



Clare County Council

Waste Licence W0170-01

Annual Environmental Report for 2017

**Name & location of facility: Lisdeen Recycling Centre &
Transfer Station, Cemetery Road, Lisdeen, Kilkee, Co. Clare**

Submitted by:

Environment Section, Clare County Council, New Road, Ennis, Co. Clare.

Table of Contents

Page Number

1) Reporting Period	3
2) Details of Activity	3
3) Volume and composition of waste received during the reporting period.	3
4) Summary report on emissions	5
5) Foul water emissions	5
6) Surface water emissions	5
7) Summary of results and interpretations of Environmental Monitoring	5
8) Resource Consumption Summary	22
9) Development works undertaken during the period and timescale for proposed works	22
10) Full title and written summary of any procedures developed by the licensee during the previous year	22
11) Drum, Tank and Bund Testing.	23
12) Reported Incidents and Complaints summaries.	23
13) Review of nuisance controls	23
14) Schedule of Environmental objectives and targets	23
15) Report on progress towards achievement of Environmental Objectives and Targets in previous years	26

Reporting Period

1/01/17 – 31/12/17

1) Details of Activity

The principal waste activity of the Transfer Station is the compaction of solid waste into 30 m³ closed containers for subsequent disposal to landfill in accordance with Class 12 of the Third Schedule of the Waste Management Act, 1996. Other waste activity is the storage of non-recoverable waste received at the facility, prior to disposal at an appropriate facility in accordance with Class 13 of the Third Schedule.

Other waste recovery activities include recycling or reclamation of organic substances which are not used as solvents (including composting and other biological transformation processes) in accordance with Class 2 of the Fourth Schedule, recycling or reclamation of metals and metal compounds in accordance with Class 3 of the Fourth Schedule, and recycling or reclamation of other inorganic materials in accordance with Class 4 of the Fourth Schedule. This covers the acceptance of waste oils, cooking oils, beverage cans, white goods, other metals, and glass at the facility.

3) Volume and composition of waste received during the reporting period.

The quantity of municipal solid waste accepted at the facility during the reporting period(s) was as follows:

Public Domestic Waste delivered to site	476.48	tonnes
Recyclable material delivered to site	244.85	tonnes
Total	721.33	tonnes

The quantity of waste materials accepted for subsequent recycling/recovery for 2017 is as outlined in Table 3.1 below

Table 3.1

Material Type	LOW Code	2017 Tonnage
Domestic waste	20 03 01	476.48
Metals	20 01 40	30.6
Glass	20 01 02	8.76
Aluminium Cans	15 01 04	0.48
Plastic bottles	20 01 39	3.52
Hard Plastics		27.41
Steel cans	15 01 04	5.37
Car Batteries	16 06 01*	1.04
Newspapers	20 01 01	22.6
Waste Engine Oil	13 02 00	1.4
Cardboard	20 01 01	23.06
Timber	20 01 38	51.4
Textiles	20 01 11	2.77
WEEE	20 01 36	50.1
Batteries	16 06 04	0.5
Oil filters	16 01 07	0.5
Green waste	20 02 01	15.34
TOTAL		721.33

The quantities of waste allowed for acceptance the facility under Schedule A of the licence at are as outlined in Table 3.2 below:

Table 3.2:

Waste Type	Maximum (Tonnes per annum)
Municipal Waste	1,800
Wastes for recovery/recycling	200 ^{Note4}
Total	2,000

Note 4: The amount of wastes accepted for recovery/recycling may be altered as long as the total accepted at the facility does not exceed 2000 tonnes per annum.

4) Summary report on emissions, including wastes from silt traps and interception sumps.

No desludging of the septic tank has taken place since installation. Loading on the tank is quite small with one w.c. and sink as well as run-off from waste transfer area.

5) Foul Water Emissions

There is no direct foul water discharge. Foul water is diverted to a septic tank unit, which in turn is discharged to a reed bed. This foul water is collected from w.c., sink unit, the transfer station shed, from the compactor and the bin transverse area. It comprises wash water and rainwater falling on the contaminated areas.

6) Surface Water Emissions

Surface water runoff from site roads and uncontaminated surfaces discharges to the surface water drains. There are no other emissions of any environmental significance from the facility.

7) Summary of Results and Interpretation of Environmental Monitoring.

Table 7.1. Lisdeen Transfer Station (WL170-1) Monitoring Schedule

Schedule D	Monitoring
D.1	Monitoring Locations
D.2	Waste Water
D.3	Landfill Gas
D.4	Surface Water, Groundwater and Leachate

Monitoring was conducted at the specified locations and frequencies as indicated in each of the above referenced Schedules of the Waste Licence, unless otherwise noted in this report. Monitoring locations are shown in Appendix 1. Wastewater monitoring has not been carried out to date as the discharge from the septic tank is directly to a percolation area. The reed bed system is now commissioned; however due to the low flow, it was not possible to obtain a sample from the system.

7.1. Landfill Gas

Monitoring of landfill gas continued during 2017 at landfill gas wells L1 and L2, in accordance with Schedule D.3 of the waste licence. Gas monitoring locations are shown in Appendix 1. Completed landfill gas monitoring forms for the period is available for inspection at the facility and can be forwarded if required

Both gas wells are located in waste; L2 is located in the centre of the waste body and L1 is close to the northwest site boundary

The methane concentrations at both wells during 2017 were in line with historic monitoring within the site.

7.2 Surface Water, Groundwater and Leachate.

JRE Environmental Consulting was retained by Clare County Council to complete groundwater, surface water and leachate sampling at the Lisdeen Waste Recycling Centre (Lisdeen) located at Kilkee, Co. Clare. Sampling was conducted on the 6th July 2017.

7.2.1 Surface Water

Trigger Levels

Clare County Council has proposed trigger levels for ammonia and BOD concentrations for the surface water monitoring locations around the site. These trigger levels are considered to highlight a significant change in water quality compared to normal results and require corrective action to be taken. The proposed trigger levels, which are yet to be agreed with the EPA are presented below in Table 7.2.1.

Table 7.2.1 Surface water trigger levels at Lisdeen Recycling Facility

Monitoring Location	SW1	SW2	SW3	SW5	SW5a	SW7
Ammonia Concentration (ppm)	2.5	-	10	12.5	-	1.2
BOD Concentration (ppm)	38	-	10	36	-	10

Evaluation of monitoring results

Annual sampling was completed at six (6) surface water sampling locations on the boundaries of the site and off site to determine any potential impacts the site may have had on surface water quality in the area.

Field monitoring (pH, dissolved oxygen, temperature and electrical conductivity) for all surface water samples was completed on 6th July 2017. The results of the field monitoring program indicated the following:

- Surface water pH ranged between 7.41 (SW3) and 7.76 (SW7). Electrical conductivity ranged between 397 $\mu\text{S}/\text{cm}$ (SW5a) and 8,167 $\mu\text{S}/\text{cm}$ (SW7).
- Surface water temperatures on July 6th, 2017 ranged between 11.8°C (SW3) and 12.3°C (SW5).
- Dissolved oxygen concentrations in surface water samples collected on July 6th, 2017 ranged between 79% saturation (SW5a) and 92% saturation (SW2).

The field parameter results indicated that surface water quality inside the site perimeter and at locations upstream and downstream from the site generally complied with the 2009 Surface Water Regulations and the applicable EPA surface water guidelines with the exception of significantly elevated electrical conductivity at locations SW3 and SW7. The elevated electrical conductivity is thought to be due to the tidal influence and resulting salinity influence on the sample locations.

Suspended Solids

Annual sampling was completed at all surface water sampling locations to assess concentrations of suspended solids. No standards are included in the 2009 Surface Water Regulations for suspended solids.

Therefore, the results for the annual sampling programme were compared to the EPA surface water guideline. The analytical results for the surface water sampling events indicated the following:

- Surface water samples submitted from sample locations SW3 (67 mg/l) and SW7 (97 mg/l) contained suspended solids concentrations greater than the EPA surface water guideline of 50mg/l.
- All remaining surface water samples submitted contained suspended solids concentrations less than the EPA surface water guideline of 50mg/l. Results ranged between <10mg/l (SW2) and 12 mg/l (SW5 and SW5a).

The elevated concentration of suspended solids in surface water samples SW3 and SW7 were considered to be due to the suspension of fine sand in the tidal channel for SW3 and SW7 rather than from inputs from the Lisdeen site as can be seen from the on-site sample results that were all significantly lower.

Biochemical Oxygen Demand

Annual sampling was completed at all surface water locations to assess BOD concentrations in surface water inside and outside the site. The analysis results indicated the following:

- Both surface water samples collected from the transitional channel (i.e., SW3 - 4 mg/l O₂ and SW7 - 2 mg/l O₂) contained BOD concentrations less than or equal to the 2009 surface Water Regulation limit for transitional waterbodies of 4.0 mg/l O₂ and were significantly less than the proposed trigger levels included in Table B.
- The remaining four (4) surface water samples (i.e. SW1 [2 mg/l O₂], SW2 [2mg/l O₂], SW5 [2mg/lO₂] and SW5a [1mg/l O₂] contained BOD concentrations less than the 2009 Surface Water Regulation limit of 2.6 mg/l O₂ for freshwater bodies and were also significantly less than the proposed trigger levels included in Table B.

The BOD concentrations in all surface water samples were less than the results for samples collected in the previous sampling event in 2016.

Chemical Oxygen Demand

Annual sampling was completed at all surface water locations to assess COD concentrations in surface water inside and outside the site. No standards are included in the 2009 Surface Water Regulations for COD. Therefore, the results for the annual

sampling programme were compared to the EPA surface water guideline. The analysis results indicated the following:

- The surface water samples collected from SW1 (71 mg/l), SW2 (46 mg/l), SW3 (333 mg/l) and SW7(424 mg/l) contained COD concentrations greater than the EPA surface water guideline of 40 mg/l O₂.
- The two (2) remaining surface water samples collected from SW5 (36 mg/l) and SW5a (23 mg/l) contained COD concentrations less than the EPA surface water guideline of 40 mg/l O₂.

Locations SW1 and SW2 are upstream from the Lisdeen site and the samples collected from these locations contained a COD concentration that exceeded the EPA surface water guideline of 40mg/l. This indicated that some sources outside the landfill (e.g. agriculture) may be contributing to the elevated COD concentrations in surface water in the area. However, SW3 and SW7 at, and downstream from the surface water outlet from the site, also contained elevated concentrations of COD indicating that surface water quality may also be influenced by outputs from the landfill at the east and northeast boundaries. COD concentrations at SW5 and SW5a were less than the EPA guideline limits indicating no impact to surface water to the southwest of the site.

Ammoniacal Nitrogen

Annual sampling was completed at all surface water locations to assess ammoniacal nitrogen (NH₄-N) concentrations in surface water inside and outside the site. The analysis results indicated the following:

- Three (3) samples collected from SW3 (0.36 mg/l), SW5 (0.57 mg/l) and SW7 (0.36 mg/l) contained concentrations of NH₄-N greater than the 2009 Surface Water Regulation limit of 0.14 mg/l.
- The remaining samples (i.e., SW1, SW2 and SW5a) contained NH₄-N concentrations less than the 2009 Surface Water Regulation limit.

The elevated NH₄-N concentrations in surface water samples were at locations that were most probably impacted by migration of NH₄-N from the landfill. It should be noted that although the NH₄-N concentrations exceeded the 2009 Surface Water limit for three of the collected samples, the concentrations were significantly less than the proposed concentration trigger levels for surface waters and the concentration in SW5 continues to indicate a downward trend when compared to previous historic concentrations.

Boron

Annual sampling was completed at all surface water locations to assess boron concentrations in surface water inside and outside the site. No standards are included in the 2009 surface water regulations for boron. Therefore, the results for the annual sampling programme were compared to the EPA surface water guideline. The analysis results indicated the following:

- One (1) sample collected from SW7 (2,942 mg/l) contained concentrations of boron greater than the EPA Surface Water Quality value of 2,000 µg/l.
- All other samples contained concentrations of boron less than the EPA Surface Water Quality value of 2,000 µg/l ranging between 29 µg/l (SW5a) and 1,977 µg/l (SW3).

The boron concentrations in SW7 is significantly higher than concentrations found at other locations in, and around, the site. However, typical boron concentrations in sea and estuarine water could be up to approximately 5 mg/l. Because the most elevated concentrations were found in the tidal channel to the south of the site, elevated boron concentrations are most likely from seawater influence at those locations.

Total Metals

Annual sampling was completed at all surface water locations to assess total metals (i.e., cadmium, chromium, copper, iron, lead, nickel and zinc) concentrations in surface water samples collected inside and outside the site boundary. The analysis results indicated the following:

- All samples collected contained concentrations of metals less than the applicable 2009 Surface Water Regulation limits.

Major Anions

Annual sampling was completed at all surface water locations to assess major anion (i.e., potassium, manganese, magnesium, sodium and calcium) concentrations in surface water inside and outside the site. The analysis results indicated the following:

- The concentration of manganese in all surface water samples were less than the applicable EPA Surface Water Guideline Value of 300 µg/l with concentrations ranging between 3 µg/l (SW5) and 181 µg/l (SW3).

There are no limit values in place under the 2009 Surface Water Regulations or the EPA Surface Water Guidelines for calcium, magnesium, potassium or sodium. The analysis results indicated the following;

- The concentration of calcium in all surface water samples were less than 100 mg/l with the exception of samples SW3 (i.e., 260.9 mg/l) and SW7 (358.9 mg/l) located in the tidal channel to the south of the site;
- The concentration of magnesium in all surface water samples were less than 100 mg/l with the exception of samples SW3 (i.e., 741.3 mg/l) and SW7 (1,159 mg/l) located in the tidal channel to the south of the site;
- The concentration of potassium in all surface water samples were less than 20 mg/l with the exception of samples SW3 (i.e., 227.9 mg/l) and SW7 (329.6 mg/l) located in the tidal channel to the south of the site; and
- The concentration of sodium in all surface water samples were less than 100 mg/l with the exception of samples SW3 (i.e., 5,340 mg/l) and SW7 (i.e., 8,438 mg/l).

Although there are no guidelines and limits for the parameters listed above, sample locations SW3 and SW7 indicated elevated concentrations of anions from dissolved salts that are indicative of seawater influence due to the location of the sample locations (i.e. the tidal channel south of the site).

Chloride

Annual sampling was completed at all surface water locations to assess chloride concentrations in surface water at locations inside and outside the site. The analysis results indicated the following:

- Samples collected from), SW3 (9,935.7 mg/l) and SW7 (14,854.1 mg/l) contained concentrations of chloride greater than the applicable EPA Surface Water Guideline Value of 250 mg/l.
- All other submitted samples contained concentrations of chloride less than the applicable EPA Surface Water Guideline Value. The two (2) samples that contained elevated chloride concentrations were collected from the main tidal channel located to the east / southeast of the site (SW3 and SW7). The site is tidally influenced and the elevated chloride concentrations are considered to be due to estuarine water intrusion from the tide or chloride dissolved in the surface water from deposited salts on the channel floor. It is not considered that the elevated chloride concentrations at SW3 and SW7 were due to discharge from the Lisdeen site.

7.2.2 Groundwater

Groundwater wells BH1, BH3s, BH3d, BH4s and BH4d were sampled on the 6th July 2017. Monitoring locations are shown in Appendix 1.

Table 7.3.1 Groundwater water locations	
Location Reference	Description of location
BH1	Artesian bedrock well located outside the site, adjacent to the northeast boundary.
BH3d	Bedrock well located close to BH3s, downgradient of the main waste body.
BH3s	Overburden well located within the landfill, close to the southern site boundary.
BH4d	Bedrock monitoring well located in waste and downgradient of the main waste body.
BH4s	Overburden well located within the landfill, close to the southern site boundary.

Water Quality Standards and Trigger Values used for comparison purposes

Table 7.2.2.1 Extracted from E.C. (Drinking Water) Regulations, 2007 SI No. 106 of 2007

Parameter	Table [1]	Drinking Water Quality Standard	Deviations
Temperature	Not Listed	-	N/A

Conductivity	Table C	2500 $\mu\text{S/cm}$ @ 20°C	none
pH	Table C	$6.5 \leq \text{pH} \leq 9.5$	none
Ammonium	Table C	0.23 mg/l N (0.30 mg/l NH_4)	See trigger levels below
Total Organic Carbon	Table C	No abnormal change	N/A
Cadmium	Table B	0.005 mg/l	none
Chromium	Table B	0.05 mg/l	none
Iron	Table B	0.2 mg/l	BH3, BH3s, BH4
Lead	Table B	0.010 mg/l	none
Manganese	Table B	0.05 mg/l	none
Nickel	Table B	0.020 mg/l	none
Sodium	Table B	200 mg/l	none

[1] The notes above quote the Table in the regulations from which parametric or limit values were obtained

N/A Not applicable.

Trigger Levels

Clare County Council has proposed trigger levels for ammonia concentrations for the monitoring wells located around the site. These trigger levels are considered to highlight a significant change in water quality compared to normal results and require corrective action to be taken. The proposed trigger levels, which are yet to be agreed with the EPA are presented below in Table 7.3.3.

Table 7.2.2.2 Groundwater trigger levels at Lisdeen Recycling Facility

Monitoring Well	BH1	BH3	BH3s	BH4
Ammonia Concentration (ppm)	0.5	1.7	1.0	0.5

Evaluation of results

Monitoring and sampling of all groundwater wells was completed on July 6th, 2017. The results of the site monitoring program indicated the following:

- Two (2) bedrock wells (i.e., BH1 and BH4) were flowing artesian wells indicating that the deeper aquifer in the area of the site is confined and the water within the aquifer had not reached subterranean hydrostatic equilibrium.
- The depth to groundwater (below ground surface [bgs]) at the remaining three (3) monitoring wells at Lisdeen on July 6th, 2017 were; 0.94m (BH3), 0.12m (BH3S) and 1.31m (BH4S) bgs; and
- During the annual monitoring event completed on July 6th, 2017 groundwater pH ranged between 7.44 (BH3S) and 7.69 (BH4). Electrical conductivity ranged between 767 $\mu\text{S}/\text{cm}$ (BH1) and 804 $\mu\text{S}/\text{cm}$ (BH3) and water temperature ranged between 13.4oC (BH4s) and 14.1oC (BH1);

All pH concentrations and electrical conductivity measured during the groundwater sampling event were within the applicable standards and guidelines included in section 2.3 of this report. The groundwater temperature was consistent with previous sampling events at the site.

Background Wells

Monitoring well BH1 is located in the southwest corner of an agricultural field located immediately to the north of the entrance gate of the Lisdeen site. The monitoring well was located up gradient from the Lisdeen site and had artesian flow when the well cap was removed. Recent land improvement works had been completed in the vicinity of the well and the groundwater was turbid even after significant purging had been completed. The analysis results for the submitted groundwater sample from BH1 indicated the following:

- The ammoniacal nitrogen (NH₄-N) concentration in the groundwater sample collected from monitoring well BH1 (i.e., 0.33 mg/l) exceeded the 2016 Groundwater Regulation limit of 0.175mg/l.
- The concentrations of manganese (i.e., 460 µg/l) exceeded the applicable EPA guideline value of 50 µg/l. The concentrations of all other anions in the groundwater sample submitted from BH1 contained concentrations less than the 2016 Groundwater Regulation limits and/or the applicable EPA guideline values;
- The concentrations of dissolved metals in the submitted groundwater sample from BH1 were less than the 2016 Groundwater Regulation limits and/or the applicable EPA guideline values.
- Although NH₄-N concentration in BH1 (i.e. 0.33 mg/l) exceeded the 2016 Groundwater Regulation limit, it was less than the proposed trigger level of 0.5 mg/l. Previous analytical results indicated that NH₄-N concentrations in BH1 have fluctuated (i.e. 0.3mg/l in October, 2012, <0.03 mg/l in March, 2013, 0.26 mg/l in February 2014, 0.27 mg/l in June, 2015 and 0.27 mg/l in July, 2016) and it is considered that due to the up-gradient location of the monitoring well the elevated NH₄-N concentrations are due to sources other than the landfill.

The manganese concentration in BH1 exceeded the EPA guideline value of 50 µg/l but is consistent with previous results. The elevated concentration of manganese indicated that there may be a natural source of manganese in the area. The background well is located up gradient of the site and would not be considered to be influenced by historic activities at the Lisdeen site. The manganese concentration in 2017 is consistent with historic concentrations observed in BH1 during previous annual monitoring and sampling events.

The EPA guideline value for manganese is set as an aesthetic objective for drinking water (i.e., staining of pipes and appliances) rather than as a concentration that would constitute a health impact. However, the monitoring well is not used for potable water extraction and the application of the standard may be overly conservative.

The elevated total alkalinity concentration in the monitoring well indicated that the water contains higher concentrations of calcium carbonate (CaCO₃) which may act as a buffer against significant pH changes within the groundwater aquifer.

Southern Area Wells

Monitoring wells BH3 and BH3S are located at the south of the site, and down gradient from the old landfill body, the analysis results for samples submitted from the monitoring wells indicated the following:

- The concentrations of NH₄-N in the samples collected from BH3 (0.46 mg/l) and BH3S (0.19 mg/l) were greater than the 2016 Groundwater Regulation limit of 0.175mg/l. Samples from both monitoring wells contained NH₄-N concentrations significantly less than the proposed trigger level of 1.7mg/l and 1mg/l, respectively;
- Concentrations of manganese in BH3 (i.e., 447 µg/l) and BH3S (i.e., 323 µg/l) were greater than the applicable EPA guideline value of 50 µg/l.
- Total alkalinity concentrations in both BH3 (i.e., 368 mg/l) and BH3S (i.e., 380 mg/l), were elevated indicating good buffering capacity;
- Concentrations of phosphorus in both monitoring wells BH3 (3.15 mg/l) and BH3s (15.14 mg/l) were greater than the 2016 Groundwater Regulation limit of 0.35 mg/l;
- Residue on evaporation concentrations were elevated in both samples collected from BH3S (i.e. 19,889 mg/l) and BH3 (i.e., 1,143 mg/l);

Major anions, dissolved metals and all other parameters analysed in submitted groundwater samples from BH3 and BH3S contained concentrations less than the applicable 2016 Groundwater Regulation limits and/or the EPA guideline values.

An elevated NH₄-N concentration was found in BH3 (i.e., 0.46 mg/l) that exceeded the 2016 Groundwater Regulation limit but was below the proposed trigger levels (i.e. 1.7 mg/l). NH₄-N concentrations have fluctuated in samples collected from BH3 as indicated by previous analytical results with concentrations of 0.43 mg/l in October 2012, 0.05 mg/l in March 2013, 0.36 mg/l in February 2014, 0.41 mg/l in June 2015 and 0.36 mg/l in July 2016. Analytical results indicated that NH₄-N concentrations in BH3 are typical of historical concentrations for groundwater in that monitoring well. NH₄-N concentrations appeared to be on a downward trend in BH3S (i.e. 0.41mg/l in October 2012, 0.24 mg/l in March 2013, 0.18 mg/l in February 2014, 0.16 mg/l in June 2015 and 0.19 mg/l in July 2016) with the trend plateauing for the 2017 event with a concentration of 0.19 mg/l.

There has been a significant reduction of iron concentrations in BH3 and BH3S compared to concentrations found in October, 2012 (i.e., 4,061 µg/l [BH3] and 19,160 µg/l [BH3S]) to <20 µg/l in both wells in March, 2013 and February, 2014, and <20µg/l [BH3], 31 µg/l [BH3s] in June 2015). Iron concentrations in both wells in 2017 were <20 µg/l and continue to be significantly less than the EPA Guideline Value of 200 µg/l.

The concentrations of manganese in BH3 and BH3S were similar to the concentrations found in background monitoring well BH1 indicating that there may be natural sources of manganese in the area.

However, it is possible that reducing conditions beneath the landfill may aid the liberation of manganese into groundwater. None of the monitoring wells are used for potable water extraction and the application of drinking water standards may be overly conservative.

The elevated total alkalinity concentration in both monitoring wells indicated that the water contains higher concentrations of calcium carbonate (CaCO₃) which may act as a buffer against significant pH changes within the groundwater aquifer.

Southeast Area Wells

Monitoring wells BH4 and BH4S are located at the southeast of the site, and down gradient from the old landfill body. The analysis results for samples submitted from the monitoring wells indicated the following:

- Concentrations of NH₄-N in BH4 (i.e., 0.35 mg/l) exceeded the 2016 Groundwater Regulation limit of 0.175mg/l and BH4S (i.e., 0.11 mg/l) was less than the 2016 Groundwater Regulation limit;
- Concentrations of manganese in BH4 (i.e., 398 µg/l) exceeded the EPA guideline value of 50 µg/l and BH4S (i.e., 5 µg/l) was less than the EPA guideline value of 50 µg/l;
- Total alkalinity concentrations in both BH4 and BH4S (i.e. 348 mg/l and 336 mg/l, respectively) were elevated in both monitoring wells indicating good buffering capacity;

Residue on evaporation concentrations were less than the EPA guideline value of 1,000mg/l in BH4 (i.e., 413 mg/l) and BH4s (i.e., 540 mg/l);

- Dissolved metals and all other inorganic parameters analysed in submitted groundwater samples from BH4 and BH4S contained concentrations less than the 2010 groundwater standards and/or the applicable EPA guideline values.

Monitoring wells BH4 and BH4S are located to the southeast of the site, and down gradient from the old landfill body. The results of the annual sampling event in 2017 indicated that the concentrations of the majority of contaminants of concern for groundwater were below the applicable 2016 Groundwater Regulation limits and/or the EPA guideline values in both monitoring wells with the exception of NH₄-N and manganese in well BH4s which is consistent with historic results.

The analytical results indicated that the concentration of NH₄-N in well BH4 (i.e. 0.35 mg/l) exceeded the 2016 Groundwater Regulation limit but was less than the proposed trigger levels (i.e., 0.5 mg/l) and the concentration in BH4s (i.e., 0.11 mg/l) was less than the Regulatory limit. The concentrations of NH₄-N in these wells are consistent with previous analytical results and are similar to the concentration found in background monitoring well BH1. The concentrations of manganese in BH4 and BH4S were less than

the concentrations found in background monitoring well BH1 indicating that there may be natural sources of manganese in the area.

However, it is possible that reducing conditions beneath the landfill may aid the liberation of manganese into groundwater. None of the monitoring wells are used for potable water extraction and the application of drinking water standards may be overly conservative. The EPA interim guidelines are based on the 2000 drinking water standards for manganese.

The elevated total alkalinity concentration in both monitoring wells indicated that the water contains higher concentrations of calcium carbonate (CaCO₃) which may act as a buffer against significant pH changes within the groundwater aquifer.

7.2.3 Leachate

Evaluation of monitoring results

Sampling was completed on July 6th, 2017. The results of the sampling programme are outlined below.

- Electrical conductivity for the leachate samples collected from L1 (891 µS/cm) and L2 (440 µS/cm) were less than mean typical leachate concentrations as outlined in Table 3 of EPA Landfill Manual "Landfill Operational Practices", 1997 (1997 Typical Leachate Concentrations) of 7,789 µS/cm;
- pH for the leachate samples collected from L1 was 7.71 and L2 was 7.14;
- The concentration of NH₄-N in both L1 and L2 (i.e., 0.68 mg/l and 181.24 mg/l, respectively) was greater than the limit value included in "Towards Setting Guideline Values for the Protection of Groundwater in Ireland - Interim Report, 2003" (i.e., EPA Groundwater Guideline Value) of 0.3mg/l, but was less than the EPA 1997 Typical Leachate Concentration of 491 mg/l. The results indicated that limited decomposition of organic material is still taking place in the central area of the landfill.

- Concentrations of heavy metals (i.e., chromium, cadmium, copper, iron, lead, mercury, nickel, cyanide and zinc), and other inorganics (i.e., fluoride, calcium, sulphate and orthophosphate) in samples collected from both leachate wells (L1 and L2) were all less than the applicable EPA Groundwater Guideline Value for each parameter and were also significantly less than the EPA 1997 Typical Leachate Concentrations;
- The concentration of magnesium (6.2 mg/l) in well L1 was significantly less than the EPA 1997 Typical Leachate Concentrations and was similar to previous results at L1. Concentrations in L2 (192.8 mg/l) were greater than the EPA 1997 Typical Leachate Concentration of 151 mg/l;
- Sodium concentration in well L1 (12.7 mg/l) and L2 (338 mg/l) were significantly less than the EPA 1997 Typical Leachate Concentration of 904 mg/l and were similar to previous results;
- The chloride concentration in well L1 (16 mg/l) and L2 (278.2 mg/l) were significantly less than the EPA 1997 Typical Leachate Concentration of 1,256 mg/l and were similar to previous results;
- The boron concentration in well L1 (35 mg/l) and L2 (1,149 mg/l) were significantly less than the EPA 1997 Typical Leachate Concentration of 7,000 mg/l and were similar to previous results;
- The concentration of manganese in L1 (i.e., 323 µg/l) and L2 (i.e., 1,153 µg/l) were less than the EPA Landfill Manual guideline value of 1,990µg/l which is consistent with previous results;
- Total alkalinity concentrations in L1 (i.e., 224 mg/l) and L2 (i.e., 2,198 mg/l) were less than the EPA 1997 Typical Leachate Concentration value of 3,438 mg/l and were consistent with previous results;
- The concentrations of BOD in L1 (i.e., 11 mg/l O₂) and L2 (i.e., 24 mg/l O₂) were significantly less than the EPA 1997 Typical Leachate Concentration. BOD concentrations have decreased in both wells compared to previous results in July 2016.
- The concentration of COD in L1 (i.e., 44 mg/l O₂) and the concentration of COD in L2 (i.e., 208 mg/l O₂) were less than the EPA 1997 Typical Leachate

Concentration of 3,078 mg/l. COD concentrations are consistent when compared to previous analytical results.

- The analytical results indicated that the concentrations of NH₄-N, boron, chloride, manganese, magnesium potassium, COD and total alkalinity were significantly higher in leachate well L2 (i.e., central area of the site) than in leachate well L1 (i.e., north western area of site). The concentrations of organic and inorganic contaminants, particularly in L2 are indicative of leachate from an historic landfill site (e.g., chloride, potassium and COD).
- Total alkalinity concentrations in both leachate wells are slightly elevated above EPA guideline values (but are lower than the EPA 1997 Typical Leachate Concentration), which indicated that the leachate contains higher concentrations of calcium carbonate (CaCO₃) which may act as a buffer against significant pH changes. The elevated manganese may be partially attributed to naturally elevated manganese concentrations in the area (e.g. upgradient well BH1 has elevated manganese concentrations).

8) Resource Consumption Summary

Diesel

Fuel consumption was similar to that used in previous years.

Electricity

Electricity usage was similar to that in previous years.

Water

Water supply to the site is via a connection to the group water scheme. Water usage on site is mainly for power washing yards, transfer station apron and hopper. Average water usage is approximately 3,000 litres monthly, with an approximate total of 36,000 litres used in 2014.

9) Development works undertaken during the period and timescale for proposed works.

Clare County Council has received Part VIII Planning Permission to begin the remediation process. Clare County Council intend to begin works as soon as finances permit.

10) Full title and written summary of any procedures developed by the licensee during the previous year.

No procedures were developed during the past year.

11) Drum, Tank and Bund Testing.

An integrity test was carried out on the bund in May 2012.

12) Reported Incidents and Complaints Summaries.

There were no complaints received during the year and no incidents recorded at the facility.

13) Review of nuisance controls

No review of nuisance controls was carried out during 2017; no nuisances were noted at the facility during 2017, therefore a review was not considered to be necessary.

14) Schedule of 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 in charge, Deputy Site Manager, Executive Chemist and Environmental Patrol Warden have responsibility for implementing this objective.

Objective 2

Ensure that sufficient funds are available to comply with condition 12 of the licence.

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

Objective 3

Increase the quantity of waste collected for recycling at the facility.

Target 3.1-Increase the quantities of cardboard and newspaper collected at the Recycling Centre. Suitable containers for each waste type will be provided on site and the public will be informed by means of appropriate awareness campaigns.

Target 3.2-Increase the quantities of glass, aluminium cans, and steel cans collected at the Recycling Centre.

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.

Objective 4

Improve facilities at the facility.

Target 4.1 - Make facility more user-friendly by providing containers and providing clear instructions as to what these are for. This will allow for proper segregation of recyclable streams. All bulky wastes and hazardous wastes will be stored in one particular area of the facility and this area will be secured thus

allowing for greater supervision when these recyclable streams are being deposited. This will also eliminate traffic hazards. On occasion there is difficulty with turning/reversing manoeuvres at the facility due to large stockpiles of white goods and large recycling receptacles.

Target 4.2 - Provision of additional recyclable streams by year-end.

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

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.

Objective 6

Comply with condition 3.10.1

Target 6.1 - Install by mid-2008 an interceptor as per condition 3.10.1 of the waste license, as part of overall landfill remediation programme.

This will be installed when funds become available.

The Executive Engineer in charge will have responsibility for implementing this objective.

Objective 7

Advance the Restoration and Aftercare Plan.

Target 7.1 - Implement the first phase of the Restoration and Aftercare plan as agreed with the Agency.

The Senior Executive Engineer, Executive Engineer, Finance Officer and Senior Staff Officer have responsibility for implementing this objective.

Time scale

A requisition for funding is with the DOEHLG at present. When this funding becomes available details of the Restoration and Aftercare plan will be submitted.

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.

15) Progress of objectives and targets

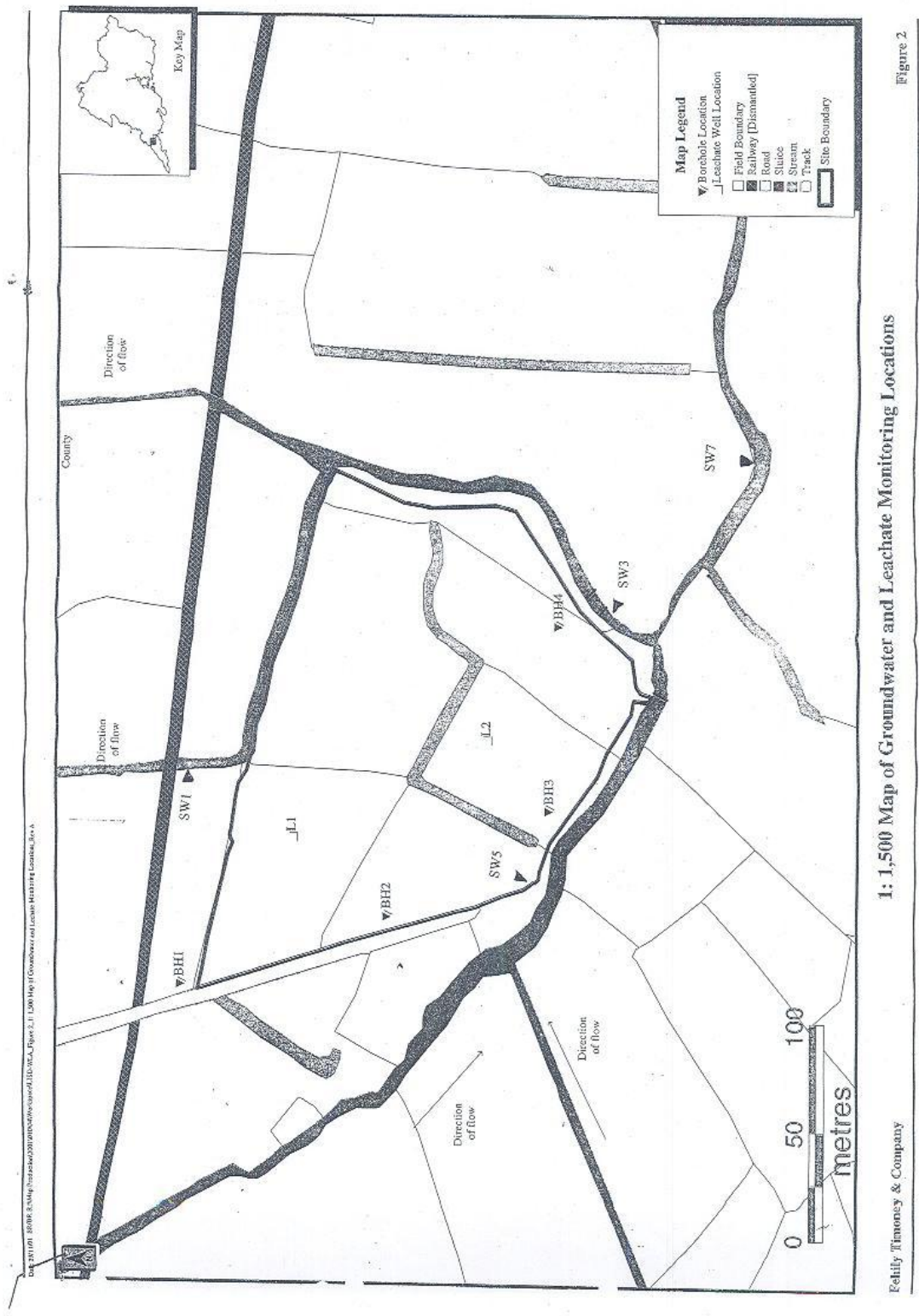
Objective 1	This is ongoing and mainly successful, the licensee will continue to aim for maximum compliance.
Objective 2	Funding has been made available and the licensee will continue to ensure funding is made available.
Objective 3	Recyclable material amounted to 50.3% of all waste accepted at the facility in 2012.
Objective 4	The licensee placed additional signage to improve user friendliness on the site. A new concrete base was installed in the main recycling area which

	improves greatly the safety and layout of the site. The licensee will continue to review the site layout in order to provide the best possible service. We introduced the following new waste streams: rigid plastics and fluorescent tubes (WEEE).
Objective 5	Correspondence with EPA as set out by EPA is an ongoing objective, the licensee will continue to progress this objective.
Objective 6	Installation of the oil Interceptor will form part of the remediation project.
Objective 7	This project will proceed when funding becomes available

16) Financial Provision

A sum of €200,000 has been set aside in the 2017 Clare Co. Council Budget for the operation of the facility. Additional monies are being sought through grants from the Department of the Environment and Local Government for the capital works relating to the Restoration and Aftercare of the Site.

Appendix I
Location of Monitoring Points



1: 1,500 Map of Groundwater and Leachate Monitoring Locations

Echly Timoney & Company

Figure 2