Clare County Council

Waste Licence W0031-01

Annual Environmental Report for 2010

Location of facility: Doora Landfill, Bunnow, Ballaghboy,

Gaurus, Doora, Co. Clare

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Appendix I ***Location of Environmental Monitoring Points.***

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1.0 Introduction

1.1 Licence Reference

Condition	Details
Condition 2 Management of the activity **Schedule C**	2.8 AER: The licensee shall submit to the agency for its agreement, within thirteen months from the date of grant of this licence, or within one month of the end of each year thereafter. AER Content.

1.2 Waste Licence Register Number

The waste license number is W0031-01.

1.3 Name of Operator, Name and Address of Facility

Clare County Council
Doora Landfill Site
Bunnow/Ballaghboy/Gaurus/Doora
County Clare

1.4 Reporting Period

The reporting period for this AER is the calendar year 2010

1.5 Site Description

1.5.1 Site Location

Doora landfill is located in a semi-rural area approximately 1.6km east of Ennis Town.

1.5.2 Area Occupied

The area occupied by the landfill and its ancillaries amounts to 29.8 hectares, of which 18.7 hectares was used for landfilling. No waste has been deposited at the site since June 30th 2001.

2.0 Waste Activities carried out at the facility.

In accordance with Condition 5.1.2 of the licence, no waste has been accepted for deposition on the site since June 30th 2001.

In accordance with Condition 4.18.1, no waste has been accepted for transfer at the facility since 30th June 2002.

Leachate collection and abstraction began at the site in 2008. This activity was subsequently suspended temporarily for much of 2009 to facilitate groundwork's as part of the remediation project. Leachate tankering off site recommenced in November 2009. Clare County Council personnel monitor the level of leachate stored in the collection tank on a frequent basis, and removed off site to an appropriate facility as required.

3.0 Quantity and Composition of Waste Received in 2010.

No waste was received at the facility since June 2002.

4.0 Environmental Monitoring Results and Interpretation.

Section 4 presents the results of environmental monitoring undertaken from January to December 2010 in accordance with Condition 9 of Waste Licence No.0031-01, as indicated in Table 4.1 below.

During this reporting period, consultants TMS Environment Ltd conducted monthly, quarterly and annual monitoring programmes for surface water, groundwater and leachate. TMS Environment also carried out monitoring for dust, noise and gas flare emissions. Conservation Services carried out biological monitoring on surface water drains and on the R. Fergus. Weekly gas monitoring and leachate level monitoring surveys, together with monthly surface water monitoring were carried out by Clare County Council staff. Monitoring locations are shown on Drawing Number 1 in Appendix I. PRTR emissions data included in Appendix III.

Table 4.1 :Doora Landfill (W0031-01) Monitoring Schedule

Schedule	Monitoring Requirement
E.1	Landfill Gas
E.2	Dust
E.3	Noise
E.4	Surface Water, Groundwater and Leachate
E.5	Enclosed Landfill Gas Flare

Note [1]: The monitoring frequency for surface water visual inspections was reduced to monthly from August 2008, as agreed with the EPA.

Monitoring was carried out in accordance with Schedule E of the Waste Licence as indicated in Table 4.1 unless otherwise noted in this report. Results for key parameters are summarised in Sections 4.1 to 4.6 of this report. A more detailed discussion of results can be found in the quarterly reports submitted to the Agency during the year.

4.1. Landfill Gas

Clare County Council staff conducted landfill gas monitoring at weekly and monthly intervals during the reporting period, in accordance with Schedule E.1 of the waste licence. Gas monitoring locations are shown in Drawing No. 1 "Environmental Monitoring Points" in Appendix I. Monitoring was undertaken at forty-two locations across the three zones of Doora landfill. Thirty-five of these locations were tested on a monthly basis primarily to enable field balancing to be carried out to optimise gas collection and flare efficiency. The remaining seven locations are the original gas monitoring wells (LG1 to LG7) that are not connected to the gas network. Wells that were previously reported as being damaged during 2008/2009 have been repaired, and routine monitoring has recommenced. Gas monitoring results from January to December 2010 are shown in figures 1a to 1e. As can be seen from these graphs, higher concentrations of landfill gas were detected in LG2, and LG3. Methane levels were higher than CO_2 levels in these wells. The ratio of CH_4 to CO_2 is related to the age and stage of decomposition of the waste. Methane and CO_2 levels were similar in LG1 and LG6, where lower landfill gas levels have been measured. Monitoring at wells LG4, 5 & 7 did not take place due to damage at these wells, however, based on historic trends at each location, concentrations of CH4 and CO2 are similar to values at the other four wells.

Weekly gas monitoring surveys were carried out during the year at offsite gas monitoring wells, OSW1 and OSW2. No methane was detected in either of the wells. In 2009, 3 exceedences of the CO2 trigger level had been notified to the EPA, however carbon dioxide levels did not exceed the 1.5%v/v trigger level in either of these wells during 2010.

Fig. 1a

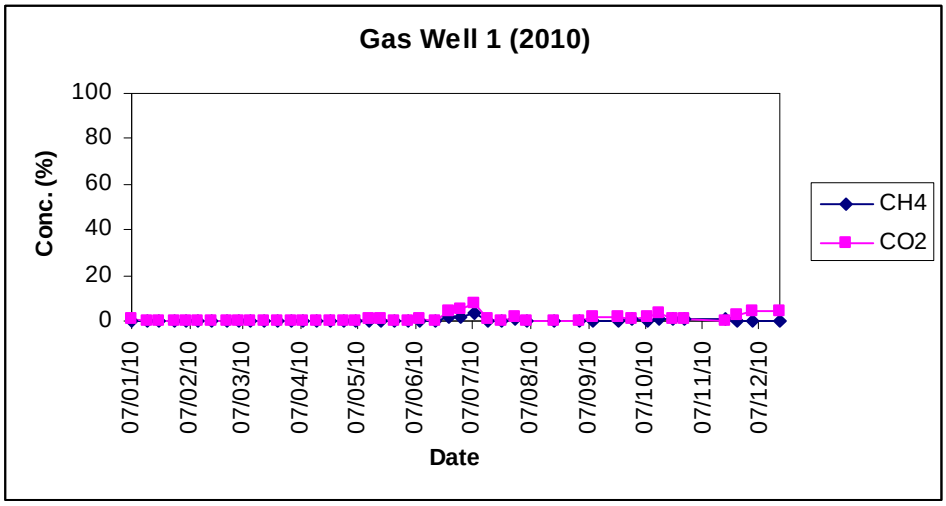

Gas Well 1 (2010)
Conc. (%)
100
80
60
40
20
0
07/01/10
07/02/10
07/03/10
07/04/10
07/05/10
07/06/10
07/07/10
07/08/10
07/09/10
07/10/10
07/11/10
07/12/10
Date
CH4
CO2

Fig. 1b

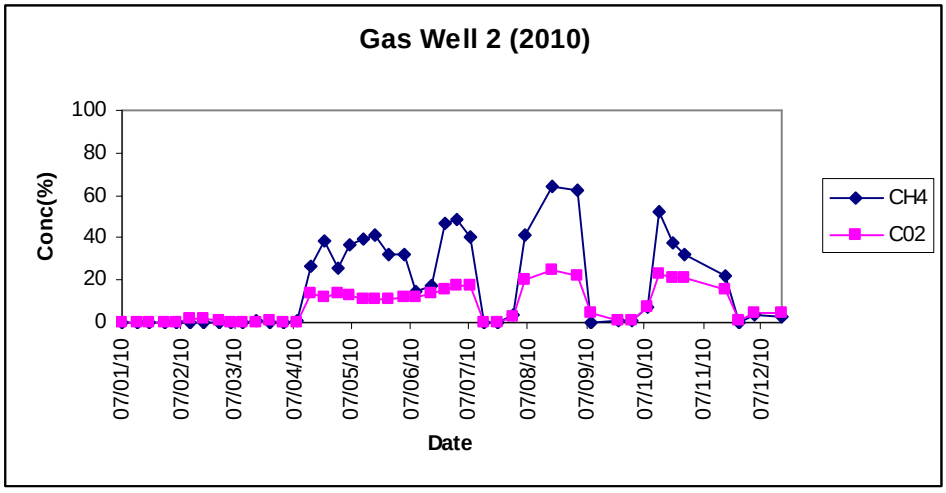

Gas Well 2 (2010)
Conc(%)
100
80
60
40
20
0
07/01/10
07/02/10
07/03/10
07/04/10
07/05/10
07/06/10
07/07/10
07/08/10
07/09/10
07/10/10
07/11/10
07/12/10
Date
CH4
C02

Fig. 1c

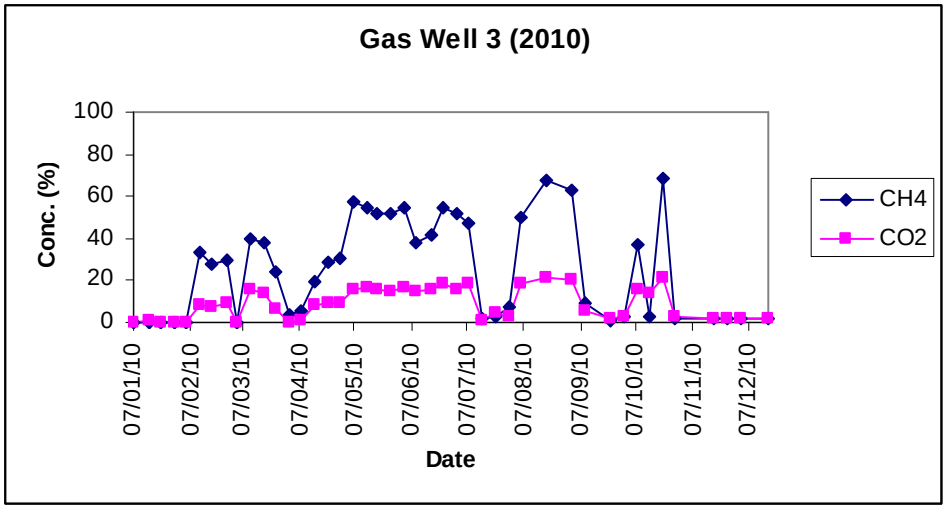
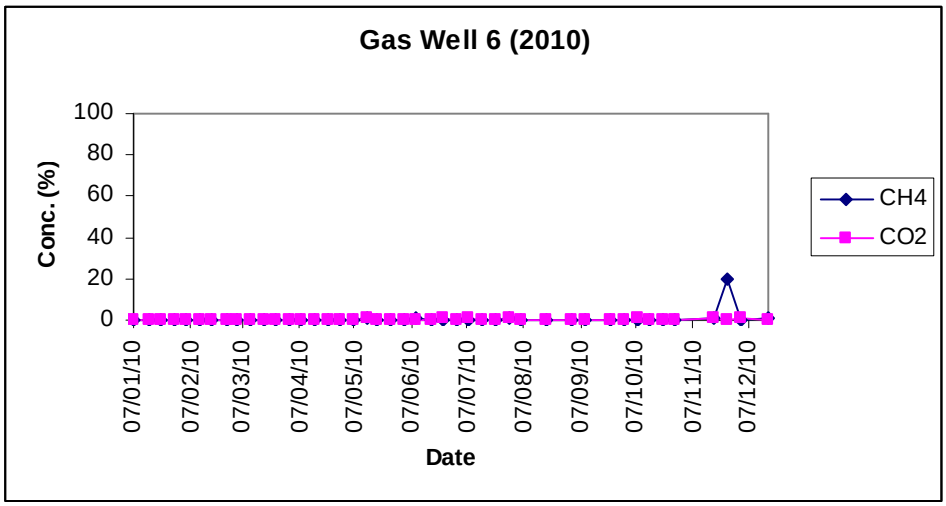

Gas Well 3 (2010)
Conc. (%)
100
80
60
40
20
0
07/01/10
07/02/10
07/03/10
07/04/10
07/05/10
07/06/10
07/07/10
07/08/10
07/09/10
07/10/10
07/11/10
07/12/10
Date
CH4
CO2

Fig. 1d


Gas Well 6 (2010)
Conc. (%)
100
80
60
40
20
0
07/01/10
07/02/10
07/03/10
07/04/10
07/05/10
07/06/10
07/07/10
07/08/10
07/09/10
07/10/10
07/11/10
07/12/10
Date
CH4
CO2

4.2. Dust

Three ambient dust monitoring surveys were completed during this reporting period 2010. Monitoring locations are shown in Drawing 1 in Appendix I. Results are summarised in Table 4.2 below. These results have previously been submitted to the Agency in the fourth quarter report for the facility.

Table 4.2: Total Dust Monitoring Results.

Sample location	Monitoring Period			Dust Deposition Limit ($mg/m^2/day$)
	12th May/ 18th June 2010	18th June.28th July 2010	28th July/30th August 2010	
	($mg/m^2/day$)	($mg/m^2/day$)	($mg/m^2/day$)	
ST1	Damaged	20	66	350
ST2	329	176	62	350
ST3	<20	<20	71	350
ST4	24	92	57	350
ST5	<20	48	114	350

4.3 Noise

An annual noise monitoring survey was conducted on the 23rd November 2010 at noise sensitive locations N1 to N4 and S1 to S4. The daytime noise limit value of 55dB(a) L $L_{Aeq,\ 30\ mins}$ was exceeded at 3 of the 8 monitoring locations. These were noted at monitoring locations S2, S3 and N4 where passing traffic was the main noise source. The noise level at N4 was also influenced by excavation works that were being conducted outside of the site boundary. None of the exceedences reported were due to activities within the landfill.

A detailed report on the noise survey was submitted in the quarterly environmental monitoring report for October to December 2010.

4.4 Groundwater, Surface Water and Leachate.

4.4.1 Groundwater

Groundwater monitoring was carried out in accordance with schedule E.4 of Waste Licence W0031-01 for the parameters and at the monitoring frequency specified in Table E.4.1 at locations: OB1, BR1, OB2, BR2, OB3, BR3, OB4, OB5, OB6, OB8, BR6, BR7, BR8 and BR9 (refer to Drawing No. 1 in Appendix I. for locations).
Results for key parameters chloride and ammonia at all wells are summarised below.

Chloride:

Groundwater chloride levels are graphed in figures 2 and 3 below. As can be seen from the graphs, higher chloride levels were observed in wells located close to the R. Fergus (OB1, BR1, OB2, BR2, and OB5). These elevated chloride levels may be in part attributed to the influence of the R. Fergus. Groundwater contamination from landfilling activities at the site may also be a factor (see section on ammonia below).

Fig. 2

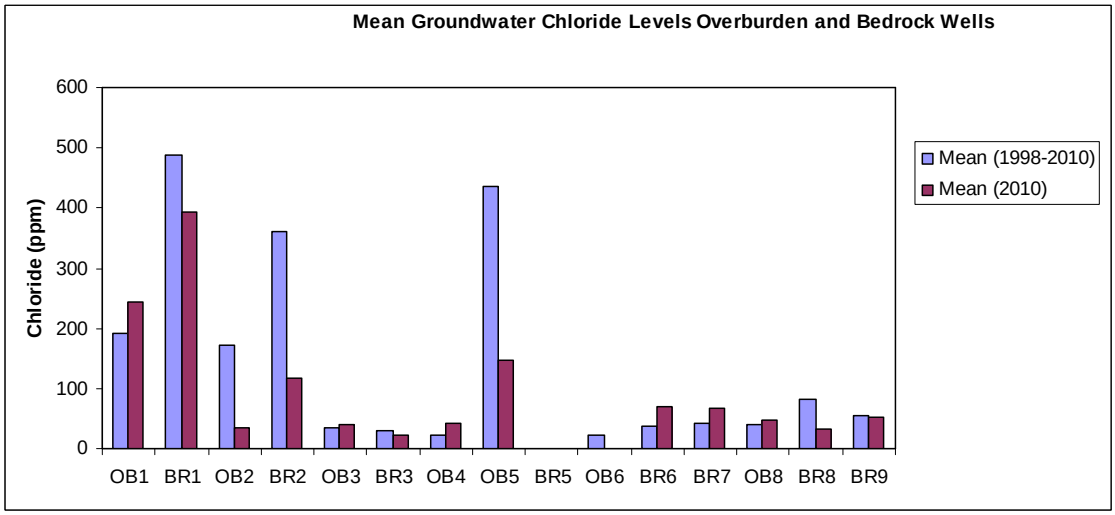
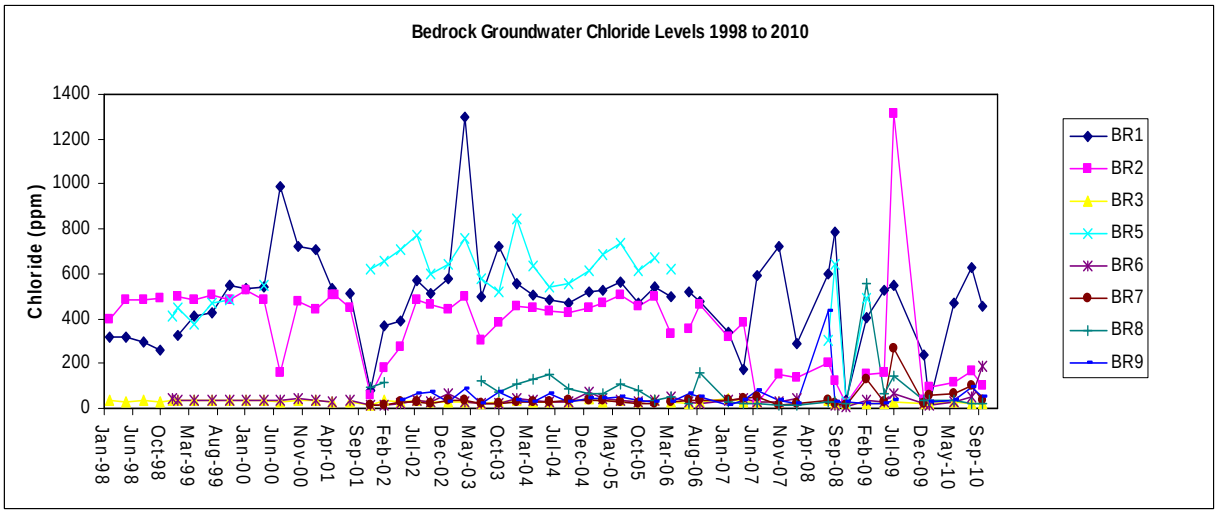


Fig. 3



Ammonia:

Groundwater ammonia levels for the seven-year period from January 2004 to December 2010 are graphed below in figures 4 to 12. Mean ammonia levels for the period are graphed in figure 13. As can be seen from the graphs, groundwater ammonia results have been elevated for onsite monitoring wells (OB1/BR1 and OB2/BR2) since monitoring commenced at the site. Highest results for 2010 were obtained at these four wells, particularly at BR2, which is located close to the south-western boundary of the site. Ammonia levels at BR2 had increased gradually in the previous years. BR2 is down-gradient of zones 2 and 3 of the landfill. BR10 was installed in 2008 to provide additional data on groundwater values. Details of such have been provided in previous AER's. BR10 was damaged during remediation work, and sampling recommenced in July 2009. Monitoring during 2010 was uninterrupted.

Results for BR10, obtained between July and December 2010 are presented below in figure 12. As can be seen from the graph, BR10 ammonia results were unusually elevated. This indicates that the elevated ammonia levels observed at BR2 (and at BR10) are likely to be due to migration of leachate from Zone 3. Monitoring results for the R. Fergus to date do not indicate that this leachate plume is causing problems in the R. Fergus.

It had been proposed in the 2009 AER to install 2 additional groundwater wells at off site locations on the western side of the R. Fergus by mid 2010. However, an unexpected problem was encountered when trying to establish the legal landowner,

in order to gain permission to enter lands and drill the required wells. The lands in question along the western bank of the R. Fergus are under the sole ownership of a construction firm, who it appears have ceased operation. All efforts to communicate with the company have proved unsuccessful, and to date, Clare County Council has not received permission to enter the required lands in order to conduct additional monitoring.

As expected, lowest ammonia levels were found in up-gradient wells OB3, BR3 and BR7 and in the cross-gradient nested pair of wells OB6 and BR6. Mean ammonia levels at these locations were below 0.5ppm for this twelve-month monitoring period (see figures 9 to 11 and 13)

Fig. 4

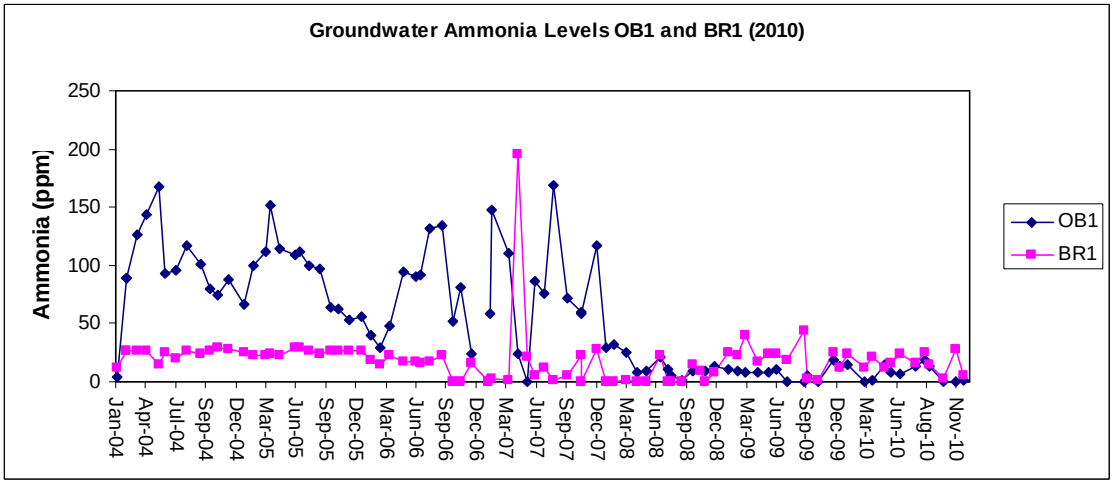


Fig 5.

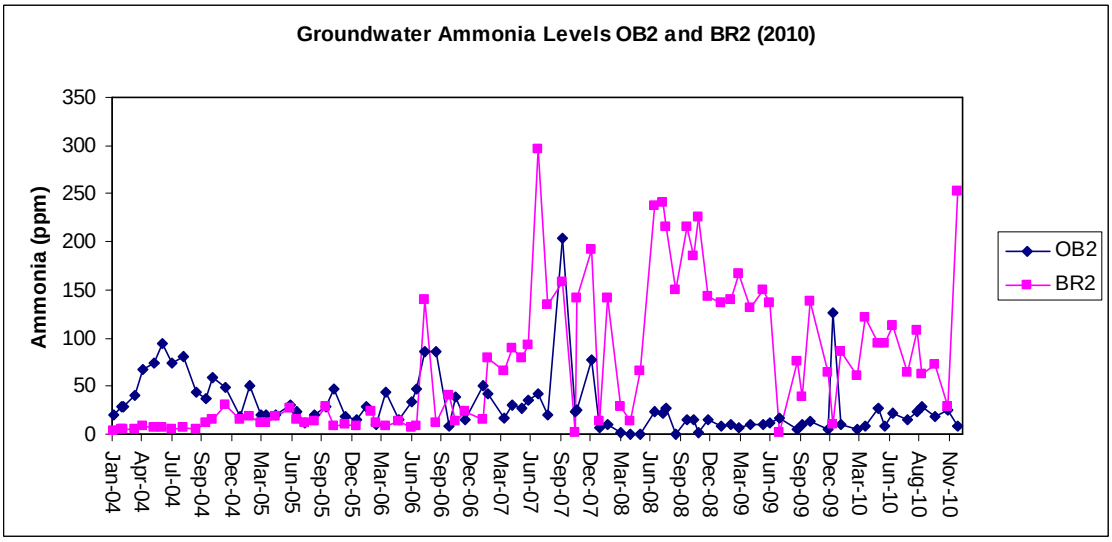


Fig 6.

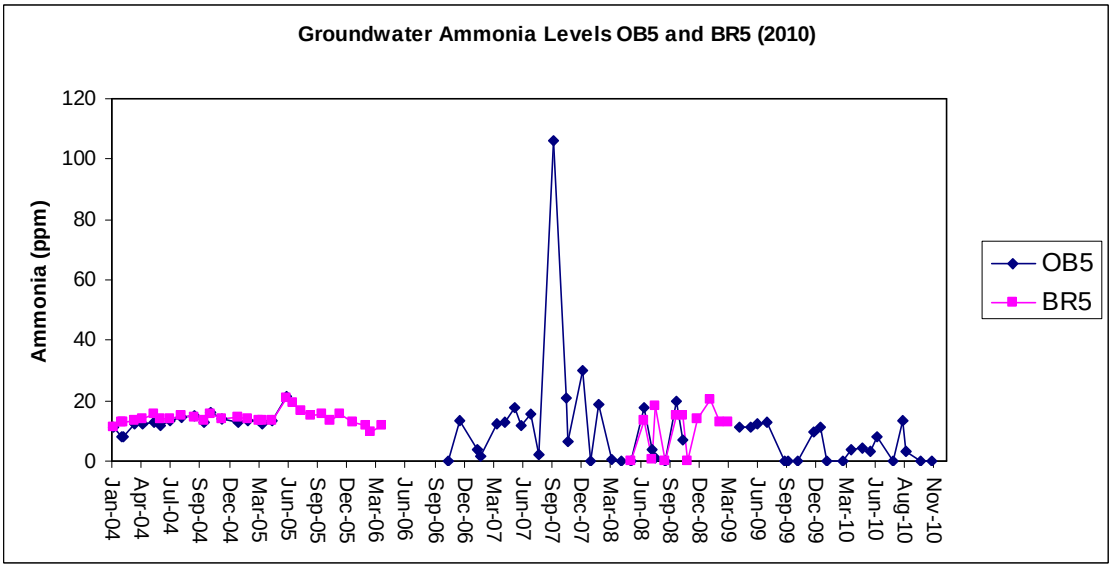

Groundwater Ammonia Levels OB5 and BR5 (2010)
Ammonia (ppm)
120
100
80
60
40
20
0
Jan-04
Apr-04
Jul-04
Sep-04
Dec-04
Mar-05
Jun-05
Sep-05
Dec-05
Mar-06
Jun-06
Sep-06
Dec-06
Mar-07
Jun-07
Sep-07
Dec-07
Mar-08
Jun-08
Sep-08
Dec-08
Mar-09
Jun-09
Sep-09
Dec-09
Mar-10
Jun-10
Aug-10
Nov-10
OB5
BR5

Fig. 7

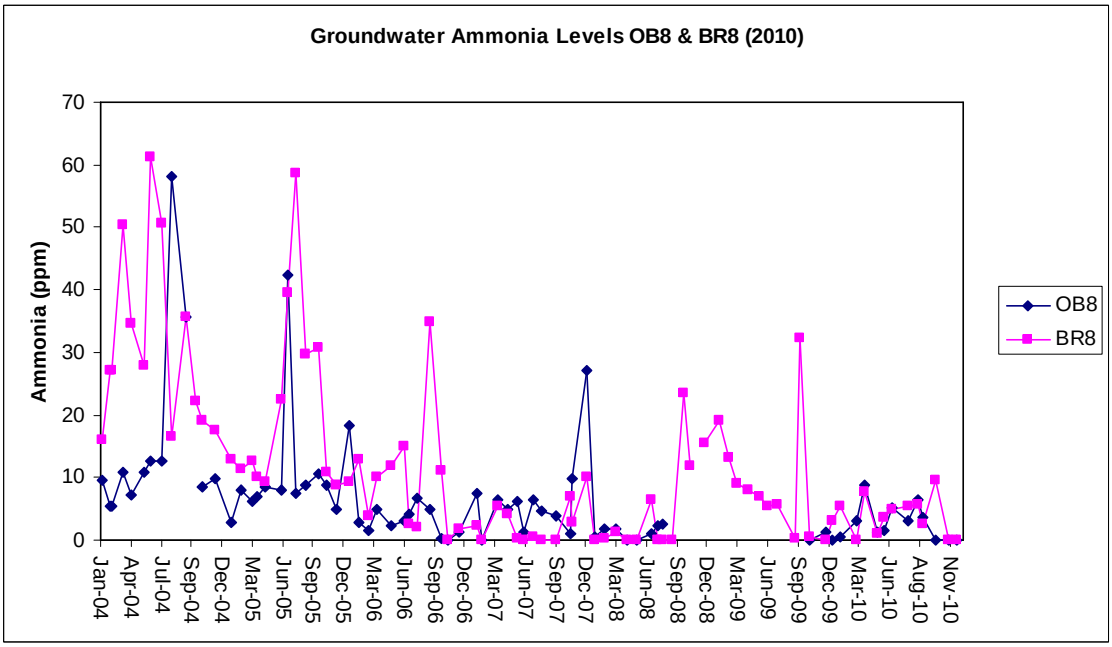

Groundwater Ammonia Levels OB8 & BR8 (2010)
Ammonia (ppm)
70
60
50
40
30
20
10
0
Jan-04
Apr-04
Jul-04
Sep-04
Dec-04
Mar-05
Jun-05
Sep-05
Dec-05
Mar-06
Jun-06
Sep-06
Dec-06
Mar-07
Jun-07
Sep-07
Dec-07
Mar-08
Jun-08
Sep-08
Dec-08
Mar-09
Jun-09
Sep-09
Dec-09
Mar-10
Jun-10
Aug-10
Nov-10
OB8
BR8

Fig. 8

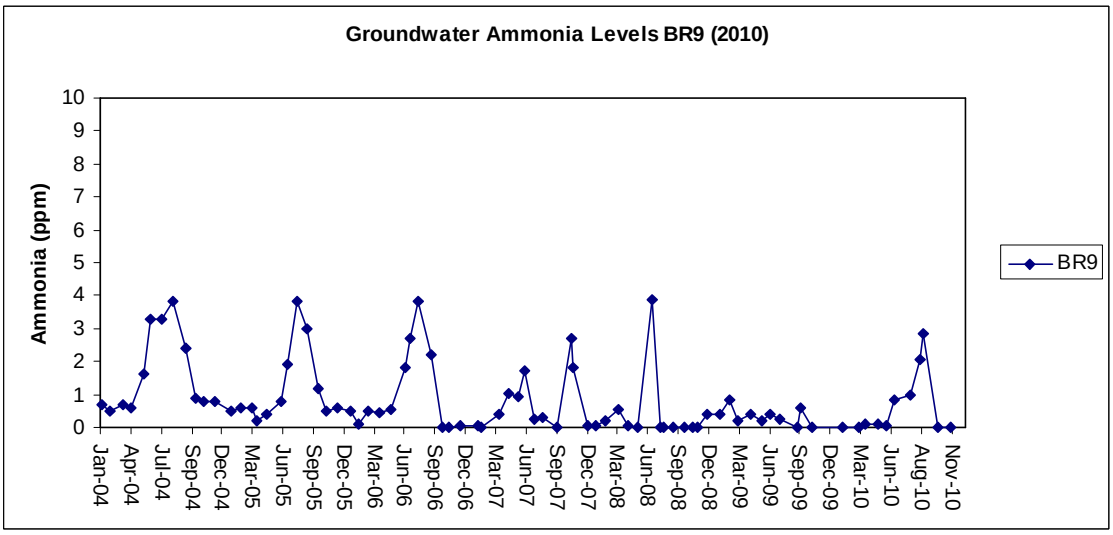

Groundwater Ammonia Levels BR9 (2010)
Ammonia (ppm)
0
1
2
3
4
5
6
7
8
9
10
Jan-04
Apr-04
Jul-04
Sep-04
Dec-04
Mar-05
Jun-05
Sep-05
Dec-05
Mar-06
Jun-06
Sep-06
Dec-06
Mar-07
Jun-07
Sep-07
Dec-07
Mar-08
Jun-08
Sep-08
Dec-08
Mar-09
Jun-09
Sep-09
Dec-09
Mar-10
Jun-10
Aug-10
Nov-10
BR9

Fig. 9

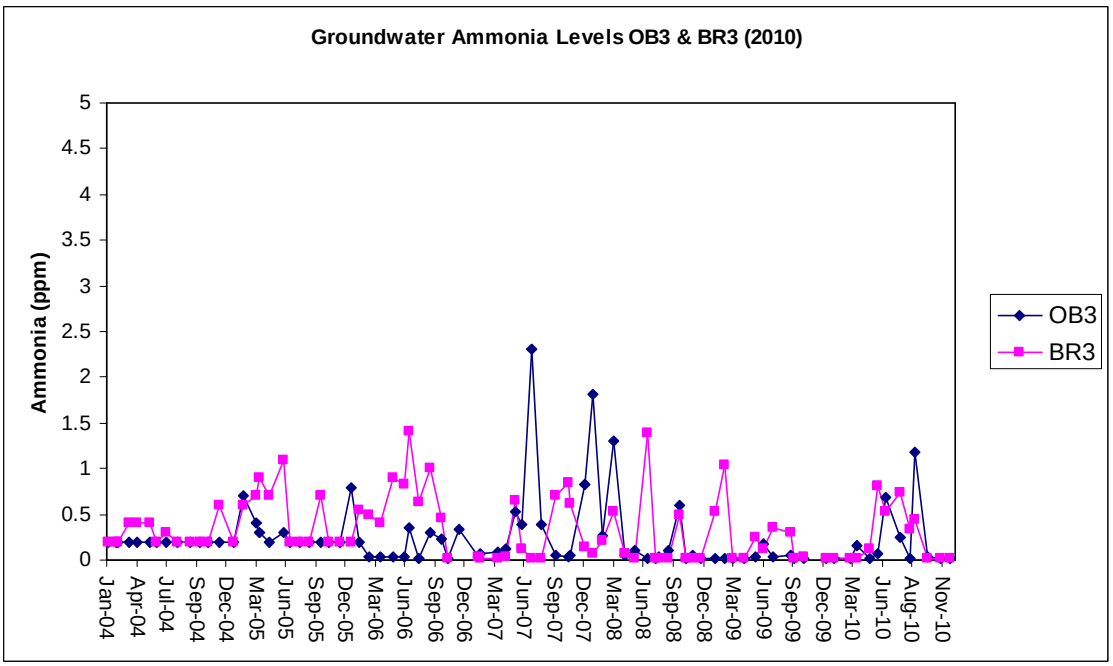

Groundwater Ammonia Levels OB3 & BR3 (2010)
Ammonia (ppm)
0
0.5
1
1.5
2
2.5
3
3.5
4
4.5
5
Jan-04
Apr-04
Jul-04
Sep-04
Dec-04
Mar-05
Jun-05
Sep-05
Dec-05
Mar-06
Jun-06
Sep-06
Dec-06
Mar-07
Jun-07
Sep-07
Dec-07
Mar-08
Jun-08
Sep-08
Dec-08
Mar-09
Jun-09
Sep-09
Dec-09
Mar-10
Jun-10
Aug-10
Nov-10
OB3
BR3

Fig. 10

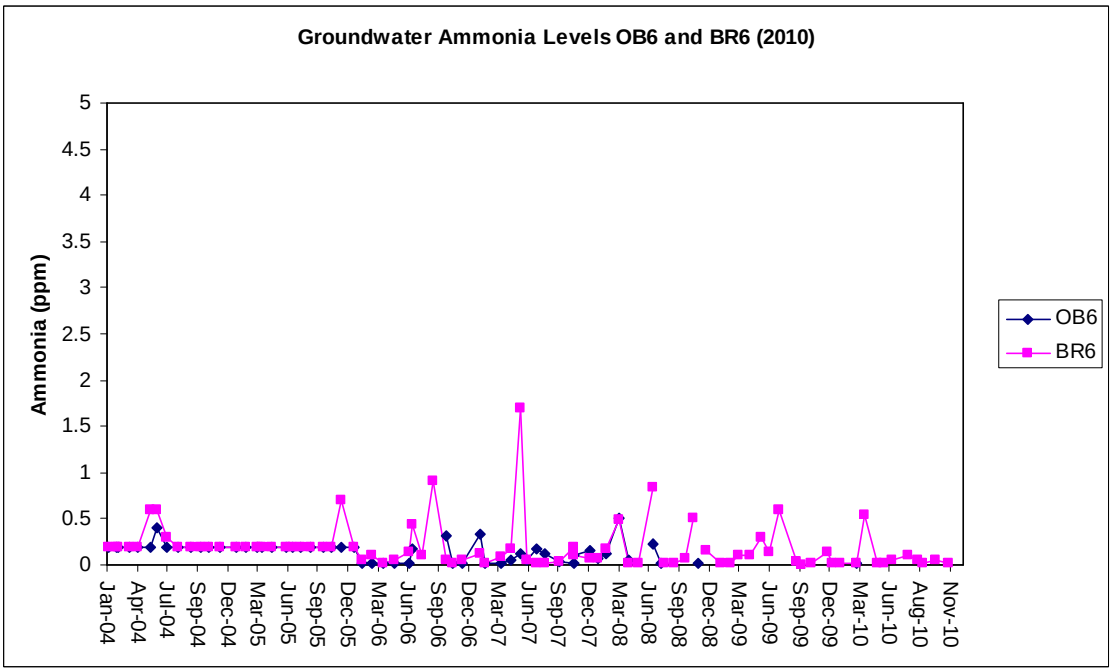

Groundwater Ammonia Levels OB6 and BR6 (2010)
Ammonia (ppm)
5
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
Jan-04
Apr-04
Jul-04
Sep-04
Dec-04
Mar-05
Jun-05
Sep-05
Dec-05
Mar-06
Jun-06
Sep-06
Dec-06
Mar-07
Jun-07
Sep-07
Dec-07
Mar-08
Jun-08
Sep-08
Dec-08
Mar-09
Jun-09
Sep-09
Dec-09
Mar-10
Jun-10
Aug-10
Nov-10
OB6
BR6

Fig. 11

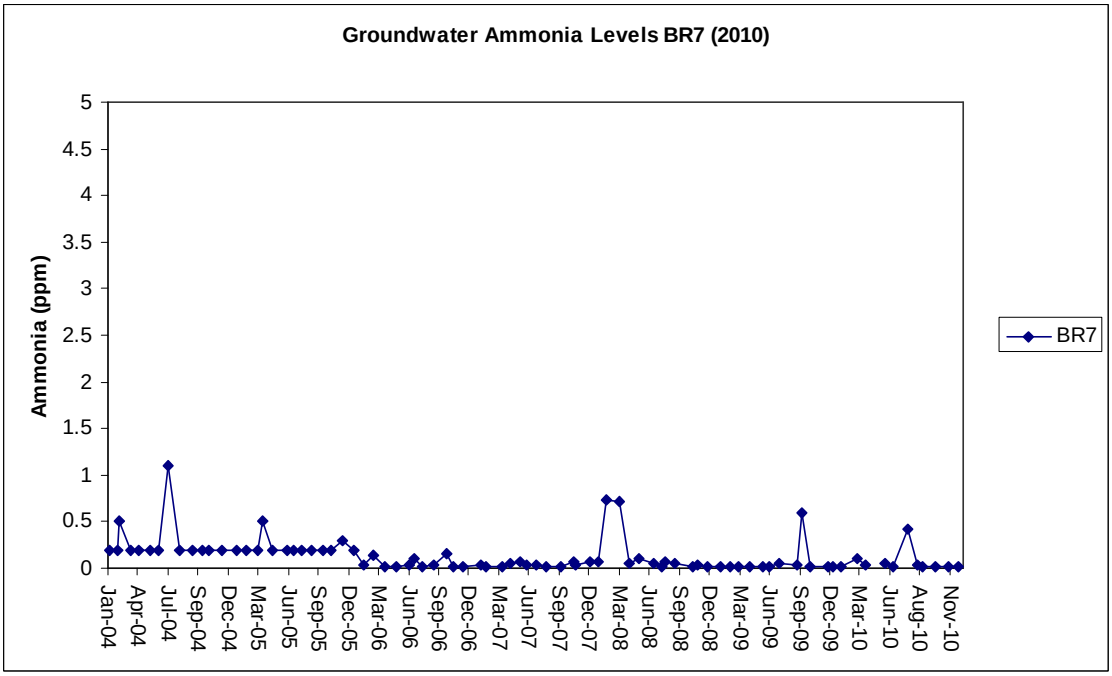

Groundwater Ammonia Levels BR7 (2010)
Ammonia (ppm)
5
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
Jan-04
Apr-04
Jul-04
Sep-04
Dec-04
Mar-05
Jun-05
Sep-05
Dec-05
Mar-06
Jun-06
Sep-06
Dec-06
Mar-07
Jun-07
Sep-07
Dec-07
Mar-08
Jun-08
Sep-08
Dec-08
Mar-09
Jun-09
Sep-09
Dec-09
Mar-10
Jun-10
Aug-10
Nov-10
BR7

Fig. 12

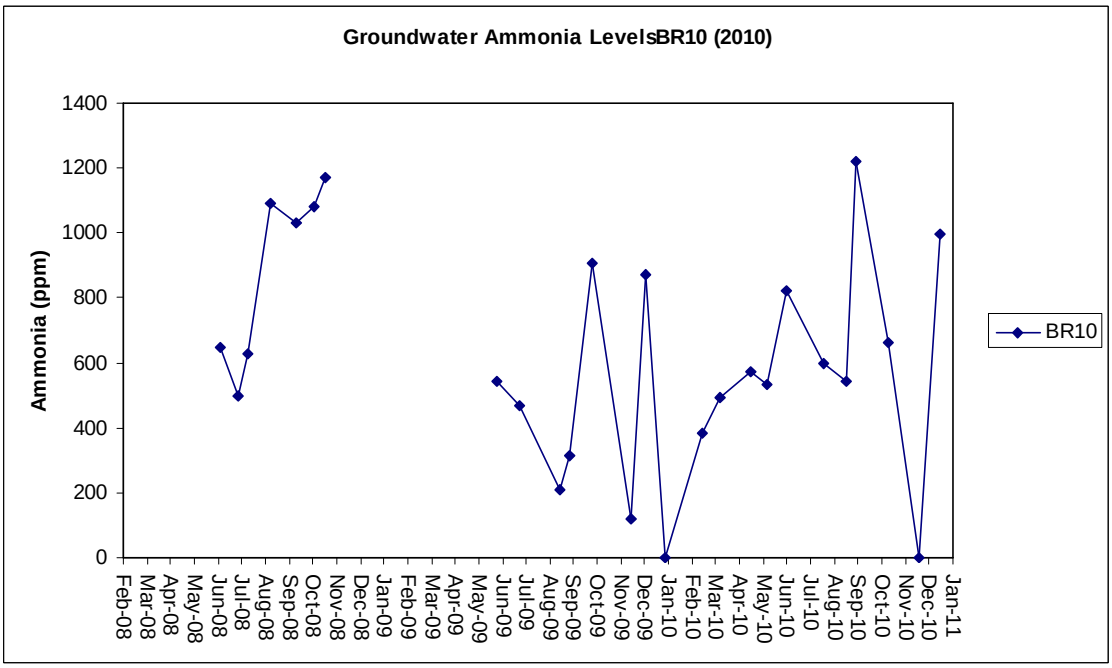
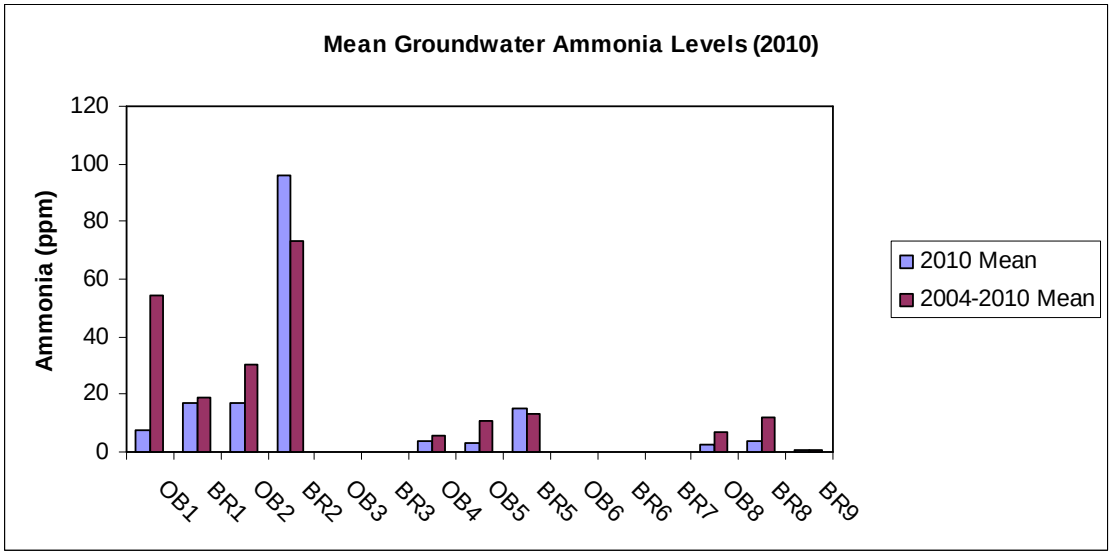

Groundwater Ammonia LevelsBR10 (2010)
Ammonia (ppm)
1400
1200
1000
800
600
400
200
0
Feb-08
Mar-08
Apr-08
May-08
Jun-08
Jul-08
Aug-08
Sep-08
Oct-08
Nov-08
Dec-08
Jan-09
Feb-09
Mar-09
Apr-09
May-09
Jun-09
Jul-09
Aug-09
Sep-09
Oct-09
Nov-09
Dec-09
Jan-10
Feb-10
Mar-10
Apr-10
May-10
Jun-10
Jul-10
Aug-10
Sep-10
Oct-10
Nov-10
Dec-10
Jan-11
BR10

Fig. 13


Mean Groundwater Ammonia Levels (2010)
Ammonia (ppm)
120
100
80
60
40
20
0
OB1
BR1
OB2
BR2
OB3
BR3
OB4
OB5
BR5
OB6
BR6
BR7
OB8
BR8
BR9
2010 Mean
2004-2010 Mean

4.4.2 Surface Water

Surface water monitoring was carried out during the year at the following locations: SW1, SW2, SW3, SW4, SW5, SW6, SW7, SW8, SW11, SW12, SW13, SW14 and SW15. Monitoring locations are shown in Drawing no. 1 in Appendix I. Surface water samples were collected for analysis as specified in Table E.4.1 of Waste Licence W0031-01. In addition, monthly monitoring was carried out at SW2, SW3 and SW7 for pH, conductivity and ammonia levels.

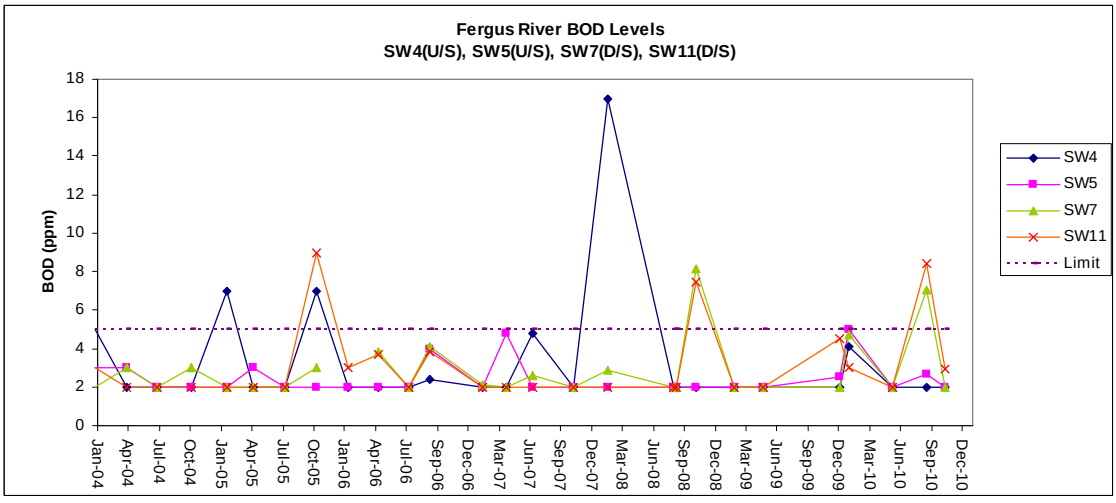
Results for key parameters ammonia and BOD are summarised in this report.

BOD:

BOD results for the R. Fergus and R. Gaurus for the seven-year period from 2004 to 2010 are graphed in figures 14 and 15 respectively. The R. Fergus is classified as a Salmonid water[1] to which a 5ppm BOD limit applies. This limit is shown in figure 14.

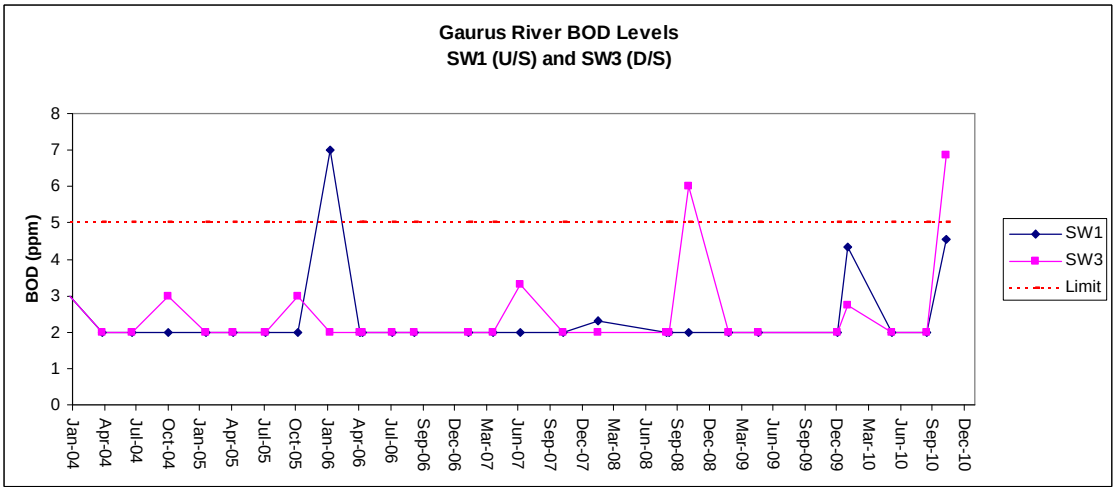
1: From European Communities (Quality of Salmonid Waters) Regulations, 1988 (SI No. 293 of 1988). Note that the freshwater fish directive 2006/44/EC does not include a mandatory BOD limit but does include a guide BOD level of ≤3ppm for salmonid waters.

Fig. 14



Gaurus River BOD results are graphed in figure 15. The 5ppm Salmonid limit is also shown on this graph for comparative purposes.

Fig. 15



There are two surface water sampling locations (SW12 and SW13) on the eastern boundary drain. This drain runs in a southerly direction along the eastern boundary and is piped underground close to the southern site boundary, feeding into the R. Fergus upstream of Doora Bridge. BOD levels in the eastern boundary drain are graphed in figure 16.

There are three sampling locations on the western boundary drain (SW2, SW8 and SW14) which feeds into the R. Gaurus downstream of SW2. Results for this drain are graphed in figure 17. Also included on the graphs is the 7ppm BOD for A3 waters from the Surface Water Regulations (1989). This limit is included for comparative purposes only; no limits exist for BOD levels in site drains.

Fig 16.

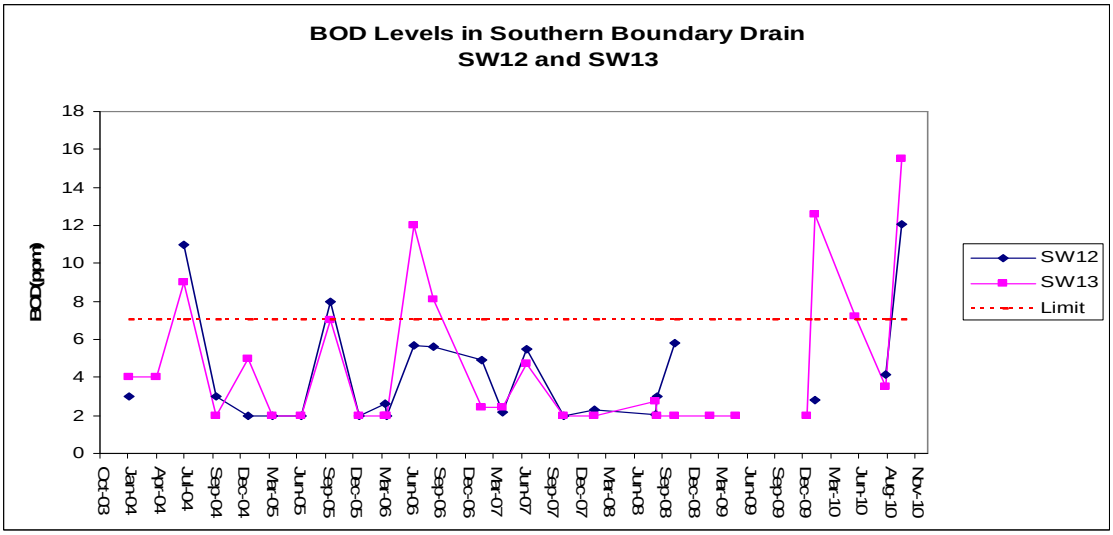
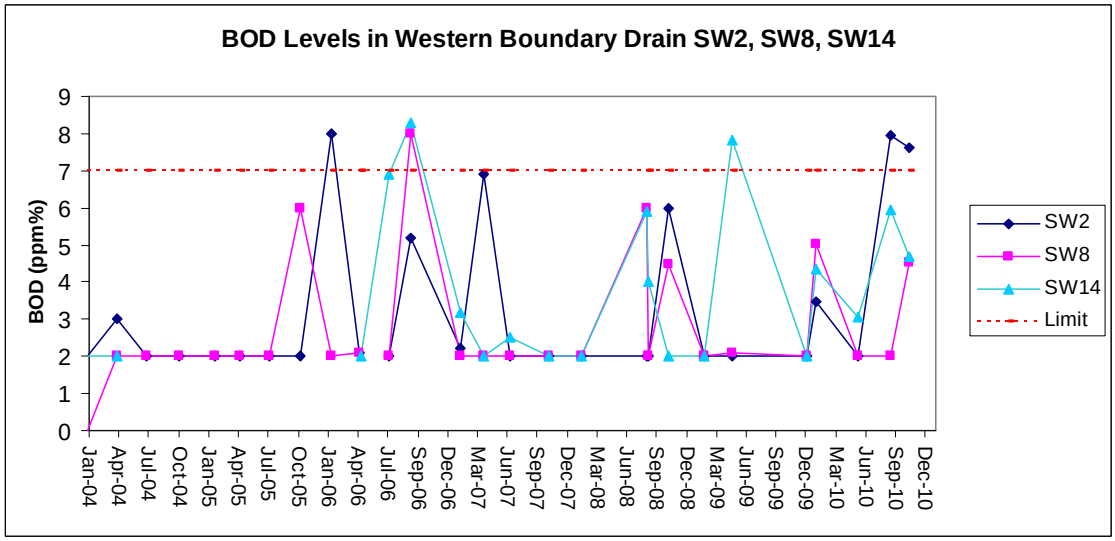


Fig 17.

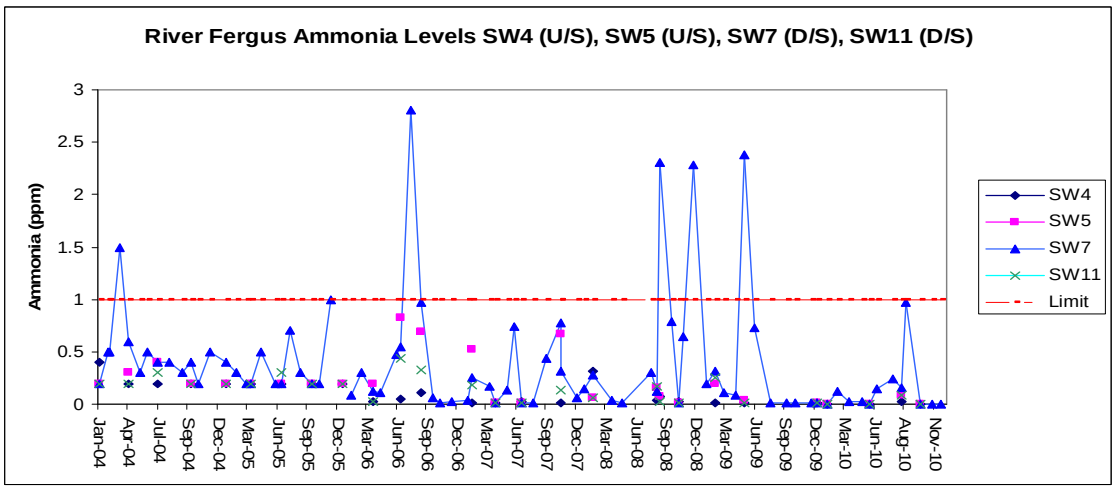


Ammonia:

Ammonia results for Gaurus and Fergus river samples for the seven-year period from January 2004 to December 2010 are graphed in figures 18 and 19 respectively. Also shown on the graphs is the 1ppm ammonia limit for Salmonid Waters. This limit is included in the Gaurus river graph for comparative purposes only.

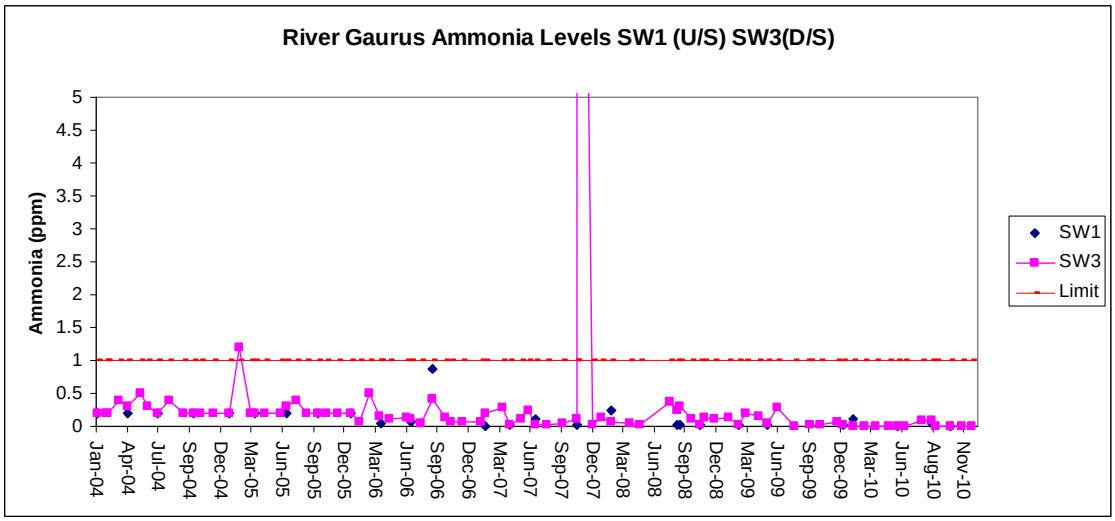
As can be seen from figure 18, ammonia levels at SW7 (Doora Bridge) remained below the 1ppm Salmonid limit throughout 2010. The anomalies as identified during the years 2008, and 2009 were not repeated during the 2010 period.

Fig. 18



Ammonia results for Gaurus river location SW1 (upstream of the landfill) have been below 1ppm for the seven year period from January 2004 to December 2010. Ammonia results at SW3 (downstream of the landfill) remained below 1ppm for the 2010 period.

Fig. 19



Ammonia results for the western and eastern boundary drains from January 2004 to December 2010 are shown in figures 20 and 21.

Fig. 20

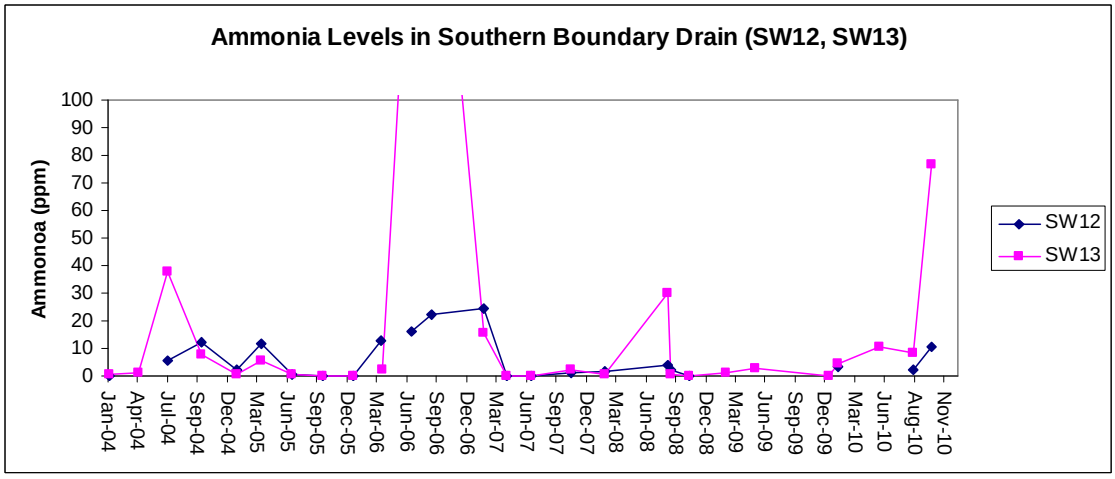
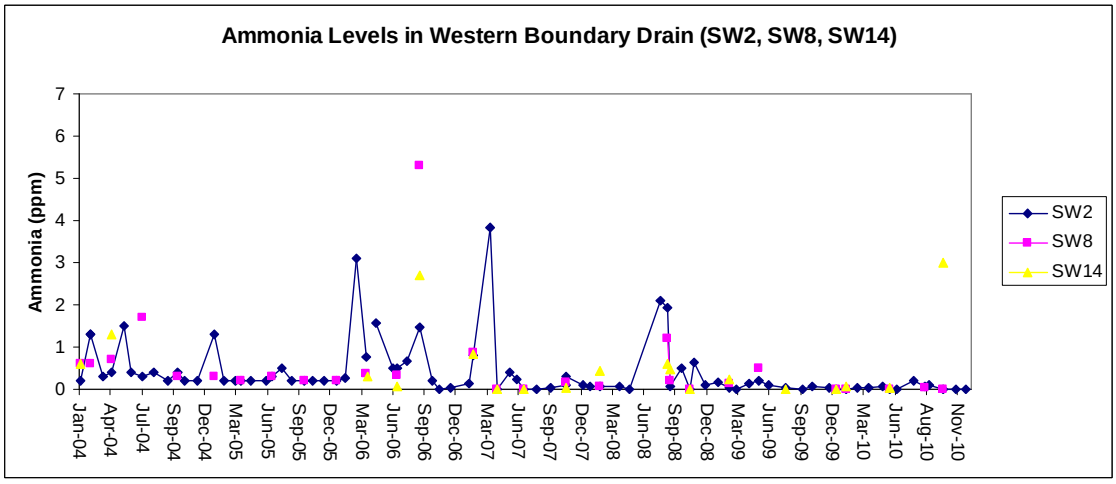


Fig. 21



Ammonia levels at all locations on the southern and western boundaries have remained consistently low for the 2010 period. Historical elevated ammonia levels displayed in Figures 20 & 21 are explained in previous AER's and other correspondence to the EPA.

4.4.3 Leachate

Leachate monitoring was conducted in accordance with Schedule E.4 of Waste Licence W0031-01 for the parameters and at the monitoring frequency specified in Table E.4.1 at locations L1, L6, L7, L8 and L9 (see Drawing No. 1 in Appendix I for locations). A new leachate abstraction well (L10) was installed in mid 2008 in zone 3 of the landfill. Monitoring of this well commenced in July 2008.

Ammonia, BOD and COD results for leachate wells are graphed in figures 22 to 25.

As would be expected given the locations of L8, L9 and L10 in Zone 3 (the area of most recent waste deposition) BOD, COD and ammonia levels were higher in these wells than in zone 1 (L1) and zone 2 (L6).

Fig. 22

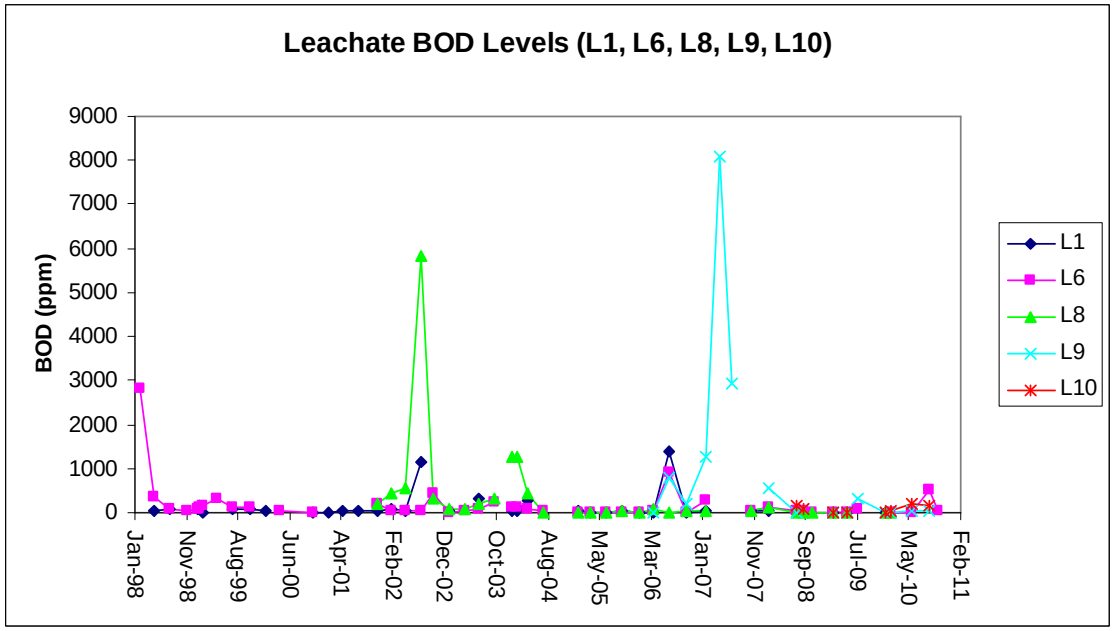


Fig. 23

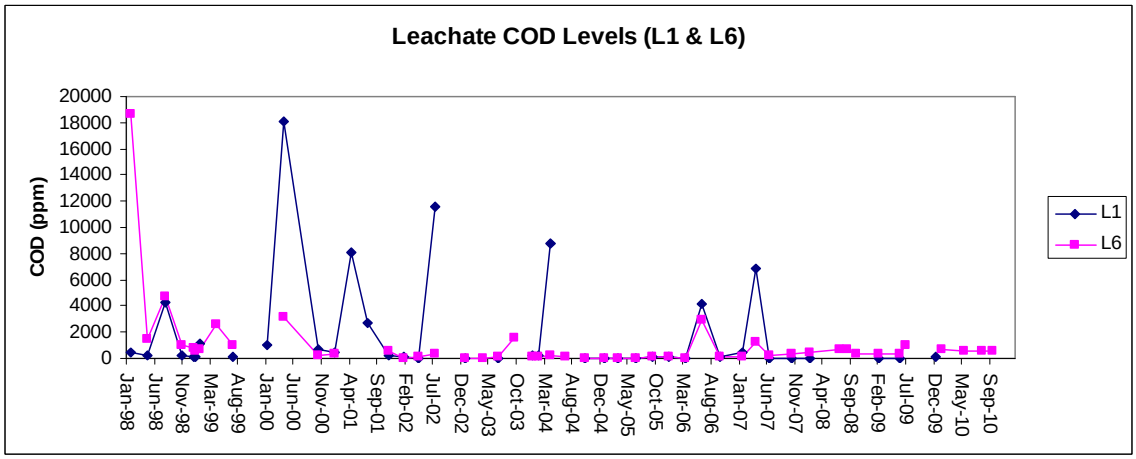


Fig. 24

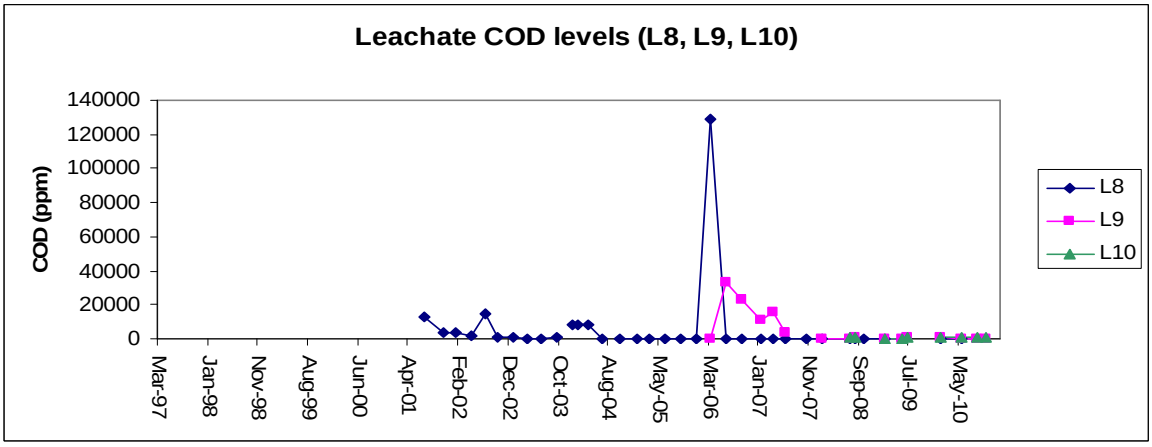
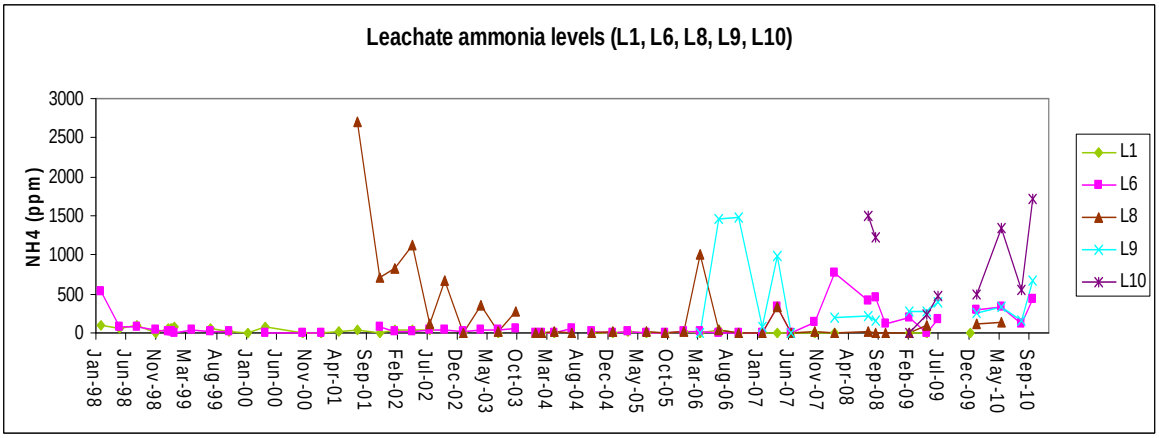


Fig. 25



4.5 Landfill Gas Flare Unit.

Emissions to atmosphere from the enclosed landfill gas flare were monitored in accordance with the requirements of Schedule E.5. of Waste Licence W0031-01. This monitoring was carried out by TMS Environment monitoring staff, on the 11th May 2010 and the 19th November 2010. Monitoring results are presented below in Table 4.3:

Table 4.3: Flare Monitoring Results:			
Parameter/units	**11th May 2010**	**19th November 2010**	**Emission Limit[1]**
Nitrogen Oxides (NO_x) as NO_2 (mg/Nm^3)	83.7	118	150 mg/m^3 for Flare Stacks
Carbon Monoxide (CO) (mg/Nm^3)	<2.13	2.67	50 mg/m^3 for Flare Stacks
Sulphur Dioxide (SO_2) (mg/Nm^3)	<4.9	<6.1	-
Temperature (^0C)	1000	998	-
Volumetric Flow Rate (Nm^3/hr)	235	175	-
Vinyl Chloride (mg/Nm^3)	<1.56	<6.4	-
Acetonitrile (mg/Nm^3)	<1.56	<6.4	-
Dichloromethane (mg/Nm^3)	<1.56	<6.4	-
Tetrachloroethylene (mg/Nm^3)	<1.56	<6.4	-
TA Luft Class I (mg/Nm^3)	<1.56	<0.63	20 mg/m^3 (at mass flows >0.1 kg/hr)
TA Luft Class II (mg/Nm^3)	<7.8	<3.2	100 mg/m^3 (at mass flows >2 kg/hr)
TA Luft Class III (mg/Nm^3)	<15.6	<6.4	150 mg/m^3 (at mass flows >3 kg/hr)
HCl (mg/Nm^3)	9	<2.7	50 mg/m^3 (at mass flows >0.3kg/hr)
HF (mg/Nm^3)	<.05	0.521	5 mg/m^3 (at mass flows >0.05 kg/hr)
All results were within emission limit values specified in Schedule F.4. of Waste Licence W0031-01.			

4.6 Biological Monitoring

A Biological Monitoring survey was carried out in July and September 2010 in accordance with Condition 9, Schedule E of WL 31-1. Results were provided to the Agency under separate cover. Survey conclusions are summarised below:

4.6.1 Gaurus River

Results at WQ1 and WQ3 as observed during the 2010 period have remained the same as results for 2009. These ratings are in line with historic data for both locations

4.6.2 Fergus River

Three sites are monitored on the R. Fergus: WQ4, WQ5 and WQ6. Sites WQ4 and WQ6 upstream and downstream of the confluence of the Fergus and Gaurus rivers, were given tentative Q-ratings of Q2-3 in 2009, indicating moderately polluted conditions.

For the 2010 period, results remained broadly the same as in 2009 at WQ4, 5, & 6, with results for the September 2010 monitoring reporting a tentative rating of Q2-3 for all three locations.

The poor water quality in the R. Fergus immediately upstream and downstream of the R. Gaurus confluence would appear to be due to upstream conditions in the Fergus rather than any impact from the Gaurus, however an impact from the R. Gaurus on both sites on incoming and outgoing tides cannot be conclusively ruled out.

The ongoing monitoring since 2002 have shown that the sites monitored on the R. Fergus have a very unstable invertebrate community. This instability is likely due to the tidal and occasional saline conditions at these sites.

It cannot be concluded from the invertebrate data that there is an adverse impact on the Fergus from the landfill, however, given the tentative nature of the Q-ratings at these sites a minor impact cannot be ruled out.

	WQ1	WQ2	WQ3	WQ4	WQ5	WQ6
April 2002	4-5	3-4	3	3	3	3
May 2002	4	3-4	3	3	3	3
April 2003	4	3-4	3	3	3	3
June 2003	3-4	3-4	3	3	3	3
Sept. 2003	3-4	3	3	3	3	3
July 2004	3	3	3	3	3	3
Sept 2004	3-4	3	3	3	3	3
May 2005	3-4	3	3	3	3	3
Sept 2005	3-4	3-4	3	3	2-3	3
May 2006	3-4	3	3	2-3	2-3	2-3
Sept 2006	3-4	3	3	3	3	3
May 2007	3-4	3	3	3	3	3
Aug 2007	3	3	3	3	3	3
May 2008	3-4	3	3	3	3	3
Aug 2008	3	3	2-3	3	3	3
May 2009	3-4	3	3	2-3	3	2-3
Oct 2009	3-4	3	3	2-3	2-3	2-3
July 2010	3-4	3	3	3	3	3
Sept 2010	3-4	3	3	2-3	2-3	2-3

4.7 Odours

No odour problems were encountered during the reporting period.

5.0 Monthly Water Balance Calculations and Interpretation

Total effective rainfall for the reporting period 2010 was calculated using monthly data from the Shannon Airport Meteorological Station. Rainfall details are summarised in Table 5.1:

Table 5.1 Rainfall Details for Shannon Airport From January to December 2010

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Rainfall	30.8	35.1	80.4	71.4	56.8	33.4	123.1	39.1	138.9	76.8	133.3	26
P_1	7.6	15.1	37.7	65.6	78.3	97.7	75.6	72	47.3	27.9	10.9	5.1
$E.R._1$	23.2	20	42.7	5.8	-21.5	-64.3	47.5	-32.9	91.6	48.9	122.4	20.9

Note[1:] Evapotranspiration values (Penman).

Note[2:] Effective rainfall

The effective rainfall for the period January to December 2010 was **304.3mm**.

The water balance calculation for the period is set out in Table 5.2 below:

Table 5.2: Water Balance Calculation at Infiltration Rates from 10-30%.

Capped area infiltration (%)	Active Area	Active area infiltration	Capped Area ($m^{2)}$	Total rainfall (m)	Net Leachate 2010 (m^3)
30%	0	0	186,900	0.304	17,045.1
20%	0	0	186,900	0.304	11,363.4
10%	0	0	186,900	0.304	5,681.7

As for previous reports, the rainfall infiltration through capping was assessed at three infiltration rates (10%, 20% and 30%), based on a variation in capping thickness throughout the site. At these infiltration rates, the theoretical total leachate production for the period ranged from 5,618.7m^3 to 17,045.1m^3. Final capping has been in place throughout the site since early November 2008 so in practice, the actual amount of rainfall infiltration will be at the lower end of the range from that time.

6.0 Volume of Leachate Produced and Discharged On Site

The theoretical assessment of leachate generation at the Doora site was based on the monthly water balance calculation provided in Table 5.2. As the landfill was operated on the "dilute and disperse" principle, it is not possible to provide an absolute value for leachate volumes arising during the year. The volume of leachate produced is linked to two external factors (in addition to the moisture content of the waste deposited):

- Possible infiltration from tidal movement as the landfill site is below the high water mark.
- Rainfall infiltration.

Infiltration from tidal movement cannot be quantified. An assessment of tidal infiltration was made from two wells in Zones 2 and 3 in January 2004 and no link was found (8m well depth). This assessment was not carried out in Zone 1 so the possibility of tidal infiltration can't be ruled out here but observations from monitoring data indicate that Zone 1 is virtually dry with very little leachate produced.

The most significant factor limiting rainfall infiltration and resultant leachate production at Doora is the extent of capping in place at the facility. Prior to November 2008, there were varying depths of soil cover through the site. Trial pit investigations revealed that the majority of Zone 3 had a capping thickness of >1.5m. The southern part of Zone 3 had up to 6m of cover and in the northeast, the cover ranged from 3.5 to 5m. Less capping was in place in the older landfilled zones - Zones 1 and 2. Areas in each of these zones had between 0.5 and 2m of capping in place but there were sections with less than 0.5m of cover. Since November 2008, the required thickness of final capping material has been in place throughout the site and rainfall infiltration should now be minimal.

Based on the water balance calculations for the period (given in table 5.2), the theoretical minimum daily volume of leachate generated was 15.6m^3 and the maximum volume generated was 46m^3. This assumes that the level of rainfall infiltration ranges form 10% to 30%, depending on the level of capping in place.

7.0 Cumulative Annual Emissions to Groundwater

Leachate is the most significant emission to groundwater from the site. Monitoring results indicate that leachate is more likely to be discharging to ground than to surface waters. Theoretical leachate volumes are addressed in Sections 5 and 6 above. In summary, the theoretical leachate generation for 2010 ranged from 15.6m^3 to 46m^3 per day. The direction of groundwater flow is northeast to southwest across the site, towards the Fergus river. Existing information from investigations on Drumcliffe Springs in the same bedrock body, located approx 3.5km to the northwest of the landfill, indicate that there is no hydrological link between surface and groundwater bodies.

In the latter period of 2009, a dedicated leachate storage tank was commissioned, as planned under the remediation project. Off site tankering commenced in late 2009, and was ongoing throughout the year 2010.

8.0 Resource and energy consumption

8.1 Fuel usage

There was minimal fuel usage on site during 2010. Restoration work was completed in 2009, and the only use of machinery on site during 2010, related to maintenance of the site, in the form of grass cutting and similar landscaping related activities

8.2 Electrical usage:

The facility is a closed landfill site with no power-consuming equipment in use except for the landfill gas flare and the leachate abstraction pumps. Approximate data on electrical usage for the period is as follows:

Day Units: 4,714

Night Units: 2,285

8.3 Water usage

No full-time staff have been employed at the site since October 2004. Toilet facilities at the site have since been decommissioned, hence, there is no water usage for the period 2010.

9.0 Review of nuisance controls

9.1 Site Inspection

As Doora landfill is a closed facility, site inspections are no longer formally carried out. However Council staff visit the facility once per week at a minimum, to carry out surface water visual inspections and to measure gas and leachate levels. No nuisance was noted during these site visits.

9.2 Litter Control

Doora landfill is a closed facility. The most significant potential issue in relation to fresh litter would be fly tipping outside the site entrance. There was no incidence of fly tipping during this reporting period. Clare County Council personnel carry out informal litter audits as part of the weekly surface water visual inspection surveys. There were no litter problems noted.

9.3 Bird Control

No bird nuisance was observed by Council staff or reported to the Council by any other person during the reporting period. Since closure of the landfill and capping of the waste body birds have not been a problem.

9.4 Odour Control

No odours were observed by Council staff or by our monitoring consultants during this reporting period. The Council received no complaints of odours relating to Doora landfill during the period.

10.0 Environmental objectives and targets.

A copy of the Environmental Objectives and Targets is included in Appendix II.

11.0 Summary of procedures developed in 2010.

No new procedures were developed during this reporting period.

12.0 Incidents

One incident report was submitted to the Agency during this reporting period. Details are provided in Table 12.1 below:

Table 12.1: Summary of Incident Reports for the period.

Incident Report No.	***Details of Incident***	***Follow-up action taken***
Doora 10/01	*Noise limit exceeded at off site noise sensitive location S2, S3 & N4.*	*None considered necessary. Copy of noise survey included in 4th Quarter report. Primary cause of noise exceedence due to passing road traffic. Activities at facility not responsible.*

12.2 Complaints

No complaints were received during the reporting period.

13.0 Development works undertaken and proposed development of the facility with timescale

Restoration of the landfill completed in latter half 2009. As part of the facility restoration, the site has been developed for recreational purposes. The completed development includes two sports pitches (located in Zone 1). A new entrance has been constructed to the east of the existing entrance, giving access to a public car park. From the car park there is a pedestrian-only access to the sports pitches and to zones 2 and 3, where a network of landscaped scenic walks have been completed.

14.0 Annual and cumulative quantities of landfill gas

The volume of gas production at Doora Landfill was estimated using a computerised gas model called "LandGEM Version 3.20", which was developed by the US EPA.
based on weighbridge data for waste tonnage information from 1998 to 2001 and on estimated tonnages for the period prior to 1998. As part of the restoration and aftercare plan for Doora landfill, the Landgem gas generation model was run for the facility in August 2006, with each of the three zones addressed separately. Results from this model for 2010 are shown below in table 15.2:

Table 15.2: Results from Landgem Gas Model for 2010

Zone	Landfill Gas m^3/yr	Methane m^3/yr
1	$2.5X10^5$	$1.3X10^5$
2	$8.6X10^5$	$4.1X10^5$
3	$2.9X10^6$	$1.4X10^6$
Total	$4.01X10^6$	$1.94X10^6$

The final landfill gas production figures derived using the Landgem model were similar to the figures obtained using the 1st Order Decay method. The Landgem model is based on the original first order decay model. The additional information provided from running each zone separately under the Landgem model indicates, as would be expected, that practically all of the theoretical tonnage of landfill gas generated is coming from Zone 3.

15.0 Financial provisions, staffing and public information.

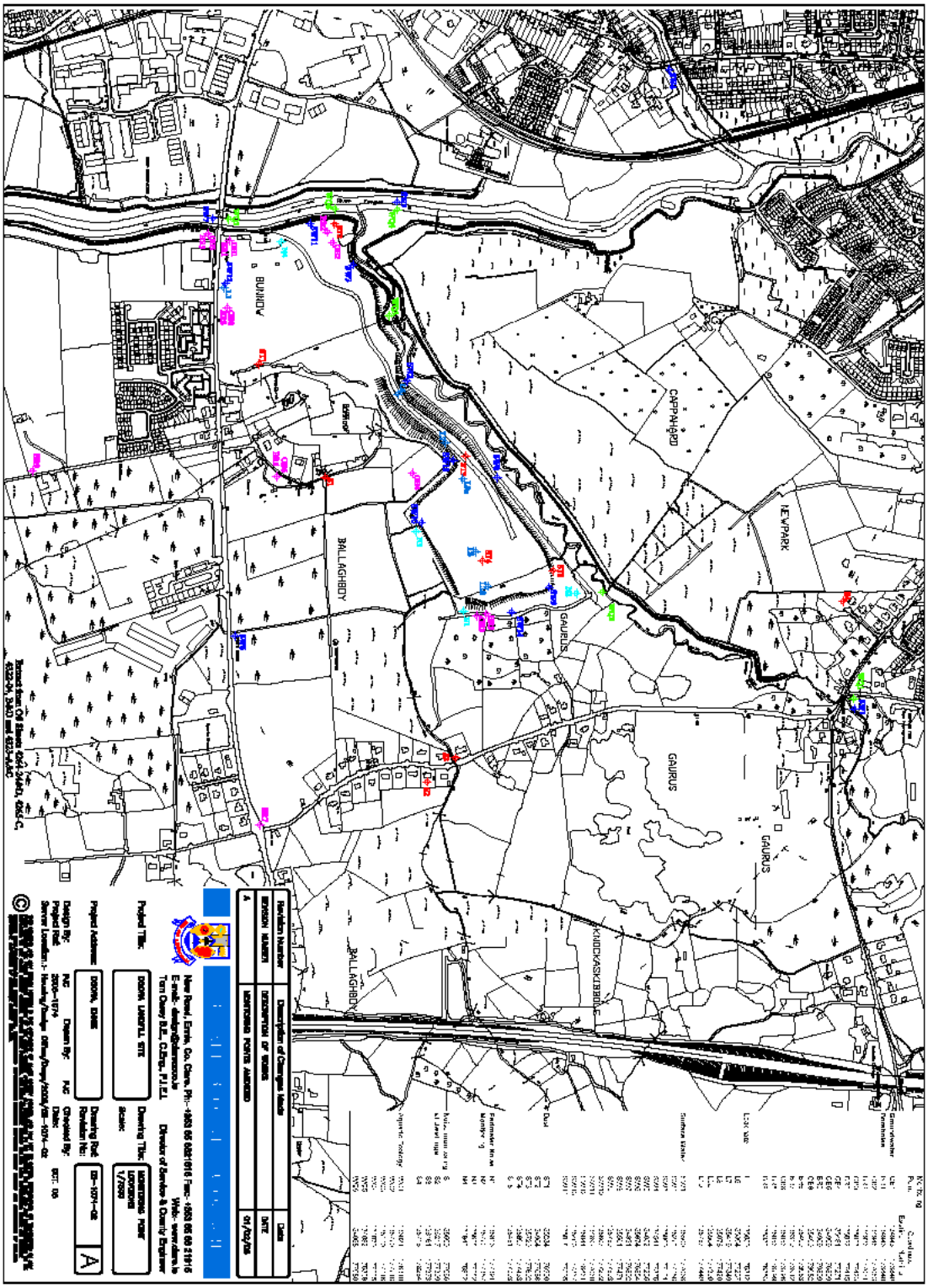
15.1 Budgetary allocations for the facility.

The maintenance budget for the facility for 2010 is €80,425. The cost of permanent restoration and landscaping is €1.3m.

15.2 Public Information.

Information relating to monitoring of the facility and correspondence to/from the EPA is available for inspection at the Environment Section of Clare County Council, Áras Contae An Chláir, New Road, Ennis, County Clare.

APPENDIX I


BURROW
BALLAGHBOY
CARRAHOD
NEWPARK
GAURUS
GAURUS
GAURUS
BALLAGHBOY
CHURCHASTOWN

APPENDIX II

DOORA LANDFILL

WASTE LICENCE

Ref W0031-01

ENVIRONMENTAL OBJECTIVES AND TARGETS

FOR PERIOD 2009-2010

Environmental Objectives and Targets

Objective 1

Comply with all aspects of the licence.

Target 1.1 - Every effort will be made to comply with all conditions of the waste licence by the prescribed dates.

The Senior Engineer, Executive Engineer and various contractors under the supervision of Clare County Council staff have responsibility for implementing this objective.

Performance against Target: - Waste licence requirements have been complied with in a timely manner on all occasions except on occasion in relation to quarterly reports where delay in receipt of reports from consultants resulted in a delay in submission of reports to the Agency.

Objective 2

Ensure that sufficient funds are available to comply with Condition 11 of the licence.

Responsibility for ensuring compliance with this objective lies with the Finance Officer of Clare County Council.

Performance against Target: Satisfactory**.**

Objective 3

Rehabilitate the closed landfill.

Target 3.1 – Ensure that the site is restored in accordance with a plan submitted to the EPA and ensure good aftercare.

The Senior Engineer, Environmental Services has responsibility for implementing this objective with the assistance of the Executive Engineer in charge and the Environmental Awareness Officer in the Environment Dept.

Performance against Target: On time. Restoration of the facility commenced in summer 2008 and is on target to be completed in August 2009.

Objective 4

Develop the closed Landfill site as an amenity for the public.

Target 4.1 – Restore the site to a green field site and develop playing pitches and facilities for the general public. These facilities to be developed by the year 2009.

The Executive Engineer in charge has responsibility for implementing this objective.

Performance against Target: Upon completion of remediation works two playing pitches and a series of public walkways will be assessable from a carpark facility on the site.

Objective 5

Improve correspondence with the E.P.A.

Target 5.1 - Council will make every effort to reply to letters of correspondence received from the Agency by the requested dates.

The Executive Engineer in charge and Senior Staff Officer have responsibility for implementing this objective.

Performance against Target: The Council has responded to EPA communications by prescribed dates

Objective 6

Continue monitoring of site for leachate and landfill gas

Performance against Target: The Council is in compliance with this objective on an ongoing basis. Upon completion of the remediation works improved gas and leachate infrastructure will have been installed on site.

Time scale

The time scale for achieving these objectives is generally outlined in the target description. The others are generally ongoing and the aim is to achieve progress before the next review of the E.M.P.

Designation of Responsibilities

The Senior Engineer, Environmental Services Section of Clare County Council has overall responsibility for the implementation of these objectives. The specific responsibilities for each objective are outlined in the description.

Responsibility for ensuring compliance with objective number 2 lies with the Finance Officer of Clare County Council.