

**Connaught Regional Residual Landfill
EPA Waste Licence W0178-02**

Annual Environmental Report

January 2013 - December 2013



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1 Introduction

Greenstar Holdings Ltd. was granted a Waste Licence (Reg.No.W0178-01) to construct and operate a landfill at Killagh More, Ballybaun, Ballintober, Ballinasloe, by the Environmental Protection Agency (Agency, EPA) on the 26th of July 2004. Following a review by the EPA a revised Waste Licence (Reg. No.W0178-02) was issued on the 23rd of March 2010. The facility has accepted waste since December 2005 at a rate of 100,000 tonnes per annum for disposal and up to 27,320 tonnes of engineering materials per annum for recovery purposes. To date approximately 820,000 tonnes of waste has been placed into 7 of the 9 constructed cells. The facility has not accepted any waste since March 2013.

The Environmental Protection Agency has exercised powers to enter the site under S.I. No. 547 of 2008 – European Communities (Environmental Liability) Regulations 2008 and have appointed Galway County Council and TOBIN Consulting Engineers as Agents and Authorised Officers on an emergency basis for the ongoing management of liabilities at the site. This decision arose from the decision of the receiver of the Greenstar group of companies to cease operating the facility with effect from May 2013.

The facility is situated in east County Galway, approximately 16km west of the town of Ballinasloe. The landfill is located in an area bounded to the north by the Athenry to Ballinasloe road (R348) with local roads immediately to the east and south; the L7442 and the L7439, respectively. A site location map is provided in Appendix A.

This report addresses Condition 11.11 of Waste Licence 178-02. Condition 11.11 states that:

11.9.1 – The licensee shall submit to the Agency for its agreement by 31st March each year, an Annual Environmental Report (AER) covering the previous year.

11.9.2 – The AER shall include as a minimum the information specified in Schedule G: Content of Annual Environmental Report of this licence and shall be prepared in accordance with any written relevant guidance issued by the Agency.

This report addresses the items listed in Schedule G: Content of Annual Environmental Report of the waste licence for the facility and the format follows guidelines set in the “Guidance Note for Annual Environmental Report” issued by the Environmental Protection Agency. Account is also taken of the AER Draft Guidance Document and AER Information Templates issued by the Agency in January 2013. This AER covers the reporting period from 1st January 2013 to the 31st December 2013.

2 Waste Activities & Records

2.1 WASTE ACTIVITIES CARRIED OUT AT THE FACILITY

The Connaught Regional Residual Landfill (CRRL) is a fully engineered and contained landfill site. It is licensed to accept 100,000 tonnes per annum of waste, as follows:

Table 2.1 Waste Acceptance Tonnages at CRRL – 2013

Waste Type	Maximum (Tonnes per Annum)
Household	45,000
Commercial	27,500
Industrial non-hazardous	24,500
Asbestos Waste	3,000
Total	100,000

Note: The tonnage of household waste, commercial waste and industrial non-hazardous waste may be altered with the prior agreement of the Agency provided that the total amount of all wastes accepted at the facility does not exceed the combined tonnage of 100,000 tonnes per annum **and the amount of asbestos does not exceed 3,000 tonnes per annum** (as specified in Table 2.1 above).

The facility is also licensed to accept 27,320 tonnes per annum of inert waste for recovery for the purposes of restoration and aftercare.

Waste activities at the facility are restricted to those outlined in Part 1 - Activities Licensed of the Waste Licence. Licensed waste disposal and recovery activities are summarised in Table 2.2 and Table 2.3 below.

Table 2.2 Licensed Waste Activities (Third Schedule of Waste Management Acts, 1996 - 2010)

Class 1	Deposit on, in or under land (including landfill): This activity is limited to the disposal of non-hazardous waste into lined cells.
Class 4	Surface impoundment, including placement of liquid or sludge discards into pits, ponds or lagoons: This activity is limited to the management of leachate and surface water at the facility.
Class 5	Specifically engineered landfill, including placement into discrete lined cells which are capped and isolated from one another and the environment: This is the principal activity. This activity is limited to the disposal of non-hazardous waste into lined cells.
Class 6	Biological treatment not referred to elsewhere in this Schedule which results in final compounds or mixtures which are disposed of by means of any activity referred to in paragraphs 1 to 10 of this Schedule: This activity is limited to potential future treatment of leachate at the facility
Class 13	Storage prior to submission of any activity referred to in a preceding paragraph of this Schedule, other than temporary storage, pending collection, on the premises where the waste concerned is produced: This activity is limited to the temporary storage of unacceptable wastes in the waste quarantine area prior to dispatch off-site to an alternative facility.

Table 2.3 Licensed Waste Recovery Activities (Fourth Schedule of the Waste Management Acts, 1996 - 2010)

Class 4	Recycling or reclamation of other inorganic materials: This activity is limited to the use of material reclaimed from construction and demolition waste for the purposes of fill, daily cover, road construction and other uses.
Class 11	Use of waste obtained from any activity referred to in a preceding paragraph of the Schedule: This activity is limited to the use of material reclaimed from construction and demolition waste for the purposes of fill, daily cover, road construction and other uses.
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 temporary storage prior to use of material reclaimed from construction and demolition waste for the purposes of fill, daily cover, road construction and other uses.

2.2 WASTE QUANTITIES AND COMPOSITION 2005 - 2013

The quantities and types of wastes accepted for disposal and recovery at CRRL between 2005 and 2013 are summarised in Table 2.4 below.

Table 2.4 Quantities of waste accepted, disposed of and recovered at CRRL from 2005 - 2013

Waste Type Disposed	Description	Total Accepted 2005 (tonnes)	Total Accepted 2006 (tonnes)	Total Accepted 2007 (tonnes)	Total Accepted 2008 (tonnes)	Total Accepted 2009 (tonnes)	Total Accepted 2010 (tonnes)	Total Accepted 2011 (tonnes)	Total Accepted 2012 (tonnes)	Total Accepted 2013 (tonnes)	Licence Limit (tonnes)
Household		-	44,221.00	46,733.69	66,578.41	61,470.22	43,023.80	50,796.08	42666.15	193.76	45,000
Commercial		-	27,024.00	27,494.63	30,730.16	35,500.04	54,983.70	47,346.73	51809.45	182.1	27,500
Industrial non-hazardous	Misc. Non-Hazardous Industrial solid wastes	-	27,023.00	27,402.73	999.52	2,667.85	3,729.90	4,236.37	11039.10	67	24,500
Asbestos		0	0	0	0	0	0	0	0	0	3,000
Total Waste Disposed		161.50	98,268.00	101,631.05	98,308.09	99,638.11	101,737.40	102,379.18	105,514.70	442.86	100,000
Waste Type Recovered	Description	Total Accepted 2005 (tonnes)	Total Accepted 2006 (tonnes)	Total Accepted 2007 (tonnes)	Total Accepted 2008 (tonnes)	Total Accepted 2009 (tonnes)	Total Accepted 2010 (tonnes)	Total Accepted 2011 (tonnes)	Total Accepted 2012 (tonnes)	Total Accepted 2013 (tonnes)	Licence Limit (tonnes)
Cover / Engineering Material	Shredded timber - reused on site	-	2,690	4,482.60	6,950.90	4,121.50	2,942.14	3,758.88	3582.58	-	-
Cover / Engineering Material	Recovered C&D Rubble reused on site	-	1,202	989.14	255.01	-	1,080.26	1584.78	69.96	-	-
Cover / Engineering Material	Soil and fine material reused on site for daily and intermediate cover and liner protection	-	14,538	23,692.17	6,711.11	803.32	2,800.92	2295.74	23,574.64	1778.36	-
Total Waste Recovered		-	18,430	29,163.91	13,917.02	4,924.82	6,823.32	7639.40	27,227.18	1778.36	27,320
Total Site Intake		-	116,698	130,794.96	112,225.11	104,562.93	108560.75	110018.58	132741.88	2221.22	127,320

2.3 CALCULATED REMAINING CAPACITY OF THE FACILITY

The remaining capacity of the landfill had been calculated to be 653,138 m³ at the end of 2012. It is estimated that the facility accepted 2,323m³ of waste in 2013. The remaining capacity of the facility at the end of 2013 has been calculated to be 650,815 m³.

2.4 METHODS OF DEPOSITION OF WASTE

Waste is delivered to the CRRL facility in heavy goods vehicles (HGVs) with the appropriate covers in place to prevent any loss of load. Each HGV passes over a weighbridge prior to proceeding to the active waste disposal area and the weight of the vehicle plus load is recorded. The weighbridge operator and/or facility manager may, at their discretion, request that the load be tipped in the Waste Inspection Area. Waste vehicles then proceed to the active waste disposal area where waste is deposited under the direction of a banks man.

Waste is deposited directly on a surface of waste close to and above the advancing tipping face. In accordance with Condition 5.3.1 of the Waste Licence, the active working face is confined to a height of 2.5 metres after compaction, a width of 25 metres and a slope no greater than 1 in 3. Deposited waste is spread in shallow layers on the inclined surface and compacted. The steel-wheeled compactor operates on the gradient of the more shallow face, pushing thin layers of wastes and applying compaction pressure to them. Light waste is mixed with heavier materials or covered with permeable soil drawn from stockpiles of heavy inert waste or fine sand stockpiles located on the site. Alternative fabric cover systems are also utilised as appropriate.

3 Report on Environmental Emissions

This summary report has been compiled in accordance with emission limit values (ELVs) for the following media as detailed in Condition 6 and Schedule C of the current Waste Licence.

- Dust
- Noise
- Landfill Gas
- Surface Water Discharge (measured at SW6 & SW7)
- E-PRTR

3.1 DUST EMISSIONS

Dust deposition Emission Limit Values as stipulated in Licence 178-02 are 350mg/m²/day.

Dust monitoring was conducted at five locations on a quarterly basis during the 2013 reporting period, as illustrated on Drawing 3588 – 1604 (see Appendix A). City Analysts Limited (Dublin) conducted

analysis on the dust deposition samples from the facility. Dust reports were included in all quarterly environmental monitoring reports issued to the Agency during 2013.

With the exception of location D5, dust monitoring results were below the required ELV (350 mg/m²/day) during all monitoring events in 2013. Dust deposition was 376.4mg/m²/day in Q1 at D5 and 466.3mg/m²/day in Q4 at D5. On both occasions, the majority of the dust deposited was of organic composition and the exceedance was attributed to falling leaves. Dust monitoring point D5 is located within a row of trees along the entrance road to the site.

3.2 NOISE EMISSIONS

Noise emission limit values as stipulated in Licence 178-02 are detailed in Table 3.1 below.

Table 3.1 Noise Emission

Day Db(A) LAeq (15 minutes)	Night dB(A) LAeq (15 minutes)
55	45

With the exception of Q2 2013, noise monitoring was conducted at five monitoring locations on a quarterly basis during 2013. Results from all noise monitoring events were issued to the Agency as part of the quarterly environmental monitoring reports for 2013.

During 2013, the measured noise levels were, for the majority of the time, within the ELV of 55 dB (A) (daytime) as set out in Schedule D of Waste Licence W0178-02. Exceedances and tones observed are summarized in the points below;

- Q1 exceedance of 55.5dB(A) at N3 and 69.5 dB(A) at N5 due to external factors not attributed to the site.
- Q4 exceedance of 57.1 dB(A) at N5. A tone of 100Hz observed at N3 attributed to activities on a nearby farm as the landfill was not audible at this location at the time of the survey.

3.3 LANDFILL GAS CONCENTRATIONS

Table 3.2 outlines landfill gas emission limit values as stipulated in Schedule C.2 of Waste Licence 178-02.

Table 3.2 Landfill Gas Concentrations

Methane	Carbon Dioxide
20% LEL (1% v/v)	1.5% v/v

3.3.1 LANDFILL GAS MONITORING WELLS

Methane concentrations exceeded the ELV in 5 no. monitoring wells during Q1 (LG5, LG9, LG11, LG21 and LG22), 5 no. monitoring wells during Q2 (LG5, LG9, LG11, LG19 and LG22), 5 no. during Q3 (LG5, LG9, LG11, LG19 and LG22) and 3 no. monitoring wells during Q4 (LG9, LG11 and LG22).

Carbon dioxide concentrations exceeded the ELV in 16 no. monitoring wells during Q1 (LG1, LG3, LG4, LG5, LG6, LG6-A, LG9, LG11, LG16, LG18, LG19, LG22, LG23, LG24, LG26 and LG28), 11 no. monitoring wells during Q2 (LG5, LG9, LG11, LG16, LG18, LG19, LG22, LG23, LG24, LG25, LG26 and LG28), 13 no. monitoring wells during Q3 (LG4, LG5, LG9, LG11, LG15, LG18, LG19, LG21, LG22, LG23, LG24, LG25, LG26 and LG28) and 10 no. monitoring wells during Q4 (LG1, LG5, LG9, LG11, LG16, LG18, LG19, LG22, LG23, LG24 and LG28). All exceedance were reported to the Agency in a landfill gas incident report after each monthly monitoring event.

Gas monitoring carried out by White Young & Green (WYG) at CRRL in December 2005, prior to waste acceptance at the facility, identified elevated CH₄ and CO₂ levels at several perimeter boreholes. Their report concluded that the source of elevated methane and/or carbon dioxide in perimeter gas monitoring wells is attributed to the continuous decay of organic peat.

3.3.2 LANDFILL GAS IN BUILDINGS

There were no instances of gas levels in Buildings/Offices breaching Landfill Gas Concentration limits specified in Schedule C.2 during 2013.

3.4 SURFACE WATER DISCHARGE LIMITS (MEASURED AT SW6 & SW7)

Surface water discharge emission limit values at monitoring locations SW6 and SW7 as stipulated in Schedule C.4 of Waste Licence 178-02 are detailed in Table 3.3 below.

Table 3.3 Surface Water Discharge Limits

Level (Suspended Solids mg/l)
35 mg/l

Suspended solids concentrations at SW6, SW7 complied with the 35mg/L ELVs during all monitoring events throughout 2013 with the exception of SW7, which was elevated in Q3 (163mg/l). On the day of sampling, the water level observed at locations SW1, SW3, SW4 and SW7 was extremely low. The elevated concentrations of Suspended solids were therefore attributed to disturbance of sediments while sampling in extremely low water levels. In Q4 2013, the water level was again extremely low at SW7 and no sample could be obtained. All exceedance and instances where sampling was not possible were reported to the EPA prior to the end of the relevant quarter.

3.5 E-PRTR

The European Pollutant Release and Transfer Register (E-PRTR) for the Connaught Regional Residual Landfill for 2013 are included in Appendix C.

4 Summary of Environmental Monitoring Results

Environmental Monitoring was conducted at the CRRL facility in accordance with Schedule D of the Waste Licence throughout the reporting period. All monitoring results from 2013 were presented to the Agency in the quarterly environmental monitoring reports and are summarised below. The locations of all environmental monitoring points are illustrated on Drawing 1322/01/01 in Appendix A.

4.1 BIOLOGICAL ASSESSMENT

4.1.1 ELECTROFISHING SURVEY

EirCo and Stillwaters Consultancy were commissioned to undertake an electro-fishing survey on selected sites (A, B, C, D, E and G) in the environs of the CRRL Landfill facility. Due to a bull present in a field, site E could not be surveyed in 2013. No fish were recorded at site B but this was likely due to inhibited access due to overgrown vegetation. The objective of the survey was to characterise fish populations in the streams within the vicinity of the landfill site.

The survey was carried out on the 28th of August 2013. The results were submitted to the Agency as part of the Q3 2013 Surface Water and Electrofishing environmental monitoring report, and are summarised below in Table 4.1 below.

While there is normal annual fluctuation in population numbers there are no major changes to species composition at these sites to indicate that the landfill area is impacting on them.

Table 4.1 Results of Electro Fishing Survey (2010-2013)

Site	Location	Site Description	Species Recorded 2010 ^(Note 1 & 2)	Species Recorded 2011 ^(Note 1 & 2)	Species Recorded 2012 ^(Note 1 & 2)	Species Recorded 2013 ^(Note 1 & 2)
A	M708297	Overgrown bog drain Peaty Substrate	Sticklebacks (p)	Sticklebacks (c) Gammarus (p)	Sticklebacks (c) Gammarus (p)	Stickleback (c)
B	M712302	Bog Drain ca. 1.5m deep, very overgrown	Sticklebacks (p)	Sticklebacks (c) Gammarus (p)	No fish recorded due to inhibited access	No fish recorded due to inhibited access
C	M707304	Shallow Stream ca. 5-10cm. Clean gravely substrate maintained by local farmer.	Sticklebacks (p) Gammarus (p)	Sticklebacks (pl) Gammarus (p) Crayfish (p)	Sticklebacks (pl) Trout 0+(p) Gammarus (p)	Stickleback (c) Crayfish (p)
D	M709309	Channel completely overgrown. Upstream Site Surveyed from 2008 on Site more open in 2010	Sticklebacks (pl)	Sticklebacks (p) Gammarus (p)	Sticklebacks (pl) Gammarus (p)	Stickleback (p)
E	M699313	Mainly silt with some rock. Channel overgrown except for stretch fish	Trout 1+ (p) Sticklebacks (p) Pike (p)	Trout 0+(p) Trout 1+ (p) Stoneloach (c) Stickleback (p)	Trout 1+(p) Stoneloach (p) Pike (p) Crayfish (p)	Not Fished
G	M682308	Shaded channel under bank cover. Good gravel and cobble substrate, Suitable salmonid habitat	Trout 0+(pl) Trout 1+ (c) Stoneloach (p) Sticklebacks (p) Crayfish (p) Pike (p)	Trout 0+(a) Trout 1+ (c) Stoneloach (p) Gudgeon (p) Eel (p) Crayfish (p)	Trout 0+(p) Trout 1+ (c) Stoneloach (p) Crayfish (p)	Trout 0+ (a) Trout 1+ (c) Stoneloach (c) Crayfish (p)

Note 1: (p) = Present, (c) = Common, (pl) = Plentiful, (a) = Abundant.

Note 2: **Trout 0+** = trout in their 1st year but not yet 1 year old, **Trout 1+** = trout in their 2nd year but not yet 2 years old.

4.1.2 SMALL STREAM RISK SCORE (SSRS) ASSESSMENT FOR CRRL 2013

Biological assessment of the surface water quality was carried out by Openfield Ecological Services at four locations along two streams at the Connaught Regional Residual Landfill at Ballybaun, Kilconnell, Co. Galway. Two locations are upstream of the landfill (IN1 and IN2) and two are located downstream of the landfill (IN3 and IN4). The information obtained was used to determine the SSRS, in accordance with the Western River Basin District Project's methodology (WRBD, 2005). As outlined in previous AER's, the SSRS assessment method replaced the EPA Q-Rating system undertaken historically at the site in 2010.

Table 4.2 SSRS Assessment Results

Sampling code	Small Stream Risk	Score Risk Assessment
IN1	1.6	At Risk
IN2	1.6	At Risk
IN3	1.6	At Risk
IN4	3.2	At Risk

The results of the 2013 assessment provided by the SSRS, which categorises each of the streams monitored as being, "At Risk", are consistent with the previous findings for the 2012, 2011 and 2010 monitoring events. It was noted that in general, visual conditions at each location had deteriorated since 2012. An abundance of sewage fungus was observed, as well as very low flow and excessive siltation. It is thought that these observations may be due to low levels of rainfall observed during the late summer of 2013, when compared the same period in previous years. The complete SSRS Report from Openfield Ecological Services was submitted as Appendix H of the Q4 report 2013.

4.2 SURFACE WATER MONITORING

Surface water monitoring was conducted at 6 no. monitoring locations (SW1, SW3, SW4, SW5, SW6 and SW7) during 2013. SW1, SW2, SW3 and SW7 are located up-stream of the landfill, which SW4 and SW5 are located downstream. SW6 is an outlet point from the surface water lagoon.

It should be noted that sampling was not carried out at SW2 during 2013 as it was dry during all four quarterly monitoring events. In addition sampling could not be carried out at SW1, SW3 or SW4 during the Q4 event in 2013 as they too were almost dry. Quarterly surface water samples were analysed for parameters stipulated in Schedule D.5 of Waste Licence 178-02 and results were forwarded to the Agency as part of the quarterly environmental monitoring reports Q1 – Q4 2013.

4.2.1 SURFACE WATER MONITORING RESULTS

Suspended solid concentrations were below the ELV (35mg/l) at SW6 and SW7 during all monitoring events in 2013, with the exception of SW7 (163mg/l) in Q3. Sampling in Q3 was carried out during an extended period of dry weather when the water level was extremely low. It is therefore likely that this exceedance was due to disturbance of the instream benthic sediments while sampling.

PH and conductivity results were found to be within normal ranges for natural uncontaminated surface waters. Chloride concentrations ranged from 10.53 mg/l (SW7 in Q3) to 24.02 mg/l (SW3 in Q1) during 2013. These results are within the normal range for uncontaminated freshwater (15-35mg/l, EPA). Ammoniacal nitrogen (total ammonium plus total ammonia) ranged between <0.01mg/l (SW7 in Q1) to 0.37mg/l (SW3 in Q3). Ammonia is generally present in natural waters, usually at very low concentrations. Concentrations of Ammoniacal nitrogen far in exceedance of 0.1 mg/l can be an

indication of contamination by sewage¹ however it can also be a result of mineralization of organic matter following the lowering of the water table in areas of peat².

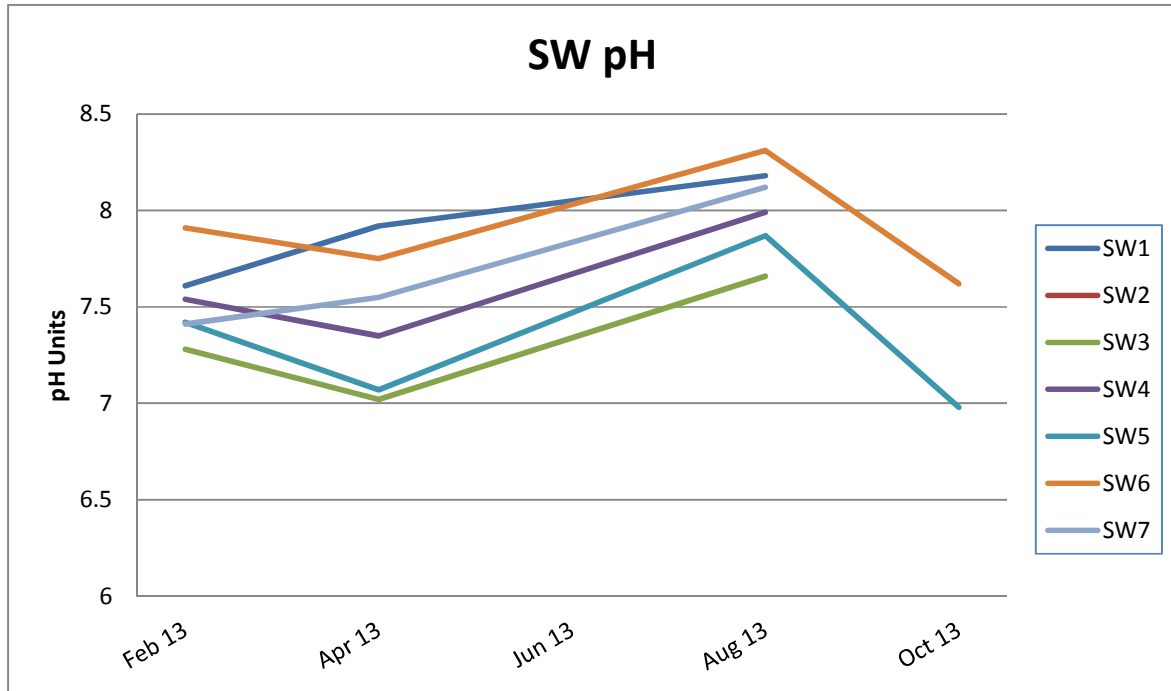


Figure 4.1 SW pH Results at CRRL 2013

Table 4.3 SW pH Results at CRRL 2013

pH Units (mg/l)	February	April	August	October
SW1	7.61	7.92	8.18	*
SW2*	*	*	*	*
SW3	7.28	7.02	7.66	*
SW4	7.54	7.35	7.99	*
SW5	7.42	7.07	7.87	6.98
SW6	7.91	7.75	8.31	7.62
SW7	7.41	7.55	8.12	*

*indicates sample could not be collected as monitoring point was too dry at the time of sampling.

¹ http://www.doeni.gov.uk/niea/water_report_web.pdf

² <http://agronomy.emu.ee/vol052/p5206.pdf>

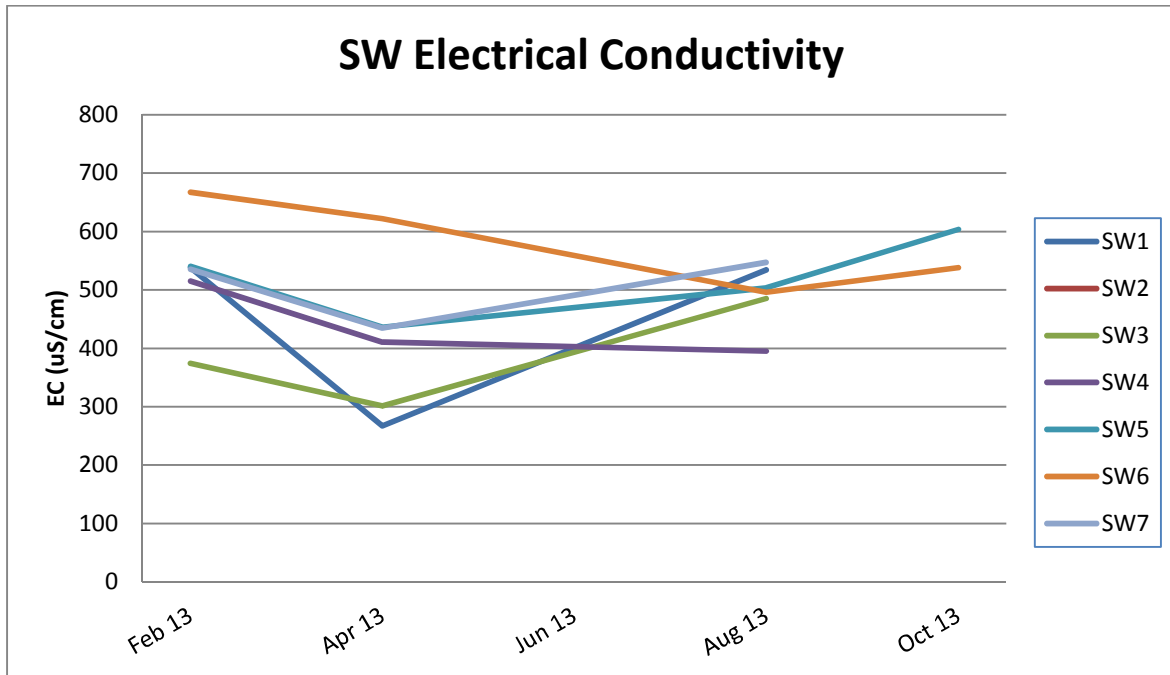


Figure 4.2 SW Conductivity Results at CRRL 2013

Table 4.4 SW Conductivity Results at CRRL 2013

Electrical Conductivity (mg/l)	February	April	August	October
SW1	537.7	266.9	534	*
SW2*	*	*	*	*
SW3	374.2	301.3	485	*
SW4	515.2	410.2	395	*
SW5	540.1	436	503	603.5
SW6	666.8	621.9	496	537.9
SW7	535	434.4	547	*

*indicates sample could not be collected as monitoring point was too dry at the time of sampling.

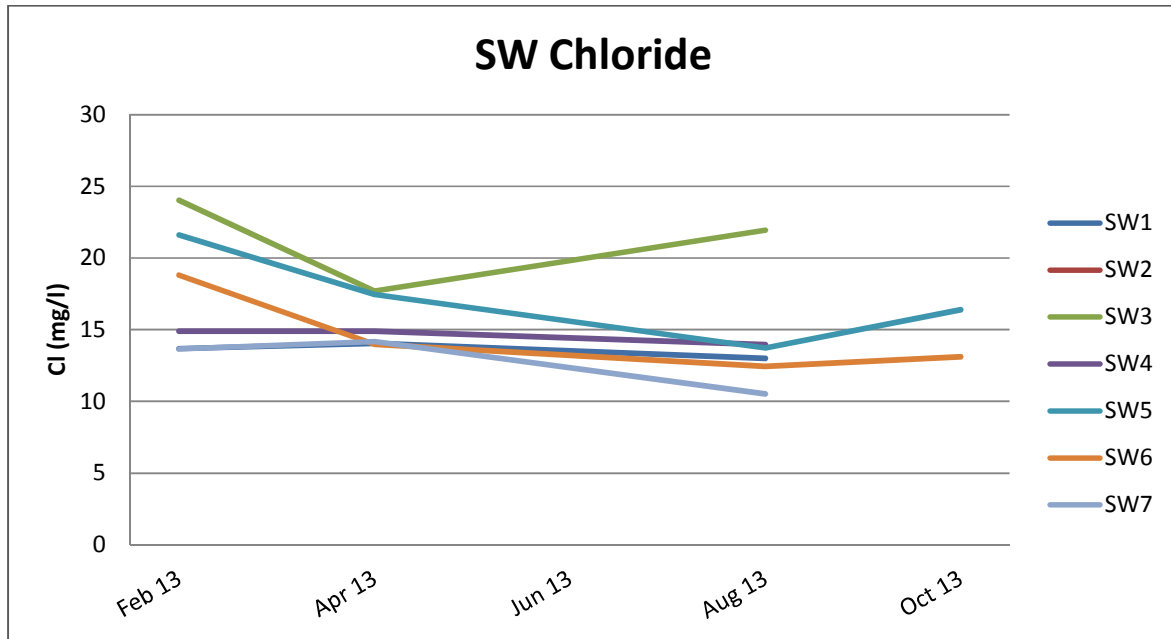


Figure 4.3 SW Chloride Results at CRRL 2013

Table 4.5 SW Chloride Results at CRRL 2013

Chloride (mg/l)	February	April	August	October
SW1	13.68	14.05	13.01	*
SW2*	*	*	*	*
SW3	24.02	17.69	21.93	*
SW4	14.9	14.89	13.96	*
SW5	21.61	17.46	13.72	16.39
SW6	18.81	13.98	12.45	13.11
SW7	13.66	14.18	10.53	*

*indicates sample could not be collected as monitoring point was too dry at the time of sampling.

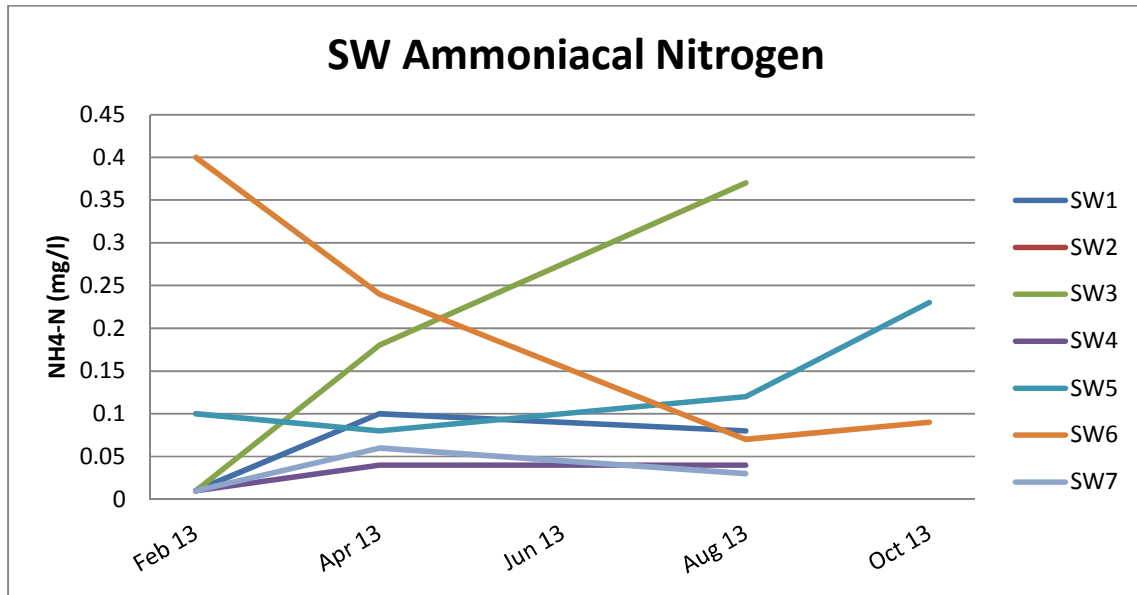


Figure 4.4 SW Ammoniacal Nitrogen Results at CRRL 2013

Table 4.6 SW Ammoniacal Nitrogen Results at CRRL 2013

Ammoniacal Nitrogen (mg/l)	February	April	August	October
SW1	<0.01	0.1	0.08	*
SW2*	*	*	*	*
SW3	<0.01	0.18	0.37	*
SW4	<0.01	0.04	0.04	*
SW5	0.1	0.08	0.12	0.23
SW6	0.4	0.24	0.07	0.09
SW7	<0.01	0.06	0.03	*

*indicates sample could not be collected as monitoring point was too dry at the time of sampling.

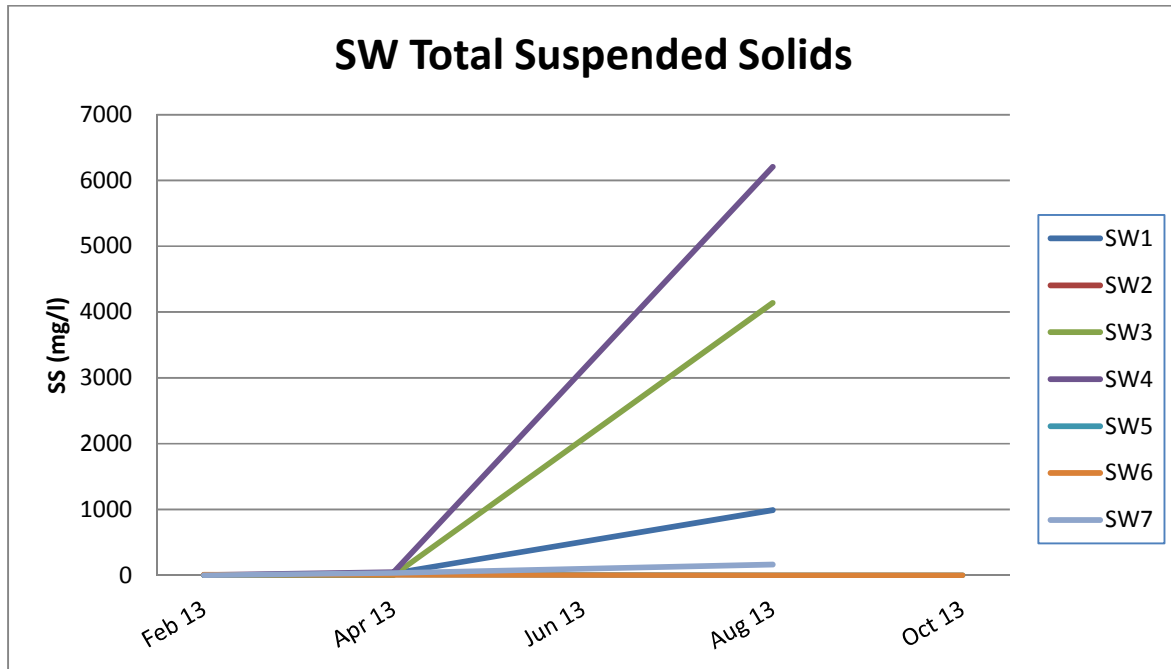


Figure 4.5 SW Total Suspended Solids Results at CRRL 2013

Table 4.7 SW Suspended Solids Results at CRRL 2013

Total Suspended Solids (mg/l)	February	April	August	October
SW1	<2	30	992	*
SW2*	*	*	*	*
SW3	<2	3	4140	*
SW4	6	50	6210	*
SW5	6	13	<2	2
SW6	10	6	4	3
SW7	4	34	163	*

*indicates sample could not be collected as monitoring point was too dry at the time of sampling.

4.3 GROUNDWATER MONITORING

Groundwater monitoring was conducted at eight locations during 2013, in accordance with Schedule D.1 and D.5 of Waste Licence 178-02.

The trigger levels for groundwater parameters are reviewed annually and were revised in 2008 (as presented in Table 4.8 below). These trigger levels were also used between 2008 and 2012. The Connaught Regional Residual Landfill requested Agency agreement of these trigger levels on 8th Dec 2009 in response to a related Agency audit observation. No response was received in relation to this. These trigger levels remain unchanged for the 2013 monitoring period.

In November 2011, the groundwater trigger levels were reviewed and a submission discussing these levels was lodged on behalf of the Connaught Regional Residual Landfill to the Agency following an EPA request for same. This was precipitated by a site inspection by the EPA on 09/09/2011. The Connaught Regional Residual Landfill is awaiting return correspondence in relation to the submission and therefore this report has continued to refer to the trigger values from the 2008-2012 AER as given in Table 4.8 below.

The results of routine licence compliance groundwater monitoring are all under the trigger values as revised and submitted in the 2008-2012 AERs. This AER report employs the aforementioned trigger levels for the parameters listed in Condition 6.4.3 of the Waste Licence for wells GW1-A, GW2, GW3, GW4-A, GW5-A, GW6, GW7 and GW8.

Table 4.8 Groundwater Trigger Values - 2013 Analyses as Revised in the 2008 AER

<i>Parameter</i>	<i>Units</i>	<i>GW1-A</i>	<i>GW2</i>	<i>GW3</i>	<i>GW4-A</i>	<i>GW5-A</i>	<i>GW6</i>	<i>GW7</i>	<i>GW8</i>
Potassium	mg/l	1.92	2.88	1.44	1.08	21.00	4.20	3.00	0.96
Sodium	mg/l	14.40	20.40	16.32	17.22	20.40	50.40	37.20	20.40
pH (lower limit)	pH Units	5.73	5.35	5.56	5.77	5.70	5.54	5.87	5.28
pH	pH Units	9.02	9.79	9.38	9.14	9.22	10.56	9.53	9.61
Chloride	mg/l	20.40	46.80	24.00	39.60	32.40	24.00	18.00	37.20
Ammoniacal Nitrogen	mg/l	1.92	6.36	5.40	3.60	8.52	7.44	2.40	3.72
TOC	mg/l	60.00	55.20	27.60	60.00	74.40	48.00	21.60	39.60

Groundwater levels were recorded on a monthly basis during 2013 and the results are presented in Figure 4.6 below. The recorded water levels remained relatively constant while allowing for seasonal variation during 2013.

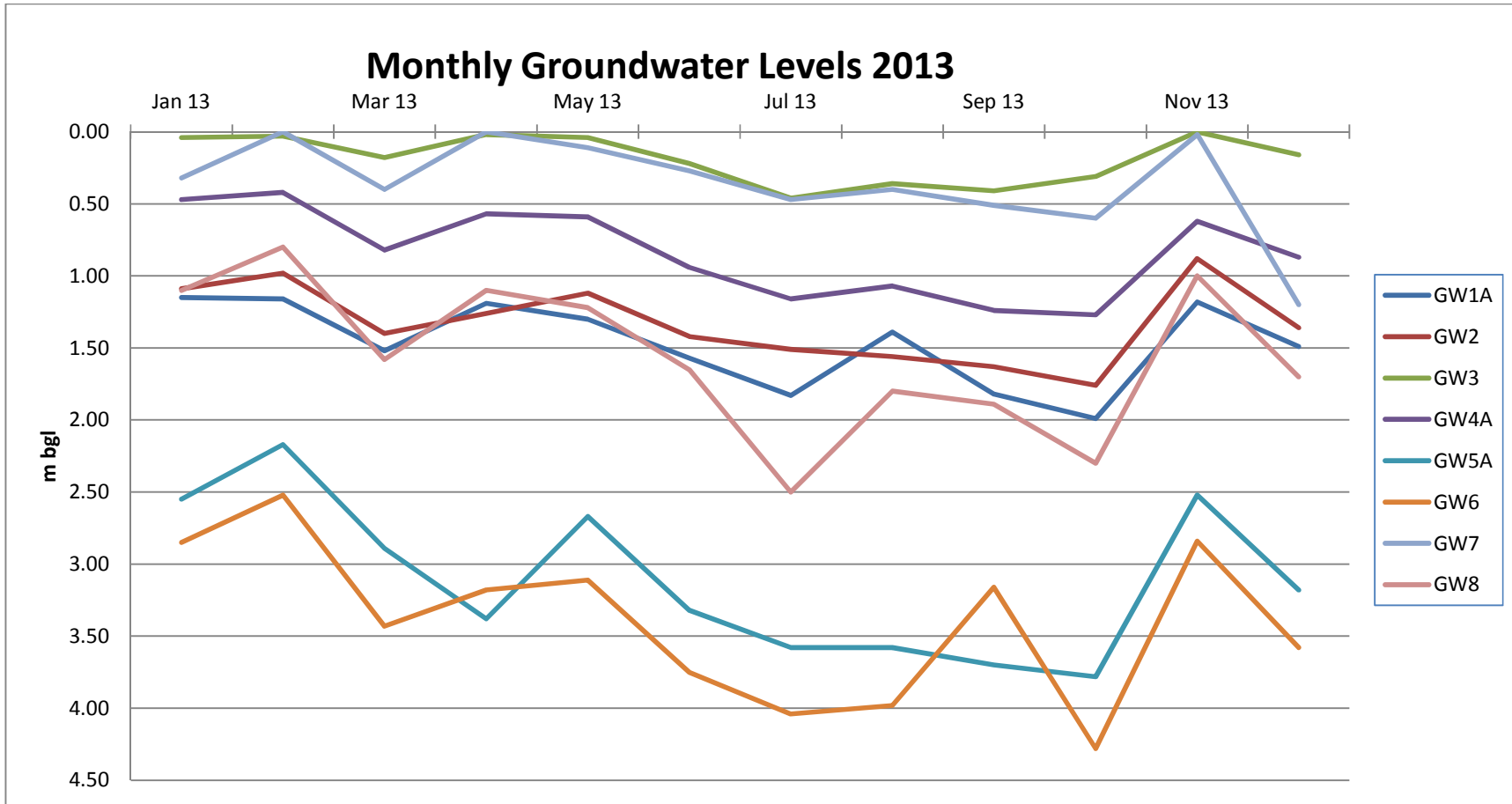


Figure 4.6 Monthly Groundwater Levels at CRRL – 2013

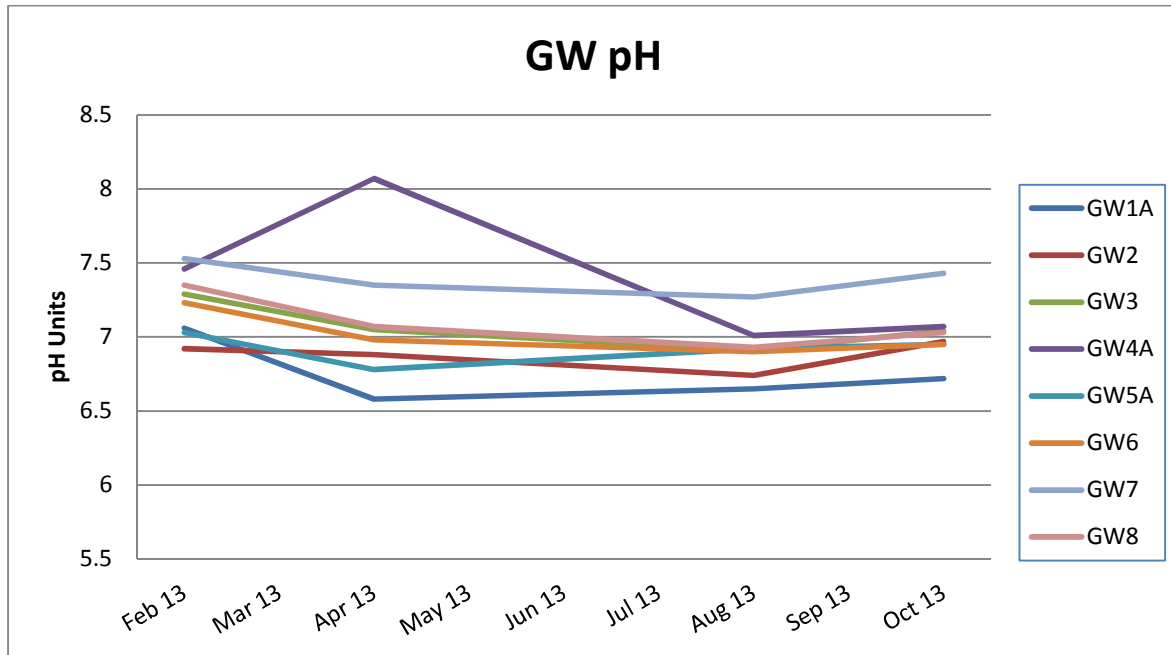


Figure 4.7 Groundwater pH Laboratory Results at CRRL – 2013

Table 4.9 Groundwater pH Laboratory Results at CRRL – 2013

pH (pH Units)	Trigger Values		February	April	August	October
	pH Lower Limit	pH Upper Limit				
GW 1 – A	5.73	9.02	7.06	6.58	6.65	6.72
GW 2	5.35	9.79	6.92	6.88	6.74	6.97
GW 3	5.56	9.38	7.29	7.05	6.91	7.04
GW 4 – A	5.77	9.14	7.46	8.07	7.01	7.07
GW 5 – A	5.70	9.22	7.03	6.78	6.92	6.95
GW 6	5.54	10.56	7.23	6.98	6.9	6.95
GW 7	5.87	9.53	7.53	7.35	7.27	7.43
GW 8	5.28	9.61	7.35	7.07	6.93	7.03

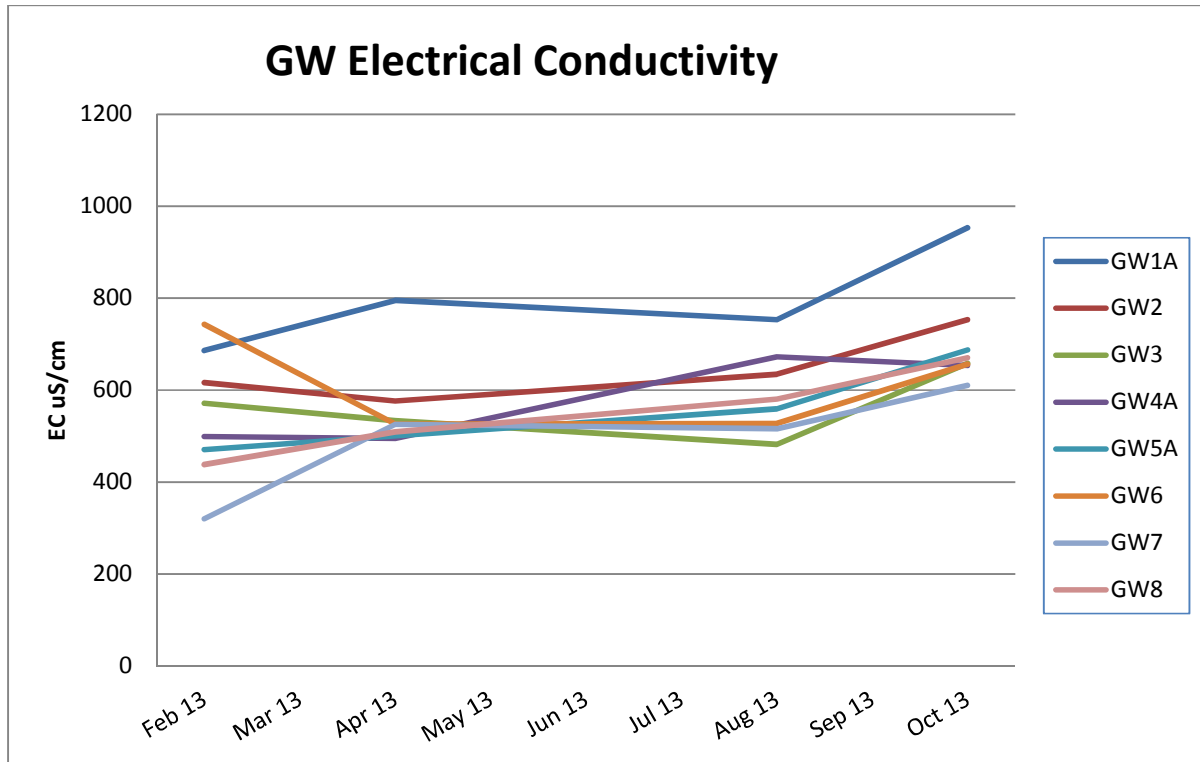


Figure 4.8 Groundwater Electrical Conductivity Results at CRRL – 2013

Table 4.10 Groundwater Electrical Conductivity Results at CRRL – 2013

Electrical Conductivity (uS/cm)	Trigger Values (Note 1)	February	April	August	October
GW 1 – A	-	686	795	753	953
GW 2	-	616	576	634	753
GW 3	-	571	533	482	658
GW 4 – A	-	499	495	672	653
GW 5 – A	-	470	500	559	687
GW 6	-	743	526	527	656
GW 7	-	320	525	516	610
GW 8	-	438	509	580	670

Note 1: No Set limit for electrical conductivity in groundwater trigger values.

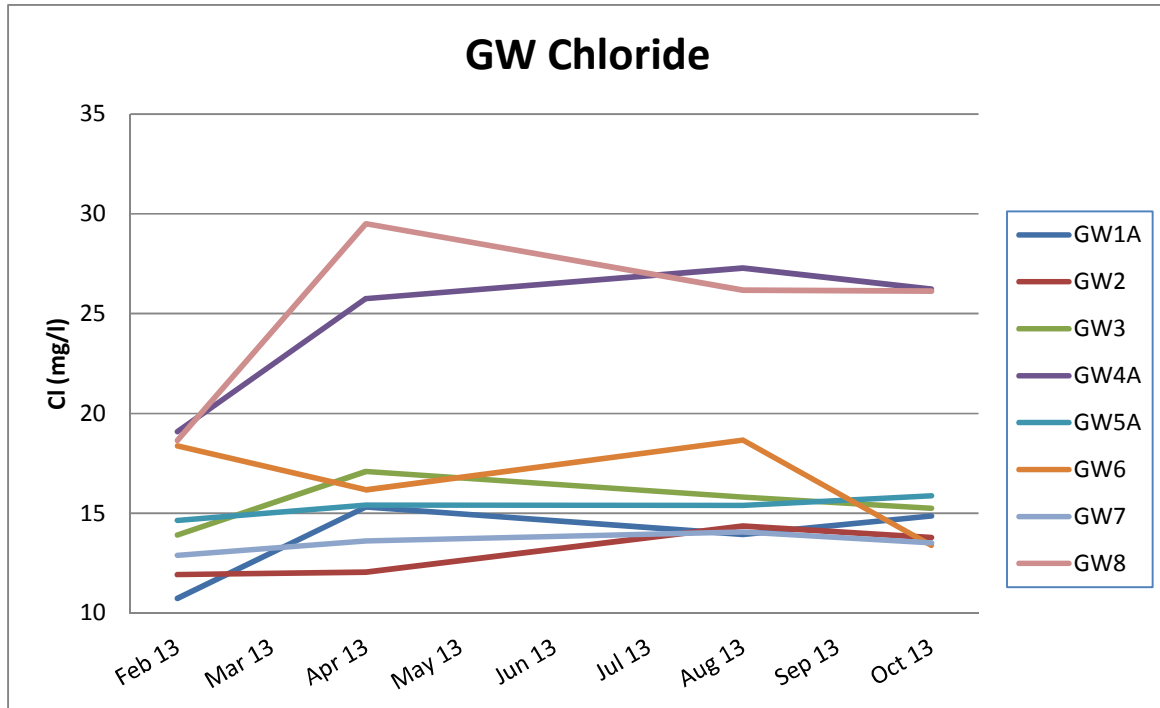


Figure 4.9 Groundwater Chloride Results at CRRL – 2013

Table 4.11 Groundwater Chloride Results at CRRL – 2013

Chloride (mg/l)	Trigger Values	February	April	August	October
GW 1 – A	20.4	10.74	15.31	13.94	14.86
GW 2	46.8	11.93	12.06	14.36	13.79
GW 3	24.0	13.91	17.1	15.82	15.26
GW 4 – A	39.6	19.1	25.76	27.28	26.22
GW 5 – A	32.4	14.64	15.41	15.39	15.88
GW 6	24.0	18.38	16.18	18.67	13.4
GW 7	18.0	12.9	13.62	14.07	13.52
GW 8	37.2	18.65	29.5	26.18	26.13

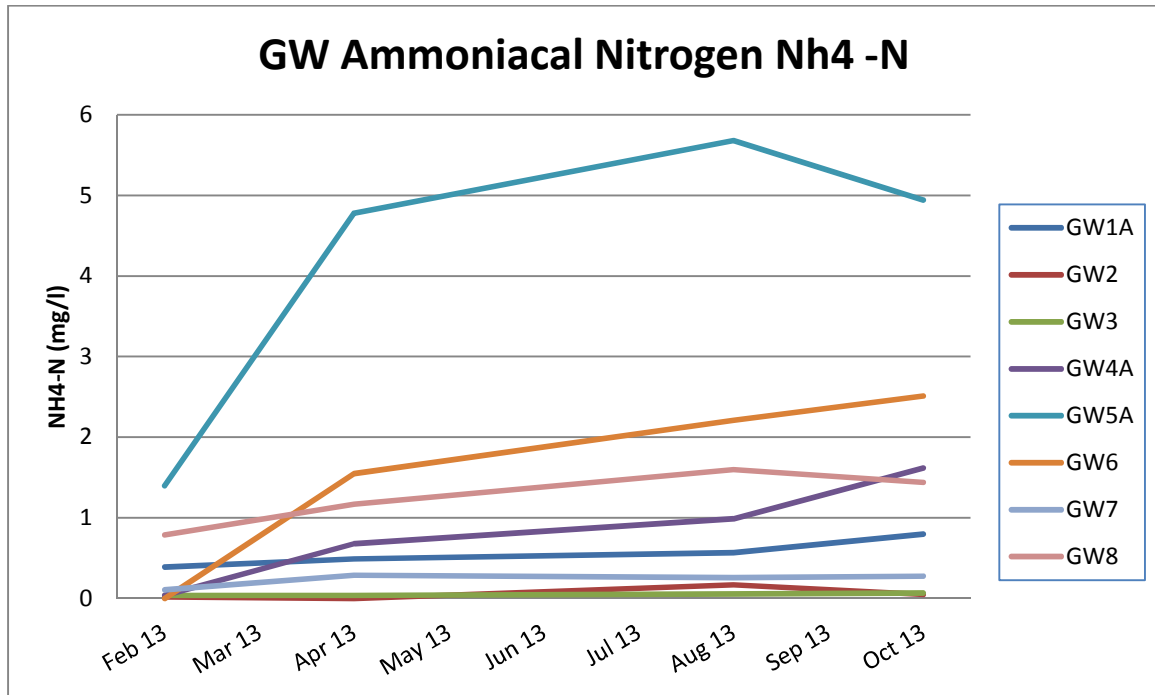


Figure 4.10 Groundwater Ammoniacal Nitrogen Results at CRRL – 2013

Table 4.12 Groundwater Ammoniacal Nitrogen Results at CRRL – 2013

Ammoniacal Nitrogen (mg/l)	Trigger Values	February	April	August	October
GW 1 – A	1.92	0.39	0.49	0.57	0.8
GW 2	6.36	0.02	<0.01	0.17	0.05
GW 3	5.40	0.04	0.04	0.06	0.07
GW 4 – A	3.60	0.04	0.68	0.99	1.62
GW 5 – A	8.52	1.4	4.78	5.68	4.94
GW 6	7.44	<0.01	1.55	2.21	2.51
GW 7	2.40	0.11	0.29	0.26	0.28
GW 8	3.72	0.79	1.17	1.6	1.44

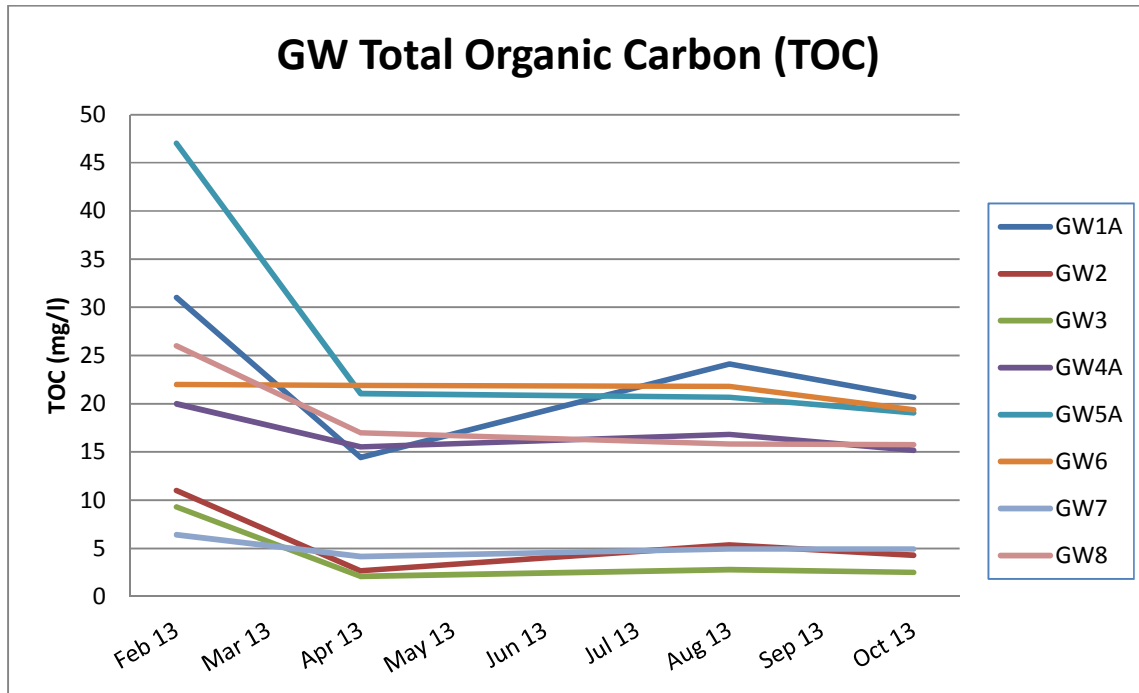


Figure 4.11 Groundwater TOC Results at CRRL – 2013

Table 4.13 Groundwater TOC Results at CRRL – 2013

TOC (mg/l)	Trigger Values	February	April	August	October
GW 1 – A	60.00	31	14.44	24.13	20.67
GW 2	55.20	11	2.65	5.34	4.27
GW 3	27.60	9.3	2.07	2.8	2.51
GW 4 – A	60.00	20	15.53	16.82	15.17
GW 5 – A	74.40	47	21.06	20.68	19.05
GW 6	48.00	22	21.91	21.8	19.38
GW 7	21.60	6.4	4.15	4.91	4.92
GW 8	39.60	26	16.97	15.83	15.75

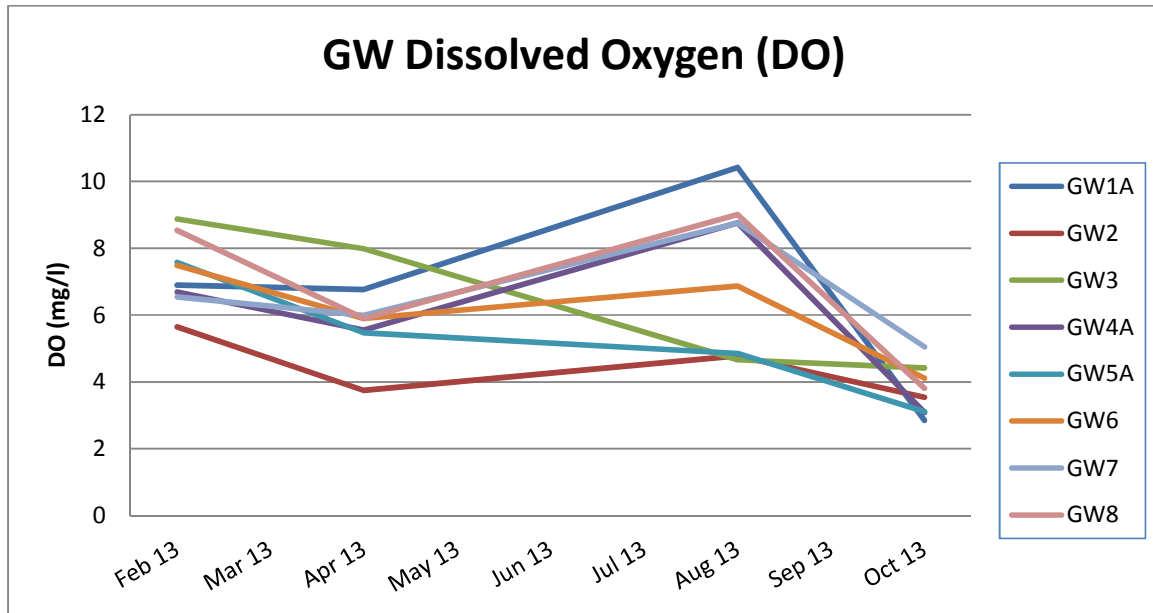


Figure 4.12 Groundwater Dissolved Oxygen Results at CRRL – 2013

Table 4.14 Groundwater Dissolved Oxygen Results at CRRL – 2013

DO (mg/l)	Trigger Values (Note 1)	February	April	August	October
GW 1 – A	-	6.9	6.77	10.42	2.85
GW 2	-	5.65	3.74	4.78	3.54
GW 3	-	8.87	7.99	4.66	4.42
GW 4 – A	-	6.69	5.55	8.76	3.08
GW 5 – A	-	7.58	5.47	4.85	3.11
GW 6	-	7.48	5.9	6.87	4.11
GW 7	-	6.54	5.99	8.75	5.05
GW 8	-	8.54	5.9	9.01	3.81

Note 1: No Set limit for dissolved oxygen in groundwater trigger values.

4.3.1 GROUNDWATER RESULTS SUMMARY

PH, Chloride, Ammoniacal Nitrogen and Total Organic Carbon concentrations were below their respective trigger values at all monitoring locations during 2013.

Conductivity measurements were typical of natural uncontaminated groundwater. Conductivity ranged from 320uS/cm to 953uS/cm during 2013.

Dissolved Oxygen concentrations ranged from 3.08mg/l to 10.42mg/l during 2013 and were consistent with previous recordings at the site.

4.4 DUST AND PM₁₀ MONITORING

4.4.1 DUST MONITORING

As discussed in Section 3.1 above dust monitoring was undertaken at 5(no.) locations (D1, D2, D3, D4, D5) in accordance with Schedule D.1 and D.3 of Waste Licence 178-02. With the exception of D5 in Q1 and Q4, dust concentrations were below the required ELV of 350mg/m²/day during all monitoring events in 2013. The majority of the dust collected in Q1 and Q4 was of organic composition; therefore exceedances were attributed to falling debris from trees in the vicinity. Dust results from 2013 are summarised in Table 4.15 below.

Table 4.15 Dust Monitoring Results 2013

Date out	Date in	D 1 (mg/m ² /day)	D 2 (mg/m ² /day)	D 3 (mg/m ² /day)	D 4 (mg/m ² /day)	D 5 (mg/m ² /day)
17/01/13	14/02/13	200.9	59.4	204.2	92.6	376.4
17/04/13	15/05/13	9.5	6.8	12.1	3.6	34.3
06/08/13	05/09/13	0.5	0.9	0.9	0.7	1.9
15/10/13	13/11/13	39.1	186.9	73.2	19.9	466.3

4.4.2

4.4.3 PM₁₀ MONITORING

With the exception of Q2, PM₁₀ monitoring was conducted quarterly at the facility in accordance with Schedule D of Waste Licence 178-02. The PM₁₀ monitoring locations are shown on Drawing 3588-1604, Appendix A. All of the PM₁₀ results were below the required limit level of 50ug/m³ during 2013. The PM₁₀ results for 2013 are summarised in Table 4.16 below.

Table 4.16 PM10 ($\mu\text{g}/\text{m}^3$) Monitoring Results for 2013

Monitoring Location	Q1 – 2013	Q3 – 2013	Q4 – 2013
	Average concentration value ($\mu\text{g}/\text{m}^3$)	Average concentration value ($\mu\text{g}/\text{m}^3$)	Average concentration value ($\mu\text{g}/\text{m}^3$)
Limit Value	50	50	50
D1	18	12	3
D2	16	8	2
D3	15	9	6
D4	12	13	7
D5	10	6	4

4.5 LEACHATE MONITORING

As per Schedule D.5 of Waste Licence 178-02 temperature readings from each of the leachate cells and the leachate holding tank (LHT) are required to be taken on a quarterly basis. Chemical analysis of the leachate was undertaken in August 2013 and submitted to the Agency as part of the Q3 environmental monitoring report.

4.5.1 LEACHATE RESULTS

Leachate temperature readings and annual chemical analysis results are summarised in Table 4.17 and Table 4.18 below.

Table 4.17 Leachate Temperatures at CRRL – 2013

Monitoring Location	Q3 2013 Temperature ($^{\circ}\text{C}$)	Q4 2013 Temperature ($^{\circ}\text{C}$)
Cell 1	15.7	15.1
Cell 2	18.3	19.5
Cell 3	20.2	23.2
Cell 4	23.0	22.7
Cell 5	19.3	17.9
Cell 6	20.4	24.2
Cell 7	21.8	22.1
Leachate Holding Tank (LHT)	16.6	13.8

* Leachate Temperature was not recorded in Q1 and Q2 2013.

Table 4.18 Annual Chemical Analysis of Leachate at CRRL – 2013

Parameter	Units	Cell 1	Cell 2	Cell 3	Cell 4	Cell 5	Cell 6	Cell 7	LHT
Ammoniacal Nitrogen	mg/l	1928.79	1416.66	1098.66	1522.45	2003.28	732.56	680.92	1081.02
BOD	mg/l	313	90	66	98	311	64	57	112
Boron	µg/l	3900.0	4940.0	2590.0	8670.0	6920.0	2590.0	2720.0	3780.0
Cadmium	mg/l	<0.125	<0.125	<0.125	<0.125	<0.125	<0.125	<0.125	<0.125
Calcium	mg/l	48.1	98.0	55.9	148.0	50.9	89.4	113.0	66.0
Chloride	mg/l	1344	1347.97	994	1759	2282	1312	1105.31	1347
Total Chromium	mg/l	0.2	0.2	<0.2	0.5	0.4	0.2	0.2	0.2
COD	mg/l	3100	1710	1460	3140	4940	1850	910	2390
Copper	mg/l	0.24	<0.2	<0.2	1.15	0.72	<0.2	<0.2	<0.2
Total cyanide	mg/l	<0.050	<0.050	<0.050	<0.050	0.083	<0.050	<0.050	<0.050
Fluoride	mg/l	0.5	0.3	0.3	0.6	0.9	0.7	0.2	0.5
Iron	mg/l	<1	<1	<1	3.07	3.61	<1	<1	1.18
Lead	mg/l	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Magnesium	mg/l	72.2	62.0	35.6	143.0	58.4	57.1	32.5	43.9
Mercury	mg/l	<0.0100	<0.0100	<0.0100	<0.0100	<0.0100	<0.0100	<0.0100	<0.0100
Nickel	mg/l	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Ortho-phosphate as P	mg/l	12.1	10.9	10.9	15.9	18.4	6.8	13.6	9.9
Potassium	mg/l	712.0	684.0	425.0	1490.0	971.0	528.0	539.0	557.0
Sodium	mg/l	1320.0	1300.0	711.0	2640.0	1710.0	903.0	831.0	645.0
Sulphate	mg/l	365.4	136.6	131.1	333.1	579.9	121.4	245.9	181.5
TON as N	mg/l	13.06	8.63	8.52	8.04	7.91	8.12	8.11	8.65
Zinc	mg/l	<0.2	<0.2	<0.2	0.31	0.43	<0.2	<0.2	<0.2

4.6 NOISE MONITORING

With the exception of Q2 2013, noise monitoring was carried out on a quarterly basis at 5 no. monitoring locations, as indicated on Drawing No. 3588 – 1604 (see Appendix A). All noise monitoring results were submitted to the Agency as part of the quarterly environmental monitoring reports for 2013. Results for noise monitoring conducted at the facility on a quarterly basis during 2013 are summarised in Table 4.19 below. All noise monitoring locations had LAeq values less than the required ELV of 55dB LAeq during 2013, with the exception of N5 during Quarters 1 and 4 and N3 during Quarter 1. However these exceedance were attributable to farming activities and passing traffic on the R348 and not attributable to facility operations.

Table 4.19 Noise Monitoring Results at CRRL – 2013

Location	Q1 2013				Q3 2013				Q4 2013			
	14/02/13 Time	LAeq dB(A)	LA10 dB(A)	LA90 dB(A)	25/09/13 Time	LAeq dB(A)	LA10 dB(A)	LA90 dB(A)	15/10/13 Time	LAeq dB(A)	LA10 dB(A)	LA90 dB(A)
	N1*	10.35	50	52.1	38.3	13:16	32.5	34.18	30.21	13:16	40	40.27
N2	11.20	48.1	48.6	38.7	14:00	31.6	31.9	30.13	14:00	34.6	35.91	30.50
N3*	13.50	55.5	59.1	41.1	16:00	45.6	40.16	30.29	16:00	34	33.24	31.12
N4	9.00	39.9	41.4	34.9	14:45	31.1	31.43	30.23	14:45	32.8	32.91	30.61
N5*	13.10	69.5	68.7	42.3	15:30	54.3	50.44	30.25	15:30	57.1	52.82	30.37

*Noise Sensitive Receptor

5 Resource and Energy Consumption Summary

The main resources consumed at the facility during the reporting period were electricity, water for potable supply & vehicle wheel cleaning and diesel. The details are listed in Table 5.1 below.

Electricity consumption for 2013 was 26,784kWhr. This is due largely to the operation of a gas utilisation plant (engine) on site which generated a substantial percentage of the sites electrical demand for 2013. It represents an increase of 11.9% on the amount consumed in 2012 and a decrease of 7.7% on the amount consumed in 2011.

Total diesel consumption decreased by 91% from 2012. This is due to the fact that the facility only accepted waste for a few days in early 2013.

Total water consumption decreased by 54% from 2012. This is largely as a result of significant site works to identify and fix any leaks on the supply line within the site. Water for dust suppression is obtained from the surface water lagoon and drains back into the surface water lagoon. It is therefore being reused and is not consumed. Water used in the wheel wash was significantly reduced as waste was not being accepted.

No Terram, imported aggregates or soil materials from site stockpiles were used as waste was not being accepted.

Table 5.1: Energy and Resource Use 2013

Resource	2013 Consumption	2012 Consumption
Electricity(kWhr)	26,784	23,940
Water, Potable Supply (Litres)	370,919	678,291
Water, Dust suppression (Litres)	0.0	0.0
Water, Wheelwash (Litres)	10,000	150,000
Total Water (Litres)	380,919	828,291
Diesel (Including Contractor Plant) (Litres)	11,555	134,509
Hydraulic & Engine Oils (Litres)	0	409
Petrol (Litres)	184	281
Grease (kg)	0	25
Terram for road base (m2)	0	14400
Imported Aggregates (Tonnes)	0	6,208
Soil materials from site stockpiles (Tonnes)	0	13,059

6 Development and Restoration Works

6.1 DEVELOPMENT WORKS UNDERTAKEN IN 2013

The following development works were carried out during 2013:

- The Installation of 6 Horizontal gas collection wells in cells 2 & 3.
- The Installation of 15,500m² of temporary impermeable gas barrier in cells 2 & 3.

6.2 DEVELOPMENT WORKS TO BE UNDERTAKEN IN 2014

The following development works are planned to be undertaken in 2014:

- Continued Installation of temporary impermeable gas barrier on parts of the landfill which do not have a temporary cap.

6.3 RESTORATION OF COMPLETED CELLS/PHASES

The Landfill facility has accepted waste from December 2005 until March 2013 at a rate of 100,000 tonnes per annum for disposal and up to 27,320 tonnes of engineering materials per annum for recovery purposes. To date approximately 820,000 tonnes of waste has been placed into 7 of the 9 constructed cells. Cell 1 and a portion of Cell 2 has been permanently capped with LLDPE liner and a drainage/protective geotextile. The majority of Cells 2 to 7 have been capped with a temporary impermeable membrane while Cells 8 & 9 have been constructed but have not accepted waste. Table 6.1 below summarises the capping status of the landfill at the end of the reporting period.

Table 6.1 Capping Status of the Landfill

Landfill Capping Status	Area m ²
Permanent capping with LLDPE and drainage/protective geotextile	22,000
Temporary Impermeable membrane	49,500
Area without capping (either temporary or permanent)	5,500
Total Landfill Plan Area (Cells 1 to 7)	77,000

7 Volume of Leachate Transported/Discharged Off Site

Volumes of leachate tankered off site on a monthly basis are summarised in Table 7.1 below.

Table 7.1 Volume of Leachate Transported Off Site

2012 (Month)	Leachate Consigned Off Site (m ³)
January	4,212.64
February	4,682.62
March	3,992.96
April	2,176.34
May	402.88
June	1,376.66
July	2,540.62
August	2,238.79
September	2,367.86
October	2,809.68
November	5,828.44
December	1,911.30
Total	34,540.79

8 Landfill Gas

Tables 8.1 to 8.4 below present the annual cumulative quantity of landfill gas captured, flared and utilised at the facility during 2013.

Table 8.1 Landfill Gas collected in 2013 – 2000 Haase Flare

Flare No. 1 Connaught 1							
Model: Haase		Type: HTN 2000 Enclosed			Commisioned: Apr-08		
2013 Monthly	Average Flow	Average CH ₄	Average CO ₂	Average O ₂	Combustion	Total CH ₄	Total CH ₄
	Rate (m ³ /hr)	%v/v	%v/v	%v/v	Efficiency (%)	m ³	kgs
January	352	40.30	24.70	1.50	99.9	105,435	67,984
February	330	39.20	24.50	1.60	99.9	86,843	56,055
March	326	40.50	25.00	1.50	99.9	98,132	63,342
April	342	39.10	22.80	1.80	99.9	96,184	62,150
May	366	42.60	26.10	1.40	99.9	115,886	74,880
June	389	43.30	26.60	1.60	99.9	121,153	78,284
July	436	41.80	26.00	1.50	99.9	135,457	87,526
August	401	41.30	24.60	1.30	99.9	123,093	79,537
September	458	40.10	25.90	1.10	99.9	132,102	85,358
October	397	40.60	26.30	1.00	99.9	119,799	77,328
November	360	39.70	24.30	1.30	99.9	102,799	66,425
December	222	43.60	29.20	1.30	99.9	71,941	46,485
Total						1,308,824	845,355

Table 8.2 Landfill Gas collected in 2013 – HTN 2000 Enclosed

Flare No. 2 Connaught 2							
Model: Haase		Type: HTN 2000 Enclosed			Commisioned: Jan-09		
2013 Monthly	Average Flow	Average CH ₄	Average CO ₂	Average O ₂	Combustion	Total CH ₄	Total CH ₄
	Rate (m ³ /hr)	%v/v	%v/v	%v/v	Efficiency (%)	m ³	kgs
January	1008	32.10	26.60	6.10	99.9	240,494	156,052
February	979	29.90	24.30	7.20	99.9	196,512	126,978
March	1053	28.80	22.60	8.20	99.9	225,403	145,646
April	912	27.20	21.80	8.00	99.9	178,427	115,535
May	851	25.80	20.30	8.60	99.9	163,188	105,890
June	1147	28.60	22.60	8.20	99.9	235,954	154,071
July	1031	32.20	27.00	4.70	99.9	246,748	160,951
August	1126	30.30	25.10	6.00	99.9	253,583	165,582
September	1160	28.10	23.60	6.60	99.9	234,457	152,934
October	1099	27.20	22.70	7.20	99.9	222,180	145,077
November	975	25.60	21.30	7.90	99.9	179,532	117,229
December	895	25.30	21.70	7.60	99.9	168,299	110,009
Total						2,544,776	1,655,954

Table 8.3 Landfill Gas collected in 2013 – Uniflare

Flare No. 3 Connaught 3							
Model: Uniflare	Type: 1000 Enclosed				Commissioned: Jun-10		
2013 Monthly	Average Flow	Average CH ₄	Average CO ₂	Average O ₂	Combustion	Total CH ₄	Total CH ₄
	Rate (m ³ /hr)	%v/v	%v/v	%v/v	Efficiency (%)	m ³	kgs
January	934	30.10	26.10	6.60	99.9	208,955	135,302
February	924	28.20	24.00	7.00	99.9	174,927	113,268
March	984	25.50	21.50	8.40	99.9	186,498	120,507
April	849	23.30	20.00	8.70	99.9	142,286	91,939
May	798	23.50	19.70	8.90	99.9	139,383	90,348
June							
July							
August							
September							
October							
November							
December							
Total					99.9	852,048	551,365

Table 8.4 Landfill Gas collected in 2013 – Engine No. 1

Engine No. 1							
Model: Deutz	Type: TGB 620 V16				Commissioned: Oct-10		
2013 Annual	Average Flow	Average CH ₄	Average CO ₂	Average O ₂	Combustion	Total CH ₄	Total CH ₄
	Rate (m ³ /hr)	%v/v	%v/v	%v/v	Efficiency (%)	m ³	kgs
2013 Annual	620	41.00	25.50	1.40	99.2	2,071,799	1,261,061
Total						2,071,799	1,261,061

9 Indirect Emissions to Groundwater

CRRL is a fully engineered and contained landfill and there are no indirect emissions to groundwater from the facility.

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

Landfill Base:	The landfill site has a composite base lining system comprising a HDPE geomembrane and a 0.5 m thick layer of compacted Bentonite Enhanced Soil. A leak detection survey of the HDPE geomembrane after placement of the drainage stone layer was completed and defects to the HDPE liner were repaired in accordance with industry standards. A CQA report was then completed and submitted to the agency.
Surface Water Collection and Treatment System:	Surface water from the paved access roads and landfill cell swale drain is collected and discharged into the surface water lagoon along with groundwater collected at the interceptor sump located below the landfill cells. Water from the lagoon is then piped to a reed bed, which further filters the water before it is finally discharged into the nearby stream.
Treated Sewage Effluent:	There is a BioCycle wastewater treatment plant located adjacent to the weighbridge which treats the canteen and office wastewater prior to being pumped to the leachate holding tank via the foul water sump. Leachate (containing foul water) is tankered off-site to a waste water treatment plant via a vacuum tanker.

10 Annual Water Balance

10.1 ESTIMATED LIQUID IN-WASTE LIQUID VOLUME

The estimated liquid in-waste liquid volume for 2013 was assessed using rainfall figures obtained from the on-site meteorological station, potential in-waste liquid volume and the assumed absorption capacity of the waste mass (see Table 10.1 below).

Table 10.1 Estimated Liquid In-Waste Liquid Volume

2013	Total uncapped area (Note 1)	Rainfall (Note 2)	Potential in waste liquid volume	Absorption capacity of Waste (assumed to be 2%)	Balance	Leachate Tankered off site (Note 3)
	(m ²)	(m)	(m ³)	(m ³)	(m ³)	(m ³)
January	27600	0.1302	3593.52	71.87	3521.65	4212.64
February	27600	0.0568	1567.68	31.35	1536.33	4682.62
March	20975	0.0610	1279.48	25.59	1253.89	3992.96
April	14895	0.1100	1638.30	32.77	1605.54	2176.34
May	12600	0.1110	1398.60	27.97	1370.63	402.88
June	12600	0.0664	836.64	16.73	819.91	1376.66
July	12600	0.0630	793.80	15.88	777.92	2540.62
August	12600	0.0612	771.12	15.42	755.70	2238.79
September	12600	0.0426	536.63	10.73	525.90	2367.86
October	12600	0.1246	1569.96	31.40	1538.56	2809.68
November	12600	0.0493	621.18	12.42	608.76	5828.44
December	12600	0.2214	2789.64	55.79	2733.85	1911.30
		1.0975	17396.55	347.93	17048.62	34540.79

Note 1: For the purposes of water balance calculation 'Uncapped Area' = area of landfill which is not under an intermediate cap of impermeable synthetic material preventing ingress of rainfall.

Note 2: Rainfall values obtained from on-site meteorological station.

Note 3: The total volume of leachate tankered off site also includes:

- Office and weighbridge foulwater;
- Run-off from within bunded areas and wheelwash;
- Condensate/leachate removed from the landfill gas collection system;
- Moisture content held in waste received and cover materials used.

11 Facility Management

11.1 NEW PROCEDURES DEVELOPED DURING 2013

The following is a description of the operating procedures for this facility developed during the reporting period:

TOB EG 10 – Out of Hours Access to CRRL – Tobin Personnel

This procedure outlines the protocol to be followed by Tobin personnel to gain 'Out of Hours' Access to this facility.

TOB EG 20 – Relocating Submersible Pump at Leachate Storage Lagoon

This procedure outlines the methodology and safe practice to be employed when periodically relocating the submersible pump on floating LLDPE cover of Leachate storage lagoon.

TOB EG 21 – Arc Welding

This procedure outlines the methodology and safe practice to be employed for use of Arc welder and associated equipment for carrying out repair work.

There were also a number of operating procedures revised during the reporting period which are also available on file at the facility.

11.2 SITE TESTING AND INSPECTION REPORTS

As per Schedule E of the waste licence, the integrity of the bunds and tanks are carried out every three years. This was last carried out in 2011 and the results were provided in the 2011 AER.

11.3 TOPOGRAPHICAL SURVEY

As per condition 8.7 of the waste licence, a survey showing the topography of the facility at the end of the reporting period is included in Appendix B.

11.4 REPORTED INCIDENTS AND COMPLAINTS SUMMARY

11.4.1 REPORTED INCIDENTS

As was the case in 2012, the majority of incidents reported to the Agency during 2013 were in relation to methane and carbon dioxide detected in the gas migration monitoring boreholes. Concentrations of these gases exceeded the limits set out in Waste Licence 178-02.

Previous monitoring at CRRL was carried out by White Young & Green (WYG) on the 6th and 13th of December 2005, prior to the facility accepting waste. These two rounds of landfill gas monitoring identified elevated CH₄ gas levels at LG14, LG16 and LG18 and elevated CO₂ levels at monitoring locations LG6, LG6-A, LG9, LG10, LG14, LG16 and LG18.

The report on LFG monitoring carried out by WYG in December 2005 concluded the slightly high levels of CH₄ and CO₂ could be attributed to the large quantities of peat deposited in the area where the monitoring wells are located. A literature search carried out for that report demonstrated that the levels of carbon dioxide and methane measured in the landfill gas monitoring wells could be attributed to the natural background levels from the continuous decay of organic peat. A summary of the reported incidents is presented in Table 11.1 below.

Table 11.1 Summary of Incidents at CRRL – 2013

Incident Reference No.	Date	Description	Action
I13/01	17/01/2013	Elevated CH ₄ & CO ₂ level in landfill gas monitoring boreholes	Incident Report Submitted. Previous monitoring carried out by White Young Green on the 6 th and 13 th December 2005 prior to facility accepting waste. These two monitoring events identified elevated methane gas levels at LG14, LG16 & LG18. Elevated CO ₂ at locations LG6, LG6a, LG9, LG10, LG14, LG16 & LG18. The Report concluded that elevated levels of Methane and Carbon Dioxide could be attributed to large quantities of peat deposited in the area of the monitoring wells.
I13/02	14/02/2013	Exceedence of Daytime Noise Limit at N5 Noise Monitoring Point (Off site location)	Incident Report Submitted. Exceedence is attributed to passing traffic on public road (R348) and not related to site activity. N5 is the furthest noise monitoring point from the facility and is in close proximity to the R348.
I13/03	20/02/2013	Elevated CH ₄ & CO ₂ level in landfill gas monitoring boreholes	Incident Report Submitted. See comment for I-13/01 above.
I13/04	14/02/2013	Exceedence of Dust deposition limit at D5 Dust Monitoring Point	Incident Report Submitted. Exceedence attributed to falling leaf litter and not related to site activity. D5 is located within a tree line near site entrance.
I13/05	22/03/2013	Elevated CH ₄ & CO ₂ level in landfill gas monitoring boreholes	Incident Report Submitted. See comment for I-13/01 above.
I13/06	24/04/2013	Elevated CO ₂ level in landfill gas monitoring boreholes	Incident Report Submitted. See comment for I-13/01 above.
I13/07	23/05/2013	Elevated CH ₄ & CO ₂ level in landfill gas monitoring boreholes	Incident Report Submitted. See comment for I-13/01 above.
I13/08	25/06/2013	Elevated CH ₄ & CO ₂ level in landfill gas monitoring boreholes	Incident Report Submitted. See comment for I-13/01 above.
I13/09	31/07/2013	Elevated CH ₄ & CO ₂ level in landfill gas monitoring boreholes	Incident Report Submitted. See comment for I-13/01 above.
I13/10	21/08/2013	Exceedence of surface VOC emission	Incident Report Submitted. Remedial measures implemented.
I13/11	29/08/2013	Elevated CH ₄ & CO ₂ level in landfill gas monitoring boreholes	Incident Report Submitted. See comment for I-13/01 above.

Incident Reference No.	Date	Description	Action
I13/12	27/09/2013	Elevated CH4 & CO2 level in landfill gas monitoring boreholes	Incident Report Submitted. See comment for I-13/01 above.
I13/13	19/08/2013	Elevated Suspended Solids at SW7	Incident Report Submitted. Exceedence attributed to contamination from substrate material at base of stream due to very low water level when sampling.
I13/14	19/08/2013	Elevated Potassium and Sodium in Groundwater monitoring boreholes	Incident Report Submitted. Additional monitoring carried out which did not indicate that the issue was Landfill related.
I13/15	15/10/2013	Exceedence of Daytime Noise Limit at N5 Noise Monitoring Point (Off site location)	Incident Report Submitted. See comment for I-13/02 above.
I13/16	15/10/2013	Elevated Potassium in Groundwater monitoring boreholes	Incident Report Submitted. See comment for I-13/13 above.
I13/17	31/10/2013	Elevated CH4 & CO2 level in landfill gas monitoring boreholes	Incident Report Submitted. See comment for I-13/01 above.
I13/18	13/11/2013	Elevated Potassium in Groundwater monitoring borehole	Incident Report Submitted. See comment for I-13/13 above.
I13/19	27/11/2013	Elevated CH4 & CO2 level in landfill gas monitoring boreholes	Incident Report Submitted. See comment for I-13/01 above.
I13/20	13/11/2013	Exceedence of Dust deposition limit at D5 Dust Monitoring Point	Incident Report Submitted. See comment for I-13/04 above.
I13/21	09/12/2013	Elevated Potassium in Groundwater monitoring borehole	Incident Report Submitted. See comment for I-13/13 above.
I13/22	20/12/2013	Elevated CH4 & CO2 level in landfill gas monitoring boreholes	Incident Report Submitted. See comment for I-13/01 above.

11.4.2 REPORTED COMPLAINTS

The number of complaints to CRRL during the 2013 reporting period decreased significantly when compared to the number received during 2012. The facility management will strive to reduce the number of complaints in 2014 by continuing to implement best practice in the operation of the facility. A summary of the complaints received is presented in Table 11.2 below.

Table 11.2 Summary of Complaints at CRRL – 2013

2013	Date	Nature of Complaint	Method of Communication
1	06/01/2013	Odour	Letter via EPA
2	09/01/2013	Odour	Phone via EPA & Alder
3	15/01/2013	Odour	Phone via EPA & Alder
4	17/01/2013	Odour	Alder
5	12/02/2013	Odour	Phone Site
6	02/05/2013	Odour	Alder
7	02/05/2013	Odour	Alder
8	05/07/2013	Odour	Phone via EPA
9	17/07/2013	Odour	Phone via EPA
10	29/07/2013	Odour	Phone via EPA
11	28/07/2013	Odour	Phone via EPA
12	31/07/2013	Odour	Phone via EPA
13	29/07/2013	Odour	Phone via EPA
14	12/08/2013	Odour	Phone via EPA
15	14/08/2013	Odour	Phone via EPA
16	19/08/2013	Odour	Email via EPA

11.5 NUISANCE CONTROL

In order to control potential sources of nuisance at the landfill best available techniques are used to minimise impacts on the environment and local neighbours and all reasonable and practical measures will be implemented to eliminate or minimise any issues or nuisances.

11.5.1 BIRD CONTROL

As the facility has not accepted waste since Quarter 1 2013 there has been no requirement to employ the services of a specialised Bird Control contractor to control potential nuisance caused by birds. At times when the facility is actively accepting waste an integrated approach to bird control is implemented involving the use of kites, heli-kites, distress calls and various birds of prey including falcons. This method is preferred as it is non-destructive to the birds and by varying the timing and use of bird control measures it is a very effective method of control.

11.5.2 VERMIN CONTROL

Pestguard were employed throughout the duration of the reporting period in order to control potential nuisance caused by rodents. Continuous baiting was carried out by Pestguard and adjusted as necessary to prevent any infestation of vermin at the facility.

11.5.3 DUST AND MUD CONTROL

Dust and mud control measures have been implemented at the facility since the start of the construction phase and continue to be implemented as required. These measures include the use of a wheel wash, road sweeper and the use of a water bowser to dampen access roads and stockpiles during periods of dry weather.

11.5.4 LITTER CONTROL

The facility has not accepted waste since Quarter 1 2013. When the facility is actively accepting waste litter is controlled by fencing installed around the landfill footprint as specified in the waste licence. Portable litter fencing is also used at the working face, which can be moved to various points around the working face depending on the wind direction. As part of the operational controls, all litter is collected at the end of the working day when the facility is actively accepting waste. All waste deposited must be covered by the end of the working day. Adequate daily cover reduces the risk of odour, windblown litter, vermin, flies and birds.

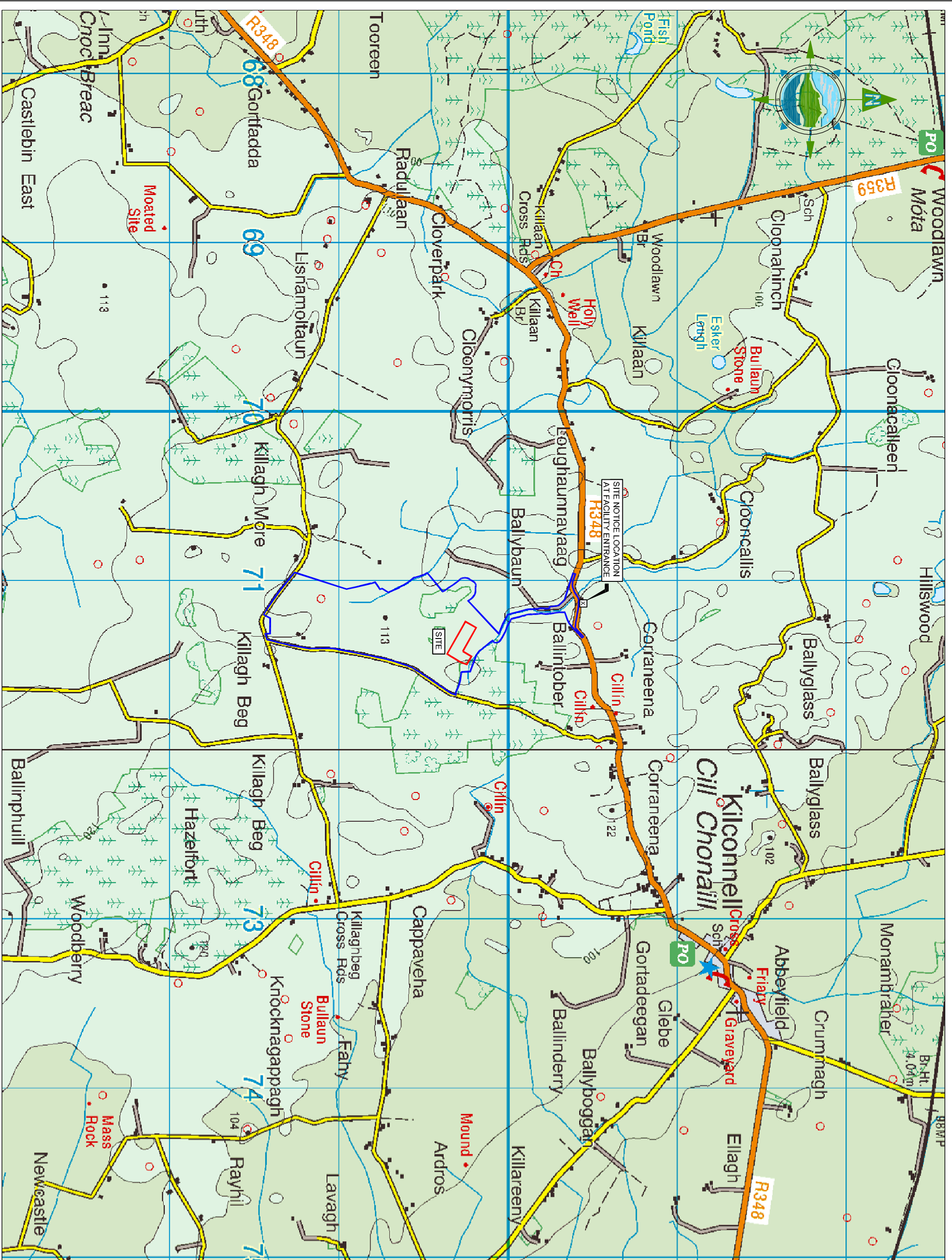
Good operational practices on site are the main controls to avoid nuisances.

11.6 STATEMENT OF ACHIEVEMENT OF WASTE ACCEPTANCE AND TREATMENT OBLIGATIONS.

In compliance with licence condition 1.12 and in line with the facility's Environmental Management System (EMS) all waste accepted at this facility is in accordance with comprehensive waste acceptance procedures. In compliance with condition 1.6 only waste that has been subject to treatment is accepted for disposal at the facility. Furthermore, this facility submits quarterly summary reports to the Agency on the quantity of MSW and BMW accepted at the landfill during the preceding quarter and on a cumulative basis for the calendar year.

APPENDIX A

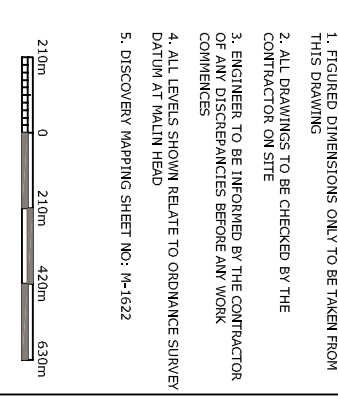
**Site Location Map
Environmental Monitoring Locations**



GENERAL LEGEND

- LANDS UNDER CONTROL OF DEVELOPER
- ACTIVITY BOUNDARY
- X SITE NOTICE LOCATION

- NOTES**
1. FIGURED DIMENSIONS ONLY TO BE TAKEN FROM THIS DRAWING
 2. ALL DRAWINGS TO BE CHECKED BY THE CONTRACTOR ON SITE
 3. ENGINEER TO BE INFORMED BY THE CONTRACTOR OF ANY DISCREPANCIES BEFORE ANY WORK COMMENCES
 4. ALL LEVELS SHOWN RELATE TO ORDNANCE SURVEY DATUM AT MALIN HEAD
 5. DISCOVERY MAPPING SHEET NO: M-1622



Client: **greenstar**
 Project: EAST GALWAY LANDFILL PLANNING APPLICATION 2007

Title: REGIONAL SITE LOCATION MAP

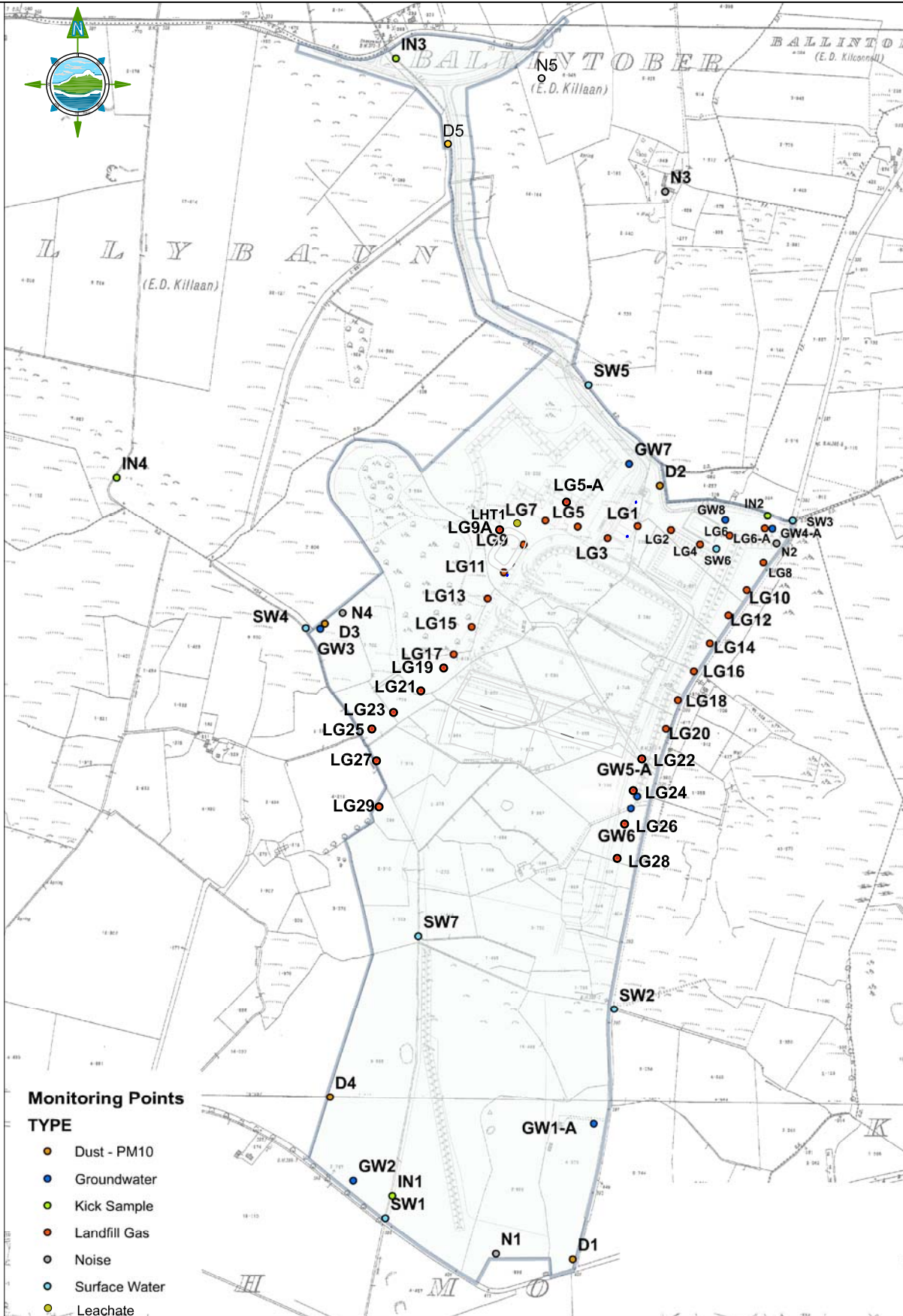
Scale @ A1: 1:10,560

Prepared by: M. Nolan
 Checked by: M. Conroy
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Drawing No.: 2228-2200 Issue: D01

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Client
GREENSTAR LTD

Project
CONNAUGHT REGIONAL
RESIDUAL LANDFILL

Title
LANDFILL ENVIRONMENTAL
MONITORING LOCATIONS

Prepared by:
R.K.

Checked:
D.O'S.

Date:
24.09.09

Project Director:
M.F.G.

Drawing Status:
LG29 ADDED

Scale @ A4:
N.T.S.



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Drawing No.

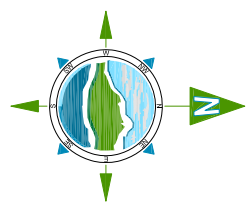
3588-1604

Revision:

A

APPENDIX B

Topographical Site Survey – August 2013



- NOTES:
1. FIGURED DIMENSIONS ONLY TO BE TAKEN FROM THIS DRAWING.
 2. ALL DRAWINGS TO BE CHECKED BY THE CONTRACTOR ON SITE.
 3. ENGINEER/PLANTERS REPRESENTATIVE AS APPROPRIATE TO BE INFORMED BY THE CONTRACTOR OF ANY DISCREPANCIES BEFORE WORK COMMENCES.
 4. THE CONTRACTOR SHALL UNDERTAKE A THOROUGH CHECK FOR THE ACTUAL LOCATION OF ALL SERVICES/UTILITIES ABOVE AND BELOW GROUND, BEFORE ANY WORK COMMENCES.
 5. ALL LEVELS SHOWN RELATE TO ORDNANCE SURVEY DATUM AT MALIN HEAD.

Rev	Date	Description	By	CHK.
A	13.02.14	FIRST ISSUE	R.K.	C.R.

Client: **EPA**

Project: **EAST GALWAY LANDFILL**

Title: **TOPOGRAPHICAL SITE SURVEY**

Scale @ A1: **1 : 750**

Prepared by: **R.K.** Checked: **C.McG.** Date: **AUG '13**

Project Director: **CIARAN MCGOVERN**

Drawing Status: **REPORT**

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Drawing No.: **7256-1111** Revision: **A**

APPENDIX C

E-PRTR



Environmental Protection Agency

| PRTR# : W0178 | Facility Name : East Galway Residual Landfill Site | Filename : W0178_2013.xls | Return Year : 2013 |

[Guidance to completing the PRTR workbook](#)

AER Returns Workbook

Version 1.1.18

REFERENCE YEAR	2013
-----------------------	------

1. FACILITY IDENTIFICATION

Parent Company Name	Greenstar Holdings Limited
Facility Name	East Galway Residual Landfill Site
PRTR Identification Number	W0178
Licence Number	W0178-02

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).
3.13	Storage prior to submission to any activity referred to in a preceding paragraph of this Schedule, other than temporary storage, pending collection, on the premises where the waste concerned is produced.
3.4	Surface impoundment, including placement of liquid or sludge discards into pits, ponds or lagoons.
3.6	Biological treatment not referred to elsewhere in this Schedule which results in final compounds or mixtures which are disposed of by means of any activity referred to in paragraphs 1. to 10. of this Schedule.
4.11	Use of waste obtained from any activity referred to in a preceding paragraph of this Schedule.
4.13	Storage of waste intended for submission to any activity referred to in a preceding paragraph of this Schedule, other than temporary storage, pending collection, on the premises where such waste is produced.
4.4	Recycling or reclamation of other inorganic materials.
Address 1	Killagh More
Address 2	Ballybaun (E.D. Killaan)
Address 3	Ballintober (E.D. Killaan)
Address 4	Ballinasloe, Co. Galway
	Galway
Country	Ireland
Coordinates of Location	-8.43099 53.31318
River Basin District	IEWE
NACE Code	3821
Main Economic Activity	Treatment and disposal of non-hazardous waste
AER Returns Contact Name	Colin Ryder (W0178)
AER Returns Contact Email Address	colin.ryder@tobin.ie
AER Returns Contact Position	Landfill Manager
AER Returns Contact Telephone Number	090-9686014
AER Returns Contact Mobile Phone Number	
AER Returns Contact Fax Number	090-9686026
Production Volume	0.0
Production Volume Units	
Number of Installations	0
Number of Operating Hours in Year	0

Number of Employees	3
User Feedback/Comments	Emission quantities (kg) of pollutants for 2013 are significantly less than those reported in 2012. This is to be expected as the landfill did not accept waste for disposal beyond early Jan 2013. As a result the landfill produced less gas in 2013 and there was less gas being managed through flaring and utilisation.
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) ?	N/A
Is the reduction scheme compliance route being used ?	N/A

4. WASTE IMPORTED/ACCEPTED ONTO SITE

[Guidance on waste imported/accepted onto site](#)

Do you import/accept waste onto your site for on-site treatment (either recovery or disposal activities) ?	
--	--

4.1 RELEASES TO AIR

[Link to previous years emissions data](#)

| PRTR#: W0178 | Facility Name : East Galway Residual Landfill Site | Filename : W0178_2013.xls | Return Year : 2013 |

19/03/2014 09:35

SECTION A : SECTOR SPECIFIC PRTR POLLUTANTS

RELEASERS TO AIR		METHOD			Please enter all quantities in this section in KGs				QUANTITY		
No. Annex II	POLLUTANT Name	M/C/E	Method Used		Emission Point 1	Emission Point 2	Emission Point 3	Emission Point 4	T (Total) KG/Year	A (Accidental) KG/Year	F (Fugitive) KG/Year
			Method Code	Designation or Description							
01	Methane (CH4)	M	ALT	TOC analyser in accordance with EN12619:2002	24.68	14.91	2.62	4225.71	4267.92	0.0	0.0
03	Carbon dioxide (CO2)	M	OTH	Horbia PG250	846351.78	2173719.36	1191682.6	1274468.22	5486221.96	0.0	0.0
02	Carbon monoxide (CO)	M	ALT	CO EN15058:2006	77.28	73.87	48.08	3137.5	3336.73	0.0	0.0
08	Nitrogen oxides (NOx/NO2)	M	ALT	Oxides of Nitrogen (EN14792:2006)	199.55	563.88	327.61	1990.7	3081.74	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

RELEASERS TO AIR		METHOD			Please enter all quantities in this section in KGs				QUANTITY		
No. Annex II	POLLUTANT Name	M/C/E	Method Used		Emission Point 1	Emission Point 2	Emission Point 3	Emission Point 4	T (Total) KG/Year	A (Accidental) KG/Year	F (Fugitive) KG/Year
			Method Code	Designation or Description							
80	Chlorine and inorganic compounds (as HCl)	M	ALT	Impinger train containing deionised water solution in accordance with EN1911:2010	2.81	1.52	0.94	20.73	26.0	0.0	0.0
84	Fluorine and inorganic compounds (as HF)	M	ALT	Impinger train containing 0.1 Molar sodium hydroxide in accordance with EN15713:2006	0.8	5.33	12.34	11.82	30.29	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)

RELEASERS TO AIR		METHOD			Please enter all quantities in this section in KGs			
Pollutant No.	POLLUTANT Name	M/C/E	Method Used		Emission Point 1	T (Total) KG/Year	A (Accidental) KG/Year	F (Fugitive) KG/Year
			Method Code	Designation or Description				
					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: Please enter summary data on the quantities of methane flared and / or utilised	East Galway Residual Landfill Site				
	T (Total) kg/Year	M/C/E	Method Used		Facility Total Capacity m3 per hour
			Method Code	Designation or Description	
Total estimated methane generation (as per site model)	4786884.0	C	Gas Sim 2	Golder Associates Report 2008	N/A
Methane flared	3052674.0	M	Landfill Gas Survey 2013	Landfill Gas Survey 2013	9500.0 (Total Flaring Capacity)
Methane utilised in engine/s	1261061.0	M	Landfill Gas Survey 2013	Landfill Gas Survey 2013	650.0 (Total Utilising Capacity)
Net methane emission (as reported in Section A above)	4267.92	C	ALT	TOC analyser in accordance with EN12619:2002	N/A

5. ONSITE TREATMENT & OFFSITE TRANSFERS OF WASTE

| PRTR# : W0178 | Facility Name : East Galway Residual Landfill Site | Filename : W0178_2013.xls | Return Year : 2013 |

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Please enter all quantities on this sheet in Tonnes

0

Transfer Destination	European Waste Code	Hazardous	Quantity (Tonnes per Year)	Description of Waste	Waste Treatment Operation	Method Used		Location of Treatment	Haz Waste : Name and Licence/Permit No of Next Destination Facility	Haz Waste : Address of Next Destination Facility	Name and License / Permit No. and Address of Final Recoverer / Disposer (HAZARDOUS WASTE ONLY)	Actual Address of Final Destination i.e. Final Recovery / Disposal Site (HAZARDOUS WASTE ONLY)
						M/C/E	Method Used		Haz Waste : Name and Licence/Permit No of Recover/Disposer	Non Haz Waste: Address of Recover/Disposer		
Within the Country	19 07 03	No	6643.9 in 19 07 02	landfill leachate other than those mentioned	D9	M	Weighed	Offsite in Ireland	Galway County Council,D0033-01	Tuam Wastewater Treatment Plant,Tuam Wastewater Treatment Plant,County Galway,Ireland		
Within the Country	19 07 03	No	13292.67 in 19 07 02	landfill leachate other than those mentioned	D9	M	Weighed	Offsite in Ireland	Enva,W0041-01	Smithstown Industrial Estate,,Shannon,County Clare,Ireland		
Within the Country	19 07 03	No	11428.9 in 19 07 02	landfill leachate other than those mentioned	D9	M	Weighed	Offsite in Ireland	Rilta Environmental Ltd,W0192-02	Block 402,Grants Drive Greenhouse Business Park,Rathcoole,County Dublin,Ireland		
Within the Country	19 07 03	No	3175.32 in 19 07 02	landfill leachate other than those mentioned	D9	M	Weighed	Offsite in Ireland	Enva,W0196-01	JFK Road,JFK Industrial Estate,Naas Road,Dublin 12,Ireland		

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