ANNUAL ENVIRONMENTAL REPORT

By

Louth County Council

to

Environmental Protection Agency

for

Waste Licence Reference: W0060-02

Reporting Period January – December 2009

WHITERIVER LANDFILL SITE, COUNTY LOUTH

Whiteriver Landfill Site

Annual Environmental Report January – December 2009

DOCUMENT CONTROL SHEET

Client	Louth County Council					
Project Title	Whiteriver Landfill Site					
Document Title	Annual Environmental Report January – December 2009					
Document No.	IBR0138/Reports					
This Document Comprises	DCS	TOC	Text	List of Tables	List of Figures	No. of Appendices
	1	1	48	1	1	14

Rev.	Status	Author(s)	Reviewed By	Approved By	Office of Origin	Issue Date
	Draft	AMG	AMG	DD	Letterkenny	23/03/10
	Final	AMG	AMG	DD	Letterkenny	13/04/10

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1.0 INTRODUCTION

Louth County Council hold a Waste Licence from the Environmental Protection Agency to operate Whiteriver landfill Site. This report provides a review of all data collected and the environmental aspects of operations at the site for the year 2009.

The site is located 1 km north of the main R169 Collon Rd at its junction with Whiteriver Cross, Co Louth. The facility is located in a rural setting at grid references O301450E 285625N in the townlands of Whiteriver. The northern and western boundaries adjoin two minor roads which serve scattered dwellings, whilst agricultural grazing lands adjoin the southern and eastern boundaries. The main access to the site is situated on the north western site boundary, immediately off the principle approach road. Louth County Council are the sole landowners of the site on which the landfilling activity is based.

The waste licence (W0060-02) issued on the 17th September 2003 relates to the existing facility and provides for the extension of the site by way of construction of six new engineered lined cells in two phases to the east of the existing facility.

1.1 REPORT PERIOD

The report period for this Annual Environmental Report (AER) is from January to December 2009 and relates to the waste licence (W0060-02).

2.0 WASTE ACTIVITIES CARRIED OUT AT THE FACILITY

In accordance with Condition 5 of the waste licence only those waste types and quantities of waste listed in the Schedule shall be disposed of at the facility unless the prior agreement of the Agency has been obtained. The maximum annual tonnage of individual waste types for disposal is listed in the Schedule of the Waste Licence and total is as follows:

Table 1 Maximum Annual Tonnage

Total (Tonnes per annum)	(W0060-02)
Total	96,000

* As from September 2003

The licence waste disposal activities in accordance with the Third Schedule of the waste Management Act, 1996 are restricted to those listed as follows:

Class 1: Deposit on, in or under land (including landfill).
Class 4: Surface impoundment, including placement of liquid or sludge discards into pits, ponds or lagoons.
Class 5: Specially engineered landfill, including placement into lined discrete cells which are capped and isolated from one another and the environment.
Class 6: Biological treatment not referred to elsewhere in this Schedule which results in Draft compounds or mixtures which are disposed of by means of any activity referred to in paragraphs 1 to 10 of this Schedule.
Class 7: Physio-chemical treatment not referred to elsewhere in this Schedule (including evaporation, drying and calcination), which results in Draft compounds or mixtures which are disposed of by means of any activity referred to in paragraphs 1 to 10 of this Schedule.
Class 12: Repacking prior to submission to any activity referred to in a preceding paragraph of this schedule.
Class 13: Storage prior to submission to any activity referred to in a preceding paragraph of this Schedule, other than temporary storage, pending collection, on the premises where the waste is produced.

The licence waste disposal activities (W0060-02), in accordance with the Fourth Schedule of the Waste Management Act, 1996 are restricted to those listed as follows:

Class 2 Recycling or reclamation of organic substances which are not used as solvents (including composting and other biological transformation processes): This activity is limited to the use of compost or similar material in the restoration of the landfill.

Class 4 Recycling or reclamation of other inorganic materials: This activity is limited to the use of soil, subsoil and construction and demolition waste for daily cover, engineering works and the restoration of cells 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 use of landfill gas as a fuel for the generation of electricity/ energy.

Class 10 The treatment of any waste on land with a consequential benefit for an agricultural activity or ecological system: This activity is limited to the use of various suitable wastes as daily or intermediate cover and in the restoration of the landfill, subject to the agreement of the Agency.

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 soil, subsoil and construction and demolitions wastes at the facility prior to recovery / reuse at the facility.

Access to site is controlled by the Site Foreman and Weighbridge Operator. All persons availing of the site must report to the site office at the time of entering and / or leaving the landfill site. Access is restricted to those times when the staff are on duty and the site is secured to prevent unauthorised entry.

3.0 QUANTITY AND COMPOSITION OF WASTE RECEIVED AND DISPOSED OF DURING THE REPORTING PERIOD AND EACH PREVIOUS YEAR

The quantities of waste accepted for disposal at the facility on a yearly basis are shown in Table 2.

Table 2 Waste Quantities Accepted (tonnes)

Waste	1996*	1997*	1998*	1999*	2000*	2001	2002	2003
Total	25,110	20,940	20,000	15,066	31,500	37,146	25,776	36,006
Waste	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**
Total	60,833	80,634	82,547	70,396	84,402	53,744		

* Figures for 1996 to 2000 are the estimated annual waste inputs (tonnes). Waste data figures where estimated by means of assessment based on the category of vehicle depositing waste at the site.

Waste data figures are currently derived from weighbridge readings. Records of quantities, EWC code and type of waste accepted for disposal and recovery at the facility are maintained at the landfill site. These figures for 2009 are shown in Table 3.

A CEN Leachate test has been carried out on water treatment sludge received at the facility. These results will be submitted to EPA when they become available.

Table 3 Total Waste Quantities Accepted (tonnes) for disposal and recovery for January to December 2009

Disposal	Commercial	C & D	Charity	Port Swill	Road Cleaning	Water Sludge	Farmyard	Household	Industrial Sludges	Industrial	Coillte	Sewage Screening	TOTAL
	20 03 01	**17 07 01**	**20 03 01**	**20 03 01**	**20 03 03**	**19 08 05**	**02 01 99**	**20 03 01**	**19 08 05**	**1501 06**	**20 03 01**	**19 08 01**	
2009	19307.56	35.68	142.9	6.98	4011.96	1938.12	57.68	26519.14	5.86	1410.00	26.00	282.56	**53744.44**

Recovery	Cover Material	Rubble	C & D Dust	Wood Chip	TOTAL
	17 05 04	**17 01 07**	**19 12 12**	**19 12 07**	
2009	12738.76	7773.94	36285.14	2240.66	**59038.5**

4.0 CALCULATED REMAINING CAPACITY OF THE FACILITY AND YEAR IN WHICH FINALCAPACITY IS EXPECTED TO BE REACHED

The Capacity of Phase V is approximately 600,000 m^3 and is divided into three cells. The breakdown of sub-cells and capacity within each Cell of Phase V are provided in Table 4 below. The sequence of filling is shown on BL542925/610 Rev A. Filling is currently being undertaken in Phase V, Cell 2A and 2B.

Table 4 Minimum Practicable Cell Capacities

Cell	Total Waste to Final Contour Level	Area m2	Years
Cell 2A	89,800	13,761	0.93
Cell 2B	99,700	5,795	1.03
Cell 1A	80,700	10,083	0.84
Cell 1B	118,900	323	1.23
Total Fill	**555,900**	**45,116**	**5.75**

The approximate void capacity of Phase 6 is shown in Table 5 takes account of capping and drainage layer requirements. These figures are taken from EIS for the proposed extension of Whiteriver landfill, Co Louth and are summarised as follows:

Table 5 Phase 6 Landfill Capacity

Phase	Cell	Estimated remaining void capacity (m^3)
6	1	253,868*
	2	247,048*
	3	143,963*

*Figures taken from EIS for the proposed extension of Whiteriver landfill, Co Louth.

A Topographical survey has been carried out in 2009 by Co Ordinate Surveying and Engineering Solutions (Drawing Number 1899-101 Rev A) and is including in Appendix A.

5.0 METHODS OF DEPOSITION OF WASTE

Waste is only accepted at the landfill facility between 8.30am to 4.00pm Monday to Thursday, 8.30am to 3.00pm Friday and 8.30am to 12.30pm Saturday during November through to February. Between March and October, waste is accepted at the landfill between 8.00am to 4.00pm Monday to Thursday, 8.00am to 3.00pm Friday and 8.30am to 12.30pm Saturday.

Waste was filled in Phase 5, Cell 3B until March 2009. Waste is now being filled Phase 5, Cell 2A and 2B.

All acceptable waste loads are directed to the active tip face where the waste is in filled, within a designated area, under the direction of the general operative and machine driver. The waste is inspected and if acceptable for disposal spread and compacted directly by the steel wheeled compactor.

Daily cover consists of construction and demolition fines from a trommel and clay from on site stockpile.

6.0 SUMMARY REPORT ON EMISSIONS

6.1 MONITORING LOCATIONS

Monitoring is carried out at locations and at frequencies as specified in Schedule D of the waste licence (W0060-02). Monitoring points are labelled and permanent access to all monitoring points is maintained. BH13 was re drilled and BH20 was installed as a groundwater water borehole to detect leakages of the lagoon on 21/06/2006.

All ditches and drains around the perimeter of the facility are kept clear to allow for surface water monitoring points to be maintained.

Monitoring points are detailed in Drawings No.IBL0069/101B,102A and Drawing IBR0138/100 Landfill Gas piezometer. The monitoring point grid references for those available are detailed in Table 6. The location of groundwater monitoring boreholes are shown in Table 7.

Table 6 Grid References of Monitoring Points

Monitoring Points of Groundwater boreholes	Easting	Northing
BH1	301 385	285 310
BH2	301 259	285 380
BH3	301 384	285 501
BH4	301 405	285 648
BH5A	301737	285541
BH6	301 856	285 480
BH7	301 740	285 438
BH8	301 588	285 302
BH9	301 944	285 348
BH10	301 824	285 117
BH11	302 045	285 105
BH12	301 943	285 356
BH13(redrilled)	301 824	285 126
BH14	302 045	285 119
BH15	302 124	284 920
BH16	301 715	285 300
BH17	301 293	285 180
BH18	302 102	284 887
BH19	301490	285650
BH20	301 428	285 623

Table 6 Grid References of Monitoring Points Continued….

Monitoring Points	Easting	Northing
Surface Water Monitoring		
SW1	301 384	285 424
SW2A	301 965	285 427
SW3	301 935	285 410
Gas Piezometers		
PZ1	301 438	285 596
PZ2	301 454	285 614
PZ3	301 496	285 628
PZ4	301 542	285 624
PZ5	301 600	285 610
PZ6	301 603	285 552
PZ7	301 603	285 512
PZ8	301 601	285 463
PZ9	301 594	285 401
PZ11	301 383	285 333
PZ12	301 382	285 381
PZ13	301 382	285 441
PZ14	301 383	285 498
PZ15	301 385	285 563
PZ16	301 410	285 579
PZ21	301 385	285 289
PZ22	301 377	285 205
PZ23	301 459	285 200
PZ24	301 490	285 201
PZ25	301 586	285 219
PZ26 PZ54	Not available	
Noise		
N1	301 336	285348
N2	135 907	270 000
N3	301345	284 739
N4	302105	284 927
N5	302 723	285 258
N6	301409	285 598

Table 6 Grid References of Monitoring Points Continued….

Monitoring Points	Easting	Northing
Dust		
DG1	301 395	285 372
DG2	301 596	285 374
DG3	301 960	285 421
DG4	302 058	285 043
Leachate		
L1	301 427	285 625
L2	301 405	285 495

Table 7 Location of Groundwater Monitoring Boreholes

Borehole	Upstream/Downstream	Private Well	Overburden or Bedrock
BH1	Upstream		Overburden
BH2A	Upstream	Crawleys Private Well	Bedrock
BH3	Upstream		Bedrock
BH4	Upstream		Bedrock
BH5	Downstream		Overburden
BH6	Downstream		Bedrock
BH9	Downstream		Bedrock
BH10	Downstream		Overburden
BH11	Downstream		Overburden
BH12	Downstream		Overburden
BH13	Downstream		Bedrock
BH14	Downstream		Bedrock
BH15	Downstream	Taffes Private Well	Domestic
BH16	Downstream	Byrnes Private Well	Domestic
BH17	Downstream	Holcrofts Private Well	Domestic
BH18	Downstream	Taffes Private Well	Domestic
BH19	Upstream	McGranes Private Well	Agricultural water supply
BH20	Upstream landfill down gradient of leachate lagoon		Overburden

Table 8 provides a summary of results in 2009 from groundwater monitoring boreholes throughout these monitoring periods.

Table 8 Summary of 2009 Results from Groundwater Monitoring Boreholes

		No. of Samples	Minimum	Maximum	Mean	Standard Deviation
	Units					
Alkalinity	mg/lCaCO3	19	0.05	440	285.06	85.62
Ammonia	mg/l N	70	0.03	0.56	0.09	0.10
Barium	µg/l					
B.O.D.	mg/l O2	36	54.2	259.5	141.37	106.10
Boron	µg/l					
Cadmium	µg/l	18	0.1	0.5	0.28	0.17
Calcium	mg/l Ca	18	57.33	147.7	95.53	29.91
C.O.D.	mg/l O2	18				
Chloride	mg/l Cl	71	9	74	21.06	11.39
Chromium	µg/l	18	1.4	18.1	5.94	4.17
Conductivity	µS/cm @ 25	71	263	919	652.00	105.55
Copper	µg/l	18	1.2	40.6	8.62	11.58
Cyanide		18	0	0		
Depth	m	71	0	25.5	11.14	7.44
D.O.	% Saturation	71	10	96	47.33	20.30
Faecal coliforms	no/100ml	45	0	58	3.92	11.40
Fluoride	mg/l	18	0.18	0.24	0.20	0.03
Iron	µg/l	36	74.9	18638.3	2028.82	4461.09
Lead	µg/l	18	1.4	40	9.73	14.09
Magnesium	mg/l Mg	18	10.11	44.21	21.19	9.20
Manganese	µg/l	18	1.5	2272.6	406.67	541.08
Mercury	µg/l	18				
Nickel	µg/l	18	1.1	51.1	8.97	14.46
Ortho-Phosphate	mg/l P	18	0.02	0.1	0.05	0.03
pH		70	6.9	8	7.43	0.22
Potassium	mg/l	36	1	3.39	1.55	0.67
Residue on evaporation	mg/l	18	304	9814	1100.06	2215.76
Sodium	mg/l	36	6.92	46.71	22.63	9.97
Sulphate		36	3.9	92	23.52	23.21
Suspended Solids	mg/l	18	0	0		
Temp	°C	70	6.2	15.2	11.06	1.47
Time						
Bacterial/Total Coliforms	No/ml	45	0	8164	376.58	1360.06
T.O.C.	mg/l	70	1.5	8.3	4.33	1.78
T.O.N	mg/l N	36	0.08	2.37	0.59	0.70
Total Suspended Solids	mg/l	18				
Zinc	µg/l	18	2	174.3	27.56	42.11

Nm not measured

7.0 SUMMARY OF RESULTS AND INTERPRETATION OF ENVIRONMENTAL MONITORING

7.1 LEACHATE QUALITY

Leachate quality can vary during the lifetime of landfill sites depending on the phase of decomposition of the waste. Leachate results for 2009 are presented in Appendix B and some of the characteristic parameters of the treated and raw leachate are listed in Tables 9 and 10.

Leachate results are shown in Appendix B. Leachate values recorded in the lagoon (treated leachate) are within the emission limit values as set out in the waste licence except for Sulphate as show in Table 9 which exceeded the limit of 250mg/l in July.

Table 9 Treated Leachate Concentrations in 2009

PARAMETER	Min. Conc	Max. Conc	Limit Value
Ammonia (mg/N)	0.66	533.09	900
BOD (mg/l)	32.4	71	500
COD (mg/l)	449	1056	1,500
Sulphate (mg/l)	123.3	405.5	250
Temperature (°C)	7	19	<25°C
pH (pH units)	8.2	8.7	6 – 9

Raw leachate results have been compared to “Typical Leachate Composition of 30 Samples from UK/Irish Landfills accepting mainly Domestic Waste” (Landfill Operational Practices) and are within the maximum concentration as shown on Table 10.

Table 10 Raw Leachate Concentrations (Jan to Dec, 2009)

	Whiteriver Landfill Site		Whiteriver Landfill Site		Whiteriver Landfill Site		From 30 samples from UK/Irish landfills accepting domestic waste		
	Raw Leachate 1		Raw Leachate 2		Active Cell		Results in mg/l		
PARAMETER	Min.Conc	Max.Conc	Min.Conc	Max.Conc	Min.Conc	Max.Conc	Min.Conc	Max.Conc	Mean
Ammonia (mg/N)	0.21	680.81	350.71	820.72	1.2	684.35	<0.2	1700	491
BOD	45.6	6588.8	1614	1614	21.8	6152.1	4.5	>4800	>834
COD	986	1126	641	2255	78	3320	<10	33,700	3078
Chloride (mg/l)	853	893	665	1625	28	1669	27	3410	1256
Iron (µg/l)	5584.5	25277.7	2129.1	8963.1	503.1	8846.6	0.4	664	54.4
Potassium (mg/l)	385.92	448.46	204.85	447.81	7.02	390.06	2.7	1480	491
Sodium (mg/l)	652.47	713.85	523.8	1198.22	16.98	1014.21	12	3000	904
TON (mg/l N)	0	0	0.16	5.93	0.08	0.08	/	/	/
Conductivity (µS/cm)	9670	9710	6240	13180	541	10860	503	19,200	7789
pH (pH units)	7.2	7.5	7.3	7.8	7	7.5	6.4	8	7.2
Sulphate	15.1	15.1	204.8	204.8	18.8	18.8	<5	739	136

7.2 GROUNDWATER

As required under the Waste Licence, groundwater monitoring has been undertaken at the borehole locations as set out in the current waste licence. The Schedules of the waste licence requires the monitoring of certain parameters on either a monthly, quarterly or annual basis; the frequencies of the monitoring of groundwater parameters are shown in Table 11.

Boreholes BH1, BH3 BH4, BH5A are located within the site boundary, whilst BH6 is located approximately 240m from the eastern boundary of the site. BH2A (Crawleys) is a private well located upstream of the facility. BH9, BH10, BH11, BH12, BH13 and BH14 were installed further downstream of the extension to the existing site. Monitoring is also undertaken in four private wells downstream. These private wells are boreholes BH15 (Taffes), BH16 (Byrnes), BH17 (Holcrofts) and BH18 (Taffes) BH19 (McGranes).

Table 11 Groundwater Parameters Monitoring Frequencies as per W0060-02

MONTHLY	QUARTERLY	ANNUALLY	
Groundwater Level	Chloride	Metals /Non Metals	List I and II Substances
	Dissolved Oxygen	Cyanide	Residue on evaporation
	pH	Fluoride	
	Total Oxidised Carbon	Total Oxidised Nitrogen	
	Visual Inspection/ Odour	Total Alkalinity	
	Ammoniacal Nitrogen	Orthophosphate	
	Electrical Conductivity	Mercury	
	Temperature	Sulphate	

The results contained in this report are assessed as follows:

- **Groundwater:** Assessed against Whiteriver Trigger Levels (WTL) agreed with the EPA (21 December 2004, 60-2/GEN09EM), the European Communities (Drinking Water) (No. 2) Regulations 2007 parametric value (DWR) and Interim Guideline Value (IGV) Towards Setting Guideline Values for the Protection of Ground Water in Ireland. The following substances defined by the European Communities (Drinking Water) (No. 2) Regulations 2007 were monitored in April and are referred to in the report:

- **Total pesticides** means the sum of all individual pesticides detected and quantified in the course of the monitoring procedure. The parametric value 0.50ug/l. (Only those pesticides which are likely to be present in a given supply require to be monitored. "Pesticides" means— — organic insecticides, — organic herbicides,— organic fungicides, —organic nematocides, — organic acaricides, — organic algicides, — organic rodenticides, — organic slimicides, — related products (*inter alia*, growth regulators) and their relevant metabolites, degradation and reaction products. The parametric value of 0.01µg/l applies to each individual pesticide. In the case of aldrin, dieldrin, heptachlor and heptachlor epoxide the parametric value is 0.030µg/l.

- **Polycyclic aromatic hydrocarbons** parametric value is 0.10ug/l. This applies to the sum of hydrocarbons concentrations of specified compounds. The specified compounds are benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(ghi)perylene and indeno(1,2,3-cd)pyrene.

- **Total trihalomethanes** are the sum of concentrations of specified compounds. The parametric value are:

  Trihalomethanes — Total Sum of
  • until 24 December 2008 150 µg/l
  • from 25 December 2008 100 µg/l

  The specified compounds are: chloroform, bromoform, dibrom-ochloromethane and bromodichloromethane

The results are presented graphically and in table format in Appendix C. The majority of parameters are below the recommended limits.

Parameters that are indicative of possible leachate contamination include Ammoniacal-N, Conductivity, Iron, Chloride and heavy metals.

7.3 QUARTERLY MONITORING PARAMETERS

All Ammoniacal Nitrogen levels analysed during the reporting period were within the Whiteriver Trigger Level (WTL) agreed with the EPA of 0.2 mg/l N with the exception of BH6 (0.28 mg/l N,) BH18 (0.27 mg/l N)and BH20 (0.56 mg/l N) in October.

Temperature values are similar in all locations up-gradient and down-gradient of the landfill site. pH values analysed during the reporting period were all within the WTL of 7.0 to 8.0.

Electrical Conductivity values do not exceed the WTL of 800 µS/cm with the exception of BH9 (825-919 µS/cm) April to October.

Chloride levels are in exceedances of the WTL of 20 mg/l in borehole BH1 and BH3 in the up-gradient boreholes. The highest level recorded was 40 mg/l Cl in BH3. This exceedance may be due to an agricultural source at this point upstream of the landfill. Downstream of the site the Chloride WTL Level has been exceeded in BH5, BH6, and BH20 throughout the monitoring period and range from 39 to 75mg/l Cl.

Dissolved oxygen ranges from 10% O_2 to 97% O_2.

TOC levels were all below WTL of 10 mg/l during the year.

7.4 ANNUAL MONITORING PARAMETERS

7.4.1 Up Gradient Annual Results

Annual analysis for List I and II substances, metals and non-metals were undertaken at one location upstream of the site in BH2A in April.

Boron, Cadmium, Calcium, Chromium, Copper, Fluoride, Lead, Magnesium, Mercury, Nickel, Potassium, Sodium and Zinc are below the WTL, IGV and/or DWR were applicable in all up-gradient boreholes.

Manganese levels exceeded the DWR of 50µg/l and the IGV of 0.05mg/l in BH1 (64.3µg/l) and BH3 (791.9µg/l). Iron levels exceeded the DWR of 200µg/l and the IGV of 0.2mg/l in BH1 (572.7µg/l).

Cyanide concentrations of <0.05mg/l were recorded in all up-gradient boreholes. This concentration is the lowest limit of detection for the methodology used for cyanide; therefore this could be lower than the WTL and IGV of 0.01mg/l. The results are below the DWR of 0.05mg/l.

Orthophosphate forms are produced by natural processes, but major man-influenced sources include: partially treated and untreated sewage, runoff from agricultural sites and application of some lawn fertilisers. Orthophosphate values were recorded at <0.02mg/l (BH2A and BH4), 0.04mg/l (BH3) and 0.05mg/l (BH1). BH1 and BH3 are above the WTL and IGV of 0.03mg/l.

Annual analysis for Total Oxidised Nitrogen (TON) values upstream range from 0.24mg/l to 1.82mg/l. Alkalinity values upstream range from 216mg/l to 328mg/l.

Sulphate values were all below the IGV of 200mg/l and the DWR of 250mg/l. BH3 was the only up-gradient borehole exceeding the WTL of 50mg/, with a reading of 51.3mg/l.

Residue on Evaporation ranges from 314mg/l in BH4 to 545mg/l in BH1.

The Drinking Water Regulation for Polycyclic Aromatic Hydrocarbon (PAH) is 0.10ug/l and is the sum of concentrations of specified compounds. The specified compounds are benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(ghi)perylene and indeno(1,2,3-cd)pyrene. These were all <0.0001 mg/l in BH2A. All other parameters measured under Polycyclic Aromatic Hydrocarbon are <0.0001 mg/l except for benzo(bk)fluoranthene measuring 0.0002mg/l.

Phenols levels were also analysed at BH2A and is <0.002mg/l. This concentration is lower than the limit of detection for the methodology used for Phenols however this is higher than the IGV of 0.5µg/l.

Pesticide and herbicide analysis was carried out in BH2A in April. The results were below the lower detection limit for the analytical methodology used except for Isoproturon d6 with a reading of 0.536µg/l and Simazine d10 with a reading of 0.509µg/l.

Simazine was withdrawn from use following documented groundwater pollution problems but the use of simazine in Ireland continued up to June 2007. These readings are possibly due to agricultural related activities upgradient.

Semivolatiles and volatile organic compound parameters were either below the IGV for those comparable or were below the lower detection limit for the analytical methodology used.

Total-Trihalomethanes (THM) is the sum of Dichloromethane, Chloroform, Bromodichloromethane and Bromoform. All levels were below the lower detection limit for the analytical methodology used (<0.1µg/l) in BH2A.

7.4.2 Down gradient Annual Results

Annual analysis for List I and II substances, metals and non-metals were undertaken at two locations downstream of the site in BH9 and BH14 in April.

These results show that Boron, Cadmium, Calcium, Chromium, Fluoride, Magnesium, Mercury, Potassium and Sodium are below the relevant WTL, IGV and/or DWR.

All down-gradient boreholes except BH15 and BH19 exceed the IGV and DWR of 50µg/l for Manganese. The exceeding Manganese concentrations range from 108.7µg/l (BH11) to 2,272.6µg/l (BH20). This may be attributed to elevated levels of these metals occurring naturally in the area.

All down-gradient boreholes except BH11, BH13, BH14 and BH15 exceed the IGV of 0.2mg/l and the DWR of 200µg/l for Iron. The Iron concentrations range from 74.9µg/l in BH14 to 18,638.3µg/l in BH20.

Copper exceeds the WTL and IGV of 30µg/l in BH19 (33.8 µg/l) and BH20 (40.6 µg/l). These results do not exceed the DWR (2,000µg/l).

BH5A (14.4µg/l) exceeds the WTL and IGV of 10µg/l for Lead but not the DWR of 25µg/l. However, BH20 (40µg/l) exceeds the WTL, IGV and DWR for Lead.

Nickel exceeds the WTL and DWR of 20µg/l and the IGV of 0.02mg/l in BH5A (22.6µg/l) and BH20 (51.1µg/l) in this monitoring period.

Zinc concentrations in BH18 (174.3µg/l) exceed the WTL of 100µg/l and the IGV of 0.1mg/l.

Cyanide concentrations of <0.05mg/l are recorded in all the downstream boreholes. These concentrations are lower limit of detection for the methodology used for Cyanide; however these are possibly higher than the WTL and IGV (0.01mg/l). These reading are below the DWR of 0.05mg/l.

Orthophosphate values upstream and downstream range from <0.02mg/l to 0.1mg/l. The 0.1mg/l reading in BH13 is the only down-gradient borehole above the WTL and IGV of 0.03mg/l.

Downstream, Annual analysis for TON values range from <0.08mg/l to 2.37mg/l. There has been a slight decrease from the last annual monitoring results. Alkalinity values down-stream range from 250mg/l to 440mg/l.

Sulphate values were all below the IGV of 200mg/l and the DWR of 250mg/l. BH5A (56.3mg/l) and BH10 (90mg/l) were the only down gradient borehole exceeding the WTL of 50mg/l.

Residue on Evaporation ranges from 304mg/l in BH16 to 9814mg/l in BH20.

The Drinking Water Regulation for PAH is 0.10ug/l and is the sum of concentrations of specified compounds. The specified compounds are benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(ghi)perylene and indeno(1,2,3-cd)pyrene. These were all <0.0001mg/l in BH9 and BH14. All other parameters measured under Polycyclic Aromatic Hydrocarbon are <0.0001 mg/l except for benzo(bk)fluoranthene reading 0.0002mg/l in BH9 and 0.002mg/l in BH14.

Phenols levels were also analysed at BH9 and BH14 and were all <0.002µg/l. These concentrations are lower than the limit of detection for the methodology used for Phenols and are less than the IGV of 0.5µg/l.

Pesticides analysis was carried out in BH9 and BH14 for this monitoring period. Parameters were either below the IGV for Total Pesticides (0.5µg/l) and/or the lower detection limit for the analytical methodology used, except for Isoproturon d6 measuring 0.575µg/l in BH9 and 0.553µg/l in BH14 and Simazine with readings of 0.529µg/l in BH9 and 0.517µg/l in BH14. These levels are similar to upstream location.

Semivolatiles and volatile organic compound parameters were either below the IGV for those comparable or were below the lower detection limit for the analytical methodology used.

Total-Trihalomethanes (THM) is the sum of Dichloromethane, Chloroform, Bromodichloromethane and Bromoform. All levels were below the lower detection limit for the analytical methodology used (<0.1µg/l) in BH9 and BH14.

7.5 EPA AUDIT

The EPA conducted a drinking water audit on 10th August. The following potable wells were sampled: Artesian Well, BH2A, BH15 Taffes, BH16 Byrnes, BH17 Holocrofts and BH18 Taffes. These results are included in Appendix C.

Exceedances were found for the following parameters:

- Coliform bacteria was found in four wells, BH2A, BH15, BH16 and BH17.
- E.Coli was found in BH15, BH16

- Clostridia Perfringens found in BH15
- Iron in Artesian well, BH16, BH17 and BH18.
- Manganese in Artesian well, BH16, BH17 and BH18.

7.6 SURFACE WATER

Whiteriver landfill site is situated on a plateau and is located in a sub-catchment of one of the main tributaries of the White River. The White River is located approximately 4km south west of the site and it is this river, which is the main receptor for any potential surface water contamination from the site.

As required under the Waste Licence, surface water monitoring has been undertaken at the station locations as set out in Table D.1.1 of the waste licence. Schedule D of the waste licence requires the monitoring of certain parameters on either a monthly, quarterly or annual basis; the frequencies of the monitoring of surface water parameters are shown in Table 12 below.

Table 12 Surface Water Parameters Monitoring Frequencies

QUARTERLY	ANNUALLY
Ammoniacal Nitrogen	Metals / non metals
Biological Oxygen Demand	Mercury
Chemical Oxygen Demand	Sulphate
Chloride	Total Alkalinity
Dissolved Oxygen	Orthophosphate
Electrical Conductivity	TON
Ph	
Total Suspended Solids	
Temperature	

The results contained in this report are assessed against the Surface Water Quality Standards (SWQS) laid out in the European Communities Quality of Surface Water Intended for the Abstraction of Drinking Water Regulations 1989, and the EPA “Parameters of Water Quality” included in Appendix C. These results are presented in table format in Appendix D.

Surface water monitoring is undertaken at one location upstream at SW1 and one location downstream of the site at SW2A. Chemical analyses of surface water are summarised in Appendix D.

The Ammoniacal Nitrogen level of SW1 ranged from 0.56mg/l N to 1.04 mg/l. An excess of 0.1mg/l N indicates agricultural contamination. Downstream samples of Ammoniacal Nitrogen

were elevated at times (<0.03 mg/l N to 0.16mg/l) however these are of a lower concentrations throughout the year than the upstream samples.

Dissolved Oxygen (DO) content in SW1 ranges from 60% O_2 to 88%O_2 however the DO in SW2A ranges from 87% to 105%. This shows an improvement in DO downstream of the site.

COD show lower concentrations down-stream (<10 mg/l – 31 mg/l) from the site than those measured in the up-stream samples (30mg/l - 288 mg/l) indicating possible contamination up-stream of the site.

BOD show lower concentrations down-stream (1.6 mg/l - <50 mg/l) from the site than those measured in the up-stream samples (7.4 mg/l - 50.2 mg/l) indicating possible contamination up-stream of the site.

Total Suspended Solids (TSS) exceeded the 1989 Surface Water Quality Standards (SWQS) of 50mg/l at a number of occasion in surface water during the year. SW1 exceeded in July (363 mg/l) and October (61 mg/l). SW2A downstream of the site was below the limit.

7.6.1 Annual Monitoring Parameters

Boron was measured at 99.8µg/l, below the SWQS of 2,000µg/l. Cadmium was recorded at <0.1µ/l in SW3, below the SWQS of 5µg/l. Chromium had a reading of 1.1µg/l in SW3, below the SWQS of 50µg/l. Copper fits into the SWQS A1 Classification of 50µg/l with a reading of 2.5µg/l. Iron had a reading of 100.9µg/l fitting into the A1 SWQS classification of 200µg/l. Lead is below the SWQS classification of 50µg/l with a reading of <1µg/l. Manganese fits into the A1 SWQS classification of 50µg/l with a reading of 42.7µg/l. Sulphate is below the SWQS of 200mg/l with a reading of 90.4mg/l. Zinc was recorded at 3.2µg/l, within the SWQS A1 Classification of 3,000µg/l in SW3. Mercury was recorded at <0.1µg/l, below SWQS of 1µg/l.

Total Alkalinity was recorded at 140mg/l in SW3. Calcium in SW3 had a reading of 76.42mg/l. Magnesium had a reading of 12.52mg/l in SW3 in April. Nickel had a reading of 4µg/l in SW3 in April. Ortho-phosphate recorded <0.02mg/l in SW3 in April. Potassium had a reading of 1.83mg/l in April. Sodium recorded 29.1mg/l in April and the TON reading for the SW3 was 0.43mg/l.

7.6.2 Lagoon/Surface Water Retention Pond

The surface water retention pond, SW3 is located on the eastern boundary of the site and discharges to the stream running along the northern boundary of the site. This was monitored in July and October.

SW3 has a pH reading of 7.8 to 8 which is within the A1 SWQS of 5.5 to 8.5. The DO concentration in SW3 monitoring point is 67% - 85 % saturation. This falls into the A1 SWQS classification (>60%).

The Ammoniacal Nitrogen level of 0.56 mg/l and 0.72 mg/l for SW3 falls into the SWQS category of A2 (1.5mg/l).

The BOD level in the SW3 was recorded at <1.5 mg/l and <2.0 mg/l during this monitoring period, below the SWQS A1 classification of 5mg/l.

Electrical Conductivity in SW3 was recorded at 547µS/cm and 550 µS/cm, which is below the SWQS of 1000µS/cm. The Chloride level of 22 mg/l to 28 mg/l is below the SWQS of 250mg/l for this monitoring period.

Total Suspended Solids has a reading of <5 mg/l and 14mg/l is below the SWQS limit of 50mg/l and below the SW1 and SW2 readings. This is also below the surface water discharge limit of 35mg/l as per Schedule C4 of the waste licence.

The COD level in SW3 was recorded at <10 mg/l and 32mg/l during this monitoring period, below the SWQS classification of 40 mg/l.

7.7 GAS MONITORING

As required under the Waste Licence, landfill gas monitoring has been undertaken at the borehole locations as set out in current waste licence.

Schedule D of the waste licence requires the licensee to conduct monthly monitoring on the perimeter and in the waste of the landfill site. The licence requirements of the following landfill gases are greater than or equal to 1.0% v/v Methane and greater than or equal to 1.5% v/v. The gas is monitored using a GA2000 infra-red analyser. These results are presented in Appendix E.

Results are below the trigger limit for CH_4 of 1% v/v for all perimeter locations (not in waste) during the year. From the results it can be seen that no methane was recorded in piezometers around the perimeter of the site.

Carbon dioxide levels around the perimeter of the site exceed the licence requirements of 1.5%v/v during the year. Exceedances were recorded in PZ3, PZ5, PZ23, PZ28, PZ31-34, PZ41, PZ42, PZ46, PZ47, and PZ49. The results can be seen in Appendix E.

There are two enclosed gas flares at Whiteriver Landfill Site with a combined capacity of 2,600m³/hr. Landfill gas is currently been flared through the 2,000 m³/hr flare.

A permanent gas monitoring system has been installed in the site building. No exceedances have been recorded.

7.8 MONITORING OF EMISSIONS FROM LANDFILL GAS FLARE

Flue gas monitoring was undertaken in at the permanent landfill gas flares. These results are provided in Appendix F. These emissions are within the limits of the waste licence.

7.9 NOISE MONITORING

The annual environmental noise survey was carried out at the site in August 2009. The purpose of this survey was to determine the noise levels generated at six monitoring points at the perimeter of the landfill site in accordance with Schedule D of the Waste Licence (W0060-02). These results can be seen in Table 13.

Table 13 Results from Noise Monitoring Analysis, Whiteriver Landfill site

Emissions	L_{eq} dB (A) Day	L_{eq} dB (A) Night
EPA Limits	55	45
Monitoring Point 1(N1)	**64**	**51**
Monitoring Point 2(N2)	51	**52**
Monitoring Point 3(N3)	**73**	**63**
Monitoring Point 4 (N4)	55	**61**
Monitoring Point 5 (N5)	53	43
Monitoring Point 6 (N6)	**60**	**48**

Day time readings exceeded the EPA recommended daytime limits of 55 dB(A) at monitoring points N1, N3 and N6. This was mainly attributed to Traffic movements. Further comments on the sources of these exceedances are provided in the noise report included in Appendix G.

Night time readings exceeded the EPA recommended daytime limits of 45 dB(A) at all monitoring points except N5. During the night time surveying there was no noise emitted from

the landfill facility except at location N6. Further comments on the source of these exceedances are provided in the noise report included in Appendix G.

7.10 DUST MONITORING

As per Schedule D of waste licence (W0060-02) dust monitoring was carried out. Table 14 details the results of the four dust monitors installed on the site. The waste licence requires dust deposition limits to be no more than 350 mg/m^2/day.

Table 14 Results from Dust Monitoring Analysis, Whiteriver Landfill Site

Sampling point	Dust monitor DG1	Dust monitor DG2	Dust monitor DG3	Dust monitor DG4
02/06/2009 30/06/2009	704.2	321.5	315	495.6
14/08/2009 14/09/2009	381.1	302.2	214.2	336.5
21/11/2009 23/12/2009	177.3	143	79.6	192.9

From Table 14 it can be seen dust monitoring results exceed the licence requirements at DG4. These exceedances are most likely due to earthworks during the construction on Phase 5.

7.11 METEOROLOGICAL MONITORING

Meteorological data is monitored in accordance with Schedule of the licence. This information is provided in Appendix H.

7.12 SLOPE STABILITY ASSESSMENT

A slope stability assessment was undertaken in March 2009 and is included in Appendix I. The analysis for the final waste slopes suggests that the factors of safety for the filling of waste are satisfactory.

7.13 ODOUR MONITORING

Total Volatile Organic compound monitoring has been undertaken at the site on a quarterly basis. Based on these reports a number of the recommendations have been carried out to reduce the landfill gas leakage from the site and therefore reducing odour. These reports were included in quarterly monitoring reports.

8.0 RESOURCES AND ENERGY CONSUMPTION SUMMARY

Consumption of resources for the reporting period were:

Table 15 Consumption of Resources

Parameters	Annual Total	Unit
Diesel	150,000	litres
Hydraulic oil	400	litres
Engine oil	300	litres
Grease 250 kg	250	kg
Electricity	71,595	Kwh

9.0 PROPOSED DEVELOPMENT OF THE FACILITY & TIMESCALE OF SUCH DEVELOPMENT

Objectives and targets have been set for 2010. These are included in Appendix J and include the following:

- Reduce pressure on non-renewable fossil fuels used to generate electricity.
- Comply with the relevant requirements of the Landfill Directive (1993/31/EC)
- Control odour from landfill
- Revise groundwater monitoring trigger levels
- Put in place maintenance regime for drainage interceptor
- Enhance the bio diversity of the site

10.0 VOLUME OF LEACHATE PRODUCED AND VOLUME OF LEACHATE TANKERED OFF SITE

The volume of leachate transported off site to Drogheda wastewater treatment plant during the period January to December 2009 is provided in Table 16. A water balance calculation has been undertaken and is included in Appendix K using rainfall data from metrological station at Ardee. This estimates the annual leachate production to be approximately 24,325 m^3.

Table 16 Volume of Leachate Transported Off Site in 2009

MONTH	No. of Loads	Weight Volume (m^3)
January	73	1691.69
February	61	1412.34
March	39	925.66
April	67	1636.44
May	78	2040.1
June	55	1336.64
July	142	3597.3
August	80	2158.3
September	73	1705.2
October	32	914.9
November	168	4129.98
December	108	2279.88
Total	**976**	**23828.43**

11.0 ON-SITE LEACHATE PRE-TREATMENT EFFICIENCY

The results for treated leachate are within the limit values for those parameters as set out in the waste licence as shown in Table 9 except for Sulphate in July.

12.0 RESTORATION OF COMPLETED CELLS/PHASES

Phase I to III and Phase 4, Cell 1 and Cell 2 have been permanently capped. Phase 4 Cell 2b has been partially capped. Intermediate capping of Phase 5, Cell 3a and 3b has been undertaken.

Permanently capping of phase 5 Cell 3a and 3b is currently being undertaken and will be completed in May 2010.

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

A topographical survey was carried out in 2009 and is included in Appendix A.

14.0 ESTIMATED ANNUAL AND CUMULATIVE QUANTITIES OF LANDFILL GAS (LFG) EMITTED FROM THE SITE

The estimated annual and cumulative gas yield for the life span of the landfill site based on wastes inputs to date and total maximum tonnage per annum as per Waste Licence is given in Appendix L.

The gas yield figures provided in Appendix M are calculated using Gassim Model 2.0. As can be seen from the gas generation curve; landfill gas production is approximately 1160 m^3/hr in 2009 based on current waste inputs.

PRTR reporting was undertaken for 2009 for emissions to air and sewer. This information is included in Appendix M.

15.0 ESTIMATED ANNUAL AND CUMULATIVE QUANTITY OF INDIRECT EMISSIONS TO GROUNDWATER

The site has been developed on a containment basis, hence controlling potential discharge to groundwater. The risk of leakage is mitigated by the following:

- The relative thickness of the low permeability boulder clays constitutes a natural effective barrier to downward groundwater migration.
- Groundwater resources within the granular horizons are confined under subartesian pressure with a net upward groundwater movement.
- Leachate levels are maintained below licence limits on site.
- Leachate is pumped from the cells, to treatment lagoon and tankered off site for treatment.

16.0 ASSESSMENT OF THE FEASIBILITY OF THE UTILISATION OF LANDFILL GAS AS AN ENERGY RESOURCE

An energy audit was conducted in 2006 and the report was subsequently been sent to the EPA. The report provided an assessment of the potential power generation from landfill gas. This is to be reviewed and electricity generation to be decided upon by June 2010.

17.0 MONTHLY WATER BALANCE CALCULATION AND INTERPRETATION

The calculation for monthly water balance is as follows

Lo = [ER (A) + LW + IRCA + ER (1)] – [aW]

Where

Lo = leachate produced (m^3)
ER = effective rainfall
A = area of cell (m^3)
LW = liquid waste
IRCA = infiltration through restored areas and capped areas (m)
a = absorptive capacity of waste (m^3/t)
W = weight of waste deposited
l = surface area of lagoons (m^2)

The monthly water balance calculations have been calculated (Appendix K). This estimates the annual leachate production to be approximately 24,325 m^3. The difference in actual and predicted quantities month to month may be partly due to the absorptive capacity of the waste, which determined the speed of percolation of rainwater through the wastes.

The meteorological data used in the calculations are from Ardee meteorological station.

18.0 REPORT ON ENVIRONMENTAL MANAGEMENT PROGRAMME

ISO14001 Environmental Management System was implemented in October 2009. This included a review of the Environmental Management Programme for the site. This is available on site.

19.0 SCHEDULE OF ENVIRONMENTAL OBJECTIVES AND TARGETS FOR THE FORTHCOMING YEAR

Objectives, targets and timescales for the year 2010 for Whiteriver Landfill Site have been completed as part of the ISO14001 Environmental Management System. These are as follows:

- Reduce pressure on non-renewable fossil fuels used to generate electricity.
- Comply with the relevant requirements of the Landfill Directive (1993/31/EC)
- Control odour from landfill
- Revise groundwater monitoring trigger levels
- Put in place maintenance regime for drainage interceptor

These are included in Appendix J.

20.0 REPORT ON THE PROGRESS TOWARDS ACHIEVEMENT OF THE ENVIRONMENTAL OBJECTIVES AND TARGETS CONTAINED IN THE PREVIOUS YEARS REPORT

The following development works were carried out on the site in the reporting period:

- New flare ordered to be installed early March 2000m^3/hr capacity – Completed in March
- Installation of piezometers around boundary 30 No – Completed on March
- Final and intermediate capping of phase 5 cell 3a and 3b – Currently being undertaken. Will be completed in May 2010.
- Investigation of the potential use of landfill gas to generate electricity in 2009 – Electricity generation to be decided upon by June 2010
- Connecting gas wells to gas extraction system – Ongoing

21.0 FULL TITLE AND A WRITTEN SUMMARY OF ANY PROCEDURES DEVELOPED BY THE LICENSEE IN THE YEAR, WHICH RELATES TO THE FACILITY OPERATION.

Environmental Management Procedures have been developed as part of the ISO14001 Environmental Management System for the purpose of maintaining and assessing the Environmental Management System. Operational procedures ensure that the routine operational tasks related to the environmental management of the facility are undertaken in a satisfactory manner as required to maintain effective control of the environmental aspects of the facility.

As part of the ISO14001 Environmental Management System the following procedure have developed in 2009.

Table 17 Environmental Management Procedures

Procedure	Scope
Corrective Action	This procedure applies to all Conditions of the Waste Licence and the procedures detailed in the EMS.
Legal	Details current and proposed legislation for Ireland and Europe as well as any Other requirements Whiteriver subscribes to and ensures that compliance with these are requirements are checked.
Environmental incident and notification	To all incidents listed in No 4 below
Training and awareness	Applies to all personnel whose work is related to the licensed facility.
Document Control	Applies to all documents in relation to Waste Licence.
Communication program	Applies to all personnel whose work is related to the licensed facility.
Environmental Objectives and Targets	Setting of the objectives and targets (O&Ts) will be based on environmental policy and those environmental aspects deemed significant.
Audits	Internal audits will be carried out for all clauses of the standard across all sites under the combined scope of ISO 14001 within LCC.
Management Review	Applies to all aspects of the facility.
Site Records and completion	Applies to all aspects of the facility
Leachate Management	To control leachate levels within the filled waste to prevent the contamination of surface and groundwater and to transport leachate from the facility in a safe

Procedure	Scope
	manner.
Odour Assessment Procedure	: This procedure applies to both the daily site inspection at the eight odour monitoring locations and any once off odour investigations in relation to complaints.
Minimisation of Gas Well Disconnections	All landfill gas extraction wells which are connected to the collection and flaring system are important as they reduce landfill gas build up in the waste mass and reduce the emissions of odorous landfill gases. This procedure applies to all gas wells producing landfill gas in sufficient quantities/concentrations to support combustion. It also applies to the use of landfill gas extraction and flaring to control odorous emissions from future gas extraction wells on-site which do not have sufficient gas concentrations to support combustion.
Waste covering procedure	This procedure applies to both the active face and areas which are intermediately covered.
High winds	This procedure applies to the active tipping area of the landfill.
Moving vehicles on capped areas procedure	To ensure the integrity of finally capped areas.
odour management procedure	To identify all potential sources of odours which could give rise to nuisance complaints and to put in place measures to eliminate/minimise all such sources.
Out of hours	To maximize the hours that the enclosed flare is operational
Sampling of Construction and Demolition Dust Procedure	sample and analyse the CDD and compare it against inert waste standards
Waste Placement Procedure	All waste disposed of at the facility
Emergency response procedures	This procedure applies to all emergency situations which may effect the environment
Wheelwash	This procedure applies to all waste vehicles exiting the facility.
Complaints	Applies to all complaints relating to the operation of the activities at the landfill.

Procedure	Scope
Waste Handling and Acceptance	▪ Household 31,200 ▪ Commercial 20,800 ▪ Industrial non-hazardous Sludges 300 ▪ Industrial non-hazardous Solids 34,700 ▪ Construction and Demolition Waste 5,000 ▪ Waste Imported for restoration purposes 4,000 ▪ Total 96,000 Only the insert wastes listed below are acceptable for recovery at the facility, unless otherwise agreed with the Agency: Acceptable Waste for Recovery Topsoil — Brickwork Subsoil — Natural Sand Stone, Rock and Slate — Concrete Clay, China and Pottery — Solid Road Planning's, Solid — Tarmacadam, Solid Asphalt Waste not accepted at the facility Whole used tyres (other than bicycle tyres and tyres with an outside diameter > 1400mm) (From 16 July 2003). Shredded used tyres (From 16 July 2006). Hazardous wastes, liquid waste or sewage sludge
Environmental Monitoring Report	Apply to all Environmental Monitoring reports in accordance with Schedule E: recording and reporting to the agency. Quarterly Monitoring Report of landfill gas, surface water quality, groundwater quality, leachate, Dust monitoring, Noise monitoring.
Environmental Nuisances	This procedure applies to nuisances caused by litter, vermin, birds, flies, mud, and dust. Please refer to odour management plan regarding odour nuisance.
Site Inspection and recording	To provide a procedure for the inspection of the facility
Site Security	This procedure applies to all staff working at the facility.
Landfill Gas Flare	To minimize landfill gas emissions to atmosphere by flaring the gas.

22.0 REPORTED INCIDENTS AND COMPLAINTS SUMMARIES, CORRESPONDENCE TO/FROM EPA

In total 91 complaints were made in relation to odour and six incidents during the reporting period. The incident are summarised in Table 18. A summary of non-compliances noted during Audits/Landfill Site Inspections undertaken during the reporting period by EPA are given in Table 19.

Table 18 Summary of Incidents Reported During the Reporting Period

Date	Nature of incident	Action Taken
18/06/09	Category 3 Incident. Non-Urgent Environmental Incident. The Trigger Level of 1.5% V/V CO_2 was exceeded in six newly installed Perimeter Piezometers	We believe that the high CO_2 concentrations are due to either naturally occurring levels or due to the disturbance of the ground during the drilling process. None of these monitoring locations are close to areas where waste is deposited. Therefore, we believe that there is no damage, injury or significant risk of exposure to the public or the environment. We propose to monitor these piezometers monthly (as per the licence conditions) for the next three months and should the concentrations not decrease then a case will be made to the Agency for either an increase in the trigger levels or a reduction in the Incident reporting threshold.
31/07/09	Category 3 Incident. Non-Urgent Environmental Incident. The Trigger Level of 1.5% V/V CO_2 was exceeded in ten Perimeter Piezometers	We believe that the high CO_2 concentrations are due to either naturally occurring levels or due to the disturbance of the ground during the drilling process. Therefore, we believe that there is no damage, injury or significant risk of exposure to the public or the environment. We propose to monitor these piezometers monthly (as per the licence conditions) for the next two months and should the concentrations not decrease then a case will be made to the Agency for either an increase in the trigger levels or a reduction in the Incident reporting threshold.
31/08/09	Category 3 Incident. Non-Urgent Environmental Incident. The Trigger Level of 1.5% V/V CO_2 was exceeded in ten Perimeter Piezometers.	We believe that the high CO_2 concentrations are due to either naturally occurring levels or due to the disturbance of the ground during the drilling process. Therefore, we believe that there is no damage, injury or significant risk of exposure to the public or the environment. Monthly monitoring of these piezometers over the last three months has shown a slight decrease in CO_2 concentrations. In July the maximum concentration recorded was 5.1% and in August it was 4.1%. Also PZ49 contained 2.1% in July and has fallen to below the trigger limit at 1.2%. We propose to monitor these piezometers monthly (as per the licence conditions) and should the concentrations not decrease then a case will be made to the Agency for either an increase in the trigger levels or a reduction in the Incident reporting threshold.

Date	Nature of incident	Action Taken
30/09/09	Category 3 Incident.Non-Urgent Environmental Incident. The Trigger Level of 1.5% V/V CO_2 was exceeded in ten Perimeter Piezometers	We believe that the high CO_2 concentrations are due to either naturally occurring levels or due to the disturbance of the ground during the drilling process. Therefore, we believe that there is no damage, injury or significant risk of exposure to the public or the environment. Monthly monitoring of these piezometers, since they have been installed, has shown a degree of flustuations up and down above the CO_2 limit. There does not appear to be any discernable trend emerging in relation to CO_2 concentrations (see attached spreadsheet). We propose to monitor these piezometers monthly (as per the licence conditions) and should the concentrations not decrease then a case will be made to the Agency for either an increase in the trigger levels or a reduction in the Incident reporting threshold for CO_2.
17/08/09	Category 3 Incident.Non-Urgent Environmental Incident. Groundwater Trigger Levels were exceeded during the 2nd Quarter 2009 sampling round.	Groundwater Trigger Levels were exceeded during the 2nd Quarter 2009 sampling round. Propose to continue quarterly sampling and review all results once the database of all results has been updated. If the concentrations do not decrease a case will be made for increasing the trigger limits or reducing the reporting threshold.
25/09/09	Category 3 Incident.Non-Urgent Environmental Incident. Groundwater, Leachate and Dust Deposition limits were exceeded during the 3rd Quarter 2009 sampling round.	Groundwater, Leachate and Dust Deposition limits were exceeded during the 3rd Quarter 2009 sampling round. Propose to continue quarterly sampling and review all results once the database of all results has been updated. If the concentrations do not decrease a case will be made for increasing the trigger limits or reducing the reporting threshold.
12/01/2010	Category 3 Incident.Non-Urgent Environmental Incident. Groundwater Trigger Levels were exceeded during the 4th Quarter 2009 sampling round.	Propose to undertake repeat sampling and continue quarterly sampling and review all results once the database of all results has been updated.

Table 19 Summary of Non Compliances and Audit Observations noted during Audits/Landfill Site Inspections undertaken during the Reporting Period by EPA

Date and Reference	Summary of Inspection Report/Audit	Response
01/04/09 **W0060-02** **/08/AR/06/ts** **Audit Report**	**Audit Observations** 1. AFS 2000 m^3 landfill gas flare unit commissioning programme. 2. Landfill gas flare unit. 3. Flare unit SCADA System 4. Landfill gas collection infrastructure. 5. Leachate Breakout. 6. Odour monitoring report 7. Gantt Chart 8. Leachate Management 9. Waste Flank Slope	Date: 03/07/09 Our Ref: W0060-02/09/11 Response letter in Appendix N.
16/09/09 **W0060-02** **/NC26EM** **Site Inspection**	**Non Compliance** 1. Public use of active tipping area. **Audit Observations** 1. Gas management for side slope risers. 2. Final capping roll out. 3. Landfill gas infrastructure. 4. Landfill gas utilisation. 5. Leachate level monitoring. 6. Landscaping.	Date: 04/01/10 Our Ref: W0060-02/10/001 Response letter in Appendix N.

23.0 REVIEW OF NUISANCE CONTROLS

The facility is inspected daily and weekly for nuisances caused by vermin, birds, flies, dust and odours and written records are made of all inspections and any actions taken. These records provide for the recording of nuisances and description of works carried out to minimise each nuisance as described below.

23.1 DUST CONTROL

In dry weather, site roads and any other areas used by vehicles shall be sprayed with water from a bowser as and when required to minimise airborne dust nuisance. Dust is generally not a problem at the facility. All waste vehicles are required to use the wheel wash prior to exiting the facility. The site road is being resurfaced to further abate dust.

23.2 LITTER

Any waste found around the boundary is removed immediately or by 10.00 a.m. the next working day. Disposal activities are confined to within bunded cells and litter nets have been around entire perimeter of Phase 5 cells 1 and 2. All waste is compacted to reduce the potential sources of litter and wastes are covered daily or as soon as practicable. Litter, which is blown away from the landfilling area, is collected as soon as possible and inspection of the facility and netting is performed on a daily basis.

All vehicles delivering and removing wastes to the facility are checked to ensure that they are appropriately covered.

23.3 BIRDS

In general during the Spring, Summer and Autumn there is no problem on-site from birds scavenging. This is due to the large area of tillage crops in the area and hence the easy availability of food sources. In the Months November – February there are increased numbers of birds trying to feed on the site.

A Pest Control company visit the site twice per week between March and October and fly a falcon, fire bangers, fly a kite, etc. to scare birds off. This is increased to full time from Mid October to Mid Feb during period of increased number of birds.

A Scarecrow bird distress call is also employed on site during operational hours. The operative on the tip face also has a hand held distress caller to scare birds.

23.4 ODOURS

An Odour Management Procedure has been developed for the site as part of the EMS. This procedure lists of all the potential sources of odours at Whiteriver Landfill as follows:

1. Active face where waste is deposited daily
2. Incoming Malodorous freshly deposited wastes
3. Fugitive emissions of landfill gas from uncapped areas
4. Emissions from around active gas extraction well head pipes
5. Emissions from untapped gas extraction pipes
6. Landfill gas flares
7. Disconnection of gas collection pipe work to facilitate works
8. Leachate side slope risers
9. Leachate aeration
10. Public tipping area

The procedure provides the measures put in place to minimise odours and whose responsibility it is to oversee mitigation measures.

24.0 REPORT ON FINANCIAL PROVISIONS MADE UNDER THIS LICENSE, MANAGEMENT AND STAFFING STRUCTURE OF THE FACILITY AND A PROGRAMME FOR PUBLIC INFORMATION

Louth County Council being a local authority is able to provide the necessary finances to ensure the proper management development and restoration of Whiteriver Landfill Site.

The 2009 gate charge at the facility were:

- €125.00 tonne Public
- €90.00 tonne Bulk Commercial

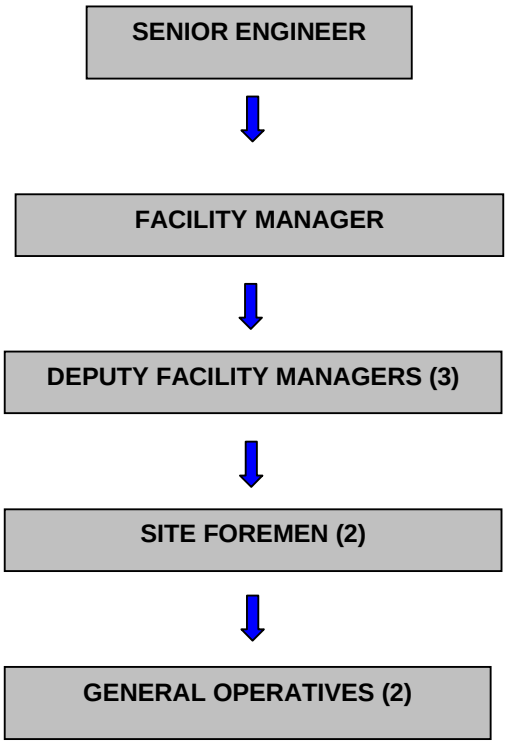
is in accordance with the requirements of SI 337 of the 2002 European Communities Amendment of Waste Management (Licensing) Regulations 2000) Regulation, 2002.

Overall responsibility for the ongoing operations and development of the landfill site is held by a Senior Engineer assigned to the Environmental Section of Louth County Council. A Facility Manager and three Deputy Facility Managers are currently assigned to the site. The Landfill Foreman oversees the day to day running of the landfill site and is assisted by two General Operatives.

As part of the ISO14001 Environmental Management System a communication programme in accordance with the Conditions of the waste licence is provided to ensure that members of the public can obtain information concerning the environmental performance of the facility at all reasonable times.

Management Structure at Whiteriver Landfill site is as follows. This is the present status although it may be changed at a future stage.

MANAGEMENT STRUCTURE AT WHITERIVER LANDFILL SITE



25.0 REPORT ON TRAINING OF STAFF

Members of staff have completed training in the operation of the newly installed 2000 m^3 flare at Whiteriver.

APPENDIX A

DRAWINGS

LEGEND

POINT NO. 207 × 7.674 SH — POINT ELEVATION (m AD); POINT DESCRIPTION (SEE LIST OF ANNOTATIONS)

ANNOTATIONS

BASE	Control Base for GPS Survey Unit
BOB	Bottom of Embankment
BOC	Bottom of Concrete Embankment/Surface
CONC	Spot Height on Concrete Platform
DPKB	Dropped Kerbline
KB	Kerbline
MH	Manhole
OUTLET	Spot Height at Outlet of Pipe (Crown Level)
PIPE	Spot Height on Pipe (Crown Level & Centreline)
SH	Spot Height
STN	Survey Station
TOB	Top of Embankment
TOC	Top of Concrete Embankment/Surface
VERGE	Verge Line

- Bottom of Embankment
- Bottom of Concrete Embankment/Surface
- Concrete Platform
- Contour Line
- Kerbline
- Fence Line
- Centrelline of Pipe
- Top of Embankment
- Top of Concrete Embankment/Surface
- Verge Line
- Container
- Klosk
- Survey Station
- Manhole
- Vent Pipe

N

COORDINATE
SURVEYING & ENGINEERING SOLUTIONS

Tel: 028 87746116 e: Info@coordinatesurveys.com
Fax: 028 87747475 Web: www.coordinatesurveys.com

1 Annagher Road, Coalisland,
Dungannon, Co. Tyrone,
BT71 4NE

Project:

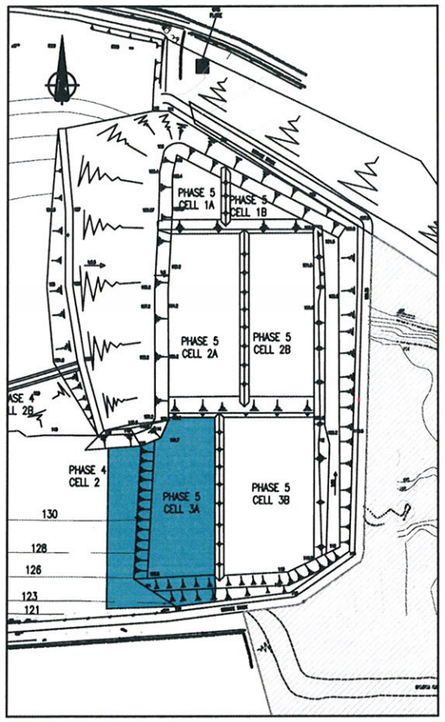
Topographical Survey of Area at
Whiteriver Landfill Site, Co. Louth

Client: RPS Consulting Engineers

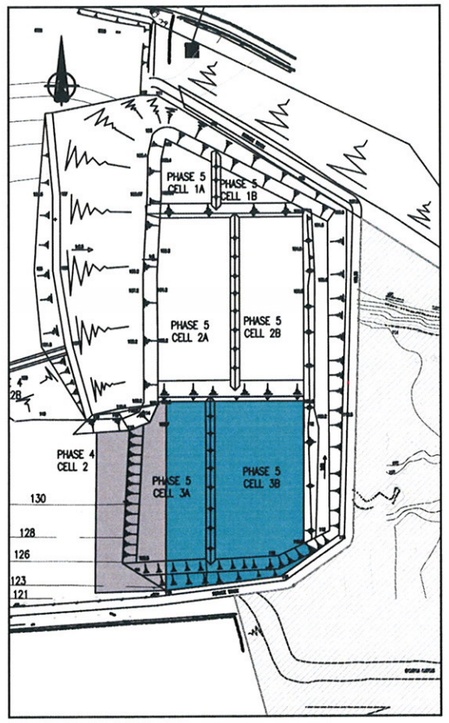
Drawing Title:

Site Topographical Layout Plan (Revision A)

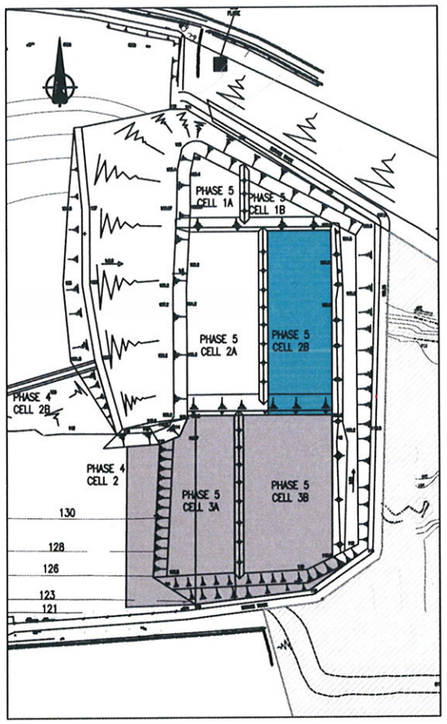
Drawing No:	Scale:
1899 - 101 (Rev A)	1:500 @ A1
Date:	Drawn by:
June 2009	Aidan Shields



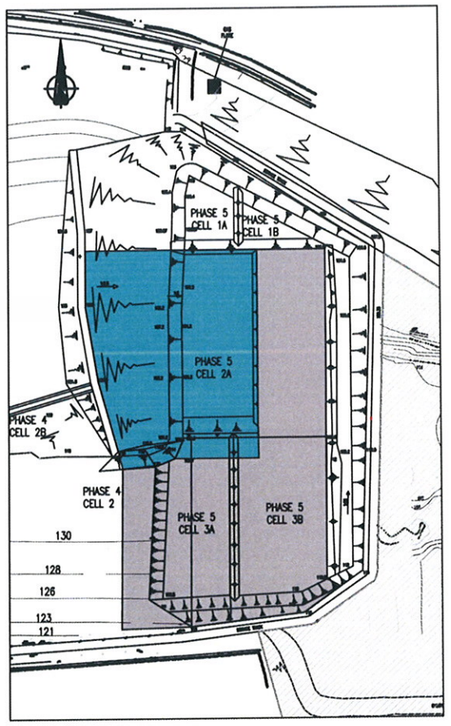
YEAR 1



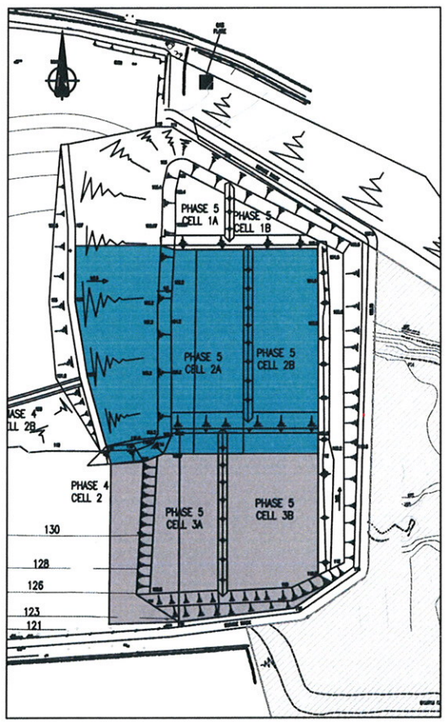
YEAR 2



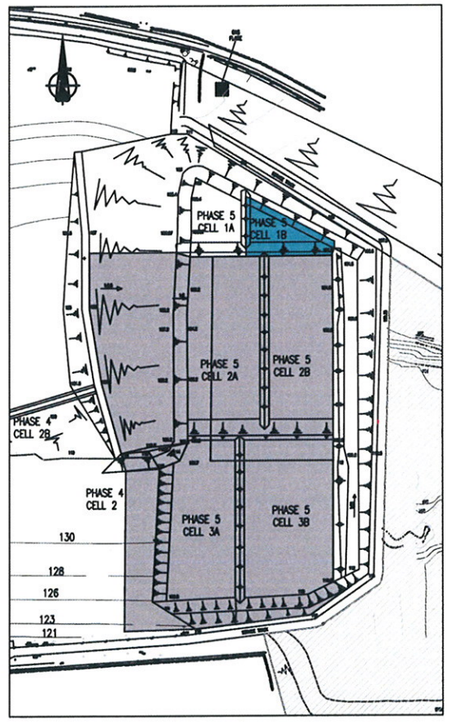
YEAR 3 INITIAL FILLING



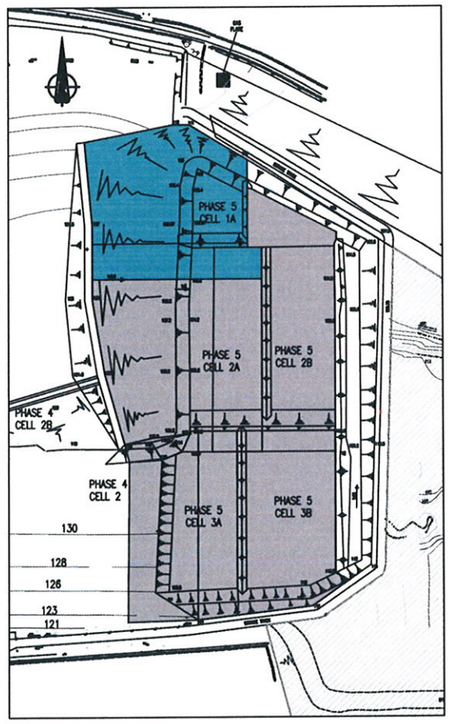
YEAR 3



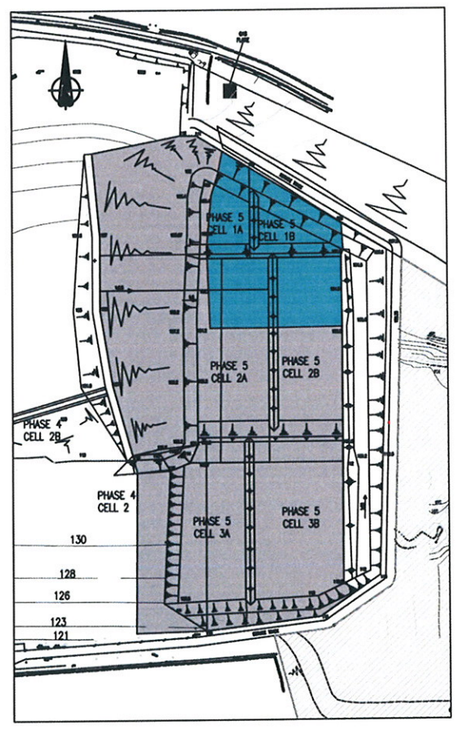
YEAR 4



YEAR 5 INITIAL FILLING



YEAR 5



YEAR 6

100mm

100mm

NOTES

1. VERIFYING DIMENSIONS. THE CONTRACTOR SHALL VERIFY DIMENSIONS AGAINST SUCH OTHER DRAWINGS OR SITE CONDITIONS AS PERTAIN TO THIS PART OF THE WORK.
2. SERVICES. APPROVED OPENINGS FOR SERVICES THROUGH THE STRUCTURE ARE INCORPORATED ON THE DRAWINGS. ANY ADDITIONAL OPENINGS OF A MINOR NATURE REQUIRED BY THE MAIN CONTRACTOR OR HIS SUBCONTRACTORS MUST BE SUBMITTED ON A DRAWING FOR APPROVAL BEFORE WORK COMMENCES.
3. DATUM
4. KEY:
   - AREA OF ACTIVE FILLING
   - AREA OF PREVIOUS FILLING

REV	DESCRIPTION	BY DATE	CHECK DATE
A	ORDER OF CELL FILLING AMENDED	P.McM. DEC 08	H.H. DEC 08

DRAWN BY P.McM. DATE MAY 07	CHECK BY H.H. DATE MAY 07	APPROVED DATE
PLOT SCALE N.T.S.	SCHEDULES	SHEET SIZE A3

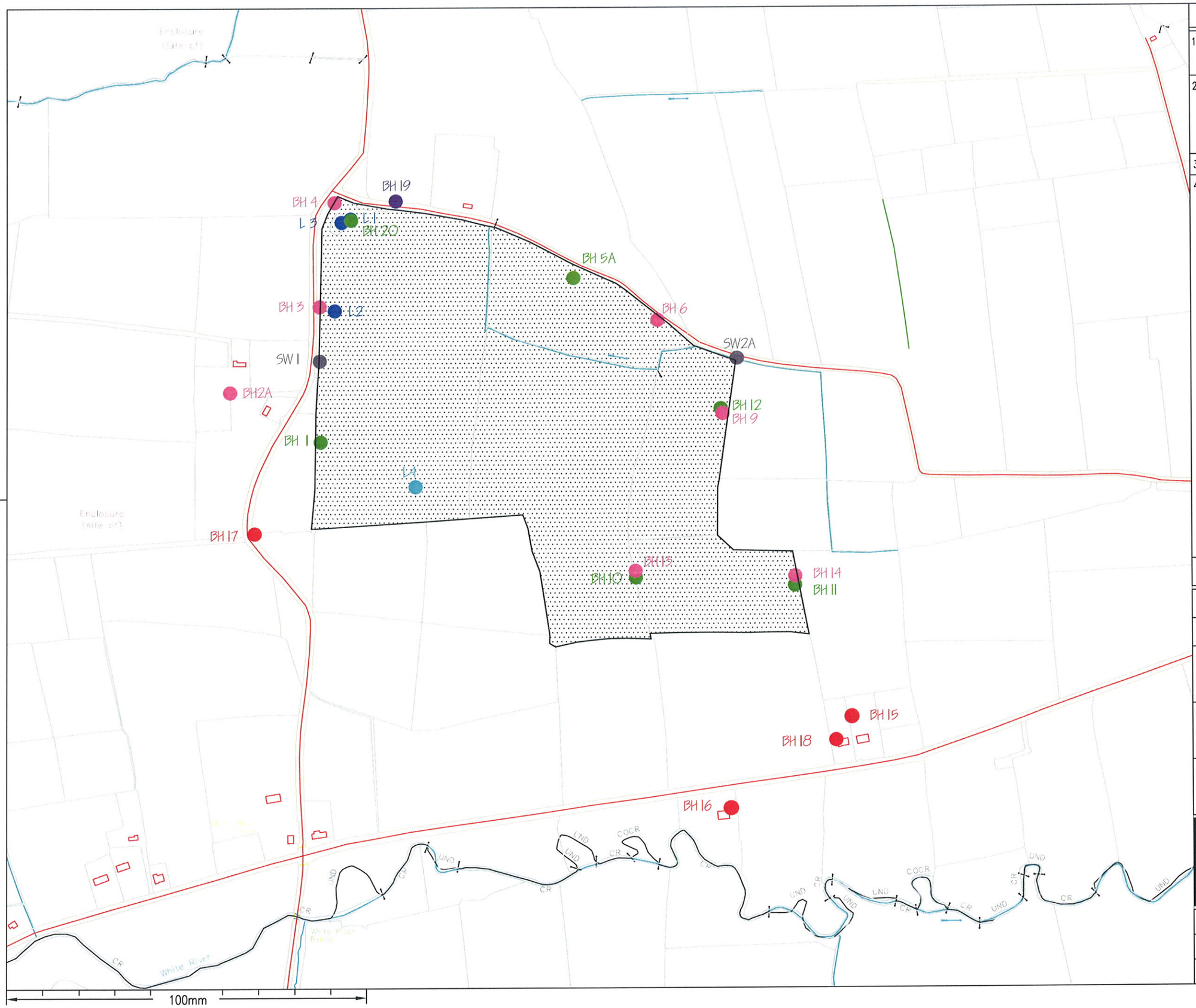
CLIENT
LOUTH COUNTY COUNCIL

PROJECT
WHITERIVER PHASE V

TITLE
FILLNG PLAN

RPS Consulting Engineers
ELMWOOD HOUSE
74 BOUCHER ROAD
BELFAST BT12 6RZ
TEL: 028 9066 7914
FAX: 028 9066 8286
www.rpsgroup.com/nireland

		DWG. STATUS
ARCHITECT		PRELIM. ●
DRAWING No.	BL542925/610	TENDER
REVISION	A	CONST.
		RECORD



NOTES

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2. SERVICES. APPROVED OPENINGS FOR SERVICES THROUGH THE STRUCTURE ARE INCORPORATED ON THE DRAWINGS. ANY ADDITIONAL OPENINGS OF A MINOR NATURE REQUIRED BY THE MAIN CONTRACTOR OR HIS SUBCONTRACTORS MUST BE SUBMITTED ON A DRAWING FOR APPROVAL BEFORE WORK COMMENCES.
3. DATUM
4. KEY

- BH15 Groundwater well (Domestic)
- BH1 Groundwater monitoring boreholes (Overbunden)
- BH4 Groundwater monitoring boreholes (Bedrock)
- SW1 Surfacewater monitoring location points
- L1 Leachate monitoring points
- L4 Leachate active cell sampling point
- BH19 Agricultural water supply

REV	DESCRIPTION	BY DATE	CHECK DATE
B	Renamed L2, L3 and BH5A	RP	AMcG
A	Boreholes locations and type corrected, new borehole added	RP	AMcG

DRAWN BY RP DATE NOV '06	CHECK BY AMcG DATE NOV '06	APPROVED D.D DATE NOV '06
PLOT SCALE 1:5000	SCHEDULES	SHEET SIZE A3

CLIENT
LOUTH COUNTY COUNCIL

PROJECT
WHITERIVER LANDFILL SITE

TITLE
MONITORING BOREHOLES

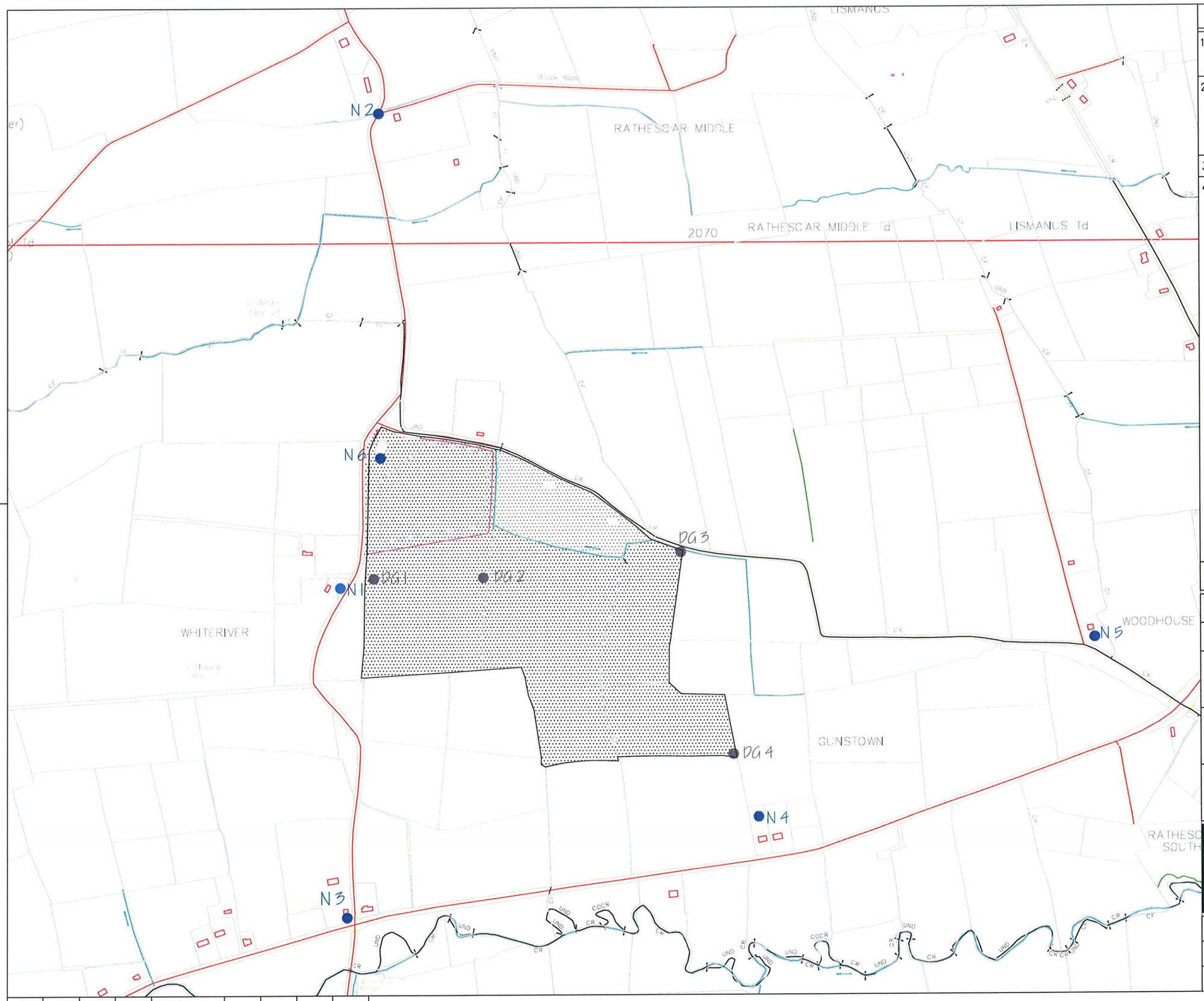
RPS Consulting Engineers
TEL: 074 91 61927 www.rpsgroup.com/Ireland FAX: 074 91 61928
THE ENTERPRISE FUND BUSINESS CENTRE, BALLYRAINE, LETTERKENNY, Co. DONEGAL

ARCHITECT

DRAWING No. IBL0069/101

REVISION A B

DWG. STATUS	
PRELIM.	
TENDER	
CONST.	
RECORD	●



NOTES

1. VERIFYING DIMENSIONS. THE CONTRACTOR SHALL VERIFY DIMENSIONS AGAINST SUCH OTHER DRAWINGS OR SITE CONDITIONS AS PERTAIN TO THIS PART OF THE WORK.
2. SERVICES. APPROVED OPENINGS FOR SERVICES THROUGH THE STRUCTURE ARE INCORPORATED ON THE DRAWINGS. ANY ADDITIONAL OPENINGS OF A MINOR NATURE REQUIRED BY THE MAIN CONTRACTOR OR HIS SUBCONTRACTORS MUST BE SUBMITTED ON A DRAWING FOR APPROVAL BEFORE WORK COMMENCES.
3. DATUM
4. KEY

- Noise monitoring location points
- Dust guage locations

REV	DESCRIPTION	BY DATE	CHECK DATE

DRAWN BY RP DATE NOV '06	CHECK BY AMcG DATE NOV '06	APPROVED D.D DATE NOV '06
PLOT SCALE 1:7500	SCHEDULES	SHEET SIZE A3

CLIENT
LOUTH COUNTY COUNCIL

PROJECT
WHITERIVER LANDFILL SITE

TITLE
NOISE & DUST MONITORING LOCATIONS

RPS Consulting Engineers
TEL: 074 91 61927 www.rpsgroup.com/Ireland FAX: 074 91 61928
THE ENTERPRISE FUND BUSINESS CENTRE, BALLYRAINE, LETTERKENNY, Co. DONEGAL

		DWG. STATUS	
ARCHITECT		PRELIM.	
DRAWING No.	IBL0069/102	TENDER	
REVISION	A	CONST.	
		RECORD	●

NOTES

1. Verifying Dimensions.
   The contractor shall verify dimensions against such other drawings or site conditions as pertain to this part of the work.

2. Existing Services.
   Any information concerning the location of existing services indicated on this drawing is intended for general guidance only. It shall be the responsibility of the contractor to determine and verify the exact horizontal and vertical alignment of all cables, pipes, etc. (both underground and overhead) before work commences.

3. Issue of Drawings.
   Hard copies, dwf and pdf will form a controlled issue of the drawing. All other formats (dwg, dxf etc.) are deemed to be an uncontrolled issue and any work carried out based on these files is at the recipients own risk. RPS will not accept any responsibility for any errors arising from the use of these files, either by human error by the recipient, listing of un-dimensioned measurements, compatibility issues with the recipient's software, and any errors arising when these files are used to aid the recipients drawing production, or setting out on site.

4. DATUM:

5. KEYS

PZ27 Landfill Gas Piezometer

rev	amendments	drawn date	checked date

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F +353 74 9161928
W www.rpsgroup.com/ireland
E ireland@rpsgroup.com

Client: LOUTH COUNTY COUNCIL

Project: Whiteriver Landfill Site

Title: Landfill Gas Piezometer

Architect:

Drawing Status	Sheet Size	Drawing Scale
Preliminary	A3	1:2500

Drawing Number	Rev
IBR0138/100	0

Drawn By / Date		Checked By / Date		Approved By / Date	
AMB	Mar '10	AMcG	Mar '10	DD	Mar '10

APPENDIX B

LEACHATE RESULTS

	Whiteriver Landfill Site																	
	LEACHATE QUALITY RESULTS																	
PARAMETERS	RESULTS																	
Monitoring Point:		Raw Leachate 1																
		Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date
	Units	11-Jan-06	04-Apr-06	11-Jul-06	10-Oct-06	23-Jan-07	19-Apr-07	03-Jul-07	11-Oct-07	15-Jan-08	08-Apr-08	01-Jul-08	07-Oct-08	13-Jan-09	21-Apr-09	14-Jul-09	06-Oct-09	
Alkalinity	mg/lCaCO3																	
Ammonia	mg/l N	445.97	418.92	923.19	391.32	256.91	593.6	452.92	762.55	418.92	562.85	838.62	557.3	680.81	606.44	652.35	0.21	
Barium	µg/l																	
B.O.D.	mg/l O2	38.2	104	102.4	57	<40	66.1		44.7	33	<40.0	<100	188.8	<40	6588.8	45.6	116	
Boron	µg/l		6443.4				7765				5161.4				47.2			
Cadmium	µg/l		0.2				0.3				<2				<1			
Calcium	mg/l Ca		164.98				143.52				165.6				144.15			
C.O.D.	mg/l O2	692	948	1373	684	487	928	580	877	548	1064	1415	940	1090	986	998	1126	
Chloride	mg/l Cl	581	700	1198	576	345	792	637	875	570	734	1317	902	893	887	893	853	
Chromium	µg/l		49.8				72.7				104.4				64.7			
Conductivity	µS/cm @ 25	6855	8180	12275	7220	5070	9040	7430	9340	6890	8800	12360	9020	9670	9710	9640	9400	
Copper	mg/l		<0.05				<0.05				<0.05				46.3			
Cyanide	mg/l		15.2				19.3				45.4				<0.05			
Depth	m																	
D.O.	% Saturation		<0.150				<0.150				0.4							
Faecal coliforms	no/100ml																	
Fluoride	mg/l														0.6			
Iron	µg/l	12818.1	12328	12676.5	10466.6	16969	8982.9	5945.5	7541.8	8868.3	9616.8	10775.2	8311	25277.7	5584.5	16442.4		
Lead	µg/l		6.7				4.7				50.6				<10			
Magnesium	mg/l Mg		109.97				121.64				123.8				119.21			
Manganese	µg/l		1003.4				926.5				1200.6				856.7			
Mercury	µg/l		0.8				2.1				0.1				0.2			
Nickel	µg/l		82				142.8				84.2				90.3			
Ortho-Phosphate	mg/l P		2.8				1.88				2.11				2.34			
pH		7.4	7.3	7.5	7.2	7.2	7.2	7.3	7.3	7.2	7.4	7.4	7.4	7.3	7.5	7.3	7.2	
Potassium	mg/l	318.66	384.43	676.59	317.04	204.54	430.16	329.35	429.82	305.81	424.6	570.96	429.71	445.98	385.92	448.46		
Residue on evaporation																		
Sodium	mg/l	439.7	571.99	1059.5	478.45	344.52	678.94	508.9	688.02	529.57	819.6	974.56	770.54	713.85	696.94	652.47		
Sulphate	mg/l SO4		61.8				22.3				58.6				15.1			
Suspended Solids	mg/l													65				
Temp	°C	8.4	13	10	10	9.3	9.45	9.55	9.45	9.2	9.15	nt	10.5	5	11	16	12	
Time				17	15	5	21	19	16	10	12	nm	13	9.5	9.3		12.15	
Total coliforms	no/100ml	9.3																
T.O.C.	mg/l																	
T.O.N	mg/l N	1.16	<0.05	0.26	0.61	0.51	1.35	5.28	4.29	1.96	2.39	4.21	2.46	<0.08	<0.08	<0.08	<0.08	
Total Suspended Solids	mg/l	75		95	80	115		53	58	75		72	440			80	250	
Zinc	µg/l		2327.2				649.8				2814.6				1377.7			

	Whiteriver Landfill Site																	
	LEACHATE QUALITY RESULTS																	
PARAMETERS	RESULTS																	
Monitoring Point:		Raw Leachate 2																
		Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date
	Units	11-Jan-06	04-Apr-06	11-Jul-06	10-Oct-06	23-Jan-07	19-Apr-07	03-Jul-07	11-Oct-07	15-Jan-08	08-Apr-08	01-Jul-08	07-Oct-08	13-Jan-09	21-Apr-09	14-Jul-09	06-Oct-09
Alkalinity	mg/lCaCO3																	
Ammonia	mg/l N	949.23	403.09	64.39	328.75	365.28	1200	943.03	1181.26	1350.46	1265.48	1032.46	606.97	624.23	820.72	350.71	<0.03
Barium	µg/l																	
B.O.D.	mg/l O2	411.6	539	93.3	1179	187.5	282			<250	<100	<1000	1614	60.5	4970.8	29.3	<100
Boron	µg/l		3685.2				7360.7		216.8		6100.2				101		
Cadmium	µg/l		0.6				<2				<2				<1		
Calcium	mg/l Ca		283.91				155.1				103.6				126.06		
C.O.D.	mg/l O2	2478	1815	317	1352	1466	3030	2120	3570	3690	2720	2820	2790	1299	1950	641	2255
Chloride	mg/l Cl	1578	1172	160	807	835	2004	1656	2168	1990	1881	2160	1356	1091	1625	665	1586
Chromium	µg/l		122.9				533				492.2				218.6		
Conductivity	µS/cm @ 25	14590	9740	2320	8720	8030	17030	14490	19060	17320	16680	16360	10980	9620	13180	6240	12690
Copper	mg/l		<0.05				<0.05				<0.05				24.3		
Cyanide	mg/l		59.3				23.8				118.8				0.06		
Depth	m																
D.O.	% Saturation		<0.150				<0.150				<0.150						
Faecal coliforms	no/100ml																
Fluoride	mg/l														0.42		
Iron	µg/l	4223.2	3228.1	6994.1	5556.3	2506.4	2883.9	1181.2	1216.5	4604.9	3696	4772.4	3186	8963.1	3611.5	2129.1	
Lead	µg/l		15.3				<20				21.8				9.3		
Magnesium	mg/l Mg		160.68				121.8				109.8				88.11		
Manganese	µg/l		1174.8				1263.1				827.2				632.4		
Mercury	µg/l		0.7				2.8				0.9				0.9		
Nickel			158.7				297.5				334.2				202		
Ortho-Phosphate	mg/l P		1.34				7.94				8.61				5.5		
pH		7.5	7.4	6.8	7.1	7.5	7.4	7.4	7.6	7.6	7.6	8	7.2	7.4	7.8	7.3	7.7
Potassium	mg/l	674.07	404.86	55.4	282.16	302.18	720.67	536.35	734.76	737.86	775	612.8	396.9	337.25	447.81	204.85	
Residue on evaporation																	
Sodium	mg/l	1330.02	949.45	151.92	663.09	815.99	>50	>500	>1000	1779.78	1969.2	1712.2	1112.03	798.17	1198.22	523.8	
Sulphate	mg/l SO4		48.2				41.8				29.5				204.8		
Suspended Solids	mg/l													60			
Temp	°C	8.5	14.1	10.1	10.05	9.4	9.5	10	9.50	9.3	9.15	9.31	10.5	5	11	17	12
Time				18	15	9	21	19	16	11	12	16	13	10	9.3		10.15
Total/ Bacteria coliforms	no/100ml	9.4															
T.O.C.	mg/l																
T.O.N	mg/l N	0.15	0.16	<0.05	0.07	0.13	0.13	0.11	<0.05	0.4	0.16	3.25	0.15	0.16	5.93	2.85	0.23
Total Suspended Solids	mg/l	270		80	170	190		543	265	240		113	309			15	130
Zinc	µg/l		613.6				350.3				2077				1254.8		

Whiteriver Landfill Site

LEACHATE QUALITY RESULTS

RESULTS

PARAMETERS																	
Monitoring Point:		Treated leachate															
		Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date
	Units	11-Jan-06	04-Apr-06	11-Jul-06	10-Oct-06	23-Jan-07	19-Apr-07	03-Jul-07	11-Oct-07	15-Jan-08	08-Apr-08	01-Jul-08	07-Oct-08	13-Jan-09	21-Apr-09	14-Jul-09	06-Oct-09
Alkalinity	mg/lCaCO3																
Ammonia	mg/l N	475.3	323.99	584.67	313.34	258.55	584.16	451.17	996.26	360.68	563.89	367.96	437.56	533.09	433.63	248.87	0.66
Barium	µg/l																
B.O.D.	mg/l O2	29.6	154	264.4	306	<50	60.4		56.1	48.2	<40.0	<50	288	32.7	<30.0	32.4	71
Boron	µg/l		4594.5				7070.1				4799.8				3063.8		
Cadmium	µg/l		<0.10				<2				<2				0.2		
Calcium	mg/l Ca		124.09				133.59				138				95.17		
C.O.D.	mg/l O2	903	1119	1287	1267	681	1300	1050	1940	640	1113	924	1280	1016	833	449	1056
Chloride	mg/l Cl	775	879	1132	715	429	1022	712	1437	628	1173	897	1082	1042	878	489	954
Chromium	µg/l		68.8				225.9				140.6				86.6		
Conductivity	µS/cm @ 25	7590	9820	10320	6890	5105	9760	8030	13050	6060	9300	6750	8000	8620	6950	4360	7570
Copper	µg/l		16.3				<20				29.4				16.6		
Cyanide	mg/l		<0.05				<0.05				<0.05				<0.05		
Depth	mg/l																
D.O.	% Saturation																
Faecal coliforms	no/100ml																
Fluoride	mg/l		<0.150				<0.150				0.34				0.21		
Iron	µg/l	8390	5248.2	6609	3695.7	4101.9	6021.5	2977.8	6937.6	4466.3	4906.2	2656.4		7486.8	2938.6	1707	
Lead	µg/l		8.6				<20				<20				4.9		
Magnesium	mg/l Mg		117.39				127.26				112.4				77.37		
Manganese	µg/l		331.7				904.6				1058.4				388.7		
Mercury	µg/l		101				141.8				117.8				0.2		
Nickel	µg/l		0.6				2.7				0.2				95.9		
Ortho-Phosphate	mg/l P		0.23				2.29				2.51				1.75		
pH		8.1	7.4	8.6	8.2	8.2	8.5	8.4	8.5	8.3	8.6	8.7	8.3	8.6	8.7	8.2	8.6
Potassium	mg/l	383.68	356.67	619.11	323.52	207.14	494.44	349.93	605.65	239.93	452.6	278		351.56	259.95	150.15	
Residue on evaporation		636.34	667.31	1242.7	635.43	434.53	1101.67	>500	>1000		1080						
Sodium	mg/l									596.51		676.4		739.35	671.23	348.5	
Sulphate	mg/l SO4								126.2	227.5		241		226.4	123.3	405.5	125.1
Suspended Solids	mg/l	90.2	164.7				82.9				170.2		141.7	70			
Temp	°C	8	13.5	19	15	8	14	20	18	12	11	nm	13	7	17	19	13
Time				13.15	12.45	13.4	13.3	13.1	13.55	13.3	13.45	nt	13.3	11.45	12.15		12.3
Total coliforms	no/100ml																
T.O.C.	mg/l	14.1															
T.O.N	mg/l N	0.56	0.13	22.09	0.2	0.13	0.72	26.67	65.95	0.64	0.76	14.24	0.1	0.73	1.79	0.53	28.45
Total Suspended Solids	mg/l	300		265	560	250		180	300	627		275	410			40	330
Zinc	µg/l		168.2				144.4				1009.2				89.3		

Whiteriver Landfill Site

LEACHATE QUALITY RESULTS

PARAMETERS		Leachate at active cell															
Monitoring Point:					P4,Cell 2	P4,Cell 2	P4,Cell 2	P4,Cell 2	P4,Cell 2	P5, Cell 3A	P5, Cell 3A	P5, Cell 3B	P5, Cell 3B	Tip Face	Tip Face	Tip Face	Tip Face
		Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date
	Units	11-Jan-06	04-Apr-06	11-Jul-06	10-Oct-06	23-Jan-07	19-Apr-07	03-Jul-07	11-Oct-07	15-Jan-08	08-Apr-08	01-Jul-08	07-Oct-08	13-Jan-09	21-Apr-09	14-Jul-09	06-Oct-09
Alkalinity	mg/lCaCO3																
Ammonia	mg/l N	325.61	352.28	7.45	265.26	303.64	638.47	919.62	828.65	39.24	87.4	54.08	124.41	531.08	684.35	1.2	378.78
Barium	µg/l																
B.O.D.	mg/l O2	788.4	535	>87	4752	568	191.8		157.5	1760	316.8	33.9	1840	251	6152.1	21.8	3070
Boron	µg/l		3957.7				5223.8				935.5				<40.0		
Cadmium	µg/l		0.2				<2				<0.10				<0.1		
Calcium	mg/l Ca		148.67				229.88				647.74				135.5		
C.O.D.	mg/l O2	2208	1911	198	5992	>1500	1917	2780	3240	3390	1710	256	2595	1680	979	78	3320
Chloride	mg/l Cl	1103	1240	1301	667	779	1449	1596	2039	415	474	314	598	1421	911	28	1669
Chromium	µg/l		135.8				261.8				37.6				63.6		
Conductivity	µS/cm @ 25	8760	9380	1423	8340	7250	11940	14170	16471	5350	5140	2960	5800	10860	9740	541	10230
Copper	µg/l		35.7				<20				12.1				39.6		
Cyanide	mg/l		<0.05				<0.05				<0.05				0.06		
Depth	mg/l																
D.O.	% Saturation																
Faecal coliforms	no/100ml																
Fluoride	mg/l		<0.150				0.54				<0.150				0.47		
Iron	µg/l	5116.5	2720.3	11847.9	10125.7	9114.2	2010.5	1288.1	1788.2	2493.9	11249.1	1983.8	8774.4	8846.6	4580.5	503.1	
Lead	µg/l		7.9				<20				8.6				<1		
Magnesium	mg/l Mg		170.92				137.81				120.11				113.15		
Manganese	µg/l		584.1				1247.6				8795.1				835.4		
Mercury	µg/l		153.1				212.6				40.6				0.2		
Nickel	µg/l		0.7				3				<0.10				88.5		
Ortho-Phosphate	mg/l P		0.74				3.58				0.2				1.69		
pH		7.4	7.6	6.5	6.6	7.5	7.1	7.3	7.4	6.5	6.8	6.8	6.6	7.2	7.4	7.5	7
Potassium	mg/l	376.84	404.15	<20	234	286	486.99	538.15	579.52	60.04	96.22	51.6	148.17	390.06	385.12	7.02	
Residue on evaporation		953.84	1033.23	55.19	495.83	733.5	1343.49	>500			342.31						
Sodium	mg/l								>1000	338.07		203.8	455.44	1014.21	719.63	16.98	
Sulphate	mg/l SO4														18.8		
Suspended Solids	mg/l		89.3				117.3				3.5			650			
Temp	°C	8	21	19	nm	26	28	27	29	11	18	18	19	18	18	17	12
Time				12	13.05	12.55	12.2	11.4	11.30	9.45	13.4	12.31	13.3	12.3	12.3		12.2
Total/ Bacteria coliforms	no/100ml																
T.O.C.	mg/l	10.15															
T.O.N	mg/l N	0.1	0.29	<0.05	0.07	0.14	0.2	0.1	0.06	0.09	<0.05	<0.05	0.24	<0.08	0.08	<0.08	<0.08
Total Suspended Solids	mg/l	245		32	280	300		775		82		21	313			15	717
Zinc	µg/l		303.7				357.6		305		158.5				256.8		

APPENDIX C

GROUNDWATER MONITORING RESULTS

		Whiteriver Landfill Site			
PARAMETERS	UNITS	Whiteriver Trigger Limits (WTL)	EC (Drinking water) Regulations 2007 (SI .no 78 of 2007) (DWR)	EPA Interim guideline values (IGV)	EC (Quality of Surface Water Intended for the Abstraction of Drinking Water) Regulations 1989 Surface Water Quality
Alkalinity	mg/l CaCO3			No abnormal change	
Aluminium	µg/l		200	200	
Ammonia	mg/l N	0.2	0.3	0.15	(A1- 0.2) (A2- 1.5) (A3- 4)
Barium	mg/l			0.1	(A1- 0.1) (A2- 1)
B.O.D.	mg/l				(A1- 5) (A2- 5) (A3- 7)
Boron	µg/l	1000	1000	1000	2000
Cadmium	µg/l	5	5	5	5
Calcium	mg/l Ca	200		200	
C.O.D.	mg/l				40
Chloride	mg/l Cl	20	250	30	250
Chromium	µg/l	30	50	30	50
Conductivity	µS/cm @20	800	2500	1000	1000
Copper	µg/l	30	2000	30	(A1- 50) (A2- 100) (A3- 1000)
Cyanide	mg/l	0.01	0.05	0.01	0.05
Depth	m	/	/	/	/
D.O	% Sat			No abnormal change	(A1- >60%), (A2- >50%), (A3- >30%)
Faecal Coliform	No/100 ml		0	0	(A1- 1000) (A2- 5000) (A3- 40000)
Fluoride	mg/l	1	0.8	1	(A1- 1) (A2- 1.7)
Iron	µg/l		200	200	(A1- 200) (A2-2000)
Lead	µg/l	10	25	10	50
Magnesium	mg/l Mg	50		50	
Manganese	µg/l		50	50	(A1- 50) (A2- 300) (A3- 1000)
Mercury	µg/l	1	1	1	1
Nickel	µg/l	20	20	20	
o-Phosphate	mg/l P	0.03		0.03	
pH		>7 or <8	6.5 - 9.5	6.5 - 9.5	(A1- 5.5-8.5) (A2- 5.5-9.0)
Phenol	mg/l			0.0005	(A1- 0.0005) (A2- 0.005) (A3- 0.1)
Potassium	mg/l	5		5	
Sodium	mg/l	150	200	150	
Sulphate	mg/l SO4	50	250	200	200
Total Dissolved Solids	mg/l			1000	
Temperature	degrees C			25	25
Total Coliform	No/100 ml		0	0	(A1- 5000) (A2- 25000) (A3- 10000)
T.O.C.	mg/l	10	No abnormal change	No abnormal change	
T.O.N	mg/l N			No abnormal change	
Nitrate	mg/l		50	25	Nitrates 50
Nitrite	mg/l		0.5	0.1	
Nitrites	mg/l		0.1		
Total S Solids	mg/l				50
Zinc	µg/l	100		100	(A1- 3000) (A2- 5000)

	Whiteriver Landfill Site																		
PARAMETERS	**GROUNDWATER QUALITY**																		
	RESULTS																		
Monitoring Point:	**BH1**																		
	UPSTREAM OVERBURDEN																		
		Trigger Level	**DWR 2007**	**Date**	**Date**	**Date**	**Date**	**Date**	**Date**	**Date**	**Date**	**Date**	**Date**	**Date**	**Date**	**Date**	**Date**	**Date**	**Date**
	Units			05-Oct-05	04-Apr-06	11-Jul-06	10-Oct-06	23-Jan-07	19-Apr-07	03-Jul-07	11-Oct-07	15-Jan-08	08-Apr-08	01-Jul-08	07-Oct-08	13-Jan-09	21-Apr-09	14-Jul-09	06-Oct-09
Alkalinity	mg/lCaCO3	NAC	0.2		266				280				258				216		
Ammonia	mg/l N	0.2	0.3	0.1	0.03	0.05	0.06	0.04	0.08	0.03	0.06	0.04	0.04	0.03	0.05	<0.03	0.03	<0.03	0.09
Barium																			
B.O.D.	mg/l O2																<50		
Boron	µg/l	1000	1000		<50				<50				<50						
Cadmium	µg/l	5	5		<0.10				<0.10				<0.10				<0.1		
Calcium	mg/l Ca	200			107.79				98.64				114.25				101.49		
C.O.D.	mg/l O2																		
Chloride	mg/l Cl	20	250	48	42	45	47	36	51	55	38	31	51	52	39	28	31	33	27
Chromium	µg/l	30	50		<1				<1				<1				6.2		
Conductivity	µS/cm @ 25	800	2500	701	686	705	690	665	688	678	652	650	683	680	651	650	647	646	636
Copper	µg/l	30	2000		3				3.8								2.3		
Cyanide		0.01	0.05		<0.05				<0.05				<0.05				<0.05		
Depth	m		/	7.5	6.6	6.9	7	6.4	6.7	6.6	6.9	6.3		6.9	6.8	6.8	6.9	6.8	6.8
D.O.	% Saturation			17	47	47	50	45	42	47	51	29	41	27	42	10	51	50	44
Faecal coliforms	no/100ml		0										0	0	39	19	0		
Fluoride	mg/l	1	0.8		<0.150				<0.150				<0.150				<0.150		
Iron	µg/l		200		428.2				1029.2				371.3				572.7		
Lead	µg/l	10	25		<1				2.5				<1				2		
Magnesium	mg/l Mg	50			10.33				9.79				8.93				10.11		
Manganese	µg/l		50		52.1				78.8				34.4				64.3		
Mercury	µg/l	1	1		<0.10				<0.10				<0.10				<0.1		
Nickel	µg/l	20	20		2.3				8.6				<1				2.7		
Ortho-Phosphate	mg/l P	0.03			0.02				0.02				<0.02				0.05		
pH		>7 or <8	6.5 - 9.5	7.4	7.2	7.4	7.3	7.3	7.1	7.3	7.3	7.2	7.3	7.4	7.3	7.3	7.2	7.2	7.4
Potassium	mg/l	5			0.53				<1				<1				<1		
Residue on evap	mg/l				441				526				484				545		
Sodium	mg/l	150	200		17.88				21.66				21.55				23.43		
Sulphate		50	250		30.8				28				29.2				22.6		
Suspended Solids	mg/l																		
Temp	°C			11.6	9.3	10	11	9	12	13.2	13	11	10	10.4	11	10.3	11	11	11
Time						11	11.15	11.45	12.15	10.15	13.00	12	12.15	12.05	13.1	12.4	12.15		12.1
Bacterial/Total Coliforms	No/ml		0										1	16	1986	411	1		
T.O.C.	mg/l	10	NAC	3.2	2.6	3.3	2.7	2.2	1.8	1.7	2.8	3.3	3	2.2	16.2	4.5	2.2	3.4	4
T.O.N	mg/l N				1.16				0.91				1.17				1.82		
Total Suspended Solids	mg/l																		
Zinc	µg/l	100			17				15.6				3.3				8.7		

	Whiteriver Landfill Site																	
PARAMETERS	GROUNDWATER QUALITY																	
	RESULTS																	
Monitoring Point:	BH2A																	
	UPSTREAM BEDROCK CRAWLEYS PRIVATE WELL- POTABLE SOURCE																	
		Trigger Level	DWR 2007	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date
	Units			04-Apr-06	11-Jul-06	10-Oct-06	23-Jan-07	19-Apr-07	03-Jul-07	11-Oct-07	15-Jan-08	08-Apr-08	01-Jul-08	07-Oct-08	13-Jan-09	21-Apr-09	14-Jul-09	06-Oct-09
Alkalinity	mg/lCaCO3	NAC	0.2	288				328				308				282		
Ammonia	mg/l N	0.2	0.3	<0.03	<0.03	0.03	<0.03	0.06	0.03	<0.03	<0.03	0.03	<0.03	0.03	<0.03	<0.03	<0.03	0.05
Barium	µg/l											<50						
B.O.D.	mg/l O2															<50		
Boron	µg/l	1000	1000	<50				<50				<50						
Cadmium	µg/l	5	5	<0.10				<0.10				<0.10				<0.1		
Calcium	mg/l Ca	200		63.73				60.25				69.75				63.64		
C.O.D.	mg/l O2																	
Chloride	mg/l Cl	20	250	15	16	15	14	14	14	14	14	16	16	16	16	16	16	16
Chromium	µg/l	30	50	<1				<1				<1				6.2		
Conductivity	µS/cm @ 25	800	2500	624	618	623	615	620	611	613	617	615	615	614	607	603	609	611
Copper	µg/l	30	2000	<1				<1								1.2		
Cyanide	mg/l	0.01	0.05	<0.05				<0.05				<0.05				<0.05		
Depth	m		/	nm	nm	nm	nm	nm	nm	nm	nm		nm	nm	nm	nm	nm	nm
D.O.	% Saturation			74	45	33	34	35	26	32	33	35	nm	34	30	25	23	33
Faecal coliforms	no/100ml		0	0	0		0	0	0	0	0	0	2	0	0	0	0	0
Fluoride	mg/l	1	0.8	<0.150				<0.150				<0.150				<0.150		
Iron	µg/l		200	140.5				126.8				65.2				101.8		
Lead	µg/l	10	25	<1				<1				<1				<1		
Magnesium	mg/l Mg	50		39.9				29.9				29				30.62		
Manganese	µg/l		50	2.6				2				2.7				4.6		
Mercury	µg/l	1	1	<0.10				<0.10				<0.10				<0.1		
Nickel	µg/l	20	20	<1				2.7				<1				<1		
Ortho-Phosphate	mg/l P	0.03		<0.02				<0.02				<0.02				<0.02		
pH		>7 or <8	6.5 - 9.5	7.4	7.4	7.5	7.4	7.3	7.4	7.4	7.5	7.5	7.5	7.4	7.5	7.4	7.2	7.5
Potassium	mg/l	5		1.03				1.05				1.08				1		
Residue on evaporation	mg/l			330				340				322				354		
Sodium	mg/l	150	200	18.59				19.98				19.89				20.75		
Sulphate		50	250	4.8				4.6				4.6				4.4		
Suspended Solids	mg/l																	
Temp	°C			6.9	14.6	12.2	3.9	11.1	13	12.5	6.8	8.3	nm	11.3	10.2	10.8	14.1	11.7
Time					11.5	11.5	12.1	11.55	12.15	11.40	11.4	12	nt	12.1	12	12.1		12.15
Total/ Bact coliforms	no/100ml		0	0			1	0	15	81	74	2	75	50	4	9	130	34
T.O.C.	mg/l	10	NAC	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	1.7	<1.5	34.4	<1.5	3.3	<3.0	<3.0
T.O.N	mg/l N			0.41				0.42				0.42				0.32		
Total Suspended Solids	mg/l																	
Zinc	µg/l	100		<1				<1				<1				2		

	Whiteriver Landfill Site																	
	GROUNDWATER QUALITY																	
PARAMETERS	RESULTS																	
Monitoring Point:	BH3																	
	UPSTREAM BEDROCK																	
		Trigger Level	DWR 2007	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date
	Units			04-Apr-06	11-Jul-06	10-Oct-06	23-Jan-07	19-Apr-07	03-Jul-07	11-Oct-07	15-Jan-08	08-Apr-08	01-Jul-08	07-Oct-08	13-Jan-09	21-Apr-09	14-Jul-09	06-Oct-09
Alkalinity	mg/lCaCO3	NAC	0.2	286				364				368				328		
Ammonia	mg/l N	0.2	0.3	<0.03	0.03	0.04	<0.03	0.07	0.03	<0.03	0.03	0.05	0.08	0.03	<0.03	<0.03	<0.03	0.07
Barium	µg/l																	
B.O.D.	mg/l O2															<50		
Boron	µg/l	1000	1000	<50				<50				<50						
Cadmium	µg/l	5	5	<0.10				<0.10				<0.10				0.2		
Calcium	mg/l Ca	200		75.61				71.19				81.73				102.59		
C.O.D.	mg/l O2																	
Chloride	mg/l Cl	20	250	13	15	14	13	13	13	12	11	15	16	23	23	37	40	33
Chromium	µg/l	30	50	<1				<1				<1				4.8		
Conductivity	µS/cm @ 25	800	2500	624	629	632	627	631	621	622	626	625	626	745	709	767	801	797
Copper	µg/l	30	2000	<1				4								4.5		
Cyanide		0.01	0.05	<0.05				<0.05				<0.05				<0.05		
Depth	m		/	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1		3.4	5.6	7.7	8.8	9.3	2.8
D.O.	% Saturation			15	21	38	30	30	15	42	21	47	29	85	47	96	82	36
Faecal coliforms	no/100ml		0									0	0	76	30	<10		
Fluoride	mg/l	1	0.8	<0.150				<0.150				0.17				<0.150		
Iron	µg/l		200	59.6				222.1				97.1				186.8		
Lead	µg/l	10	25	<1				<1				<1				<1		
Magnesium	mg/l Mg	50		26.83				24.57				24.34				27.77		
Manganese	µg/l		50	59.8				78.6				321				791.9		
Mercury	µg/l	1	1	<0.10				<0.10				<0.10				<0.1		
Nickel	µg/l	20	20	<1				4.2				<1				2.8		
Ortho-Phosphate	mg/l P	0.03		0.04				0.04				0.05				0.04		
pH		>7 or <8	6.5 - 9.5	7.5	7.5	7.5	7.5	7.3	7.4	7.6	7.5	7.7	7.7	7.4	7.4	7.3	7.1	7.3
Potassium	mg/l	5		1.33				1.38				1.4				1.25		
Residue on evaporation	mg/l			346				352				404				495		
Sodium	mg/l	150	200	19.57				21.47				20.99				22.77		
Sulphate		50	250	5.1				4.9				5.8				51.3		
Suspended Solids	mg/l																	
Temp	°C			9.7	13	13	9.2	12	13.2	14	11	10	12	11	10.5	11	12	12
Time					11.35	11.4	12	12.55	10.1	13.15	12.55	12.35	12.21	13.25	12.2	12.3		12.3
Total/ Bact coliforms	no/100ml		0									153	>2420	>12100	>2420	8164		
T.O.C.	mg/l	10	NAC	<1.5	<1.5	1.5	<1.5	<1.5	<1.5	<1.5	2.1	2.8	<1.5	27.2	2.9	7.9	6.3	4.6
T.O.N	mg/l N			0.25				0.24				0.12				0.24		
Total Suspended Solids	mg/l																	
Zinc	µg/l	100		<1				13.2				<1				11.9		

	Whiteriver Landfill Site																	
PARAMETERS	GROUNDWATER QUALITY																	
	RESULTS																	
Monitoring Point:	BH4																	
	UPSTREAM BEDROCK																	
		Trigger Level	DWR 2007	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date
	Units			04-Apr-06	11-Jul-06	10-Oct-06	23-Jan-07	19-Apr-07	03-Jul-07	11-Oct-07	15-Jan-08	18-Apr-08	01-Jul-08	07-Oct-08	13-Jan-09	21-Apr-09	14-Jul-09	06-Oct-09
Alkalinity	mg/lCaCO3	NAC	0.2	260				298				280				284		
Ammonia	mg/l N	0.2	0.3	0.08		0.03	0.1	0.07	0.06	<0.03		0.03	<0.03	0.04	<0.03	<0.03	<0.03	<0.03
Barium	µg/l																	
B.O.D.	mg/l O2															<50		
Boron	µg/l	1000	1000	<50				<50				<50						
Cadmium	µg/l	5	5	<0.10				<0.10				<0.10				<0.1		
Calcium	mg/l Ca	200		73.12				69.13				76.19				74.07		
C.O.D.	mg/l O2																	
Chloride	mg/l Cl	20	250	12		12	13	12	12	11		13	14	13	13	13	14	13
Chromium	µg/l	30	50	<1				<1				<1				3.1		
Conductivity	µS/cm @ 25	800	2500	551		563	560	566	559	560		565	562	563	559	556	561	560
Copper	µg/l	30	2000	2.1				10.6								2.9		
Cyanide		0.01	0.05	<0.05				<0.05				<0.05				<0.05		
Depth	m		/	<0.1		<0.1	nm	<0.1	<0.1	<0.1			nm	10.3	nm	nm	nm	0
D.O.	% Saturation			27		41	17	42	46	39		17	26	20	25	29	25	27
Faecal coliforms	no/100ml		0	0								0	0	0	0	0		
Fluoride	mg/l	1	0.8	<0.150				<0.150				<0.150				<0.150		
Iron	µg/l		200	654.1				52158.3		7.4		1283.1				77.8		
Lead	µg/l	10	25	<1				2.3				<1				<1		
Magnesium	mg/l Mg	50		25.19				18.61				19.26				19.45		
Manganese	µg/l		50	30.5				43.7				9.7				1.5		
Mercury	µg/l	1	1	<0.10				<0.10				<0.10				<0.1		
Nickel	µg/l	20	20	<1				53.3		14		<1				<1		
Ortho-Phosphate	mg/l P	0.03		0.04				<0.02		13.25		<0.02				<0.02		
pH		>7 or <8	6.5 - 9.5	7.4		7.3	7.4	7.2	7.4	7.4		7.4	7.5	7.4	7.4	7.4	7.3	7.5
Potassium	mg/l	5		0.95				<1				<1				<1		
Residue on evaporation	mg/l			304				496				327				314		
Sodium	mg/l	150	200	14.81				15.36				16.72				16.74		
Sulphate		50	250	3.2				3.6				3.5				4		
Suspended Solids	mg/l																	
Temp	°C			10		14	6.9	12.2	15.6	14		11	12.5	11.4	9.8	12	12	12
Time						11.45	13.3	13.35	12.55	13.25		14.1	12.41	13.4	12.55	12.4		13.2
Total/ Bact coliforms	no/100ml		0	0								12	2	1	0	0		
T.O.C.	mg/l	10	NAC	<1.5		<1.5	<1.5	<1.5	<1.5	<1.5		<1.5	<1.5	28.1	<1.5	5.5	<3.0	<3.0
T.O.N	mg/l N			0.12				0.39				0.53				0.55		
Total Suspended Solids	mg/l																	
Zinc	µg/l	100		9.5				131.2				13.3				44.4		

	Whiteriver Landfill Site																	
	GROUNDWATER QUALITY																	
PARAMETERS	RESULTS																	
Monitoring Point:	BH5A																	
	DOWNSTREAM OVERBURDEN																	
		Trigger Level	DWR 2007	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date
	Units			04-Apr-06	11-Jul-06	10-Oct-06	23-Jan-07	19-Apr-07	03-Jul-07	11-Oct-07	15-Jan-08	08-Apr-08	01-Jul-08	07-Oct-08	13-Jan-09	21-Apr-09	14-Jul-09	06-Oct-09
Alkalinity	mg/lCaCO3	NAC	0.2	276				336				230				270		
Ammonia	mg/l N	0.2	0.3	0.03	0.04	0.04	0.05	0.09	0.07	0.04	<0.03	0.12	0.05	0.03	<0.03	0.05	<0.03	0.08
Barium	µg/l																	
B.O.D.	mg/l O2															<50		
Boron	µg/l	1000	1000	<50				<50				11.8						
Cadmium	µg/l	5	5	<0.10				<0.10				<0.10				0.1		
Calcium	mg/l Ca	200		105.7				102.87				110.27				114.58		
C.O.D.	mg/l O2																	
Chloride	mg/l Cl	20	250	20	11	13	28	11	10	11	67	75	41	59	74	57	40	25
Chromium	µg/l	30	50	<1				<1				8.1				11.9		
Conductivity	µS/cm @ 25	800	2500	634	628	640	647	611	618	626	703	716	671	756	763	706	664	638
Copper	µg/l	30	2000	4.1				3.1								15.2		
Cyanide		0.01	0.05	<0.05				<0.05				<0.05				<0.05		
Depth	m		/	5.5	6	6.6	6.2	5.9	5.9	6.2	6.3		6.8	7.1	7.5	7.7	7.8	7.2
D.O.	% Saturation			58	43	42	61	42	42	62	74	77	26	47	21	52	69	36
Faecal coliforms	no/100ml		0									0	0	4	1	<10		
Fluoride	mg/l	1	0.8	0.16				<0.150				0.16				0.19		
Iron	µg/l		200	731.3				731.5				3954.4				6848.9		
Lead	µg/l	10	25	<1				<1				9				14.4		
Magnesium	mg/l Mg	50		12.04				11.07				12.69				17.1		
Manganese	µg/l		50	22.5				47.3				229.6				592.7		
Mercury	µg/l	1	1	<0.10				<0.10				<0.10				<0.1		
Nickel	µg/l	20	20	3.9				7.7				14.8				22.6		
Ortho-Phosphate	mg/l P	0.03		0.02				<0.02				0.05				<0.02		
pH		>7 or <8	6.5 - 9.5	7.2	7.2	7.3	7.3	6.9	7.1	7.2	7.4	7.6	7.5	7.4	7.6	7.6	7.5	7.5
Potassium	mg/l	5		0.67				<1				<1				1.3		
Residue on evaporation	mg/l			1532				416				755				2103		
Sodium	mg/l	150	200	14.18				10.53				23.42				30.55		
Sulphate		50	250	19.6				11.4				46.6				56.3		
Suspended Solids	mg/l																	
Temp	°C			10	11	12	10	11	12.4	13	11	10	10.5	11	10.4	11.4	12	11
Time					11.2	12.05	13.1	10.1	12.1	10.20	12.15	13.3	11.21	12.55	13.45	14.05		13.1
Total/ Bact coliforms	no/100ml		0									0	46	45	18	41		
T.O.C.	mg/l	10	NAC	2.7	2.2	2.6	2.7	<1.5	<1.5	1.9	3.9	3.4	2.3	18.4	4.1	2.9	4.3	4.4
T.O.N	mg/l N			0.69				0.57				0.39				0.16		
Total Suspended Solids	mg/l																	
Zinc	µg/l	100		<1								13.2				32.5		

	Whiteriver Landfill Site																
PARAMETERS	GROUNDWATER QUALITY																
	RESULTS																
Monitoring Point:	BH6																
	DOWNSTREAM BEDROCK																
		Trigger Level	DWR 2007	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date
	Units			04-Apr-06	11-Jul-06	10-Oct-06	23-Jan-07	19-Apr-07	03-Jul-07	11-Oct-07	15-Jan-08	08-Apr-08	01-Jul-08	07-Oct-08	13-Jan-09	21-Apr-09	14-Jul-09	06-Oct-09
Alkalinity	mg/lCaCO3	NAC	0.2	260				274				276				250		
Ammonia	mg/l N	0.2	0.3	0.04	0.28	0.03	0.05	0.07	0.2	<0.03	0.06	0.08	0.07	0.05	<0.03	<0.03	<0.03	0.28
Barium	µg/l																	
B.O.D.	mg/l O2															54.2		
Boron	µg/l	1000	1000	<50				56.7				57.5						
Cadmium	µg/l	5	5	<0.10				<0.10				<0.10				<0.1		
Calcium	mg/l Ca	200		75.47				69.19				81.68				75.21		
C.O.D.	mg/l O2																	
Chloride	mg/l Cl	20	250	12	13	12	13	12	12	12	11	16	13	15	32	16	9	10
Chromium	µg/l	30	50	<1				<1				3.3				5.3		
Conductivity	µS/cm @ 25	800	2500	548	539	554	552	549	545	541	533	558	546	534	422	536	263	638
Copper	µg/l	30	2000	2.6				3.7								3.6		
Cyanide		0.01	0.05	<0.05				<0.05				<0.05				<0.05		
Depth	m		/	13.1	13.3	13.1	13.1	13.2	13	13.1	13		13.3	13.9	13.3	13.1	nm	13.8
D.O.	% Saturation			30	30	26	37	25	23	19	32	27	17	30	72	28	78	48
Faecal coliforms	no/100ml		0									2	687	114	58	<10		
Fluoride	mg/l	1	0.8	<0.150				<0.150				<0.150				<0.150		
Iron	µg/l		200	316.6				1223.9				2834				871.5		
Lead	µg/l	10	25	<1				4.1				59.5				3.9		
Magnesium	mg/l Mg	50		19.01				17.13				16.82				16.65		
Manganese	µg/l		50	50.2				754.6				375.5				121.8		
Mercury	µg/l	1	1	<0.10				<0.10				<0.10				<0.1		
Nickel	µg/l	20	20	<1				6.7				9.6				2.9		
Ortho-Phosphate	mg/l P	0.03		0.04				0.04				0.06				0.02		
pH		>7 or <8	6.5 - 9.5	7.3	7.5	7.5	7.5	7.3	7.4	7.5	7.6	7.5	7.7	7.5	7.5	7.5	7.6	7.5
Potassium	mg/l	5		1.68				1.79				2.07				1.98		
Residue on evaporation	mg/l			584				656				1566				1077		
Sodium	mg/l	150	200	15.14				15.55				16.13				16.29		
Sulphate		50	250	11.6				11.3				12.7				10.5		
Suspended Solids	mg/l																	
Temp	°C			10	11	10.6	9.5	11	14.5	13.8	7.2	10.3	11	11.2	10.3	11.9	11.8	12.3
Time					12.45	12.5	12.55	12.5	13.1	12.45	12.15	13	12.35	12.45	12.4	13.4		12.5
Total/ Bact coliforms	no/100ml		0									87	2420	>12100	>2420	98		
T.O.C.	mg/l	10	NAC	2.9	2.9	2.2	<1.5	1.7	<1.5	2.8	2.8	6.3	1.9	24.2	5.6	4	5.3	8.2
T.O.N	mg/l N			0.23				0.1				0.17				0.28		
Total Suspended Solids	mg/l																	
Zinc	µg/l	100		<1				7.6				16.1				8.4		

	Whiteriver Landfill Site																	
	GROUNDWATER QUALITY																	
PARAMETERS	RESULTS																	
Monitoring Point:	BH9																	
	DOWNSTREAM BEDROCK																	
		Trigger Level	DWR 2007	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date
	Units			04-Apr-06	11-Jul-06	10-Oct-06	23-Jan-07	19-Apr-07	03-Jul-07	11-Oct-07	15-Jan-08	08-Apr-08	01-Jul-08	07-Oct-08	13-Jan-09	21-Apr-09	14-Jul-09	06-Oct-09
Alkalinity	mg/lCaCO3	NAC	0.2	298				340				376				440		0.05
Ammonia	mg/l N	0.2	0.3	0.03	0.03	0.03	<0.03	0.08	0.08	<0.03	0.03	0.04	0.13	0.03	<0.03	<0.03	<0.03	
Barium	µg/l																	
B.O.D.	mg/l O2															<50		
Boron	µg/l	1000	1000	<50				<50				<50						
Cadmium	µg/l	5	5	<0.10				<0.10				<0.10				<0.1		
Calcium	mg/l Ca	200		105.14				107.75				114.06				139.46		
C.O.D.	mg/l O2																	
Chloride	mg/l Cl	20	250	12	14	12	13	14	13	13	12	14	14	14	15	14	15	15
Chromium	µg/l	30	50	<1				<1				<1				5.4		
Conductivity	µS/cm @ 25	800	2500	642	645	650	673	714	728	723	704	687	703	726	737	825	872	919
Copper	µg/l	30	2000	<1				<1								1.5		
Cyanide		0.01	0.05	<0.05				<0.05				<0.05				<0.05		
Depth	m		/	23.4	23.4	23.3	23.2	23.2	23.2	23.1	22.8		23.1	23	23	23.2	23.1	23
D.O.	% Saturation			60	62	72	64	62	50	68	54	62	60	66	36	85	59	47
Faecal coliforms	no/100ml		0									0	0	5	0	20		
Fluoride	mg/l	1	0.8	<0.150				<0.150				<0.150				<0.150		
Iron	µg/l		200	172.5				3223.7				13918.2				1215.8		
Lead	µg/l	10	25	<1				<1				<1				<1		
Magnesium	mg/l Mg	50		15.9				16.01				15.58				18.92		
Manganese	µg/l		50	97.4				1123.4				3435.1				217		
Mercury	µg/l	1	1	<0.10				<0.10				<0.10				<0.1		
Nickel	µg/l	20	20	<1				8.4				19.3				1.6		
Ortho-Phosphate	mg/l P	0.03		<0.02				<0.02				<0.02				<0.02		
pH		>7 or <8	6.5 - 9.5	7.2	7.5	7.3	7.3	7	7.1	7.2	7.2	7.2	7.3	7.1	7.2	7.2	7	7.1
Potassium	mg/l	5		0.81				<1				<1				<1		
Residue on evaporation	mg/l			394				440				590				605		
Sodium	mg/l	150	200	11.78				12.85				14.43				14.63		
Sulphate		50	250	10.7				13.6				14.3				32.4		
Suspended Solids	mg/l																	
Temp	°C			10.5	11	11	9.1	11	13.5	12	11	9	11	11	8.8	11	12	11
Time					10.45	11	12.5	10.25	11.2	11.10	10.2	10.15	10.55	11.25	10.25	10.55		10.5
Total/ Bact coliforms	no/100ml		0									0	71	548	105	31		
T.O.C.	mg/l	10	NAC	2.8	2.6	3.1	1.9	2	2	3.8	7.7	8.3	2.2	27.2	2.8	6.5	4.9	5.4
T.O.N	mg/l N			<0.05				0.05				0.05				0.08		
Total Suspended Solids	mg/l																	
Zinc	µg/l	100		<1				2.7				4.9				3.7		

	Whiteriver Landfill Site																	
	GROUNDWATER QUALITY																	
PARAMETERS	**RESULTS**																	
Monitoring Point:	**BH10**																	
	DOWNSTREAM OVERBURDEN																	
		Trigger Level	**DWR 2007**	**Date**	**Date**	**Date**	**Date**	**Date**	**Date**	**Date**	**Date**	**Date**	**Date**	**Date**	**Date**	**Date**	**Date**	**Date**
	Units			04-Apr-06	11-Jul-06	10-Oct-06	23-Jan-07	19-Apr-07	03-Jul-07	11-Oct-07	15-Jan-08	08-Apr-08	01-Jul-08	07-Oct-08	13-Jan-09	21-Apr-09	14-Jul-09	06-Oct-09
Alkalinity	mg/lCaCO3	NAC	0.2	234				300				320				294		
Ammonia	mg/l N	0.2	0.3	0.04	0.1	0.04	0.08	0.2	0.03	0.09	<0.03	0.06	0.11	0.05	<0.03	0.06	0.06	0.06
Barium	µg/l											467.2						
B.O.D.	mg/l O2															<50		
Boron	µg/l	1000	1000	<50				<50				<50						
Cadmium	µg/l	5	5	<0.10				<0.10				0.2				<0.1		
Calcium	mg/l Ca	200		94.73				98.87				125.16				132.91		
C.O.D.	mg/l O2																	
Chloride	mg/l Cl	20	250	18	16	17	23	20	9	17	16	19	29	21	23	24	18	21
Chromium	µg/l	30	50	<1				4.7				11.4				6.9		
Conductivity	µS/cm @ 25	800	2500	549	629	601	622	639	541	644	631	650	987	686	767	772	768	716
Copper	µg/l	30	2000	3.9				7								5.3		
Cyanide		0.01	0.05	<0.05				<0.05				<0.05				<0.05		
Depth	m		/	1.3	3.9	1.8	1.9	3	1.9	3	1.8		9.2	2	1.8	2.3	1.8	3.6
D.O.	% Saturation			51	90	72	73	67	72	59	41	72	36	51	22	67	44	54
Faecal coliforms	no/100ml		0						435			0	2	26	3	<10		
Fluoride	mg/l	1	0.8	<0.150				<0.150				<0.150				<0.150		
Iron	µg/l		200	264.6				2949.3				6978.1				1576.6		
Lead	µg/l	10	25	<1				5.6				18.2				4.8		
Magnesium	mg/l Mg	50		7.67				10.55				13.38				13.19		
Manganese	µg/l		50	12.6				180.6				652.4				735.7		
Mercury	µg/l	1	1	<0.10				<0.10				<0.10				<0.1		
Nickel	µg/l	20	20	<1				14.2				27.9				6.7		
Ortho-Phosphate	mg/l P	0.03		<0.02				0.04				<0.02				<0.02		
pH		>7 or <8	6.5 - 9.5	7.2	7.5	7.2	7.4	7.2	7.2	7.3	7.3	7.3	7.4	7.1	7.3	7.2	7.1	7.3
Potassium	mg/l	5		1.29				1.33				1.52				1.25		
Residue on evaporation	mg/l			357				1044				2282				765		
Sodium	mg/l	150	200	8.85				11.94				12.55				15.97		
Sulphate		50	250	10.8				14.1				24.2				92		
Suspended Solids	mg/l																	
Temp	°C			8.7	10	12	7.1	11	13.9	14	10	11	11	11	8.8	11	13	11
Time					10.1	10.2	11.05	11.45	10.25	12.15	10.45	11.45	10.11	12.35	11.3	11.55		11.55
Total/ Bact coliforms	no/100ml		0						>2419			0	308	2420	579	52		
T.O.C.	mg/l	10	NAC	4.8	2.9	5.8	3	2.5	6	2.9	4.5	3.6	88.5	16.4	3.7	4.7	7.3	3.6
T.O.N	mg/l N			4.36				2.97				2.16				0.46		
Total Suspended Solids	mg/l																	
Zinc	µg/l	100		4.8				12.2				29.6				11.6		

	Whiteriver Landfill Site																	
PARAMETERS	GROUNDWATER QUALITY																	
	RESULTS																	
Monitoring Point:	BH11																	
	DOWNSTREAM OVERBURDEN																	
		Trigger Level	DWR 2007	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date
	Units			04-Apr-06	11-Jul-06	10-Oct-06	23-Jan-07	19-Apr-07	03-Jul-07	11-Oct-07	15-Jan-08	08-Apr-08	01-Jul-08	07-Oct-08	13-Jan-09	21-Apr-09	14-Jul-09	06-Oct-09
Alkalinity	mg/lCaCO3	NAC	0.2	268				288				272				280		
Ammonia	mg/l N	0.2	0.3	0.03	0.03	0.09	<0.03	0.07	0.09	<0.03	0.03	0.04	0.04	0.04	<0.03	<0.03	<0.03	0.04
Barium	µg/l											113.2						
B.O.D.	mg/l O2															<50		
Boron	µg/l	1000	1000	<50				<50				<50						
Cadmium	µg/l	5	5	<0.10				<0.10				<0.10				<0.1		
Calcium	mg/l Ca	200		60.01				40.33				69.22				67.21		
C.O.D.	mg/l O2																	
Chloride	mg/l Cl	20	250	4	15	15	9	8	10	14	8	10	11	9	10	9	9	10
Chromium	µg/l	30	50	<1				<1				<1				2.1		
Conductivity	µS/cm @ 25	800	2500	585	670	677	614	595	646	671	528	544	587	601	452	594	630	617
Copper	µg/l	30	2000	5.5				2.4								1.9		
Cyanide		0.01	0.05	<0.05				<0.05				<0.05				<0.05		
Depth	m		/	9.4	9.4	9.4	9.5	9.4	9.2	9.5	9		9.3	9.2	9.3	9.4	9.2	9.1
D.O.	% Saturation			99	41	nm	60	58	46	53	91	78	83	97	54	81	69	83
Faecal coliforms	no/100ml		0						99			0	2	8	0	0		
Fluoride	mg/l	1	0.8	0.15				0.15				<0.150				<0.150		
Iron	µg/l		200	147.1				116.2				142				119.4		
Lead	µg/l	10	25	<1				<1				<1				<1		
Magnesium	mg/l Mg	50		10.64				10.63				13.79				14.13		
Manganese	µg/l		50	234.7				87.2				150.6				108.7		
Mercury	µg/l	1	1	<0.10				<0.10				<0.10				<0.1		
Nickel	µg/l	20	20	3				<1				2				1.1		
Ortho-Phosphate	mg/l P	0.03		<0.02				<0.02				<0.02				<0.02		
pH		>7 or <8	6.5 - 9.5	7.6	7.5	7.5	7.8	7.6	7.6	7.6	8.1	7.8	7.9	7.6	8	7.7	7.4	7.6
Potassium	mg/l	5		1				1.43				1.26				1.25		
Residue on evaporation	mg/l			357				365				337				376		
Sodium	mg/l	150	200	51.53				69.28				39.21				46.71		
Sulphate		50	250	26.4				44.3				20.7				25.4		
Suspended Solids	mg/l																	
Temp	°C			9.7	11	11	7.2	11	12.4	12	11	10	10.8	11	10	11	12	11
Time					10.35	10.35	11.15	11.2	11.1	11.55	11	11.3	9.55	11.55	11.1	11.25		11.1
Total/ Bact coliforms	no/100ml		0						>2419			21	205	1414	51	7		
T.O.C.	mg/l	10	NAC	7.2	1.9	2.3	fqc	2.3	3.1	1.5	3.6	2.7	2.8	25.2	2.3	2.9	4.5	3.2
T.O.N	mg/l N			0.49				0.12				0.47				0.29		
Total Suspended Solids	mg/l																	
Zinc	µg/l	100		5.9				<1				<1				4.5		

	Whiteriver Landfill Site																	
	GROUNDWATER QUALITY																	
PARAMETERS	RESULTS																	
Monitoring Point:	BH12																	
	DOWNSTREAM OVERBURDEN																	
		Trigger Level	DWR 2007	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date
	Units			04-Apr-06	11-Jul-06	10-Oct-06	23-Jan-07	19-Apr-07	03-Jul-07	11-Oct-07	15-Jan-08	08-Apr-08	01-Jul-08	07-Oct-08	13-Jan-09	21-Apr-09	14-Jul-09	06-Oct-09
Alkalinity	mg/lCaCO3	NAC	0.2	200				270				300				348		
Ammonia	mg/l N	0.2	0.3	0.05	0.04	0.12	0.1	0.22	0.09	<0.03	0.12	0.06	0.05	0.06	<0.03	0.03	<0.03	<0.03
Barium	µg/l											201.7						
B.O.D.	mg/l O2															<50		
Boron	µg/l	1000	1000	<50				<50				<50						
Cadmium	µg/l	5	5	<0.10				0.2				0.5				0.3		
Calcium	mg/l Ca	200		80.25				97.46				128.2				135.76		
C.O.D.	mg/l O2																	
Chloride	mg/l Cl	20	250	9	10	16	11	11	10	9	11	10	14	12	10	10	10	11
Chromium	µg/l	30	50	<1				3				7.2				5.5		
Conductivity	µS/cm @ 25	800	2500	450	547	520	522	579	615	581	564	645	704	754	731	727	748	793
Copper	µg/l	30	2000	4.9				4.8								5.5		
Cyanide		0.01	0.05	<0.05				<0.05				<0.05				<0.05		
Depth	m		/	5.6	5.8	5.6	5.6	5.7	5.4	5.8	5.4		5.9	5.5	5.6	5.7	5.4	5.5
D.O.	% Saturation			92	77	78	79	62	64	97	90	70	51	75	46	94	80	58
Faecal coliforms	no/100ml		0						105			3	11	131	0	<10		
Fluoride	mg/l	1	0.8	<0.150				<0.150				<0.150				<0.150		
Iron	µg/l		200	141.7				1557.2				2998.6				912.8		
Lead	µg/l	10	25	<1				3.4				7.5				1.6		
Magnesium	mg/l Mg	50		5.86				8.13				11.01				11.74		
Manganese	µg/l		50	7.8				274				553.9				773.5		
Mercury	µg/l	1	1	<0.10				<0.10				<0.10				<0.1		
Nickel	µg/l	20	20	<1				11				13.3				6.2		
Ortho-Phosphate	mg/l P	0.03		<0.02				0.02				<0.02				<0.02		
pH		>7 or <8	6.5 - 9.5	7.3	7.4	7.3	7.4	6.9	7.1	7.5	7.3	7.2	7.6	6.9	6.9	7.1	6.9	7.1
Potassium	mg/l	5		<0.50				<1				<1				<1		
Residue on evaporation	mg/l			1813				658				963				655		
Sodium	mg/l	150	200	<5.00				5.59				6.97				6.92		
Sulphate		50	250	11.2				29.1				41.4				31.3		
Suspended Solids	mg/l																	
Temp	°C			10.8	10	11	8.6	11	13	13	11	10	10.2	11	9.7	11	12	11
Time					10.5	11.05	12.35	10.4	11.45	10.45	10.1	10.3	11.05	11.2	10.4	10.5		10.35
Total/ Bact coliforms	no/100ml		0						>2419			20	1986	>12100	>2420	135		
T.O.C.	mg/l	10	NAC	6.5	3.7	10.1	7.3	2.6	6.3	4.2	11.8	7.2	7.5	49.3	6.8	6.3	8.3	5.6
T.O.N	mg/l N			2.26				0.86				2.86				0.13		
Total Suspended Solids	mg/l																	
Zinc	µg/l	100		<1				19				37.2				19.9		

	Whiteriver Landfill Site																		
	GROUNDWATER QUALITY																		
PARAMETERS	RESULTS																		
Monitoring Point:	BH13A																		
	DOWNSTREAM BEDROCK																		
		Trigger Level	DWR 2007	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date
	Units			04-Apr-06	11-Jul-06	10-Oct-06	23-Jan-07	19-Apr-07	03-Jul-07	11-Oct-07	15-Jan-08	08-Apr-08	01-Jul-08	07-Oct-08	13-Jan-09	21-Apr-09	14-Jul-09	06-Oct-09
Alkalinity	mg/lCaCO3	NAC	0.2					300				400				332		
Ammonia	mg/l N	0.2	0.3		0.04	0.03	0.07	0.1	0.17	0.03	0.09	0.05	0.06	0.1	0.03	0.04	0.08	0.03
Barium	µg/l											70.9						
B.O.D.	mg/l O2															<50		
Boron	µg/l	1000	1000					<50				<50						
Cadmium	µg/l	5	5					<0.10				<0.10				<0.1		
Calcium	mg/l Ca	200						68.11				82.08				79.9		
C.O.D.	mg/l O2																	
Chloride	mg/l Cl	20	250		22	26	23	22	22	21	22	24	24	24	22	22	22	21
Chromium	µg/l	30	50					<1				<1				2.6		
Conductivity	µS/cm @ 25	800	2500		613	634	655	666	658	659	667	665	663	656	658	659	660	662
Copper	µg/l	30	2000					3.6								2		
Cyanide		0.01	0.05					<0.05				<0.05				<0.05		
Depth	m		/		25.8	25.7	25.6	25.6	25.5	25.6	25.3		25.5	25.4	25.4	25.5	25.5	25.4
D.O.	% Saturation				42	27	35	37	25	44	43	30	28	53	<10	42	40	35
Faecal coliforms	no/100ml		0						38			0	1	7	0	0		
Fluoride	mg/l	1	0.8					<0.150				<0.150				<0.150		
Iron	µg/l		200					455.5				155				156.6		
Lead	µg/l	10	25					<1				<1				<1		
Magnesium	mg/l Mg	50						22.29				24.56				23.96		
Manganese	µg/l		50					490.8				364				264.5		
Mercury	µg/l	1	1					<0.10				<0.10				<0.1		
Nickel	µg/l	20	20					4.6				<1				<1		
Ortho-Phosphate	mg/l P	0.03						0.06				0.08				0.1		
pH		>7 or <8	6.5 - 9.5		7.7	7.6	7.6	7.3	7.5	7.6	7.6	7.5	7.6	7.5	7.6	7.5	7.3	7.6
Potassium	mg/l	5						1.63				1.53				1.33		
Residue on evaporation	mg/l							404				406				409		
Sodium	mg/l	150	200					26.64				30.05				27.71		
Sulphate		50	250					11.6				11.6				11.6		
Suspended Solids	mg/l																	
Temp	°C				11	11	7.4	12	13.2	13	11	10	11	11	10	11	12	11
Time					10.15	10.25	10.5	12	10.4	12.35	12.4	11.55	10.21	12.25	11.2	11.45		11.35
Total/ Bact coliforms	no/100ml		0						>2419			4	291	170	54	5		
T.O.C.	mg/l	10	NAC		2.3	11.1	2	<1.5	<1.5	2.9	1.8	<1.5	<1.5	31.1	<1.5	1.8	<3.0	<3.0
T.O.N	mg/l N							<0.05				<0.05				<0.08		
Total Suspended Solids	mg/l																	
Zinc	µg/l	100						26.2				3.8				10.8		

	Whiteriver Landfill Site																	
PARAMETERS	GROUNDWATER QUALITY																	
	RESULTS																	
Monitoring Point:	BH14																	
	DOWNSTREAM BEDROCK																	
		Trigger Level	DWR 2007	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date
	Units			04-Apr-06	11-Jul-06	10-Oct-06	23-Jan-07	19-Apr-07	03-Jul-07	11-Oct-07	15-Jan-08	08-Apr-08	01-Jul-08	07-Oct-08	13-Jan-09	21-Apr-09	14-Jul-09	06-Oct-09
Alkalinity	mg/lCaCO3	NAC	0.2	276				272				308				324		
Ammonia	mg/l N	0.2	0.3	<0.03	<0.03	0.06	0.03	0.08	0.09	<0.03	0.04	0.04	<0.03	0.32	<0.03	<0.03	0.04	<0.03
Barium	µg/l											160.9						
B.O.D.	mg/l O2															<50		
Boron	µg/l	1000	1000	<50				<50				<50						
Cadmium	µg/l	5	5	<0.10				<0.10				<0.10				<0.1		
Calcium	mg/l Ca	200		97.39				79.76				89.01				84.86		
C.O.D.	mg/l O2																	
Chloride	mg/l Cl	20	250	11	17	16	11	10	5	13	13	16	16	17	15	15	15	15
Chromium	µg/l	30	50	<1				<1				<1				5		
Conductivity	µS/cm @ 25	800	2500	632	648	652	592	595	551	631	641	650	646	652	641	638	650	645
Copper	µg/l	30	2000	2.5				<1								1.2		
Cyanide		0.01	0.05	<0.05				<0.05				<0.05				<0.05		
Depth	m		/	19.1	19.1	19	8.9	19	18.7	18.8	18.7		18.9	18.8	18.7	18.9	18.9	18.8
D.O.	% Saturation			79	53	51	70	82	88	55	40	55	28	56	19	63	51	39
Faecal coliforms	no/100ml		0						75			0	0	2	0	<10		
Fluoride	mg/l	1	0.8	<0.150				<0.150				<0.150				<0.150		
Iron	µg/l		200	185.1				305.7				192.1				74.9		
Lead	µg/l	10	25	<1				<1				<1				<1		
Magnesium	mg/l Mg	50		16.73				13.92				21.94				21.33		
Manganese	µg/l		50	461.5				118.3				194.2				326.6		
Mercury	µg/l	1	1	<0.10				<0.10				<0.10				<0.1		
Nickel	µg/l	20	20	2				3.9				<1				<1		
Ortho-Phosphate	mg/l P	0.03		0.02				<0.02				<0.02				<0.02		
pH		>7 or <8	6.5 - 9.5	7.3	7.5	7.4	7.6	7.3	7.3	7.5	7.4	7.4	7.5	7.4	7.5	7.5	7.3	7.5
Potassium	mg/l	5		0.89				<1				1.27				1.2		
Residue on evaporation	mg/l			370				352				387				396		
Sodium	mg/l	150	200	11.75				10.65				25				23.15		
Sulphate		50	250	7				8.4				9				8.4		
Suspended Solids	mg/l																	
Temp	°C			9.8	11	11	6.9	11	12.8	12	11	10	14	11	9.8	11	12	11
Time					10.25	10.4	11.3	11	10.55	11.25	11.2	11.1	9.45	12.1	10.55	11.1		11.2
Total/ Bact coliforms	no/100ml		0						>2419			0	59	60	56	173		
T.O.C.	mg/l	10	NAC	3	<1.5	1.7	2.5	<1.5	3.5	2	1.6	<1.5	<1.5	27.1	2.1	1.6	3.4	<3.0
T.O.N	mg/l N			5.18				3.65				0.26				0.2		
Total Suspended Solids	mg/l																	
Zinc	µg/l	100		2.4				<1				<1				4.9		

	Whiteriver Landfill Site																		
	GROUNDWATER QUALITY																		
PARAMETERS	RESULTS																		
Monitoring Point:	BH15																		
	DOWNSTREAM DOMESTIC TAFFES PRIVATE WELLS- POTABLE SOURCE																		
		Trigger Level	DWR 2007	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date
	Units			04-Apr-06	11-Jul-06	10-Oct-06	23-Jan-07	19-Apr-07	03-Jul-07	11-Oct-07	15-Jan-08	08-Apr-08	01-Jul-08	07-Oct-08	13-Jan-09	21-Apr-09	14-Jul-09	06-Oct-09
Alkalinity	mg/lCaCO3	NAC	0.2	324				356				360				372		
Ammonia	mg/l N	0.2	0.3	<0.03	<0.03	0.03	<0.03	0.06	0.04	<0.03	0.04	0.05	<0.03	<0.03	<0.03	0.03	<0.03	<0.03
Barium	µg/l											113.2						
B.O.D.	mg/l O2															110.4		
Boron	µg/l	1000	1000	128.8				99.1				105.5						
Cadmium	µg/l	5	5	<0.10				<0.10				<0.10				<0.1		
Calcium	mg/l Ca	200		119.04				101.57				118.17				123.79		
C.O.D.	mg/l O2																	
Chloride	mg/l Cl	20	250	16	19	13	10	10	10	10	14	11	12	10	12	12	12	11
Chromium	µg/l	30	50	<1				<1				<1				4.6		
Conductivity	µS/cm @ 25	800	2500	758	766	745	687	716	762	783	713	703	760	756	741	754	764	786
Copper	µg/l	30	2000	11				13.5								14.5		
Cyanide		0.01	0.05	<0.05				<0.05				<0.05				<0.05		
Depth	m		/	nm	nm	nm	nm	nm	nm	nm	nm		nm	nm	nm	nm	nm	nm
D.O.	% Saturation			26	63	55	45	47	51	47	40	38	47	43	40	59	54	41
Faecal coliforms	no/100ml		0	0	0		4	0	5	9	10	0	1	1	0	0	>201	1
Fluoride	mg/l	1	0.8	<0.150				<0.150				<0.150				<0.150		
Iron	µg/l		200	145.9				212.4				74.8				112		
Lead	µg/l	10	25	<1				<1				<1				<1		
Magnesium	mg/l Mg	50		15.57				12.81				14.56				14.78		
Manganese	µg/l		50	<1				<1				<1				2.2		
Mercury	µg/l	1	1	<0.10				<0.10				<0.10				<0.1		
Nickel	µg/l	20	20	4.2				6.3				2.4				2.9		
Ortho-Phosphate	mg/l P	0.03		0.03				0.02				<0.02				<0.02		
pH		>7 or <8	6.5 - 9.5	7.3	7.5	7.4	7.4	7.1	7.3	7.2	7.4	7.3	7.4	7.1	7.2	7.3	7.6	7.4
Potassium	mg/l	5		3.18				3.3				2.76				2.36		
Residue on evaporation	mg/l			446				446				405				487		
Sodium	mg/l	150	200	12.78				12.67				15.45				14.72		
Sulphate		50	250	35.8				32.6				30.7				27.3		
Suspended Solids	mg/l																	
Temp	°C			7.5	16.2	12	5	9.7	15.2	13.2	6.7	4	15	12.2	6.2	10.2	13.3	12.6
Time					10.35	10.3	10.55	10.25	10.35	10.15	10.1	10.2	8.21	10.5	10.4	10.4		10.5
Total/ Bact coliforms	no/100ml		0	726			308	51	1733	75		153	687	613	308	435	>201	16
T.O.C.	mg/l	10	NAC	2.5	2.2	3	2.8	2	1.9	3.1	2.6	2.9	2.2	32.4	2.8	2.9	4.4	<3.0
T.O.N	mg/l N			4.21				2.4				2.45				2.37		
Total Suspended Solids	mg/l																	
Zinc	µg/l	100		7.2								10.9				25.8		

	Whiteriver Landfill Site																		
PARAMETERS	**GROUNDWATER QUALITY**																		
	RESULTS																		
Monitoring Point:	**BH16**																		
	DOWNSTREAM DOMESTIC BRYNES PRIVATE WELLS- POTABLE SOURCE																		
	Units	**Trigger levels**	**DWR 2007**	**Date**	**Date**	**Date**	**Date**	**Date**	**Date**	**Date**	**Date**	**Date**	**Date**	**Date**	**Date**	**Date**	**Date**	**Date**	**Date**
				11-Jan-06	04-Apr-06	11-Jul-06	10-Oct-06	23-Jan-07	19-Apr-07	03-Jul-07	11-Oct-07	15-Jan-08	08-Apr-08	01-Jul-08	07-Oct-08	13-Jan-09	21-Apr-09	14-Jul-09	06-Oct-09
Alkalinity	mg/lCaCO3	NAC	0.2		248				280				262				232		
Ammonia	mg/l N	0.2	0.3	0.05	<0.03	0.08	0.08	0.05	0.06	0.05	0.03	0.03	0.05	0.05	0.06	0.03	0.05	0.04	0.04
Barium	µg/l												<50						
B.O.D.	mg/l O2																<50		
Boron	µg/l	1000	1000		<50				<50				<50						
Cadmium	µg/l	5	5		<0.10				<0.10				<0.10				<0.1		
Calcium	mg/l Ca	200			<5.00				<1				57.52				60.67		
C.O.D.	mg/l O2																		
Chloride	mg/l Cl	20	250	18	18	20	18	17	18	18	17	17	18	28	20	19	19	18	18
Chromium	µg/l	30	50		<1				<1				<1				<1		
Conductivity	µS/cm @ 25	800	2500	522	538	521	517	517	578	534	526	540	514	533	525	524	520	525	527
Copper	µg/l	30	2000		<1				<1								<1		
Cyanide		0.01	0.05		<0.05				<0.05				<0.05				<0.05		
Depth	m		/	nm	nm	nm	nm	nm	nm	nm	nm	nm		nm	nm	nm	nm	nm	nm
D.O.	% Saturation			49	47	58	57	44	46	48	46	39	51	54	40	60	38	58	45
Faecal coliforms	no/100ml		0		0	0		0	0	0	0		0	0	0	0	0	0	0
Fluoride	mg/l	1	0.8		0.16				0.28				0.17				0.18		
Iron	µg/l		200		<50				<50				464.3				336.3		
Lead	µg/l	10	25		<1				<1				<1				<1		
Magnesium	mg/l Mg	50			<0.50				<1				20.85				18.58		
Manganese	µg/l		50		3.9				4.1				293.9				296.9		
Mercury	µg/l	1	1		<0.10				<0.10				<0.10				<0.1		
Nickel	µg/l	20	20		<1				<1				<1				<1		
Ortho-Phosphate	mg/l P	0.03			0.03				0.09				<0.02				<0.02		
pH		>7 or <8	6.5 - 9.5	7.6	8	7.7	7.5	7.8	8.2	7.9	7.7	8	7.8	7.8	7.6	7.7	7.7	7.6	7.7
Potassium	mg/l	5			0.55				<1				1.49				1.54		
Residue on evaporation	mg/l				316				356				308				304		
Sodium	mg/l	150	200		115.88				123.02				28.88				23.33		
Sulphate		50	250		9.8				12.2				10.5				11		
Suspended Solids	mg/l																		
Temp	°C			8.8	6.2	15.1	11	4.7	11.1	14.4	14.6	7.1	7.2	11	12.2	6.8	11	13.1	12.2
Time						11.1	11.1	11.35	11	11.2	10.55	10.55	11.15	10.31	11.3	11.15	11.15		11.35
Total/ Bact coliforms	no/100ml		0		0			5	0	17	16		0	4	12	2	12	201	5
T.O.C.	mg/l	10	NAC	4.7	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	21.4	<1.5	<1.5	<3.0	<3.0
T.O.N	mg/l N				<0.05				<0.05				<0.05				<0.08		
Total Suspended Solids	mg/l																		
Zinc	µg/l	100			<1				<1				26.9				3.2		

	Whiteriver Landfill Site																		
	GROUNDWATER QUALITY																		
PARAMETERS	**RESULTS**																		
Monitoring Point:	**BH17**																		
	DOWNSTREAM DOMESTIC HOLCROFT'S PRIVATE WELLS -POTABLE SOURCE																		
		Trigger Level	**DWR 2007**	**Date**	**Date**	**Date**	**Date**	**Date**	**Date**	**Date**	**Date**	**Date**	**Date**	**Date**	**Date**	**Date**	**Date**	**Date**	**Date**
	Units			11-Jan-06	04-Apr-06	11-Jul-06	10-Oct-06	23-Jan-07	19-Apr-07	03-Jul-07	11-Oct-07	15-Jan-08	08-Apr-08	01-Jul-08	07-Oct-08	13-Jan-09	21-Apr-09	14-Jul-09	06-Oct-09
Alkalinity	mg/lCaCO3	NAC	0.2		332				320				332				286		
Ammonia	mg/l N	0.2	0.3	0.05	<0.03	<0.03	<0.03	<0.03	0.06	0.06	<0.03	0.03	<0.03	0.03	0.05	<0.03	0.05		0.03
Barium	µg/l												<50						
B.O.D.	mg/l O2																<50		
Boron	µg/l	1000	1000		<50				<50				<50						
Cadmium	µg/l	5	5		<0.10				<0.10				<0.10				<0.1		
Calcium	mg/l Ca	200			66.02				47.66				54.96				57.33		
C.O.D.	mg/l O2																		
Chloride	mg/l Cl	20	250	35	34	32	30	29	31	30	30	30	32	51	31	29	29		28
Chromium	µg/l	30	50		<1				<1				<1				<1		
Conductivity	µS/cm @ 25	800	2500	699	708	716	693	687	695	683	678	691	685	753	682	678	676		673
Copper	µg/l	30	2000		16.4				15								3.7		
Cyanide		0.01	0.05		<0.05				<0.05				<0.05				<0.05		
Depth	m		/	nm	nm	nm	nm	nm	nm	nm	nm	nm		nm	nm	nm	nm		nm
D.O.	% Saturation			46	78	84	77	50	76	76	79	68	80	40	75	68	59		61
Faecal coliforms	no/100ml		0		0	0		0	0	0	0		26	0	0	1	0		0
Fluoride	mg/l	1	0.8		<0.150				<0.150				<0.150				<0.150		
Iron	µg/l		200		164.5				198.3				451.5				320.2		
Lead	µg/l	10	25		<1				<1				4.6				<1		
Magnesium	mg/l Mg	50			43.93				40.22				49.21				44.21		
Manganese	µg/l		50		298				163.7				77.8				179.5		
Mercury	µg/l	1	1		<0.10				<0.10				<0.10				<0.1		
Nickel	µg/l	20	20		7.5				7.7				<1				<1		
Ortho-Phosphate	mg/l P	0.03			<0.02				<0.02				<0.02				<0.02		
pH		>7 or <8	6.5 - 9.5	7.5	7.3	7.4	7.6	7.7	7.3	7.7	7.6	7.6	7.7	7.7	7.7	7.7	7.7		7.8
Potassium	mg/l	5			1.26				1.29				1.39				1.23		
Residue on evap	mg/l				384				408				390				395		
Sodium	mg/l	150	200		18.35				18.01				24.9				19.91		
Sulphate		50	250		5.7				12.2				8.6				4.4		
Suspended Solids	mg/l																		
Temp	°C			9.5	6.4	14.6	11.7	2.5	10.6	12.2	13.5	6	8.2	10.6	11.2	10.3	10.4		10.6
Time						11.3	11.3	11.55	11.2	11.45	11.15	11.15	11.4	9.12	11.55	11.4	11.4		11.55
Total/ Bact coliforms	no/100ml		0		23			411	0	980	214		31	>2420	579	2420	>2420		613
T.O.C.	mg/l	10	NAC	7.2	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	43	<1.5	<1.5		<3.0
T.O.N	mg/l N				<0.05				<0.05				<0.05				<0.08		
Total Suspended Solids	mg/l																		
Zinc	µg/l	100			39.1				926.3				188.8				15.5		

	Whiteriver Landfill Site																		
PARAMETERS	GROUNDWATER QUALITY																		
	RESULTS																		
Monitoring Point:	BH18																		
	DOWNSTREAM DOMESTIC TAFFE'S PRIVATE WELLS- POTABLE SOURCE																		
		Trigger Level	DWR 2007	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date
	Units			11-Jan-06	04-Apr-06	11-Jul-06	10-Oct-06	23-Jan-07	19-Apr-07	03-Jul-07	10-Oct-07	15-Jan-08	08-Apr-08	01-Jul-08	07-Oct-08	13-Jan-09	21-Apr-09	15-Jul-09	06-Oct-09
Alkalinity	mg/lCaCO3	NAC	0.2		284				348				332				294		
Ammonia	mg/l N	0.2	0.3	0.05	<0.03	0.03	0.05	<0.03	0.06	0.31	0.05	0.08	<0.03	0.04	0.06	<0.03	0.04	0.03	0.27
Barium	µg/l												146.9						
B.O.D.	mg/l O2																<50		
Boron	µg/l	1000	1000		<50				<50				<50						
Cadmium	µg/l	5	5		<0.10				<0.10				<0.10				<0.1		
Calcium	mg/l Ca	200			81.23				78.57				80.51				83.42		
C.O.D.	mg/l O2																		
Chloride	mg/l Cl	20	250	26	25	26	26	24	26	12	26	25	28	28	28	26	26	26	26
Chromium	µg/l	30	50		<1				<1				<1				<1		
Conductivity	µS/cm @ 25	800	2500	635	642	641	647	628	711	634	637	643	640	640	642	635	632	640	635
Copper	µg/l	30	2000		12.1				8.1								6.9		
Cyanide		0.01	0.05		<0.05				<0.05				<0.05				<0.05		
Depth	m		/	nm	nm	nm	nm	nm	nm	nm	nm	nm		nm	nm	nm	nm	nm	nm
D.O.	% Saturation			16	48	17	<10	16	27	<10	<10	16	16	13	10	14	<10	<10	10
Faecal coliforms	no/100ml		0		0	0			0	0	0		0	0	0	0	<10	0	0
Fluoride	mg/l	1	0.8		<0.150				<0.150				<0.150				<0.150		
Iron	µg/l		200		3705.4				1173.2				3095.4				3257.9		
Lead	µg/l	10	25		<1				<1				50.7				<1		
Magnesium	mg/l Mg	50			20.3				19.49				21.23				19.12		
Manganese	µg/l		50		117.4				57.2				623.2				543.9		
Mercury	µg/l	1	1		<0.10				<0.10				<0.10				<0.1		
Nickel	µg/l	20	20		4.7				4.1				2.4				3		
Ortho-Phosphate	mg/l P	0.03			<0.02				<0.02				<0.02				<0.02		
pH		>7 or <8	6.5 - 9.5	7.4	7.4	7.5	7.5	7.6	7.1	7.5	7.5	7.5	7.6	7.6	7.4	7.5	7.5	7.3	7.5
Potassium	mg/l	5			1.12				1.27				1.2				1.08		
Residue on evaporation	mg/l				356				404				379				373		
Sodium	mg/l	150	200		21.22				21.81				30.93				23.77		
Sulphate		50	250		8.3				10.5				9.1				7.9		
Suspended Solids	mg/l																		
Temp	°C			6.9	7.7	16.1	11.9	4.8	12	15	13.7	7	6.4	10.1	11.7	6.3	11	15.2	12.6
Time						10.5	10.45	11.15	10.4	10.55	10.35	10.25	10.5	8.32	11.15	11	11		11.2
Total/ Bact coliforms	no/100ml		0	11	0				0	0	0		0	0	0	0	<10	0	0
T.O.C.	mg/l	10	NAC	1.9	<1.5	<1.5	2	<1.5	<1.5	<1.5	<1.5	1.8	<1.5	<1.5	30.6	<1.5	<1.5	<3.0	<3.0
T.O.N	mg/l N				<0.05				<0.05				<0.05				<0.08		
Total Suspended Solids	mg/l																		
Zinc	µg/l	100			109.8				100.9	100.9			120.8				174.3		

Whiteriver Landfill Site

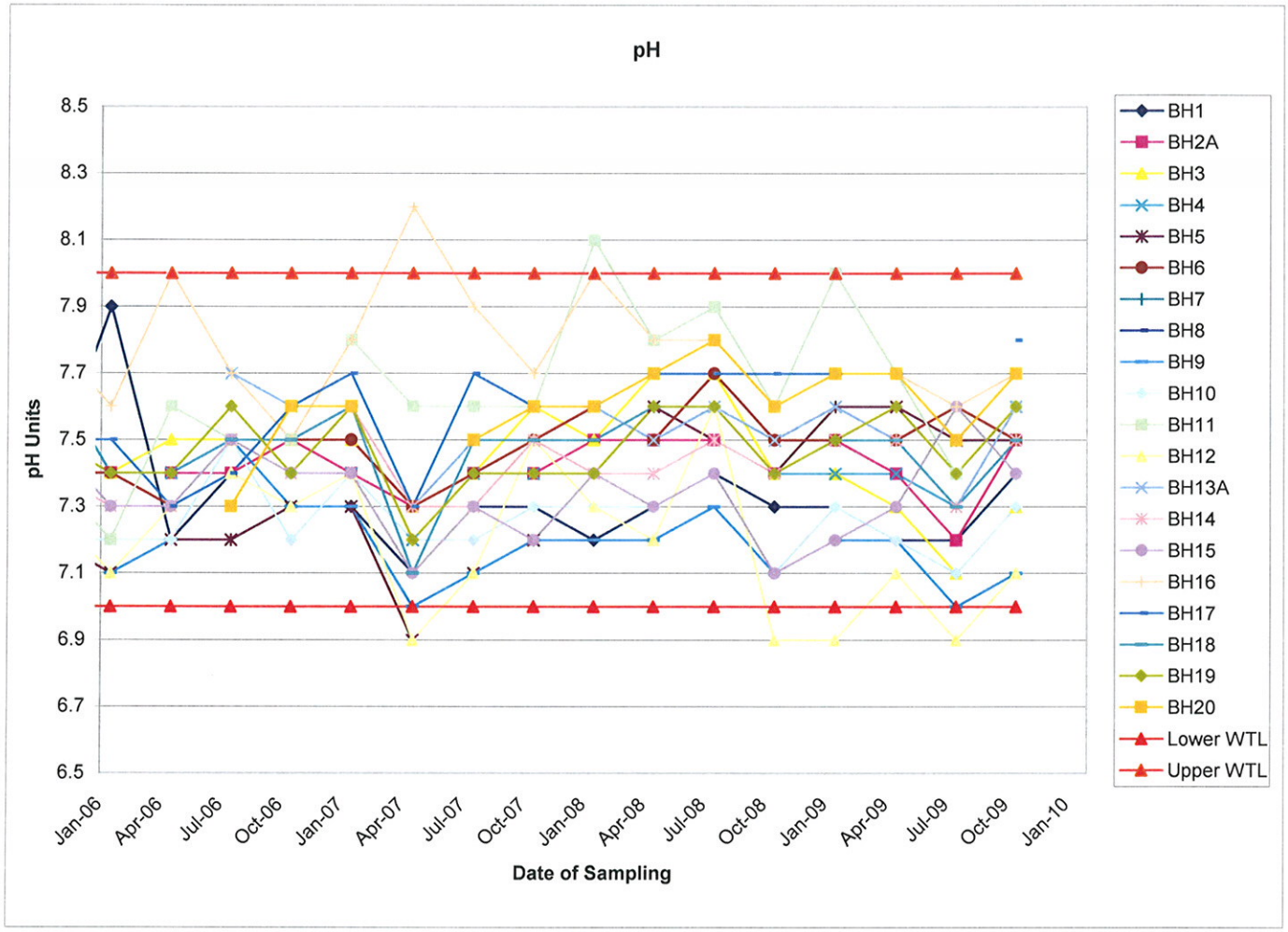
GROUNDWATER QUALITY

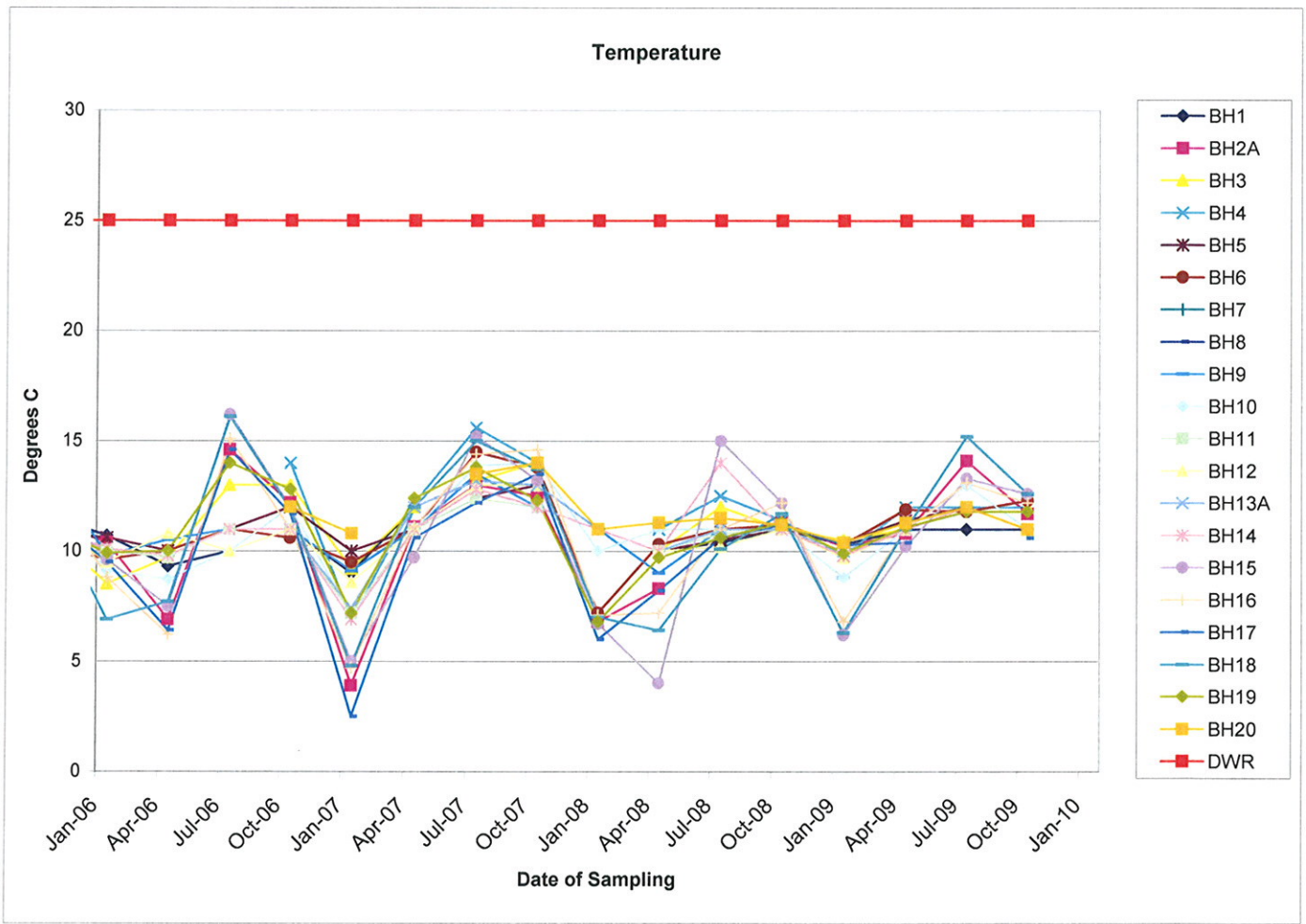
RESULTS

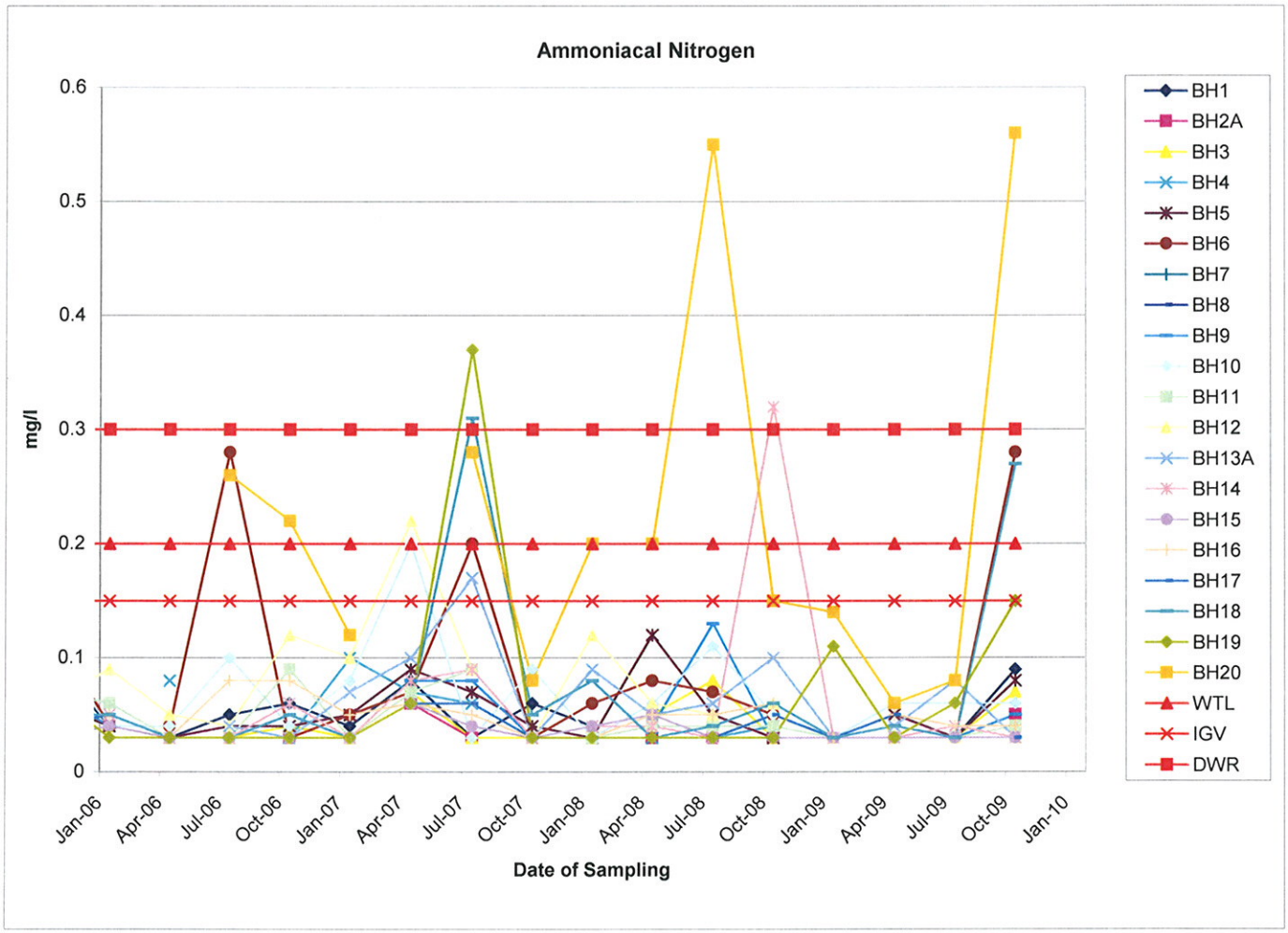
BH19

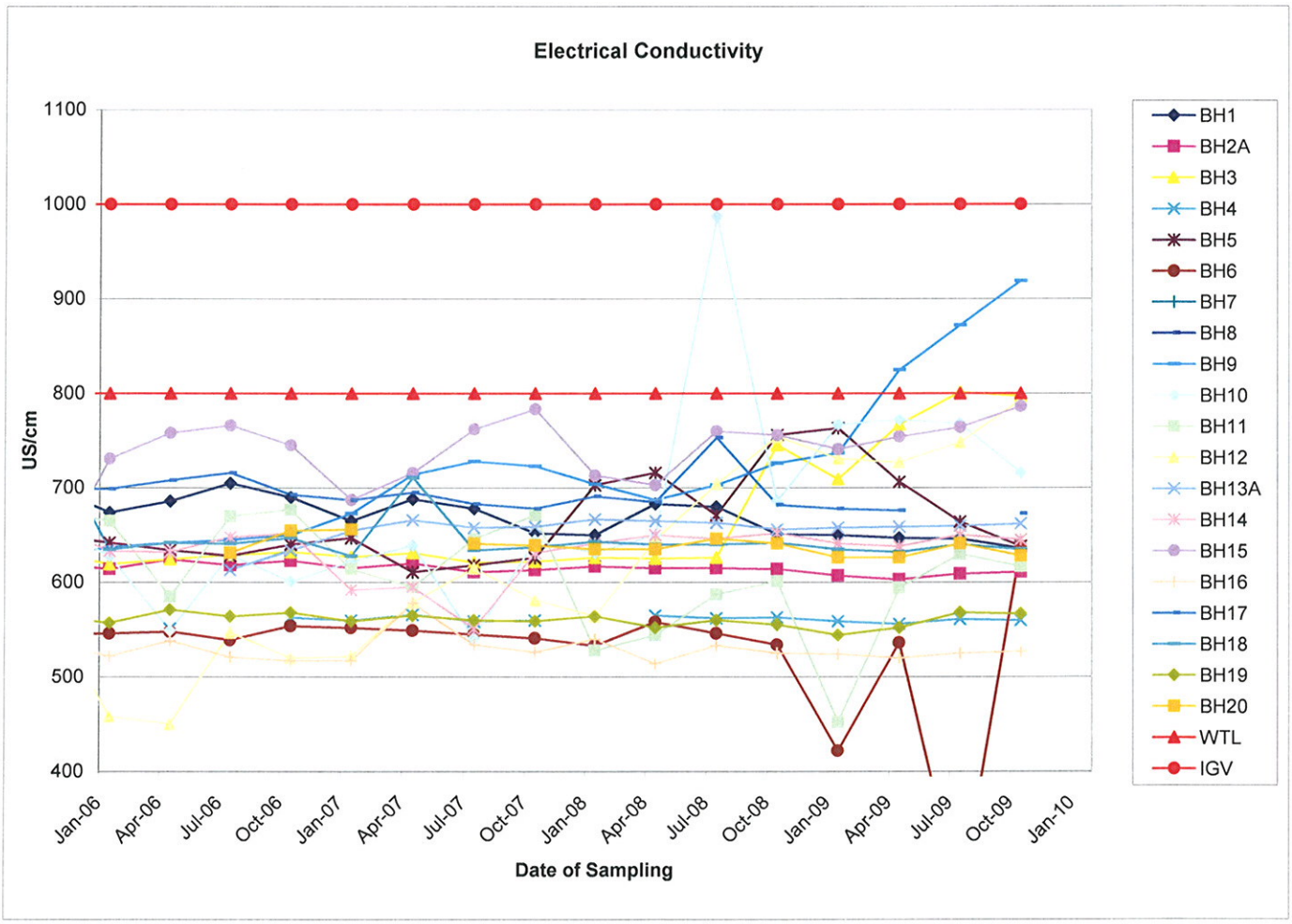
UPSTREAM AGRICULTURAL WATER SUPPLY ONLY

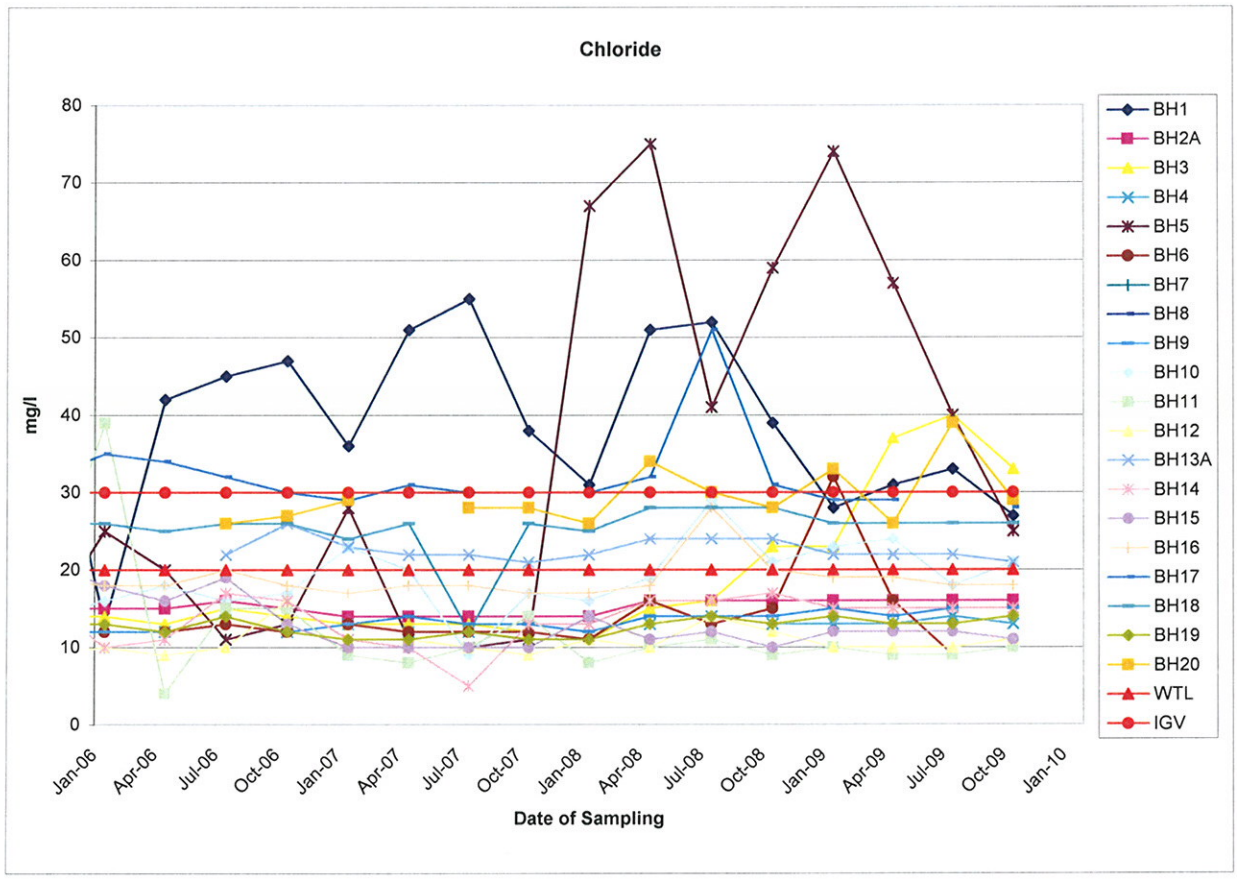
PARAMETERS		Trigger Level	DWR 2007	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date
Monitoring Point:	Units			11-Jan-06	04-Apr-06	11-Jul-06	10-Oct-06	23-Jan-07	19-Apr-07	03-Jul-07	11-Oct-07	15-Jan-08	04-Apr-08	01-Jul-08	07-Oct-08	13-Jan-09	21-Apr-09	14-Jul-09	06-Oct-09
Alkalinity	mg/lCaCO3	NAC	0.2		280				284				288				280		
Ammonia	mg/l N	0.2	0.3	0.03	<0.03	<0.03	0.03	<0.03	0.06	0.37	<0.03	<0.03	0.03	0.03	0.03	0.11	<0.03	0.06	0.15
Barium	µg/l												<50						
B.O.D.	mg/l O2																<50		
Boron	µg/l	1000	1000		<50				<50				<50						
Cadmium	µg/l	5	5		<0.10				<0.10				<0.10				<0.1		
Calcium	mg/l Ca	200			72.99				59.36				70.94				75.01		
C.O.D.	mg/l O2																		
Chloride	mg/l Cl	20	250	13	12	14	12	11	11	12	11	11	13	14	13	14	13	13	14
Chromium	µg/l	30	50		2.1				<1				9.6				1.4		
Conductivity	µS/cm @ 25	800	2500	557	571	564	568	559	565	560	559	564	552	560	555	544	552	568	567
Copper	µg/l	30	2000		118				24.4								33.8		
Cyanide		0.01	0.05		<0.05				<0.05				<0.05				<0.05		
Depth	m		/	0.8	1.3	<0.1	<0.1	<0.1	<0.1	nm	<0.1	<0.1		3.6	4	nm	7.2	9.6	3.2
D.O.	% Saturation			21	29	48	25	28	24	26	20	21	18	18	27	27	38	49	47
Faecal coliforms	no/100ml		0			0				84			1	10	9	8	0		
Fluoride	mg/l	1	0.8		<0.150				<0.150				<0.150				<0.150		
Iron	µg/l		200		9672.4				1194.6				5195.6				1138.4		
Lead	µg/l	10	25		<1				<1				<1				1.4		
Magnesium	mg/l Mg	50			20.83				17.52				21.98				19.95		
Manganese	µg/l		50		12.6				10.8				32.2				22.2		
Mercury	µg/l	1	1		<0.10				<0.10				<0.10				<0.1		
Nickel	µg/l	20	20		14.5				4.2				23.6				4		
Ortho-Phosphate	mg/l P	0.03			0.03				<0.02				<0.02				<0.02		
pH		>7 or <8	6.5 - 9.5	7.4	7.4	7.6	7.4	7.6	7.2	7.4	7.4	7.4	7.6	7.6	7.4	7.5	7.6		7.6
Potassium	mg/l	5			0.9				1.02				0.97				<1		
Residue on evaporation	mg/l				336				330				371				334		
Sodium	mg/l	150	200		14.44				14.09				20.38				15.76		
Sulphate		50	250		3.2				3.4				4.5				3.9		
Suspended Solids	mg/l																		
Temp	°C			9.9	10	14	12.8	7.2	12.4	13.8	12.3	6.8	9.7	10.6	11.3	9.9	11.1		11.8
Time						12.2	12.2	13.1	13.1	13.3	13.15	13.05	13.5	11.35	13.35	13.15	12.55		13.1
Total/ Bact coliforms	no/100ml		0							>2419			42	345	272	129	10		
T.O.C.	mg/l	10	NAC	4.4	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	23.4	1.5	<1.5		<3.0
T.O.N	mg/l N				0.45				0.42				0.07				0.73		
Total Suspended Solids	mg/l																		
Zinc	µg/l	100			<1				<1				12.9				25.4		

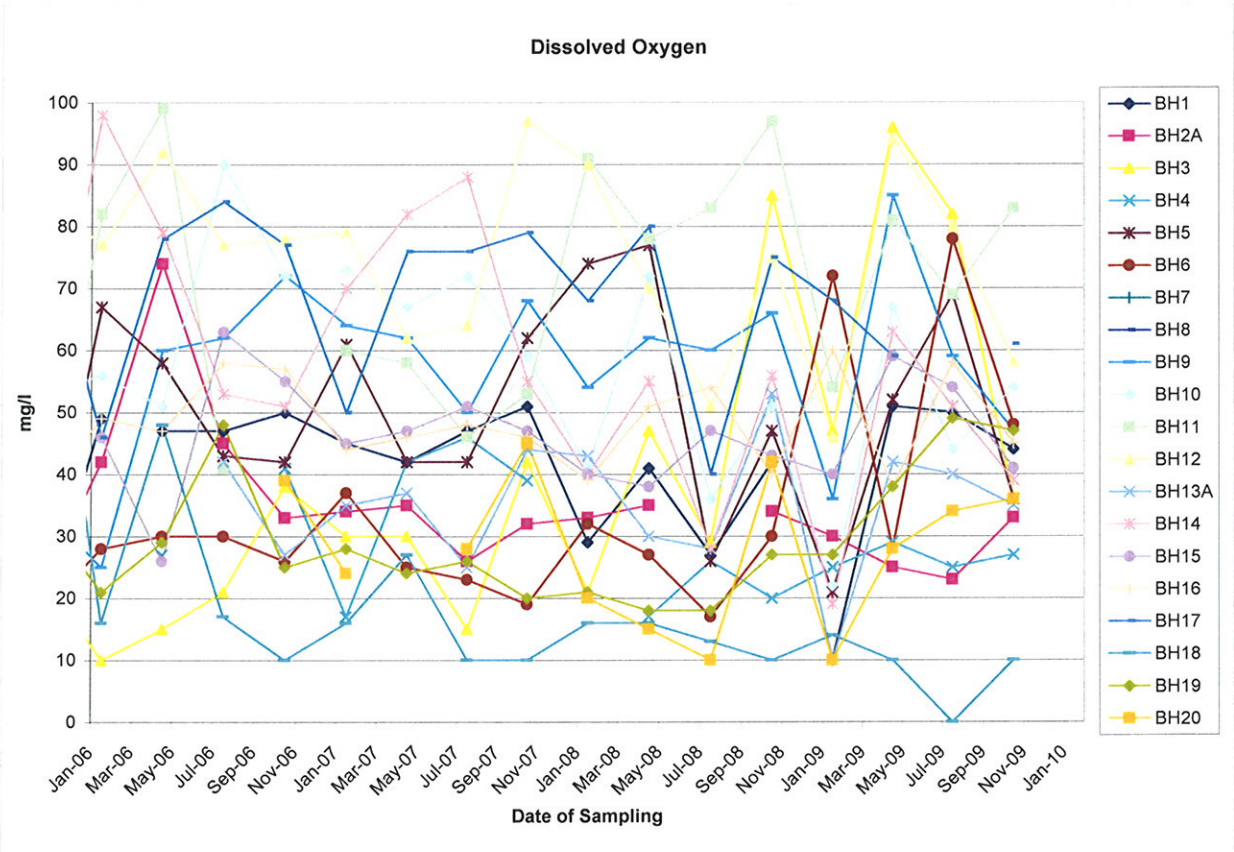

pH
pH Units
8.5
8.3
8.1
7.9
7.7
7.5
7.3
7.1
6.9
6.7
6.5
Jan-06
Apr-06
Jul-06
Oct-06
Jan-07
Apr-07
Jul-07
Oct-07
Jan-08
Apr-08
Jul-08
Oct-08
Jan-09
Apr-09
Jul-09
Oct-09
Jan-10
Date of Sampling
BH1
BH2A
BH3
BH4
BH5
BH6
BH7
BH8
BH9
BH10
BH11
BH12
BH13A
BH14
BH15
BH16
BH17
BH18
BH19
BH20
Lower WTL
Upper WTL

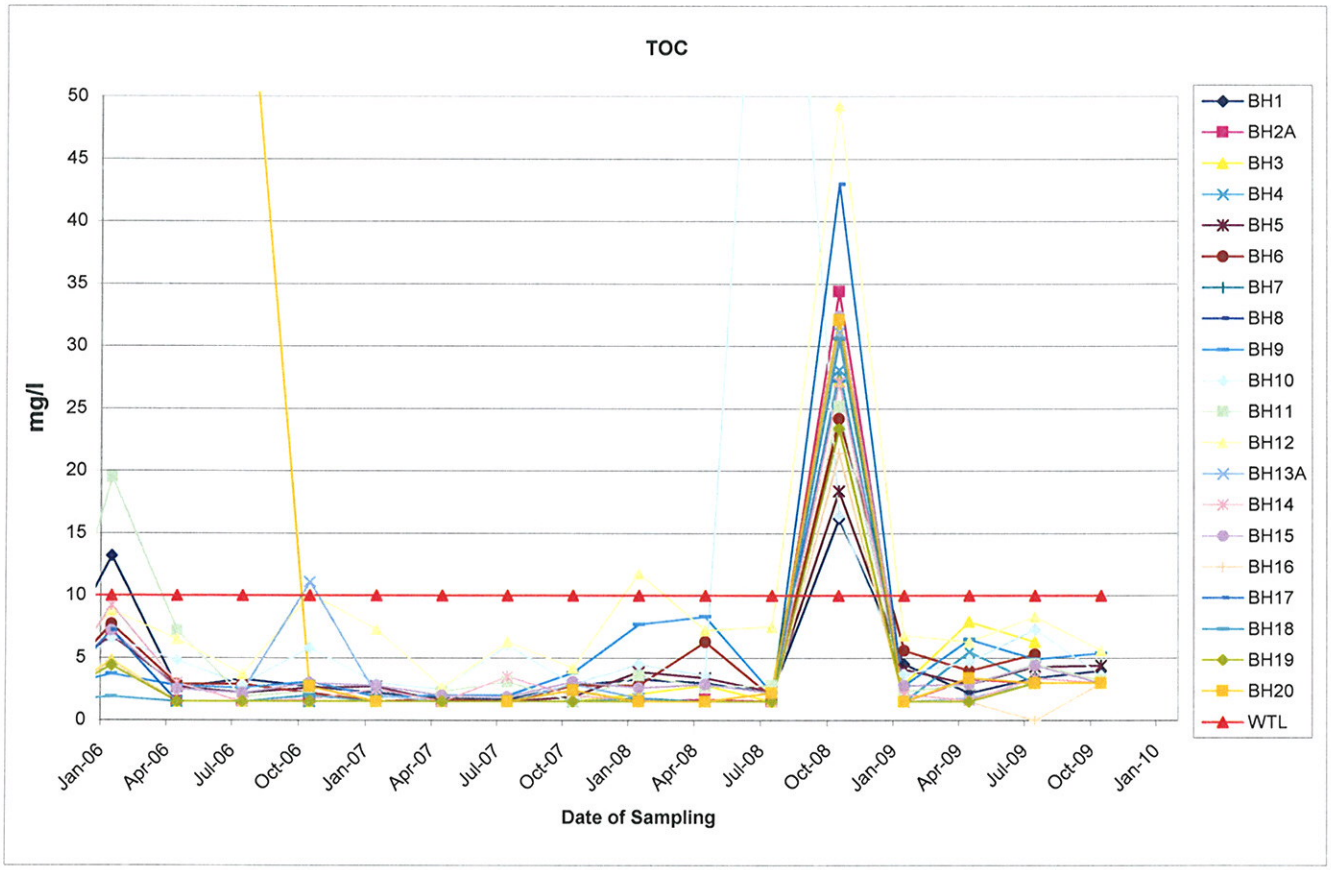

Temperature
Degrees C
30
25
20
15
10
5
0
Jan-06
Apr-06
Jul-06
Oct-06
Jan-07
Apr-07
Jul-07
Oct-07
Jan-08
Apr-08
Jul-08
Oct-08
Jan-09
Apr-09
Jul-09
Oct-09
Jan-10
Date of Sampling
BH1
BH2A
BH3
BH4
BH5
BH6
BH7
BH8
BH9
BH10
BH11
BH12
BH13A
BH14
BH15
BH16
BH17
BH18
BH19
BH20
DWR


Ammoniacal Nitrogen
mg/l
0.6
0.5
0.4
0.3
0.2
0.1
0
Jan-06
Apr-06
Jul-06
Oct-06
Jan-07
Apr-07
Jul-07
Oct-07
Jan-08
Apr-08
Jul-08
Oct-08
Jan-09
Apr-09
Jul-09
Oct-09
Jan-10
Date of Sampling
BH1
BH2A
BH3
BH4
BH5
BH6
BH7
BH8
BH9
BH10
BH11
BH12
BH13A
BH14
BH15
BH16
BH17
BH18
BH19
BH20
WTL
IGV
DWR


Electrical Conductivity
US/cm
1100
1000
900
800
700
600
500
400
Jan-06
Apr-06
Jul-06
Oct-06
Jan-07
Apr-07
Jul-07
Oct-07
Jan-08
Apr-08
Jul-08
Oct-08
Jan-09
Apr-09
Jul-09
Oct-09
Jan-10
Date of Sampling
BH1
BH2A
BH3
BH4
BH5
BH6
BH7
BH8
BH9
BH10
BH11
BH12
BH13A
BH14
BH15
BH16
BH17
BH18
BH19
BH20
WTL
IGV


Chloride
mg/l
0
10
20
30
40
50
60
70
80
Jan-06
Apr-06
Jul-06
Oct-06
Jan-07
Apr-07
Jul-07
Oct-07
Jan-08
Apr-08
Jul-08
Oct-08
Jan-09
Apr-09
Jul-09
Oct-09
Jan-10
Date of Sampling
BH1
BH2A
BH3
BH4
BH5
BH6
BH7
BH8
BH9
BH10
BH11
BH12
BH13A
BH14
BH15
BH16
BH17
BH18
BH19
BH20
WTL
IGV


Dissolved Oxygen
mg/l
0
10
20
30
40
50
60
70
80
90
100
Jan-06
Mar-06
May-06
Jul-06
Sep-06
Nov-06
Jan-07
Mar-07
May-07
Jul-07
Sep-07
Nov-07
Jan-08
Mar-08
May-08
Jul-08
Sep-08
Nov-08
Jan-09
Mar-09
May-09
Jul-09
Sep-09
Nov-09
Jan-10
Date of Sampling
BH1
BH2A
BH3
BH4
BH5
BH6
BH7
BH8
BH9
BH10
BH11
BH12
BH13A
BH14
BH15
BH16
BH17
BH18
BH19
BH20


TOC
mg/l
50
45
40
35
30
25
20
15
10
5
0
Jan-06
Apr-06
Jul-06
Oct-06
Jan-07
Apr-07
Jul-07
Oct-07
Jan-08
Apr-08
Jul-08
Oct-08
Jan-09
Apr-09
Jul-09
Oct-09
Jan-10
Date of Sampling
BH1
BH2A
BH3
BH4
BH5
BH6
BH7
BH8
BH9
BH10
BH11
BH12
BH13A
BH14
BH15
BH16
BH17
BH18
BH19
BH20
WTL

APPENDIX D

SURFACE WATER MONITORING RESULTS

	Whiteriver Landfill Site													
	SURFACE WATER QUALITY													
PARAMETERS	**RESULTS**													
Monitoring Point:		**SW1**												
		Date	**Date**	**Date**	**Date**	**Date**	**Date**	**Date**	**Date**	**Date**	**Date**	**Date**	**Date**	**Date**	**Date**
	Units	11-Jan-06	04-Apr-06	11-Jul-06	10-Oct-06	23-Jan-07	19-Apr-07	03-Jul-07	15-Jan-08	08-Apr-08	07-Oct-08	13-Jan-09	21-Apr-09	14-Jul-09	06-Oct-09
Alkalinity	mg/lCaCO3						328			280			304		
Ammonia	mg/l N	1.27	2.88	2.88	1.49	0.22	8.29	3.55	0.56	1.37	0.68	0.75	0.56	1.04	0.57
Barium	µg/l														
B.O.D.	mg/l O2	16.6	11.6	11.6	6	<3.0	23.8		4.5	5.4	174.9	7.4	<50	50.2	24.7
Boron	µg/l						<50			<50			6.2		
Cadmium	µg/l						<0.10			<0.10			<0.1		
Calcium	mg/l Ca						89.84			98			108.98		
C.O.D.	mg/l O2	155	90	90	43	34	90	220	42	35	801	30	37	288	98
Chloride	mg/l Cl	29	47	47	27	21	41	28	28	32	40	25	32	36	54
Chromium	µg/l						<1			<1			1.7		
Conductivity	µS/cm @ 25	534	912	912	626	474	824	652	498	659	444	574	692	604	954
Copper	µg/l						5.1			2.2			3		
Cyanide	mg/l														
Depth	m														
D.O.	% Saturation	73	31	31	85	84	81	45	80	60	72	88	84	69	60
Faecal coliforms	no/100ml														
Fluoride	mg/l														
Iron	µg/l						935.9			418.4			586.5		
Lead	µg/l						14.6			<1			1.6		
Magnesium	mg/l Mg						10.16			11.69			11.69		
Manganese	µg/l						332.7			124.8			96		
Mercury	µg/l						<0.10			<0.10			<0.1		
Nickel	µg/l						7.9			2			3.2		
Ortho-Phosphate	mg/l P						0.63			0.4			0.47		
pH		7.3	7.3	7.3	7.8	8	7.8	7.6	7.8	7.8	7.3	7.8	8	7.4	7.8
Potassium	mg/l						19.99			10.97			12.71		
Residue on evaporation															
Sodium	mg/l						21.89			17.92			16.98		
Sulphate	mg/l SO4						52.2			28.1			19.5		
Suspended Solids	mg/l											12			
Temp	°C	6.5	15.6	15.6	11.7	3.8	11.4	16.8	6.5	6	11.9	5	10.3	14.1	13.2
Time				13.1	13.35	12.25	12.1	12.35	12.35	12.15	13	12.55	13.1		14.3
Total/ bacteria coliforms	no/100ml	12.15	13.1												
T.O.C.	mg/l											11.6			
T.O.N	mg/l N						0.9			1.93			2.15		
Total Suspended Solids	mg/l	38		44	7	24	37	51	8	21	1410		26	363	61
Zinc	µg/l		44				6.7			<1			9.1		

Whiteriver Landfill Site

SURFACE WATER QUALITY

RESULTS

PARAMETERS															
Monitoring Point:		SW2A													
		Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date
	Units	11-Jan-06	04-Apr-06	11-Jul-06	10-Oct-06	23-Jan-07	19-Apr-07	03-Jul-07	15-Jan-08	08-Apr-08	07-Oct-08	13-Jan-09	21-Apr-09	14-Jul-09	06-Oct-09
Alkalinity	mg/lCaCO3		160				211	0.39		280			280		
Ammonia	mg/l N	0.72	0.27	0.13	0.33	0.3	0.13		0.23	0.08	0.12	0.6	<0.03	0.16	0.09
Barium	µg/l														
B.O.D.	mg/l O2	6	1.6	3.1	2.7	2.1	2.4		<2	1.7	8.5	2.7	<50	2.2	1.6
Boron	µg/l		<50				<50			<50			2.4		
Cadmium	µg/l		<0.10				<0.10			<0.10			<0.1		
Calcium	mg/l Ca		64.09				74	52		95.9			95.36		
C.O.D.	mg/l O2	80	150	50	58	29	36	19	21	19	49	17	<10	31	10
Chloride	mg/l Cl	32	20	25	29	20	44		40	44	51	53	40	52	36
Chromium	µg/l		<1				<1			<1			<1		
Conductivity	µS/cm @ 25	531	443	601	635	379	645	440	530	662	602	685	662	651	632
Copper	µg/l		4.9				3.6			12.3			2.8		
Cyanide	mg/l														
Depth	mg/l														
D.O.	% Saturation	74	96	51	86	87	115	79	69	86	82	90	105	87	87
Faecal coliforms	no/100ml														
Fluoride	mg/l														
Iron	µg/l		318.3				961			307.9			239.4		
Lead	µg/l		<1				2.2			<1			<1		
Magnesium	mg/l Mg		8.62				10.74			12.38			13.8		
Manganese	µg/l		156.9				451			128.4			124.7		
Nickel	µg/l		<0.10				<0.10			<0.10			<0.1		
Mercury	µg/l		3.3				8.2			2.2			2.8		
Ortho-Phosphate	mg/l P		0.05				0.03			0.1			0.05		
pH		7.3	7.7	7.5	7.8	8.2	8.4	7.8	7.7	8.1	7.7	8	8	7.7	8.2
Potassium	mg/l		3.49				7.41			5.8			3.99		
Sodium	mg/l														
Residue on evaporation			11.76				20.75			30.33			24.81		
Suspended Solids	mg/l		33				66.9			38.4			56.3		
Sulphate	mg/l SO4											<5			
Temp	°C	6.6	7	15.5	11.6	3.8	12.1	16.9	6.4	6.8	12.2	5.2	11.9	16.5	13.3
Time				13.25	13.1	12.4	12.25	12.5	12	12.3	12.2	12.15	12.2		13.25
T.O.C.	mg/l	12.35													
Total coliforms	no/100ml														
T.O.N	mg/l N		1.65				2.17			1.53			0.75		
Total Suspended Solids	mg/l	52	2020	44	252	84	46	20	16	15	55		8	20	36
Zinc	µg/l		<1				2.7			<1			4.2		

	Whiteriver Landfill Site													
	SURFACE WATER QUALITY													
PARAMETERS	RESULTS													
Monitoring Point:		SW3												
		Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date	Date
	Units	11-Jan-06	04-Apr-06	11-Jul-06	10-Oct-06	23-Jan-07	19-Apr-07	03-Jul-07	15-Jan-08	08-Apr-08	07-Oct-08	13-Jan-09	21-Apr-09	14-Jul-09	06-Oct-09
Alkalinity	mg/lCaCO3														
Ammonia	mg/l N													0.56	0.72
Barium	µg/l														
B.O.D.	mg/l O2													<2.0	<1.5
Boron	µg/l														
Cadmium	µg/l														
Calcium	mg/l Ca														
C.O.D.	mg/l O2													32	<10
Chloride	mg/l Cl													22	28
Chromium	µg/l														
Conductivity	µS/cm @ 25													550	547
Copper	µg/l														
Cyanide	mg/l														
Depth	mg/l														
D.O.	% Saturation													85	67
Faecal coliforms	no/100ml														
Fluoride	mg/l														
Iron	µg/l														
Lead	µg/l														
Magnesium	mg/l Mg														
Manganese	µg/l														
Nickel	µg/l														
Mercury	µg/l														
Ortho-Phosphate	mg/l P														
pH														7.8	8
Potassium	mg/l														
Sodium	mg/l														
Residue on evaporation															
Suspended Solids	mg/l														
Sulphate	mg/l SO4														
Temp	°C													17.6	13
Time															13.3
T.O.C.	mg/l														
Total coliforms	no/100ml														
T.O.N	mg/l N														
Total Suspended Solids	mg/l													14	<5
Zinc	µg/l														

APPENDIX E

GAS MONITORING RESULTS

Jan-09

ID	Date/Time	CH4	CO2	O2
PZ2 WHIT	28/01/2009 00:00	0	1.1	20
PZ3 WHIT	28/01/2009 00:00	0	0	20.6
PZ1 WHIT	28/01/2009 00:00	0	0.8	20.2
PZ16 WHI	28/01/2009 00:00	0	0.5	20.9
PZ15 WHI	28/01/2009 00:00	0	0.1	21.1
PZ14 WHI	28/01/2009 00:00	0	0	21.2
PZ13 WHI	28/01/2009 00:00	0	0	21.3
PZ11 WHI	28/01/2009 00:00	0	1.3	19.2
PZ21 WHI	28/01/2009 00:00	0	0.6	21.4
PZ23 WHI	28/01/2009 00:00	0	0.7	20.6
PZ24 WHI	28/01/2009 00:00	0	0	21.3

Feb-09

ID	Date/Time	CH4	CO2	O2
PZ2 WHIT	10/02/2009 00:00	0	0.8	20.2
PZ3 WHIT	10/02/2009 00:00	0	0	20.6
PZ1 WHIT	10/02/2009 00:00	0	0.8	20.2
PZ16 WHI	10/02/2009 00:00	0	0.5	20.9
PZ15 WHI	10/02/2009 00:00	0	0.1	21.1
PZ14 WHI	10/02/2009 00:00	0	0	21.2
PZ13 WHI	10/02/2009 00:00	0	0	21.3
PZ11 WHI	10/02/2009 00:00	0	1.4	19
PZ21 WHI	10/02/2009 00:00	0	0.6	21.4
PZ23 WHI	10/02/2009 00:00	0	0.6	20.7
PZ24 WHI	10/02/2009 00:00	0	0.2	21.1

Mar-09

ID	Date/Time	CH4	CO2	O2
PZ2 WHIT	09/03/2009 11:24	0	0.2	19.6
PZ3 WHIT	09/03/2009 11:27	0	0.9	19.6
PZ1 WHIT	09/03/2009 11:23	0	0.7	19.7
PZ16 WHI	09/03/2009 12:33	0	0.1	20.5
PZ15 WHI	09/03/2009 12:32	0	0.1	20.6
PZ14 WHI	09/03/2009 12:32	0	0.1	20.5
PZ13 WHI	09/03/2009 12:31	0	0.1	20.5
PZ11 WHI	09/03/2009 12:29	0	0.1	20.6
PZ21 WHI	09/03/2009 12:28	0	0.1	20.5
PZ23 WHI	09/03/2009 12:24	0	0.1	20.5
PZ24 WHI	09/03/2009 12:23	0	0.2	20.4
PZ3A WHI	09/03/2009 11:25	0	1.1	19.5
PZ4 WHIT	09/03/2009 11:29	0	0.7	19.9
PZ5 WHIT	09/03/2009 11:29	0	0.1	19.8
PZ54 WHI	09/03/2009 11:30	0	0.8	19.8
PZ53 WHI	09/03/2009 11:33	0	0.5	19.9
PZ52 WHI	09/03/2009 11:35	0	0.8	19.6
PZ51 WHI	09/03/2009 11:37	0	0.5	19.8
PZ50 WHI	09/03/2009 11:39	0	0.3	20
PZ49 WHI	09/03/2009 11:40	0	0.4	20
PZ48 WHI	09/03/2009 11:43	0	0.4	19.9
PZ47 WHI	09/03/2009 11:44	0	1.2	19.6
PZ46 WHI	09/03/2009 11:46	0	0.6	20
PZ45 WHI	09/03/2009 11:48	0	1.1	18.8
PZ44WHIT	09/03/2009 11:50	0	1.3	19
PZ43 WHI	09/03/2009 11:51	0	0.3	20
PZ42 WHI	09/03/2009 11:53	0	0.2	20
PZ41 WHI	09/03/2009 11:54	0	0.3	20.1
PZ40 WHI	09/03/2009 11:56	0	1.6	19.8
PZ39 WHI	09/03/2009 11:58	0	0.3	20.1
PZ38 WHI	09/03/2009 11:59	0	0.3	20.2
PZ37 WHI	09/03/2009 12:01	0	0.7	20
PZ36 WHI	09/03/2009 12:02	0	0.1	20.2
PZ35 WHI	09/03/2009 12:04	0	0.2	19.8
PZ34 WHI	09/03/2009 12:05	0	0.3	20.2
PZ33 WHI	09/03/2009 12:07	0	1.5	19.5
PZ32 WHI	09/03/2009 12:09	0	1.7	19.1
PZ31 WHI	09/03/2009 12:10	0	1.7	19.7
PZ30 WHI	09/03/2009 12:12	0	0.1	20.3
PZ29 WHI	09/03/2009 12:13	0	0.8	19.7
PZ28 WHI	09/03/2009 12:15	0	0.5	20.3
PZ27 WHI	09/03/2009 12:17	0	2.1	19.4
PZ26 WHI	09/03/2009 12:19	0	0.1	20.3
PZ25 WHI	09/03/2009 12:22	0	0.3	20.4
PZ22 WHI	09/03/2009 12:27	0	0.9	20.1
PZ12 WHI	09/03/2009 12:30	0	0.1	20.5

Apr-09

Device ID	Empty	Date/Time (UK)	CH4	CO2	O2
PZ1 WHIT		23/04/2009 15:26	0	0.5	20.8
PZ2 WHIT		23/04/2009 15:27	0	0.1	20.6
PZ3 WHIT		23/04/2009 15:28	0	0.3	20.8
PZ4 WHIT		23/04/2009 15:29	0	0.7	21
PZ5 WHIT		23/04/2009 15:30	0	0.1	21
PZ54 WHI		23/04/2009 15:31	0	0.8	20.8
PZ53 WHI		23/04/2009 15:32	0	0.5	20.6
PZ52 WHI		23/04/2009 15:33	0	0.8	20.8
PZ51 WHI		23/04/2009 15:34	0	0.5	21
PZ50 WHI		23/04/2009 15:36	0	0.2	21
PZ49 WHI		23/04/2009 15:37	0	0.4	20.8
PZ48 WHI		23/04/2009 15:38	0	1.2	20.6
PZ47 WHI		23/04/2009 15:39	0	1	20.8
PZ46 WHI		23/04/2009 15:40	0	4	19.8
PZ45 WHI		23/04/2009 15:41	0	0.6	21
PZ44 WHI		23/04/2009 15:42	0	0.2	21
PZ43 WHI		23/04/2009 15:43	0	0.2	21.1
PZ42 WHI		23/04/2009 15:45	0	3.1	17.3
PZ41 WHI		23/04/2009 15:46	0	0.6	20.8
PZ40 WHI		23/04/2009 15:47	0	1	20.6
PZ39 WHI		23/04/2009 15:48	0	0.6	20.8
PZ38 WHI		23/04/2009 15:48	0	0.5	20.8
PZ37 WHI		23/04/2009 15:49	0	0.1	21
PZ36 WHI		23/04/2009 15:50	0	0.1	21
PZ35 WHI		23/04/2009 15:52	0	0.2	20.8
PZ34 WHI		23/04/2009 15:53	0	1.6	19.5
PZ33 WHI		23/04/2009 15:54	0	1.6	18
PZ32 WHI		23/04/2009 15:55	0	1.8	20
PZ31 WHI		23/04/2009 15:56	0	4.2	17.1
PZ30 WHI		23/04/2009 15:57	0	0.4	20.3
PZ29 WHI		23/04/2009 15:58	0	0.5	20.7
PZ28 WHI		23/04/2009 15:59	0	0.5	20.5
PZ27 WHI		23/04/2009 16:00	0	0.4	20.8
PZ26 WHI		23/04/2009 16:01	0	0.4	20.8
PZ25 WHI		23/04/2009 16:05	0	0.2	20.9
PZ24 WHI		23/04/2009 16:08	0	0.1	20.8
PZ23 WHI		23/04/2009 16:09	0	0	20.9
PZ22 WHI		23/04/2009 16:09	0	0	20.9
PZ21 WHI		23/04/2009 16:10	0	0.2	20.7
PZ11 WHI		23/04/2009 16:12	0	0	20.9
PZ12 WHI		23/04/2009 16:13	0	0	21
PZ13 WHI		23/04/2009 16:15	0	0.1	20.5
PZ14 WHI		23/04/2009 16:16	0	0	21
PZ15 WHI		23/04/2009 16:17	0	0	21
PZ16 WHI		23/04/2009 16:19	0	0.4	20.4

May-09

Device ID	Empty	Date/Time (UK)	CH4	CO2	O2
PZ1 WHIT		29/05/2009 10:16	0	0	21
PZ2 WHIT		29/05/2009 10:17	0	1.2	20.2
PZ3 WHIT		29/05/2009 10:18	0	0.7	20.7
PZ4 WHIT		29/05/2009 10:19	0	1.1	20.7
PZ5 WHIT		29/05/2009 10:20	0	0.7	20.1
PZ54 WHI		29/05/2009 10:21	0	0.3	20.6
PZ53 WHI		29/05/2009 10:23	0	0.2	20.9
PZ52 WHI		29/05/2009 10:24	0	0.1	21
PZ51 WHI		29/05/2009 10:26	0	0.4	20.9
PZ50 WHI		29/05/2009 10:27	0	1.1	20.6
PZ49 WHI		29/05/2009 10:28	0	1.4	19.7
PZ48 WHI		29/05/2009 10:31	0	1.2	20.1
PZ47 WHI		29/05/2009 10:31	0	1	20
PZ46 WHI		29/05/2009 10:32	0	4.8	19.4
PZ45 WHI		29/05/2009 10:34	0	0.6	20.5
PZ44 WHI		29/05/2009 10:35	0	0.2	21
PZ43 WHI		29/05/2009 10:37	0	0.2	21.1
PZ42 WHI		29/05/2009 10:40	0	3.3	17.3
PZ41 WHI		29/05/2009 10:41	0	0.6	20.8
PZ40 WHI		29/05/2009 10:43	0	1	20.6
PZ39 WHI		29/05/2009 10:44	0	0.6	20.8
PZ38 WHI		29/05/2009 10:45	0	0.4	20.8
PZ37 WHI		29/05/2009 10:46	0	0.1	21
PZ36 WHI		29/05/2009 10:47	0	0.1	21
PZ35 WHI		29/05/2009 10:48	0	0.2	20.8
PZ34 WHI		29/05/2009 10:49	0	1.6	19.5
PZ33 WHI		29/05/2009 10:51	0	1.8	18
PZ32 WHI		29/05/2009 10:52	0	1.7	20
PZ31 WHI		29/05/2009 10:55	0	4.1	17.1
PZ30 WHI		29/05/2009 10:55	0	0.4	20.3
PZ29 WHI		29/05/2009 10:57	0	0.5	20.7
PZ28 WHI		29/05/2009 10:58	0	0.5	20.5
PZ27 WHI		29/05/2009 11:00	0	0.4	20.8
PZ26 WHI		29/05/2009 11:02	0	0.4	20.8
PZ25 WHI		29/05/2009 11:03	0	0.2	20.9
PZ24 WHI		29/05/2009 11:04	0	0.1	20.8
PZ23 WHI		29/05/2009 11:05	0	0	20.9
PZ22 WHI		29/05/2009 11:05	0	0	20.9
PZ21 WHI		29/05/2009 11:06	0	0.2	20.7
PZ11 WHI		29/05/2009 11:07	0	0	20.9
PZ12 WHI		29/05/2009 11:08	0	0	21
PZ13 WHI		29/05/2009 11:08	0	0.1	20.5
PZ14 WHI		29/05/2009 11:09	0	0	21
PZ15 WHI		29/05/2009 11:10	0	0	21
PZ16 WHI		29/05/2009 11:11	0	0.4	20.4

Jun-09

Device ID	Empty	Date/Time (UK)	CH4	CO2	O2
PZ1 WHIT		18/06/2009 15:00	0	0	20.9
PZ2 WHIT		18/06/2009 15:01	0	0.1	20.6
PZ3 WHIT		18/06/2009 15:03	0	1.4	20.1
PZ4 WHIT		18/06/2009 15:05	0	1.1	20.4
PZ5 WHIT		18/06/2009 15:06	0	1.9	19.9
PZ54 WHI		18/06/2009 15:08	0	0.3	20.7
PZ53 WHI		18/06/2009 15:09	0	0.7	20.1
PZ52 WHI		18/06/2009 15:11	0	0.4	20.5
PZ51 WHI		18/06/2009 15:12	0	0.5	20.4
PZ50 WHI		18/06/2009 15:13	0	0.9	20.2
PZ49 WHI		18/06/2009 15:15	0	0.5	20.1
PZ48 WHI		18/06/2009 15:16	0	2	19.7
PZ47 WHI		18/06/2009 15:18	0	0.6	20.2
PZ46 WHI		18/06/2009 15:22	0	4.8	18.4
PZ45 WHI		18/06/2009 15:24	0	0.8	20.1
PZ44 WHI		18/06/2009 15:25	0	0.5	20.5
PZ43 WHI		18/06/2009 15:27	0	0.2	20.7
PZ42 WHI		18/06/2009 15:29	0	0.6	20.4
PZ41 WHI		18/06/2009 15:31	0	2.2	19.5
PZ40 WHI		18/06/2009 15:32	0	0.4	20.4
PZ39 WHI		18/06/2009 15:34	0	0.5	20.5
PZ38 WHI		18/06/2009 15:35	0	0.5	20.4
PZ37 WHI		18/06/2009 15:37	0	0	20.7
PZ36 WHI		18/06/2009 15:38	0	0.1	20.6
PZ35 WHI		18/06/2009 15:40	0	0.2	20.6
PZ34 WHI		18/06/2009 15:41	0	1.4	18.8
PZ33 WHI		18/06/2009 15:43	0	4.3	12.5
PZ32 WHI		18/06/2009 15:44	0	1.8	19.1
PZ31 WHI		18/06/2009 15:45	0	2.4	18.3
PZ30 WHI		18/06/2009 15:46	0	0.7	19.5
PZ29 WHI		18/06/2009 15:48	0	0.5	20.3
PZ28 WHI		18/06/2009 15:49	0	3	17.6
PZ27 WHI		18/06/2009 15:51	0	0.3	20.5
PZ26 WHI		18/06/2009 15:52	0	0.2	20.7
PZ25 WHI		18/06/2009 15:53	0	0	20.8
PZ24 WHI		18/06/2009 15:54	0	0	20.9
PZ23 WHI		18/06/2009 15:55	0	1	19.8
PZ22 WHI		18/06/2009 15:57	0	0.1	20.8
PZ21 WHI		18/06/2009 15:58	0	0	20.9
PZ11 WHI		18/06/2009 15:59	0	0	21
PZ12 WHI		18/06/2009 16:01	0	0	21
PZ13 WHI		18/06/2009 16:02	0	0	21.1
PZ14 WHI		18/06/2009 16:02	0	0	21.1
PZ15 WHI		18/06/2009 16:03	0	0	21.1
PZ16 WHI		18/06/2009 16:04	0	0	21.2

Jul-09

Device ID	Empty	Date/Time (UK)	CH4	CO2	O2
PZ1 WHIT		30/07/2009 11:43	0	0.2	20.6
PZ2 WHIT		30/07/2009 10:38	0	0.2	20.5
PZ3 WHIT		30/07/2009 10:39	0	1.8	19.8
PZ4 WHIT		30/07/2009 10:42	0	1.4	20.3
PZ5 WHIT		30/07/2009 10:43	0	3.2	17.8
PZ54 WHI		30/07/2009 10:45	0	0.4	20.4
PZ53 WHI		30/07/2009 10:47	0	0.1	20.7
PZ52 WHI		30/07/2009 10:48	0	0.1	20.8
PZ51 WHI		30/07/2009 10:49	0	0.7	20.2
PZ50 WHI		30/07/2009 10:51	0	0.1	20.8
PZ49 WHI		30/07/2009 10:52	0	2.1	18.6
PZ48 WHI		30/07/2009 10:54	0	0.4	20.6
PZ47 WHI		30/07/2009 10:55	0	1.5	19.4
PZ46 WHI		30/07/2009 10:56	0	4.4	18.6
PZ45 WHI		30/07/2009 10:58	0	0.5	20.3
PZ44 WHI		30/07/2009 10:59	0	0.1	20.6
PZ43 WHI		30/07/2009 11:01	0	0.2	20.6
PZ42 WHI		30/07/2009 11:04	0	0	20.6
PZ41 WHI		30/07/2009 11:05	0	0.4	20.5
PZ40 WHI		30/07/2009 11:07	0	0.2	20.5
PZ39 WHI		30/07/2009 11:08	0	0.8	20.1
PZ38 WHI		30/07/2009 11:09	0	0.7	20.2
PZ37 WHI		30/07/2009 11:11	0	0	20.6
PZ36 WHI		30/07/2009 11:12	0	0.1	20.6
PZ35 WHI		30/07/2009 11:14	0	0.1	20.6
PZ34 WHI		30/07/2009 11:15	0	1.4	19.8
PZ33 WHI		30/07/2009 11:17	0	3.2	12.3
PZ32 WHI		30/07/2009 11:18	0	1.9	19.6
PZ31 WHI		30/07/2009 11:20	0	4.7	15.8
PZ30 WHI		30/07/2009 11:21	0	0.4	20.5
PZ29 WHI		30/07/2009 11:23	0	0.9	20.1
PZ28 WHI		30/07/2009 11:24	0	5.1	16.5
PZ27 WHI		30/07/2009 11:26	0	0.4	20.2
PZ26 WHI		30/07/2009 11:27	0	0.4	20.6
PZ25 WHI		30/07/2009 11:28	0	0.1	20.8
PZ24 WHI		30/07/2009 11:30	0	0	20.8
PZ23 WHI		30/07/2009 11:31	0	2.5	18.3
PZ22 WHI		30/07/2009 11:34	0	0.3	20.6
PZ21 WHI		30/07/2009 11:35	0	0.1	20.7
PZ11 WHI		30/07/2009 11:37	0	0	20.8
PZ12 WHI		30/07/2009 11:38	0	0	20.8
PZ13 WHI		30/07/2009 11:39	0	0	20.9
PZ14 WHI		30/07/2009 11:40	0	0	20.9
PZ15 WHI		30/07/2009 11:41	0	0	20.9
PZ16 WHI		30/07/2009 11:42	0	0.1	20.8

Aug-09

	Device ID	Date/Time (UK)	CH4	CO2	O2
	PZ1 WHIT	31/08/2009 11:31	0	0	20.3
	PZ2 WHIT	31/08/2009 11:31	0	0.7	20.3
	PZ3 WHIT	31/08/2009 11:32	0	1.8	19.9
	PZ4 WHIT	31/08/2009 11:33	0	1.4	20.2
	PZ5 WHIT	31/08/2009 11:34	0	3.1	19.2
	PZ54 WHI	31/08/2009 11:36	0	0.3	20.3
	PZ53 WHI	31/08/2009 11:37	0	0.7	20.1
	PZ52 WHI	31/08/2009 11:38	0	0.6	20.4
	PZ51 WHI	31/08/2009 11:40	0	1	19.9
	PZ50 WHI	31/08/2009 11:41	0	0.1	20.5
	PZ49 WHI	31/08/2009 11:43	0	1.2	19.2
	PZ48 WHI	31/08/2009 11:44	0	1.1	20.3
	PZ47 WHI	31/08/2009 11:45	0	1.5	19.7
	PZ46 WHI	31/08/2009 11:46	0	3	19
	PZ45 WHI	31/08/2009 11:47	0	0.7	20
	PZ44 WHI	31/08/2009 11:49	0	0.6	20.2
	PZ43 WHI	31/08/2009 11:50	0	0.6	20.3
	PZ42 WHI	31/08/2009 11:52	0	0.3	20.3
	PZ41 WHI	31/08/2009 11:53	0	1.1	19.8
	PZ40 WHI	31/08/2009 11:56	0	0.6	19.9
	PZ39 WHI	31/08/2009 11:58	0	0.3	20.3
	PZ38 WHI	31/08/2009 12:07	0	0.6	20.1
	PZ37 WHI	31/08/2009 12:08	0	0	20.4
	PZ36 WHI	31/08/2009 12:10	0	0.2	20.2
	PZ35 WHI	31/08/2009 12:11	0	0	20.4
	PZ34 WHI	31/08/2009 12:12	0	2	19.4
	PZ33 WHI	31/08/2009 12:13	0	2.1	19.1
	PZ32 WHI	31/08/2009 12:14	0	1.7	19.8
	PZ31 WHI	31/08/2009 12:15	0	3.9	16.3
	PZ30 WHI	31/08/2009 12:16	0	0.7	20.1
	PZ29 WHI	31/08/2009 12:18	0	0.7	20.1
	PZ28 WHI	31/08/2009 12:19	0	4.1	17.7
	PZ27 WHI	31/08/2009 12:20	0	0.4	20
	PZ26 WHI	31/08/2009 12:21	0	0.3	20.6
	PZ25 WHI	31/08/2009 12:23	0	0	20.7
	PZ24 WHI	31/08/2009 12:24	0	0	20.7
	PZ23 WHI	31/08/2009 12:25	0	2.2	18.7
	PZ22 WHI	31/08/2009 12:27	0	0	20.7
	PZ21 WHI	31/08/2009 12:35	0	0.1	20.7
	PZ11 WHI	31/08/2009 12:39	0	0	20.9
	PZ12 WHI	31/08/2009 12:40	0	0	20.9
	PZ13 WHI	31/08/2009 12:41	0	0	20.9
	PZ14 WHI	31/08/2009 12:42	0	0	20.9
	PZ15 WHI	31/08/2009 12:43	0	0	20.8
	PZ16 WHI	31/08/2009 12:42	0	0.5	20.3

Sep-09

Device ID	Date/Time (UK)	CH4	CO2	O2
PZ1 WHIT	28/09/2009 10:48	0	1	19.5
PZ2 WHIT	28/09/2009 10:48	0	1.1	19.4
PZ3 WHIT	28/09/2009 10:49	0	1.5	19.3
PZ4 WHIT	28/09/2009 10:50	0	1.3	19.5
PZ5 WHIT	28/09/2009 10:51	0	3.3	18.2
PZ54 WHI	28/09/2009 10:53	0	0.3	19.8
PZ53 WHI	28/09/2009 10:54	0	1.1	19
PZ52 WHI	28/09/2009 10:56	0	1.5	19
PZ51 WHI	28/09/2009 10:57	0	0.6	19.7
PZ50 WHI	28/09/2009 10:59	0	1.9	18.3
PZ49 WHI	28/09/2009 11:00	0	3	18.5
PZ48 WHI	28/09/2009 11:02	0	3	18.8
PZ47 WHI	28/09/2009 11:03	0	1.6	18.9
PZ46 WHI	28/09/2009 11:04	0	6.1	17.4
PZ45 WHI	28/09/2009 11:06	0	1.1	19.1
PZ44 WHI	28/09/2009 11:07	0	0.8	19.6
PZ43 WHI	28/09/2009 11:09	0	1.3	19.1
PZ42 WHI	28/09/2009 11:11	0	1	19.5
PZ41 WHI	28/09/2009 11:12	0	3	17.4
PZ40 WHI	28/09/2009 11:14	0	0.4	19.9
PZ39 WHI	28/09/2009 11:15	0	0.4	20
PZ38 WHI	28/09/2009 11:17	0	0	20.2
PZ37 WHI	28/09/2009 11:18	0	0.5	20
PZ36 WHI	28/09/2009 11:20	0	1.8	18.6
PZ35 WHI	28/09/2009 11:22	0	0.4	20.1
PZ34 WHI	28/09/2009 11:23	0	3.4	10.4
PZ33 WHI	28/09/2009 11:24	0	3.1	14.7
PZ32 WHI	28/09/2009 11:25	0	2.4	17.3
PZ31 WHI	28/09/2009 11:26	0	3.1	18.1
PZ30 WHI	28/09/2009 11:28	0	1.4	18.8
PZ29 WHI	28/09/2009 11:29	0	0.6	19.9
PZ28 WHI	28/09/2009 11:30	0	2.5	18.4
PZ27 WHI	28/09/2009 11:32	0	0.6	18.4
PZ26 WHI	28/09/2009 11:33	0	0.6	20.1
PZ25 WHI	28/09/2009 11:34	0	0.1	20.4
PZ24 WHI	30/09/2009 10:48	0	0.1	20.8
PZ23 WHI	30/09/2009 11:00	0	1.2	20.1
PZ22 WHI	30/09/2009 10:58	0	0.1	20.8
PZ21 WHI	30/09/2009 10:56	0	0.3	20.7
PZ16 WHI	30/09/2009 10:51	0	0.1	20.8
PZ15 WHI	30/09/2009 10:52	0	0.1	20.7
PZ14 WHI	30/09/2009 10:54	0	0.1	20.8
PZ13 WHI	30/09/2009 10:55	0	0.1	20.8
PZ12 WHI	30/09/2009 10:55	0	0.1	20.8
PZ11 WHI	30/09/2009 10:56	0	0.1	20.8

Oct-09

Device ID	Date/Time (UK)	CH4	CO2	O2
PZ1 WHIT	22/10/2009 12:02	0	3.7	19.3
PZ2 WHIT	22/10/2009 12:01	0	0	21.2
PZ3 WHIT	22/10/2009 12:00	0	1.3	20.7
PZ4 WHIT	22/10/2009 11:59	0	1.3	20.7
PZ5 WHIT	22/10/2009 11:57	0	2.4	19.9
PZ54 WHI	22/10/2009 11:55	0	0.4	21.1
PZ53 WHI	22/10/2009 11:53	0	0.9	19.8
PZ52 WHI	22/10/2009 11:52	0	1	20.6
PZ51 WHI	22/10/2009 11:50	0	0.3	21
PZ50 WHI	22/10/2009 11:48	0	1.6	20.3
PZ49 WHI	22/10/2009 11:47	0	0.9	20.2
PZ48 WHI	22/10/2009 11:45	0	2.5	19.8
PZ47 WHI	22/10/2009 11:44	0	1.8	19.4
PZ46 WHI	22/10/2009 11:43	0	6.9	18
PZ45 WHI	22/10/2009 11:41	0	1.8	19.5
PZ44 WHI	22/10/2009 11:40	0	1	20.1
PZ43 WHI	22/10/2009 11:38	0	1.2	20.1
PZ42 WHI	22/10/2009 11:36	0	0.9	20.4
PZ41 WHI	22/10/2009 11:34	0	2.4	19.9
PZ40 WHI	22/10/2009 11:32	0	0.7	20.5
PZ39 WHI	22/10/2009 11:31	0	0.9	20.7
PZ38 WHI	22/10/2009 11:30	0	0.6	20.8
PZ37 WHI	22/10/2009 11:28	0	0.1	21
PZ36 WHI	22/10/2009 11:27	0	0.3	21
PZ35 WHI	22/10/2009 11:26	0	0.4	20.9
PZ34 WHI	22/10/2009 11:25	0	3.7	17.8
PZ33 WHI	22/10/2009 11:23	0	4.8	11.9
PZ32 WHI	22/10/2009 11:22	0	3.2	18.1
PZ31 WHI	22/10/2009 11:21	0	1.6	19.9
PZ30 WHI	22/10/2009 11:19	0	1.7	19.4
PZ29 WHI	22/10/2009 11:18	0	0.6	20.8
PZ28 WHI	22/10/2009 11:16	0	1.6	20.1
PZ27 WHI	28/10/2009 11:32	0	0.6	18.4
PZ26 WHI	28/10/2009 11:33	0	0.6	20.1
PZ25 WHI	28/10/2009 11:34	0	0.1	20.4
PZ24 WHI	30/10/2009 10:48	0	0.1	20.8
PZ23 WHI	30/10/2009 11:00	0	1.2	20.1
PZ22 WHI	30/10/2009 10:58	0	0.1	20.8
PZ21 WHI	30/10/2009 10:56	0	0.3	20.7
PZ16 WHI	30/10/2009 10:51	0	0.1	20.8
PZ15 WHI	30/10/2009 10:52	0	0.1	20.7
PZ14 WHI	30/10/2009 10:54	0	0.1	20.8
PZ13 WHI	30/10/2009 10:55	0	0.1	20.8
PZ12 WHI	30/10/2009 10:55	0	0.1	20.8
PZ11 WHI	30/10/2009 10:56	0	0.1	20.8

Nov-09

Device ID	Date/Time (UK)	CH4	CO2	O2
PZ1 WHIT	17/11/2009 12:33	0	0	20.9
PZ2 WHIT	17/11/2009 12:35	0	0.5	20.5
PZ3 WHIT	17/11/2009 12:38	0	1.2	20.3
PZ4 WHIT	17/11/2009 12:40	0	1.1	20.6
PZ5 WHIT	17/11/2009 12:41	0	1.7	19.9
PZ54 WHI	17/11/2009 12:43	0	0.3	20.6
PZ53 WHI	17/11/2009 12:45	0	1	18.5
PZ52 WHI	17/11/2009 12:46	0	0.7	20.5
PZ51 WHI	17/11/2009 12:48	0	0.3	21.1
PZ50 WHI	17/11/2009 12:49	0	0.4	21
PZ49 WHI	17/11/2009 12:50	0	1.2	19.6
PZ48 WHI	17/11/2009 12:52	0	2.2	20
PZ47 WHI	17/11/2009 12:53	0	1.2	20.4
PZ46 WHI	17/11/2009 12:55	0	6.3	17.8
PZ45 WHI	17/11/2009 12:56	0	1.5	19.2
PZ44 WHI	17/11/2009 12:58	0	0.8	20.6
PZ43 WHI	17/11/2009 12:59	0	1	20.5
PZ42 WHI	17/11/2009 13:01	0	0.6	20.8
PZ41 WHI	17/11/2009 13:02	0	1.2	20.5
PZ40 WHI	17/11/2009 13:04	0	0.8	20
PZ39 WHI	17/11/2009 13:05	0	0.2	21.1
PZ38 WHI	17/11/2009 13:06	0	0.2	21
PZ37 WHI	17/11/2009 13:07	0	0.1	21.2
PZ36 WHI	17/11/2009 13:09	0	0.5	20.7
PZ35 WHI	17/11/2009 13:10	0	0.1	21.2
PZ34 WHI	17/11/2009 13:11	0	0.9	20.6
PZ33 WHI	17/11/2009 13:13	0	2.1	20.2
PZ32 WHI	17/11/2009 13:14	0	1.2	20.7
PZ31 WHI	17/11/2009 13:15	0	1.3	19.6
PZ30 WHI	17/11/2009 13:16	0	2	19.1
PZ29 WHI	17/11/2009 13:17	0	0.3	21
PZ28 WHI	17/11/2009 13:19	0	2.3	17.8
PZ27 WHI	17/11/2009 13:21	0	0.4	20.6
PZ26 WHI	17/11/2009 13:22	0	0.2	21.1
PZ25 WHI	17/11/2009 13:23	0	0.1	21.2
PZ24 WHI	17/11/2009 13:24	0	0.2	20.9
PZ23 WHI	16/11/2009 12:58	0	0.7	20.1
PZ22 WHI	16/11/2009 13:00	0	1.7	19.4
PZ21 WHI	16/11/2009 13:02	0	0.1	20.8
PZ16 WHI	16/11/2009 13:07	0	0.1	20.8
PZ15 WHI	16/11/2009 13:06	0	0.1	20.8
PZ14 WHI	16/11/2009 13:06	0	0	20.9
PZ13 WHI	16/11/2009 13:05	0	0	20.9
PZ12 WHI	16/11/2009 13:04	0	0	20.9
PZ11 WHI	16/11/2009 13:03	0	0	20.9

Dec-09

Device ID	Date/Time (UK)	CH4	CO2	O2
PZ1 WHIT	31/12/2009 13:11	0	0.1	23.2
PZ2 WHIT	31/12/2009 13:12	0	0.4	23.2
PZ3 WHIT	31/12/2009 13:13	0	1.4	23.1
PZ4 WHIT	31/12/2009 13:14	0	1.1	23.1
PZ5 WHIT	31/12/2009 13:15	0	2	22.6
PZ54 WHI	31/12/2009 13:16	0	0.3	23.2
PZ53 WHI	31/12/2009 13:17	0	1.1	22.1
PZ52 WHI	31/12/2009 13:18	0	0.9	22.7
PZ51 WHI	31/12/2009 13:19	0	0.4	23.2
PZ50 WHI	31/12/2009 13:20	0	1.3	22.8
PZ49 WHI	31/12/2009 13:21	0	2.5	21.9
PZ48 WHI	31/12/2009 13:23	0	2.4	22.5
PZ47 WHI	31/12/2009 13:24	0	0.7	23.1
PZ46 WHI	31/12/2009 13:25	0	5	18.7
PZ45 WHI	31/12/2009 13:26	0	1.6	21.5
PZ44 WHI	31/12/2009 13:27	0	1.1	22.9
PZ43 WHI	31/12/2009 13:29	0	1.4	22.7
PZ42 WHI	31/12/2009 13:30	0	0.9	23.1
PZ41 WHI	31/12/2009 13:32	0	1.6	21.6
PZ40 WHI	31/12/2009 13:33	0	1	22.7
PZ39 WHI	31/12/2009 13:34	0	0.5	23.5
PZ38 WHI	31/12/2009 13:35	0	0.4	23.4
PZ37 WHI	31/12/2009 13:36	0	0.1	23.6
PZ36 WHI	31/12/2009 13:38	0	0.6	22.9
PZ35 WHI	31/12/2009 13:39	0	0.1	23.7
PZ34 WHI	31/12/2009 13:40	0	2	17.6
PZ33 WHI	31/12/2009 13:42	0	2.5	19.7
PZ32 WHI	31/12/2009 13:43	0	1	23.4
PZ31 WHI	31/12/2009 13:44	0	0.7	23.4
PZ30 WHI	31/12/2009 13:45	0	1.4	22.8
PZ29 WHI	31/12/2009 13:46	0	0.2	23.6
PZ28 WHI	31/12/2009 13:47	0	3.2	21.7
PZ27 WHI	31/12/2009 13:49	0	0.1	23.7
PZ26 WHI	31/12/2009 13:50	0	0.2	23.7
PZ25 WHI	31/12/2009 13:51	0	0.1	23.7
PZ24 WHI	31/12/2009 13:52	0	0.1	23.7
PZ23 WHI	31/12/2009 13:53	0	0.3	23.7
PZ22 WHI	31/12/2009 13:55	0	1.7	20.3
PZ21 WHI	31/12/2009 13:56	0	0.1	23.6
PZ16 WHI	31/12/2009 14:01	0	0.1	23.7
PZ15 WHI	31/12/2009 14:00	0	0.1	23.7
PZ14 WHI	31/12/2009 13:59	0	0.1	23.8
PZ13 WHI	31/12/2009 13:59	0	0.1	23.7
PZ12 WHI	31/12/2009 13:58	0	0.1	23.8
PZ11 WHI	31/12/2009 13:58	0	0.1	23.7

APPENDIX F

FLUE GAS MONITORING

Monitoring of AFS Flare Emissions at Whiteriver Landfill - October 2009

DOCUMENT CONTROL SHEET

Client	AFS Ltd.					
Project Title	Monitoring of AFS Flare Emissions at Whiteriver Landfill					
Document Title	Emissions Monitoring October 2009					
Document No.	MDE0946Rp001					
This Document Comprises	DCS	TOC	Text	List of Tables	List of Figures	No. of Appendices
	1	1	5	1	0	1

Rev.	Status	Author(s)	Reviewed By	Approved By	Office of Origin	Issue Date
D01	Draft	Ronan Murphy	Martin Doherty	Paul Chadwick	Dublin Environment	23/11/2009
F01	Final	Ronan Murphy	Martin Doherty	Paul Chadwick	Dublin Environment	24/11/2009

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1 INTRODUCTION

This report presents the results of the flare monitoring undertaken at Whiteriver Landfill in accordance with Schedule D.7 of Waste Licence No. W0060-02.

AFS Ltd. commissioned RPS Group to monitor emissions to atmosphere from a 2000 m^3 flare unit at Whiteriver Landfill, Whiteriver and Gunstown Townland, Dunleer, Drogheda, Co. Louth. The flare system is used to burn off landfill gas emitted from the decaying landfill waste and was sampled for emissions of:

- NO_X, CO, SO_2 (Biannual)
- Inorganic Acids
- Total Organic Carbon

2 MONITORING

Suitably qualified personnel from RPS Group conducted the monitoring on the flare unit on 13th November 2009. The sampling and analytical methodologies employed are outlined below.

2.1 FLUE GAS ANALYSIS

Flue gas emissions were measured using a Kane-May KM9106 Quintox Analyzer. This is a specialised flue gas analysis system fully equipped with electrochemical sensors. The Flue Gas Analyser measures the following parameters:

- Carbon Monoxide (CO)
- Nitrogen Oxides (NO_x)
- Sulphur Dioxide (SO_2)

Sampling rounds were conducted over a 10-minute period.

2.2 INORGANIC ACIDS

Samples of the gas stream were extracted using a low flow, intrinsically safe pump at a flow rate of 2000 ml/min, acids in the gas stream were consequently collected through impingers containing deionised water and issued to a UKAS accredited laboratory (RPS Manchester) for analysis for Hydrochloric and Hydrofluoric Acids. The pumps used to extract the gas from the flue were calibrated before and after use to ensure that a consistent extraction rate was maintained throughout the sampling procedure.

2.3 TOTAL ORGANIC CARBON

A Microfid portable Flame Ionisation Detector was used to measure concentrations of Total Organic Carbon (TOC) within the flue gas emissions. The unit was set to log continuously over a 5-minute duration. An average value over this period has been presented and referenced against the emission limit value as specified in the licence for the site.

3 RESULTS

3.1 FLUE GAS ANALYSIS

The results of flue gas emissions monitoring from the flare unit at Whiteriver Landfill are presented in Table 3.1 below and compared with the emission limit values outlined in Schedule C.5 of the Waste Licence:

Table 3.1 Results of Flue Gas Monitoring from the Flare Unit

Parameter	Units	Emission Value[1]	Emission Limit[2]
Nitrogen Oxides (NO_x) as NO_2	(mg/Nm^3)	11	500
Carbon Monoxide (CO)	(mg/Nm^3)	8	650
Sulphur Dioxide (SO_2)	(mg/Nm^3)	16	-

Note: 1 Normalised to 273K, 101.3 kPa and $\%O_2$ reference of 3
Note: 2 As stated in Schedule C.5. of Waste Licence W0060-02

3.2 INORGANIC ACIDS

The results of flue gas emissions monitoring from the flare unit at Whiteriver Landfill are presented in Table 3.2 below and compared with the emission limit values outlined in Schedule C.5 of the Waste Licence:

Table 3.2 Results of Inorganic Acids Sampling

Parameter	Units	Emission Value	Emission Limit[1]
Hydrochloric Acid (HCL)	(mg/Nm^3)	1.08	50
Hydrofluoric Acid (HF)	(mg/Nm^3)	0.58	5

Note: 1 As stated in Schedule C.5. of Waste Licence W0060-02

3.3 TOTAL ORGANIC CARBON

The results of flue gas emissions monitoring from the flare unit at Whiteriver Landfill are presented in Table 3.3 below and compared with the emission limit values outlined in Schedule C.5 of the Waste Licence:

Table 3.3 Results of Total Organic Carbon

Parameter	Units	Emission Value	Emission Limit[1]
Total Organic Carbon (TOC)	(mg/m^3)	1.03	10

Note: 1 As stated in Schedule C.5. of Waste Licence W0060-02

4 CONCLUSIONS

The level determined for Nitrogen Oxides (NOx as NO_2) from the Flare Unit are within the emission limit value stated in Schedule C.5 of Waste Licence W0060-02.

The level determined for Carbon Monoxide (CO) emissions from the Flare Unit are within the emission limit value stated in Schedule C.5 of Waste Licence W0060-02.

The level determined for inorganic acid (namely HCL and HF) emissions from the Flare Unit are within the emission limit value stated in Schedule C.5 of Waste Licence W0060-02.

The level determined for TOC emissions from the Flare Unit are within the emission limit value stated in Schedule C.5 of Waste Licence W0060-02.

The findings of the flare test show that all Waste Licence parameters listed in Waste Licence W0060-02 are within the limits specified in schedule C.5. These findings show that efficient combustion in taking place within the combustion chamber of the Whiteriver flare and in general, is operating under the original manufacturers specification.

Appendix A - Survey Details

Location

Whiteriver Landfill
Whiteriver and Gunstown Townland
Dunleer
Drogheda
Co. Louth

Personnel Present

Ronan Murphy – Environmental Consultant RPS

Date and Time

Tuesday 13th October 2009

15:00 – 16:00

Equipment

Kane-May KM9106 Quintox Analyzer
Microfid portable Flame Ionisation Detector
Impinger and Deionised Water Samples

APPENDIX G

NOISE SURVEY REPORT

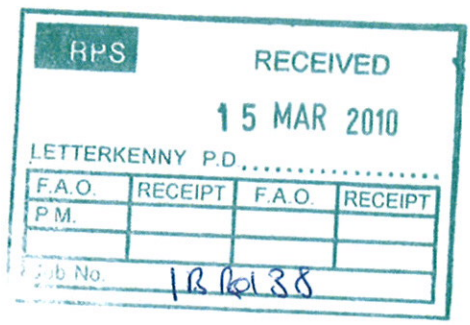
Louth County Council

White River Landfill, Dunleer, Co. Louth

Noise Survey

Report Date:

1st September 2009



EURO environmental services

Unit 35A, Boyne Business Park, Drogheda, Co. Louth

Report No. 2610/M08

1.0 Introduction

EURO environmental services were requested by Louth County Council to carry out a day and night time noise survey at the White River Landfill Facility. Victor Olmos of EURO environmental services, carried out the following noise survey at White River Landfill, Dunleer, Co. Louth on the 20th and 21st August 2009. The noise survey was carried out at 6 locations during the daytime and the same 6 locations during the night to fulfil requirements set out in their IPC Licence Reg. No. 60-2. The White River Landfill is located in a rural setting on a tertiary road, approximately three quarters of a mile from the R169 Dunleer/Collon route. The main land uses in the area are agricultural and residential.

2.0 Duration and Measurements of Surveying

The daytime survey was carried out between 9:04 and 12:56 on the 20th August 2009. The night time survey was carried out between the hours of 22:00 on the 20th August 2009 and 01:13 on the 21st August 2009. The following measurements were carried out at each site:

- Daytime Broadband measurements $L(A)_{eq}$, $L(A)_{10}$, $L(A)_{90}$, $L(A)_{50}$, $L(A)_{1}$ and $L(A)_{99}$ over a 30 minute period.
- Daytime 1/3 Octave measurements.
- Night time Broadband measurements $L(A)_{eq}$, $L(A)_{10}$, $L(A)_{90}$, $L(A)_{50}$, $L(A)_{1}$ and $L(A)_{99}$ over a 30 minute period.
- Night time 1/3 Octave measurements.

3.0 Weather Conditions

Weather conditions for the daytime survey varied from rain to sunshine spells with night time weather dry with a slight breeze.

4.0 Location of Monitoring Points

4.1 N2

N2 monitoring point was located on the northern boundary of the landfill approximately a ¼ of a mile away from the landfill entrance in a laneway 8m from a nearby farmyard.

4.2 N1

This monitoring site was located at the entrance to a private residence, 3m from the tertiary road and approximately 25m from the western perimeter Landfill fence.

4.3 N3

N3 monitoring point was situated at the crossroads leading to the R169. The meter was placed approximately 1.5 m from the main R169 road and 5 m from the private residence at the crossroads.

4.4 N4

N4 monitoring point was located in a field behind a private dwelling house on the south eastern boundary of the landfill, adjacent to the R169.

4.5 N5

This monitoring site was situated in the front garden of a private dwelling house near the eastern boundary of the landfill, approximately 300m from the R169 and approximately 500m from the landfill.

4.6 N6

This monitoring point was located by the entrance to the Landfill Facility on the northern boundary. The monitor was positioned approximately 1 metres from the adjacent public road, and 5m from the perimeter fence.

Table 1. GPS Coordinates of Noise Monitoring Locations

Monitoring Location	GPS Coordinates
N1	N 53^{0}48'26.7"; W 006^{0}27'46.6"
N2	N 53^{0}48'57.3"; W 006^{0}27'39.9"
N3	N 53^{0}48'08.5"; W 006^{0}27'45.3"
N4	N 53^{0}48'12.0"; W 006^{0}27'03.9"
N5	N 53^{0}48'24.6"; W 006^{0}26'31.3"
N6	N 53^{0}48'38.3"; W 006^{0}27'38.7"

5.0 Activities on Site

The main sources of noise were:

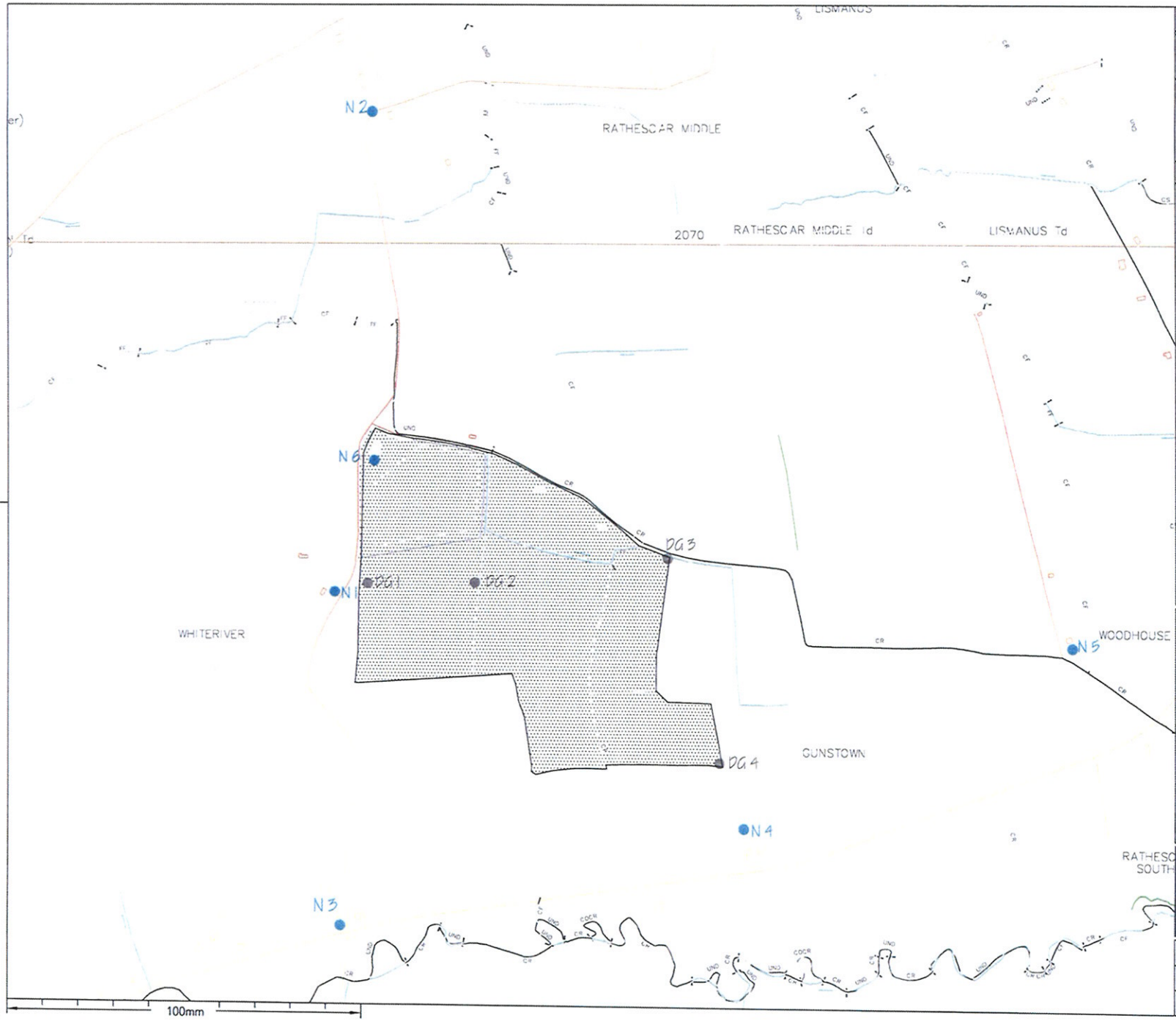
- Traffic on the R169 and the tertiary routes adjacent to the landfill.
- Waste trucks transporting material to the landfill
- Intermittent background noises from nearby farmyards and residential areas

Operations at White River Landfill were carried on as normal during daytime noise survey. Noise emanating from the landfill during the monitoring period included the arrival and departure of lorries/cars/tractors with trailers transporting waste to the facility. However there were many sources of noise off site that contributed to the noise levels recorded including traffic from the R169 and other roads adjacent to the landfill.

6.0 Methodology

The noise survey was carried out in accordance with ISO 1996/1/2/3 – Acoustics – Description and Measurement of Environmental Noise and The Environmental Noise Survey Guidance Document issued by the EPA.

Reference was also made with the European Communities (Protection of Workers (Exposure to Noise) Regulations, 1990 and BS 5228 Part1, Noise and vibration control on construction and open sites.



NOTES

1. VERIFYING DIMENSIONS. THE CONTRACTOR SHALL VERIFY DIMENSIONS AGAINST SUCH OTHER DRAWINGS OR SITE CONDITIONS AS PERTAIN TO THIS PART OF THE WORK.
2. SERVICES. APPROVED OPENINGS FOR SERVICES THROUGH THE STRUCTURE ARE INCORPORATED ON THE DRAWINGS. ANY ADDITIONAL OPENINGS OF A MINOR NATURE REQUIRED BY THE MAIN CONTRACTOR OR HIS SUBCONTRACTORS MUST BE SUBMITTED ON A DRAWING FOR APPROVAL BEFORE WORK COMMENCES.
3. DATUM
4. KEY

- Noise monitoring location points
- Dust quage locations

REV	DESCRIPTION	BY DATE	CHECK DATE

DRAWN BY RP DATE NOV '06	CHECK BY AMcG DATE NOV '06	APPROVED D.D DATE NOV '06
PLOT SCALE 1:7500	SCHEDULES	SHEET SIZE A3

CLIENT
LOUTH COUNTY COUNCIL

PROJECT
WHITERIVER LANDFILL SITE

TITLE
NOISE & DUST MONITORING LOCATIONS

RPS Consulting Engineers
TEL: 074 91 61927 www.rpsgroup.com/ireland FAX: 074 91 61928
THE ENTERPRISE FUND BUSINESS CENTRE, BALLYRAINE, LETTERKENNY, Co. DONEGAL

ARCHITECT	DWG. STATUS
DRAWING No. IBL0069/102	PRELIM. / TENDER / CONST. / RECORD ●
REVISION A	

Broadband measurements were 30 minute intervals, in the set range 20 - 80dBA during the night survey and 30 -- 90 dBA for day time.

The sound level meter was calibrated before and after the survey.

7.0 Equipment

The equipment used was a Bruel & Kjaer 2250 serial No. 2463166 integrating sound pressure meter, with selective 1:1 or 1:3 octave band measurements.

The meter was fixed to a tripod 1.3 meters above ground level and the microphone was protected using a windshield. The microphone cartridge type was BK4189, serial number 2457949 with open circuit sensitivity level of 53.2 mV per Pa.

7.1 Calibration

Calibration was carried out on site using an acoustic calibrator at 94dBA. The meter was calibrated before and after the monitoring round.

8.0 Day Time Measurements

Monitoring Point	Date/ Time	Sampling Interval	L(A)eq	$L(A)_{10}$	$L(A)_{90}$	Comments
N1	20/08/2009 10:13	30	**64**	55	39	The main source of noise can be attributed to traffic movements along the White River Road. This included 6 cars and 6 HGV's. Additional noise from vehicles moving along the internal road at the landfill site was slightly audible at this monitoring location. Interference noise included birds singing, traffic movements on the R169 and planes flying overhead.
N2	20/08/2009 9:04	30	51	52	39	Noise at this monitoring point consisted of a low level traffic hum from vehicles travelling on the R169. The main noise source at this location was from vehicles passing the monitoring location on the tertiary road. This included 5 cars. There was no noise audible at this location that originated from landfill activities. Interference noise at this location emanated from birds singing and traffic movements.
N3	20/08/2009 10:46	30	**73**	75	48	The main source of noise emanated from traffic on the R169 road and vehicles travelling along the Whiteriver road. There was no noise audible at this location that originated from landfill activities.
N4	20/08/2009 11:20	30	55	59	38	The primary source of noise at this point was due to traffic movements on R169. The landfill operations were not audible at this point.
N5	20/08/2009 11:56	30	53	53	42	The main noise source at this point emanated from vehicles travelling along the tertiary road and also along the R169 road approximately 200m away. Interference noise included the traffic hum from the R169.
N6	20/08/2009 9:37	30	**60**	60	40	Main source of noise was from waste lorries idling and leaving site, cars carrying trailers entering and exiting site, people talking, lorry pumping leachate at the leachate lagoon. Interference included birds singing, traffic movements and planes flying overhead. 7 cars and 6 HGVs arrived and left the landfill during monitoring.

9.0 Night Time Measurements

Monitoring Point	Date/ Time	Sampling Interval	L(A)eq	$L(A)_{10}$	$L(A)_{90}$	Comments
N1	20/08/2009 23:04	30	**51**	48	37	The main source of noise at this point was from the low level traffic hum of vehicles travelling on the R169. There was no noise audible from the Landfill site. Interference included traffic movements. car idling in front of monitoring location, planes flying overhead and wind blowing.
N2	20/08/2009 22:00	30	**52**	52	43	There was no noise audible from landfill activities at this location. The primary source of noise at this site was from low level traffic hum of vehicles travelling on the R169. Interference included cars entering and exiting nearby property and wind blowing.
N3	20/08/2009 23:37	30	**63**	55	39	There was no noise audible from the landfill site at this location. Noise from traffic on the R169 was the primary noise source audible at this point. 19 Cars and 2 HGVs passed the monitoring location during the survey period. Other noises included the wind blowing through the trees.
N4	21/08/2009 0:10	30	**61**	49	35	There was no noise audible from the landfill site at this location. The principal noise at N4 emanated from vehicles travelling on the R169. A total of 6 cars and 2 HGV passed during the monitoring period. Other interferences included wind blowing.
N5	21/08/2009 0:43	30	43	46	36	There was no noise audible from the landfill site. Main source of noise at this location was a low level traffic hum from vehicles travelling along the R169. Interference noise included the wind blowing through the trees.
N6	21/08/2009 22:32	30	**48**	51	43	Low level traffic hum from vehicles travelling on the R169 and a slight rumbling noise from the landfill flare was audible at this location. Interference noise included noise from vehicles travelling along the White River Road and the wind rustling through the trees.

10.0 Interference

The main interference with the monitoring of noise was the passing traffic on the roads (R169 and tertiary routes) adjacent to the monitoring points; this included cars and HGVs.

Other interferences from outside of the landfill site included birds singing, wind blowing through the trees, planes flying overhead and people talking loudly.

11.0 Summary and Conclusions

The main source of noise emitted from White River Landfill was from traffic transporting waste to the landfill.

11.1 Day Time Survey

Daytime readings were within the EPA recommended daytime limits of 55 dB(A) at monitoring points N2, N4 and N5. The noise location N6 exceeded the limit due to traffic both within the landfill and that passing on the adjacent public road. N1 and N3 monitoring points were also above the advised limit. The primary noise sources at these points were emitted from road traffic.

All monitoring points were in close proximity to public roads. Traffic movement along these routes, in particular on the busy R169, was the dominant noise source emitted for the majority of the noise monitoring survey period.

11.1.1 Tonal Noise Qualities

Tonal noise is characterised by a prominent frequency and by a definite pitch. No tonal noise qualities were detected at any of the monitoring locations for daytime monitoring.

11.2 Night Time Survey

During the night time noise survey there was no noise emitted from the landfill facility. Noise levels monitored were attributable to traffic movements at certain monitoring points. Only N5 was within the 45 dB(A) noise limit for the site. N1, N2, N3, N4 and N6 exceeded the recommended night time noise limit of 45 dB(A). The primary source of noise at these points emanated from traffic on the R169 and vehicles passing by the monitoring locations during the monitoring period.

11.2.1 Tonal Noise Qualities

A tonal noise component was detected at N1 at a frequency of 31.50 Hz (61.7 dB). This tonal noise may be due to a diesel car engine idling when a neighbour entered his property.

Aadil Khan
Environmental Technical Manager

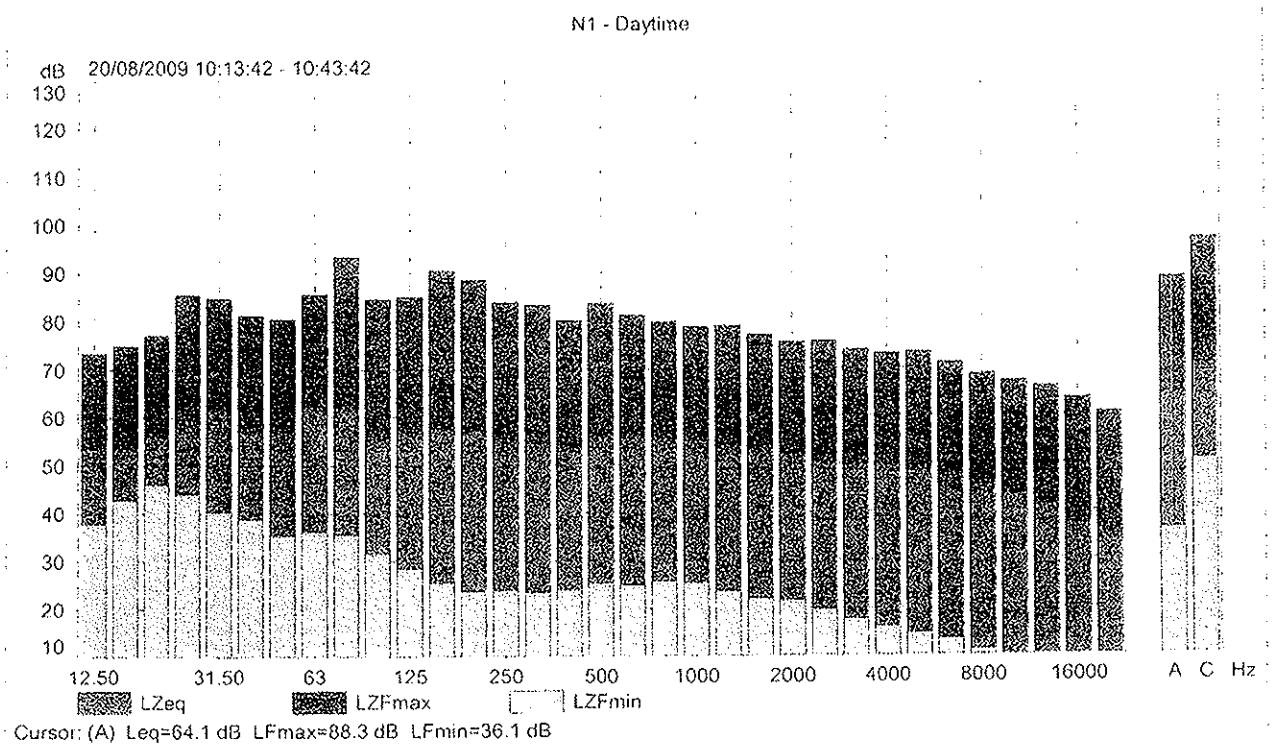
Victor Olmos
Environmental Technician

1st September 2009

Appendix 1: Broadband Measurements and 1/3 Octave Spectra for Monitoring Locations

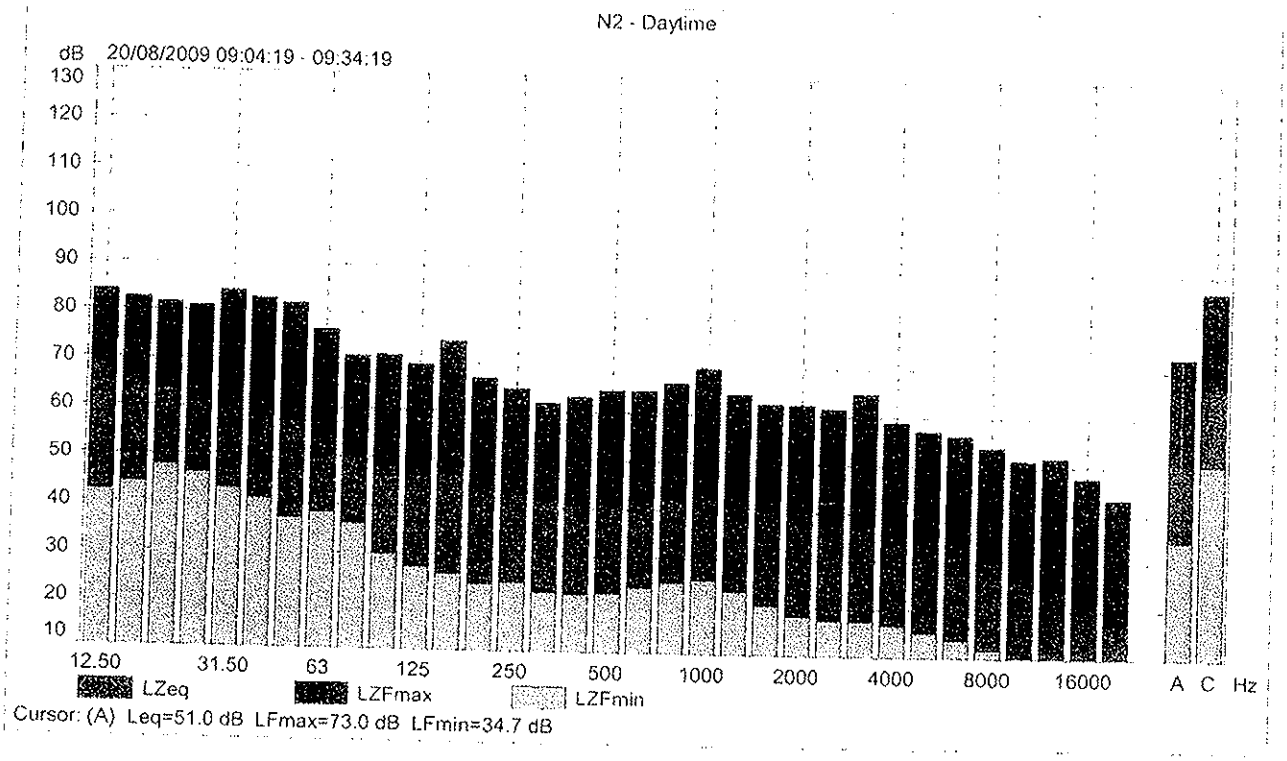
N1 - Daytime

	Start time	End time	Overload [%]	LAFmax [dB]	LAFmin [dB]	LAeq [dB]	LAF10 [dB]	LAF90 [dB]	LCpeak [dB]
Value			0.00	88.3	36.1	64.1	54.7	39.3	106.8
Time	10:13:42	10:43:42							10:34:28
Date	20/08/2009	20/08/2009							20/08/2009



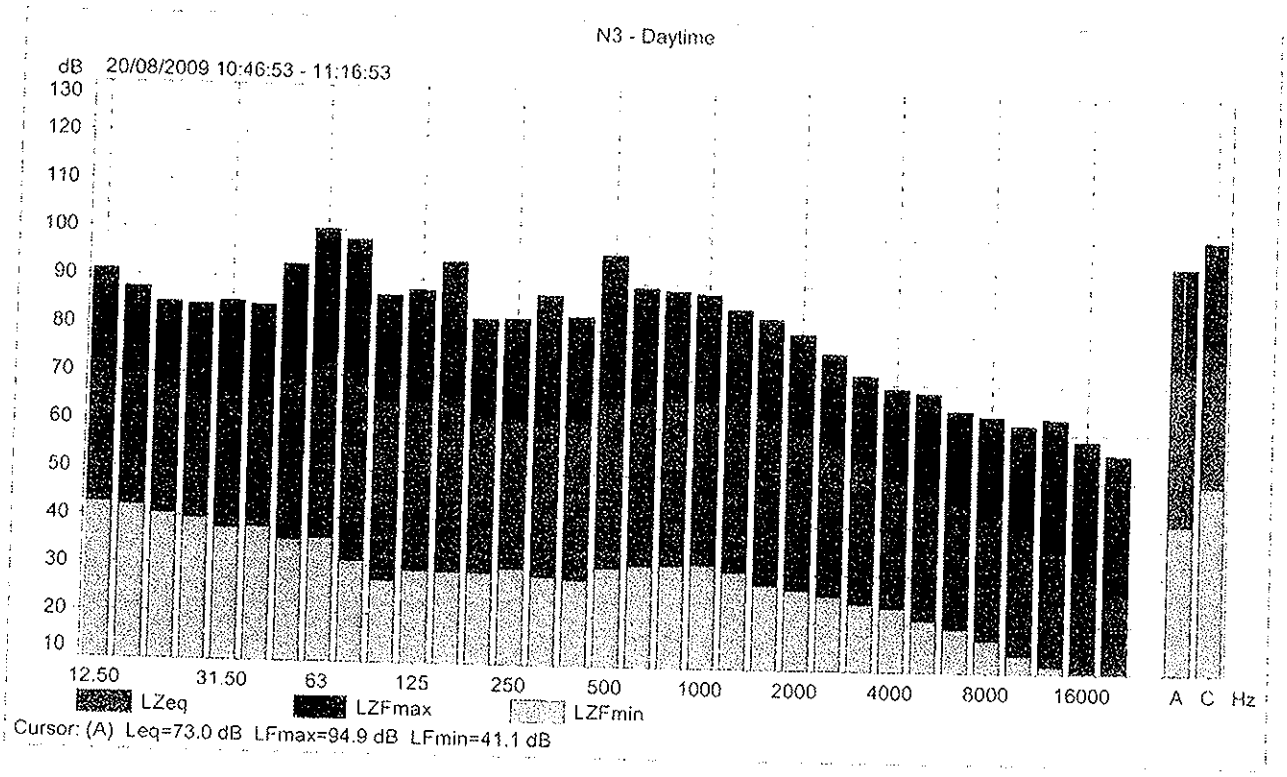
N2 - Daytime

	Start time	End time	Overload [%]	LAFmax [dB]	LAFmin [dB]	LAeq [dB]	LAF10 [dB]	LAF90 [dB]	LCpeak [dB]
Value			0.00	73.0	34.7	51.0	51.7	38.7	96.5
Time	09:04:19	09:34:19							09:22:09
Date	20/08/2009	20/08/2009							20/08/2009



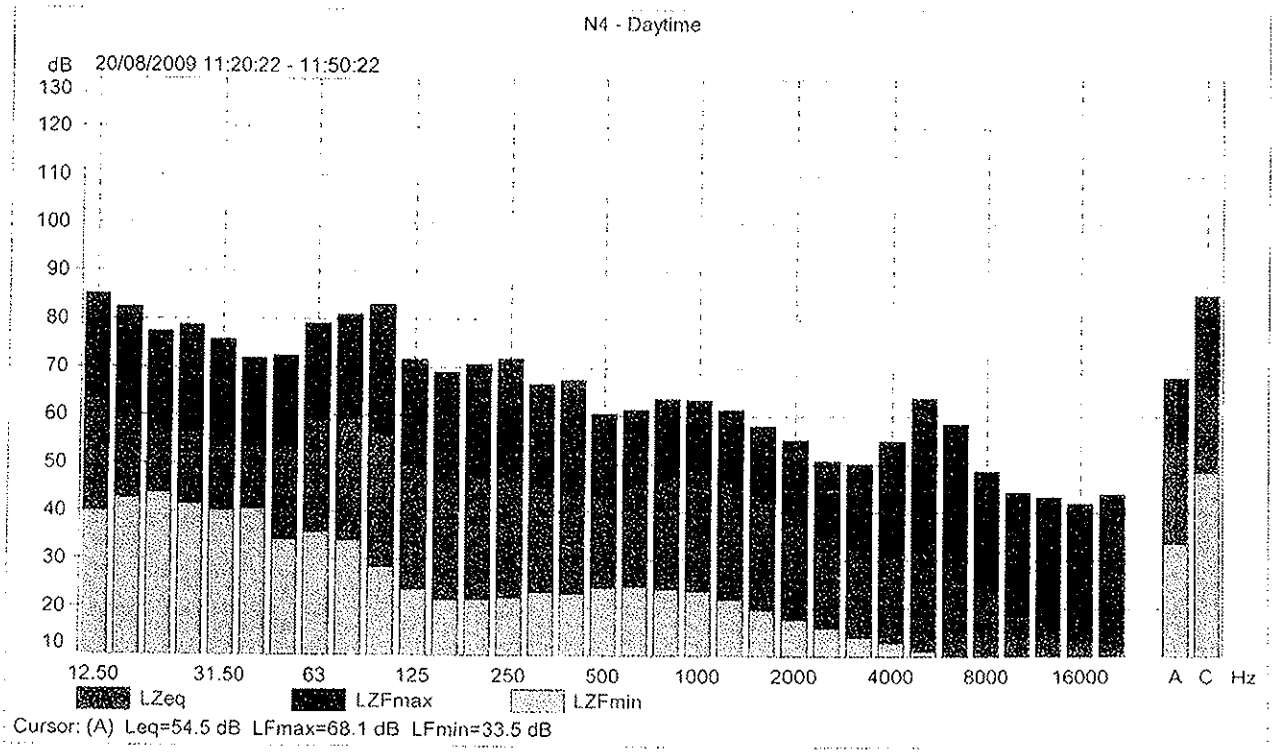
N3 - Daytime

	Start time	End time	Overload [%]	LAFmax [dB]	LAFmin [dB]	LAeq [dB]	LAF10 [dB]	LAF90 [dB]	LCpeak [dB]
Value			0.00	94.9	41.1	73.0	75.2	47.5	107.9
Time	10:46:53	11:16:53							10:57:42
Date	20/08/2009	20/08/2009							20/08/2009



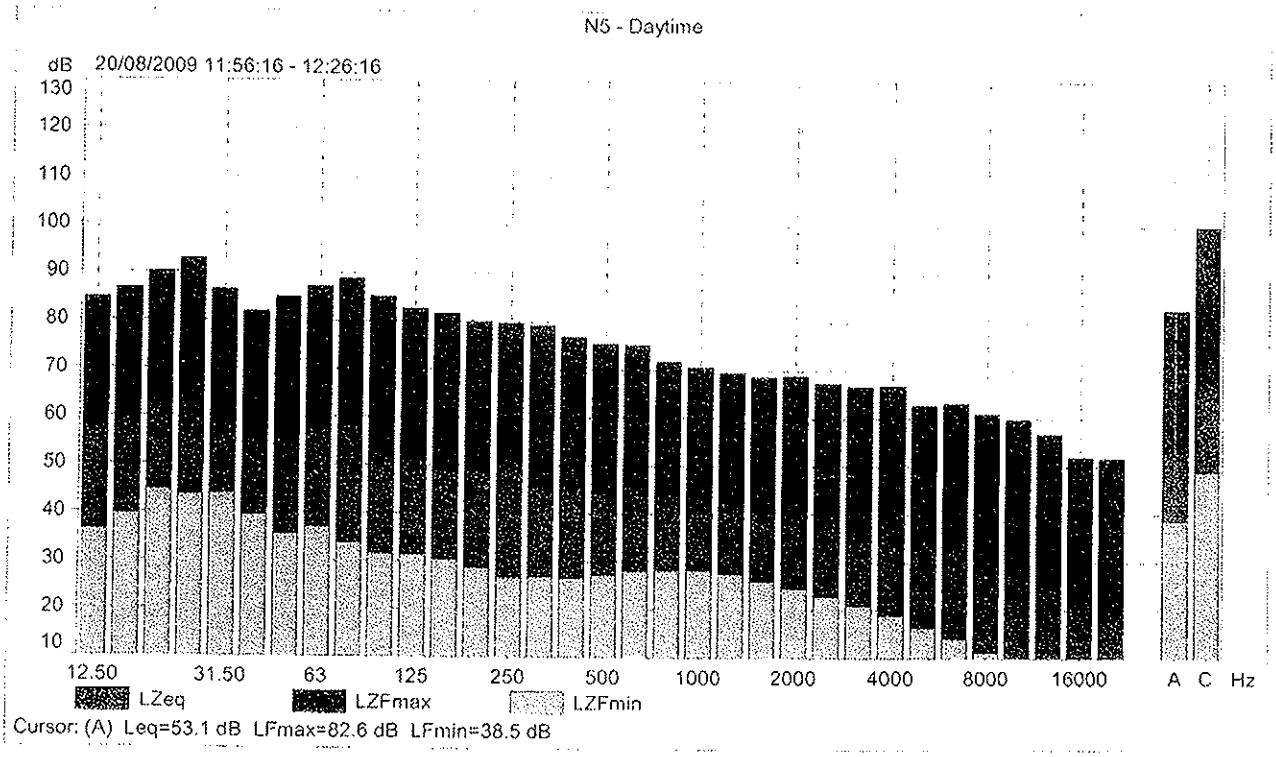
N4 - Daytime

	Start time	End time	Overload [%]	LAFmax [dB]	LAFmin [dB]	LAeq [dB]	LAF10 [dB]	LAF90 [dB]	LCpeak [dB]
Value			0.00	68.1	33.5	54.5	59.0	38.2	93.5
Time	11:20:22	11:50:22							11:50:18
Date	20/08/2009	20/08/2009							20/08/2009



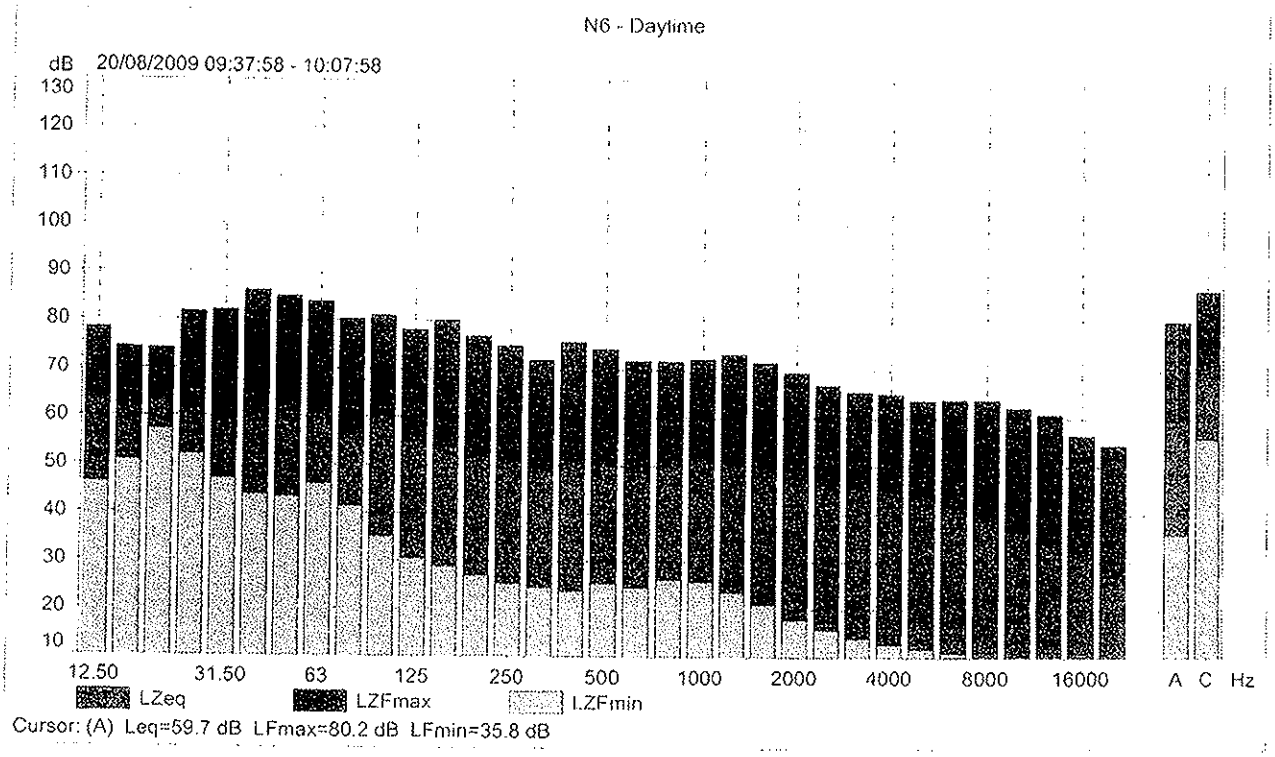
N5 - Daytime

	Start time	End time	Overload [%]	LAFmax [dB]	LAFmin [dB]	LAeq [dB]	LAF10 [dB]	LAF90 [dB]	LCpeak [dB]
Value			0.00	82.6	38.5	53.1	53.3	42.2	111.9
Time	11:56:16	12:26:16							12:26:00
Date	20/08/2009	20/08/2009							20/08/2009



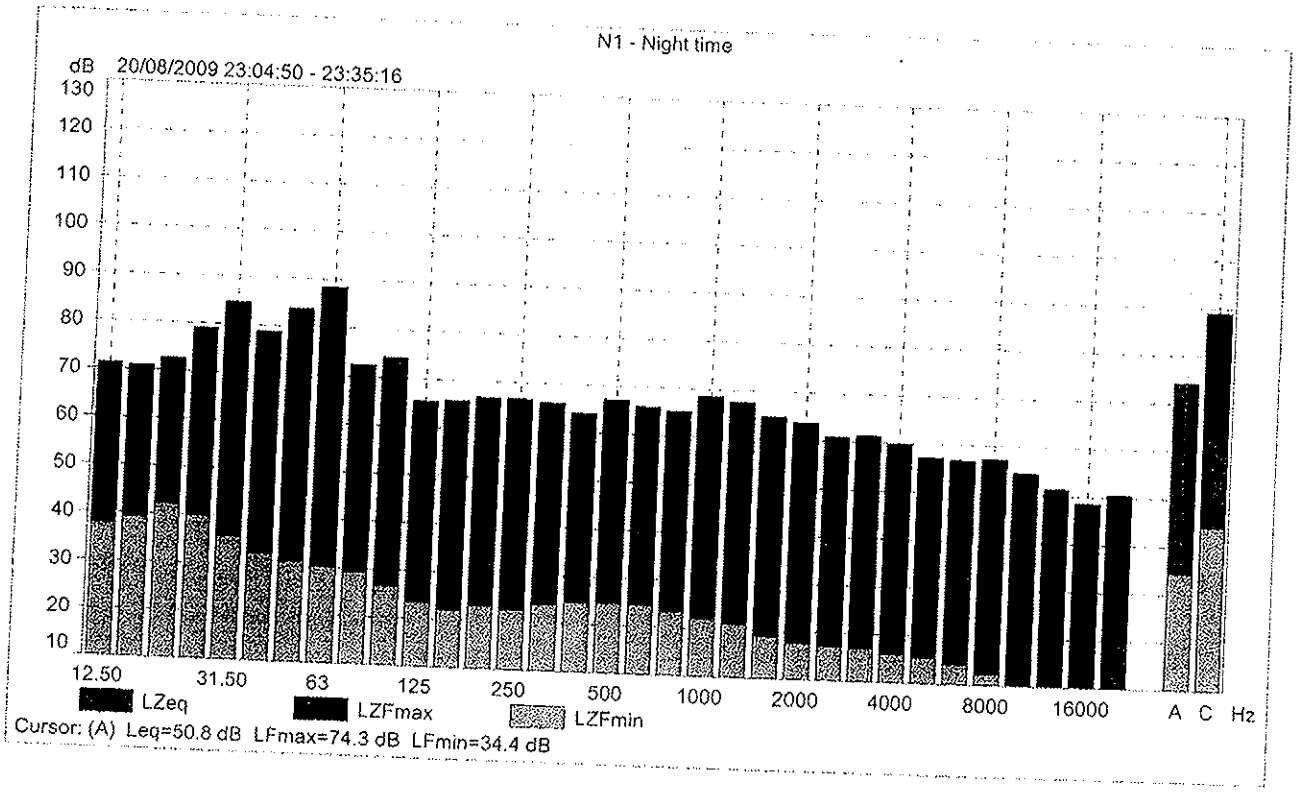
N6 - Daytime

	Start time	End time	Overload [%]	LAFmax [dB]	LAFmin [dB]	LAeq [dB]	LAF10 [dB]	LAF90 [dB]	LCpeak [dB]
Value			0.00	80.2	35.8	59.7	60.4	39.9	97.1
Time	09:37:58	10:07:58							09:39:50
Date	20/08/2009	20/08/2009							20/08/2009



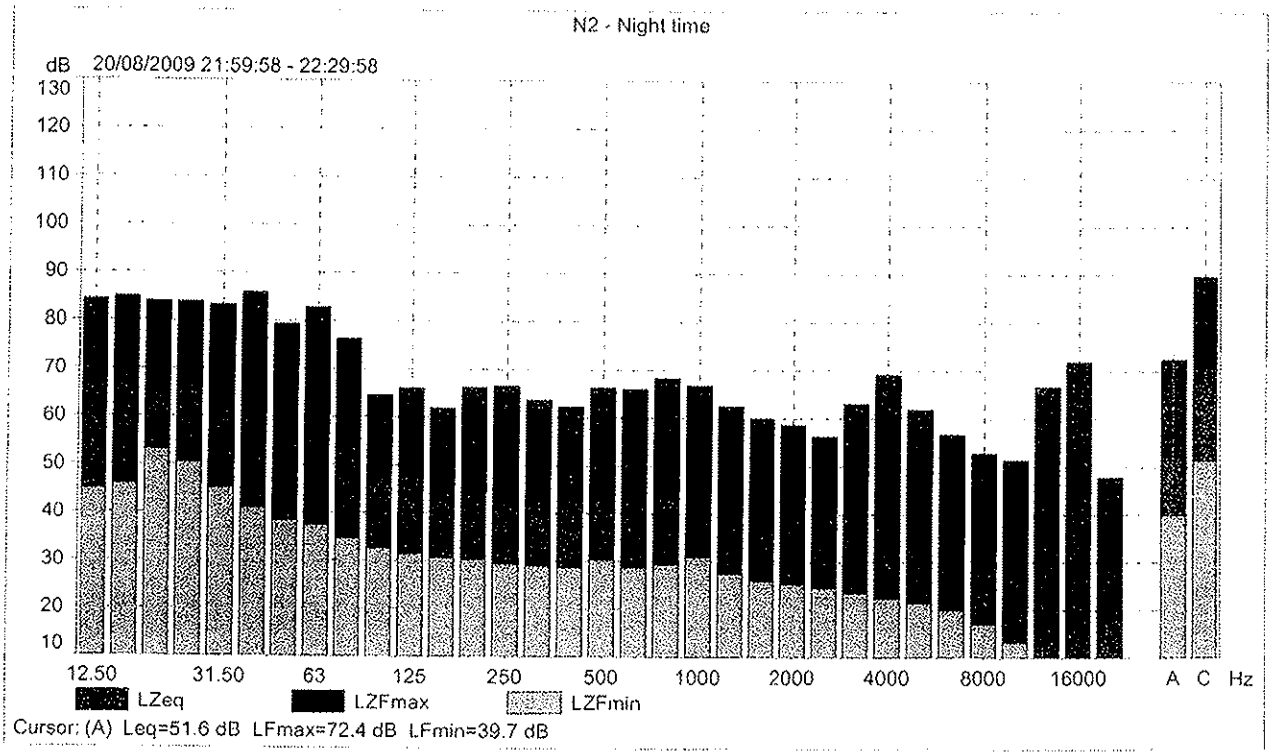
N1 - Night time

	Start time	End time	Overload [%]	LAFmax [dB]	LAFmin [dB]	LAeq [dB]	LAF10 [dB]	LAF90 [dB]	LCpeak [dB]
Value			0.00	74.3	34.4	50.8	47.5	37.1	94.9
Time	23:04:50	23:35:16							23:18:26
Date	20/08/2009	20/08/2009							20/08/2009



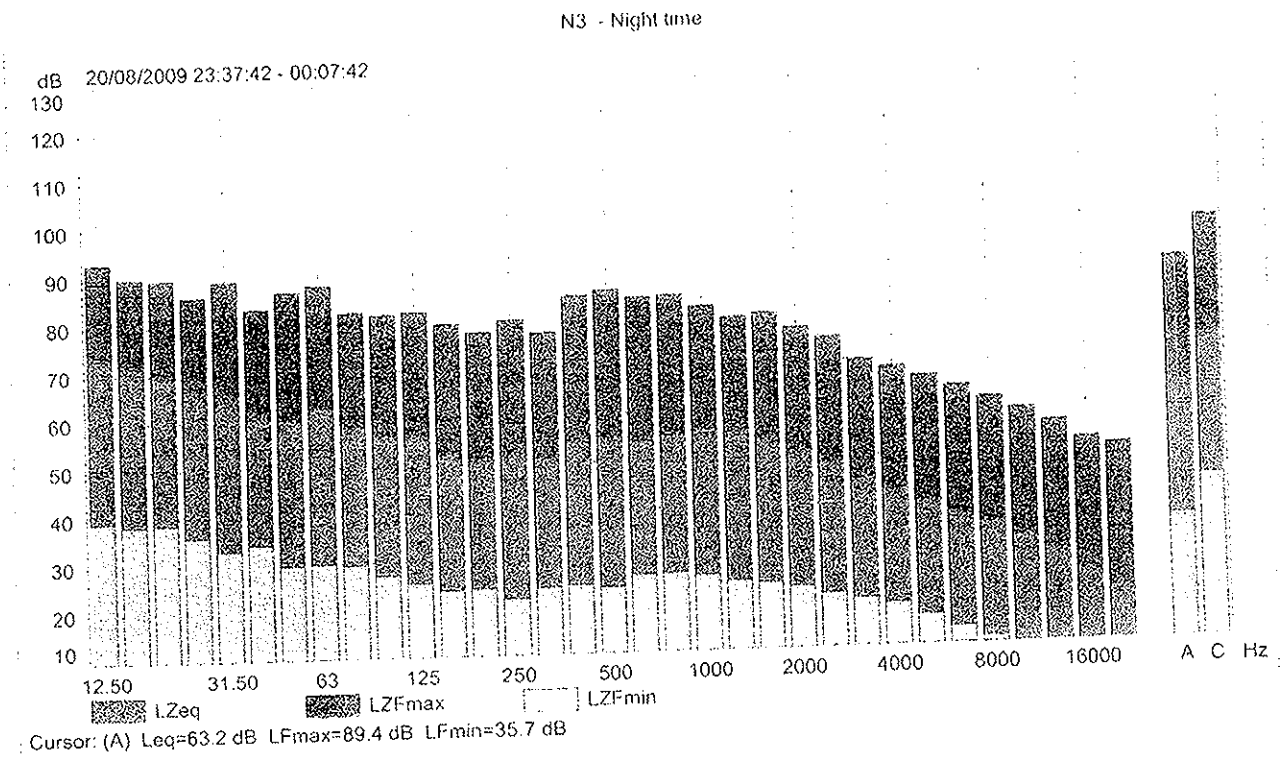
N2 - Night time

	Start time	End time	Overload [%]	LAFmax [dB]	LAFmin [dB]	LAeq [dB]	LAF10 [dB]	LAF90 [dB]	LCpeak [dB]
Value			0.00	72.4	39.7	51.6	52.2	43.0	97.5
Time	21:59:58	22:29:58							22:11:44
Date	20/08/2009	20/08/2009							20/08/2009



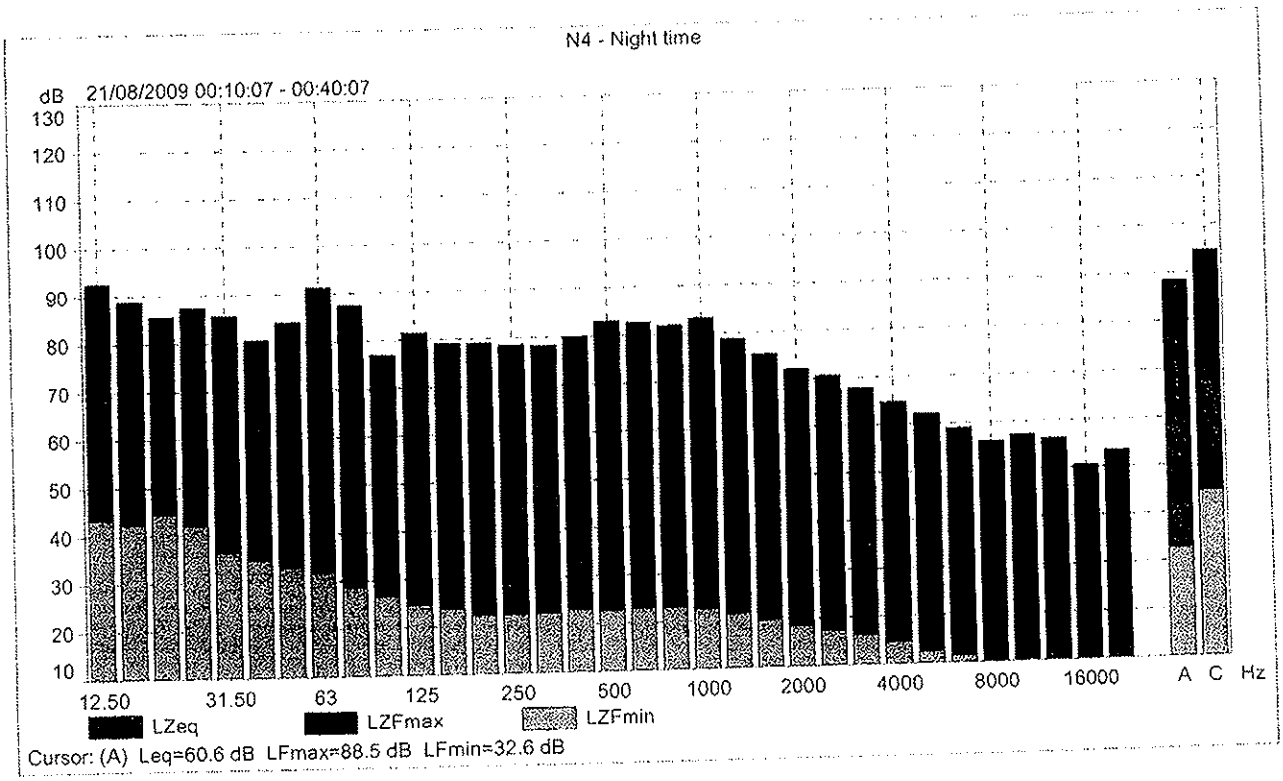
N3 - Night time

	Start time	End time	Overload [%]	LAFmax [dB]	LAFmin [dB]	LAeq [dB]	LAF10 [dB]	LAF90 [dB]	LCpeak [dB]
Value			0.00	89.4	35.7	63.2	55.3	38.6	107.0
Time	23:37:42	00:07:42							23:43:49
Date	20/08/2009	21/08/2009							20/08/2009



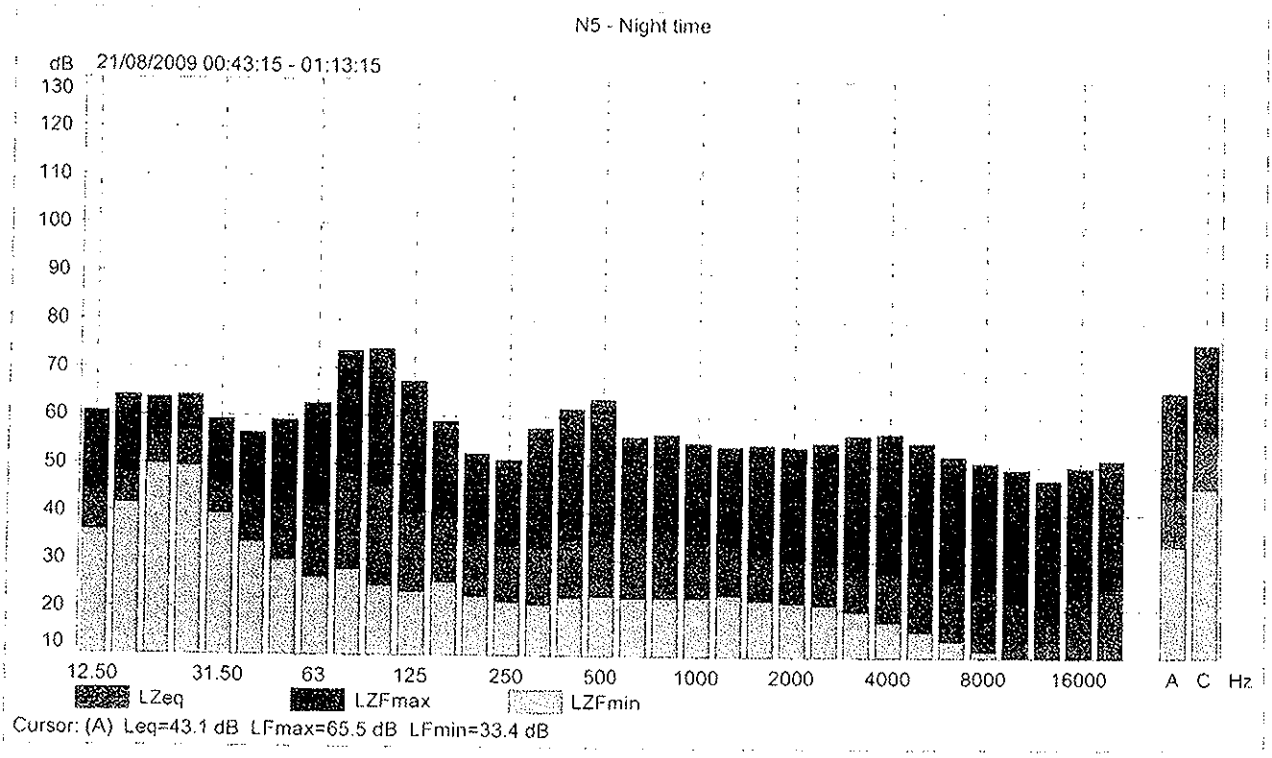
N4 - Night time

	Start time	End time	Overload [%]	LAFmax [dB]	LAFmin [dB]	LAeq [dB]	LAF10 [dB]	LAF90 [dB]	LCpeak [dB]
Value			0.00	88.5	32.6	60.6	49.0	35.0	104.9
Time	00:10:07	00:40:07							00:17:44
Date	21/08/2009	21/08/2009							21/08/2009



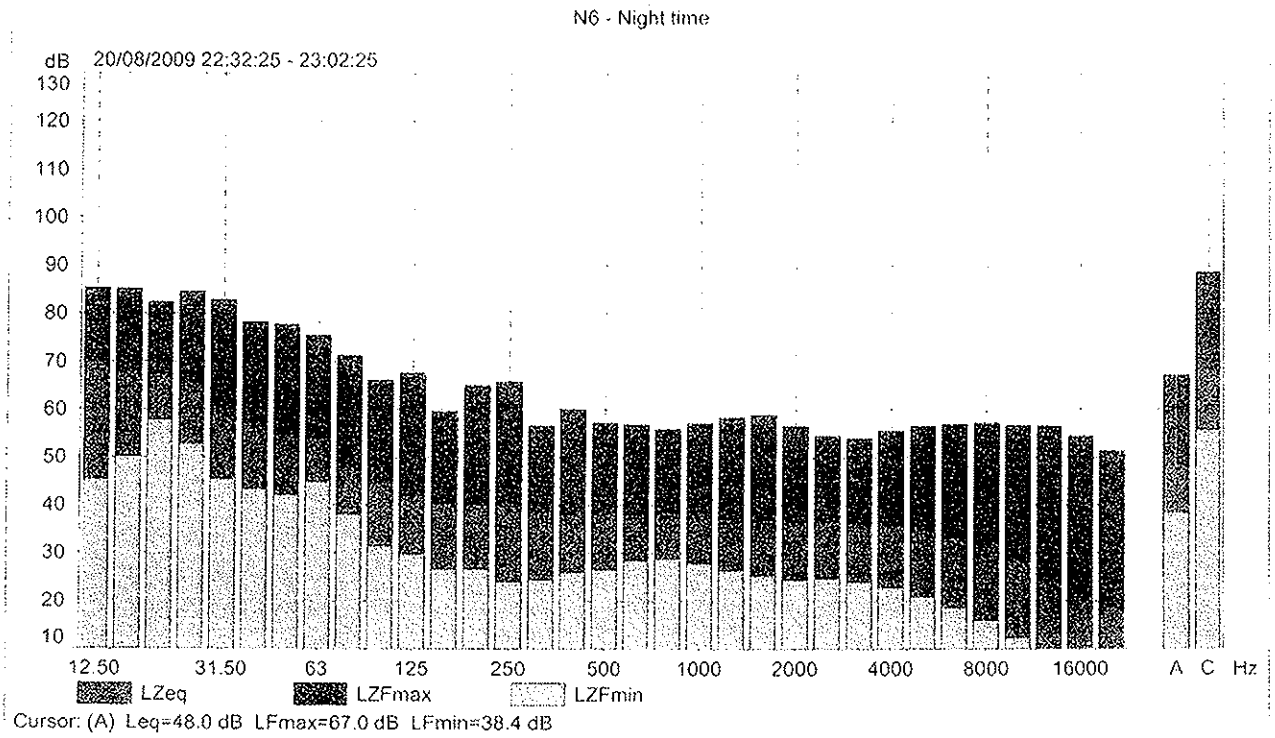
N5 - Night time

	Start time	End time	Overload [%]	LAFmax [dB]	LAFmin [dB]	LAeq [dB]	LAF10 [dB]	LAF90 [dB]	LCpeak [dB]
Value			0.00	65.5	33.4	43.1	46.2	36.1	92.3
Time	00:43:15	01:13:15							01:11:34
Date	21/08/2009	21/08/2009							21/08/2009



N6 - Night time

	Start time	End time	Overload [%]	LAFmax [dB]	LAFmin [dB]	LAeq [dB]	LAF10 [dB]	LAF90 [dB]	LCpeak [dB]
Value			0.00	67.0	38.4	48.0	50.8	42.5	98.5
Time	22:32:25	23:02:25							22:44:08
Date	20/08/2009	20/08/2009							20/08/2009



APPENDIX H

METEOROLOGICAL DATA

MONTHLY CLIMATOLOGICAL SUMMARY for JAN. 2009

NAME: Damien CITY: STATE:
ELEV: 0 m LAT: 37° 36' 00" N LONG: 122° 06' 00" W

TEMPERATURE (°C), RAIN (mm), WIND SPEED (km/h)

DAY	MEAN TEMP	HIGH	TIME	LOW	TIME	HEAT DEG DAYS	COOL DEG DAYS	RAIN	AVG WIND SPEED	HIGH	TIME	DOM DIR
1	2.6	3.2	2:30	1.9	11:30	15.7	0.0	0.0	14.2	30.6	19:00	ENE
2	3.7	4.7	11:30	2.3	0:30	14.7	0.0	0.0	8.9	32.2	4:30	ESE
3	2.2	3.6	0:30	0.8	19:00	16.1	0.0	0.0	2.9	22.5	2:00	SW
4	1.3	2.9	14:30	0.7	2:30	17.0	0.0	0.0	7.6	24.1	5:30	WNW
5	1.8	4.4	12:30	0.1	2:30	16.5	0.0	1.0	4.7	27.4	12:30	ESE
6	-0.4	1.2	13:30	-2.1	19:30	18.7	0.0	0.0	6.6	25.7	23:30	WSW
7	0.4	2.9	13:30	-2.2	1:30	17.9	0.0	0.0	13.4	30.6	2:00	WSW
8	1.4	3.6	14:30	-0.7	5:30	16.9	0.0	0.3	8.7	27.4	13:00	SW
9	2.5	5.4	13:30	-0.2	1:30	15.8	0.0	0.0	6.3	29.0	14:30	S
10	6.1	8.4	21:30	1.2	1:00	12.3	0.0	1.0	23.5	61.2	17:30	SSW
11	9.9	11.0	12:00	7.6	0:30	8.4	0.0	13.7	28.6	72.4	11:30	SSW
12	7.1	8.7	0:30	5.2	19:30	11.2	0.0	1.0	14.6	43.5	2:00	SW
13	4.2	5.9	14:00	1.9	00:00	14.2	0.0	1.0	10.3	27.4	11:30	WSW
14	5.1	9.8	21:00	0.4	5:30	13.3	0.0	13.7	13.5	54.7	15:00	SSE
15	8.7	9.8	11:30	5.9	00:00	9.7	0.0	2.3	16.7	53.1	13:00	SSW
16	6.1	7.9	15:00	4.3	6:00	12.2	0.0	1.3	12.2	56.3	13:00	SSW
17	4.4	7.4	15:00	0.9	23:30	13.9	0.0	12.7	22.5	88.5	15:00	SW
18	2.1	4.2	00:00	0.5	6:30	16.3	0.0	6.1	22.0	57.9	11:30	SW
19	2.1	4.6	2:30	0.8	8:30	16.2	0.0	3.6	19.6	49.9	1:30	WSW
20	1.7	2.7	17:30	0.7	12:30	16.7	0.0	2.8	22.0	53.1	7:00	WSW
21	3.2	8.1	23:30	-0.2	2:30	15.1	0.0	9.1	14.3	40.2	15:30	SW
22	5.1	9.8	3:30	2.5	00:00	13.2	0.0	5.1	18.2	56.3	4:00	SW
23	2.3	5.6	15:00	0.5	23:00	16.0	0.0	0.3	17.1	45.1	13:00	WSW
24	2.8	5.8	00:00	0.4	2:00	15.6	0.0	1.0	17.9	59.5	22:00	WSW
25	4.2	6.7	2:30	1.0	7:30	14.1	0.0	4.6	11.7	53.1	5:30	S
26	4.4	7.7	14:30	1.8	5:00	13.9	0.0	1.0	10.8	35.4	22:00	WNW
27	6.2	7.6	14:00	4.5	23:00	12.1	0.0	2.8	9.8	37.0	1:00	WSW
28	4.8	8.3	14:30	0.9	9:00	13.6	0.0	0.3	5.6	24.1	2:30	WSW
29	6.4	7.6	13:00	3.2	0:30	11.9	0.0	1.5	20.8	62.8	21:00	SSE
30	7.7	9.2	9:30	5.6	00:00	10.7	0.0	5.1	24.9	59.5	5:00	SSE
31	5.2	5.9	22:00	4.8	7:30	13.1	0.0	17.0	10.9	37.0	0:30	SSE
	4.0	11.0	11	-2.2	7	443.1	0.0	108.2	14.2	88.5	17	WSW

Max >= 32.0: 0
Max <= 0.0: 0
Min <= 0.0: 5
Min <= -18.0: 0
Max Rain: 17.02 ON 31/01/09
Days of Rain: 24 (> .2 mm) 13 (> 2 mm) 0 (> 20 mm)
Heat Base: 18.3 Cool Base: 18.3 Method: Integration

MONTHLY CLIMATOLOGICAL SUMMARY for FEB. 2009

NAME: Damien CITY: STATE:
ELEV: 0 m LAT: 37° 36' 00" N LONG: 122° 06' 00" W

TEMPERATURE (°C), RAIN (mm), WIND SPEED (km/h)

DAY	MEAN TEMP	HIGH	TIME	LOW	TIME	HEAT DEG DAYS	COOL DEG DAYS	RAIN	AVG WIND SPEED	HIGH	TIME	DOM DIR
1	2.6	5.0	0:30	0.9	00:00	15.8	0.0	0.0	21.1	45.1	16:00	E
2	0.6	1.9	13:30	-1.1	9:00	17.8	0.0	0.0	17.5	40.2	4:00	N
3	1.6	3.1	20:00	0.0	0:30	16.7	0.0	8.1	19.8	48.3	17:00	ENE
4	2.1	4.1	14:30	-1.2	23:30	16.3	0.0	2.0	8.9	35.4	0:30	ENE
5	0.0	0.7	14:30	-1.2	1:00	18.3	0.0	2.3	15.1	40.2	16:30	N
6	0.1	2.8	15:00	-1.7	4:00	18.3	0.0	0.0	15.9	37.0	15:00	WNW
7	0.6	3.5	14:00	-1.7	00:00	17.7	0.0	0.0	16.6	40.2	1:30	NW
8	0.7	3.5	18:00	-1.6	1:00	17.7	0.0	2.8	9.7	33.8	15:30	W
9	0.3	1.9	0:30	-1.7	9:00	18.1	0.0	0.0	9.5	35.4	23:00	WSW
10	1.9	5.6	15:00	-1.0	5:00	16.4	0.0	0.0	13.2	30.6	1:00	W
11	2.6	5.2	14:00	1.0	22:30	15.8	0.0	0.3	10.3	30.6	11:30	W
12	5.0	8.6	16:30	1.2	0:30	13.3	0.0	0.0	12.6	37.0	11:00	W
13	6.9	9.2	15:00	5.3	5:00	11.4	0.0	0.0	7.7	27.4	0:30	W
14	6.6	8.2	15:30	5.4	4:00	11.7	0.0	0.0	7.1	27.4	23:00	SW
15	7.5	9.8	14:00	6.2	3:00	10.8	0.0	0.3	13.8	35.4	2:30	WSW
16	6.7	8.9	15:00	4.2	7:00	11.7	0.0	0.0	14.6	30.6	4:00	WSW
17	7.3	10.8	14:30	4.7	7:00	11.1	0.0	0.0	10.9	29.0	9:30	W
18	6.4	7.3	16:00	5.6	22:00	11.9	0.0	0.0	4.8	20.9	00:00	SSW
19	6.3	8.4	15:30	4.3	00:00	12.0	0.0	1.0	7.6	27.4	11:00	NW
20	4.9	7.6	14:00	1.7	6:30	13.4	0.0	0.0	9.0	27.4	14:00	WSW
21	7.4	10.0	14:30	4.4	1:00	10.9	0.0	0.0	15.6	37.0	20:00	WSW
22	8.1	9.8	13:30	6.9	8:00	10.2	0.0	0.3	18.3	41.8	5:30	WNW
23	8.2	11.6	15:00	5.8	22:30	10.2	0.0	0.0	13.0	35.4	0:30	NW
24	7.3	8.4	12:00	6.4	23:30	11.0	0.0	0.0	5.6	22.5	17:30	W
25	6.9	9.8	13:57	4.9	23:55	11.0	0.0	3.3	15.4	43.5	13:55	WSW
26	7.3	10.2	17:20	4.4	2:45	11.0	0.0	0.0	21.4	49.9	00:00	WSW
27	8.5	9.8	13:10	6.7	00:00	9.8	0.0	0.3	17.2	49.9	1:10	WSW
28	7.4	9.3	14:50	5.9	00:00	10.9	0.0	1.0	10.6	40.2	15:10	SSW
	4.7	11.6	23	-1.7	6	381.2	0.0	21.6	13.0	49.9	26	WSW

Max >= 32.0: 0
Max <= 0.0: 0
Min <= 0.0: 9
Min <= -18.0: 0
Max Rain: 8.13 ON 03/02/09
Days of Rain: 11 (> .2 mm) 5 (> 2 mm) 0 (> 20 mm)
Heat Base: 18.3 Cool Base: 18.3 Method: Integration

MONTHLY CLIMATOLOGICAL SUMMARY for MAR. 2009

NAME: Damien CITY: STATE:
ELEV: 0 m LAT: 37° 36' 00" N LONG: 122° 06' 00" W

TEMPERATURE (°C), RAIN (mm), WIND SPEED (km/h)

DAY	MEAN TEMP	HIGH	TIME	LOW	TIME	HEAT DEG DAYS	COOL DEG DAYS	RAIN	AVG WIND SPEED	HIGH	TIME	DOM DIR
1	5.4	8.9	14:10	3.2	00:00	12.9	0.0	1.3	14.8	43.5	15:40	W
2	5.8	9.9	14:20	2.5	2:00	12.5	0.0	0.5	19.0	49.9	18:00	WSW
3	3.7	6.3	11:50	-0.7	00:00	14.7	0.0	4.8	17.2	53.1	12:50	SSW
4	0.3	4.3	16:40	-1.9	6:30	18.0	0.0	0.0	8.9	33.8	1:00	WSW
5	2.5	7.6	15:10	-1.7	1:30	15.8	0.0	3.3	12.1	38.6	11:50	WNW
6	4.9	8.8	16:50	0.4	4:00	13.4	0.0	0.3	11.7	32.2	13:30	WSW
7	7.9	11.9	15:30	4.3	00:00	10.4	0.0	4.6	21.1	72.4	20:40	SW
8	2.8	5.2	15:40	1.3	6:00	15.5	0.0	6.6	24.6	64.4	16:00	WSW
9	4.9	7.9	13:30	2.3	6:30	13.4	0.0	5.8	20.3	53.1	4:30	WSW
10	6.7	8.7	16:00	4.8	9:10	11.7	0.0	0.5	11.9	40.2	4:10	W
11	10.1	13.9	14:20	6.4	1:50	8.3	0.0	0.5	15.9	51.5	23:10	SW
12	8.5	11.7	15:30	5.3	00:00	9.8	0.0	0.5	15.9	49.9	12:10	W
13	7.8	9.4	15:00	4.9	2:10	10.6	0.0	1.3	12.6	49.9	16:10	S
14	8.1	10.9	14:50	5.9	6:00	10.3	0.0	0.3	22.4	56.3	12:20	WSW
15	8.6	11.6	12:10	5.8	7:30	9.8	0.0	0.0	10.5	37.0	11:40	SW
16	8.0	10.6	13:20	4.8	7:00	10.3	0.0	0.0	9.7	32.2	11:00	SSW
17	7.6	10.7	16:00	4.1	23:40	10.7	0.0	0.0	5.3	25.7	12:20	ESE
18	6.9	12.9	14:30	2.0	00:00	11.4	0.0	0.5	2.4	16.1	15:30	ESE
19	4.9	7.1	15:50	1.1	0:50	13.4	0.0	0.3	4.7	22.5	11:40	E
20	7.7	11.7	12:30	4.7	0:10	10.7	0.0	0.3	4.7	27.4	23:20	SSE
21	7.1	11.8	16:30	3.8	6:50	11.2	0.0	0.0	13.5	30.6	17:00	WNW
22	8.4	12.8	15:10	4.9	0:30	9.9	0.0	0.0	19.5	45.1	14:00	W
23	7.0	9.8	10:30	3.4	23:40	11.3	0.0	1.0	28.0	61.2	10:20	W
24	6.3	10.6	15:50	2.3	5:00	12.1	0.0	0.5	19.8	57.9	22:00	W
25	7.9	10.6	14:20	5.8	1:50	10.4	0.0	0.3	27.7	57.9	10:10	WNW
26	6.7	9.2	5:20	2.9	23:00	11.6	0.0	2.3	30.1	64.4	15:40	W
27	4.6	7.8	15:40	2.5	1:30	13.7	0.0	4.1	26.4	57.9	17:10	W
28	3.9	6.2	15:00	0.1	23:50	14.4	0.0	0.0	25.3	59.5	8:20	NNW
29	4.7	9.4	13:50	-0.3	6:10	13.1	0.0	0.3	12.4	46.7	16:10	SSW
30	9.2	12.6	17:00	6.8	6:10	9.2	0.0	0.0	11.1	30.6	14:40	WSW
31	10.0	15.0	16:00	6.4	9:00	8.3	0.0	0.0	7.7	27.4	7:40	WSW
	6.4	15.0	31	-1.9	4	368.9	0.0	39.6	15.7	72.4	7	W

Max >= 32.0: 0
Max <= 0.0: 0
Min <= 0.0: 4
Min <= -18.0: 0
Max Rain: 6.60 ON 08/03/09
Days of Rain: 22 (> .2 mm) 7 (> 2 mm) 0 (> 20 mm)
Heat Base: 18.3 Cool Base: 18.3 Method: Integration

MONTHLY CLIMATOLOGICAL SUMMARY for APR. 2009

NAME: Damien CITY: STATE:
ELEV: 0 m LAT: 37° 36' 00" N LONG: 122° 06' 00" W

TEMPERATURE (°C), RAIN (mm), WIND SPEED (km/h)

DAY	MEAN TEMP	HIGH	TIME	LOW	TIME	HEAT DEG DAYS	COOL DEG DAYS	RAIN	AVG WIND SPEED	HIGH	TIME	DOM DIR
1	8.1	11.1	16:30	4.7	6:20	10.2	0.0	0.0	4.0	22.5	2:20	S
2	8.9	13.2	14:30	5.3	7:20	9.4	0.0	0.0	3.7	22.5	16:40	S
3	8.6	13.5	13:00	4.8	5:00	9.8	0.0	6.6	9.7	38.6	12:00	S
4	7.9	10.7	14:00	5.7	00:00	10.4	0.0	0.5	18.8	51.5	12:00	W
5	7.1	11.1	16:50	3.0	7:20	11.3	0.0	0.0	10.0	38.6	11:50	SW
6	6.6	7.8	19:30	5.4	00:00	11.7	0.0	5.1	11.1	43.5	14:10	SSE
7	6.5	11.1	15:10	3.1	5:10	11.8	0.0	12.2	16.7	64.4	23:30	SSW
8	8.6	12.9	15:50	4.9	6:20	9.8	0.0	0.5	22.0	74.0	1:40	W
9	9.9	12.3	13:20	6.7	1:10	8.4	0.0	4.8	17.5	56.3	16:10	SSE
10	7.3	10.6	17:40	4.1	23:10	11.0	0.0	3.6	10.6	33.8	1:40	WSW
11	6.9	12.2	17:00	1.7	6:30	11.4	0.0	0.0	7.7	27.4	16:40	SSW
12	8.8	12.7	16:10	5.4	6:50	9.6	0.0	0.0	5.6	25.7	16:00	WSW
13	7.6	8.7	13:20	5.4	1:40	10.8	0.0	8.1	11.1	35.4	13:30	SSE
14	8.7	11.3	15:50	6.3	23:10	9.6	0.0	2.8	6.8	29.0	13:30	SSE
15	8.4	10.0	17:20	6.6	0:20	9.9	0.0	9.9	19.3	46.7	16:50	ENE
16	9.6	11.5	14:30	7.8	6:50	8.8	0.0	0.0	24.5	59.5	11:50	ENE
17	8.2	9.7	17:40	7.1	3:40	10.2	0.0	0.0	22.2	53.1	12:30	ENE
18	7.9	10.4	15:40	6.0	6:30	10.4	0.0	0.0	10.9	30.6	9:10	ENE
19	8.8	13.4	12:40	5.1	6:30	9.5	0.0	0.3	3.5	22.5	17:00	ENE
20	11.3	15.3	14:40	7.2	6:00	7.1	0.0	0.0	4.7	24.1	1:10	W
21	10.3	15.1	16:50	6.8	4:20	8.1	0.0	1.5	12.1	37.0	10:50	SW
22	9.9	14.7	16:10	6.3	1:50	8.4	0.0	0.0	12.6	46.7	19:00	SSW
23	10.4	13.3	13:30	8.6	22:10	7.9	0.0	2.5	8.0	40.2	0:30	SSE
24	9.0	10.7	10:20	7.7	12:00	9.3	0.0	4.1	7.2	32.2	11:00	SSE
25	9.1	11.5	10:30	7.2	2:30	9.3	0.0	7.6	11.7	41.8	10:00	N
26	8.6	11.2	15:40	7.2	7:50	9.7	0.0	9.7	9.8	45.1	21:30	SSW
27	7.1	10.9	14:00	3.9	6:30	11.2	0.0	4.3	11.1	48.3	1:00	W
28	7.8	11.4	15:20	3.5	5:20	10.5	0.0	0.0	6.4	20.9	14:00	WNW
29	8.9	11.1	17:30	7.4	7:50	9.4	0.0	5.6	10.6	35.4	20:40	NE
30	10.3	14.3	17:30	8.1	7:50	8.1	0.0	16.8	8.4	33.8	12:30	SSE
	8.6	15.3	20	1.7	11	293.1	0.0	106.4	11.3	74.0	8	SSE

Max >= 32.0: 0
Max <= 0.0: 0
Min <= 0.0: 0
Min <= -18.0: 0
Max Rain: 16.76 ON 30/04/09
Days of Rain: 19 (> .2 mm) 15 (> 2 mm) 0 (> 20 mm)
Heat Base: 18.3 Cool Base: 18.3 Method: Integration

MONTHLY CLIMATOLOGICAL SUMMARY for MAY. 2009

NAME: Damien CITY: STATE:
ELEV: 0 m LAT: 37° 36' 00" N LONG: 122° 06' 00" W

TEMPERATURE (°C), RAIN (mm), WIND SPEED (km/h)

DAY	MEAN TEMP	HIGH	TIME	LOW	TIME	HEAT DEG DAYS	COOL DEG DAYS	RAIN	AVG WIND SPEED	HIGH	TIME	DOM DIR
1	10.4	14.7	14:30	7.4	00:00	7.9	0.0	4.8	17.7	48.3	14:10	WSW
2	9.3	14.0	16:10	4.9	4:30	9.1	0.0	1.0	12.7	40.2	22:10	WSW
3	7.6	11.9	16:40	3.7	6:10	10.7	0.0	3.3	15.9	48.3	12:40	W
4	9.7	13.5	15:20	6.9	2:40	8.6	0.0	3.3	21.2	57.9	11:30	WSW
5	11.2	14.1	15:40	9.8	0:40	7.1	0.0	1.8	25.3	62.8	18:40	WSW
6	11.4	13.5	15:50	8.3	23:40	6.9	0.0	4.6	23.2	61.2	15:00	WSW
7	8.1	12.1	16:10	5.0	19:40	10.3	0.0	2.0	22.4	64.4	18:20	SW
8	7.8	12.6	14:30	4.9	2:00	10.6	0.0	2.5	25.1	66.0	6:10	WSW
9	8.2	12.3	15:00	4.8	10:10	10.1	0.0	2.5	15.8	53.1	10:00	SSW
10	9.1	12.7	15:10	5.9	3:20	9.3	0.0	0.0	5.1	20.9	14:50	E
11	8.9	11.6	16:50	5.4	3:30	9.4	0.0	0.0	13.0	40.2	15:00	ENE
12	8.6	11.8	18:00	6.1	5:20	9.8	0.0	0.0	17.7	41.8	3:20	E
13	9.1	11.9	14:20	6.8	5:40	9.3	0.0	2.3	15.8	43.5	10:50	E
14	9.0	9.7	16:50	8.6	0:10	9.3	0.0	11.4	9.8	33.8	23:00	E
15	8.9	11.3	16:50	7.9	3:30	9.4	0.0	20.6	8.7	32.2	7:30	ENE
16	9.1	13.5	13:20	5.8	2:50	9.3	0.0	3.8	15.0	49.9	15:00	S
17	8.1	10.2	14:50	6.1	2:20	10.3	0.0	5.3	8.9	37.0	8:20	SE
18	9.8	13.7	14:00	7.2	0:10	8.6	0.0	7.6	11.9	46.7	15:40	SW
19	10.5	15.0	15:40	8.7	2:20	7.8	0.0	1.5	12.2	40.2	6:30	SSW
20	10.3	13.9	16:30	7.9	4:20	8.0	0.0	5.6	9.5	29.0	3:00	SW
21	9.5	13.6	14:40	6.6	5:10	8.8	0.0	6.1	11.1	41.8	15:40	W
22	11.1	15.7	15:50	7.8	0:30	7.2	0.0	0.8	4.2	20.9	3:10	S
23	11.8	13.8	11:40	8.7	22:30	6.6	0.0	0.8	13.4	43.5	10:30	SSW
24	12.4	18.0	18:20	5.8	5:20	5.9	0.0	0.0	9.0	38.6	9:40	SW
25	13.2	16.8	11:40	8.3	00:00	5.2	0.0	1.5	7.6	32.2	18:20	WNW
26	9.4	13.5	15:20	5.3	5:30	8.9	0.0	0.3	17.9	54.7	12:30	W
27	12.7	17.7	15:30	8.2	3:20	5.6	0.0	2.3	20.4	53.1	13:30	W
28	15.1	19.9	18:30	11.7	6:30	3.4	0.2	0.0	12.1	41.8	0:30	WSW
29	12.8	18.3	18:00	9.8	2:30	5.5	0.0	0.0	4.3	27.4	18:30	SSE
30	15.1	18.9	12:30	10.4	1:00	3.3	0.1	0.0	6.6	33.8	8:30	SSE
31	14.3	17.3	19:00	10.2	5:00	4.0	0.0	0.0	5.1	22.5	13:30	ENE
	10.4	19.9	28	3.7	3	246.3	0.3	95.8	13.5	66.0	8	WSW

Max >= 32.0: 0
Max <= 0.0: 0
Min <= 0.0: 0
Min <= -18.0: 0
Max Rain: 20.57 ON 15/05/09
Days of Rain: 23 (> .2 mm) 16 (> 2 mm) 1 (> 20 mm)
Heat Base: 18.3 Cool Base: 18.3 Method: Integration

MONTHLY CLIMATOLOGICAL SUMMARY for JUN. 2009

NAME: Damien CITY: STATE:
ELEV: 0 m LAT: 37° 36' 00" N LONG: 122° 06' 00" W

TEMPERATURE (°C), RAIN (mm), WIND SPEED (km/h)

DAY	MEAN TEMP	HIGH	TIME	LOW	TIME	HEAT DEG DAYS	COOL DEG DAYS	RAIN	AVG WIND SPEED	HIGH	TIME	DOM DIR
1	16.0	20.7	17:30	11.3	5:30	2.7	0.4	0.0	4.0	19.3	13:00	ENE
2	19.2	25.9	18:00	11.3	5:00	1.7	2.6	0.0	1.8	19.3	20:30	ENE
3	13.6	16.4	1:00	10.8	23:30	4.8	0.0	0.0	6.3	25.7	10:30	E
4	13.5	18.8	16:30	7.8	5:30	4.8	0.0	0.0	4.0	24.1	19:00	E
5	9.8	13.8	14:00	7.4	6:30	8.5	0.0	0.0	11.7	35.4	15:00	N
6	7.6	9.7	21:30	5.4	5:30	10.8	0.0	21.3	15.3	54.7	13:30	NE
7	10.5	12.7	16:30	8.3	5:30	7.8	0.0	0.0	16.1	40.2	15:00	NE
8	10.7	13.1	14:30	7.9	5:00	7.6	0.0	0.0	11.1	30.6	11:00	ENE
9	10.9	13.8	17:00	7.7	00:00	7.4	0.0	0.0	8.0	29.0	10:30	ENE
10	10.9	15.0	15:30	6.9	2:30	7.4	0.0	0.8	3.9	25.7	16:00	NNE
11	10.9	15.7	18:30	6.2	5:00	7.4	0.0	0.0	9.0	27.4	9:30	WNW
12	10.9	13.9	18:00	8.1	2:30	7.4	0.0	0.5	6.0	33.8	15:00	SE
13	14.1	19.9	16:00	10.4	1:00	4.3	0.1	0.3	8.2	35.4	19:30	SSW
14	13.6	17.9	15:00	9.7	4:00	4.7	0.0	11.7	4.2	24.1	13:30	SSW
15	13.7	17.7	16:30	9.7	6:00	4.7	0.0	0.0	2.6	22.5	12:30	ESE
16	15.2	20.0	14:00	10.1	1:30	3.4	0.2	0.0	6.4	40.2	21:30	ESE
17	12.8	15.9	14:30	9.7	23:30	5.5	0.0	33.3	16.7	48.3	19:00	W
18	11.4	15.8	14:30	8.4	3:30	6.9	0.0	2.8	16.1	53.1	15:30	W
19	11.9	15.0	16:00	8.9	3:00	6.4	0.0	0.0	18.8	51.5	12:30	W
20	12.7	15.6	15:30	10.8	2:30	5.6	0.0	0.5	18.0	45.1	10:30	WNW
21	14.8	19.4	16:30	11.3	1:00	3.6	0.1	0.5	10.8	29.0	21:30	W
22	18.1	21.8	19:00	14.5	6:00	1.4	1.1	0.0	7.1	27.4	3:00	WNW
23	16.6	21.2	17:00	13.2	3:30	2.3	0.6	0.0	3.9	17.7	12:00	E
24	15.9	19.1	12:30	12.6	23:00	2.4	0.1	0.0	5.0	25.7	16:00	ESE
25	14.2	16.3	18:00	12.6	6:30	4.1	0.0	0.0	9.8	35.4	13:00	E
26	15.4	18.4	19:00	12.9	4:30	2.9	0.0	0.0	6.9	29.0	9:00	ENE
27	15.7	18.8	14:30	12.9	00:00	2.6	0.0	0.0	3.7	20.9	16:00	ENE
28	14.6	18.5	18:00	11.8	3:30	3.7	0.0	1.0	3.9	16.1	13:30	ENE
29	16.6	19.9	11:30	14.2	5:00	1.9	0.2	0.5	4.3	17.7	8:00	ENE
30	16.6	20.1	13:00	11.7	5:00	2.0	0.2	0.0	4.0	27.4	11:00	SSE
	13.6	25.9	2	5.4	6	147.2	5.6	73.2	8.3	54.7	6	ENE

Max >= 32.0: 0
Max <= 0.0: 0
Min <= 0.0: 0
Min <= -18.0: 0
Max Rain: 33.27 ON 17/06/09
Days of Rain: 11 (> .2 mm) 4 (> 2 mm) 2 (> 20 mm)
Heat Base: 18.3 Cool Base: 18.3 Method: Integration

MONTHLY CLIMATOLOGICAL SUMMARY for JUL. 2009

NAME: Damien CITY: STATE:
ELEV: 0 m LAT: 37° 36' 00" N LONG: 122° 06' 00" W

TEMPERATURE (°C), RAIN (mm), WIND SPEED (km/h)

DAY	MEAN TEMP	HIGH	TIME	LOW	TIME	HEAT DEG DAYS	COOL DEG DAYS	RAIN	AVG WIND SPEED	HIGH	TIME	DOM DIR
1	18.1	21.1	18:00	15.9	6:30	0.7	0.5	10.7	3.2	19.3	8:30	SSE
2	16.5	18.7	14:30	14.7	3:30	1.8	0.0	23.4	2.3	32.2	5:00	SE
3	17.2	21.7	16:00	14.6	00:00	1.7	0.6	1.8	7.4	32.2	13:00	SSW
4	15.5	20.2	17:00	12.7	4:00	2.9	0.1	6.9	9.0	41.8	17:30	SSE
5	14.7	18.8	12:00	11.3	6:00	3.7	0.0	2.8	9.3	37.0	13:30	SSE
6	14.2	18.1	16:00	12.2	6:00	4.1	0.0	46.7	8.0	30.6	13:30	WSW
7	14.6	17.7	15:30	12.5	00:00	3.7	0.0	0.5	19.2	43.5	14:30	NW
8	13.4	16.2	18:00	11.4	6:00	4.9	0.0	0.3	13.5	30.6	3:00	NW
9	12.8	15.4	15:30	10.4	4:30	5.6	0.0	0.0	10.8	35.4	4:30	WNW
10	12.8	15.9	19:30	8.9	4:00	5.6	0.0	0.0	2.9	16.1	12:00	NW
11	14.4	16.7	16:30	12.5	5:00	3.9	0.0	19.0	8.2	53.1	22:30	SSE
12	14.4	18.1	16:30	12.1	23:30	3.9	0.0	2.3	11.7	41.8	8:30	SW
13	13.5	18.2	11:30	11.1	00:00	4.8	0.0	16.0	6.4	38.6	15:00	SSE
14	13.9	17.4	14:30	10.6	1:00	4.4	0.0	2.5	6.8	30.6	13:30	SSE
15	15.2	20.0	17:30	12.1	4:00	3.3	0.1	4.8	6.9	30.6	16:30	W
16	14.0	18.1	16:00	10.9	6:30	4.3	0.0	6.9	6.3	24.1	11:00	WSW
17	14.3	18.3	15:30	11.4	00:00	4.0	0.0	0.0	18.2	48.3	15:30	NW
18	12.6	16.2	17:30	9.5	4:30	5.8	0.0	6.9	10.3	33.8	18:00	W
19	13.6	17.1	17:00	11.2	00:00	4.8	0.0	2.3	9.0	37.0	14:30	W
20	13.8	18.3	17:00	10.2	6:00	4.5	0.0	0.8	11.1	37.0	9:00	WSW
21	14.3	20.0	16:30	10.3	3:30	4.2	0.1	13.2	10.1	45.1	14:30	S
22	15.2	19.3	15:00	12.4	6:30	3.2	0.1	8.1	7.6	40.2	14:30	SW
23	14.0	17.3	14:00	11.9	23:30	4.3	0.0	3.3	10.1	37.0	14:30	SW
24	13.8	17.7	13:30	11.6	2:30	4.6	0.0	12.2	6.1	32.2	16:00	WSW
25	14.3	18.4	17:00	9.4	5:30	4.0	0.0	0.0	6.4	30.6	19:30	WNW
26	15.1	18.4	14:30	12.4	5:30	3.2	0.0	15.2	14.3	49.9	16:30	SSW
27	14.3	17.8	16:30	11.6	00:00	4.0	0.0	1.3	11.7	43.5	14:00	WSW
28	13.6	17.0	13:00	10.2	3:30	4.8	0.0	7.1	12.4	49.9	15:30	SSW
29	13.7	18.3	15:30	10.4	5:30	4.7	0.0	3.8	8.9	38.6	18:00	SW
30	13.1	17.7	17:30	9.7	6:30	5.3	0.0	0.5	10.0	38.6	11:30	WSW
31	13.0	15.0	18:00	10.1	4:30	5.3	0.0	11.2	11.3	45.1	18:30	SSE
	14.3	21.7	3	8.9	10	125.9	1.4	230.4	9.3	53.1	11	SSE

Max >= 32.0: 0
Max <= 0.0: 0
Min <= 0.0: 0
Min <= -18.0: 0
Max Rain: 46.74 ON 06/07/09
Days of Rain: 27 (> .2 mm) 21 (> 2 mm) 2 (> 20 mm)
Heat Base: 18.3 Cool Base: 18.3 Method: Integration

MONTHLY CLIMATOLOGICAL SUMMARY for AUG. 2009

NAME: Damien CITY: STATE:
ELEV: 0 m LAT: 37° 36' 00" N LONG: 122° 06' 00" W

TEMPERATURE (°C), RAIN (mm), WIND SPEED (km/h)

DAY	MEAN TEMP	HIGH	TIME	LOW	TIME	HEAT DEG DAYS	COOL DEG DAYS	RAIN	AVG WIND SPEED	HIGH	TIME	DOM DIR
1	13.8	16.8	15:00	11.4	6:00	4.6	0.0	3.0	13.4	43.5	15:00	W
2	13.0	16.9	17:00	9.2	6:30	5.3	0.0	1.3	7.1	29.0	11:30	SW
3	15.4	19.7	16:30	12.9	0:30	3.0	0.1	8.6	13.2	40.2	16:30	SSE
4	16.6	19.2	15:30	13.6	00:00	1.8	0.1	0.5	11.7	38.6	19:30	S
5	15.5	20.4	16:30	11.6	6:00	3.1	0.2	1.8	12.4	40.2	12:30	SSW
6	14.3	18.3	14:30	10.3	5:30	4.0	0.0	0.0	5.6	25.7	10:00	SSW
7	14.8	18.3	14:30	11.9	6:00	3.6	0.0	0.0	5.0	24.1	10:30	W
8	15.7	19.3	14:30	12.4	3:30	2.7	0.1	5.1	6.6	32.2	12:00	SSW
9	15.6	18.2	14:30	13.2	7:00	2.7	0.0	0.0	4.7	25.7	14:30	WSW
10	16.0	19.9	14:30	12.6	00:00	2.4	0.1	1.5	11.6	37.0	5:30	WNW
11	14.9	19.1	15:30	10.8	6:30	3.4	0.0	0.3	11.3	37.0	11:00	W
12	15.2	18.9	16:00	11.8	23:00	3.2	0.0	2.3	8.9	32.2	16:00	WNW
13	13.9	16.6	15:00	12.0	6:00	4.4	0.0	0.0	3.7	16.1	1:30	WNW
14	16.3	20.1	15:00	12.8	2:30	2.2	0.2	2.8	11.3	48.3	17:00	SSW
15	16.1	18.3	16:00	13.0	00:00	2.3	0.0	17.0	14.5	41.8	2:00	W
16	14.4	17.0	14:00	12.6	1:30	3.9	0.0	2.0	14.5	46.7	8:30	WSW
17	15.4	19.4	17:00	12.8	6:30	3.0	0.1	3.8	9.2	33.8	8:30	WSW
18	16.1	18.8	17:00	13.1	4:00	2.3	0.0	8.9	10.3	40.2	11:30	S
19	17.8	21.7	15:00	15.6	00:00	1.1	0.6	9.7	13.5	45.1	10:00	S
20	14.3	16.9	18:00	11.6	00:00	4.0	0.0	27.7	12.4	49.9	16:00	WSW
21	12.6	16.3	17:30	9.6	5:00	5.8	0.0	0.8	13.5	53.1	15:30	WSW
22	13.6	18.1	16:00	8.9	6:00	4.8	0.0	3.3	9.0	43.5	00:00	SSE
23	15.4	19.2	15:30	11.2	00:00	2.9	0.0	24.1	13.0	48.3	14:00	S
24	12.2	16.4	14:00	7.7	6:30	6.2	0.0	2.3	8.9	46.7	15:00	SSW
25	13.2	17.4	17:30	9.1	6:30	5.1	0.0	0.0	9.3	32.2	11:30	SSW
26	15.2	19.1	15:00	12.3	23:30	3.2	0.0	18.5	13.4	43.5	5:00	SSE
27	12.7	16.2	17:00	10.2	7:30	5.7	0.0	4.8	11.7	51.5	15:00	WSW
28	11.7	14.8	18:00	9.3	6:30	6.7	0.0	0.0	19.8	56.3	15:00	W
29	12.0	15.0	16:00	9.1	6:30	6.3	0.0	0.0	11.7	37.0	12:30	W
30	14.4	18.7	18:30	8.8	5:30	3.9	0.0	3.6	7.4	35.4	15:00	SSW
31	15.3	17.2	14:30	12.3	22:30	3.0	0.0	16.5	12.4	48.3	14:00	SSW
	14.6	21.7	19	7.7	24	116.4	1.3	170.2	10.7	56.3	28	SSW

Max >= 32.0: 0
Max <= 0.0: 0
Min <= 0.0: 0
Min <= -18.0: 0
Max Rain: 27.69 ON 20/08/09
Days of Rain: 24 (> .2 mm) 18 (> 2 mm) 2 (> 20 mm)
Heat Base: 18.3 Cool Base: 18.3 Method: Integration

MONTHLY CLIMATOLOGICAL SUMMARY for SEP. 2009

NAME: Damien CITY: STATE:
ELEV: 0 m LAT: 37° 36' 00" N LONG: 122° 06' 00" W

TEMPERATURE (°C), RAIN (mm), WIND SPEED (km/h)

DAY	MEAN TEMP	HIGH	TIME	LOW	TIME	HEAT DEG DAYS	COOL DEG DAYS	RAIN	AVG WIND SPEED	HIGH	TIME	DOM DIR
1	12.1	16.1	17:00	9.4	7:00	6.2	0.0	1.3	11.9	40.2	18:30	WSW
2	11.3	14.1	13:30	9.5	6:30	7.1	0.0	29.5	10.0	40.2	23:30	SW
3	11.3	15.2	15:30	8.7	00:00	7.0	0.0	2.3	18.5	49.9	14:00	W
4	11.2	15.4	14:30	7.8	5:30	7.2	0.0	0.8	17.2	57.9	16:00	W
5	12.6	15.7	16:30	9.3	0:30	5.7	0.0	0.0	12.7	41.8	11:30	WSW
6	13.0	15.6	22:00	11.3	6:00	5.3	0.0	8.9	11.9	48.3	22:00	S
7	14.2	16.8	14:00	11.7	6:30	4.2	0.0	2.5	9.7	38.6	1:00	WSW
8	15.1	17.7	7:30	10.2	23:30	3.3	0.0	5.1	17.2	59.5	5:30	SSW
9	12.3	16.7	18:00	8.3	5:00	6.1	0.0	0.3	7.2	25.7	1:00	WNW
10	12.7	18.1	15:30	8.8	7:00	5.7	0.0	0.0	3.5	17.7	14:30	WNW
11	12.2	18.0	16:00	7.8	7:30	6.2	0.0	0.0	1.4	19.3	16:00	E
12	13.3	19.7	16:30	8.4	3:30	5.1	0.1	0.3	2.6	16.1	23:00	W
13	12.3	17.1	15:30	8.1	7:00	6.0	0.0	0.3	5.0	20.9	13:00	ENE
14	11.9	13.8	14:30	8.6	23:30	6.4	0.0	0.3	5.0	20.9	12:30	ENE
15	11.6	15.7	16:00	8.2	2:00	6.8	0.0	0.0	7.2	29.0	18:30	N
16	12.0	15.7	14:30	10.0	4:30	6.3	0.0	0.0	6.6	24.1	10:30	N
17	10.9	14.3	13:30	7.7	5:30	7.4	0.0	0.0	1.8	16.1	12:00	NE
18	11.8	14.1	15:00	9.1	00:00	6.6	0.0	0.0	2.4	22.5	11:30	SSE
19	11.2	15.5	17:00	8.3	00:00	7.1	0.0	0.8	7.1	25.7	9:00	WNW
20	11.1	14.2	18:30	7.2	5:30	7.2	0.0	0.0	7.9	32.2	22:00	SW
21	13.8	18.1	17:30	11.6	2:30	4.5	0.0	0.0	14.8	48.3	22:00	SW
22	13.5	16.1	15:30	11.0	00:00	4.8	0.0	2.0	14.8	46.7	5:00	WSW
23	12.1	15.7	15:00	9.6	22:00	6.3	0.0	0.3	10.5	38.6	11:30	WSW
24	12.2	15.7	17:00	9.5	3:00	6.2	0.0	0.0	10.3	33.8	13:00	WSW
25	12.7	16.9	16:30	8.9	5:30	5.6	0.0	0.0	9.7	37.0	14:00	WSW
26	13.7	16.8	16:00	11.7	6:30	4.7	0.0	0.0	6.0	27.4	23:30	W
27	13.9	16.8	15:00	12.2	5:30	4.4	0.0	0.3	9.2	32.2	23:30	W
28	13.8	16.1	16:00	12.6	22:00	4.5	0.0	0.3	14.6	45.1	14:30	W
29	13.8	16.0	15:00	12.5	5:30	4.5	0.0	0.0	13.4	35.4	2:00	W
30	13.4	16.9	14:00	11.4	00:00	4.9	0.0	0.8	13.5	33.8	13:30	W
	12.6	19.7	12	7.2	20	173.0	0.1	55.6	9.5	59.5	8	W

Max >= 32.0: 0
Max <= 0.0: 0
Min <= 0.0: 0
Min <= -18.0: 0
Max Rain: 29.46 ON 02/09/09
Days of Rain: 17 (> .2 mm) 6 (> 2 mm) 1 (> 20 mm)
Heat Base: 18.3 Cool Base: 18.3 Method: Integration

MONTHLY CLIMATOLOGICAL SUMMARY for OCT. 2009

NAME: Damien CITY: STATE:
ELEV: 0 m LAT: 37° 36' 00" N LONG: 122° 06' 00" W

TEMPERATURE (°C), RAIN (mm), WIND SPEED (km/h)

DAY	MEAN TEMP	HIGH	TIME	LOW	TIME	HEAT DEG DAYS	COOL DEG DAYS	RAIN	AVG WIND SPEED	HIGH	TIME	DOM DIR
1	10.6	13.1	15:00	8.4	4:30	7.8	0.0	0.0	9.3	29.0	15:30	WNW
2	11.9	15.0	14:00	8.6	1:30	6.4	0.0	0.3	15.1	51.5	22:30	WSW
3	10.8	12.9	15:00	7.8	00:00	7.6	0.0	3.8	21.6	62.8	12:30	WSW
4	8.9	12.7	15:30	6.1	7:30	9.4	0.0	0.0	7.1	29.0	11:30	W
5	10.3	15.3	15:30	6.6	1:30	8.0	0.0	0.0	3.2	20.9	14:00	SW
6	9.4	11.3	12:30	5.1	23:30	8.9	0.0	7.9	6.3	33.8	13:00	S
7	8.3	12.9	15:30	4.2	6:00	10.1	0.0	0.0	6.4	24.1	11:00	WNW
8	8.6	12.3	14:00	5.3	8:00	9.7	0.0	0.0	4.3	19.3	5:00	W
9	10.9	12.0	18:00	8.2	0:30	7.4	0.0	11.7	9.3	35.4	8:30	SSE
10	11.6	14.2	16:00	10.0	5:00	6.8	0.0	0.3	7.2	25.7	1:30	W
11	11.1	12.9	11:30	7.5	00:00	7.3	0.0	0.5	12.6	40.2	14:00	NW
12	9.4	13.8	17:00	5.7	6:30	8.9	0.0	0.0	3.7	20.9	1:30	SW
13	11.6	13.9	15:00	7.9	3:00	6.8	0.0	0.3	4.0	19.3	9:30	SSW
14	12.7	14.0	14:30	12.1	00:00	5.6	0.0	0.0	2.1	11.3	0:30	SSW
15	12.1	14.0	15:30	9.2	00:00	6.2	0.0	0.3	3.4	22.5	17:30	SSW
16	10.1	13.2	13:00	7.1	22:00	8.3	0.0	0.0	3.9	19.3	11:00	WNW
17	9.1	12.5	16:00	5.0	8:00	9.3	0.0	0.5	2.9	20.9	22:30	SSE
18	10.6	12.8	16:00	7.8	1:30	7.8	0.0	3.3	10.0	32.2	8:00	SW
19	11.3	13.3	13:30	10.2	00:00	7.1	0.0	2.5	13.7	45.1	22:00	SSE
20	10.5	13.2	16:30	9.1	7:00	7.8	0.0	12.7	10.5	45.1	5:30	SE
21	11.4	13.1	15:00	9.7	0:30	6.9	0.0	8.4	10.6	48.3	17:00	SE
22	11.9	13.3	13:00	9.9	23:00	6.4	0.0	0.3	7.9	38.6	6:30	SE
23	10.7	13.5	16:00	8.8	3:30	7.7	0.0	0.8	6.3	27.4	6:00	SW
24	12.9	15.3	11:00	11.1	23:30	5.4	0.0	6.6	20.9	67.6	18:30	WSW
25	11.7	13.6	15:00	10.3	23:30	6.6	0.0	0.3	22.9	53.1	0:30	W
26	11.3	13.2	13:30	10.1	7:00	7.1	0.0	0.8	6.1	29.0	0:30	W
27	13.3	14.8	10:00	11.8	0:30	4.9	0.0	4.6	11.1	41.8	10:30	SSE
28	13.3	16.6	14:30	10.8	21:00	5.0	0.0	0.0	9.0	30.6	10:00	SSW
29	13.6	14.7	12:30	10.6	1:00	4.7	0.0	2.0	13.7	41.8	17:00	SSE
30	13.9	15.0	14:00	12.4	00:00	4.4	0.0	7.9	16.1	43.5	3:30	SSE
31	12.2	15.0	13:00	10.9	8:00	6.1	0.0	3.8	10.8	41.8	11:00	SSW
	11.2	16.6	28	4.2	7	222.4	0.0	79.2	9.4	67.6	24	SSE

Max >= 32.0: 0
Max <= 0.0: 0
Min <= 0.0: 0
Min <= -18.0: 0
Max Rain: 12.70 ON 20/10/09
Days of Rain: 22 (> .2 mm) 12 (> 2 mm) 0 (> 20 mm)
Heat Base: 18.3 Cool Base: 18.3 Method: Integration

MONTHLY CLIMATOLOGICAL SUMMARY for NOV. 2009

NAME: Damien CITY: STATE:
ELEV: 0 m LAT: 37° 36' 00" N LONG: 122° 06' 00" W

TEMPERATURE (°C), RAIN (mm), WIND SPEED (km/h)

DAY	MEAN TEMP	HIGH	TIME	LOW	TIME	HEAT DEG DAYS	COOL DEG DAYS	RAIN	AVG WIND SPEED	HIGH	TIME	DOM DIR
1	9.2	12.2	0:30	6.3	23:00	9.1	0.0	37.6	15.9	56.3	11:30	W
2	7.2	9.6	00:00	5.8	6:30	11.1	0.0	0.5	16.3	45.1	2:30	WSW
3	8.1	10.7	3:30	5.4	00:00	10.3	0.0	4.3	20.0	48.3	5:30	WSW
4	7.3	8.9	22:00	5.2	1:00	11.1	0.0	5.3	23.7	54.7	20:00	WSW
5	7.9	10.8	14:00	6.3	22:00	10.4	0.0	1.0	21.9	57.9	11:00	W
6	6.6	9.8	12:00	3.7	00:00	11.8	0.0	6.1	15.4	56.3	12:30	WSW
7	5.2	7.7	14:30	3.3	1:30	13.2	0.0	0.5	16.6	43.5	9:30	SW
8	6.8	10.3	14:00	4.2	0:30	11.6	0.0	0.0	10.5	30.6	2:00	NNW
9	7.1	8.9	15:00	4.9	2:00	11.2	0.0	12.2	5.3	27.4	21:00	SSE
10	7.1	9.8	14:00	4.0	00:00	11.2	0.0	0.8	11.4	29.0	2:00	WNW
11	7.0	9.4	14:00	3.4	0:30	11.3	0.0	19.3	5.5	32.2	18:30	SE
12	7.7	10.8	13:00	4.7	6:00	10.6	0.0	6.1	13.4	64.4	13:00	SSW
13	6.4	9.1	12:30	3.7	6:00	11.9	0.0	6.3	11.6	53.1	00:00	SSW
14	7.3	9.7	1:30	3.7	23:30	11.1	0.0	1.5	13.7	43.5	13:30	S
15	8.4	11.1	14:00	3.9	0:30	9.9	0.0	0.3	10.0	35.4	00:00	SSW
16	8.8	10.3	1:30	6.8	10:30	9.6	0.0	13.2	21.7	62.8	11:30	WSW
17	6.7	8.6	00:00	5.0	7:30	11.6	0.0	9.1	16.7	49.9	00:00	SW
18	8.4	13.5	00:00	4.6	5:00	9.9	0.0	17.8	15.6	59.5	21:30	SSW
19	13.2	13.7	2:30	12.1	00:00	5.2	0.0	20.6	23.3	64.4	14:30	SSW
20	8.7	12.1	0:30	5.7	19:30	9.6	0.0	3.3	14.0	48.3	11:30	SW
21	10.3	13.9	13:30	7.2	0:30	8.1	0.0	5.6	18.3	56.3	11:00	SSE
22	7.5	9.0	0:30	6.1	7:30	10.8	0.0	5.3	27.0	78.9	11:30	SSW
23	8.0	10.0	14:30	6.2	7:30	10.3	0.0	2.0	21.9	57.9	0:30	WSW
24	9.0	12.3	13:00	5.2	00:00	9.3	0.0	18.5	18.7	64.4	11:30	SW
25	6.2	8.5	13:30	4.9	1:30	12.1	0.0	1.0	26.4	75.6	6:30	SW
26	4.6	6.2	13:00	2.9	21:30	13.8	0.0	0.0	21.4	53.1	16:00	WSW
27	3.3	3.8	6:00	2.9	1:00	5.3	0.0	0.0	20.1	40.2	5:00	WSW
28												
29								+ 21 mm				
30												
	7.6	13.9	21	2.9	27	281.4	0.0	198.4	16.9	78.9	22	WSW

219.4

Max >= 32.0: 0
Max <= 0.0: 0
Min <= 0.0: 0
Min <= -18.0: 0
Max Rain: 37.59 ON 01/11/09
Days of Rain: 24 (> .2 mm) 17 (> 2 mm) 2 (> 20 mm)
Heat Base: 18.3 Cool Base: 18.3 Method: Integration

APPENDIX I

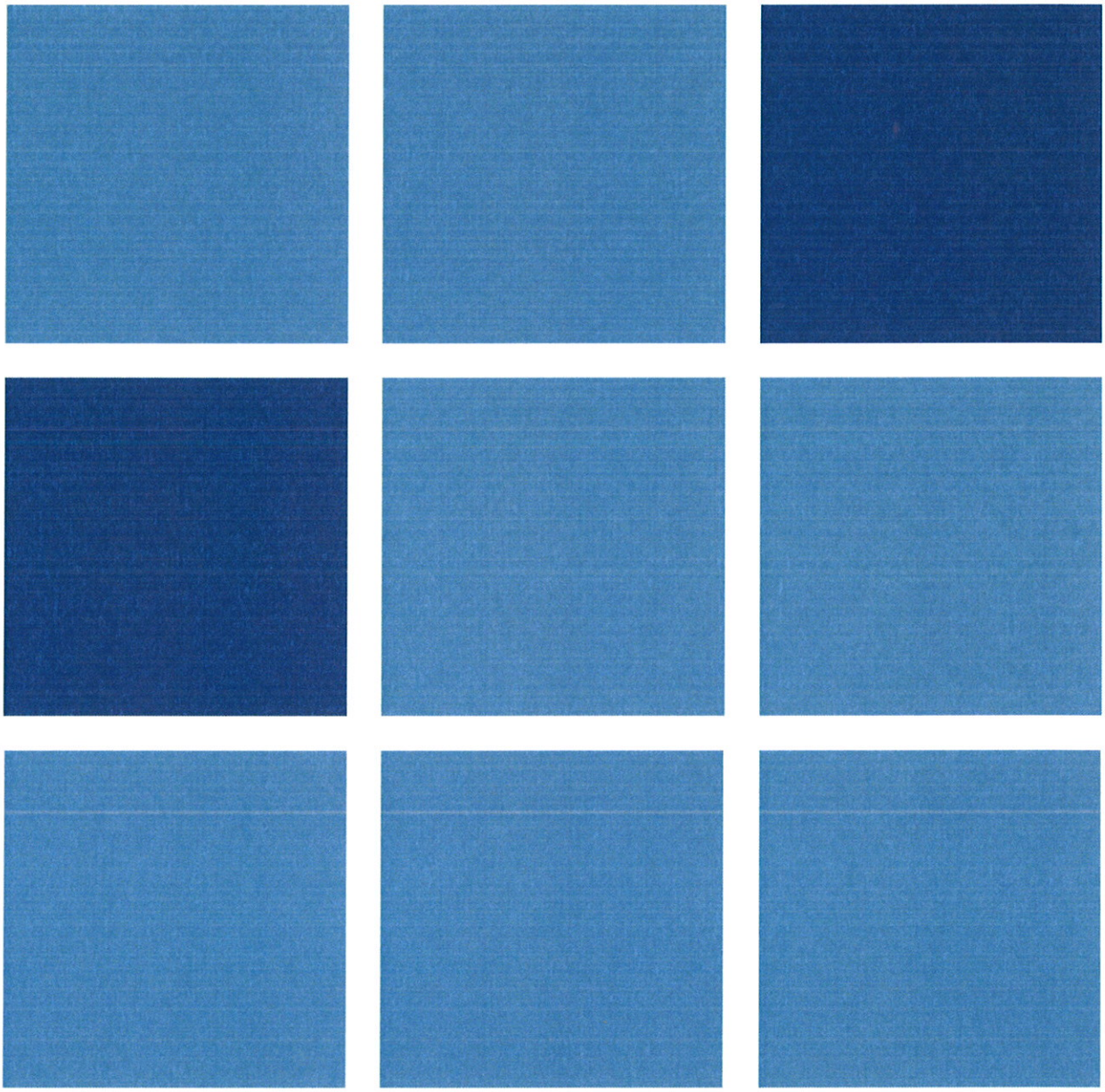
SLOPE STABILITY ASSESSMENT

RPS

Louth County Council

Whiteriver Landfill Site
Annual Slope Stability Report - 2009

IBR0100 / April 2010



LOUTH COUNTY COUNCIL

WHITERIVER LANDFILL
ANNUAL SLOPE STABILITY REPORT

2009

ELMWOOD HOUSE, 74 BOUCHER ROAD,
BELFAST, BT12 6RZ

Telephone: 028 90 667914 Facsimile: 028 90 668286

DOCUMENT CONTROL SHEET

Client	Louth County Council					
Project Title	Whiteriver Landfill					
Document Title	Slope Stability Report					
Document No.	IBR0100					
This Document Comprises	DCS	TOC	Text	No. of Tables	No. of Figures	No. of Appendices
	1	1	3	2	0	2

Rev.	Status	Author(s)	Reviewed & Approved By	Issue Date
1.0	FINAL	H. Halliday	D. Doyle, Director	08/04/10

CONTENTS

1.0 INTRODUCTION

Under condition 8.13 of Waste License 60-2 for Whiteriver Landfill requires an annual Slope Stability Assessment is required. This report details the slope stability assessment undertaken at Whiteriver in 2009/2010.

The report is based on the annual topographical survey of the site and a site walkover. The annual site survey was undertaken in June 2009.

The slopes assessed for stability are the most recently completed slopes. These are slopes to the south of the site, Phase 5, Cell 3B east, and Cell 3A north. Locations of the sections analysed are shown on Drawing IBR0100/ 500. Appendix A.

1.1 CONCEPTUAL STABILITY MODEL

1.1.1 Final Waste Slope

The requirement for waste filling in Phase 5 was that filling should be undertaken at not more than 1vertical:3 horizontal. An assessment of the stability of the final waste slope as survey in June 2009 is undertaken using stability modelling software, Slope W.

2.0 STABILITY RISK ASSESSMENT

2.1 RISK SCREENING

The slopes to the north of Phase 1& 2 to the west of Phases 2 and 3 and in Phase 4 Cell 1 and 2 have been considered previously. A site walkover survey of these slopes is undertaken to determine if there are any visible changes in the slope geometry or indications of instability.

A site walkover of these slopes was undertaken on Thursday 25th March 2010. No visible changes to the slope geometry or slope instability features were noted. Photographs from the site survey of these slopes are included in Appendix 2.

Analysis of the remaining waste slopes in Cells 3A and 3B are examined using Slope/W.

2.2 DATA SUMMARY

Waste properties are derived from literature[1].

1 D R V Jones, D Taylor & N Dixon (1997). Shear Strength of Waste and its use in Landfill Stability analysis. Proc. Geoenvironmental Engineering Conf., Yong & Thomas (eds.) Thomas Telford, pp99-117

2.3 FACTORS OF SAFETY

A minimum factor of safety of 1.3 will be considered acceptable for overall stability of the final waste slope.

2.4 PARAMETERS FOR FINAL WASTE MASS STABILITY

Table 1

Material	Unit Weight y, (kN/m^3)	Effective Cohesion, c' (kPa)	Friction Angle, Φ' (degrees)
Waste	10	5	25

2.5 ANALYSES

Stability analyses was carried out on two sections through the site for examination of the waste slope mass stability, see Drawing IBR0100/500.

Section A-A and Section B-B (Appendix 1) represent two sections through the Waste Slopes of Phase 5, Cell 3b east and Cell 3b north. They have a 1v:4h and 1v:2.7h filled slopes of waste respectively. Stability analysis has been carried out on both grades.

The slope of Phase 5, Cell 3A's finished slope was also considered. From the survey the slope is at a grade of 1v:5h. The grade of 1v:5h has been examined in the 2008 slope stability assessment and as the site conditions are reflective of those analysed for Phase 4, Cells 1& 2 no further consideration is necessary.
A piezometric line is not included in the analysis as a leachate is extracted from the cell.
Both sections show rotational failures within a satisfactory factor of safety.

2.5.1 Waste Slope Analysis

A summary of the Slope/W runs for the waste slopes is presented in Table 2 and the output files are presented in Appendix 1.

Table 2

Reference	Description	Factor of Safety
A-A	Waste Slope, Cell 3B east	1.9
B-B	Waste Slope, Cell 3A north	2.5

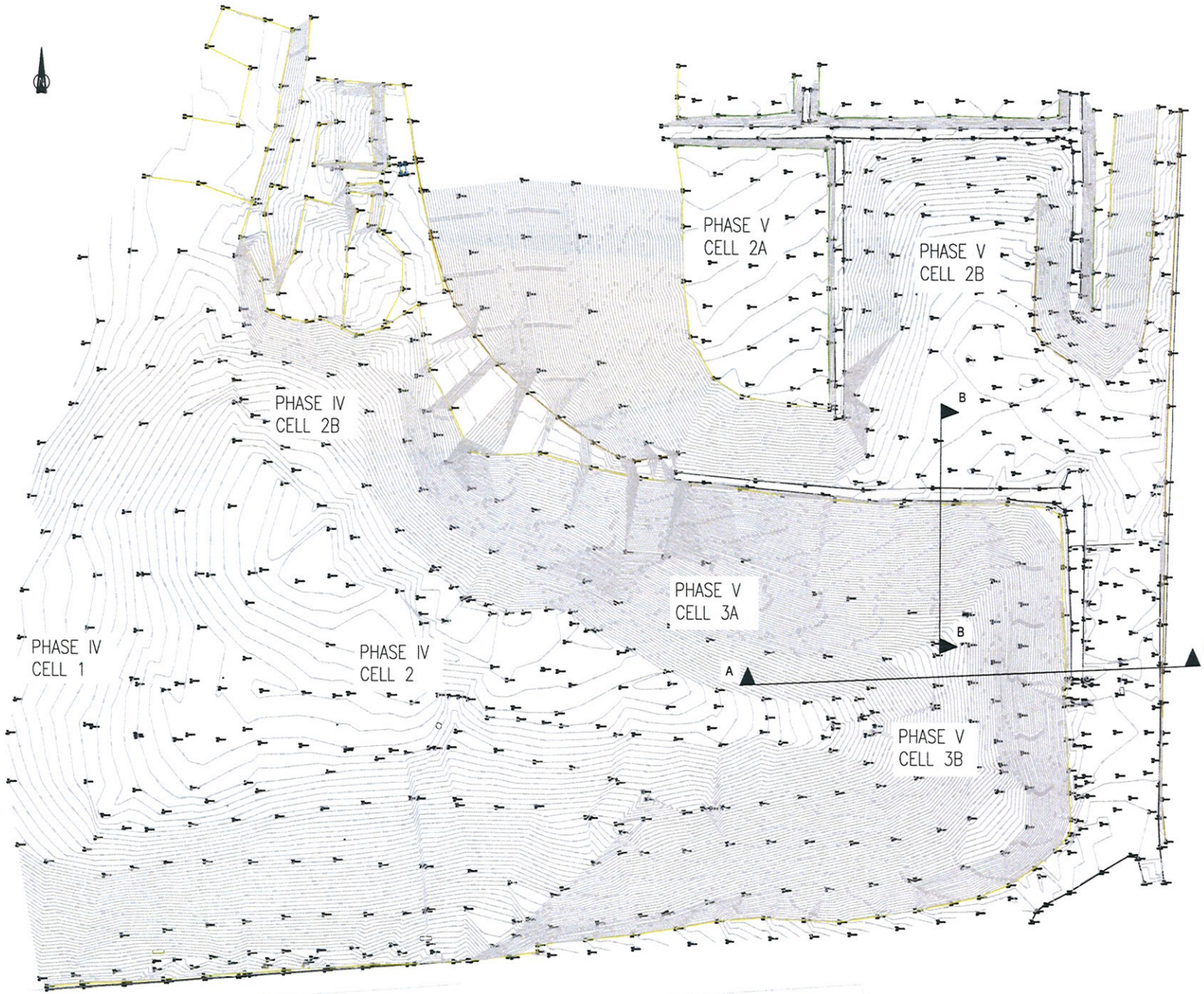
2.6 ASSESSMENT

The analysis for the final waste slopes suggests that the factors of safety for the filling of waste are satisfactory. In addition a site walkover survey and examination of the restored slope's as illustrated in the photographs in Appendix B evidenced no apparent slope instability on this recently completed slope and on slopes at lesser slopes gradients to the west and north of the site.

APPENDIX A

Drawings

Slope/W Analysis



NOTES

1. Verifying Dimensions.
   The contractor shall verify dimensions against such other drawings or site conditions as pertain to this part of the work.
2. Existing Services.
   Any information concerning the location of existing services indicated on this drawing is intended for general guidance only. It shall be the responsibility of the contractor to determine and verify the exact horizontal and vertical alignment of all cables, pipes, etc. (both underground and overhead) before work commences.
3. Issue of Drawings.
   Hard copies, dwf and pdf will form a controlled issue of the drawing. All other formats (dwg, dxf etc.) are deemed to be an uncontrolled issue and any work carried out based on these files is at the recipients own risk. RPS will not accept any responsibility for any errors arising from the use of these files, either by human error by the recipient, listing of unwitnessed measurements, compatibility issues with the recipient's software, and any errors arising when these files are used to aid the recipients drawing production, or setting out on site.
4. Datum:

rev	amendments	drawn	date
A	Cells Labelled	P.McM.	09.04.10

RPS
Elmwood House
74 Boucher Road
Belfast
BT12 6RZ
T +44 (0) 28 90 667914
F +44 (0) 28 90 668286
W www.rpsgroup.com/Ireland
E Ireland@rpsgroup.com

Client
Louth County Council

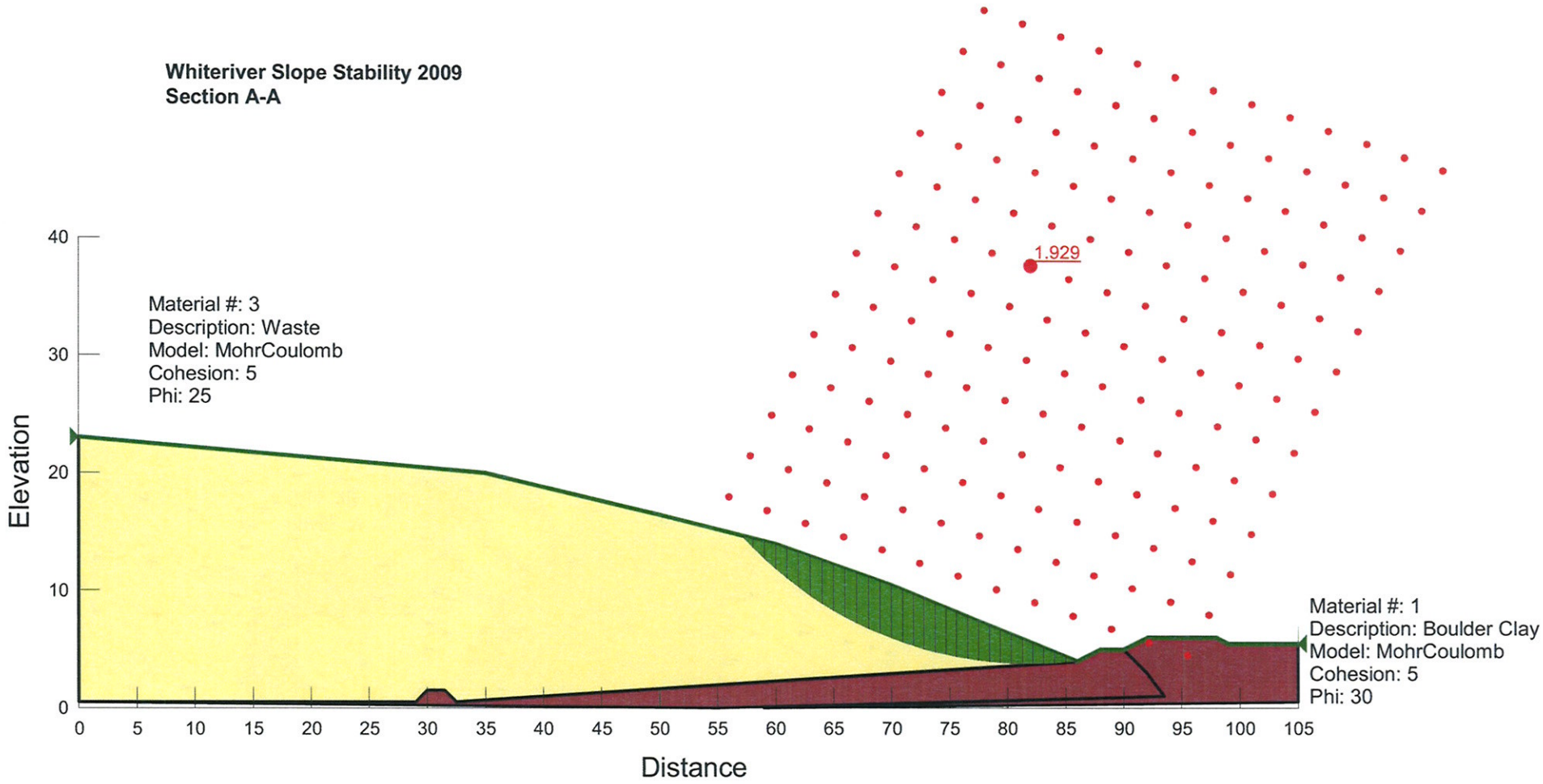
Project
Whiteriver Phase 5
Cell 3 Capping

Title
Slope Stability Section Locations

Drawing Status	Sheet Size	Drawing Scale
Preliminary	A3	1:1,000

Drawing Number	Rev
IBR0100 /500	A

Project Leader	Drawn By	Date	Initial Review
A. Baskin	P. McMath	08/04/10	H. Halliday


Whiteriver Slope Stability 2009
Section A-A
1.929
Material #: 3
Description: Waste
Model: MohrCoulomb
Cohesion: 5
Phi: 25
Material #: 1
Description: Boulder Clay
Model: MohrCoulomb
Cohesion: 5
Phi: 30
Elevation
Distance
0
10
20
30
40
0
5
10
15
20
25
30
35
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45
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100
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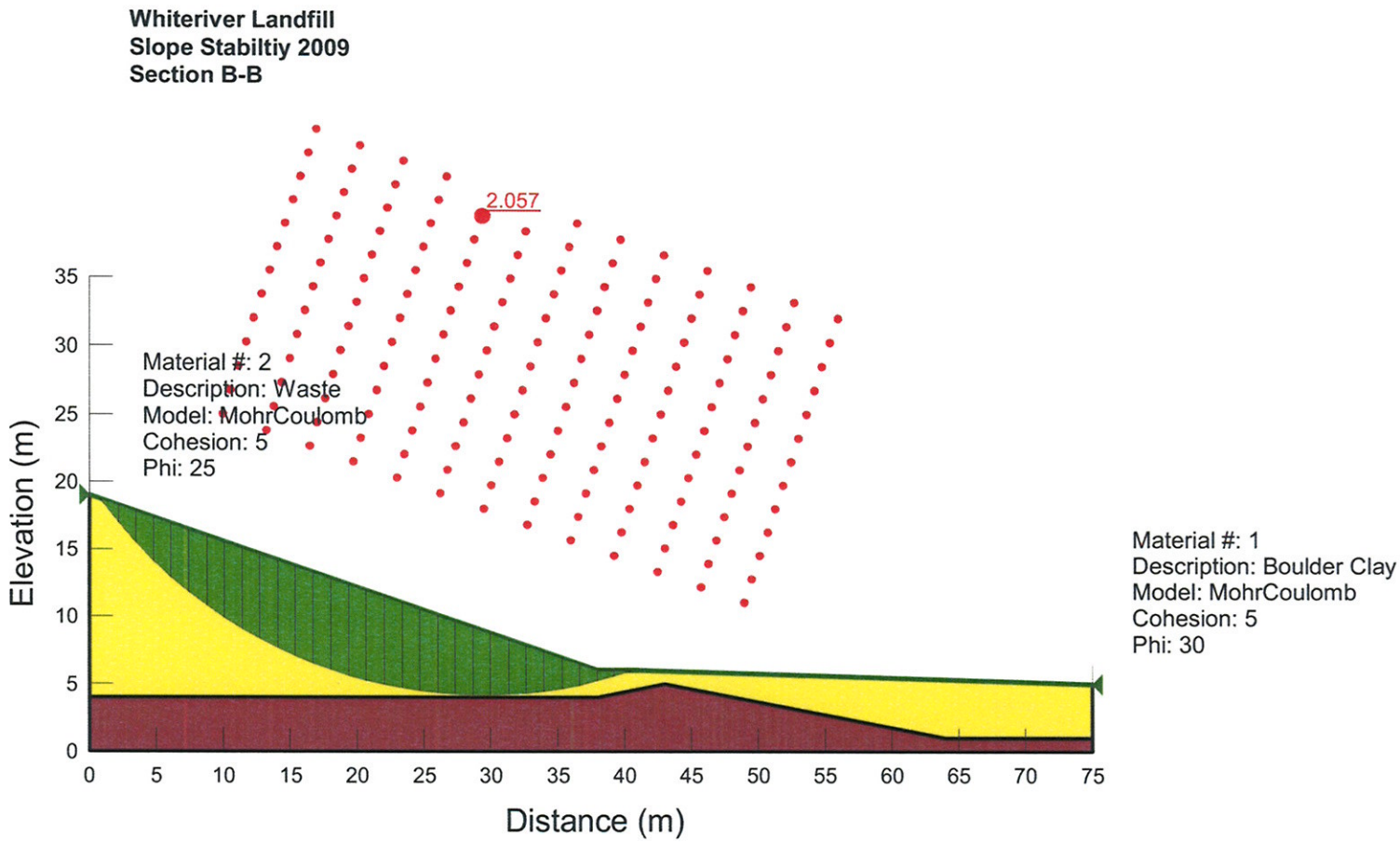

Whiteriver Landfill
Slope Stabiltiy 2009
Section B-B
2.057
Material #: 2
Description: Waste
Model: MohrCoulomb
Cohesion: 5
Phi: 25
Material #: 1
Description: Boulder Clay
Model: MohrCoulomb
Cohesion: 5
Phi: 30
Elevation (m)
Distance (m)
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
75

APPENDIX B

Photographs

Photograph 1 Restored Slope to north of site

Photograph 2 Restored Slope to west of site

Photograph 3 Cell 3A/B north prior to

Photograph 4 Cell 3B east

Photograph 5 Cell 3A south prepared for final capping

APPENDIX J

OBJECTIVES AND TARGETS

Document number: L-AL-FOR-002-02	Title: Objectives, Targets and EMP Review Form
Issue Date: 09/09/08	Issued by: GS/ NMcC / HC Approved by: GS

OBJECTIVES, TARGETS AND EMP REVIEW FORM

Objective: Reduce pressure on non-renewable fossil fuels used to generate electricity.

Target: Devise strategy to utilise landfill gas as a fuel for the generation of electricity / energy

Linked to aspect(s) No: 4 & 3

EMP No: 1 (WR)	**Overall Responsibility:** Senior Engineer (The above named person shall check the status of each task until closed out)	**Start Date:** Nov' 09 (Tasks shall be checked regularly from the above date until closed out)

Task	Details	Due Date	Task responsibility	Status
A	Review business case and devise procurement strategy	Mar 2010.	Senior Engineer	
B				
C				
D				

Reviewed by: **Date:**
(Upon reaching the due date a task with a status of not complete shall be reissued below using the initial task lettering whereby checking shall continue)

Reviewed by: **Date:**
(Upon reaching the due date a task with a status of not complete shall be reissued below using the initial task lettering whereby checking shall continue)

Notes:

Estimated cost and funding available to implements objectives

- Depends on procurement strategy adopted.

Payback from Project

- Simple payback for Grid Connection occurs within four years.

Close out reviewed by: **Date:**

Objective tasks completed

Signature (Director): _____ **Date:** _____

Document number: L-AL-FOR-002-02	Title: Objectives, Targets and EMP Review Form
Issue Date: 09/09/08	Issued by: GS/ NMcC / HC Approved by: GS

OBJECTIVES, TARGETS AND EMP REVIEW FORM

Objective: Comply with the relevant requirements of the Landfill Directive (1993/31/EC)

Target: Comply with EPA targets set to divert biodegradable municipal waste from landfill

Linked to aspect(s) No: 1

EMP No: 2 (WR)	**Overall Responsibility:** Senior Engineer (The above named person shall check the status of each task until closed out)	**Start Date:** Nov '09 (Tasks shall be checked regularly from the above date until closed out)

Task	Details	Due Date	Task responsibility	Status
A	Update and revise waste acceptance procedures for the acceptance and handling of all wastes.	Feb'10	Facility Manager	
B	Review on a quarterly basis for 2010 such data and records to demonstrate compliance with diversion targets.	Dec '10	Senior Engineer	

Reviewed by: **Date:**
(Upon reaching the due date a task with a status of not complete shall be reissued below using the initial task lettering whereby checking shall continue)

Reviewed by: **Date:**
(Upon reaching the due date a task with a status of not complete shall be reissued below using the initial task lettering whereby checking shall continue)

Notes:

Close out reviewed by: **Date:**

Objective tasks completed

Signature (Director): _____ **Date:** _____

Document number: L-AL-FOR-002-02	Title: Objectives, Targets and EMP Review Form
Issue Date: 09/09/08	Issued by: GS/ NMcC / HC Approved by: GS

OBJECTIVES, TARGETS AND EMP REVIEW FORM

Objective: Control odour from landfill

Target: Carry out final and intermediate capping of Phase 5 Cell 3 by Mid 2010.

Linked to aspect(s) No: 3 & 2

EMP No: 3 (WR)	**Overall Responsibility:** Senior Engineer (The above named person shall check the status of each task until closed out)	**Start Date:** Nov '09 (Tasks shall be checked regularly from the above date until closed out)

Task	Details	Due Date	Task responsibility	Status
A	Appoint contractor	Dec '09	Senior Engineer	
B	Manage implementation of project. Ensure CQA report is signed off by Engineer.	Aug '10	Senior Engineer	

Reviewed by: **Date:**
(Upon reaching the due date a task with a status of not complete shall be reissued below using the initial task lettering whereby checking shall continue)

Reviewed by: **Date:**
(Upon reaching the due date a task with a status of not complete shall be reissued below using the initial task lettering whereby checking shall continue)

Notes:

Close out reviewed by: **Date:**

Objective tasks completed

Signature (Director): _____ **Date:** _____

Document number: L-AL-FOR-002-02	Title: Objectives, Targets and EMP Review Form
Issue Date: 09/09/08	Issued by: GS/ NMcC / HC Approved by: GS

OBJECTIVES, TARGETS AND EMP REVIEW FORM

Objective: Revise groundwater monitoring trigger levels

Target: Submit proposals to EPA for revising trigger levels for ground water reporting by June 2010.

Linked to aspect(s) No: 6

EMP No: 4 (WR)	**Overall Responsibility:** Senior Engineer (The above named person shall check the status of each task until closed out)	**Start Date:** Nov '09 (Tasks shall be checked regularly from the above date until closed out)

Task	Details	Due Date	Task responsibility	Status
A	Compile the data base of all historic monitoring results for all ground water monitoring boreholes.	Mar 10	Facility Manager	
B	Compile a report of these historic results / trends including proposals for their revision.	Jun 10	Facility Manager	
C	Submit proposals for revision of groundwater trigger levels to EPA for its agreement.	July 10	Senior Engineer	

Reviewed by: **Date:**
(Upon reaching the due date a task with a status of not complete shall be reissued below using the initial task lettering whereby checking shall continue)

Reviewed by: **Date:**
(Upon reaching the due date a task with a status of not complete shall be reissued below using the initial task lettering whereby checking shall continue)

Notes:

Close out reviewed by: **Date:**

Objective tasks completed

Signature (Director): _____ **Date:** _____

Document number: L-AL-FOR-002-02	Title: Objectives, Targets and EMP Review Form
Issue Date: 09/09/08	Issued by: GS/ NMcC / HC Approved by: GS

OBJECTIVES, TARGETS AND EMP REVIEW FORM

Objective: Put in place maintenance regime for drainage interceptor

Target: Empty the interceptor and put in place inspection procedure.

Linked to aspect(s) No: 9

EMP No: 5 (WR)	**Overall Responsibility:** Senior Engineer (The above named person shall check the status of each task until closed out)	**Start Date:** Nov '09 (Tasks shall be checked regularly from the above date until closed out)

Task	Details	Due Date	Task responsibility	Status
A	Contact contractor to remove any waste oil in interceptor.	Dec 09	Facility Manager	
B	Retain fully completed consignment note for waste.	Dec 09	Facility Manager	
C	Draw up interceptor inspection procedure and implement.	Dec 09.	Facility Manager	

Reviewed by: **Date:**
(Upon reaching the due date a task with a status of not complete shall be reissued below using the initial task lettering whereby checking shall continue)

Reviewed by: **Date:**
(Upon reaching the due date a task with a status of not complete shall be reissued below using the initial task lettering whereby checking shall continue)

Notes:

Close out reviewed by: **Date:**

Objective tasks completed

Signature (Director): _____ **Date:** _____

Document number: L-AL-FOR-002-02	Title: Objectives, Targets and EMP Review Form
Issue Date: 09/09/08	Issued by: GS/ NMcC / HC Approved by: GS

OBJECTIVES, TARGETS AND EMP REVIEW FORM

Objective: Enhance the bio diversity of the site

Target: Incorporate measures in the agreed landscaping plan to enhance bio diversity by April 2010.

Linked to aspect(s) No: 10 & 2

EMP No: 6 (WR)	**Overall Responsibility:** Senior Engineer (The above named person shall check the status of each task until closed out)	**Start Date:** Nov '09 (Tasks shall be checked regularly from the above date until closed out)

Task	Details	Due Date	Task responsibility	Status
A	Agree terms of reference with LCC Bio Diversity Officer for preparing plan	Nov' 09	Facility Manager	
B	Review draft Plan to ensure compatibility with landscaping plan agreed with EPA.	Mar 10	Facility Manager	
C	Submit Plan to EPA for consideration.	Apr' 10	Facility Manager	

Reviewed by: **Date:**
(Upon reaching the due date a task with a status of not complete shall be reissued below using the initial task lettering whereby checking shall continue)

Reviewed by: **Date:**
(Upon reaching the due date a task with a status of not complete shall be reissued below using the initial task lettering whereby checking shall continue)

Notes:

Close out reviewed by: **Date:**

Objective tasks completed

Signature (Director): _____ **Date:** _____

APPENDIX K

MONTHLY WATER BALANCE CALCULATION

MONTHLY WATER BALANCE CALCULATION 2009

Month	Active Phase	Active Area A(m^2)	Waste Input t/month	Rainfall mm	Active Area Infilitration AR(A)(m^3)	Liquid Waste LW(m3) Excess Water From Sludge	Temp Restored area	Temp Restored area(Temp) RCA(m^2)	Restored area(Temp) infiltration IRCA(m3)	Leachate Lagoon AR(l)	Permanently Restored area	Permanently Restored area	Restored area RCA(m^2)	Total Water	Cumulative Water	Absorptive Capacity aW(m3)	Cumulative Absorptive Capacity	Cumulative Leachate	Leachate produced Lo(m3)
January	5, Cell 3B	7,180	6728.80	72.0	517	142.34	Cell 3A	7,974	172	115	1,2,3,4	70690	509	1456	1456	403.73	403.73	1052	1052
February	5, Cell 3B	7,180	8217.62	17.3	124	128.45	Cell 3A	7,974	41	28	1,2,3,4	70690	122	444	1900	493.06	896.79	1003	-49
March	5, Cell 3B	7,180	5220.06	27.1	195	119.15	Cell 3A	7,974	65	43	1,2,3,4	70690	192	613	2513	313.20	1209.99	1303	300
April	5, Cell 3B	7,180	3818.64	73.7	529	100.26	Cell 3A	7,974	176	118	1,2,3,4	70690	521	1445	3958	229.12	1439.11	2519	1216
May	5, Cell 2 A & B	19,556	3690.42	72.0	1408	88.19	Cell 3A 3B	15,154	327	115	1,2,3,4	70690	509	2448	6406	221.43	1660.53	4745	2226
June	5, Cell 2 A & B	19,556	3797.86	68.6	1342	135.26	Cell 3A 3B	15,154	312	110	1,2,3,4	70690	485	2383	8789	227.87	1888.40	6901	2155
July	5, Cell 2 A & B	19,556	4837.52	127.7	2497	163.49	Cell 3A 3B	15,154	581	204	1,2,3,4	70690	903	4348	13137	290.25	2178.66	10959	4058
August	5, Cell 2 A & B	19,556	3246.40	113.8	2225	122.82	Cell 3A 3B	15,154	517	182	1,2,3,4	70690	804	3852	16989	194.78	2373.44	14616	3657
September	5, Cell 2 A & B	19,556	3308.56	23.4	458	140.18	Cell 3A 3B	15,154	106	37	1,2,3,4	70690	165	907	17897	198.51	2571.95	15325	709
October	5, Cell 2 A & B	19,556	3246.08	93.2	1823	180.02	Cell 3A 3B	15,154	424	149	1,2,3,4	70690	659	3234	21131	194.76	2766.72	18364	3040
November	5, Cell 2 A & B	19,556	3093.56	132.3	2587	126.16	Cell 3A 3B	15,154	601	212	1,2,3,4	70690	935	4462	25593	185.61	2952.33	22640	4276
December	5, Cell 2 A & B	19,556	2600.80	53.0	1036	104.19	Cell 3A 3B	15,154	241	85	1,2,3,4	70690	375	1841	27434	156.05	3108.38	24325	1685
Total			51806.32	874.1	14741	1550.50			3564	1399			6179	27434		3108			24325

Assumptions

IRCA=	Temporarily capped/restored area infiltration of rainfall estimated %	30%	%
	Permanent capped/restored area infiltration of rainfall estimated %	10%	%
Absorptive Capacity=	waste density of 0.8 tonnes/m3. Estimated absorptive capacity (water per tonne waste before leachate is produced) t/m3	0.06	t/m3
Temporary restored assumed 50% Phase I to III permanent restored.	Area of landfill site restored (1,2)	41,000	m^2
	Area of Phase 3	11,500	m^2
	Area of Phase 1,2 and 3 remaining to be temp capped	7,000	m^2
	Area of Phase 4, Cell 1A	2,190	m^2
	Area of Phase 4, Cell 1	15,000	m^2
	Area of Phase 4, Cell 2	8,000	m^2
	Area of Phase 5, Cell 3A	7,974	m^2
	Area of Phase 5, Cell 3B	7,180	m^2
	Area of Phase 5, Cell 2A	13,761	m^2
	Area of Phase 5, Cell 2B	5,795	m^2
	Surface Area Leachate Lagoon	1,500	m^2
Rainfall	Rainfall taken from Ardee weather station	874.1	mm

APPENDIX L

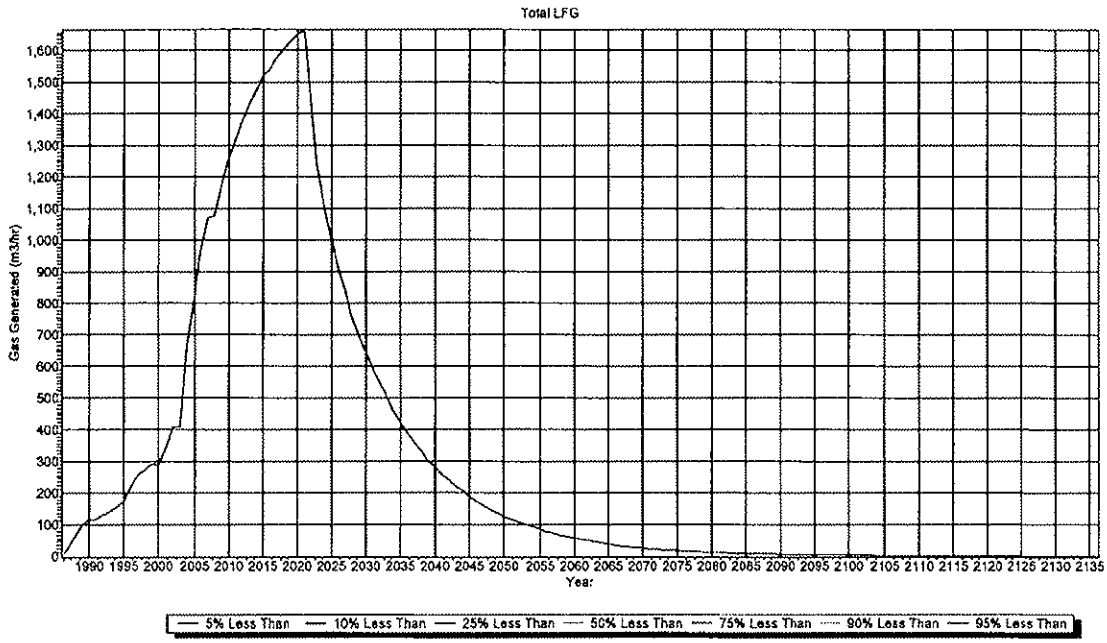
ESTIMATED ANNUAL GAS YIELD

GasSim Version V 2.00

Project Name: Whiteriver

Project Client: Louth County Council

Total: Total Bulk LFG Produced



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APPENDIX M

PRTR REPORTING

| PRTR# : W0060 | Facility Name : Whiteriver Landfill Site | Filename : W0060_2009(1).xls | Return Year : 2009 |

Environmental Protection Agency

AER Returns Worksheet

Version 1.1.10

REFERENCE YEAR	2009

1. FACILITY IDENTIFICATION

Parent Company Name	Louth County Council
Facility Name	Whiteriver Landfill Site
PRTR Identification Number	W0060
Licence Number	W0060-02

Waste or IPPC Classes of Activity

No.	class_name
3.5	Specially engineered landfill, including placement into lined discrete cells which are capped and isolated from one another and the environment.
3.1	Deposit on, in or under land (including landfill).
3.12	Repackaging prior to submission to any activity referred to in a preceding paragraph of this Schedule.
3.13	Storage prior to submission to any activity referred to in a preceding paragraph of this Schedule, other than temporary storage, pending collection, on the premises where the waste concerned is produced.
3.4	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.
3.7	##
4.10	The treatment of any waste on land with a consequential benefit for an agricultural activity or ecological system.
4.13	Storage of waste intended for submission to any activity referred to in a preceding paragraph of this Schedule, other than temporary storage, pending collection, on the premises where such waste is produced.
4.2	Recycling or reclamation of organic substances which are not used as solvents (including composting and other biological transformation processes).
4.4	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	Whiteriver & Gunstown Townland
Address 2	Dunleer
Address 3	Co Louth
Address 4	
Country	Ireland
Coordinates of Location	-6.45823 53.8084
River Basin District	GBNIIENB
NACE Code	3821
Main Economic Activity	Treatment and disposal of non-hazardous waste
AER Returns Contact Name	Damien Holmes
AER Returns Contact Email Address	damien.holmes@louthcoco.ie
AER Returns Contact Position	Landfill Manager

AER Returns Contact Telephone Number	042 935 3130
AER Returns Contact Mobile Phone Number	086 6097315
AER Returns Contact Fax Number	041 6851623
Production Volume	96000.0
Production Volume Units	TONNES
Number of Installations	6
Number of Operating Hours in Year	8760
Number of Employees	9
User Feedback/Comments	
Web Address	

2. PRTR CLASS ACTIVITIES

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

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

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

4.1 RELEASES TO AIR

SECTION A : SECTOR SPECIFIC PRTR POLLUTANTS

RELEASES TO AIR										
POLLUTANT		METHOD						QUANTITY		
			Method Used		Landfill Cap	AFS Flare	HAASE Flare			
No. Annex II	Name	M/C/E	Method Code	Designation or Description	Emission Point 1	Emission Point 2	Emission Point 3	T (Total) KG/Year	A (Accidental) KG/Year	F (Fugitive) KG/Year
					0.0	0.0	0.0	0.0	0.0	0.0
03	Carbon dioxide (CO2)	C	SSC	Gassim Version 2	0.0	0.0	0.0	0.0	0.0	0.0
01	Methane (CH4)	C	SSC	Gassim Version 2	0.0	15030000.0	1670000.0	16700000.0	0.0	0.0
55	1,1,1-trichloroethane	C	SSC	Gassim Version 2	553000.0	22331.0	2549.0	577880.0	0.0	0.0
04	Hydro-fluorocarbons (HFCs)	C	SSC	Gassim Version 2	0.0	43.38	4.82	48.2	0.0	0.0
					0.0	40.68	4.52	45.2	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		Landfill cap	AFS FLARE	Haase Flare			
No. Annex II	Name	M/C/E	Method Code	Designation or Description	Emission Point 1	Emission Point 2	Emission Point 3	T (Total) KG/Year	A (Accidental) KG/Year	F (Fugitive) KG/Year
					0.0	0.0	0.0	0.0	0.0	0.0
15	Chlorofluorocarbons (CFCs)	C	SSC	Gassim Version 2	0.0	51.48	5.72	57.2	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: Whiteriver Landfill Site

Please enter summary data on the quantities of methane flared and / or utilised	T (Total) kg/Year	M/C/E	Method Used: Method Code	Method Used: Designation or Description	Facility Total Capacity m3 per hour	
Total estimated methane generation (as per site model)	2799696.0	C	GASSIM	2 flares and GASSIM Model	N/A	
Methane flared	2488034.0	C	Flow data from flare	2 flares and GASSIM Model	2600.0	(Total Flaring Capacity)
Methane utilised in engine/s	0.0				0.0	(Total Utilising Capacity)
Net methane emission (as reported in Section A above)	577880.0	C	Flow data from flare	2 flares and GASSIM Model	N/A	

4.3 RELEASES TO WASTEWATER OR SEWER

| PRTR# : W0060 | Facility Name : Whiteriver Landfill Site | Filename : W0060_2009(1).xls | Return Y 09/04/2010 12:44

SECTION A : PRTR POLLUTANTS

OFFSITE TRANSFER OF POLLUTANTS DESTINED FOR WASTE-WATER TREATMENT OR SEWER								
POLLUTANT		METHOD			QUANTITY			
			Method Used		Drogheda WWTP			
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
06	Ammonia (NH3)				0.0	0.0	0.0	0.0
79	Chlorides (as Cl)	M	CRM	EPA Monaghan Lab	8736.91	8736.91	0.0	0.0
82	Cyanides (as total CN)	M	CRM	EPA Monaghan Lab	26967.64	26967.64	0.0	0.0
83	Fluorides (as total F)	M	CRM	EPA Monaghan Lab	1.19	1.19	0.0	0.0
24	Zinc and compounds (as Zn)	M	CRM	EPA Monaghan Lab	11.2	11.2	0.0	0.0
18	Cadmium and compounds (as Cd)	M	CRM	EPA Monaghan Lab	6.12	6.12	0.0	0.0
20	Copper and compounds (as Cu)	M	CRM	EPA Monaghan Lab	0.047	0.047	0.0	0.0
		M	CRM	EPA Monaghan Lab	0.94	0.94	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		Drogheda WWTP			
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
303	BOD				0.0	0.0	0.0	0.0
306	COD	M	CRM	EPA Monaghan lab	1049.0	1049.0	0.0	0.0
343	Sulphate	M	CRM	EPA Monaghan lab	20845.0	20845.0	0.0	0.0
		M	CRM	EPA Monaghan lab	5728.0	5728.0	0.0	0.0

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

Gas	CAS	Threshold	Value to Report	25th Percentile	75th Percentile
Inorganics					
Ammonia	7664-41-7	1000 kg	n/a		
Asbestos	1332-21-4	1 kg	n/a		
Carbon Dioxide - 'chemical'	124-38-9	10000000 kg	brt		
Carbon Dioxide - 'thermal'	124-38-9	10000000 kg	16,700.00 t	16,500.00 t	16,900.00 t
Carbon disulphide	75-15-0	1000 kg	brt		
Carbon monoxide	630-08-0	100000 kg	brt		
Hydrogen chloride	7647-01-0	10000 kg	brt		
Hydrogen cyanide	74-90-8	100 kg	n/a		
Nitrous oxide	10024-97-2	10000 kg	n/a		
Phosgene	75-44-5	10 kg	n/a		
Sulphur hexafluoride	2551-62-4	10 kg	n/a		
Organics					
Acetaldehyde [Ethanal]	75-07-0	100 kg	brt		
Acrolein	107-02-8	10 kg	n/a		
Acrylamide [2-Propenamide]	79-06-1	10 kg	n/a		
Acrylonitrile [2-Propenenitrile]	107-13-1	1000 kg	brt		
Aldrin	309-00-2	1 kg	n/a		
Allyl alcohol [2-Propen-1-ol]	107-18-6	10 kg	n/a		
Amitrole [3-Amino-1,2,4-triazole]	61-82-5	1 kg	n/a		
Aniline [Benzeneamine]	62-53-3	10 kg	n/a		
Anthracene	120-12-7	10 kg	n/a		
Benzene	71-43-2	1000 kg	brt		
Benzo(a)pyrene	50-32-8	1 kg	brt		
Benzo(b)fluoranthene	205-99-2	1 kg	n/a		
Benzo(g,h,i)perylene	191-24-2	1 kg	n/a		
Benzo(k)fluoranthene	207-08-9	1 kg	n/a		
Benzo butyl phthalate (BBP)	85-68-7	10 kg	n/a		
Benzyl chloride	100-44-7	10 kg	n/a		
Bromoethene	593-60-2	10 kg	n/a		
Butadiene [1,3-Butadiene]	106-99-0	100 kg	brt		
Butene - all isomers	-	1000 kg	brt		
Carbon tetrachloride [Tetrachloromethane]	56-23-5	10 kg	brt		
Chlordane	57-74-9	1 kg	n/a		
Chlordecone	143-50-0	1 kg	n/a		
Chlororethane	75-00-3	10 kg	n/a		
Chloroform [Trichloromethane]	67-66-3	100 kg	brt		
Chloroprene	126-99-8	10 kg	n/a		
Chrysene	218-01-9	10 kg	n/a		
Crotonaldehyde	4170-30-3	10 kg	n/a		
Cumene hydroperoxide	80-15-9	10 kg	n/a		
Dibutyl phthalate	84-74-2	10 kg	n/a		
p-Dichlorobenzene [1,4-Dichlorobenzene]	106-46-7	1 kg	brt		
Dichlorodiphenyltrichloroethane (DDT)	50-29-3	1 kg	n/a		
Dichloromethane (DCM) [Methylene chloride]	75-09-2	1000 kg	brt		
Dieldrin	60-57-1	1 kg	n/a		
Diethyl aniline [N,N-Diethyl benzeneamine]	91-66-7	10 kg	n/a		
Di(2-ethylhexyl)phthalate (DEHP)	117-81-7	10 kg	n/a		
Diethyl ether	60-29-7	10 kg	n/a		
Diisopropyl ether	108-20-3	10 kg	n/a		
Dimethylaniline [N,N-Dimethyl benzeneamine]	121-69-7	10 kg	n/a		
Dimethyl sulphate	77-78-1	1 kg	n/a		
Dimethylformamide	68-12-2	1000 kg	n/a		
Dimethyl-o-toluidine	609-72-3	10 kg	n/a		
Dimethyl-p-toluidine	99-97-8	10 kg	n/a		
1,4-Dioxane	123-91-1	10 kg	n/a		
Diphenylamine	122-39-4	10 kg	n/a		
Endrin	72-20-8	1 kg	n/a		
2-Ethoxyethanol [Ethyleneglycol ethylether]	110-80-5	10 kg	n/a		
2-Ethoxyethyl acetate [Ethyleneglycol ethylether acetate]	111-15-9	1 kg	n/a		
Ethyl acrylate	140-88-5	10 kg	n/a		
Ethyl benzene	100-41-4	100 kg	n/a		
Ethyl bromide [Bromoethane]	74-96-4	10 kg	n/a		
1-Ethyl-3,5-dimethylbenzene	934-74-7	10 kg	n/a		
Ethylene [Ethene]	74-85-1	1000 kg	brt		
Ethylene dichloride [1,2-Dichloroethane]	107-06-2	1000 kg	brt		
Ethylene oxide [1,2-Epoxyethane]	75-21-8	1000 kg	n/a		
Ethyl toluene - all isomers	25550-14-5	10 kg	brt		
Fluoranthene	206-44-0	1 kg	n/a		
Formaldehyde [Methanol]	50-00-0	10 kg	brt		
Heptachlor	76-44-8	1 kg	n/a		

Hexabromobiphenyl	36355-1-8	0.1 kg	n/a		
Hexabromocyclododecane	25637-99-4	10 kg	n/a		
Hexachlorobenzene	118-74-1	1 kg	n/a		
Hexachlorocyclohexane - all isomers	608-73-1	1 kg	brt		
Hexane	110-54-3	10 kg	n/a		
1-Hexene	592-41-6	10 kg	n/a		
Indeno(1,2,3-cd)pyrene	193-39-5	1 kg	n/a		
Iodomethane	74-88-4	10 kg	n/a		
Isophorone	78-59-1	10 kg	n/a		
Isophorone diisocyanate	4098-71-9	1 kg	n/a		
Isoprene	78-79-5	10 kg	n/a		
Lindane	58-89-9	1 kg	n/a		
Maleic anhydride	108-31-6	10 kg	n/a		
Methane	74-82-8	10000 kg	553.00 t	516.00 t	589.00 t
Methanol	67-56-1	100 kg	n/a		
2-(Methoxyethoxy)ethanol	111-77-3	10 kg	n/a		
2-Methoxyethanol	109-86-4	10 kg	n/a		
2-Methoxyethyl acetate	110-49-6	10 kg	n/a		
Methyl bromide [Bromomethane]	74-83-9	100 kg	n/a		
2-Methyl-2-butene	513-35-9	10 kg	n/a		
3-Methyl-1-butene	563-45-1	100 kg	n/a		
Methyl chloride [Chloromethane]	74-87-3	1000 kg	brt		
Methyl chloroform [1,1,1-Trichloroethane]	71-55-6	10 kg	48.20 kg	20.70 kg	130.00 kg
4,4'-Methylene-bis(2-chloroaniline)	101-14-4	1 kg	n/a		
4,4'-Methylene dianiline	101-77-9	10 kg	n/a		
4,4'-Methylenediphenyl diisocyanate	101-68-8	1 kg	n/a		
Methyl isocyanate	624-83-9	1 kg	n/a		
Mirex	2385-85-5	1 kg	n/a		
Naphthalene	91-20-3	100 kg	n/a		
Nitrobenzene	98-95-3	10 kg	n/a		
2-Nitropropane	79-46-9	1 kg	n/a		
Pentachlorobenzene	608-93-5	1 kg	n/a		
Pentachlorophenol	87-86-5	1 kg	n/a		
Pentane	109-66-0	100 kg	brt		
Pentene - all isomers	25377-72-4	1000 kg	brt		
Phenol	108-95-2	10 kg	brt		
Propylbenzene	103-65-1	10 kg	n/a		
Propylene	115-07-1	10000 kg	n/a		
Propylene oxide	75-56-9	100 kg	n/a		
Styrene	100-42-5	100 kg	n/a		
Tetrachloroethane [1,1,2,2-Tetrachloroethane]	79-34-5	10 kg	brt		
Tetrachloroethylene	127-18-4	100 kg	brt		
Tetrafluoroethylene	116-14-3	10 kg	n/a		
Toluene	108-88-3	100 kg	brt		
Toluene diisocyanate - all isomers	-	10 kg	n/a		
Toxaphene	8001-35-2	1 kg	n/a		
Trichlorobenzene - all isomers	12002-48-1	1 kg	brt		
Trichloroethylene	79-01-6	1000 kg	brt		
Trichlorotoluene	98-07-7	10 kg	n/a		
Trimellitic anhydride	552-30-7	1 kg	n/a		
Trimethylbenzene - all isomers	25551-13-7	10 kg	brt		
Vinyl acetate	108-05-4	10 kg	n/a		
Vinyl chloride	75-01-4	1000 kg	brt		
Xylene - all isomers	1330-20-7	1000 kg	brt		
Metals and compounds					
Antimony	7440-36-0	1 kg	n/a		
Arsenic	7440-38-2	1 kg	n/a		
Beryllium	7440-41-7	1 kg	n/a		
Boron	7440-42-8	1000 kg	n/a		
Cadmium	7440-43-9	1 kg	n/a		
Chromium	7440-47-3	10 kg	n/a		
Copper	7440-50-8	10 kg	n/a		
Lead	7439-92-1	100 kg	n/a		
Manganese	7439-96-5	10 kg	n/a		
Mercury	7439-97-6	1 kg	n/a		
Nickel	7440-02-0	10 kg	n/a		
Selenium	7782-49-2	100 kg	n/a		
Vanadium	7440-62-2	10 kg	n/a		
Zinc	7440-66-6	100 kg	n/a		
Other substances					
Brominated diphenylethers - penta, octa and deca	-	10 kg	n/a		
Chlorine and total inorganic compounds - as HCl	7782-50-5	10000 kg	n/a		

Chlorofluorocarbons (CFCs)	EDF-079	1 kg	57.20 kg	28.00 kg	116.00 kg
Dioxins and furans (PCDDs/PCDFs) - WHO-TEQ	-	0.00001 kg	n/a		
Dioxins and furans (PCDDs/PCDFs) - I-TEQ	-	0.00001 kg	brt		
Fluorine and total inorganic compounds - as HF	7782-41-4	1000 kg	n/a		
Halons	-	1 kg	brt		
Hydrobromofluorocarbons (HBFCs)	-	10 kg	n/a		
Hydrochlorofluorocarbons (HCFCs)	-	1 kg	45.20 kg	23.10 kg	99.70 kg
Hydrofluorocarbons (HFCs)	-	100 kg	brt		
Nitrogen oxides - NO and NO2 as NO2	-	100000 kg	brt		
Non-methane volatile organic compounds (NMVOCs)	-	10000 kg	brt		
Particulate matter - PM2.5	-	1000 kg	n/a		
Particulate Matter - PM10	-	1000 kg	brt		
Particulate Matter - total	-	10000 kg	n/a		
Perfluorocarbons (PFCs)	-	10 kg	brt		
Polychlorinated biphenyls (PCBs)	1336-36-3	0.1 kg	n/a		
Polychlorinated Biphenyls (PCBs) - as WHO TEQ	1336-36-3	0.00001 kg	n/a		
Sulphur oxides - SO2 and SO3 as SO2	-	100000 kg	brt		

APPENDIX N

RESPONSE TO SITE INSPECTION REPORT, AUDIT

epa
Office of Environmental Enforcement

Environmental Protection Agency
Regional Inspectorate, McCumiskey House
Richview, Clonskeagh Road, Dublin 14, Ireland
An Ghníomhaireacht um Chaomhnú Comhshaoil
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Mr Eamonn Walsh
Director of Services, Environment Section
Louth County Council
County Hall
Millennium Centre
Dundalk, Co. Louth

REF: Whiteriver Landfill

28th May 2009 Our Ref:W0060-02/gc17ts

Dear Mr Walsh,

Following a recent Agency Audit at Louth County Council, Whiteriver Landfill Reg. No. W0060-02 on 1st April 2009 please find enclosed the Audit Report (Ref. No. W0060-02/08/AR/06/ts).

Please quote the above reference in future correspondence in relation to this matter. If you have any queries please contact Mr. Eamonn Merriman at (01) 268 0100.

Yours sincerely,

Thomas Sexton
Inspector
Office of Environmental Enforcement

encl.

LOUTH COUNTY COUNCIL
RECEIVED
2 0 MAY 2009
ENVIRONMENT SECTION

RECEIVED
15 MAR 2010
LETTERKEN
F.A.O.
P.M.
A.O
RECEIPT

Licence Audit Report

Environmental Protection Agency
Regional Inspectorate, McCumiskay House
Richview, Clonskeagh Road, Dublin 14, Ireland
An Ghníomhaireacht um Chaomhnú Comhshaoil
Cigireacht Réigiúnach, Teach Mhic Chumaiscigh
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Mr Eamonn Walsh
Director of Services, Environment Section
Louth County Council
County Hall
Millennium Centre
Dundalk, Co. Louth

REF: Whiteriver Landfill

Date of Issue of Audit Report: 28th May 2009

Lead Auditor:	Mr Thomas Sexton	**Licence Register No:**	W0060-02
Inspector:	Mr Eamonn Merriman	**Audit Reference No:**	W0060-02/08/AR/06/ts
Audit Criteria:	Licence Reg. No. W0060-02	**Scheduled:**	Yes
Audit No:	6	**Date of Audit:**	1st April 2009

F.A.O: Mr Eamonn Walsh, Director of Services, Environment Section / Mr Damien Holmes, Landfill Manager

This Licence Audit Report details the Agency's findings following an audit at Whitriver Landfill on 1st April 2009. Louth County Council was found to be in compliance with the conditions of your licence on the date of the Audit.

Louth County Council have been found to be in compliance with the conditions of the Waste Licence as set out in this Audit Report.

Notwithstanding the above you are required to submit a schedule to the Agency within fourteen (14) working days of receipt of this Report detailing how observations specified therein are to be rectified. Please quote the above Audit Reference Number in any future correspondence in relation to this Report. If you have any further queries please contact Mr Eamonn Merriman at 01 268 0100.

1. OPENING MEETING

The opening meeting commenced at 10:50 hours and the following were in attendance:

Representing Louth County Council:

Mr Damien Holmes	Landfill Manager

Representing the Environmental Protection Agency:

Mr Thomas Sexton	Lead Auditor
Mr Eamonn Merriman	Inspector

Mr Thomas Sexton gave a brief introduction to the objectives and scope of the audit and the procedure to be followed for the remainder of the audit.

2. ON-SITE ASSESMENT

2.1 Review of Previous Agency Audit Report (Ref. No. W0060-02/AR/ 07/AP)

Mr Damien Holmes outlined the progress made in respect to the non-compliances recorded in the previous Agency audit report as follows:.

Non-Compliance No. 2: Tyres now dispatched off-site.

Non-Compliance No. 3: The routing of leachate collection line feeding to L1 has recently changed. See Observations.

Non-Compliance No. 4: Different thermocouples are now employed and monitoring of temperature is now satisfactory.

Non-Compliance No. 5: The Licensee said that there is no fly problem at this facility and that no fly spray has been deployed. Records of fly presence/absence are required to be monitored during nuisance inspections nonetheless.

The licensee addressed a number of the non-compliances satisfactorily, however the Agency is concerned that the licensee failed to address observation No. 6 that relates to the manner in which the slope of waste cells are engineered.

2.2 Site Inspection and Assessment

An inspection of the site was conducted, special attention was paid to leachate lagoon, public tipping area, active tipping face, quarantine area, Phase IV, Phase V, landfill gas well(s)/infrastructure and associated flare unit(s).

2.3 Interview

The following representatives were interviewed during the audit:

Name	Position	Issue
Mr Damien Holmes	Landfill Manager	Waste Licence Compliance
Mr Pat Finn	Senior Engineer, Environment Section	General

2.4 Documentation

The following documentation was requested for review:

Record	Condition No.	Comment
Corrective Action Procedure Ref. EMP/01, Rev. August 2008	2.3.2.3	Satisfactory
Emergency Response Procedure	9.2	Satisfactory
Daily Odour Inspection Log for 2009	n/a	Satisfactory
Complaints log	10.4	Satisfactory
Odour Ireland Report – Assessment of Total VOC Surface Emissions	n/a	See Inspection Findings
Infrastructure Roll-Out (Gantt Chart)	n/a	See Inspection Findings

3. GENERAL COMMENT

The licensee was found to be in compliance with the conditions of the waste licence. Notwithstanding this a significant number of observations were made that need to be addressed. In particular the observations made in respect to landfill gas infrastructure and the associated flare unit(s) are required to be addressed immediately in order to limit and or prevent fugitive emissions of landfill gas migrating off-site. The licensee has provided a designated complaints line that provides complainants with an alternative means to log complaints by text message, this is to be commended.

4. CLOSING MEETING

The closing meeting commenced at 17:20 hours and the attendees included Mr Damien Holmes, Mr Pat Finn, Mr Thomas Sexton and Mr Eamonn Merriman.

Mr Thomas Sexton gave a summary of the audit result. The licensee was found to be in compliance with the Licence in the area listed below observations made during the audit, were discussed.

The licensee was briefed on the Agency's reporting procedures and was advised that an audit report would be issued.

Finally, the licensee was thanked for the courteous and co-operative manner of the staff, and the assistance and co-operation extended during the audit.

5. AUDIT FINDINGS

5.1 Audit Observations

The audit process is a random sample on a particular day of a facility's compliance with some of its licence conditions. Where a non-compliance against a particular condition has not been reported, this should not be construed to mean that there is full compliance with that condition of the licence.

5.2 Audit Observations

While these observations do not constitute non-compliances with any condition of the licence. They should be addressed or where relevant noted by the licensee in order to ensure compliance, improve environmental performance of the facility and provide clarification on certain issues. Where requested the actions taken and clarifications requested should be reported back to the Agency.

1. **AFS 2000 m^3 Landfill Gas Flare Unit Commissioning Programme**

A 2,000 m^3/hr capacity landfill gas flare unit was installed on 11th March of 2009 and commissioning is ongoing. The licensee had not fully commissioned, calibrated and tested the flare unit efficiency to date. Only the Facility Manager has been trained to-date in the operation of this flare.

Corrective Action Required

The licensee shall employ an appropriate person(s) to complete the commissioning of the 2000 m^3/hr flare unit in accordance with the instructions issued by the manufacturer/supplier installer. The licensee is required; to establish all criteria for operation, control and management of the flare unit to ensure optimum combustion of landfill gas; assess the performance of monitors on the flare unit and establish maintenance and calibration programme for each monitor. The licensee shall, post calibration carry out such monitoring in accordance with Condition 8.1 and *Schedule D: Monitoring*, Table D.7 Landfill Gas Combustion Plant/Enclosed Flare of this licence. Written records of the commissioning programme to include calibration and monitoring shall be maintained and available for inspection by Agency personnel. The licensee shall ensure that additional staff are trained in the operation of this flare in order to provide for contingency cover.

2. **Landfill Gas Flare Units**

The licensee indicated that the AFS 2000 m^3/hr flare unit once commissioned will be the duty flare and the HAAS 600 m^3/hr flare unit will be on standby.

Corrective Action Required

The licensee is required to maintain the 600 m^3/hr flare unit. The licensee shall have regard to Condition 5.12.1 and Condition 8.1 and *Schedule D: Monitoring*, Table D.7 Landfill Gas Combustion Plant/Enclosed Flare of this licence in this regard. This flare shall be utilised at regular intervals to ensure it is functioning as required by the licence and readily available in the instance the 2000 m^3/hr flare unit fails to function as per the requirements of the licence.

3. **Flare Unit SCADA** (supervisory control and data acquisition) **System**

The licensee has installed the flare unit SCADA system in the on-site office. The licensee has not established the full potential of the SCADA system to date.

Corrective Action Required

The licensee is required to ensure the full potential of the flare unit SCADA system. The licensee is required to establish the following:

- Reporting functionality. The SCADA system reporting function should provide the flare operational history. Such information should include the relevant date, time, duration of shut down and recommencement periods;
- Out of hours flare unit fault notification;
- Remote system to start and stop flare;
- Remote access to SCADA system for off-site management and control; and
- Where possible the licensee is required to connect landfill environmental and operational monitoring and control systems to the SCADA system. In particular, groundwater and leachate monitoring and control systems.

The licensee shall have regard to Condition 3.18.1 of the licence in this regard. Personnel assigned responsibility for maintaining, managing and operating the flare unit(s) and associated systems shall be qualified on the basis of appropriate training and experience, as required. Appropriate training records shall be maintained on-site, having regard to Condition 2.7 of the licence.

4. **Landfill Gas Collection Infrastructure**

A number of observations were made in respect to the gas collection infrastructure, as follows:

(i) Six landfill gas wells were not connected to the collection system on Phase V Cell 3A and 3B. The Audit team detected persistent odour associated with landfill gas while in the vicinity of the six wells.

(ii) A landfill side slope riser (SSR) located on Phase IV Cell 4 (refer to photo DSCF0002.JPG) was not sealed appropriately. Mr Holmes verified that negative pressure has not been achieved at this well to date.

(iii) Gas collection infrastructure condensate collection pots were not sealed;

(iv) Landfill gas well(s) were not labelled in-situ appropriately.

Corrective Action Required

The licensee is required:

(i) To connect the six wells to the gas infrastructure collection system as a matter of urgency. The licensee is required to develop and document methods that will ensure the gas collection infrastructure is provided in line with landfill development. The licensee shall have regard to Condition 6.2 of the licence in this regard;

(ii) To appropriately seal the SSR located on Phase IV immediately. The licensee is required to assess the current SSRs to determine if individual SSRs are appropriately sealed and achieving negative pressure. The licensee is required to appropriately connect all SSRs to the extract landfill gas collection infrastructure. The licensee is required to document the aforementioned assessment;

(iii) Seal gas collection infrastructure condensate collection pots;

(iv) To appropriately label landfill gas collection well(s) in-situ. Landfill gas wells shall be labelled and delineated on appropriated scaled drawing detailing the landfill gas collection infrastructure. Submit the aforementioned drawing to the Agency.

The licensee is required to ensure the documentation indicated in points (i), (ii) and (iv) are available for inspection be Agency personnel.

5. **Leachate Breakthrough**

Leachate break through was taking place on Phase IV Cell 2 (refer to photo DSCF0007.JPG). Strong odour associated with landfill gas was detected in the area.

Corrective Action Required

The licensee is required to take measures to address the leachate breakthrough. The licensee shall have regard to Condition 6.2 of the licence in this regard.

6. **Odour Monitoring Report**

The Agency notes the licensee has made progress addressing landfill gas emissions arising from the landfill in Odour Monitoring Irelands report entitled *"Assessment of Total VOC Surface Emissions"*. During the site inspection the audit team detected landfill gas in the vicinity of new gas monitoring wells and associate infrastructure located on Phase V that did not fall within the scope of the aforementioned report. The audit team also notes the potential for odours to arise from the leachate lagoon.

Corrective Action Required

The licensee is required to carry out a topographic survey of the facility. The scope of the survey is required to incorporate the existing landfill gas well(s) and gas wells that coincide with the phased development of the facility. The landfill gas wells identified in this survey should be incorporated in the quarterly odour survey planned to take place on-site by Odour Ireland. The licensee is required to include the leachate lagoons in the odour assessment in order to ascertain the lagoons, as a possible source of fugitive odours arising from the facility.

7. **Gantt Chart**

The licensee has not updated the Gantt chart bi- annually (twice a year).

Corrective Action Required

The licensee is required to review and up-date the Gantt chart bi- annually (January and June) and to submit amendments to the Agency within ten days of completion. The licensee shall submit the amended Gantt chart to the Agency as soon as possible.

8. **Leachate Management**

The Licensee indicated that the leachate collection system was altered in the vicinity of the leachate lagoon approximately two weeks before the audit.

Corrective Action Required

The licensee shall submit to the Agency a drawing which shows the revised leachate collection system and a proposal to monitor the quality of collected leachate prior to its dispatch via tanker from the facility.

9. **Waste Flank Slope**

The waste flank slope on Phase V Cell 3A was noted to be quite steep such that it was greater than 1(V):3(L) .

Corrective Action Required

The licensee is required to maintain the waste flank slope at a gradient no greater than 1(V):3(L).

6. FOLLOW-UP ACTIONS

The licensee shall take the actions required to close out the non-compliances and observations raised in this Licence Audit Report. These actions will be verified during subsequent site inspections/audits.

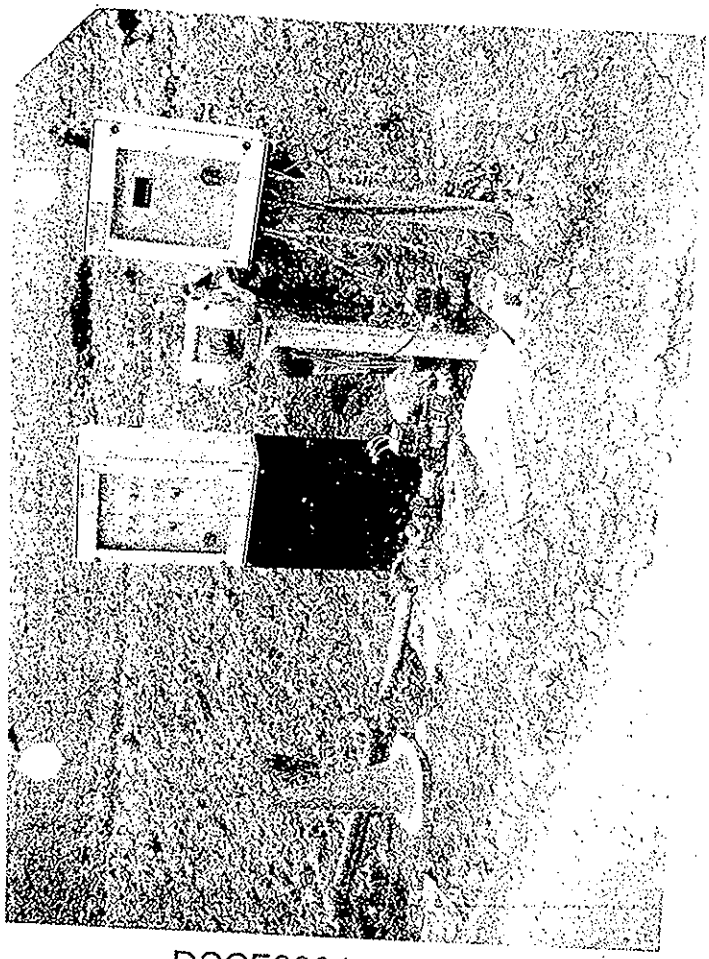
Please quote the Audit Reference Number in any future correspondence in relation to this Report.

Report prepared by: Thomas Sexton

Date: 28th May 2009

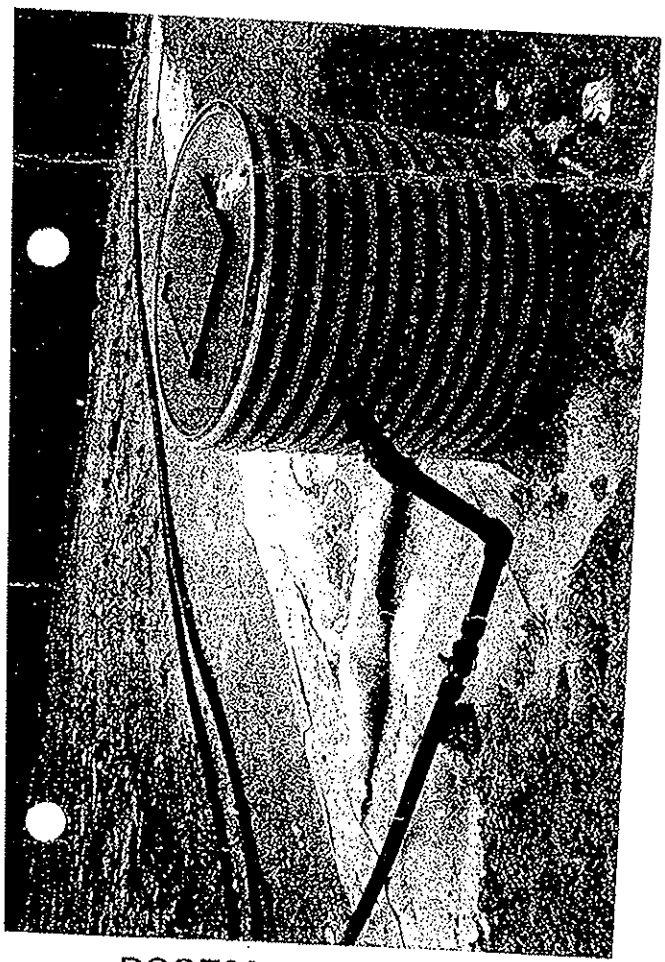
Reviewed by: Donal Howley

Date: 28/05/09



DSCF0001.JPG

DSCF0002.JPG



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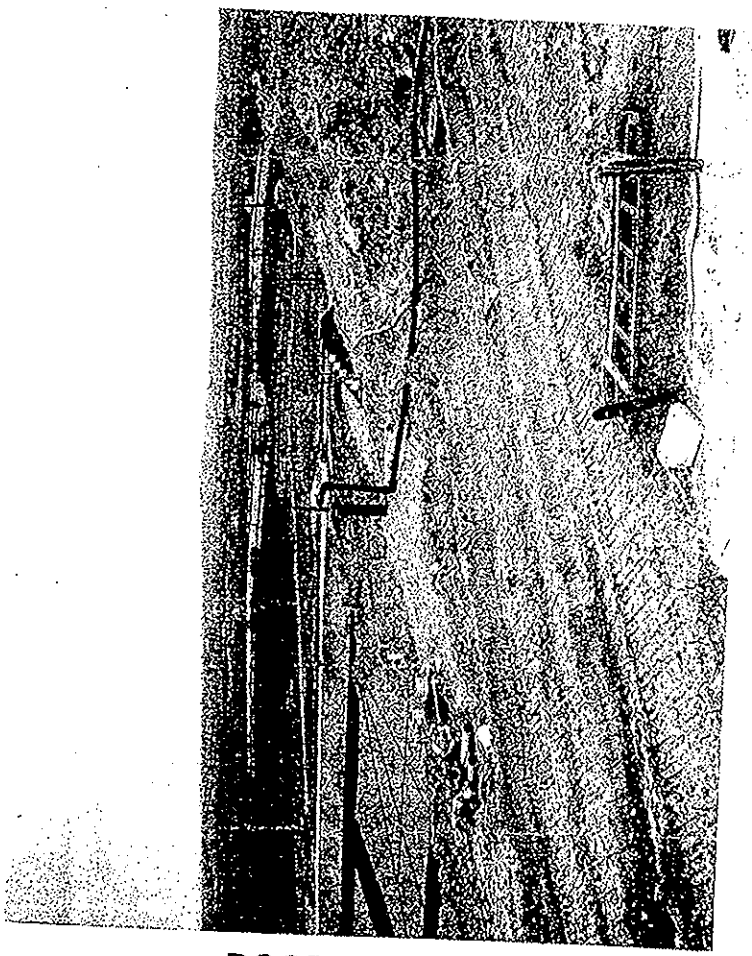

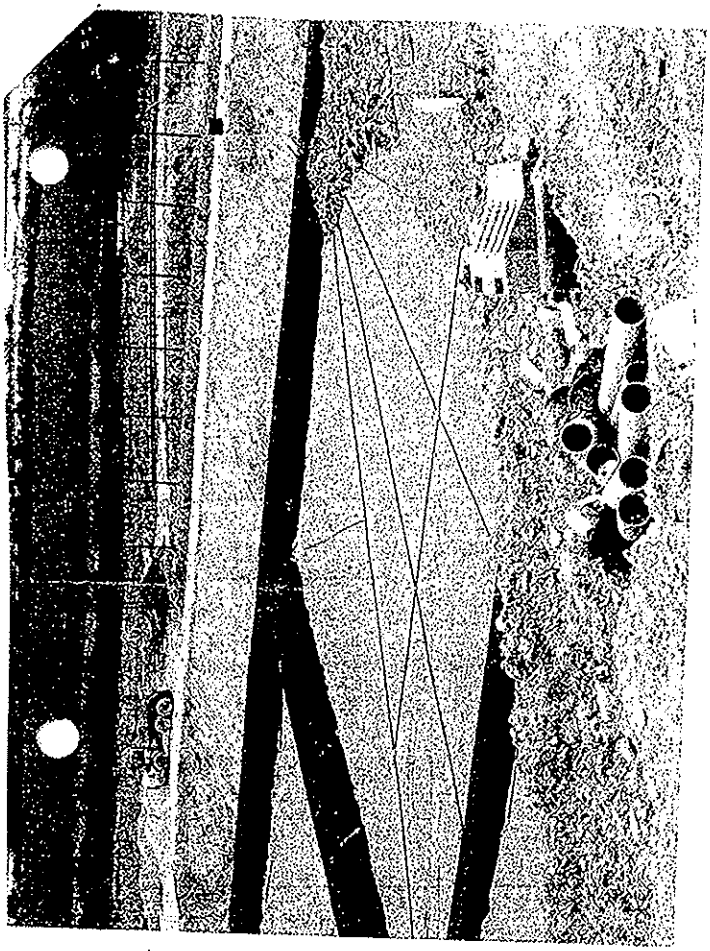

DSCF0005.JPG

DSCF0006.JPG

Mr. Eamonn Merriman,
Office of Environmental Enforcement,
Environmental Protection Agency,
East/North East Region,
McCumiskey House,
Richview,
Clonskeagh Road,
Dublin 14

Date: 03/07/09

Our Ref: W0060-02/09/11
Your Ref: W0060-02/08/AR/06/ts

Re: Whiteriver Landfill - Response to Licence Audit Report

A Chara,

In response to the Agency's Licence Audit Report of the 28th May 2009 Louth County Council would like to make the following comments in relation to the Observations made in the report.

1. AFS Flare Commissioning

Commissioning of the flare has been completed successfully by the manufacturer of the flare i.e. AFS Ltd. The documentation for the commissioning and efficiency testing will be available for inspection on site within two months.

The criteria to operate the flare to achieve the optimum combustion of the landfill gas are set by the manufacturer of the flare. As long as the gas field is managed to supply landfill gas within the limits specified by the manufacturer the flare will optimise the combustion process. A calibration and maintenance programme is in place for the flare to ensure optimum combustion.

The following six staff have been trained by AFS Ltd in the operation of the flare.

Name	Title
Damien Holmes	Facility Manager
Pat Finn	Senior Engineer
Sean Callaghan	Deputy Facility Manager
Ben Gallagher	Deputy Facility Manager
Ciaran Kinney	Deputy Facility Manager
Jim Byrne	Site Foreman

All persons assigned the responsibility for managing and operating the flares will be appropriately trained. Training records will be maintained on-site.

2. Landfill GAS Flare Unit

The 600m^3/h Haase flare will be maintained in working order in compliance with condition 5.12.1 of the licence. It is envisaged that the flare will be operated one day per week to ensure that it is functioning properly. Quarterly and annual servicing will be carried out as normal. Annual emissions testing will also be carried out.

3. Flare unit SCADA System

Both flares are connected to the SCADA system. The SCADA system records the following information Flare On/Off, flow rate, temperature, % methane, % oxygen, % carbon dioxide and carbon monoxide emissions (ppm).

The facility to send a text message alert from either flare is now set up and operational. Louth County Council are currently formalising a procedure to streamline the out of hours response for the flare with the councils general out of hours response service. We expect this to be completed within three months.

It is possible to remote star the flares from the managers office via the SCADA system. Louth County Councils IT section has investigated the potential to dial into the SCADA system via a modem and laptop and start, stop and reset the flares remotely. It is expected to have this system operational within the next two months.

All on site leachate pumps, leachate lagoon, surface water lagoon and flares are connected to the SCADA system. All of the new pumps installed as part of the Phase 5 extension will be connected to the SCADA system by the end of July 2009.

4. Landfill Gas Collection Infrastructure

The six wells in question were connected to the landfill gas extraction and flaring system on the 8th April 2009.

The two SSR's in Phase 4 have been sealed and connected to the flares. Negative pressure is now applied to these SSR's. However, a more robust method of sealing around the pipes/cables is currently being investigated.

All gas collection condensate pots are sealed.

All gas wells are labelled in-situ. The more recently installed gas wells have been surveyed in and will be placed on an updated monitoring map. A copy of this will be submitted to the agency within the next month.

5. Leachate Breakthrough

The cover in this has been augmented by placing additional soils on top of it. It is proposed to seal this entire area as part of the temporary and permanent capping works to be carried out this year. A close watch will be kept on this area to identify if it causes any further odour or leachate breakout issues before it is capped.

6. Odour Monitoring Report

A topographical survey of the site has been carried out. A new monitoring drawing will be complied from the topographical survey which will include all the new gas wells in Phase 5 Cell 3. The surface emissions surveys carried out by Odour Monitoring Ireland already assess this area for emissions.

The leachate lagoon will be included in the next quarter's emissions survey to be carried out by Odour Monitoring Ireland. This will attempt to quantify it as a possible source of fugitive emissions from the facility. This survey is expected to be carried out in July 2009.

7. Gantt Chart

The Gantt chart will be updated twice annually as requested and submitted to the agency.

8. Leachate Management

A revised drawing showing the revised leachate collection system will be submitted to the agency once the final "As Built" drawings have been received from the contractor. It is expected to have these drawings within one month.

Currently leachate samples are analysed quarterly from the two leachate lines L1 and L2, the leachate lagoon, the active cell and the MLSS of the Leachate lagoon is also monitored.

Louth County Council proposes that only the leachate lagoon and active cell be analysed quarterly in accordance with the licence. In addition to this all cells could be monitored once per annum for the quarterly parameters.

9. Waste Flank Slope

With the exception of one historic slope in part of Phase 4 Cell2 / Phase 5 Cell 3A all slopes are now kept to a 1 (V) :3 (L) gradient. It is expected that waste will be placed against the toe of this steep slope within the next three to six months and it will then be regraded in preparation for placement of a gas impermeable cap as per the one ear filling plan previously submitted to the agency. The tender process for the placement of the gas impermeable cap is already under way.

Once this slope is done away with all future slopes will be kept to 1:3.

Mise le meas,

Pat Finn

Office of
Environmental
Enforcement

Environmental Protection Agency
Regional Inspectorate, McCumiskey House
Richview, Clonskeagh Road, Dublin 14, Ireland
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Mr Eamonn Walsh
Director of Services, Environment Section
Louth County Council
County Hall
Millennium Centre
Dundalk
Co. Louth

FAO: Mr. Pat Finn/Mr. Damien Holmes

15th December 2009 Our Ref: W0060-02/NC26EM

Notification of Non-Compliance

Dear Mr Walsh

I refer to Whiteriver Landfill. The non-compliance with Waste Licence Register No. W0060-02, as detailed in the attached site inspection report from a site inspection conducted by Mr. Eamonn Merriman on 16/09/2009 (Inspection Reference No. W0060-02/09/SI27EM), has been noted by the Agency.

ACTION REQUIRED

In view of the above you are required to:

- Ensure that access to the active tipping area is adequately controlled and that all staff are aware of this requirement.
- The observations listed in the report should be addressed by the licensee and reported back to the Agency.

You should be aware that failure to comply with the conditions of a waste licence is an offence under the Waste Management Act 1996. Failure to comply with the requirements specified in this notification of non-compliance will lead to further enforcement action by the Agency. Please quote the above reference in future correspondence in relation to this matter. If you have any queries please contact Mr. Eamonn Merriman at the Dublin Regional Inspectorate.

Yours sincerely

Eamonn Merriman
Inspector, Office of Environmental Enforcement

Site Inspection Report

Office of Environmental Enforcement

Environmental Protection Agency
Regional Inspectorate, McCumiskey House
Richview, Clonskeagh Road, Dublin 14, Ireland
An Ghníomhaireacht um Chaomhnú Comhshaoil
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Mr Eamonn Walsh
Director of Services, Environment Section
Louth County Council
County Hall
Millennium Centre
Dundalk,
Co. Louth

Licence Register No:	W0060-02	**Inspection Reference No:**	W0060-02/09/SI27EM
Date of Inspection:	16/09/2009	**Inspectors:**	Eamonn Merriman
Date of issue of Inspection Report:	15/12/2009	**Announced:**	No

F.A.O: Mr. Damien Holmes/Mr. Pat Finn

This Site Inspection Report details the Agency's findings following an inspection of Louth County Council on 17/10/2009.

16/9/09

NOTIFICATION OF NON-COMPLIANCE

Louth County Council has been found to be in non-compliance with the conditions of the Waste Licence as set out in this Site Inspection Report. You are required to undertake the corrective actions specified to close out the Non-Compliance and Observations raised in this Report or further enforcement action may be taken by the Agency.

In view of the above you are required to submit a schedule to the Agency within 14 working days of receipt of this Report detailing how the non-compliances and observations specified therein are to be rectified. Please quote the above Inspection Reference Number in any future correspondence in relation to this Report. If you have any further queries please contact Eamonn Merriman at 01-2680100.

1. SITE INSPECTION AND ASSESSMENT

The Site Inspection commenced at 10:10 a.m. and the following were in attendance:

Representing Louth Co. Co.

Mr. Damien Holmes	Facility Manager

Representing the Environmental Protection Agency:

Mr. Eamonn Merriman	Inspector
Dr. John Casey	Odour Modelling Ireland

This site inspection was timed to coincide with a landfill gas leakage survey undertaken by Odour Monitoring Ireland on behalf of the Agency. The preliminary findings were presented to the Licensee during a closing meeting for immediate attention. The final findings report for this survey are attached to this report.

An Inspection of the site was conducted while the landfill gas leakage survey was being conducted by Odour Monitoring Ireland. Special attention was paid to landfill gas monitoring and control, the active tipping area (Phase V-Cell 2B), leachate levels and the public waste deposition area.

Interview

The following representatives were interviewed during the Inspection:

Name	Position	Issue
Mr. Damien Holmes	Facility Manager	Various

Documentation

The following documentation was requested for review:

Record	Condition No.	Comment
Landfill gas collection system plan	3.15.3	Update this plan as new wells and pipework is installed.

General Comment

The Licensee shall close out Corrective Actions identified by the Agency in a timely manner..

The licensee was briefed on the Agency's reporting procedures and was advised that a Site Inspection Report would be issued.

Finally, the licensee was thanked for the courteous and co-operative manner of the staff, and the assistance and co-operation extended during the Inspection.

2. INSPECTION FINDINGS

Inspection Non-Compliances

The site.inspection process is a random sample on a particular day of a facility's compliance with some of its licence conditions. Where a non-compliance against a particular condition has not been reported, this should not be construed to mean that there is full compliance with that condition of the licence.

The licensee was found to be in non-compliance with the requirements of the Licence in respect of the following on the day of the Inspection (Schedule and Condition numbers refer to the Licence):

1. **Public Use of Active Tipping Area**

   A private vehicle towing a small trailer of waste was observed to drive onto the active tipping area and deposit its cargo of waste. This vehicle should only have had access to the Public Tipping Area.

   This is in non-compliance with **CONDITION 5.2.**

Corrective Action Required

The licensee shall ensure that access to the active tipping area is adequately controlled and that all staff are aware of this requirement.

Inspection Observations

While these observations do not constitute non-compliances with any condition of the Licence, they should be addressed or where relevant noted by the licensee in order to ensure compliance, improve environmental performance of the facility and provide clarification on certain issues, as required. Where requested the actions taken and clarifications requested should be reported back to the Agency.

1. **Gas Management for Side Slope Risers**

The Side Slope Riser (SSR) for Phase IV-Cell 1 was not fully sealed from the atmosphere, thus allowing potential escape of landfill gas to the atmosphere. This SSR was not tapped for active gas abstraction. The Agency previously requested that these items be addressed and is concerned at the slow achievement of Corrective Actions identified by the Agency. The Licensee stated that a tender process to seal and tap all SSR's was about to commence.

P3 cell 3B ✓
P4 cell 1 ✓
P4 cell 2 ✓
P5 cell 3A ✓
P5 cell 2 ✓
P1/2/3 ✓
Interceptor ✓

Corrective Action Required

The licensee shall ensure that all SSR's are sealed to prevent gas aggress and are connected to the active landfill gas collection system without delay (existing SSR's) and prior to use for any SSR's constructed henceforth.

2. **Final Capping Roll-Out**

Phase IV-Cell 2 and Phase V-Cell 3A are awaiting final capping. The Licensee stated that a tender process to complete this final capping was about to commence.

Corrective Action Required

The licensee shall ensure that that final capping is undertaken as soon as possible.

3. **Landfill Gas Infrastructure**

A number of vertical wells and horizontal abstraction pipes were not connected to the active landfill gas collection system. One of these vertical wells was temporarily disconnected to provide for vehicular access to the Active Tipping Area: this well was adequately sealed from atmosphere. The horizontal gas collection pipes in Phase V-Cell 2A were open to atmosphere. Three other vertical wells were awaiting connection to the collection system

Manifold No. 10 was not labelled in situ. Some wells in Phase V-Cell 2A/2B were not labelled in situ.

Corrective Action Required

The licensee shall ensure that

- landfill gas extraction wells or pipes in contact with waste are sealed from the atmosphere at all times and that negative extraction pressure is applied to them at the earliest opportunity.
- al wells and manifold are labelled in situ, ideally during installation.

4. **Landfill Gas Utilisation**

There are no plans yet to utilise the gas generated at the facility.

Corrective Action Required

The licensee shall submit to the Agency a review of the possibility of utilising gas arising from the facility.

5. **Leachate Level Monitoring**

Item No. 2 of the Agency's correspondence W0060-02/AK46EM (issued 08/07/2009) was reviewed with the Licensee. The Licensee indicated that a company had been contracted to amend the SCADA system in order to provide for the recording of minimum and maximum leachate levels on a monthly basis.

Corrective Action Required

The licensee shall complete this SCADA adjustment as soon as possible and comply with the requirements of the Agency's correspondence W0060-02/AK46EM.

6. **Landscaping**

A gap in the perimeter berm on the southern side of Phase V/VI has been created to allow soil to be drawn from beyond this berm. This berm was installed and planted with trees, inter alia, to provide visual screening for the landfill. This gap is unsightly and undermines the visual screening capacity of the berm.

Corrective Action Required

The licensee shall re-instate the berm and henceforth plan operations to avoid any damage to visual screening works and/or plantings.

3. Follow-Up Actions

The licensee shall take the actions required to close out the non-compliances and observations raised in this Site Inspection Report. These actions will be verified during subsequent Inspections.

Please quote the above Inspection Reference Number in any future correspondence in relation to this Report.

Report prepared by Inspector: Eamon Merriman **Date:** 15/12/09

Mr. Eamonn Merriman,
Office of Environmental Enforcement,
Environmental Protection Agency,
East/North East Region,
McCumiskey House,
Richview,
Clonskeagh Road,
Dublin 14

Date: 04/01/10

Our Ref: W0060-02/10/001
Your Ref: W0060-02/NC26EM
Inspection Ref. No. W0060-02/09/S127EM

Re: Whiteriver Landfill - Response to Site Inspection Report

A Chara,

In response to the Agency's Site Inspection Report Dated 15th December 2009 Louth County Council would like to make the following comments in relation to the Non-Compliance and the Observations made in the report.

Non-Compliance

1. Public Use of Active Tipping Area.

Members of the public are not permitted to use the active tipping face. However several small scale waste permitted operators are allowed to use the active face, depending on the type of load they are carrying. These operators use vans and or small trailers to transport their loads.

All staff will receive refresher training, in the form of a toolbox talk, to ensure they are aware of Condition 5.2 of the licence its requirements.

Observations

1. Gas Management for Side Slope Risers

There are currently seven side slope risers with the potential to give rise to landfill gas emissions to atmosphere, see table below.

Side Slope Riser Label	Connected to Flare
Phase 3 Cell 2	Yes
Phase 4 Cell 1	Yes
Phase 4 Cell 2	Yes
Phase 5 Cell 3	No
Phase 5 Cell 2	No
Phase 1/2/3	No
Interceptor trench	No

All of these side slope risers have an end plate and are sealed around using expanding foam/silicon sealant. It is proposed to install a more robust gas seal at the end of all of the side slope risers as part of the capping works to be carried out on Phase 4 Cell 2 / Phase 5 Cell 3A. This contract is scheduled to commence 6th January 2010 and take approx 20 weeks to complete.

2. Final Cap Roll-Out

These capping works are scheduled to commence 6th January 2010 and take approx 20 weeks to complete, weather dependant.

3. Landfill Gas Infrastructure

The horizontal gas collection pipe line in Phase 5 Cell 2a was installed and was waiting for waste to be placed over it. There was no landfill gas escaping from this pipe as only a small amount of waste had been placed on top of it over the previous few days. Landfill gas would not be generated that quickly.

All landfill gas wells are sealed from atmosphere and will be connected to the flare as soon as possible. Once a well is installed and sealed it is regularly monitored to check gas composition. Once it reaches a reasonable composition where it can be blended in to the good quality gas it turned on and a negative pressure applied to it.

All landfill gas wells are now labelled on-site. All future wells will be labelled as they are installed.

4. Landfill Gs Utilisation

As part of the Objectives of the ISO14001 Environmental Management System, implemented at Whiteriver Landfill in 2009, Louth County Council plan to revisit the potential use of landfill gas to generate electricity. It is planned to complete this by the end of April 2010. The results of this assessment will be submitted to the Agency once completed.

5. Leachate Level Monitoring

The existing SCADA System does record the leacahte levels continuously. However the data is not easily exported into a report format; however it can be viewed on the SCADA System for any period since the installation of the system. Shaw Automation is currently investigating the best method of exporting this data as discussed during the site inspection.

It is expected that this reporting module will be installed by the end of March 2010.

6. Landscaping

This gap in the berm was made to use the area to the south of it as a stockpile area for soils during the construction of Phase 5. The remaining soils in this area will be used as part of the capping works for Phase 4 Cell 2 and Phase 5 Cell 3a over the coming months. Once these capping works are completed, which is expected to be by mid 2010, this gap will be reinstated and the entire area to the south of the berm will be permanently landscaped.

Is Mise le meas,

Raymond McKenna
Senior Engineer