31st March 2010

ANNUAL ENVIRONMENTAL REPORT 2009

Ballynagran Residual Landfill. W0165-01

Record of Issue

Submitted to:
Mr. John Jones & Mr. Robert Kirwan
Greenstar Limited
Coolbeg & Killcandra
Ballynagran
Co. Wicklow

REPORT

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1.0 INTRODUCTION

This Annual Environmental Report (AER) has been prepared in accordance with Condition 11.5 of Waste Licence Register No. W0165-01 and contains the required elements and information listed in Schedule G of the Licence.

2.0 SITE HISTORY

Ballynagran Residual Landfill, a wholly owned subsidiary company of Greenstar Recycling Ltd. is currently developing and operating the Landfill at Ballynagran under Waste Licence Register Number W0165-01. Ballynagran Residual Landfill was granted a Waste Licence (W0165-01) by the Environmental Protection Agency (EPA) on the 5th of September 2003.

3.0 REPORTING PERIOD

The reporting period for the Annual Environmental Report (AER) is from the 1st of January 2009 to the 31st December 2009. During this reporting period Waste Licence Register No. W0165-01 was in effect.

4.0 WASTE ACTIVITIES CARRIED OUT AT THE FACILITY

Ballynagran Residual Landfill is a fully engineered facility with a composite lining system on the base and side walls of a large excavation. The licensed waste activities are as follows:

Table 1: 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 4	Surface impoundment, including placement of liquids or sludge discards into pits, ponds or lagoons: This activity is limited to the storage and management of leachate and surface water at the facility.
Class 5	Specially engineered landfill, including placement into lines discrete cells which are capped and isolated from one another and the environment: This is the principal activity. This activity is limited to the construction of the landfill in distinct phases consisting of specially engineered lined cells, the deposit of non-hazardous waste into these lined cells and the collection of leachate and landfill gas.
Class 6	Biological treatment not referred to elsewhere in this Schedule which results in final compounds or mixtures which are disposed of by means of any activity referred to in paragraphs 1 to 10 of this Schedule: This activity is limited to the treatment of leachate at the facility.

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. This activity is limited to the storage of unacceptable waste prior to its transport off-site to another facility.

Table 2: Licensed Waste Recovery Activities, in accordance with the Fourth Schedule of the Waste Management Act 1996

Class 4	Recycling or reclamation of other inorganic materials. This activity is limited to the use of recycled construction and demolition waste as cover and/or construction material at the facility.
Class 9	Use of any waste principally as a fuel or other means to generate energy: This activity is limited to the utilisation of landfill gas at the facility.
Class 11	Use of waste obtained from any activity referred to in a preceding paragraph of this Schedule: This activity is limited to the use of recycled construction and demolition waste at the facility.
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: This activity is limited to the storage of recycled construction and demolition waste prior to reuse.

5.0 QUANTITIY AND COMPOSITION OF WASTE RECEIVED, DISPOSED OF AND RECOVERED DURING THE REPORTING PERIOD.

5.1 Waste Input Summary 2009

The quantity of wastes received and recovered on site for disposal and recovery during 2009 is shown in Tables 3 and 4.

Table 3: Ballynagran Residual Landfill Waste Inputs 2009 (Wastes Received)

Waste Description	European Waste Code (EWC)	Tonnage
Waste after mechanical treatment (MSW/C&I)	19 12 12	86,709
Agricultural Waste (Kennel Sweepings)	02 01 06	8.62
Waste plastics not suitable for recycling (Except Packaging)	02 01 04	98
Compost	19 05 03	232.86
Mixed municipal waste	20 03 01	38,684
Street cleaning residues	20 03 03	36.1
Premixed waste compounds only of non-hazardous waste	19 02 03	9,862
Material unsuitable for consumption – food processing waste	02 02 03	118.84
Healthcare – Non-infectious	18 01 04	62.68
Spent Activated Carbon (Non-Hazardous)	06 13 99	25.28
Screenings from waste water treatment plant	19 08 01	1068.32
Waste from desanding	19 08 02	449.38
Waste Water Treatment waste	19 09 01	11.18
Filter Cake (non-hazardous)	07 05 14	165
Plastic – Soiled – not suitable for recycling	20 01 39	1.16
Shredded wood used on site for engineering material (C&I Dry Mixed)	19 12 07	23.92

Sewage Cleaning	20 03 06	13.36
Total Tonnage		**137,569.09**

Table 4: Wastes Recovered

Waste Description	European Waste Code (EWC)	Tonnage
Shredded wood used on site for engineering	19 12 07	11,258.09
Stones and fines used for engineering	19 12 09	25,962.34
Mixed C&D Wastes	17 09 04	7.00
Mixed C&D inert wastes	17 01 07	316.48
Total Recovered 2009		**37,543.91**

6.0 CALCULATED REMAINING CAPACITY OF THE FACILITY

The remaining capacity of the Ballynagran facility is a function of time and available space at the site. The initial total void space available for use at the facility was estimated at 2,770,000 m³.

From the figures gathered for the annual waste survey carried out at the site by Golder Associates, the void space consumed since the site opened up until the 19th of January 2010 is approximately 667,000 m³. The remaining capacity therefore is estimated to be 2,103,000 m³.

7.0 WASTE DEPOSITION METHODS AND TREATMENT OF WASTE

7.1 Waste Acceptance

The waste accepted for disposal is residual waste from the County Wicklow and adjoining counties, from household, commercial and industrial sources. At present the majority of waste is delivered to the facility by waste contractors based in County Wicklow. Waste contractors have systems in place whereby the recyclable fraction is either collected separately, or else separation is carried out mechanically at their facilities.

All waste is delivered to the site in Heavy Goods Vehicles (HGV) and small refuse trucks provided with the appropriate covers to prevent loss of load. Each vehicle first proceeds to the incoming weighbridge where it is weighed. The weighbridge operator and/or the facility manager may at their own discretion request the load to be tipped in the Waste Inspection Area.

The vehicles then proceed to the active waste disposal area where waste is deposited under the direction of a banks man. The vehicles weigh out at the outgoing weighbridge and receive an individual weighbridge docket before exiting the site. Each landfill cell is divided into a number of grids, which are used to identify the areas where waste is deposited. Each load is assigned the relevant grid number.

7.2 Working Face

Waste is deposited close to and above the advancing tipping face. In accordance with Condition 5.6.1 the active face is confined to a height of 2.5 metres after compaction, a width of 25 metres and a slope no greater than 1 in 3. Deposited waste is spread in shallow layers on the inclined surface and compacted. The steel-wheeled compactors operate on the gradient of the more shallow face, pushing thin layers of waste and applying compaction pressure to them. The site operatives inspect the deposited waste for items that are not acceptable under the Waste Licence, such as tyres, gas bottles, batteries etc. These are removed and stored in appropriate areas for later removal from the site. Each day waste is deposited to form a block, which is compacted and covered as described above. The following day a new block of waste is deposited adjacent to the existing block. The waste is covered at the end of each day with a covering of fines and woodchips

This ordered method of waste deposition enables areas, which have been filled and are to be left for a period to be progressively restored over the site life, minimising the areas of active waste deposition.

7.3 Report on Development and Restoration at the site

During 2008 Cells 6 and 7 were constructed. Construction of Cell 7 was completed during October 2008. The CQA report for Cell 7 was approved during December 2008 and waste placement in Cell 7 commenced during mid-December 2008. Cell 6 construction was completed during January 2009 and this Cell was approved for waste placement during early March 2009. Waste placement commenced in Cell 6 during June 2010. Construction of Cells 9 and 10 commenced during October 2009 – construction is scheduled to be completed during spring 2010.

During 2009 waste placement was focused in Cells 7,6 and 5. A ramp is being constructed in these cells in order to provide access to the top of cells 1 to 5 in order that waste placement can be completed in these areas. Capping of parts of Cells 1-5 is scheduled to commence during autumn 2010.

7.4 Progress and Implementation of Landscaping Programme

There was no additional tree planting at the facility during 2009. Maintenance involving re-stacking and re-tying of existing trees was carried out during November 2009.

7.5 Report on meeting the requirements of the Landfill Directive

The site is fully compliant with the requirements of the Landfill Directive.

7.6 Programme for Public Information

During 2009 the site accommodated all requests for site visits and tours.

8.0 RESOURCE AND ENERGY CONSUMPTION SUMMARY

The principal energy resources consumed at the site are electricity, water for potable supply oil, vehicle wheel cleaning and dust suppression, diesel fuel and hydraulic oils. All site vehicles are fuelled by diesel. Details of resource usage are presented below in Table 5.

Table 5: Resource usage and Energy Consumption

Consumable	Units	Total Consumption in 2009
Electricity	kWh	**340,585**
Diesel Oil	Litres	**132,438**
Total Water Usage	m^3	**2,310**
Water, potable supply	Litres	**50,000**
Water, dust suppression	Litres	**2,160,000**
Water, wheelwash	Litres	**100,000**
Hydraulic Oils	Litres	**1,000**

An audit of energy consumption was conducted in February 2010. The audit was carried out to improve efficiency and minimise unnecessary waste at the facility. The audit report is attached in Appendix D.

9.0 VOLUME OF LEACHATE GENERATED/TRANSPORTED OFF-SITE DURING 2009

At Ballynagran, leachate generated on-site is collected in the main leachate storage lagoon prior to removal off-site for treatment. The total volume of leachate tankered off-site during the reporting period January 2009 – December 2009 was 25,849 m^3. Details figures are presented below in Table 6.

Table 6: Volume of Leachate generated/transported off-site during 2009 at Ballynagran

Month	Volume (m^3)
January	1,730
February	3,056
March	1,723
April	1,222
May	1,123
June	1,204
July	2,188
August	1,455
September	2,075
October	1,039
November	2,617
December	6,416
Total	**25,849**

10.0 ESTIMATED AND ANNUAL CUMULATIVE QUANTITIES OF LANDFILL GAS EMITTED FROM THE FACILITY

The enclosed 2,500 m³/hour landfill gas flare was installed in February 2008 and is connected to 64 No. vertically drilled and passive gas wells, 62 No. spike gas wells and 24 n. horizontal gas wells. In addition, there are 3 No. knockout pots. The most recent gas well information is presented in Drawing W-S21-01 Rev B (4) 18/02/10 in Appendix B.

Landfill gas infrastructure such as the different variety of wells is installed progressively as the waste is placed and the different gas types are chosen to meet the specific needs of that particular landfill area.

The enclosed flare is presently extracting on average 2,450 m³/hour of landfill gas. Provision to install an open flare in the area adjacent to Cells 6 and 7 was approved by the Agency in December 2008. Currently, 2 No. 500 m³/hour flares are extracting poor quality landfill gas from Cells 6 and 7 and will further improve collection efficiency in the areas of Cells 6 and 7. These open flares are presently extracting on average 850 m³/hour

11.0 ESTIMATED ANNUAL AND CUMULATIVE QUANTITY OF INDIRECT EMISSIONS TO GROUNDWATER

The potential sources of indirect emissions to groundwater from the facility are as follows:

- **Landfill Base** – The landfill has a composite base lining system comprising a HDPE geomembrane and a half metre thick layer of Bentonite Enhanced Soil. A leak detection survey of the HDPE geomembrane after placement of the drainage stone layer was completed and defects to the HDPE liner were repaired in accordance with industry standards.
- **Surface Water Collection and Treatment System** – Surface water from the paved access roads and landfill cell swale drain is collected and discharged into the surface water lagoon along with groundwater collected at the interceptor sump located below the landfill cells. Water from the lagoon discharges to the reed bed which further filters the water before it is finally discharged to the Longford Stream
- **Treated Sewage Effluent** – There is a biocycle wastewater treatment plant located adjacent to the weighbridge which treats the canteen and office waste water prior to being pumped to the leachate holding tank via the foul-water sump. Leachate (containing foul water) is tankered off-site to a waste water treatment plant via a vacuum tanker.

In summary, as the landfill is fully contained, there is no indirect emissions to groundwater

12.0 METEROLOGICAL DATA & POTENTIAL LEACHATE GENERATION

12.1 Meteorological Report

Climate data for 2009 was collected from the synoptic stations at Casement Aerodrome and Ashford Climatological Station which is located 16km to the north of the facility. The rainfall data was taken from the Ashford station as it is closer to the landfill site than Casement. Table 7 below details the summary monthly data for 2009.

Table 7: Climatological Data for 2009

Ashford Climatological Station					Casement Aerodrome Synoptic Station				
Month	Rainfall (mm)	Max Temp °C	Min Temp °C	Average Monthly Temp. °C	Average Wind Speed (Knots)	Average Wind Direction (Degrees from North)	Average MSL Pressure (hPa)	Average Relative Humidity (%)	Average Potential Evapotran Spiration mm (Penman)
January	162.5	12.0	-6.0	4.4	12.0	185.48	1005.3	87	0.38
February	64.9	14.1	-1.7	5.7	8.8	214.286	1016.6	88	0.59
March	120.0	16.7	-2.3	7.5	11.3	217.74	1014.2	83	1.15
April	27.0	18.4	-1.1	8.7	8.6	170.5	1010.8	83	1.64
May	59.7	22.1	2.9	11.6	11.3	192.9	1015.2	81	2.42
June	104.5	22.1	4.2	13.7	7.4	128.167	1017.4	77	3.00
July	125.6	22.5	6.1	15.3	9.0	210.48	1008.9	83	2.53
August	61.1	24.6	4.7	15.6	11.2	216.452	1011.5	84	2.20
September	44.7	19.9	3.2	13.1	9.1	177.5	1022.1	85	1.51
October	222.3	17.4	2.0	11.7	8.4	191.452	1013.5	88	0.83
November	138.3	14.2	-0.4	8.3	13.6	210.667	995.9	89	0.49
December	110.5	12.3	-3.9	4.3	9.7	179.355	1004.9	91	0.27

12.2 Estimation of potential leachate generation within waste mass

Climate data from Casement Synoptic Weather Station and Ashford Climatological Station was used in the estimation of potential leachate generation at the site during the period January 2009 – December 2009. Total annual precipitation at Ashford was calculated as 1241.10 mm (P). Evapotranspiration in mm as potential evaporation (EP) was taken from data collected from Casement Weather Station and stands at 518.75 mm. Therefore effective precipitation (EP) is estimated as being 722.35 mm. The potential leachate generation calculations are shown below in Table 8.

Table 8: Potential Leachate Generation at Ballynagran Landfill during 2009

Landfill Cell	Area (m^2)	Effective Rainfall (Rainfall less ET)	Potential Leachate Generation
Cell 1	10,000	0.722	7220.0
Cell 2	3,900	0.722	2815.80
Cell 3	5,100	0.722	3682.20
Cell 4	2,950	0.722	2129.90
Cell 5	2,400	0.722	1732.80
Cell 6	8,700	0.722	6281.40
Cell 7	8,400	0.722	6064.80
Potential Volume (m^3)			**29,926.90**
Absorptive Capacity Estimate aW m^3 0.025 Aw/t			**4,377 aW m^3**
Estimated Leachate Generation			**25,549 m^3**

13.0 SUMMARY REPORT ON EMISSIONS

This summary report has been compiled in accordance with emission limit values (ELVs) for the

following media as detailed in Condition 6 and Schedule C of Waste Licence (W0165-01).

- Surface Water Discharge
- Groundwater
- Leachate
- Landfill Gas
- Dust
- Noise
- Biological Assessment

13.1 Surface Water Discharge at Lagoon Outlet

Surface water discharge emission limit values measured at the outlet from the surface water lagoon as stipulated in Waste Licence Register Number W0165-01.

Surface Water Discharge Limits Level (Suspended Solids mg/l)
35 mg/l

Over the course of the year 2009, levels of Total Suspended Solids recorded from samples retrieved at SW10 were below the emission limit value on all occasions except once during the 4th Quarter of 2009. This was as a direct result of works being carried out at the surface water lagoon. In total surface water samples are taken quarterly from the following locations. The recorded Total Suspended Solids results are also included.

Table 9: Surface Water Monitoring Locations showing TSS Results for 2009

Surface Water	Location	Quarter 1	Quarter 2	Quarter 3	Quarter 4
SW1	On-Site	<10	<6	<2	5
SW2	On-Site	<10	<6	2	3.50
SW3	Off Site	<10	<6	2	10
SW4	Off Site	<10	<6	<4	5.5
SW5	On-Site	<10	<4	<2	7.50
SW6	Off Site	<10	<6	<4	9.50
SW7	Off Site	<10	<6	2.5	12.5
SW8	On-Site	<10	<6	3	3.50
SW9	On-Site	35	23	3	230
SW10	On-Site	26	<9	3	25.5

13.2 Surface Water monitoring methodology

3 no. watercourses flow within the site boundary, namely, the Kilcandra Stream, Ballynagran Stream and the Longford Stream. These watercourses are all tributaries of the Three Mile River, which flows down-gradient of the landfill footprint, in a west-east direction under the N11 and east towards the townland of Newtown.

10 no. surface water monitoring points are sampled quarterly as defined in Schedule D of Waste Licence W0165-01. Surface water sampling involves the retrieval of water from within water-body at the monitoring location. The sample container is fully submerged and completely filled ensuring no headspace during the sampling exercise and every effort is made to remove air bubbles that are created in the sampling media. This is easily done by tapping on the side of the container allowing bubbles to travel to the surface of the container.

SW1 is upstream of the landfill footprint. SW4 is downstream of SW1, but upstream of phase 1 of the development; both are located within the site boundary on the Ballynagran Stream. SW3 is located south of the landfill footprint on the Kilcandra Stream. SW2 is located upstream of the landfill footprint and SW5 is downstream on the Longford Stream. SW6 and SW7 are both off-site monitoring locations downstream of the facility on the Three Mile River. SW8 is situated at a road culvert on the Longford Stream upstream of the reed bed outfall. SW9 is located at the inlet to the surface water attenuation pond and SW10 is at the outlet of the attenuation pond prior to discharging into the reed bed. The locations of these monitoring points are shown in Drawing 5 Rev C in Appendix A.

Details and analyses of all surface water sampling was forwarded to the Agency in Quarterly reports 1 to 4 of 2009. A summary of concentrations from a number of indicator parameters up-gradient and down-gradient of the facility recorded during the reporting period are presented in Figures 1-3. These basic indicator parameters are pH, Electrical Conductivity and Chloride.

Figure 1: pH Levels in Surface Water at Ballynagran Landfill during 2009

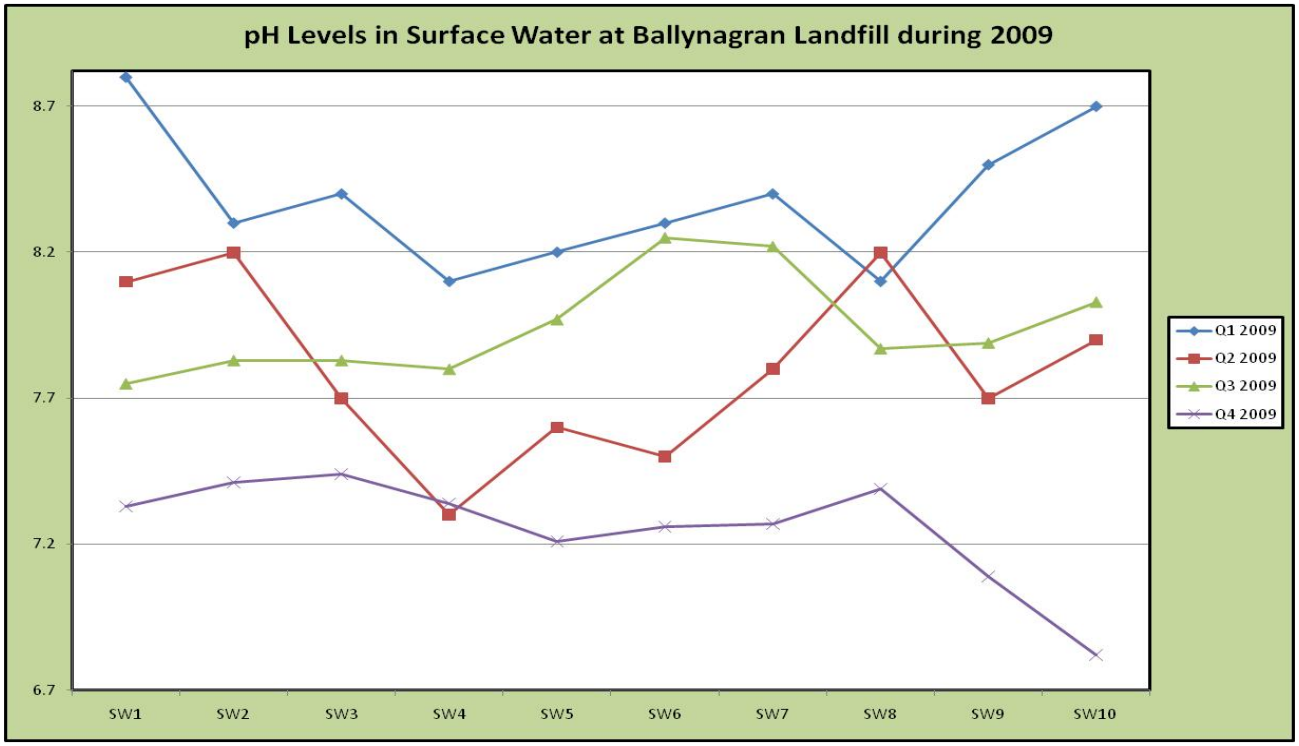


Figure 2: Electrical Conductivity Levels in Surface Water at Ballynagran Landfill during 2009

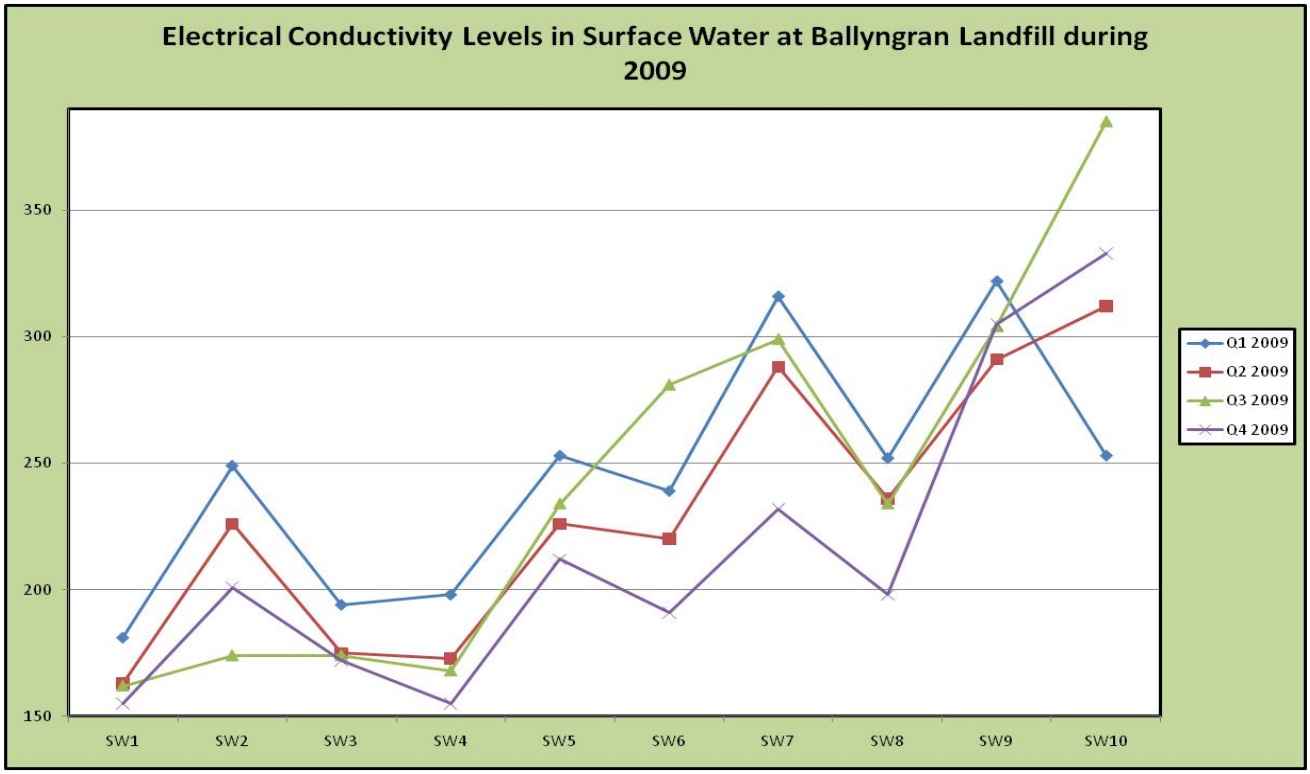
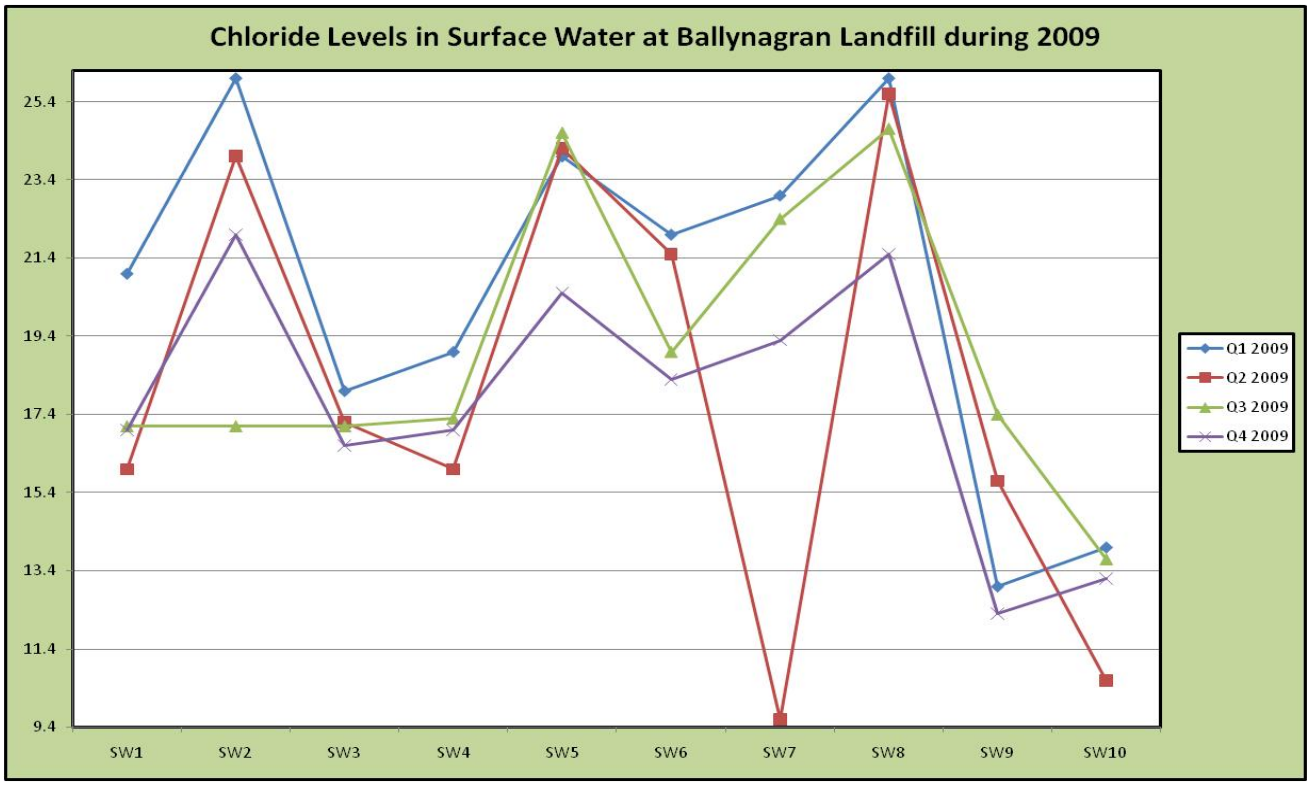


Figure 3: Chloride Levels in Surface Water at Ballynagran Landfill during 2009



13.3 Discussion of surface water monitoring results

Surface water was sampled at the site on 4 separate occasions during 2009. The graphs shown above in Figures 1-3 detail those parameters for which result data was above the limit of detection. During 2009, ammoniacal nitrogen was not detected at any monitoring location during the 1st and 2nd Quarters of 2009. There was an elvation in ammoniacal nitrogen at 1 No. location during the 3rd and 4th Quarters of 2009 where figures of 0.332 and 0.542 mg/l respectively were detected. This also coincides with works being carried out at the surface water lagoon.

Biological Oxygen Demand (BOD) was not detected in any samples during the 1st and 2nd Quarters of 2009. BOD was detected at Locations SW7 and SW10 at concentrations of 0.16 mg/l and 1.07 mg/l respectively during the 3rd Quarter of 2009. In addition, BOD was detected at locations SW9 and SW10 during the 4th Quarter of 2009 at concentrations of 4.49 mg/l and 5.57 mg/l respectively.

SW7 is located off-site and SW10 is situated in an area where construction works are on-going. It can be seen from the reported data during 2009 that the landfill operations at Ballynagran are not having a detrimental effect on the surface water system in the area.

13.4 Surface water results comparison with upstream values versus downstream values

Surface water is monitored and tested on a quarterly basis at the landfill. Over the course of the reporting year 2009, seasonal differences were evident in the surface water results. However, as the surface water system in the area is connected, the minor changes in the surface water chemistry occurred throughout the system.

13.5 Depositional Dust Monitoring

13.5.1 Locations and Methods

In compliance with Table D.3 of Waste Licence W0165-01, atmospheric depositional dust monitoring is conducted on a monthly basis at Ballynagran Landfill. Dust gauges are installed on a rolling basis and are collected and changed each month in conjunction with the groundwater level monitoring. A description and co-ordinates of the dust monitoring stations at the site are presented below in Table 10. Sampling locations are illustrated on Drawing 5 Rev C Environmental Monitoring Locations which is attached in Appendix A.

Table 10: Atmospheric Depositional Dust Monitoring Locations

Dust Monitoring Location	Eastings	Northings
AD5	327325	191517
AD6	327107	190974
AD7	326347	191276
AD8	327007	190967
AD9	327540	190819
AD10	327748	191038
AD12	327897	190950

13.5.2 Dust Monitoring Methods

Total dust deposition was measured at the site using Bergerhoff gauges as specified in the Standard Method VDI 2119 (German Engineering Institute).

The dust gauges were set up such that the glass containers were approximately 2m above the ground surface. In order to inhibit the growth of algae in the dust jars 20ml of 5% 2-methoxyethanol was added to each jar. The glass jars containing the dust were submitted to GeoTesting Ltd. for analysis.

13.5.3 Dust Monitoring Results

The atmospheric dust monitoring results for 2009 are presented below in Table 11.

Table 11: Depositional Dust Levels Recorded at Ballynagran Residual Landfill during 2009

ID	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
AD5	34	58	<50	69.7	114.83	97.61	195.2	77.6	77.6	75.0	27.7	126.3
AD6	<5	71	<50	80.4	126.32	68.90	235.4	127.5	127.5	16.1	33.3	68.9
AD7	56	120	63	37.5	45.93	74.64	218.2	110.9	110.9	117.9	33.3	68.9
AD8	80	92	<50	48.2	34.45	166.51	68.9	116.4	116.4	42.9	77.6	34.5
AD9	51	<5	<50	69.7	51.60	120.57	<5	83.2	83.2	21.4	27.7	40.2
AD10	61	81	54	80.4	103.35	137.80	310.1	271.6	271.6	428.7	55.4	40.2
AD12	48	79	<50	96.5	143.54	172.25	367.5	61.0	61.0	48.2	277.2	137.8

14.0 GROUNDWATER MONITORING

14.1 Locations and Methods

Groundwater levels are monitored on a monthly basis at Ballynagran Landfill. In total 16 No. wells are dipped each month. During 2009, Locations MW8s and MW8d have been found to dry on all occasions. The description and co-ordinates of all groundwater monitoring locations at the site are presented below in Table 12 and in Figures 4, 5 and 6. Details of groundwater levels recorded during 2009 were sent to the Agency in each Quarterly Report during 2009. Groundwater flow direction across the site is to the south-east. Sampling locations are illustrated on Drawing 5 Rev C Environmental Monitoring Locations which is attached in Appendix A.

Table 12: Static Groundwater Levels ay Ballynagran Residual Landfill during 2009. All figures are presented in metres below top of casing.

ID	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
MW1s	2.64	3.80	5.10	5.55	4.02	1.37	4.11	4.54	3.00	5.23	2.67	3.98
MW1d	3.32	4.88	5.91	6.33	4.74	5.97	4.84	5.21	3.64	5.98	3.33	3.55
MW2s	4.90	6.76	5.58	6.01	6.06	6.15	6.02	5.98	5.97	6.01	5.96	6.24
MW2d	12.30	13.42	12.43	12.59	12.57	12.58	12.49	12.50	12.20	12.57	12.33	12.63
MW3s	0.00	3.80	2.36	2.30	2.27	2.35	2.42	2.23	2.10	2.54	0.58	0.79
MW3d	2.31	2.48	2.70	2.51	2.58	3.65	2.83	2.78	2.71	2.89	2.62	2.89
MW4s	7.02	5.98	6.80	7.00	7.03	7.14	7.20	7.01	6.97	6.99	6.32	6.17
MW4d	6.61	6.10	6.43	6.66	6.69	6.82	6.80	6.73	6.63	6.59	5.98	5.82
MW5s	1.33	2.48	1.45	1.55	5.05	4.77	1.73	1.11	1.48	1.60	1.62	1.67
MW5d	4.72	3.97	4.62	4.75	4.85	4.85	4.78	4.70	3.92	4.59	4.06	4.13
MW6s	1.23	1.32	1.50	1.44	1.45	1.54	1.44	1.48	1.32	1.50	1.21	1.48
MW6d	0.82	0.83	1.08	1.03	1.04	1.11	1.02	1.07	0.92	1.10	0.81	1.06
MW7s	0.55	1.36	1.39	1.41	1.10	0.84	1.08	1.04	0.78	1.82	0.72	0.97
MW7d	10.41	10.23	11.26	11.12	10.90	12.70	11.02	10.33	10.09	11.24	10.71	9.50
MW8s	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY
MW8d	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY

14.1.1 Method of Retrieving Static Groundwater Level

Groundwater levels were measured using a standard dip-meter probe, which upon contact with water emits an audible signal. Measurements were made to the nearest centimetre relative to the top of the steel casing that protects each monitoring pipe.

14.1.2 Groundwater Quality

Analysis of groundwater quality at the facility was conducted on a quarterly basis in accordance with Schedule D.5 of the current licence (W0165-01).

14.1.3 Methods of Measuring Groundwater Quality

Groundwater samples were collected by purging a minimum 3 borehole volumes prior to sample collection. This allowed stagnant water to be removed and representative groundwater to be drawn into the hole. Dedicated sampling equipment was used to prevent cross contamination between sampling locations. Field measurements of temperature, pH and conductivity were recorded. Samples were decanted into accredited laboratory designated containers and stored in cooler boxes to maintain sample temperature at approximately 4°C. All samples were submitted to the laboratory within 24 hours of sampling.

14.1.4 Groundwater Quality Results 2009

14.1.4.1 Locations and Methods

According to Schedule D.1 of the waste licence, groundwater quality is to be monitored at sixteen locations. During 2009 in a total of 14 No. groundwater wells were monitored as locations MW8s and MW8d were found to be dry during all monitoring events. The results of all quarterly monitoring have been presented to The Agency in reports Quarter 1 to Quarter 4 of 2009. A summary of concentrations from a number of indicator parameters up-gradient and down-gradient of the facility recorded during the reporting period are presented in Figures 5 – 12.

14.1.5 Private Well Groundwater Monitoring

During 2009, 14 No. private groundwater wells were sampled and analysed for set parameters. These sampling events took place during the 3rd and 4th Quarters of 2009. The dates of these events were the 9th of September 2009 for the 3rd Quarter and the 24th of November 2009. The results of the chemical analysis of the samples were included the 3rd and 4th Quarterly environmental reports.

Figure 4: Static Groundwater Levels in Monitoring Boreholes at Ballynagran Residual Landfill during 2010

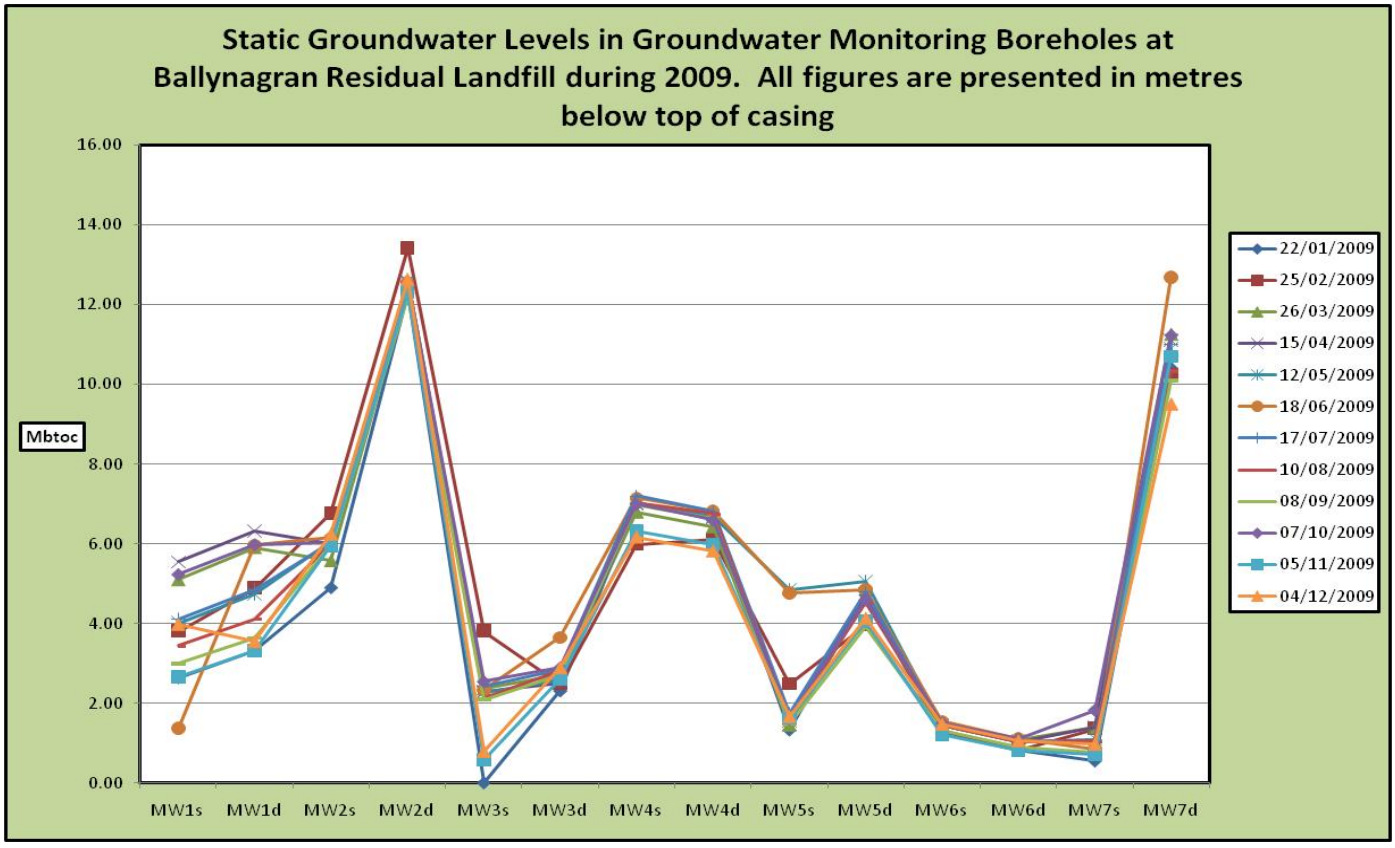


Figure 5: pH Values in Down-Gradient Groundwater Monitoring Wells

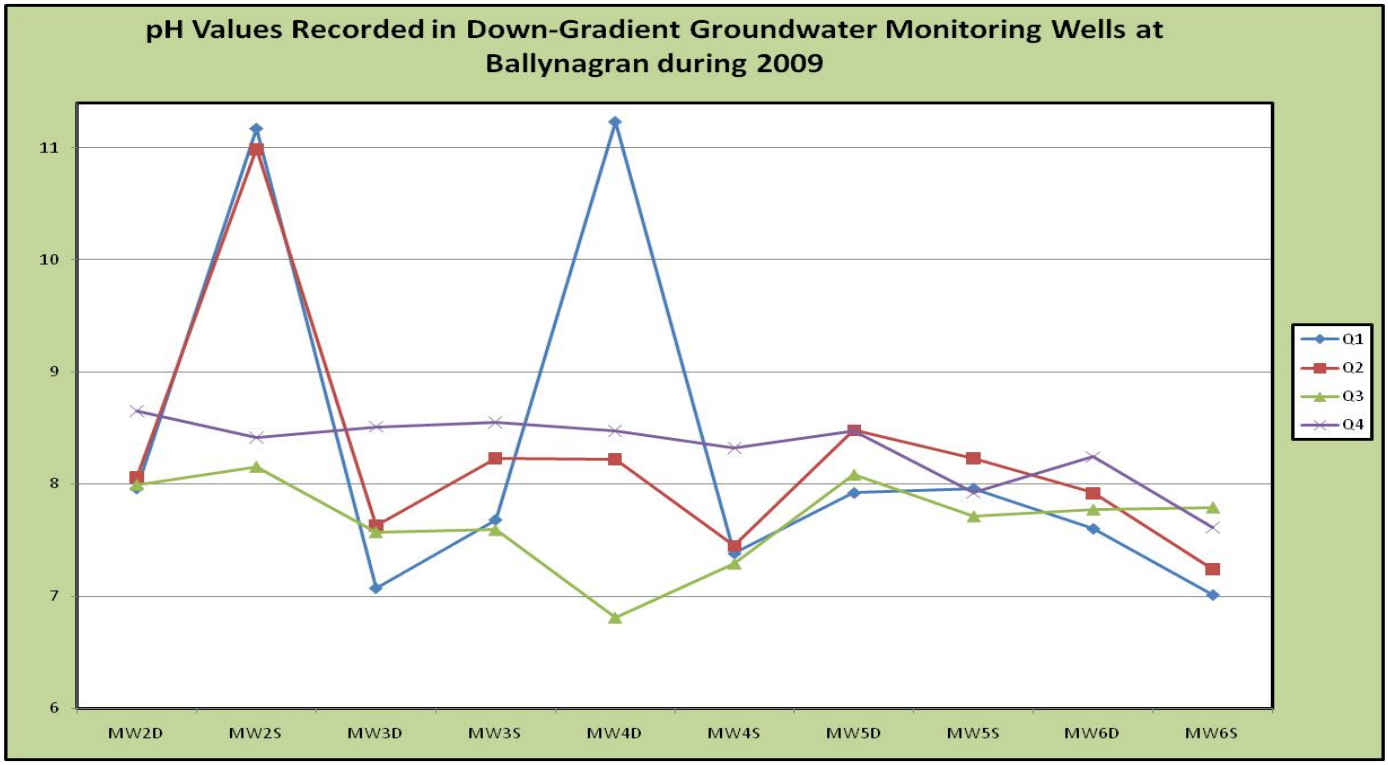


Figure 6: pH Values in Up-Gradient Groundwater Monitoring Wells during 2009

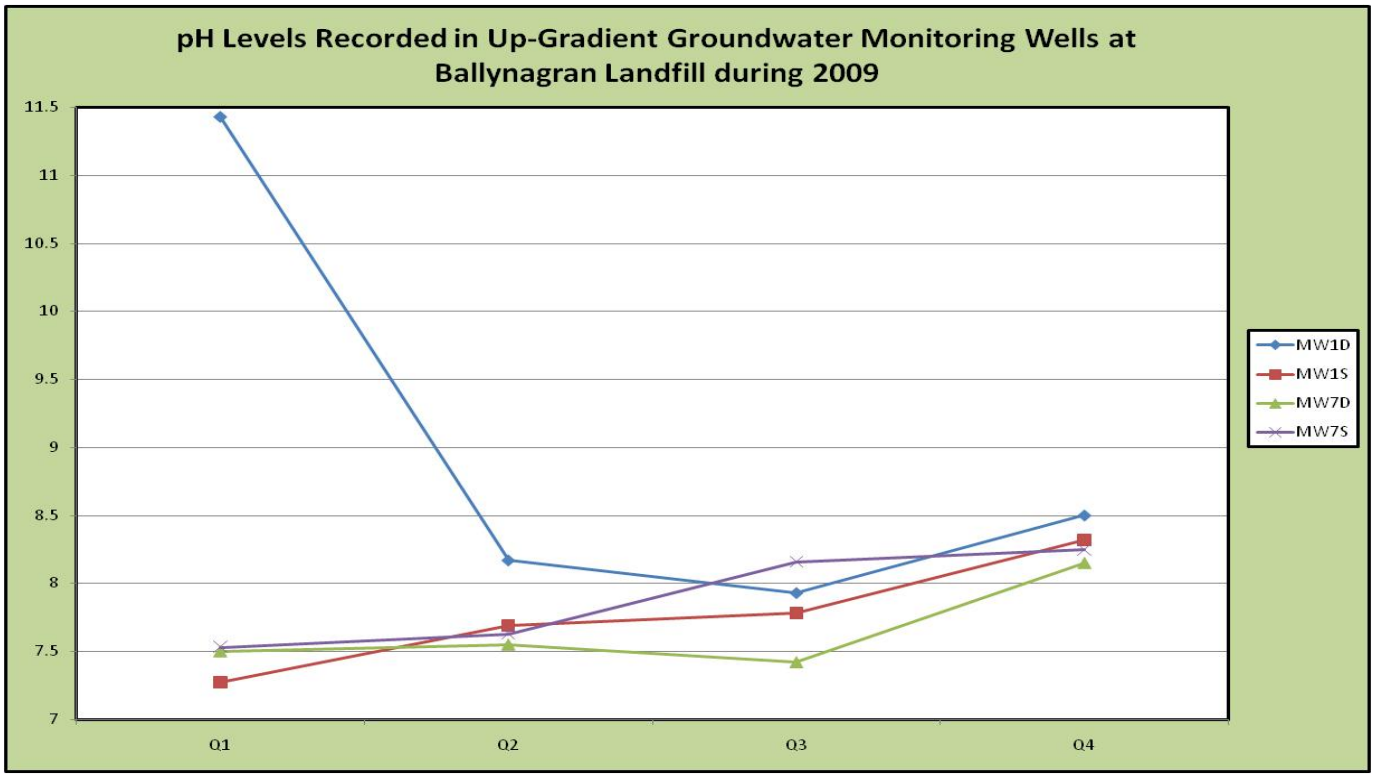


Figure 7: Electrical Conductivity Levels in Down-Gradient Wells at Ballynagran during 2009

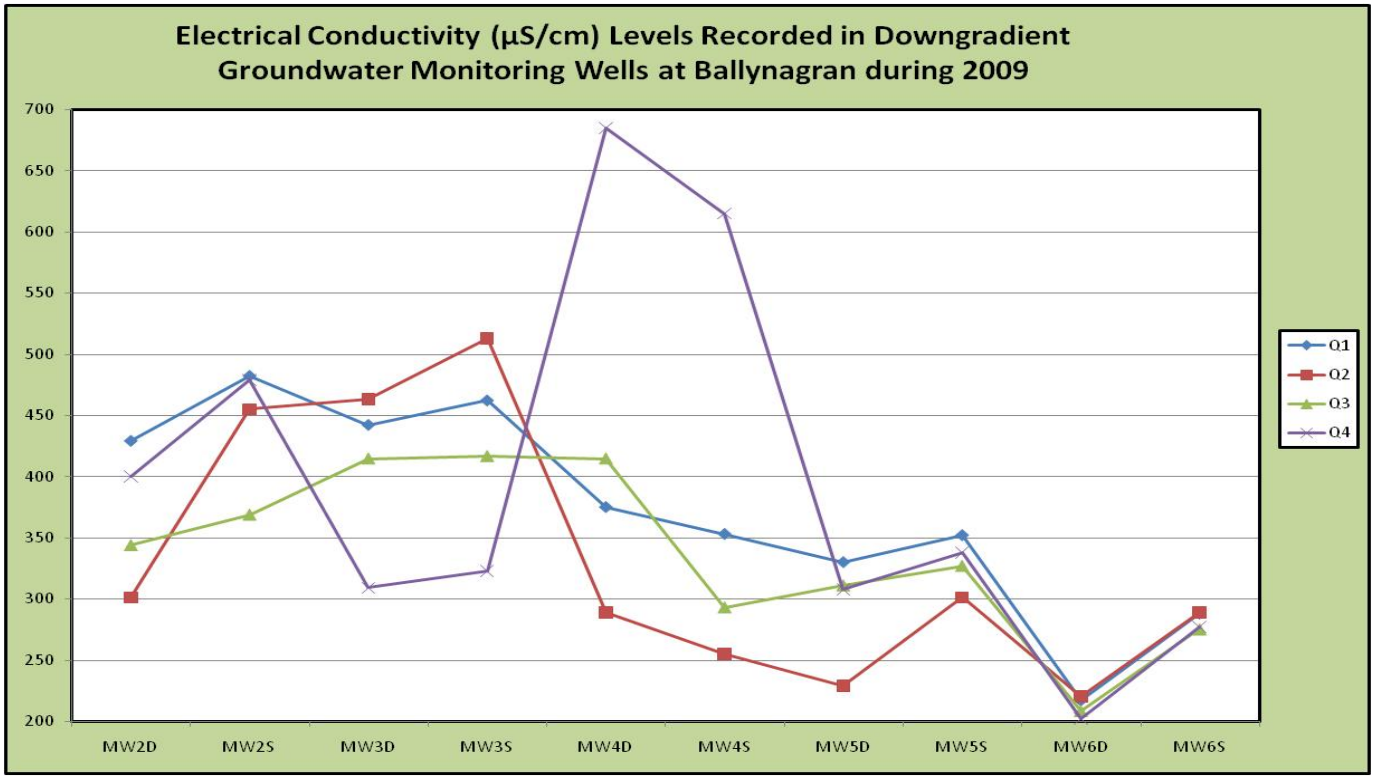


Figure 8: Electrical Conductivity Levels in Up-Gradient Wells at Ballynagran during 2009

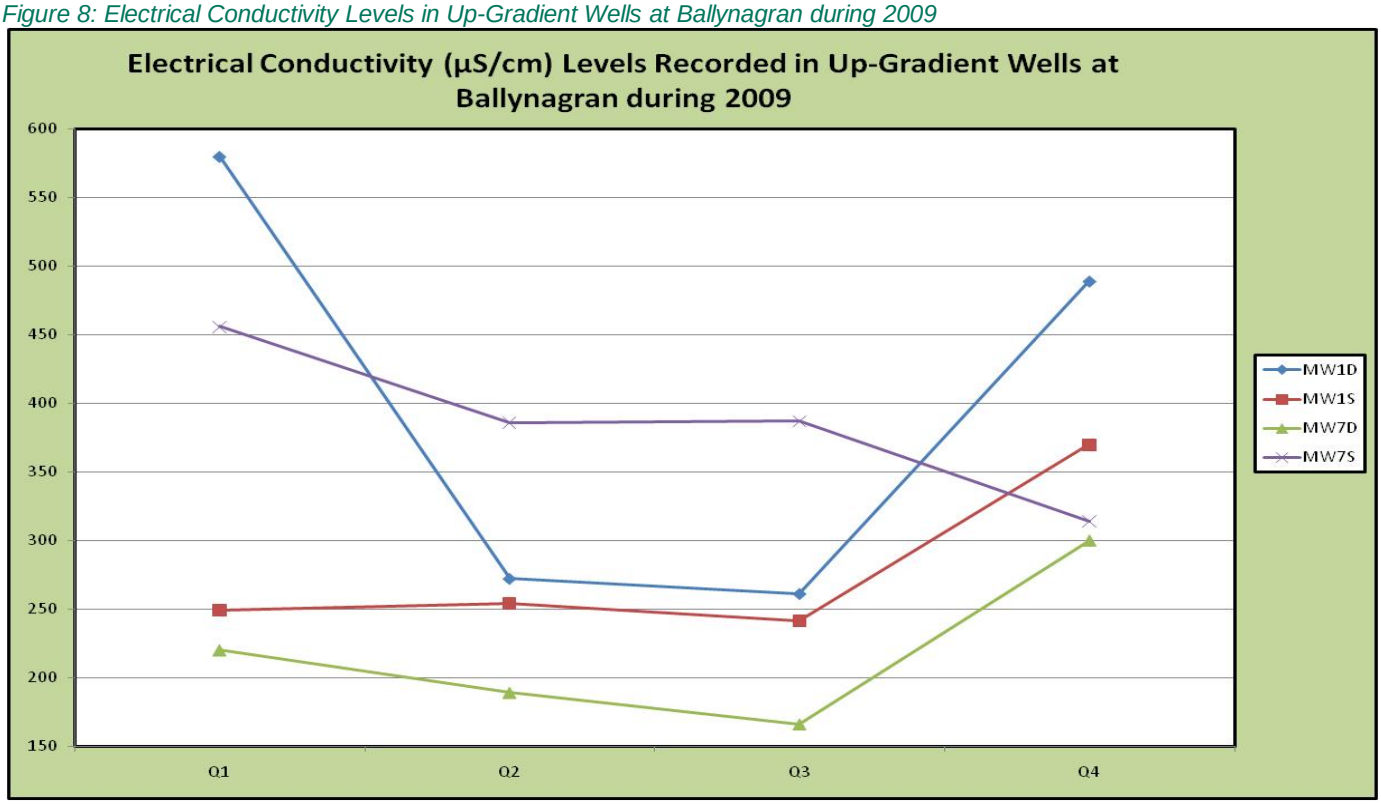


Figure 9: Chloride Levels Detected in Down-Gradient Groundwater Monitoring Wells during 2009

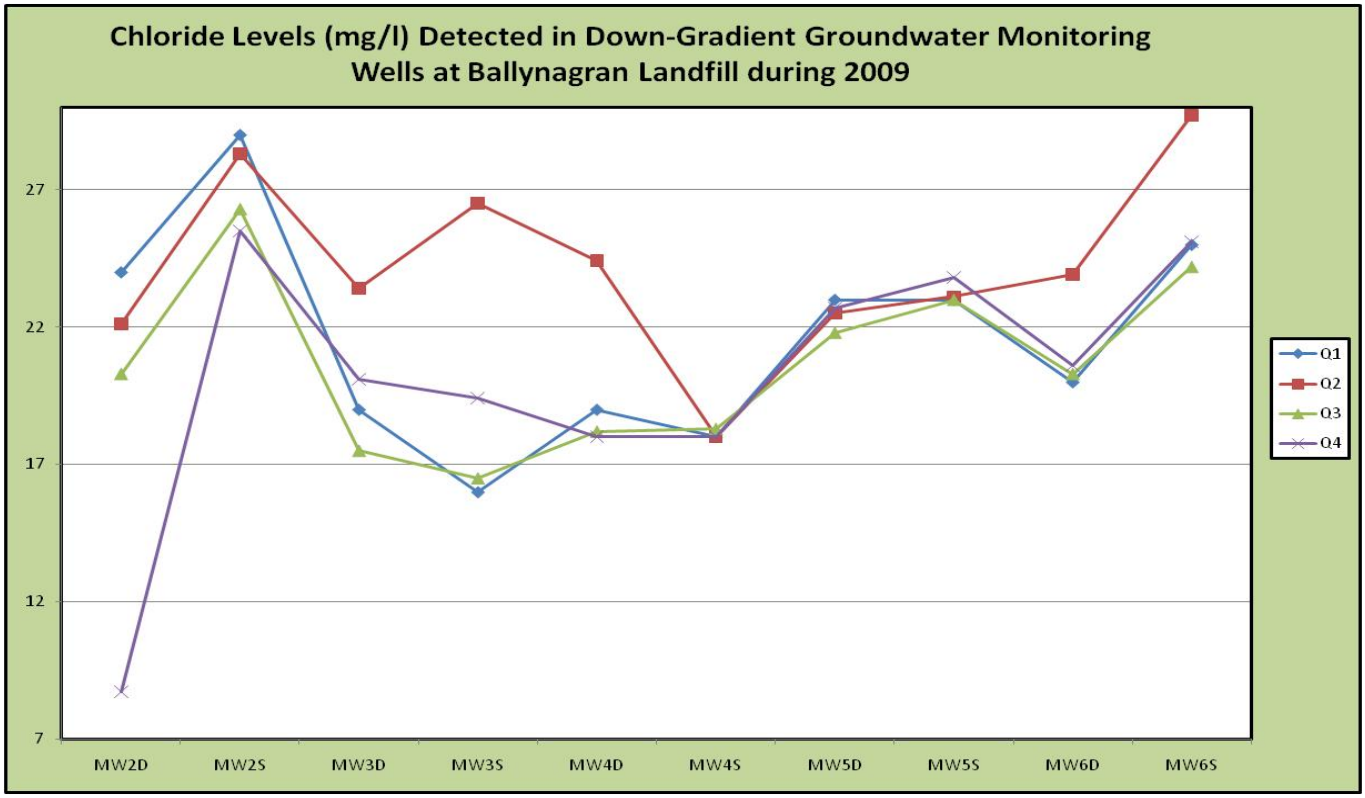


Figure 10: Chloride Levels Detected in Up-Gradient Groundwater Monitoring Wells during 2009

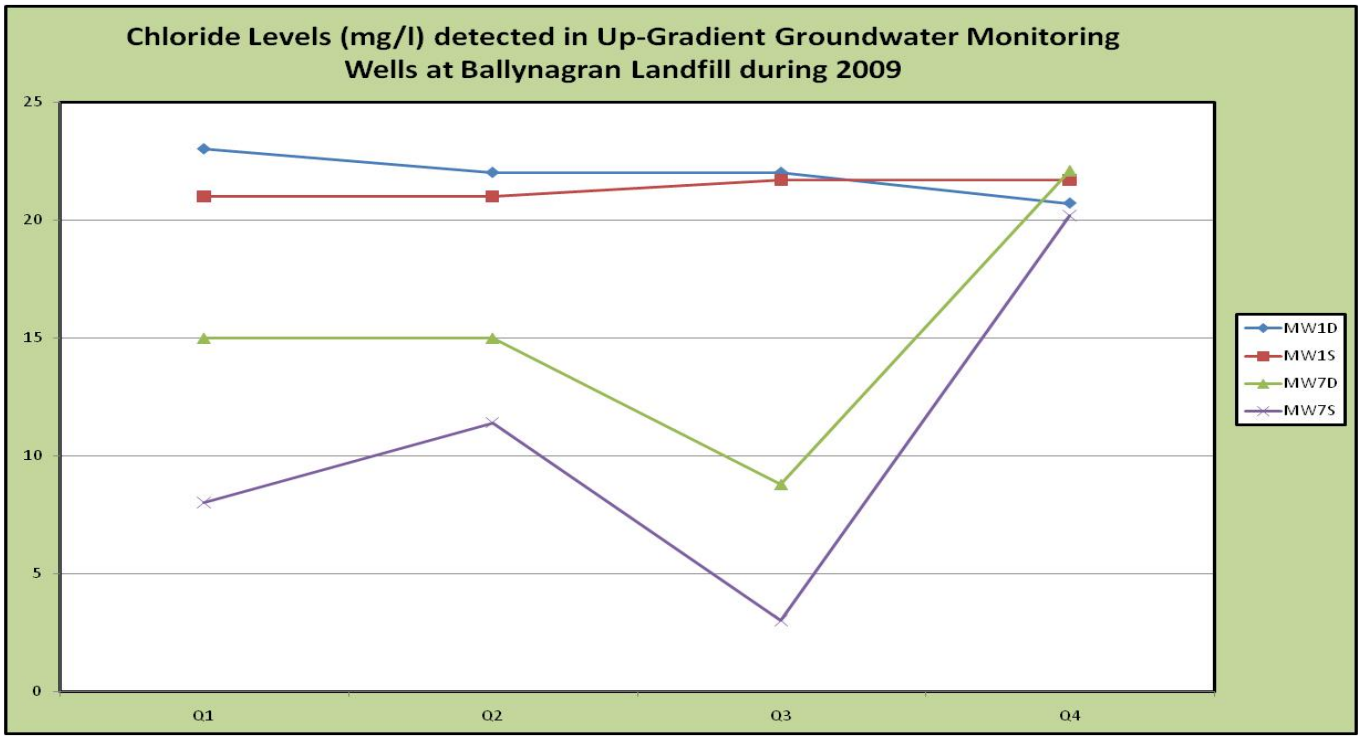


Figure 11: Dissolved Oxygen Levels in Down-Gradient Groundwater Monitoring Wells during 2009

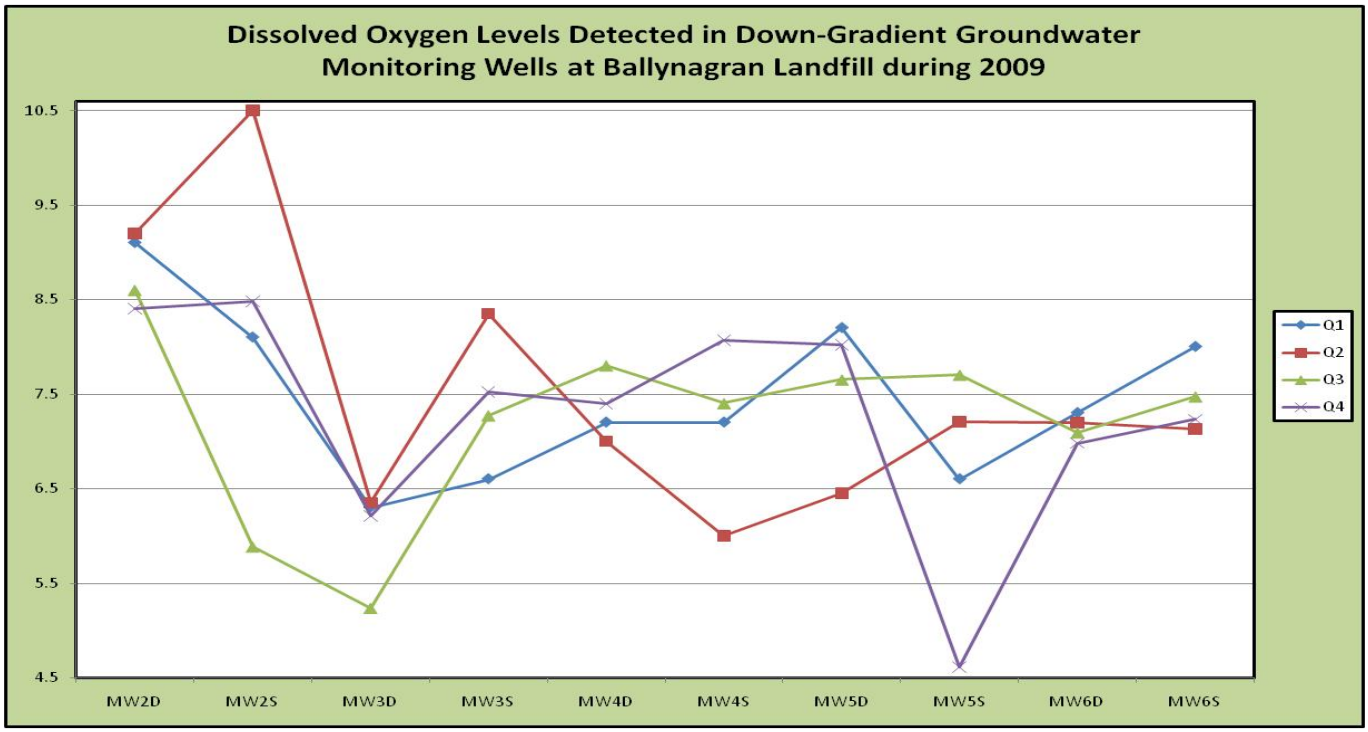
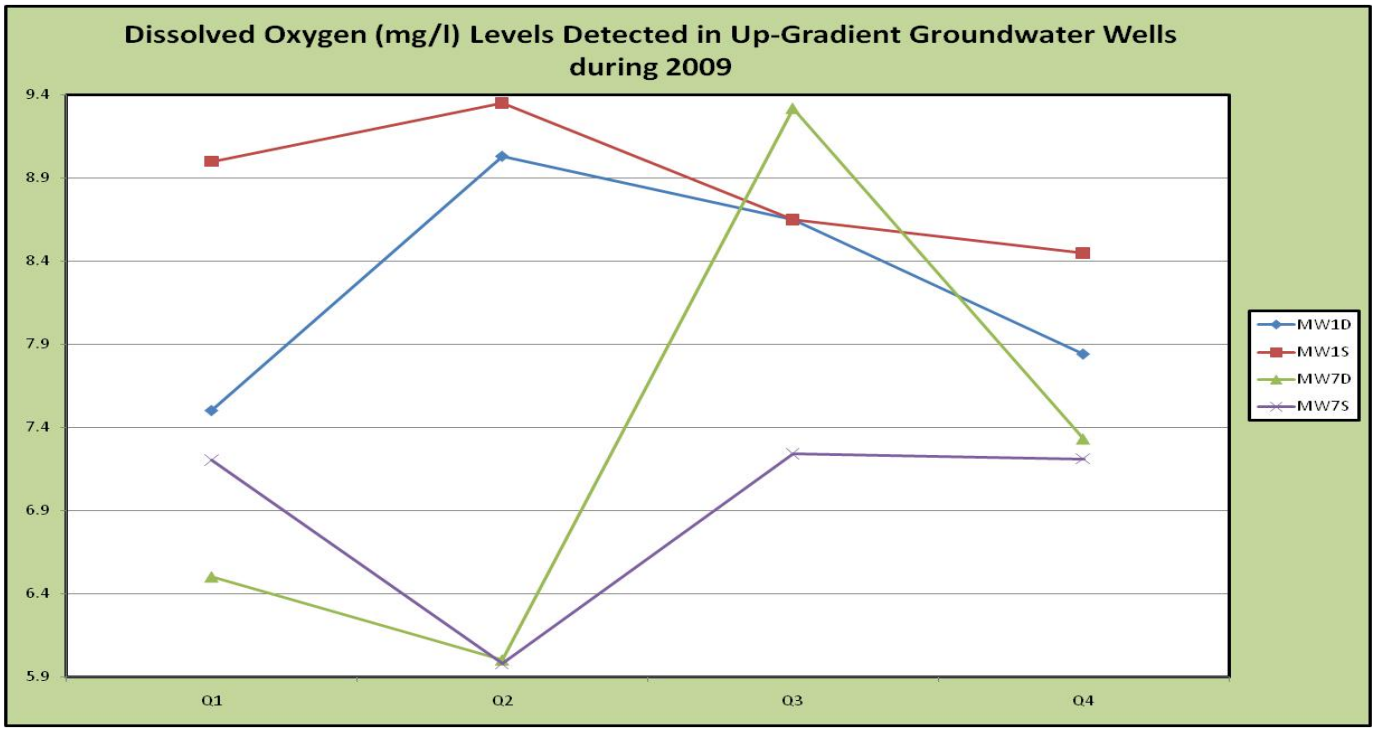


Figure 12: Dissolved Oxygen Levels in Up-Gradient Groundwater Wells during 2009



14.2 Groundwater results discussion – Review of 2009 Chemical Trigger Parameter Concentrations

Table 13: Groundwater Trigger Levels as per Condition 6.4.2 of Waste Licence W0165-01

Parameter	pH	Chloride	Ammoniacal Nitrogen	Total Organic Carbon	Potassium
Units	pH Units	mg/l	mg/l	mg/l	mg/l
All Wells	≤6 pH ≥9	40 mg/l	0.15 mg/l	50 mg/l	12 mg/l

Ammoniacal Nitrogen levels in groundwater during 2009 at Ballynagran Landfill.

During the 1st Quarter of 2010, neither the EPA IGV or the trigger value for Ammonical Nitrogen were breached.

Samples tested during the 2nd Quarter of 2009 indicated that the trigger value and the IGV were breached at several locations across the site at locations MW1S and MW1D, MW2S and MW2D, MW3S and MW3D, MW6S and MW6D and MW7S. The most significant breach was recorded at location MW1S where a level of 6.82 mg/l was recorded.

Following the 3rd Quarter 2009 sampling round, ammoniacal nitrogen level breaches were detected at locations MW2S, MW4D, MW6S, and MW7S

During the 4th Quarter of 2009, level breaches were detected at locations MW2S, MW4D, MW6S and MW7D. The remaining locations showed levels at less than the limit of detection for the laboratory.

Chloride Levels in groundwater during 2009 at Ballynagran Landfill.

Samples taken and analysed for chloride during the 1st Quarter of 2009 indicated that neither the Trigger Level of 40 mg/l nor the EPA IGV of 30 mg/l were breached.

Samples taken and analysed for chloride during the 2nd Quarter of 2009 indicated that neither the Trigger Level of 40 mg/l nor the EPA IGV of 30 mg/l were breached.

Samples taken and analysed for chloride during the 3rd Quarter of 2009 indicated that neither the Trigger Level of 40 mg/l nor the EPA IGV of 30 mg/l were breached.

Samples taken and analysed for chloride during the 4th Quarter of 2009 indicated that neither the Trigger Level of 40 mg/l nor the EPA IGV of 30 mg/l were breached.

pH Levels in groundwater during 2009 at Ballynagran Landfill.

pH values in groundwater samples taken during the 1st Quarter of 2009 indicated that several breached occurred. These were reported to the Agency in the 1st Quarter 2009 environmental monitoring report. These level breached were recorded at locations MW1D, MW2S and MW4D.

During the 2nd Quarter of 2009 pH level breaches were recorded at locations MW1D, MW1S, MW2D, MW2S, MW4D and MW7S.

Samples taken and analysed for pH during the 3rd Quarter of 2009 indicated that neither the Trigger Level of nor the EPA IGV were breached.

Samples taken and analysed for pH during the 4th Quarter of 2009 indicated that neither the Trigger Level of nor the EPA IGV were breached.

Total Organic Carbon Levels in groundwater during 2009 at Ballynagran Landfill

Samples taken and analysed for Total Organic Carbon during the 1st Quarter of 2009 indicated that the EPA IGV of 30 mg/l was not breached.

Samples taken and analysed for Total Organic Carbon during the 2nd Quarter of 2009 indicated that the EPA IGV of 30 mg/l was not breached.

Samples taken and analysed for Total Organic Carbon during the 3rd Quarter of 2009 indicated that the EPA IGV of 30 mg/l was not breached.

Samples taken and analysed for Total Organic Carbon during the 4th Quarter of 2009 indicated that the EPA IGV of 30 mg/l was not breached.

Potassium Levels in groundwater during 2009 at Ballynagran Landfill

Samples taken and analysed for potassium during the 1st Quarter of 2009 indicated that neither the Trigger Level of 12 mg/l nor the EPA IGV of 5 mg/l were breached.

Samples taken and analysed for potassium during the 2nd Quarter of 2009 indicated that neither the Trigger Level of 12 mg/l nor the EPA IGV of 5 mg/l were breached.

Samples taken and analysed for potassium during the 3rd Quarter of 2009 indicated that neither the Trigger Level of 12 mg/l nor the EPA IGV of 5 mg/l were breached.

Samples taken and analysed for potassium during the 4th Quarter of 2009 indicated that neither the Trigger Level of 12 mg/l nor the EPA IGV of 5 mg/l were breached.

The results for 2009 indicate that the operation of the landfill is not having any negative effect on the underlying groundwater.

In accordance with Condition 8.7 of the waste licence W0165-01, a monitoring programme of private wells was conducted within 500m of the facility subject to the agreement of the well owners. The results of the monitoring rounds were reported in the 3rd and 4th Quarter Environmental Monitoring Reports of 2009.

15.0 LANDFILL GAS MONITORING

15.1 Locations and Methods

Landfill gas is monitored at Ballyngran landfill in compliance with Condition 6.3 Landfill Gas as well as Table C.2 of Schedule C: Emission Limits and Table D.2.2 Landfill Gas Monitoring Parameters, Frequency and Technique.

15.1.1 Landfill gas Emission Limit Values

Landfill gas emission limit values as given in Licence W0165-01 are assigned to gas monitoring locations at the perimeter of the landfill. These emission limit values are listed below in Table 14.

Table 14: Waste Licence Landfill Gas Emission Limit Values

Methane	Carbon Dioxide
1.0 % v/v	1.5 % v/v

Landfill gas monitoring was conducted by Ballynagran Landfill staff members and Golder Associates consultants.

In accordance with Table D.2.2 of the waste licence, landfill gas must be monitored on a monthly basis. During 2009, TOBIN Consulting Engineers carried out landfill gas monitoring during the 1st quarter of 2009. Golder Associates carried landfill gas monitoring once during September 2009 and Ballynagran staff members conducted landfill gas monitoring for the remaining part of 2009. In total 19 no. landfill gas monitoring wells were monitored at Ballynagran during 2009.

A description and detailed co-ordinates of all landfill gas monitoring wells at Ballynagran is given in Table 15 below.

Table 15: Landfill Gas Monitoring Locations at Ballynagran during 2009

Monitoring Location	Eastings	Northings
MG01	327146	191328
MG02	326926	191073
MG03	326949	191034
MG04	326980	191002
MG05	327017	190975
MG06	327062	191971
MG07	327107	191974
MG08	327151	190977
MG09	327196	190978
MG10	327239	190993
MG11	327264	191031
MG12	327285	191070
MG13	327301	191112
MG14	327305	191157
MG15	327303	191202
MG16	327288	191244
MG17	327269	191285
MG18	327233	191313
MG19	327189	191314
MG20	327146	191328

MG47	326852	191226
MG48	326879	191191
MG49	326901	191151

15.2 Landfill Gas Monitoring Methodology

Landfill gas measurements were undertaken using a GA2000 Landfill Gas Analyser. The gas is analysed for its content by % volume of the following constituents:

- Methane CH4
- Carbon dioxide CO2
- Oxygen O2
- Hydrogen sulphide H2S

The LEL (lower explosive limit of methane), atmospheric pressure (millibars) and temperature (°C) were also recorded by the GA2000 Landfill Gas Analyser.

15.3 Landfill Gas Monitoring Results

Monthly gas results are sent to Golder Associates for inclusion in each quarterly environmental monitoring report. These were included as an appendix in each report sent to the Agency during 2009.

During 2009, methane levels were detected in levels above the licence emission limit value (ELV) of 1% at locations MG16 and MG17. The methane levels have diminished dramatically over the course of the year with a high of 75.5% v/v recorded in MG16 in February 2009 falling to a low of 5.4% v/v detected in MG17 during the October 2009 monitoring round. This diminishing pattern has been detected in MG17 also.

A methane level of 69.1% v/v was detected in April 2009 and a low of 0.2% v/v was detected in the same monitoring well in December 2009.

Elevated levels of Carbon Dioxide were detected in levels above the licence emission limit value of 1.5% v/v in monitoring wells in MG2, MG5, MG9, MG10, MG11, MG16, MG17 and MG49 during 2009. The highest level detected was recorded in monitoring well MG17 in July 2009 at a level of 28.3% v/v.

Levels of landfill gas during 2009 (methane and carbon dioxide) recorded at the site are depicted below in Tables 16 and 17below. Sampling locations are illustrated on Drawing 5 Rev C Environmental Monitoring Locations with is attached in Appendix A.

Historically, high concentrations of methane and carbon dioxide were recorded in MG15, MG16, MG17 and MG18 in October 2006, which was prior to the placement of any waste in the landfill. Background CH_4 and CO_2 concentrations continue be elevated outside the perimeter of the landfill active waste area. These concentrations are consistent with baseline levels recorded prior to the period of active landfilling on the site. The concentrations may be as a result of the natural degradation of organic material and historical waste having been placed in the vicinity prior to the current operators being active at the site.

Analysis carried out in the vicinity of Ballynagran on two occasions in 2007, and reported by Odour Monitoring Ireland (OMI), showed a VOC profile that is significantly different when comparing perimeter gas wells with active gas wells. In their report, they state that it is highly unlikely that methane and carbon dioxide concentrations in the perimeter gas wells are the results of lateral or horizontal landfill gas migration.

They indicate that the most likely source of the high measurements is from disturbed ground from the construction phase and results represent natural degradation of organic material. The client has forwarded on these reports by Odour Monitoring Ireland to the Agency for their consideration.

Table 16: Methane Levels Recorded at Ballynagran Landfill during 2009

CH4	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
MG01	0.2	0.2	0.2	0.4	0.3	0.3	0.4	0.4	0	0	0.1	0.2
MG02	0.2	0.2	0.2	0.3	0.3	0.3	0.2	0.4	0	0	0.1	0.1
MG04	0.2	0.2	0.2	0.3	0.3	0.2	0.4	0.4	0	0	0.1	0.1
MG05	0.2	0.2	0.2	0.3	0.3	0.3	0.4	0.4	0	0	0.1	0.3
MG06	0.2	0.2	0.2	0.3	0.3	0.2	0.4	0.4	0	0	0.1	0.1
MG07	0.2	0.2	0.2	0.3	0.3	0.2	0.4	0.4	0	0	0.1	0.1
MG09	0.2	0.2	0.2	0.3	0.3	0.2	0.4	0.4	0	0	0.1	0.1
MG10	0.2	0.2	0.2	0.3	0.3	0.3	0.4	0.4	0	0	0.1	0.1
MG11	0.2	0.2	0.2	0.3	0.3	0.3	0.4	0.4	0	0	0.1	0.2
MG12	0.2	0.2	0.2	0.3	0.3	0.3	0.4	0.4	0	0	0.1	0.1
MG13	0.2	0.2	0.2	0.3	0.3	0.3	0.4	0.4	0	0	0.1	0.4
MG14	0.2	0.2	0.2	0.3	0.3	0.3	0.4	0.4	0	0	0.1	0.1
MG15	0.2	0.2	0.2	0.3	0.3	0.3	0.4	0.4	0	0	0.1	0.1
MG16	51.1	75.5	70	63.2	63.4	5.6	9.2	9.9	7.1	5.4	7.7	6.8
MG17	58.9	14.7	25	69.1	0.3	28.6	63.2	44.2	7.0	1.4	0.2	0.2
MG18	0.2	0.2	0.2	0.3	0.3	0.3	0.5	0.4	0	0	0.1	0.1
MG19	0.2	0.2	0.2	0.3	0.3	0.3	0.5	0.4	0	0.5	0.2	0.2
MG47	0.2	0.2	0.2	0.4	0.3	0.3	0.4	0.4	0.8	0	0.1	0.1
MG48	0.2	0.2	0.2	0.4	0.3	0.2	0.4	0.4	0.2	0	0.1	0.2
MG49	0.2	0.2	0.2	0.3	0.3	0.3	0.5	0.4	0	0	0.1	0.2

Table 17: Carbon Dioxide Levels Recorded at Ballynagran Landfill during 2009

CO2	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
MG01	0	0	0	0.1	0.0	0.0	0	0	0	0	0	0
MG02	0	0	0	2.3	0.0	0.0	0	0.0	3.3	0	0.1	0.1
MG04	0	0	0	0.2	0.1	0.1	1	0	0	0	0	0.2
MG05	0	3.6	2.8	3.3	0.0	0.1	0.5	0.3	6.8	0.1	0.2	0.2
MG06	0	0	0	0.2	0.6	0.7	0.4	0.6	0.0	0.8	0.7	0.7
MG07	0	0	0	0	0	0	0	0	1.1	0	0	0
MG09	0	2.4	2.1	1.4	0.0	0.0	0.8	0.3	2.9	0.0	0.1	0.2
MG10	0	5.7	3.6	0.1	0.0	0.0	0.5	0.0	5.5	0.0	0.0	0.0
MG11	0.2	2.5	2.1	2.5	0.7	2.5	2.1	2.8	3.2	0.0	0.3	0.3
MG12	0	0	0	0.3	0.3	0.3	0.6	0.0	0.0	0.5	0.3	0.3
MG13	0	0	0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2
MG14	0	0	0	0.6	0.3	0.0	0.0	0.4	0.0	0.7	0.3	0.3
MG15	0	0	0	0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0
MG16	16.8	19	18.8	18.3	17.9	3.0	2.6	2.9	2.1	1.8	2.2	2.3
MG17	23.7	4.1	10.3	22.0	6.0	12.8	28.3	15.6	4.6	1.0	0.1	0.1
MG18	0	0	1.6	1.3	0.5	0.7	0.0	0.9	0.0	1.4	0.2	0.2
MG19	0	0	0	1.1	0.2	0.0	0.0	0.1	0.0	0.0	0	0
MG47	0	0	0	0.7	0.0	0.0	0.0	1.2	1.4	0.0	0.0	0.0
MG48	0	0	0	0.4	1.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
MG49	0	0	0	0.1	1.1	0.3	0.7	0.0	0.0	2.0	4.9	0

16.0 PM10 MONITORING

16.1 Locations and Methods

In accordance with Table D.3.1 of Waste Licence W0165-01, PM10 monitoring is conducted quarterly at the site. During 2009, two companies conducted PM10 sampling at the site, Odour Monitoring Ireland (OMI) and Emerald Environmental. 4 No. locations are sampled at the site labelled PM1 – PM4 inclusive. During the 1st Quarter of 2009, OMI conducted the PM10 survey between the 17th and the 24th of February 2009. During the 2nd Quarter of 2009 Emerald Environmental conducted the PM10 survey between the 22nd of June 2009 and the 26th of June 2009. The 3rd Quarter survey was conducted again by Emerald Environmental between the 7th of September 2009 and the 11th of September 2009 and the final PM10 survey for 2009 was conducted by Emerald Environmental between the 15th of December 2009 and the 19th of December 2009. All reports were forwarded to the Agency as an attachment to each corresponding quarterly report. Sampling locations are illustrated on Drawing 5 Rev C Environmental Monitoring Locations which is attached in Appendix A. A summary table of results is presented below.

Table 18: Summary of PM10 Survey Results at Ballynagran during 2009

Monitoring Location	Quarter 1 2009	Quarter 2 2009	Quarter 3 2009	Quarter 4 2009
Licence Limit	50 µg/m³	50 µg/m³	50 µg/m³	50 µg/m³
PM1	12.0	55.1	6.5	8.2
PM2	17.0	7.4	12.3	3.1
PM3	16.0	13.3	15.0	5.5
PM4	15.0	20.4	12.5	3.7

16.2 Interpretation and Discussion

The level limit breach at PM1 during the 2nd Quarter 2009 survey was interpreted as intermittent interference by the engineer and was not affected by operations at the landfill. This report was issued to the Agency as an appendix to the 2nd Quarter report of 2009. The report goes on to state that the interference was as a result of trucks passing close to the monitoring location and producing large plumes of dust in their wake which is indicated in the level limit breach. All subsequent PM10 results for 2009 are below the licence limit.

17.0 ENVIRONMENTAL NOISE

17.1 Locations and Methods

During 2009, noise monitoring was conducted quarterly at the site in accordance with Table D.4 of Waste Licence W0165-01. Noise monitoring was conducted at 4 No locations on-site and a further 3 noise sensitive locations off-site during each survey. Each survey was reported to the agency in a separate report attached as an appendix to each corresponding quarterly report. In summary, it was noted that location NSL3 is influenced to a very dominant level by road traffic on the main N11 motorway. Operations at the landfill do not have any influence on the environmental noise level at locations NSL2 and NSL3. Both of these locations are dominated to a much greater extent by road traffic on the N11 and other surrounding local access roads. Of the on-site noise monitoring locations, operations are inaudible although distant reversing sirens can be heard intermittently. Operations are inaudible at locations NL3 and NL4. Passing site traffic and operational activities are dominant at location NL2 although on all occasions during 2009, the licence emission limit value of 55 dB (A) was not breached. Sampling locations are illustrated on Drawing 5 Rev C. Environmental Monitoring Locations. A summary of results is presented below in Tables 19 - 22.

Table 19: Summary Table of Recorded Noise Survey Results during Quarter 1 2009

Monitoring Location	Date/Time	LAeq 30 mins	LA10 30 mins	LA90 30 mins
N1	10/03/09 11:00	46	50	37
N2	10/03/09 14:16	47	48	39
N3	10/03/09 09:21	44	46	37
N4	10/03/09 11:48	49	45	36
NSL1	10/03/09 12:25	46	44	36
NSL2	10/03/09 13:02	64	65	47
NSL3	10/03/09 13:38	66	69	58

Table 20: Summary Table of Recorded Noise Survey Results during Quarter 2 2009

Monitoring Location	Date/Time	LAeq 30 mins	LA10 30 mins	LA90 30 mins
N1	22/04/09 14:38	61	61	50
N2	22/04/09 13:14	50	53	47
N3	22/04/09 15:48	51	52	48
N4	22/04/09 11:37	48	60	43
NSL1	22/04/09 10:56	58	57	42
NSL2	22/04/09 16:30	58	61	44
NSL3	22/04/09 12:24	62	65	58

Table 21: Summary Table of Recorded Noise Survey Results during Quarter 3 2009

Monitoring Location	Date/Time	LAeq 30 mins	LA10 30 mins	LA90 30 mins
N1	09/09/09 14:24	37	38	32
N2	09/09/09 13:32	47	49	34
N3	09/09/09 15:40	52	53	50
N4	09/09/09 12:12	56	52	44
NSL1	09/09/09 11:36	48	75	38
NSL2	09/09/09 10:49	64	61	41
NSL3	09/09/09 12:52	49	51	45

Table 22: Summary Table of Recorded Noise Survey Results during Quarter 4 2009

Monitoring Location	Date/Time	LAeq 30 mins	LA10 30 mins	LA90 30 mins
N1	20/11/09 15:41	45	41	30
N2	20/11/09 13:58	49	49	42
N3	20/11/09 16:15	55	53	50
N4	20/11/09 12:15	53	52	52
NSL1	20/11/09 11:32	53	50	42
NSL2	20/11/09 13:03	67	67	46
NSL3	20/11/09 14:37	64	66	61

17.2 Results and Interpretation

Noise monitoring was conducted at 7 No. monitoring locations on a quarterly basis at Ballynagran Landfill in compliance with Section D.4 and Table D.4.1 of Waste Licence W0165-01. During 2009, the dominant noise source that produced noise levels above 55 dB(A) LAeq – the licence limit, was road traffic. The two locations that regularly show figures above this licence limit are locations NSL2 and NSL3.

Both of these locations are situated very close to busy local access routes and in the case of NSL3, the main N11 motorway. It is noted that during the 2nd Quarter of 2009, a figure of 61 dB(A) LAeq was recorded at location NL1. This was caused by wind blowing through trees behind the sound level metre. On-site, the dominant noise source comes from reversing sirens on site plant. This is a necessary safety feature of these vehicles and is an intermittent noise source.

18.0 BIOLOGICAL ASSESSMENT

18.1 Locations and Methods

Biological sampling and water quality assessment was carried out by Golder Associates Ireland on behalf of Greenstar as part of the Environmental Monitoring Programme for compliance with their Waste Licence W0165-01. Sampling was carried out on the 23rd September 2009 in accordance with EPA Q-rating methodology (Clabby *et al*., 2004) at eight locations on 3 no. watercourses which flow within, and outside of, the Site boundary at Ballynagran. Sampling locations are described below in Table 23 and illustrated on Drawing 5 Rev. C Environmental Monitoring Locations. A detailed report was issued as an appendix to the Quarter 3 2009 report to the Agency.

Table 23: Biological Assessment Monitoring Locations

Monitoring Point	Description
SW1	Ballynagran Stream – west of landfill, upstream of landfill
SW2	Longford Stream – east of landfill, upstream of landfill
SW3	Killandra Stream - southeast of landfill, upstream of confluence with Ballynagran Stream
SW4	Ballynagran Stream – west of landfill, downstream of SW1, upstream of Phase 1 Area
SW5	Longford Stream – east of landfill, downstream of landfill
SW6	Three Mile Water River – off-site to south, downstream of landfill
SW7	Three Mile Water River – off-site to south, downstream of landfill
SW8	Longford Stream – east of landfill, downstream of landfill

18.2 Interpretation and Discussion

Samples are dominated by tolerant 'Group C' taxa such as *Gammarus duebeni*, Simuliidae and *Baetis rhodani*. Group B taxa were relatively common, Group D taxa were scare, and Group E taxa were absent. Samples that warranted a Q3-4 rating contained just one individual from a Group A taxon, though apart from this they were largely similar to the Q3 samples. Similar results in upstream (SW1-4) and downstream (SW5-7) locations indicate that there is no evidence of water quality deterioration as a result of the landfill development. Results are broadly similar to those obtained in 2008 and 2007; in 2008 samples were mostly assigned a quality index of Q3, with SW3 and SW6 being assigned a value of Q3-4. The currently results differ slightly in that while SW3 still warrants Q3-4, SW6 has been assigned Q3; however SW7 located downstream of this point has been assigned Q3-4 (Q3 in 2008). SW1, an upstream location, has also been assigned Q3-4 on this occasion. However given that only one individual specimen accounted for the Q3-4 assignment in all three cases, it is not considered that the water quality at these sites is significantly different to the sites assigned a Q3 index.

A summary table of results for the biological assessment is presented below in Table 24.

Table 24: Biological Assessment 2009 Summary Results Table

Taxa	SW1	SW2	SW3	SW4	SW5	SW6	SW7	SW8
GROUP A								
Ephemeroptera								
Heptagenidae	1		1					
Rhithrogena semicolorata							1	
GROUP B								
Plecoptera								
Leuctra spp.	10		1	2		2	3	
Cased Trichoptera								
Glossosomatidae	2	7	1		2	1	1	1
Limnephilidae		1			1	2	1	1
Goeridae					1			
Odontoceridae albicorne								1
GROUP C								
Ephemeroptera								
Baetis rhodani	14	4	36	1	15	1	2	157
Ephemerella ignita								1
Uncased Trichoptera								
Hydropsyche siltalai	19	3	10	6	9	1	2	1
Wormaldia spp.	2		1	4				
Rhyacophila dorsalis			2				2	
Coleoptera								
Elminthidae								
Dytiscidae								
Crustacea								
Gammarus duebeni	23	195	32	11	56	27	17	13
Gastropoda								
Potamopyrgus jenkinsi		9			17	3		37
Planorbis spp.				1				
Ancylus fluviatilis	2			2				
Diptera								

Taxa	SW1	SW2	SW3	SW4	SW5	SW6	SW7	SW8
Simuliidae	57	2	93	36	3	11		10
Tipulidae	4	1	2		8	1	2	11
Chironomidae	4	3	3	3			1	
GROUP D								
Lamellibranchiata								
Pisidium spp.		1						
Crustacea								
Asellus aquaticus						2	1	
Hirudinea								
Glossiphonia complanata						2		2
Group E - None								
GROUP E								
None								
OTHER								
Tricladida								
Polycelis spp.	3	1	2	2	15	1		3
Oligochaeta					7	4	2	5
Q VALUE	**Q3-4**	**Q3**	**Q3**	**Q3**	**Q3**	**Q3**	**Q3-4**	**Q3**

19.0 SCHEDULE OF OBJECTIVES AND TARGETS FOR 2009

Table 25 below details the objectives and targets at Ballynagran Residual Landfill for 2009.

Table 25: Schedule of Objectives and Targets for 2009

Originated from	Objective	Target including timescale	Project no.
F01 - impact no. 1 / AER 2008	Develop landfill gas collection infrastructure and gas utilisation plant.	Extend gas collection infrastructure into new cells, respond to increased gas generation by installing additional flares, as required. Progress LFG utilisation plant set up. Collect and burn approximately 90% of all landfill gas generated by the facility. In 2010 apply Geohess on southern boundary to improve gas containment and increase FID surveys from biannually to quarterly. (for timescale see project sheet)	1
F01 – impact no. 3	Minimise risk of potential water pollution from generation of leachate	Minimise leachate generation. In 2010 apply Geohess on southern boundary to reduce leachate generation. (for timescale see project sheet)	2
F01 – impact no. 5	Reduce dust nuisance on environment and surrounding neighbours	All dust emissions in accordance with Licence (for timescale see project sheet)	3
F01 – impact no. 4	Avoid contamination of groundwater after a spillage or emergency situation	Carry out spillage emergency response training (for timescale see project sheet)	7
F01 – impact no. 6 and AER 2007	Reduce risk of windblown litter when the site is operating in adverse weather conditions	Ensure site remains compliant with Licence conditions which refer to windblown litter (for timescale see project sheet)	8
Risk assessment (hazard no. 5) **and** F01 – impact no. 2	Reduce the hazard posed to all personnel and the environment (emissions to air) by fire or explosion from flammable materials on site	Minimise the occurrence of this type of incident	6

Originated from	Objective	Target including timescale	Project no.
Risk assessment (hazard no. 4)	To reduce the risk of site personnel being hit by a vehicle	To significantly reduce this type of incident on site.	14
F01 - impact no. 7 / AER 2007 / AER 2008	Review and assess the effectiveness of nuisance control procedures including bird, rats and mice	Continually review and assess all nuisance control procedures to ensure minimal impact on surrounding area. Update reports on bird control and odour abatement measures. Prepare and implement odour nuisance management plan (for timescale see project sheet)	4
AER 2007 / AER 2008	Minimise nuisance from vehicle movements and uploading / tipping	Ensure noise, dust, odour from vehicle movements are minimised by correct implementation of relevant operational protocols (for timescale see project sheet)	5
AER 2007 / AER 2008	Continue to improve relationships with neighbouring communities / reduce environmental complaints	Develop communications with site neighbours and respond to queries as quickly as reasonably practicable, ensuring that any complaints are followed up in writing as soon as possible after receipt of compliant (for timescale see project sheet).	10
AER 2007	Environmental monitoring	Ensure monitoring results comply with Licence limits and investigate any breaches of emission limit value (for timescale see project sheet).	11
AER 2007 / AER 2008	Monitor progress of planting programme on a regular basis	Regularly review planted woodland area and ensure the replacement of any failed trees to ensure visual impact of site is minimised (for timescale see project sheet).	12
AER 2008	Awareness and training programme	Carry out continued ISO and Health and Safety Training	n/a

Originated from	Objective	Target including timescale	Project no.
AER 2008 / Energy Audit March 10	Assess and review resource and energy consumption at the site (AER 2008) 15 points from Energy Audit March 2010. 1. Prepare energy policy statement. 2. Appoint responsible person for implementing energy policy and monitoring overall. Appoint responsibility for day to day management of energy issues. 3. Provide appropriate training to responsible persons. 4. Prepare targets and objectives 5. Annual summary on performance in AER 6. Assessment of energy efficiency of future plant and equipment 7. Communicate policy objectives to staff 8. Provide sub meters for gas utilisation plants 9. Bi-monthly data analyses and identification of efficiency opportunities 10. Annual summary report in AER 11. Provide awareness training to staff 12. Provide feedback to staff 13. Provide time sensors for office lighting 14. Consider introducing bio-diesel for mobile plant 15. Benchmark gas utilisation plant against KTK and IPS systems	Carry out energy efficiency and resource use audit Annually next audit report to be carried out in January 2011. For 15 points of energy audit carried out in March 2010 see project sheet.	17

Originated from	Objective	Target including timescale	Project no.
H&S Policy	• Promotion of H&S amongst all employees and the generation of an ethos of continual improvement • Diligent management of operations by employing control mechanisms, procedures and processes that are technologically proven and economically feasible • Promotion of continual improvement, good health and safety work practices through continual review of O&Ts • Fostering of openness, dialogue, enhanced communication and discussion with employees, clients, neighbours, suppliers, contractors and all interested parties regarding our H&S and our O&Ts • Publication and communication of our policy internally and ensuring its availability to the public and interested parties on request so that it is understood implemented and maintained • Measurement of performance by conducting regular audits and assessment of compliance with the OHSAS 18001:2007 standards, EHS policy, relevant legislation and regulatory requirements	• Improvement driven Safety Observation Audit Reports are to be undertaken bi-monthly focussing on swiftly resolving problems as they occur • Develop H&S training giving more focus on empowering employees to become safety representatives, as applicable • Look to develop staff interaction enabling keen spotting of potential problem or hazards through training and communication • Encourage feedback on equipment and resources including adequacy of PPE in protective properties, wear ability and durability and look at alternatives, where appropriate • Develop neighbour relations by encouraging site visits to complainants or mediation through local groups such as the liaison committee or anti-dump group also handling complaints with higher degree of positive feedback	n/a

Risk assessment (hazard no. 13)	Reduce or eliminate the risk from tipper vehicles overturning	Actively discourage tipper type vehicles from the site in favour of more stable and safer type vehicles more suitable to the landfill terrain.	15
Risk assessment (hazard no. 26)	Reduce exposure to biological waste i.e. sterilised hospital waste including syringes.	To significantly improve H&S measures against this type of waste causing an incident	16

20.0 PROGRESS ON AER 2008 OBJECTIVES AND TARGETS

Develop landfill gas infrastructure and gas utilisation plant
16 Feb 2009 – JJ receiving quotes at the moment for gas ring in new cell.
26 May 09 – gas ring extension to C6 & C7, back up flare delivered and will be installed w/ending 6 June 09, more gas wells to be installed during June 09
25 Aug 09 - installed 13 new gas wells and 25 pin wells which were all connected up in July 09
27 Nov 09 - installed additional open flare. Relocated old open flare. Installed 125 mm gas ring, 24 additional pins wells installed in November with 5 horizontal trenches to be installed during December.

Review and assess effectiveness of nuisance controls
16 February 09 – on going
March 09 – annual review of O&T by GM
26 May 09 – on going
25 Aug 09 – on going
27 Nov 09 – no changes – on going

Nuisance from vehicles movements
16 February 09 – on going
March 09 – annual review of O&T by GM
26 May 09 – ongoing – into C6 soon which is completely out of site
25 Aug 09 - continue to tip in Cells 6&7 which are out of sight of the general public
27 Nov 09 – no changes

Relationship with neighbouring communities / reduce environmental complaints
16 Feb 09 – all complaints are up to date. Anti dump group to visit site on 17 Feb 09 to raise any concerns and take a site tour.
March 09 – annual review of O&T by GM
26 May 09 – An Bord Pleanála still have not confirmed the set up of Community Liaison Committee, sponsorship however has been given to the following in Q1 09 :- Wicklow lifeboat Glenealy IT centre for ECDL courses and BNG team entered their golf classic Buffers Alley Hurling Team Golf Classic Glenealy National School Golf Classic Glenealy Camogie Team Met with Anti Dump group in Feb 09 – please see management review minutes for details.
26 Aug 09 – in July we received a letter from the County Council in respect of a flooding complaint they had received. JJ responded by providing the County Council with the independent flooding report carried out and recommending the County Council clean under the bridge WSPCA visited the site after they had been informed that the falconer employed on site was operating without a licence. JJ provided the WSPCA inspector with Falcon Bird Control's correspondence address for clarification of the licence held by them. JJ advised Falcon Bird Control directly who confirm they hold a valid licence and will contact the WSPCA to resolve this. The first community liaison committee meeting is to be held in September 09. The liaison committee decides which community facilities and environmental projects the fund is to support in the local area. RK and Damien Martin (foreman at Galway) are to provide a master class training session with Glenealy Hurling team for boys and girls under 14 on 27 July. RK and John Nolan (GRS Business Manager) has arranged for the event to be covered by the press. BNG intends to sponsor Bray Chamber of Commerce, President's speech in October 09 BNG won a Green Apple Award for environmental best practice in August 2009

BNG are continuing to support Wicklow Lifeboats and made a further donation in June 09
27 Nov 09 - at the liaison committee meeting held in October an agreement was reached on the boundary area of the neighbourhood to benefit from the fund which is a 3 km radius around the site namely the Ballynagran area another meeting is to be held on Friday, 4 December where a cheque will be handed over to the fund of €100K

Planting programme
March 2009 – annual review of O&T by GM
Lots of maintenance carried out to leylandi on the southern screen, landscapers are due back to stake other trees and do some additional maintenance during June 09
25 Aug 09 - next planting programme will commence in 2010 budget dependant
27 Nov 09 - trees were damaged during the recent adverse weather conditions but trees are to be reinstated during December

Awareness and Training Programme

The next awareness training is due in June 2011 for all staff members and in September 2012 for Renton Plant contractors. Contractors to site are inducted to site before commencing work, part of the inductions includes information on the environmental systems operating on site and how to handle environmental emergency situations.

Assess and Review Energy Consumption

During 2009 an energy audit was undertaken and consideration given to recommendations. However, further development of thorough energy management systems are being undertaken in Spring 2010 and onwards.

21.0 PROCEDURES DEVELOPED BY THE LICENCEE DURING 2009 WHICH RELATE TO THE OPERATION OF THE FACILITY

Work procedures developed during the reporting period with respect to the operation of the facility are detailed below in Table 26.

Table 26: Work procedures developed at the facility during 2009

Item Number	Description	Date
F09 001	Covering down procedure	16/02/09
F09 003	Management plan for monitoring and prevention of odour nuisance in event of engine malfunction	15/04/09
F09 004	Procedure for jump starting a dead vehicle battery	27/04/09
F09 005	Procedure for handling needle sticks	30/07/09
F09 006	Safe use of lifting equipment	14/12/09
S13	Checking: Incident investigation	06/11/09

22.0 SITE TESTING REPORTS

22.1 Tank, Pipeline and Bund Testing & Inspection Reports

Bund testing was carried out at Ballynagran Landfill on the 5th of October 2010.

22.2 Slope Stability Reports

A surface water and leachate management system inspection and slope stability assessment report was prepared by Golder Associates and delivered to the Agency separately.

23.0 REPORTED INCIDENTS AND COMPLIANTS SUMMARIES

In total, Ballynagran Residual Landfill received 4 No. minor incidents of Non Urgent Category 3 level with regard to trigger levels as specified in Condition 6.4.2 of the licence and 5 No. minor incidents of Non Urgent Category 3 level excess emissions as specified in Schedule C of the licence. These were reported to the Agency as soon as the licensee was notified. The site received a total of 75 No. complaints over the course of the reporting period January 2009 – December 2009. A table containing the date, the issue number, the corrective action taken and the date that the compliant was closed off is provided in Appendix C.

A summary of the overall number of complaints and issues raised are presented in Table 27 below.

Table 27: Reported Incidents and Complaints 2009

Complaint	Issue
75	Odour
1	Noise
1	Odour/Noise

24.0 REVIEW OF NUISANCE CONTROLS

In accordance with Condition 7 of the waste licence, Greenstar is committed to ensure that the facility does not give rise to nuisance at the facility or in the immediate area of the facility. The potential sources of nuisance at a landfill facility are odour, vermin, birds, flies, mud, dust and litter. A procedure, (F09j - Completion of Daily Site Condition Reports) has been drawn up to comply with Condition 7 and is being carried out at the facility. To adhere with procedure F 09j, and form F 09 (j) (i) is completed daily.

24.1 Odour

In accordance with Condition 8.12.2 of the waste licence, Greenstar has submitted a programme to the Agency for the monitoring and assessment of odours emissions arising from the facility. An odour control and monitoring procedure (F 09 r) has been drawn up and carried out in 2009.

Good operational practices on site are the main controls to avoid odour nuisances. Procedures on the Operation Start-Up and Shut-Down (F 09 001) and Waste Acceptance (F 09 a (iv) deal with the handling, depositing and covering of waste at Ballynagran Residual Landfill. These procedures have been written in accordance with the Landfill Manual .Landfill Operational Practices., published by the Environmental Protection Agency and are incorporated into the odour control and monitoring procedure onsite.

Landfill gas extraction wells and a landfill gas flare are currently in operation. This active gas extraction system allows for the long term control of any potential odours. Independent experts Odour Ireland conducted monitoring on behalf of the Office of Environmental Enforcement in September. The PID/FID survey highlighted areas where there could be potential for VOC escape, by measuring VOC levels around the landfill area. Recommendations from their study of the site have been implemented.

In accordance with daily condition reports F 09 j (i) odour inspections have been carried out on a daily basis by site staff at the facility, agreed locations in the neighbouring areas with the agency and also in response to any odour complaints. In the monitoring period there have been 75 complaints in relation to odours and these are dealt more specifically in Reported Incidents and Complaints.

24.2 Litter

Litter is controlled by fencing which was installed around the landfill footprint as specified in the waste licence. Portable litter fencing is also used at the working face, which can be moved to various points around the working face depending on the wind direction. Litter inspections are carried out and recorded as part of the daily inspection, which is outlined in the Completion of Daily Site Condition Reports (F09j (i)) and the Procedure for Litter Prevention & Assembly/Disassembly of Nets (F 09 g). The presence of litter shall be noted on the Inspection Form and removed immediately if practicable. Any litter noted at or outside the boundary fence, which appears to be illegally dumped, shall be inspected for any indications of identity if possible and reported to the Facility Manager.

24.3 Vermin & Birds

Inspections for vermin shall be carried out on a weekly basis for rodents etc. and on a daily basis for birds, in particular crows. Specialist contractors are employed by Greenstar to control vermin and birds on the facility. Vermin control measures used as part of this programme includes internal and external bait boxes, rodenticides and insect control measures. The specialist contractor visits the site at regular intervals throughout the year to inspect the control measures and assess their effectiveness. These control measures have found to be successful. Any observations made during inspections shall be recorded on the Daily Site Condition Report (F09j (i)).

24.4 Flies

Particularly during the warmer months, attention shall be paid to observations of flies. Any observations shall be recorded on the Daily Site Condition Report (F09(j)(i)). The Facility Manager or the Site Supervisor shall be notified immediately in order to take measures to eliminate any fly populations from establishing.

24.5 Mud and Dust

The site roads shall be inspected on a daily basis for mud or dust and any observations recorded on the Daily Site Condition Report ((F09(j)(i)). Special attention shall be paid to dust during the dry months and mud during the wet months and the Site Supervisor or the Facility Manager will be notified immediately in order to take measures to minimise or eliminate any potential nuisances arising from mud or dust accumulating on site roads. Some measures include the use of a wheelwash, road sweeper and the use of a water bowser to dampen access roads and stockpiles during periods of dry weather.

25.0 FINANCIAL PROVISION, STAFF TRAINING AND LOCAL ENTERPRISE PROJECTS

25.1 Financial provisions made during 2009

During 2009 the EPA Bank Guarantee was reviewed and is in place for €1,662,504. A copy of the bond was sent to the Agency in January 2010.

25.2 Proportion of waste charges and gate fees spent on appropriate local environmental improvement schemes

The liaison committee for allocating funds from the Community Fund was established during October 2009. The scheme has now been advertised with the closing date for application the 16th April 2010. It is anticipated that the first payments from the fund will therefore take place during May/June 2010.

25.3 Management and Staffing Structure

The management and staffing structure at Ballynagran landfill is presented in Figure 15.

25.4 Programme of Public Information

Ballynagran Landfill pursues an active programme of disseminating information on its operations to all interested parties. This is undertaken through a variety of means including site tours, the company website, presentations and open days. During 2008, a short film was produced detailing how the facility was constructed and is operated. The film is shown to all those visiting the facility.

The overall communications programme contains the following objectives:

- To promote public awareness of Greenstar's activities and environmental policies
- To maintain an ongoing dialogue with authorities that have direct involvement with waste.
- To make available Environmental Performance Data to all interested parties
- To disseminate information relating to the operation and management of the site
- To encourage liaison between the site and local residents and those who may be affected by the site operations.
- To provide general information on waste management issues
- To ensure all users and customers of the site are conversant with the requirements of the site waste licence
- To ensure that all objectives are, where possible, measurable and quantifiable.

The objectives of the programme are met through the following elements as appropriate:

- Personal contact
- Residents meetings/Liaison groups
- Information displays
- Information packs
- Site visits
- Web page
- Educational links
- Published information

25.5 Report on Staff Training

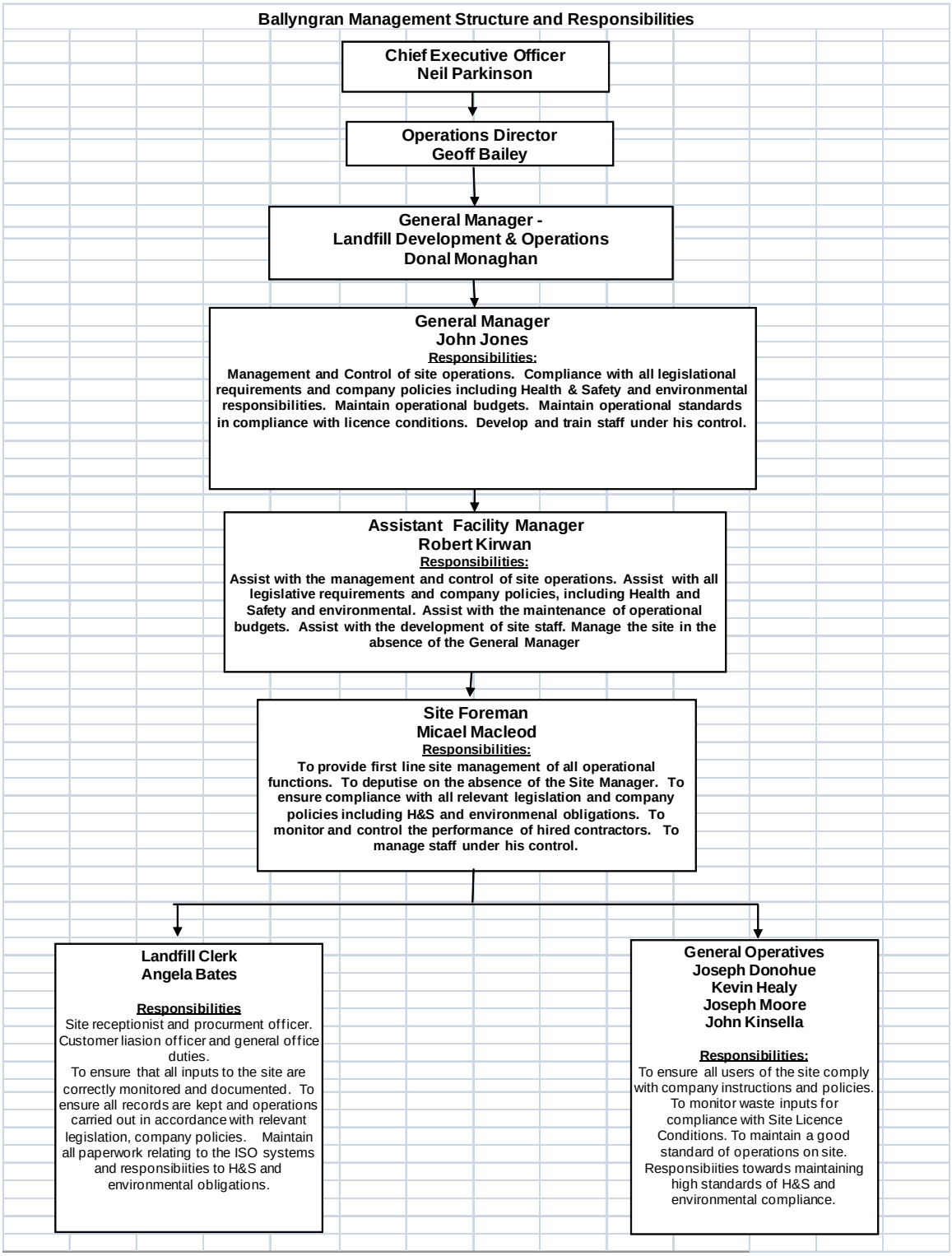
A full training schedule for 2009 at Ballynagran is presented in Table 28 below.

Table 28: Training Schedule and training completed during 2009 at Ballynagran

Trainee (C denotes a course where a certificate has been received and is on display in the offices) Course / Trainer	JONES, John	MACLEOD, Michael	KIRWAN, Robbie	DONOHUE, Joseph	MOORE, Joseph	HEALY, Kevin	KINSELLA, John	BATES, Angela
Emergency Response Drill FIRE	May-09	May-09	May-09	May-09	May-09	May-09	May-09	May-09
Emergency Response Drill SPILL	Jun-09	Jun-09	Jun-09	Jun-09	Jun-09	Jun-09	Jun-09	Jun-09
Hazard Identification & Risk Assessment Workshop / Oliver Callan		Mar-09 **C**						
Refresher Gas system check and balancing / Robert Kirwan			Jan-09		Jan-09	Jan-09	Jan-09	
HR Disciplinary / Grievance Policy	Apr-09	Mar-09	Apr-09					
TBT Ken Woodward Complete Safety	Jan-09	Jan-09		Jan-09	Jan-09	Jan-09	Jan-09	Jan-09
TBT Tractor Safety / DVD Safety Media	Jan-09	Jan-09	Jan-09	Jan-09	Jan-09	Jan-09	Jan-09	
TBT Covering down procedure	Feb-09	Feb-09	Feb-09	Feb-09	Feb-09	Feb-09	Feb-09	Feb-09
TBT DVD on landfill operation and facility management / in house	Feb-09	Feb-09	Feb-09	Feb-09	Feb-09	Feb-09	Feb-09	Feb-09
TBT Risk assessment DVD / Safety Media	Apr-09	Apr-09	Apr-09	Apr-09	Apr-09	Apr-09	Apr-09	Apr-09
	May-09	May-09	May-09	May-09	May-09	May-09	May-09	May-09

TBT Computer and workstation safety DVD								
TBT Manual handling and electrical safety - farming DVD	Jun-09	Jun-09	Jun-09		Jun-09	Jun-09	Jun-09	Jun-09
TBT Procedure for handling needle stick (F09 005)	Jul-09	Jul-09	Jul-09		Jul-09	Jul-09	Jul-09	Jul-09
TBT swine flu information	Aug-09	Aug-09	Aug-09	Aug-09	Aug-09	Aug-09	Aug-09	
TBT waste acceptance	Sep-09	Sep-09	Sep-09	Sep-09	Sep-09	Sep-09	Sep-09	Sep-09
TBT accident investigation	Oct-09	Oct-09		Oct-09	Oct-09	Oct-09		Oct-09
TBT Occupational H&S system awareness	Nov-09	Nov-09	Nov-09	Nov-09	Nov-09	Nov-09	Nov-09	Nov-09
TBT Safe use of lifting equipment and working in adverse weather conditions	Jan-10	Jan-10	Jan-10	Jan-10	Jan-10	Jan-10	Jan-10	
Tractor and Bowser / Jo Donohue		May-07		Jun-07		Jun-07		
VDU assessments	Jan-10	Jan-10	Jan-10	Jan-10	Jan-10		Jan-10	

Figure 13: Management and Staffing Structure at Ballynagran Landfill during 2009



26.0 POLLUTION RELEASE TRANSFER RECORD

Under EU Regulation 166/2006, all licensed facilities are obliged to prepare a PRTR which details all releases of pollutants and off-site transfer of pollutants and waste. Figures for releases to air, releases top storm-water and wastes transferred off-site are included in Appendix F. The complete PRTR document was also uploaded to the dedicated EPA PRTR website.

Report Signature Page

VAT NO.: 8297875W

Garrett Byrne
Project Manager

Thomas Vainio-Mattila
Project Director

GB/TVM

Registered in Ireland Registration No. 297875
Town Centre House, Dublin Road, Naas, Co. Kildare
Directors: M. Gilligan, M. L. J. Maher, G.F. Parker, C. Wall, R. White
VAT No.: 8297875W

\\naa1-s-main02\company\projects\9. waste\greenstar recycling\ballynagran lf - co. wicklow\09 5071 90005 - env monitoring - ballynagran\10. outgoing tech documents\aer 2009 folder only\aer 2009 base template a.0 client reviewed 060410.docx

APPENDIX A

Drawing 5 Rev C - Environmental Monitoring Locations

CAD\GREENSTAR\BALLYNAGRAN\ GOLDER DWGS\05

N

NL1
AD6
MW8d
MW8s
BALLINACLOGH
PROPOSED LANDFILL FOOTPRINT
EXISTING LANDFILL FOOTPRINT
MW1d
MW1s
SW1
NL3
PM3
AD11
MW7s
MW7d
7d
LONGFORD STREAM
PM1
NL4
AD7
MW2s
MW2d
INSIDE TOE
OUTSIDE TOE
BALLYNAGRAN STREAM
KILLANDRA STREAM
MG20
MG19
MG18
MG17
MG16
MG15
MG14
MG13
MG12
MG11
MG10
MG47
MG48
MG49
MG1
MG2
MG3
MG4
MG5
MG6
MG7
MG8
MG9
PM2
SW3
SW4
NSL1
MW3s
MW3d
AD8
NL2
MW6s
MW6d
SW2
AD10
AD12
NSL3
MW4s
MW4d
5d
SW9
SW10
SW8
SW5
SURFACE WATER LAGOON
MW5d
MW5s
AD9
PM4
NSL2
L1111
L1113
THREE MILE WATER RIVER

LEGEND
SITE BOUNDARY
EXISTING CONDITIONS CONTOUR

MONITORING

- NL1 BOUNDARY NOISE LOCATION
- NSL1 NOISE SENSITIVE LOCATION
- AD7 DUST MONITORING LOCATION
- PM10 PM1 MONITORING LOCATION
- 7D GROUNDWATER MONITORING LOCATION
- SW1 SURFACE WATER MONITORING /KICK SAMPLING LOCATION
- MG1 GAS MONITORING
- MW MONITORING WELL

Client: greenstar

Project: BALLYNAGRAN RESIDUAL LANDFILL SITE

Location: BALLYNAGRAN

Title: SITE LAYOUT PLAN SHOWING ENVIRONMENTAL MONITORING LOCATIONS

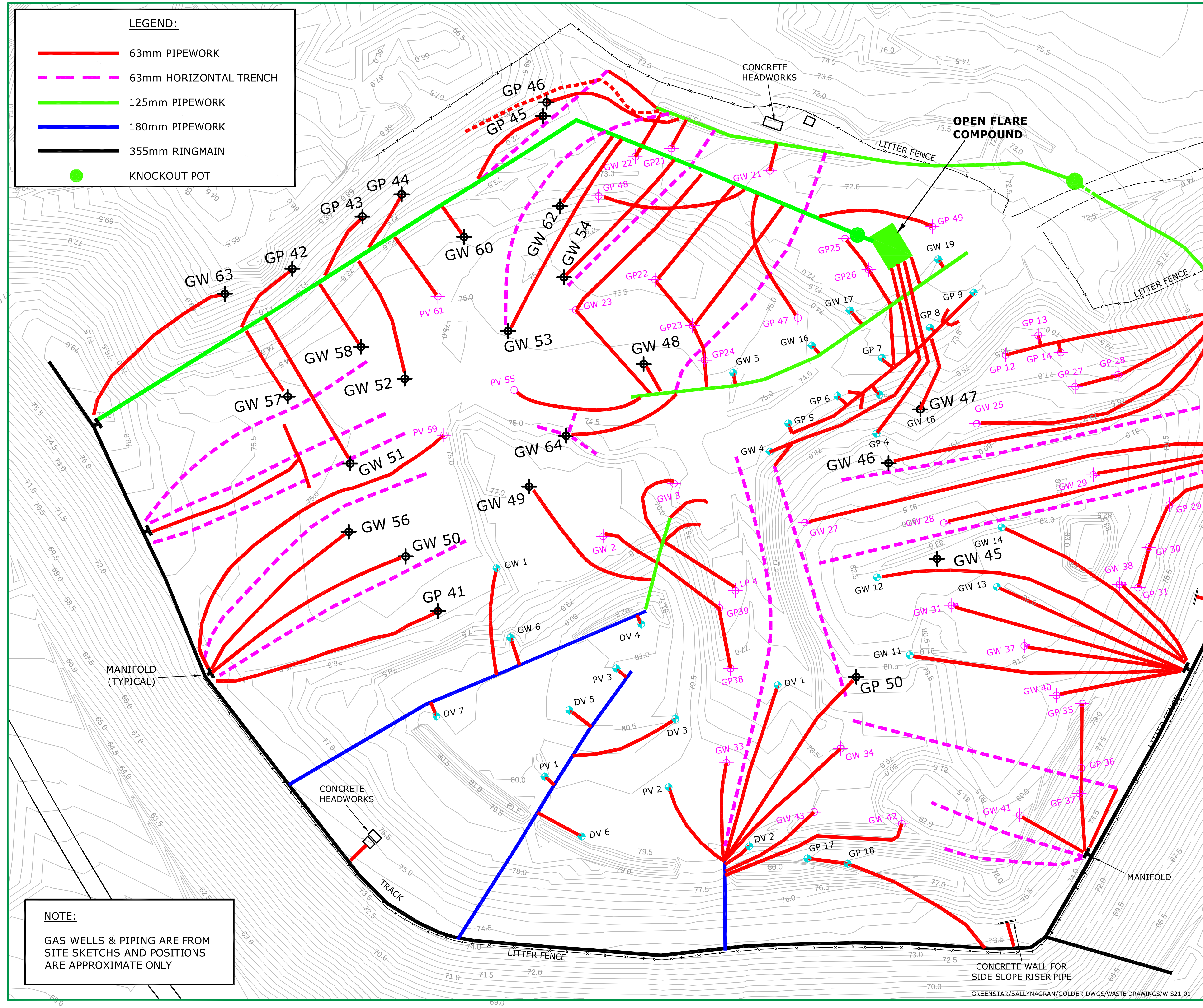
Project No. 06719466	Engineer CC	Drawing No. 05	
File No. 05	Reviewed by TVM		
Created by POB			
ISSUE TO EPA		MARCH '07	A
ISSUE TO EPA		APRIL '09	B
ISSUE TO EPA		JULY '09	C
Description		Date	Revision
Scale 1:3,000A1 1:6,000A3		Date APRIL 2009	

Golder Associates
TOWN CENTRE HOUSE, DUBLIN ROAD, NAAS, CO. KILDARE
TEL.: 045 874411 - FAX:045 874549 - www.golder.com

CAD\GREENSTAR\BALLYNAGRAN\GOLDER DWGS\05rev'C

APPENDIX B

Drawing W-S21-01 Rev B (4) 18/02/10



Client	greenstar		
Project	BALLYNAGRAN RESIDUAL LANDFILL SITE		
Location	BALLYNAGRAN, Co. WICKLOW		
Title	WASTE CONDITIONS SURVEYED 19th JANUARY 2010 & PROPOSED GAS WELLS AS SURVEYED ON THE 02/12/09		
Project No. 09507190113	Checked by CC	Drawing No. W-S21/01	
File No. 21-01	Reviewed by TVM		
Created by POB			
TO CLIENT		21/01/10	A
TO CLIENT-GAS PIPING UPDATE		FEB. '10	B
Description		Date	Version
Scale 1:1,000 A3	Date January 2010		

Golder Associates

TOWN CENTRE HOUSE, DUBLIN ROAD, NAAS, CO. KILDARE
TEL.: 045 874411 - FAX:045 874549 - www.golder.com

APPENDIX C

Reported Incidents and Complaints 2009

COMPLAINTS REGISTER 2009

Complaint Number	Date/s of complaint	Date when complaint closed out	Name of Complainant	Number of complaints	Nature of Complaint	Corrective Action	Formal/ Informal F/I
77	**02.02.09 03.02.09 04.02.09 05.02.09**	**02.02.09 03.02.09 04.02.09 05.02.09**	**Mr Mulvihill**	**4**	**Odour**	Site Inspection carried out. No odour at boundary	**F**
78	**09.02.09 12.02.09**	**09.02.09 12.02.09**	**Mr Mulvihill**	**2**	**Odour**	Site Inspection carried out. No odour at boundary	**F**
79	**19.02.09**	**19.02.09**	**Mr Mulvihill**	**1**	**Odour**	Site Inspection carried out. No odour at boundary	**F**
80	**23.02.09**	**23.02.09**	**Mr Mulvihill**	**1**	**Odour**	Site Inspection carried out. No odour at boundary	**F**
81	**15.04.09 16.04.09 17.04.09**	**15.04.09 16.04.09 17.04.09**	**Mr Mulvihill**	**3**	**Odour**	Site Inspection carried out. No odour at boundary	**F**
82	**30.04.09**	**30.04.09**	**Mr Mulvihill**	**1**	**Odour**	Site Inspection carried out. No odour at boundary	**F**
Complaint Number	**Date/s of complaint**	**Date when complaint closed out**	**Name of Complainant**	**Number of complaints**	**Nature of Complaint**	**Corrective Action**	**Formal/ Informal F/I**

83	**13.05.09 14.05.09**	**13.05.09 14.05.09**	**Mr Mulvihill**	**2**	**Odour**	Site Inspection carried out. No odour at boundary	**F**
84	**01.06.09**	**01.06.09**	**Mr Mulvihill**	**1**	**Odour**	Site Inspection carried out. No odour at boundary	**F**
85	**09.06.09**	**09.06.09**	**Mr Mulvihill**	**1**	**Odour**	Site Inspection carried out. No odour at boundary	**F**
86	**06.07.09**	**06.07.09**	**Mr Mulvihill**	**1**	**Odour**	Site Inspection carried out. No odour at boundary	**F**
87	**08.07.09**	**08.07.09**	**Mr Mulvihill**	**1**	**Odour**	Site Inspection carried out. No odour at boundary	**F**
88	**21.07.09**	**21.07.09**	**Mr Mulvihill**	**1**	**Noise**	Site Inspection carried out. No odour at boundary	**I**
89	**10.08.09 &12.08.09**	**10.08.09 &12.08.09**	**Mr Mulvihill**	**2**	**Odour**	Site Inspection carried out. No odour at boundary	**F**
90	**09.09.09 & 10.09.09**	**09.09.09 & 10.09.09**	**Mr Mulvihill**	**2**	**Odour**	Site Inspection carried out. No odour at boundary	**F**
Complaint Number	**Date/s of complaint**	**Date when complaint closed**	**Name of Complainant**	**Number of complaints**	**Nature of Complaint**	**Corrective Action**	**Formal/ Informal F/I**

		out					
91	**11.09.09, 12.09.09,13.09.09, 14.09.09, 15.09.09 &16.09.09**	**11.09.09, 12.09.09,13.09.09, 14.09.09, 15.09.09 &16.09.09**	**Mr Mulvihill**	**6**	**Odour**	Site Inspection carried out. No odour at boundary	**F**
92	**05.10.09**	**05.10.09**	**Mrs Delahunt**	**1**	**Odour**	Site Inspection carried out. No odour at boundary	**F**
93	**06.10.09 & 07.10.09**	**06.10.09 & 07.10.09**	**Mr Mulvihill**	**2**	**Odour**	Site Inspection carried out. No odour at boundary	**F**
94	**15.10.09 & 16.10.09**	**15.10.09 & 16.10.09**	**Mr Mulvihill**	**3**	**Odour/ Noise**	Site Inspection carried out. No odour at boundary	**F**
95	**09.11.09**	**09.11.09**	**Mr Pat King**	**1**	**Odour**	Site Inspection carried out. No odour at boundary	**I**
96	**10.11.09**	**10.11.09**	**Mr Vincent Mulvihill**	**1**	**Odour**	Site Inspection carried out. No odour at boundary	**F**
97	**28.11.09, 29.11.09, 30.11.09 01.12.09& 02.12.09**	**28.11.09, 29.11.09, 30.11.09 01.12.09& 02.12.09**	**Mr Mulvihill**	**5**	**Odour**	Site Inspection carried out. No odour at boundary	**F**
Complaint Number	**Date/s of complaint**	**Date when complaint**	**Name of Complainant**	**Number of complaints**	**Nature of Complaint**	**Corrective Action**	**Formal/ Informal F/I**

		closed out					
98	**28.11.09, 29.11.09, 30.11.09 & 02.12.09**	**28.11.09, 29.11.09, 30.11.09 & 02.12.09**	**Ms Liz Hayden**	**4**	**Odour**	Site Inspection carried out. No odour at boundary	**F**
99	**10.12.09**	**10.12.09**	**Mrs Delahunt**	**1**	**Odour**	Site Inspection carried out. No odour at boundary	**F**
100	**10.12.09, 11.12.09, 12.12.09 & 13.12.09**	**10.12.09, 11.12.09, 12.12.09 & 13.12.09**	**Ms Liz Hayden**	**4**	**Odour**	Site Inspection carried out. No odour at boundary	**F**
101	**16.12.09, 17.12.09 & 21.12.09**	**16.12.09, 17.12.09 & 21.12.09**	**Ms Liz Hayden**	**3**	**Odour**	Site Inspection carried out. No odour at boundary	**F**
102	**14.12.09**	**14.12.09**	**Bill Ryan**	**1**	**Odour**	Site Inspection carried out. No odour at boundary	**F**
103	**23.12.09, 24.12.09, 25.12.09 28.12.09, 06.01.09, 07.01.09 & 08.01.09**	**23.12.09, 24.12.09, 25.12.09 28.12.09, 06.01.09, 07.01.09 & 08.01.09**	**Ms Liz Hayden**	**4**	**Odour**	Site Inspection carried out. No odour at boundary	**F**
Complaint Number	**Date/s of complaint**	**Date when complaint closed**	**Name of Complainant**	**Number of complaints**	**Nature of Complaint**	**Corrective Action**	**Formal/ Informal F/I**

		out					
104	**25.12.09**	**25.12.09**	**Rosie Cooney**	**1**	**Odour**	Site Inspection carried out. No odour at boundary	**F**
105	**25.12.09**	**25.12.09**	**Alison Cooney**	**1**	**Odour**	Site Inspection carried out. No odour at boundary	**F**
106	**28.12.09**	**28.12.09**	**Mrs. Tallon**	**1**	**Odour**	Site Inspection carried out. No odour at boundary	**F**
107	**22.12.09**	**22.12.09**	**Mrs K McCoy**	**1**	**Odour**	Site Inspection carried out. No odour at boundary	**F**
108	**17.12.09**	**17.12.09**	**Edel Mulvihill**	**1**	**Odour**	Site Inspection carried out. No odour at boundary	**F**
109	**30.12.09**	**30.12.09**	**Mr. O' Neill**	**1**	**Odour**	Site Inspection carried out. No odour at boundary	**I**

Complaint Number	Date/s of complaint	Date when complaint closed out	Name of Complainant	Number of complaints	Nature of Complaint	Corrective Action	Formal/ Informal F/I
110	**15.12.09, 17.12.09, 18.12.09, 19.12.09 21.12.09, 23.12.09, 24.12.09, 25.12.09 27.12.09, 28.12.09,**	**15.12.09, 17.12.09, 18.12.09, 19.12.09 21.12.09, 23.12.09, 24.12.09, 25.12.09 27.12.09, 28.12.09,**	**Mr Mulvihill**	**10**	**Odour**	Site Inspection carried out. No odour at boundary	**F**

Incident Register 2009 for Greenstar Ballynagran Residual Landfill

Incident no.	Type of incident	Date of incident	Date of incident report	Details of incident
I-014	Excess Trigger Level	26-Feb-09	29-Apr-09	Elevated Ammoniacal N at MW 1d and MW 4d . Elevated pH at MW1d, MW2s and MW4d
I-015	Excess Emission	10-Mar-09	29-Apr-09	NSL2 and NSL3 over 55dB limit
I-016	Excess Emission	22-Apr-09	25-May-09	NL1, NSL1, NSL2 and NSL3 over 55dB limit
I-017	Excess Emission	22-Jun-09	27-Jul-09	PM1 location recorded a level greater than 50ug/m3
I-018	Excess Trigger Level	08-Sep-09	15-Oct-09	Elevated Ammoniacal Nitrogen levels in groundwater wells
I-019	Excess Emission	Jul-09	15-Oct-09	AD 12 exceeded ambient dust quality standards
I-020	Excess Emission	09-Sep-09	15-Oct-09	NSL 2 and NL4 exceeded their emission limits
I-021	Use of Open Flare	15-Oct-09	23-Oct-09	2110hrs 15.10.09 to 0800hrs 16.10.09
I-022	Excess Trigger Level	24-Nov-09	26-Jan-10	Elevated Ammoniacal Nitrogen, TOC and Chloride levels in groundwater wells
I-023	Excess Emission	Oct-09	26-Jan-10	AD 10 exceeded ambient dust quality standards
I-024	Excess Emission	24-Nov-09	26-Jan-10	NSL 2 and NSL3 exceeded their emission limits

APPENDIX D

Energy Consumption Audit 2009

Granary House
Rutland Street
Cork

Tel. [021] 4321521
Fax. [021] 4321522

environmental management for business

Mr. Robert Kirwan,
Greenstar Ltd.,
Ballynagran Landfill,
Ballynagran,
Co. Wicklow

9th March 2010

RE: Energy Audit – Greenstar Ltd. – Ballynagran Residual Landfill, Waste Licence No. W0165-01

Dear Mr. Kirwan,

Please find enclosed two copies our report in relation to the above referenced project.

Should you have any questions please contact me.

Yours sincerely,

Michael Watson

1004805/MW/MG
Encl

Granary House
Rutland Street
Cork

Tel. [021]4321521
Fax. [021]4321522

environmental management for business

ENERGY AUDIT

GREENSTAR LTD.

BALLYNAGRAN RESIDUAL LANDFILL

WASTE LICENCE NO. W0165-01

Prepared For: -

Greenstar Ltd.,
Ballynagran Residual Landfill,
Ballynagran,
Co Wicklow

Prepared By: -

O' Callaghan Moran & Associates,
Granary House,
Rutland Street,
Cork

9th March 2010

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APPENDIX 1 - Energy Consumption Information

1. INTRODUCTION

O'Callaghan Moran & Associates (OCM) was appointed by Greenstar Ltd. (Greenstar) to undertake an energy efficiency audit of their landfill facility at Ballynagran County Wicklow. The facility is a non-hazardous residual landfill and operates under Waste Licence (W0165-01) issued by the Environmental Protection Agency (Agency). The facility is one of the four operational Greenstar landfills in the country. OCM carried out an energy audit of the facility in 2008 for the calendar year 2008 and this report updates that report and includes energy consumption figures for the calendar year 2009. This report assesses the implementation of the recommendations in the 2008 report and assesses the current energy management practices at the facility.

The facility is a non-hazardous residual landfill and operates under Waste Licence (W0178-01) issued by the Environmental Protection Agency (Agency). The objective of this audit is to:-

(i) identify all opportunities for energy use reduction and efficiency;

(ii) be carried out in accordance with the guidance published by the Agency - "Guidance Note on Energy Efficiency Auditing (2003)".

1.1 Audit Process

The audit was carried out in accordance with the Agency's Guidance Note and included a site visit on 14th January 2010. At the time of the site visit the facility was fully operational. The weather was cold, with intermittent rain showers and a moderate south easterly breeze.

The Facility Deputy Manager, Mr. Robert Kirwan, was interviewed and provided information on facility activities, energy usage and resource consumption. A site inspection was carried out, which included the administration buildings, maintenance building, operational areas, landfill gas flare, leachate storage lagoon and surface water storage lagoon.

The Guidance Note recommends at least twelve months of data on the various energy using systems. Electricity meter records and records of diesel use from January to December 2009 formed the basis for the assessment of consumption levels.

2. SITE LAYOUT & ACTIVITIES

2.1 Site Location

The site, which encompasses approximately 128 ha, is located on the eastern side of the Wicklow Mountains in the townlands of Ballynagran, Coolbeg and Kilcandra. It is approximately 5 km to the south west of Wicklow Town and 1.5 km to the south east of Glenealy. It is on the southern side of an east-west ridge at an elevation between 52 and 147 m Ordnance Datum (OD).

The setting is predominantly rural, with dispersed residential dwellings. The site is bounded to the south by a country road (L1111 / L1113), to the east by a green waste composting facility, and to the north and west by agricultural lands – a mix of pasture and tillage. There is a former concrete batching plant to the east of the composting facility and further east is the N11 national primary route.

2.2 Site Layout and Description

The facility is a non-hazardous waste residual landfill, which is licensed to accept up to 175,000 tonnes of Household, Commercial and Industrial Non-Hazardous waste per annum for disposal and up to 28,000 tonnes of Construction and Demolition Waste for recovery purposes. The site layout is shown on Drawing No. 3 and the facilities used include: -

- Waste Reception Area;
- Weighbridges (2 No.);
- Wheel Wash;
- Waste Quarantine & Inspection Areas;
- Landfill Cells;
- Leachate Storage lagoon;
- Surface Water Pond;
- Administration Block (offices, stores, canteen, toilets and showers);
- Standby Generator (Diesel);
- Oil Storage Tank & Bund;
- Security Fencing.

The facility will be developed in five phases. The initial phase involved the provision of five (5) landfill cells (1, 2, 3, 4 and 5A/B), and the entire supporting infrastructure. In 2007 the

Agency approved the development of two additional cells (Cells 6 and 7), which were constructed in 2008 and became active in 2009. An active gas abstraction and flaring system was commissioned in April 2007. Subsequent phases will involve the provision of additional landfill cells and the associated expansion of leachate, landfill gas and surface water control measures.

2.3 Activities:

2.3.1 Overview

All waste delivery vehicles are inspected and recorded at the weighbridge. Following acceptance at the weighbridge, waste carrying vehicles drive to the active landfill cell, where they discharge their load. The waste is then spread and compacted using a steel-wheeled diesel fuelled landfill compactor. There are two diesel fuelled excavators which are used mainly to place daily cover material, which is delivered by road vehicles and stockpiled adjacent to the active fill area. The excavators and compactor are the most significant users of diesel at the facility.

Landfill gas is actively abstracted from the fill areas using electrically powered boosters. The gas was initially flared in an open flare between November 2007 and March 2008. The open flare was replaced by an enclosed flare in March 2008. In November 2009 an additional two open flares were installed and commissioned at the facility. These flares run off a diesel generator. This is discussed in more detail in Section 2.2.4. Leachate is pumped from the cells and sanitary wastewater is pumped from the Administration Block to the leachate storage lagoon using electrically powered pumps. Groundwater intercepted by a drainage layer beneath the cells is directed to a sump, from where it is pumped to surface water swails. Surface water is pumped from the surface water storage lagoon to a wetland. Further details are provided in Section 2.2.5.

2.3.2 Weighbridge & Administration Block

The Weighbridge Office and Administration Block contain offices, meeting room, welfare and canteen facilities and a supervisory control and data acquisition system (SCADA) room, all of which are provided with lighting and electrically powered heating units. A list of the electrically powered items in the buildings is shown on Tables 2.2.-2.3.

Table 2.2 – Weighbridge

No.	Item
1	Electric Wall Mounted Heater
1	Microwave
1	Kettle
1	Toaster
1	Fridge
1	Air Conditioner
2	PCs & Screens
1	Photocopier & Printer
1	Printer
1	Shredder
1	Electronic Fly Killer
1	Hand Dryer
1	Water Cooler
1	60W Light
3	Double Fluorescent Lights

Table 2.3 – Main Administration Block including Canteen

No.	Item
9	Electric Wall Mounted Heaters
5	Air Conditioners
3	PCs & Screens
3	Printers
2	Shredders
7	Halogen Lights
17	Double Fluorescent Lights
3	Single Fluorescent Lights
1	Scanner
1	Microwave
1	Dishwasher
1	Fridge
1	Water Cooler
1	Coffee Machine
1	Radio
1	Electric Grill
1	Clothes Washer
2	Electric Showers
3	Hand dryers
1	Kettle
1	SCADA System
1	Photo copier
9	Fluorescent Lights (Coiled)
2	Water Heaters

2.3.3 Maintenance Garage

Maintenance of the fixed and mobile plant is carried out in the on-site garage. The garage is provided with electrical lighting, but there is no heating system. There is a skid steer road sweeper, quad bike and a small diesel generator stored at the garage, which use small amounts of diesel.

2.3.4 Gas Flares

In 2009 the active gas extraction and flaring system comprised sixty four (64 No.) vertical gas wells, sixty two (62) spike wells and twenty two (22) horizontal wells and three (3) knock-out pots in the body of the waste, one (1) condensate knockout pot and four (4) flares. A 2,500m^3/hour enclosed flare was commissioned in March 2008 and runs continuously. There is also an open 2,500m^3/hour flare which provides back-up for the main enclosed flare and runs less than 1% of the year. Two open 500m^3/hour flares were installed in November 2009 and which are run off a diesel powered generator. These flares are running constantly in Cell 7.

As the facility only began accepting waste at the end of 2006, the volume of landfill gas is not yet sufficient to generate electricity. It is expected that a gas utilisation plant will be installed in 2010. The size of the utilisation plant will depend on the outcome of pumping and flaring trials. The utilisation plant will be benchmarked against the systems used at Greenstar's KTK and Knockharley landfills.

2.3.5 Leachate Management

The facility is designed to minimise leachate generation. Surface water run-off and groundwater flow is directed away from the fill area by means of interceptor drains installed outside the landfill cells.

The leachate collection system in the individual landfill cells drains by gravity to leachate collection sumps. Leachate accumulating in the cells is pumped from the collection sumps located inside the cells via side risers to the leachate main, from where it flows to a leachate storage lagoon.

In the reporting period there were six (6 No.) electrically powered (1.5 kW) submersible leachate pumps in operation within the cells. These pumps are ATEX rated to operate in explosive atmospheres. There is also a pump (1.5kW) used to collect composite samples of leachate for environmental monitoring purposes, which is used once per month for ten minutes.

Sanitary wastewater from the Administration Block is pumped using one (1 No.) electrically powered 1.5kW pump to the leachate storage tank.

2.3.6 Surface Water Pumping

There is one pump (2.2 kW) used to discharge surface water from the surface water storage lagoon to a wetland.

2.3.7 Ground Water Pumping

Groundwater intercepted by a drainage layer beneath the cells is directed to a sump, from where it is pumped using five 1.5kW pumps to surface water swails.

2.3.8 External Lighting

Area lighting comprising fourteen (14 No.) halogen lights fitted to standards are provided from the site entrance to the maintenance shed. They are all fitted with photocell daylight sensors and time clocks. There are also twelve (12) area lights around the weighbridge which are fitted with photocell daylight sensors and time clocks. These are turned off when not required. There are thee (3) small safety lights around the lagoons, which are fitted with photocell daylight sensors and motion detectors.

3. CURRENT ENERGY USE

3.1 Electricity Consumption January 2009 – December 2009

The following electricity consuming energy systems were operational in the reporting period:-

- Landfill gas abstraction and flaring;
- Leachate/Waste water pumping;
- Surface water pumping;
- Groundwater Pumping,
- Office lighting;
- Office heating;
- Area lighting;
- Office IT.

There is only one electricity meter on-site, which provides data for the entire facility and therefore a breakdown of the usage by the individual energy systems is not available. A copy of the electricity bills for the period January to December 2009 are included in Appendix 1. Electricity consumption was estimated where possible using the kW/hr rating and operational hours. The estimates are presented in Table 3.1.

Table 3.1 – Electricity Consumption

Energy System	kWh/year	% of total	Cost (€)	Comments
Enclosed Flare (9kw)	78,840	23.1	8,097.12	In operation 8,760 hours at 9kw
Open Flare (9kw)	900	0.3	92.43	In operation 100 hours at 9kw
Leachate Pumps	39,420	11.6	4,048.56	Six 1.5kw pumps. Assumed to operate 6 months per annum. (4,380 hours)
Outdoor Lights	65,592	19.3	6,736.51	14 outdoor halogen lights used and provided with daylight sensors. 12 area lights, 3 motion sensor lights
Offices Lights	13,589	4.0	1,395.63	No time/daylight controls
Offices Electrical Heating	65,700	19.3	6,747.60	Wall mounted storage heaters. Manually controlled, individual thermostat
Groundwater Pumps	32,850	9.6	3,373.80	Five 1.5 kw pumps assumed to operate 6 months per annum. (4,380 hours)
Surface Water Pump	9,636	2.8	989.65	1 pump (2.2 kw) lagoon to wetland Assumed to operate six months per annum (4,380 hours)
Borrow Pump	16,425	4.8	1,686.90	1 pump (7.5 kw). Assumed to operate 3 months per annum. (2,190 hours)
Other	17,633	5.2	1,810.97	PCs, printer, photocopier, SCADA, CCTV Maintenance Shed. Misc
Total	**340,585**	**100**	**€34,979.17**	

The total consumption of electricity at the facility in 2009 was 340,585 kWh, which cost €34,979.17 (excluding VAT, capacity and standing charges). The average cost is 0.10c per unit, which comprises a daytime kWh cost of approximately 0.1384c and 0.0680c for night time.

The increase in consumption from 2008 (181,174 kWh) is due to the increased number of pumps in operation at the facility in 2009 and also due to increased usage of the wall mounted heaters and lights during the extended colder and darker winter in 2009.

3.2 Diesel

A breakdown on diesel usage in 2009 is presented in Table 3.2 and Appendix 1. The volume was calculated from fuel delivery logs. Some of the diesel fuelled equipment used in day to day operations are owned and operated by a separate contracting company - Rentons. Table 3.2 includes all of diesel used on site by both Greenstar and the contractor. The average cost of diesel was 0.53 c per litre.

Table 3.2 – Onsite Day to Day Diesel Usage Totals 2009

User	Volume (litre)	Cost € 0.53c/l	Comments
Greenstar & Contractor	132,438	64,358.86	Greenstar – Vehicles, Generators Rentons - Compactor & Excavator

3.3 Carbon Footprint

The total carbon footprint for the facility is estimated at 355 tonnes of Carbon Dioxide (CO_2) per annum, which is negligible in the context of national CO_2 emissions per annum. The carbon emissions are from diesel energy consumption (2.68 kg/litre) (plant, equipment and vehicles) at the facility in 2009.

The electricity supplier is Airtricity, who generate power from renewable sources. This means there is zero carbon emissions from this source, which has resulted in a reduction of an estimated 230 tonnes of CO_2 released to the air in the reporting period. The Airtricity summary of consumption sheet is included in Appendix 1.

4. EXISTING ENERGY MANAGEMENT SYSTEM

The Agency's Guidance Note is targeted at industrial sites, which typically have multiple and complex energy systems and high consumption rates of different energy sources (e.g. electricity, natural gas, fuels). A landfill, while it can occupy a large physical footprint, has more simple energy systems and relatively low consumption rates.

A landfill is a significant source of greenhouse gas emissions, not through the use of fossil fuels, but as a result of the production, capture and flaring of landfill gas. It is intended to install a landfill gas utilisation plant at the facility in 2010, which will generate electricity and thereby achieve a negative carbon footprint.

4.1 Energy Management System

The objective of an Energy Management System is to make the best possible use of the energy consumed at a particular facility. An energy management system may include the following elements: relevant policies, procedures, action plans, responsibility chains, training, awareness and motivation, data collection and monitoring systems.

The Agency's Guidance Document presents an energy management matrix to assist in the assessment of the status of the different key elements that comprise the system. The facility's existing management system is assessed below using the categories set out in the Matrix.

4.2 Energy Policy

The facility operates an Environmental Management System and has achieved ISO 14001 accreditation. This EMS includes the adoption of an environmental policy. The facility management team is aware of the importance of energy savings and does apply unwritten guidelines. However a facility specific documented energy policy has not yet been prepared.

The purpose of the policy is to provide the supporting framework for the implementation of measures to ensure that energy is actively managed in day to day activities and that the assessment of energy efficiency is an integral part of the procurement process for plant items during the lifetime of the facility.

4.3 Organising

Facility management is already aware of the need for energy efficiency in the operation of the facility. The areas of responsibility have been clearly defined and are to be documented in job descriptions. The Deputy Facility Manager is scheduled to receive formal training in energy management issues.

4.4 Motivation

At present the need for efficient energy management is not communicated to the facility staff. However, given the relatively small number of site staff and the active involvement of the Facility Manager and Deputy Manager in day to day operations, it is considered that there are adequate channels of communication to ensure that facility staff can be adequately informed of energy management measures.

4.5 Information Systems

There is one electricity meter on-site, which provides data for the entire facility. There are no sub meters so a breakdown of the actual usage by individual energy systems (flares, lighting, pumps storage heaters) is not available.

The data provided by Airtricty allows an assessment of total consumption, broken down into daily and night time on a bi-monthly basis which allows seasonal changes in usage patterns to be determined. Less electricity was used in the summer months as would be expected with reduced demand for lighting and heating.

4.6 Marketing

Although termed marketing this element actually relates to the communication and 'selling' the concept of energy management within an organisation. At present there is no formal site specific training/awareness programmes on energy management for site staff. In the context of the energy usage and employee numbers it is considered that a formal training/awareness programme is not required; however there is the potential to improve awareness among staff members about good housekeeping practices. This can be done informally by the Facility Manager and Deputy Manager.

4.7 Investment

While at present only low cost measures have been applied (e.g. storage heaters using night time electricity units, photo cells on the external lights) the Facility Management is aware of the need for future investment to contribute to energy efficiencies. It is also intended to install a landfill gas utilisation plant in 2010. This measure will achieve a negative carbon footprint for the facility.

4.8 Overall Assessment

An overall assessment of the current level of performance of the facility's energy management system is included in Table 4.1. The Table, which is based on the Matrix in the Agency Guidance, includes levels (0 to 4) that represent the possible range of performance. Level 4 represents Best Practice; however the Agency Guidance recognises that this level of development may not be appropriate for all sites.

While at present the facility is at the lowest level in the Energy Matrix, the Facility Management Team is aware of the need for the implementation of an energy management system. The framework to allow for the effective communication and promotion of an energy management system is in place. It should also be borne in mind that the energy systems at the facility are simple and that, at this stage in the development of the facility, the energy costs comprise a small percentage of the overall operational costs.

Table 4.1 Energy Management Matrix

Level	Energy Policy	Organising	Motivation	Information systems	Marketing	Investment
4	Energy policy, Action Plan and regular review have commitment of top management as part of an environmental strategy	Energy management fully integrated into management structure. Clear delegation of responsibility for energy consumption.	Formal and informal channels of communication regularly exploited by energy manager and energy staff at all levels.	Comprehensive system sets targets, monitors consumption, identifies faults, quantifies savings and provides budget tracking.	Marketing the value of energy efficiency and the performance of energy management both within the organisation and outside it.	Positive discrimination in favour of 'green' schemes with detailed investment appraisal of all new-build and refurbishment opportunities.
3	Formal energy policy, but no active commitment from top management for energy.	Energy manager accountable to energy committee representing all users, chaired by a member of the managing board.	Energy committee used as main channel together with direct contact with most users.	M&T reports for individual premises based on sub-metering, but savings not reported effectively to users.	Programme of staff awareness and regular publicity campaigns.	Same pay back Criteria employed as for all other investment.
2	Un-adopted energy policy set by energy manager or senior departmental manager.	Energy manager in post, reporting to ad-hoc committee, but line management and authority are unclear.	Contact with most users through ad-hoc committee chaired by senior departmental manager.	Monitoring and targeting reports based on supply meter data. g.	Some ad-hoc staff awareness training.	Investment using short-term payback criteria only.
1	An unwritten set of guidelines	Energy management is the part-time responsibility of an office staff.	Informal contacts with a few users.	Cost reporting based on invoice data. Engineer compiles reports for internal use within technical department.	Informal contacts used to promote energy efficiency.	Only low cost measures taken.
0	No explicit policy	No energy management or any formal delegation of responsibility for energy consumption	No contact with users.	No information system. No accounting for energy consumption.	No promotion of energy efficiency.	No investment in increasing energy efficiency in premises.

5. CONCLUSIONS & RECOMMENDATIONS

The current energy management practices are described in Sections 3 and 4 and an assessment of the main elements presented in Table 4.1. Although there is no need, based on the nature of the facility, to achieve Level 4 there is a requirement to introduce measures to improve performance. The necessary actions required to achieve a satisfactory level of performance are presented below.

As the facility is in the early stages of its life, all of the energy management systems, with the exception of the heating and lighting in the Administration Block and the mobile plant, are not fully developed. There will be a progressive expansion of three energy systems - leachate pumping, groundwater pumping and landfill gas utilisation over the operational lifetime of the facility. Therefore, it is not yet possible to provide benchmarks against which targets can be set and improvements measured. However, it is the objective of the energy management system to avoid unnecessary costs by ensuring that the expansion of the energy systems is done in the most efficient manner.

There was a general increase in electricity consumption since the previous report in 2008. The main causes for this increase were:

- Greater number of electrical pumps in use due to expansion of the landfill and also due to increased rainfall at the facility in 2009 (1,250 mm in 2008, 1,500 mm in 2009);
- Colder, darker winter in 2009 leading to increased usage of storage heaters and both internal and external lighting.

5.1 Energy Policy

A documented energy policy statement has not been prepared for the facility. A policy statement is fundamental to the successful implementation of any management system as it provides the framework for the introduction and maintenance of energy efficiency and conservation measures in the day to day operation of the facility.

An energy policy statement should be prepared and communicated to all staff members. The policy should emphasise a commitment, at corporate level, to reduce energy consumption at the facility. As the facility is not involved in any unique energy using activities the policy can be modelled on that developed at other Greenstar facilities. This Statement should be referenced in the facility's Environmental Management System.

5.2 Organising

Effective energy management requires the assignation of responsibility to a senior member of the Facility Management Team for the implementation of the Energy Policy and monitoring performance. It is recommended that the Facility Manager should be assigned overall responsibility for energy management at the facility. Responsibility for the day to day implementation of energy management issues can be delegated to the Deputy Manager.

The responsible person should receive appropriate training. The level of training can be assessed using the training and awareness matrix included in the facility's Environmental Management System. It is likely that the training can be provided by staff at other Greenstar landfills and that there is no need for external trainers.

The responsible person should prepare a list of objectives and targets based on the recommendations contained in this report. These should be incorporated into the overall Schedule of Objectives and Targets set out in the facility's Environmental Management Programme.

The responsible person should conduct annual reviews of energy usage; assess progress towards achieving objectives and targets and prepare a summary report for inclusion in the Annual Environmental Report. The responsible person should be involved at the initial stage of the procurement of all items of plant and equipment to ensure that energy efficiency is one of the key elements assessed.

It is expected that, given the relatively simple energy systems that will be in use during the facility lifetime, energy management will take approximately 5% of the responsible person's time annually. The cost of the time invested should be quickly recouped from efficiencies in the existing energy management system and the avoidance of unnecessary costs during the planned expansion of these systems.

5.3 Motivation

The Facility Manager or Deputy Manager should be responsible for the communication of energy management issues to all facility staff. This can be done informally through direct discussion with individual staff members and by posting memoranda and notices on office notice boards and in the canteen and changing areas. It is not possible to predict the energy cost savings from this measure.

5.4 Information Systems

At present there is only one electricity meter on-site. This provides data on total consumption, but does not allow an accurate assessment of usage by the different energy

systems. Airtricity provides a spreadsheet of the bi-monthly electricity consumption figure and comparisons can be made on a bi-monthly basis.

Electricity usage at the facility will increase significantly in the future due to the installation of the landfill gas utilisation plant and the expansion of gas pumping however electricity will be generated from this activity**.** These will comprise the largest of the individual energy systems at the facility. There is a need to monitor energy usage so as to target particular areas where improvements can be achieved.

It is recommended that the sub-meters be installed to record usage on the gas abstraction/utilisation plant. An integral energy metering system should be part of the specification for the landfill gas utilisation plant.

Electricity consumption should be monitored on a bi-monthly basis. The data should be analysed in context of the site operations, and information recorded by the SCADA system, to identify possible opportunities for efficiencies. These may include the following: -

- Identification of unnecessary loads e.g. excessive leachate pumping from the landfill cells; use of storage heaters in the summer;
- Load shifting to lower tariff periods, and
- Reducing peak demand.

In the absence of accurate data on electricity usage it is not possible to predicate precise energy savings, but it could be in the range of 10 - 20% with a pay back period of 3 years.

5.5 Marketing

At present energy awareness training is not provided to staff members. Such awareness is crucial in the implementation of an effective energy management system and the achievement of targets and objectives.

The Facility Manager or nominated Deputy should be responsible for the implementation of the awareness programme. Given the size of the facility formal training is not necessary. There are adequate lines of communication between the facility management and the staff to achieve the necessary increase in awareness.

The awareness training should start after the adoption of the energy policy statement and the provision of the monitoring and targeting system so that it is possible to monitor the success or otherwise of the programme. The results of the programme should be communicated regularly to the staff in order to maintain the requisite level of awareness and avoid the development of indifference.

5.6 Investment

The external lighting system is provided with daylight and motion sensors, which represent best practice.

The office lighting is not fitted with time or daylight sensors. It is recommended that consideration be given to the installation of daylight/time controls. These could achieve up to 30% savings with a pay back time of 2 - 3 years.

The mobile plant uses diesel. There is the potential to change to biodiesel, which would reduce the facilities carbon footprint.

It is intended to provide the landfill gas utilisation plant in 2010. This will be a significant user of electricity. It is recommended that the system be benchmarked against the systems in operation at the KTK landfill and operated by Irish Power Systems Ltd to ensure that the most energy efficient system is procured.

5.7 Summary Recommendations

A summary of the recommendations is presented in Table 5.1. The table, which follows the format set out in the Agency's Guidance Document, includes projected cost savings and reductions in CO_2 emissions.

Table 5.1

	Action	Investment Cost Category	Payback (years)	Annual Energy Savings (kWh)	Annual Energy Savings (€)	Annual CO_2 Emissions Savings (Tonnes)
Energy Policy	1.Prepare Energy Policy Statement	No Cost	NA	NA	NA	NA
Organising	2. Appoint responsible person	No Cost	NA			
	3. Provide appropriate training	Low Cost	NA			
	4. Prepare targets and objectives	Low Cost	NA			
	5. Annual summary on performance in AER	Low Cost	NA			
	6. Assessment of energy efficiency of future plant and equipment	Low Cost	Immediate	*		
Motivation	7.Communicate policy objectives to staff	Low Cost	Immediate	**		
Information Systems	8. Provide sub meters for gas utilisation plants	Moderate Cost	3 years	*		
	9. Bi-Monthly data analyses and identification of efficiency opportunities.	Low Costs	NA	*		
	10. Annual summary report in AER	Low Cost	NA	NA		
Marketing	11. Provide awareness training to staff	Low Cost	Immediate	**		
	12. Provide feed back to staff.	Low Cost	Immediate	**		
Investment	13. Provide time sensors for office lighting	Low Cost	2-3 years	2128	274.51	1.65
	14. Consider introducing bio-diesel for mobile plant.	No Cost	NA			
	15. Benchmark gas utilisation plant against KTK and IPS systems	No Cost	NA			

NA: Not Applicable

* : Not possible to quantify as benchmark not established.

** : Costs incorporated into savings associated with Recommendations 13 and 14.

APPENDIX 1

Energy Consumption Information

Resource Description (eg. diesel)	Quantity Used	Time period
Green Diesel	2680	12 Dec 06 to 8 Jan 07
	4501	9 Jan 07 to 15 March 07
	5000	16 March 07 to 1 July 07
	4629	2 July 07 to 19 Aug 07
	5148	20 Aug 07 to 25 Sept 07
	5000	26 Sept 07 to 30 Oct 07
	4318	31 Oct 07 to 7 Jan 08
	5010	8 Jan 08 to 18 Feb 08
	5010	19 Feb to 13 April 08
	4000	14 April to 21 July 08
	4000	21 July to 22 Aug 08
	5000	22 Aug to 13 Oct 08
	4000	14 Oct to 5 Nov 08
	5000	5 Nov to 17 Dec 08
	3000	18 Dec to 26 Jan 09
	8016	27 Jan to 12 March 09
	7001	13 March to 14 May 09
	8003	14 May to 24 June 09
	7000	24 June to 29 July 09
	7168	29 July to 3 Sept 09
	5001	3 Sept to 22 Sept 09
	4125	22 Sept to 2 Nov 09
	5004	2 Nov 09 to 23 Nov 09
	6983	23 Nov to 17 Dec 09
	5888	17 Dec to 18 Jan 2010
	7802	18 Jan to

Diesel Usage at Ballynagran Landfill Site Wicklow 2009		
	Gas Oil	
Month	Litres	
Jan-09	10251	
Feb-09	12152	
Mar-09	13705	
Apr-09	6701	
May-09	11235	
Jun-09	12075	
Jul-09	10603	
Aug-09	13822	
Sep-09	12032	
Oct-09	8699	
Nov-09	12287	
Dec-09	8876	
Total	132438	

	Day LVMD	Night LVMD	Low Power Factor LVMD	Demand 24 hr LVMD	Units
16/03/2009	29200	17900	1200	64	
15/05/2009	25750	16500	7267	46	
15/07/2009	26900	16450	11800	49	
15/09/2009	26000	16150	12900	41	
16/11/2009	31200	19350	10450	63	
15/01/2010	42150	24950	4133	72	
Total					340585

	Day LVMD	Night LVMD	Low Power Factor LVMD	Demand 24 hr LVMD	euro
16/03/2009	€6,712.73	€1,696.60	€28.52	€118.52	
15/05/2009	€3,598.40	€1,098.20	€89.01	€57.76	
15/07/2009	€3,563.80	€1,122.00	€50.14	€64.80	
15/09/2009	€3,722.96	€1,118.60	€81.42	€69.03	
16/11/2009	€4,318.08	€1,315.80	€72.11	€88.75	
15/01/2010	€4,660.32	€1,217.20	€8.82	€105.60	
Total					€34,979.17

APPENDIX E

Bund Test Reports

Bund Testing Form

Bund name and ref No.:	Date of day 1 of test:	Work instruction no :	Test no :
6000L Diesel	5/10/9	BNG01	01

Pre-filling checks :	(Initial if complete)
No visible cracks or other features likely to affect integrity	HJ
Bund clean and free of debris	HJ
Bund and sump empty	HJ
Isolate all electrical components in the sump	HJ
Carry out all health and safety checks	HJ
If all of the 4 checks above are complete then proceed with the test. If it is not possible to carry out all the above checks contact the manager.	HJ

Day	Time	Bund Level (mm)	Control Level (mm)	Personnel involved	Comments
0-8hrs	9:30	526		JJ	Stabilisation period
1	8:10	526		JJ	
2	10:23	525		JJ	
3					
Final level					
Drop in level (mm)= Day 1- Final level		A -1mm	B	Note: If the control level drops by more than the bund level the test is deemed void and must be rescheduled	

Test Result

Calculation: A-B= X (Where X is positive the bund level has risen. Where X is negative the bund level has dropped)	X=
Is X between -10 mm and 10 mm? If 'yes' the bund is deemed passed (Y/N)	

Final Result (Pass/ Fail): Pass

Test completed by : HJones Date : 6/10/9

Follow up in event of failed bund test

Carry out visual inspection of the bund. Specifically try to identify cracks, holes or other defects likely to affect bund integrity.

Date of Visual Inspection

Description and Results of Visual Inspection :

Does bund require further repairs or maintenance? If 'yes' pass request to manager and await completion of remedial works before scheduling re-test. If 'no' follow instruction below (Y/N)	
Schedule re-test within 3 months of end of original test (initial if complete)	

Completed by : _____ Date : _____

APPENDIX F

Pollution Emission Transfer Register

Environmental Protection Agency

AER Returns Worksheet

Version 1.1.10

REFERENCE YEAR	2009

1. FACILITY IDENTIFICATION

Parent Company Name	Greenstar Holdings Limited
Facility Name	Ballynagran Residual Landfill
PRTR Identification Number	W0165
Licence Number	W0165-01

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).
3.13	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.
3.4	Surface impoundment, including placement of liquid or sludge discards into pits, ponds or lagoons.
3.6	Biological treatment not referred to elsewhere in this Schedule which results in final compounds or mixtures which are disposed of by means of any activity referred to in paragraphs 1. to 10. of this Schedule.
4.11	Use of waste obtained from 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.
4.4	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	Ballynagran
Address 2	Coolbeg and Kilcandra
Address 3	Co Wicklow
Address 4	
Country	Ireland
Coordinates of Location	-6.11271 52.9597
River Basin District	IEEA
NACE Code	3821
Main Economic Activity	Treatment and disposal of non-hazardous waste
AER Returns Contact Name	John Jones (W0165)
AER Returns Contact Email Address	robert.kirwan@greenstar.ie
AER Returns Contact Position	Landfill Manager
AER Returns Contact Telephone Number	0404-25440
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 ?	
If applicable which activity class applies (as per Schedule 2 of the regulations) ?	
Is the reduction scheme compliance route being used ?	

SECTION A : SECTOR SPECIFIC PRTR POLLUTANTS

RELEASES TO AIR								
POLLUTANT		METHOD				QUANTITY		
			Method Used		Main Flare			
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
					0.0	0.0	0.0	0.0
08	Nitrogen oxides (NOx/NO2)	M	ISO 14792		467.4	467.4	0.0	0.0
11	Sulphur oxides (SOx/SO2)	M	PER		11764.0	11764.0	0.0	0.0
03	Carbon dioxide (CO2)	E	Estimate	Gas Sim Estimate	10600000.0	0.0	0.0	0.0
01	Methane (CH4)	E	Estimate	Gas Sim Estimate	1520000.0	0.0	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				QUANTITY		
			Method Used					
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
					0.0	0.0	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				QUANTITY		
			Method Used					
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
					0.0	0.0	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: Ballynagran Residual Landfill

Please enter summary data on the quantities of methane flared and / or utilised	**T (Total) kg/Year**	**M/C/E**	**Method Used**		**Facility Total Capacity m3 per hour**	
			Method Code	**Designation or Description**		
Total estimated methane generation (as per site model)	3535000.0	E	Estimate	Gas Sim Model Estimate	N/A	
Methane flared	2227050.0	C	PER		0.0	(Total Flaring Capacity)
Methane utilised in engine/s	0.0				0.0	(Total Utilising Capacity)
Net methane emission (as reported in Section A above)	0.0				N/A	

4.2 RELEASES TO WATERS

SECTION A : SECTOR SPECIFIC PRTR POLLUTANTS

Data on ambient monitoring of storm/surface water or groundwater, conducted as part of your licence requirements, should NOT

RELEASES TO WATERS						
POLLUTANT						
			Method Used		SW10	
No. Annex II	Name	M/C/E	Method Code	Designation or Description	Emission Point 1	T (Total) KG/Year
79	Chlorides (as Cl)	E	Estimate	Reed Bed Flow and Measured Levels	2323.0	2323.0
20	Copper and compounds (as Cu)	E	Estimate	Reed Bed Flow and Measured Levels	0.3952	0.3952
22	Nickel and compounds (as Ni)	E	Estimate	Reed Bed Flow and Measured Levels	0.31046	0.31046
24	Zinc and compounds (as Zn)	E	Estimate	Reed Bed Flow and Measured Levels	1.805	1.805

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

SECTION B : REMAINING PRTR POLLUTANTS

RELEASES TO WATERS						
POLLUTANT						
			Method Used			
No. Annex II	Name	M/C/E	Method Code	Designation or Description	Emission Point 1	T (Total) KG/Year
					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 WATERS						
POLLUTANT						
			Method Used		SW10	
Pollutant No.	Name	M/C/E	Method Code	Designation or Description	Emission Point 1	T (Total) KG/Year
303	BOD	E	Estimate	Reed Bed Flow and Measured Levels	519.84	519.84
240	Suspended Solids	E	Estimate	Reed Bed Flow and Measured Levels	3279.0	3279.0
238	Ammonia (as N)	E	Estimate	Reed Bed Flow and Measured Levels	78.87	78.87
305	Calcium	E	Estimate	Reed Bed Flow and Measured Levels	11082.0	11082.0
320	Magnesium	E	Estimate	Reed Bed Flow and Measured Levels	1564.93	1564.93
321	Manganese (as Mn)	E	Estimate	Reed Bed Flow and Measured Levels	8.57	8.57
338	Potassium	E	Estimate	Reed Bed Flow and Measured Levels	705.755	705.755
341	Sodium	E	Estimate	Reed Bed Flow and Measured Levels	1985.5	1985.5
343	Sulphate	E	Estimate	Reed Bed Flow and Measured Levels	0.0	0.0

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

be submitted under AER / PRTR Reporting as this only concerns Releases from your facilit

QUANTITY	
A (Accidental) KG/Year	F (Fugitive) KG/Year
0.0	0.0
0.0	0.0
0.0	0.0
0.0	0.0

QUANTITY	
A (Accidental) KG/Year	F (Fugitive) KG/Year
0.0	0.0

QUANTITY	
A (Accidental) KG/Year	F (Fugitive) KG/Year
0.0	0.0
0.0	0.0
0.0	0.0
0.0	0.0
0.0	0.0
0.0	0.0
0.0	0.0
0.0	0.0
0.0	0.0

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		LL1							
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
79	Chlorides (as Cl)	C	EN ISO 17025	Based on amount of leachate removed over the course of the year	16646.75	0.0	0.0	0.0	0.0	16646.75	0.0	0.0
13	Total phosphorus	C	EN ISO 17025	Based on amount of leachate removed over the course of the year	141.65	0.0	0.0	0.0	0.0	141.65	0.0	0.0
20	Copper and compounds (as Cu)	C	EN ISO 17025	Based on amount of leachate removed over the course of the year	0.7754	0.0	0.0	0.0	0.0	0.7754	0.0	0.0
23	Lead and compounds (as Pb)	C	EN ISO 17025	Based on amount of leachate removed over the course of the year	0.31	0.0	0.0	0.0	0.0	0.31	0.0	0.0
22	Nickel and compounds (as Ni)	C	EN ISO 17025	Based on amount of leachate removed over the course of the year	2.17	0.0	0.0	0.0	0.0	2.17	0.0	0.0
24	Zinc and compounds (as Zn)	C	EN ISO 17025	Based on amount of leachate removed over the course of the year	13.88	0.0	0.0	0.0	0.0	13.88	0.0	0.0
83	Fluorides (as total F)	C	EN ISO 17025	Based on amount of leachate removed over the course of the year	10.34	0.0	0.0	0.0	0.0	10.34	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		LL1			
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
306	COD	C	EN ISO 17025	Based on amount of leachate removed over the course of the year	52680.0	52680.0	0.0	0.0
303	BOD	C	EN ISO 17025	Based on amount of leachate removed over the course of the year	4458.9	4458.9	0.0	0.0
238	Ammonia (as N)	C	EN ISO 17025	Based on amount of leachate removed over the course of the year	26460.0	26460.0	0.0	0.0
332	Ortho-phosphate (as PO4)	C	EN ISO 17025	Based on amount of leachate removed over the course of the year	3.877	3.877	0.0	0.0
305	Calcium	C	EN ISO 17025	Based on amount of leachate removed over the course of the year	1695.69	1695.69	0.0	0.0
357	Iron	C	EN ISO 17025	Based on amount of leachate removed over the course of the year	8.78	8.78	0.0	0.0
320	Magnesium	C	EN ISO 17025	Based on amount of leachate removed over the course of the year	2238.52	2238.52	0.0	0.0
321	Manganese (as Mn)	C	EN ISO 17025	Based on amount of leachate removed over the course of the year	1362.24	1362.24	0.0	0.0
338	Potassium	C	EN ISO 17025	Based on amount of leachate removed over the course of the year	21454.67	21454.67	0.0	0.0
341	Sodium	C	EN ISO 17025	Based on amount of leachate removed over the course of the year	42392.36	42392.36	0.0	0.0
343	Sulphate	C	EN ISO 17025	Based on amount of leachate removed over the course of the year	2522.0	2522.0	0.0	0.0

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

5. ONSITE TREATMENT & OFFSITE TRANSFERS OF WASTE

| PRTR# : W0165 | Facility Name : Ballynagran Residual Landfill | Filename : W0165_2009 3.xls | Return Year : 2009 |

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
						M/C/E	Method Used			
Within the Country	19 07 03	No	23037.77	Leachate other than listed in 19 07 02	R3	M	Weighed	Offsite in Ireland	Enniskerry Waste Water Treatment Plant,D0088-01	Enniskerry Waste Water Treatment Plant,No,Enniskerry,No,Ireland
Within the Country	**19 07 03**	**No**	2638.22	Leachate other than listed in 19 07 02	R3	M	Weighed	Offsite in Ireland	Greystones Waste Water Treament Plant,D0010-01	Greystones Waste Water Treament Plant,No ,Greystones,No ,Ireland
Within the Country	19 07 03	No	173.36	Leachate other than listed in 19 07 02	R3	M	Weighed	Offsite in Ireland	Greystones Waste Water Treatment Plant,D0010-01	Greystones Waste Water Treatment Plant,No,Greystones,No,Ireland

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

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)

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Africa	+ 27 11 254 4800
Asia	+ 852 2562 3658
Australasia	+ 61 3 8862 3500
Europe	+ 356 21 42 30 20
North America	+ 1 800 275 3281
South America	+ 55 21 3095 9500

solutions@golder.com
www.golder.com

Golder Associates Ireland
Town Centre House
Dublin Road
Naas
Co. Kildare
Ireland
T: +353 45 87 4411

Golder Associates