlor</b>	WP 295

**Figure 1: Monitoring Location Map**



INVERT LANDFILL SITE  
 QUANTIFIED IN RHP = 22 ACRES  
 (AS HECTARES)

KILMURRY SOUTH

PRIVATE  
 WELLS

SURFACE  
 WATER  
 POINTS

GROUND WATER  
 BORE HOLES

NOISE  
 MONITORING  
 POINTS

DUST  
 MONITORING  
 POINTS

NORTH

APPROVED - APPROVED ASH BINS

EUGENE M. DOYLE & ASSOC.  
 CONSULTING ENGINEERS, P.C.  
 36 STEERN CROSS BUN, PK.  
 BOGHILL RD, BNAI.  
 PH. 01-2861226  
 FAX. 01-2861277.

JOB  
 INVERT LANDFILL FACILITY  
 AT KILMURRY SOUTH,  
 CO. WICKLOW.

CLIENT  
 MARLBOROUGH LTD.

DATE	SCALE
SEPT 2007	1/2500.

DRAWING TITLE  
 MONITORING LOCATIONS

ML-2007

DRAWING REF. NO.



## **Appendix 1: PRTR**