Comhairle Contae Fhine Gall
Fingal County Council

DUNSINK LANDFILL
ANNUAL ENVIRONMENTAL REPORT 2015

REPORTING PERIOD: JANUARY TO DECEMBER 2015

WASTE LICENCE REGISTER NO. W0127-01

FINGAL COUNTY COUNCIL
COUNTY HALL
MAIN STREET
SWORDS
COUNTY DUBLIN

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1.0 INTRODUCTION

The Environmental Protection Agency (EPA) granted a waste licence (register no. 127-1) to Fingal County Council in respect of their landfill facility at Dunsink, Co. Dublin on 9th January 2004. From July 2006 the register number was changed to W0127-01. This licence is for the closure and restoration of areas previously landfilled. Under its terms, the County Council was required to restore and remediate the facility, to install infrastructure to monitor and manage landfill gas and leachate emissions, to cap previously filled areas using inert materials and these works have been completed. In accordance with the requirements of condition 11.6 of the Waste Licence, an Annual Environmental Report (AER) for the facility must be submitted to the Environmental Protection Agency on an annual basis.

1.1 REPORTING PERIOD

The reporting period for the AER is 1st January to 31st December 2015. This is the twelfth AER for the facility as required by the waste licence.

1.2 FACILITY LOCATION

Fingal County Council has responsibility for the management and operation of the facility. The facility is located at:

Dunsink Landfill,
Dunsink Lane,
Finglas,
County Dublin.

Access to the landfill is from the Elm Green end of Dunsink Lane only, Irish National Grid 238886 (Northings) 311766 (Eastings). Figure 1 presents a map of the facility and the surrounding locations.

1.3 ENVIRONMENTAL POLICY FOR DUNSINK LANDFILL

Comply with the terms of waste licence W0127-01 and all other relevant legislation, standards and codes of practice.

Strive for continuous improvement in the management of the facility, in order to minimise the effects of the landfill on the environment.

Create better awareness and training for all staff involved in the running of the landfill.

Develop a good relationship with local residents around Dunsink for the betterment of the surrounding area.

FIGURE 1: DUNSINK LANDFILL SITE LOCATION AND SITE ACCESS

2.0 SITE DESCRIPTION

Dunsink Landfill is situated southwest of Finglas, County Dublin (National Grid Reference 239500N, 310500E). It is bounded by Dunsink Lane to the South, Rathoath Road to the East, the M50 motorway to the Northwest and Cappagh Hospital to the North. It is approximately 61ha. in extent. The most elevated point of the site (as measured in 2010) lies at 100m on the western side of the site. The base of the landfill varies topographically but is estimated to average from 65-70m.

The landfill opened in 1976. Approximately 4,400,000 tonnes of waste is estimated to have been deposited at the facility to June 1996. The landfill subsequently phased to closure, culminating in the closure of the civic amenity in 2003. A landfill gas utilisation plant was installed on site in 1996.

The original application for a waste licence was submitted to the Environmental Protection Agency in September 1999. An amendment to the original application was sought in February 2003. A Proposed Decision was issued in August 2003. Waste Licence 127-1 was issued in January 2004.

2.1 LICENCED WASTE ACTIVITIES AT THE FACILITY

On January 9th 2004 Fingal County Council was licensed to carry out the following waste activities at Dunsink Landfill, Finglas, County Dublin subject to twelve conditions.

Licensed Waste Disposal Activities, in accordance with the *Third Schedule* of the Waste Management Act 1996.

Class 4 Surface impoundment, including placement of liquid or sludge discards into pits, ponds or lagoons:

This activity is limited to:

The provision and use of a leachate lagoon to temporarily store leachate generated in the landfill, prior to discharge to the public foul sewer; and

The provision and use of a surface water attenuation pond to control the quality and quantity of the surface water run-off from the site.

Licensed Waste Recovery Activities, in accordance with the *Fourth Schedule* of the Waste Management Act 1996.

Class 2 Recycling or reclamation of organic substances, which are not used as solvents (including composting and other biological transformation processes):
This activity is limited to the composting of green waste, the recycling / reclamation of cardboard, paper and waste oil at the facility.

Class 3 Recycling or reclamation of metals and metal compounds:
This activity is limited to the recycling of ferrous / non-ferrous metals and white goods.

Class 4 Recycling or reclamation of other inorganic materials:
This activity is limited to the recycling or reclamation of subsoil and topsoil (for the restoration of the site) and dry recyclables at the bring centre.

Class 9 Use of any waste principally as a fuel or other means to generate energy:
This activity is limited to the utilisation of landfill gas for the generation of electricity.

Class 11 The use of waste obtained from any activity referred to in a preceding paragraph of this Schedule:
This activity is limited to the use of suitable subsoil and topsoil and composted material for the restoration programme.

Class 13 Storage of waste intended for submission to any activity referred to in a preceding paragraph of this Schedule, other than temporary storage, pending collection, on the premises where such waste is produced:
This activity is limited to the storage of recyclable waste prior to recovery off site and the storage of soil on site for the restoration programme.

3.0 EMISSIONS AND INTERPRETATION OF MONITORING RESULTS

3.1 GROUNDWATER

There are eight groundwater stations (BH3, BH4, BH16, BH18, BH28, BH-29, BH31 and BH32) listed in Schedule D.1 of the waste licence. BH28 listed in Table D.1.1 of the licence was not installed, however, BH27 was added to the monitoring infrastructure under agreement with the *Environmental Protection Agency.* Borehole monitoring recorded leachate characteristics from BH29 suggesting that it was a potential migration pathway to groundwater for leachate. It was therefore decommissioned on 14th March 2005, upon agreement with *The Agency*. Two additional groundwater stations (BH33 and BH34) were added to the sampling programme upon agreement with *The Agency*, these were installed on Dunsink Observatory land between the 14th and 16th March 2005. BH18 was destroyed during slope stability work in August 2006 and was replaced as BH18_R on 7th September 2006. BH18_R was decommissioned during Q1 of 2011 and replaced with BH35 during the same quarter. BH34 became damaged in 2011 and was replaced in 2012 by a new borehole, BH34N installed adjacent. The grid references for these are shown in Table 1. The sample locations are illustrated in Figure 2.

Table 1: Groundwater Monitoring Locations

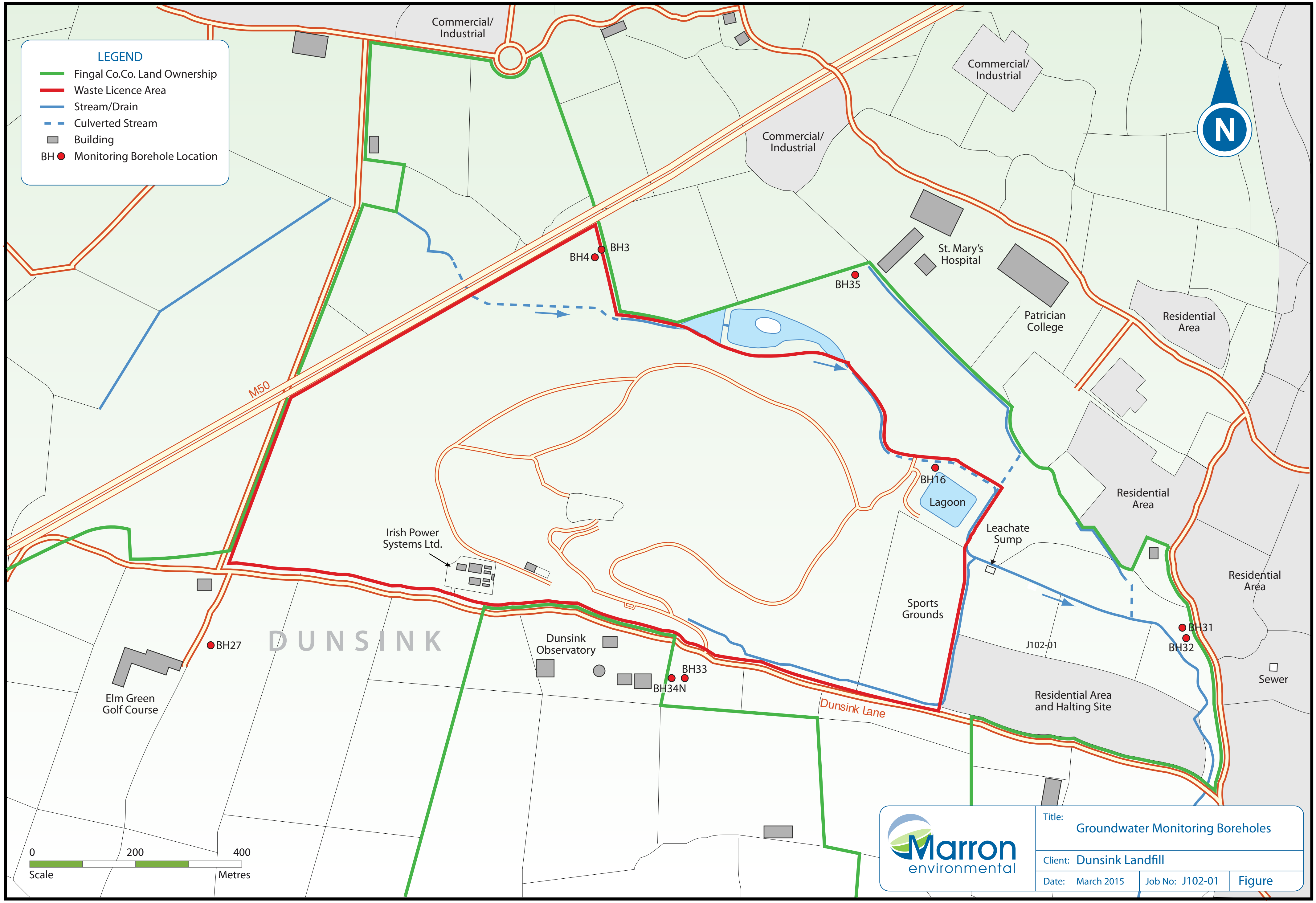
Groundwater Borehole Monitoring Location	Eastings	Northings	Classification
BH3	310665	239505	Deep Groundwater
BH4	310650	239490	Shallow Groundwater
BH16	311340	239085	Deep Groundwater
BH18_R	Decommissioned		
BH27	310030	238720	Deep Groundwater
BH28	Not Installed		
BH29	Decommissioned		
BH31	311765	238820	Deep Groundwater
BH32	311770	238800	Shallow Groundwater
BH33	310735	238724	Deep Groundwater
BH34	310719	238725	Shallow Groundwater
BH34N	310717	238724	Shallow Groundwater
BH35	311158	239456	Deep Groundwater

Detailed groundwater quality analysis reports are contained in Appendix I. The results obtained have been compared to the Interim Guideline Values of EPA document "Towards Setting Guideline Values for the Protection of Groundwater Ireland", 2003 and the trigger levels set as per Condition 6.4.1 of the Licence. The Threshold Values of European Communities (Groundwater) Regulations S.I. 9 of 2010 have also been cited for reference since 2011. The following sampling programme was completed in 2015 (Table 2).

Table 2: Groundwater Sampling Programme 2015

Groundwater Borehole Monitoring Location	Q1 January-March	Q2 April-June	Q3 July-September	Q4 October – December
BH3	Sampled	Sampled	Sampled	Sampled
BH4	Sampled	Sampled	Sampled	Sampled
BH16	Sampled	Sampled	Sampled	Sampled
BH18_R	Decommissioned			
BH27	Sampled	Sampled	Sampled	Sampled
BH28	Not Installed			
BH29	Decommissioned 14th March 2005			
BH31	Sampled	Sampled	Sampled	Sampled
BH32	Sampled	Sampled	Sampled	Sampled
BH33	Sampled	Sampled	Sampled	Sampled
BH34	Replaced by BH34N	Replaced by BH34N	Replaced by BH34N	Replaced by BH34N
BH34N	Sampled	Sampled	Sampled	Sampled
BH35	Sampled	Sampled	Sampled	Sampled

Figure 2 – Groundwater Monitoring Stations



LEGEND
Fingal Co.Co. Land Ownership
Waste Licence Area
Stream/Drain
Culverted Stream
Building
BH Monitoring Borehole Location
N
Commercial/ Industrial
Commercial/ Industrial
Commercial/ Industrial
St. Mary's Hospital
Patrician College
Residential Area
Residential Area
Residential Area
M50
BH3
BH4
BH35
BH16
Lagoon
Leachate Sump
Sports Grounds
Irish Power Systems Ltd.
DUNSINK
BH27
Elm Green Golf Course
Dunsink Observatory
BH33
BH34N
Dunsink Lane
J102-01
BH31
BH32
Sewer
Residential Area and Halting Site
0
200
400
Scale
Metres
Marron environmental
Title: Groundwater Monitoring Boreholes
Client: Dunsink Landfill
Date: March 2015
Job No: J102-01
Figure

3.1.1 Groundwater Monitoring Quality - Findings (See Appendix I)

Q1 January to March 2015 – Sampling dated 10th February 2015

Results from groundwater sampling during the 1st Quarter of 2015 indicated generally good groundwater quality. There was a slightly elevated level of ammoniacal nitrogen at BH34N (0.22 mg/l) above the threshold and trigger values and all other results were below the threshold values and the control and trigger values where defined.

Q2 April to June 2015 - Sampling dated 13th May 2015

Results from groundwater sampling during the 2nd Quarter of 2015 indicated good groundwater quality. All results were below the threshold values and the control and trigger values where defined.

It is noted that there were slightly elevated levels of conductivity (above normal background levels) recorded at BH4 (1,005 µS/cm) and BH27 (1,030 µS /cm), however, none of these exceeded the threshold, control or trigger values.

Q3 July to September 2015 - Sampling dated 19th August 2015

Results from annual groundwater sampling carried out during the 3rd Quarter of 2015 indicated generally moderate or good quality groundwater with a few exceptions. While there were elevated levels of manganese and iron at many of the boreholes this is not unusual in Irish limestones. There were elevated levels of sodium, chloride and conductivity at BH3 and BH4 located to the northwest and outside the zone of influence of the landfill. This may indicate a saline source up-gradient of the landfill. There were slightly elevated levels of ammoniacal nitrogen at BH32, BH34N and BH35 ranging from 0.2 mg/l to 0.66 mg/l and a high concentration of alkalinity at BH34N (1,380 mg/l). Parameters that exceeded stipulated values or were above normal background levels were not generally significantly above the values and results from other parameters and the other boreholes were generally below control, trigger and S.I. threshold values.

BH3, BH4, BH31, BH32, BH33 and BH34N were analysed for VOCs, Semi-VOCs and pesticides and all results were recorded at less than the laboratory detection limits.

In overview, with the exception of BH34N where elevated levels in some parameters were recorded, the results indicated no significant contamination of groundwater and relatively similar quality compared to the 2014 results.

Q4 October to December 2015- Sampling dated 14th October 2015

Results from groundwater sampling during the 4th Quarter of 2015 indicated generally good groundwater quality with most results below the threshold, control and trigger values. However, there were slight elevations in levels of ammoniacal nitrogen at BH16, BH32 and BH35 ranging from 0.18 mg/l to 0.22 mg/l marginally above the SI 9 of 2010 threshold value and an elevated level of 0.97 mg/l at BH34N above the threshold, control and trigger values.

Following on from a high level of alkalinity (1,380 mg/l) and slightly elevated levels of iron and manganese recorded at BH34N during the annual sampling event on 19/08/15 it was decided to resample BH34N on 11/11/15 for these and other indicator parameters. The results indicated a reduction in levels of most parameters though there remained a high level of alkalinity (742 mg/l). The borehole was resampled again on 9/12/15 for the same parameters and the results indicated a further reduction in levels of all parameters apart from an increase in alkalinity (906 mg/l) and residue on evaporation (15,112 mg/l) which was also increasing. The total hardness was also relatively high (297 mg/l) and reflected the high level of carbonate hardness in the water which is the cause of the high alkalinity. The levels of alkalinity and hardness are higher than normal levels found in Irish limestones and therefore may result from an unusual source such as artificial liming of the soils or from contamination. In the case of contamination it would be expected to see elevated levels of other indicator parameters which, apart from the slightly elevated level of ammoniacal nitrogen was not evident from the latest sampling round.

3.1.2 Groundwater Levels

Groundwater levels were recorded from each borehole during each quarter and the results are displayed in Table 3.

Table 1: Groundwater borehole water levels in metres below ground level (mbgl)

Groundwater Borehole Monitoring Location	Q1 2015 10/02/15 (mbgl)	Q2 2015 13/05/15 (mbgl)	Q3 2015 19/08/15 (mbgl)	Q4 2015 14/10/15 (mbgl)
BH3	2.68	2.64	2.85	3.19
BH4	2.38	2.42	2.21	2.59
BH16*	0.0	0.0	0.0	0.0
BH27	2.08	1.53	3.38	3.32
BH31	0.43	0.23	0.62	0.48
BH32	3.53	3.35	3.03	3.27

BH33	1.98	1.85	2.97	2.82
BH34N	0.62	0.52	1.20	0.90
BH35	2.68	2.71	3.71	3.60

* artesian

A hydrogeological Assessment of the facility was forwarded to the Agency in November 2004 (FCC-127-1-2004-065). It determined a regional up gradient / down gradient trending of groundwater from West-North-West to East-South-East beneath the landfill and surrounds. This pattern is generally consistent with the regional drainage pattern.

Bedrock Groundwater Quality

Results during 2015 indicated generally good quality groundwater in bedrock monitoring wells during quarters 1, 2 and 4 with a slight dip in quality during quarter 3.

There were slightly elevated levels of conductivity at BH3 in Q1 and BH27 in Q2 though no threshold values were exceeded and a slightly elevated level of ammoniacal nitrogen at BH35 (0.18 mg/l) in Q4.

During the annual monitoring round in Q3, there were slight elevations in manganese at some of the deep boreholes, ammoniacal nitrogen at BH33 and BH35, magnesium at BH35, conductivity and sulphate at BH3 and BH27 and chloride and sodium at BH3. These results were generally marginally above the threshold values or above what would be considered normal background values in this geological environment. It is noted that elevated levels of iron and manganese are not unusual in this geological environment.

Overburden Groundwater Quality

Shallow groundwater at the site was of generally moderate or good quality during Quarter 1 and Quarter 2 though there were slightly elevated levels of conductivity at BH4 and ammoniacal nitrogen at BH34N (0.22 mg/l) in Q1 and conductivity (1,005 µS/cm) at BH4 in Q2.

During Q3 there were slightly elevated levels of ammoniacal nitrogen at BH32 and BH34N, manganese at BH32 and BH34N, chloride at BH4 and BH32, sodium, conductivity and sulphate at BH4, iron at BH32 and a high level of alkalinity at BH34N (1,380 mg/l).

During Q4 there were slightly elevated levels of ammoniacal nitrogen at BH32 (0.22 mg/l) and BH34N (0.97 mg/l). BH34N was resampled on 11/11/15 and 09/12/15 and returned alkalinity results of 792 mg/l and 906 mg/l respectively. Levels of hardness and total suspended solids were also elevated on 09/12/15. This indicated an unusually high level of alkalinity at BH34N from the 3rd quarter on. The levels of alkalinity and hardness are higher than normal levels found in Irish limestones and therefore may result from unusual sources such as artificial liming of the soils or from contamination. In the case of contamination it would be expected to see elevated levels of other indicator parameters which, apart from the slightly elevated level of ammoniacal nitrogen was not evident from the latest sampling round.

3.1.3 Conclusion & Annual Assessment

In overview, groundwater was of generally moderate to good quality during quarters 1, 2 and 4 at most of the boreholes and while there were elevations in some parameters in some boreholes above either the control, trigger or threshold values the concentrations were not very high or indicative of significant contamination. There was a slight dip in quality during quarter 3 with slight elevations in a number of parameters at many boreholes and a high level of alkalinity at the shallow borehole BH34N.

3.2 SURFACE WATER

Schedule D.1 of the waste licence requires the monitoring of surface water at six locations (SW1, SW2, SW4, SW7, SW9 & SW10).

SW11 was incorporated as an additional sampling location under instruction from *The Agency* following Q1 Monitoring Report 2004. SW11 was replaced by SW11A (c. 20m downstream of SW11 at the outfall of the southern tributary to the Scribblestown stream).

Surface water sampling points were established at the discharge from the wheelwash to the open channel WWSW1 and from the open channel to the Scribblestown Stream WWSW2.

SW1 is located downstream of the facility and sampling at this point monitors the effect of the facility on water quality. SW1 is located some distance downstream of the facility and a breakers yard lies adjacent to the stream and illegal waste tipping occurs between the facility and SW1. A case was put to *The Agency* to move SW1 further upstream to avoid these potential sources of surface water contamination and provide a truer picture of the effect of the facility on surface water quality. During the annual audit of the licence *The Agency* agreed and from 15th August 2005 a new downstream monitoring point, SW17, was used instead of SW1.

SW4 was replaced on 27/2/2006 by SW18 as the upstream sampling point as agreed with *The Agency* (127-1/AK11EM).

In October 2012 it was agreed by the Agency to include SW21 located on the Scribblestown stream upstream of the landfill (on the opposite side of the M50) in the monitoring programme.

SW9 was often dry during 2015 and removed from the monitoring programme in July 2015.

Some small springs were noted on the site haul route along the southern boundary in the Winter of 2014/2015 and when flowing, drained to the east in the direction of the southern tributary to the Scribblestown stream. The water (when flowing) collected into a depression along the lane and this point was included in the monitoring programme from July 2015 onwards and was referenced as 'Lane Pond'.

On occasion, slightly elevated levels of certain parameters were noted at monitoring stations downstream of SW10. An additional monitoring point SW10A, located at the outfall from a small northern tributary to the Scribblestown stream just downstream of SW10 was included in the monitoring programme on certain occasions.

Biological water sampling of the site stream was not conducted in 2015.

Table 2: Surface Water Monitoring Locations

Surface Water Monitoring Location	Eastings	Northings
SW1	311800	238460
SW2	311380	238980
SW4	310480	239365
SW7	311120	239220
SW9	310885	238795
SW10	311350	239100
SW11*	311360	238915
SW12**	310424	239410
SW13**	310829	239356
SW14**	311173	239277
SW15**	311417	239069
SW16**	311410	238926
SW17***	311687	238826
SW18****	310464	239394
SW21*	310334	239455
KS1*****	310781	239373

KS2*****	311145	239242
KS3*****	311739	238812
KS3a*****	311600	238840
KS4*****	311415	239052
KS6*****	311590	238994
WWSW1******	311616	238921
WWSW2******	311644	238835

* Additional sampling location for monitoring programme.

** Enhanced monitoring programme undertaken 30th July 2004.

*** New downstream sampling point agreed during EPA audit August 2005.

**** New upstream sampling point agreed with *The Agency*.

***** Biological Sampling Programme.

****** Sampling points at discharge from wheelwash to open channel and from open channel to Scribblestown Stream. Only sampled when clay was imported onto the Landfill.

See Table 5 for sampling programme completed in 2015.

3.2.1 Surface Water Monitoring Quality - Findings of quarterly monitoring (See Appendix II)

Surface water quality was monitored in the drainage network within the landfill and its immediate environs throughout 2015 (Table 5).

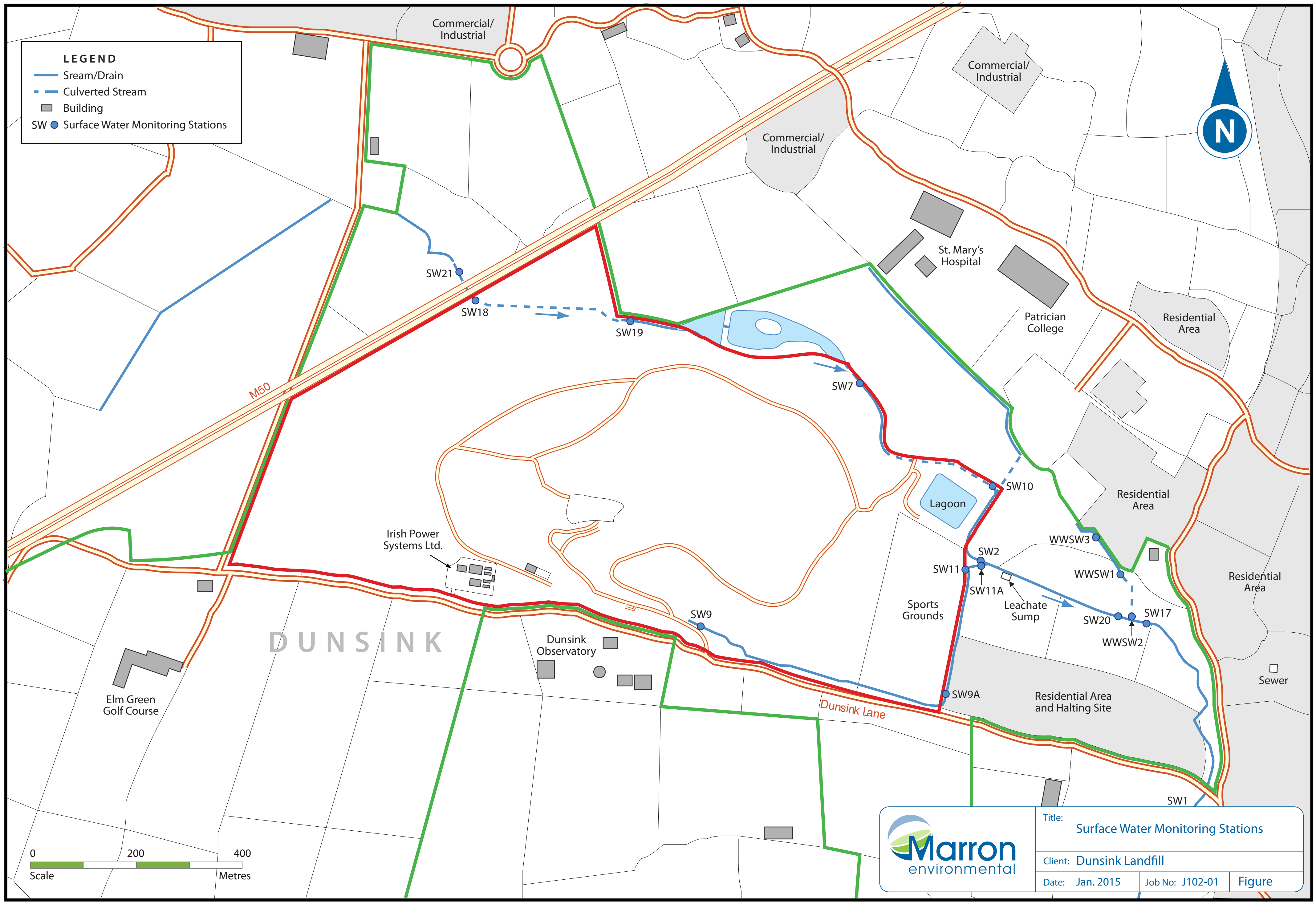
The water quality results have been compared to SI 293 of 1988 European Communities (Quality of Salmonid Waters) Regulations 1988 and SI 272 of 2009 (Surface Water Regulations) (Appendix II).

Table 3: Surface Water Monitoring Programme 2015

Surface Water Monitoring Location	Q1	Q2	Q3	Q4	Monthly Visual	Annual
SW2	Y	Y	Y	Y	Y	Y
SW4	N	N	N	N	N	N
SW7	Y	Y	Y	Y	Y	Y
SW9	Y	Y	N	N	Y (7 months)	N
SW10	Y	Y	Y	Y	Y	Y
SW11A	Y	Y	Y	Y	Y	Y
Lane Pond	N	Y	N	N	Y	N

SW12	N	N	N	N	N	N
SW13	N	N	N	N	N	N
SW14	N	N	N	N	N	N
SW15	N	N	N	N	N	N
SW16	N	N	N	N	N	N
SW17	Y	Y	Y	Y	Y	Y
SW18	Y	Y	Y	Y	Y	Y
SW19	N	N	Y	Y	Y	Y
SW21	Y	Y	Y	Y	Y	Y
WWSW1	N	N	N	N	Y	N
WWSW2	Y	Y	Y	Y	Y	Y
KS1	N	N	N	N	N	N
KS2	N	N	N	N	N	N
KS3	N	N	N	N	N	N
KS3a	N	N	N	N	N	N
KS4	N	N	N	N	N	N
KS6	N	N	N	N	N	N

Figure 3 – Surface Water Monitoring Stations



LEGEND
Sream/Drain
Culverted Stream
Building
SW Surface Water Monitoring Stations
Commercial/ Industrial
Commercial/ Industrial
Commercial/ Industrial
St. Mary's Hospital
Patrician College
Residential Area
Residential Area
Residential Area
Residential Area and Halting Site
M50
SW21
SW18
SW19
SW7
SW10
Lagoon
SW2
SW11
SW11A
WWSW3
WWSW1
Leachate Sump
SW20
SW17
WWSW2
Sports Grounds
SW9
SW9A
Sewer
SW1
Irish Power Systems Ltd.
DUNSINK
Dunsink Observatory
Elm Green Golf Course
Dunsink Lane
N
0
200
400
Scale
Metres

Marron environmental
Title: Surface Water Monitoring Stations
Client: Dunsink Landfill
Date: Jan. 2015
Job No: J102-01
Figure

The Environmental Protection Agency's document "Parameters of Water Quality – Interpretation and Standards" details concentrations of total ammonia in fresh water which contain an unionised ammonia concentration of 0.02mg/l at their given pH and temperature. Unionised ammonia is the component of total ammonia which at "the value of 0.02 mg/l has a long term toxic effect level for fish both salmonid and cyprinid. Lethal levels are about ten times greater".

Using this data, concentrations of ammoniacal nitrogen determined during sampling in 2015 indicated that the concentrations of unionized ammonia exceeded 0.02 mg/l on 15/07/15 at Lane Pond, on 19/08/15 at SW21, SW18, WWSW1 and WWSW2 and on 16/09/15 at Lane Pond. All other results were lower than the threshold value throughout the year.

Q1 January to March 2015 – Quarterly Sampling dated 10th February 2015

A review of historical data indicates that there has been a rise in conductivity levels at the site during the Winter months in previous years and reducing again during the following Q2 and Q3 periods. This may relate to gritting of the M50 during the Winter months or there may be other seasonal factors causing this trend. The trend continued this Winter with elevated levels of conductivity arising in November 2014 and elevating further in February and March 2015. Levels ranged from 810 µS/cm (WWSW2, 10/28/15) to 1,860 µS/cm (SW7 11/03/15).

Surface water results during the Q1 2015 quarterly sampling round indicated slightly contaminated water at most sampling stations due to the elevated conductivity results. There were also slightly elevated levels of ammoniacal nitrogen at SW21 on two occasions (0.32 mg/l and 0.2 mg/l), BOD at SW7 and WWSW2 (3 mg/l at both stations), total suspended solids at SW10 and SW2 (39 mg/l and 134 mg/l respectively).

In January 2015, a new source of surface water was found to appear from underground (small springs), at a location on the South of the landfill, along the haul road to the East of the Gas Utilisation Plant. This new source of water was found to leave orange staining on the surface of the haul road. Initial sampling on 14/01/15 and 10/02/15 showed elevated levels of ammoniacal nitrogen (2.35 and 2.3 mg/l respectively), manganese (1.08 and 0.6 mg/l), sulphate (83.39 and 103.52 mg/l), potassium (8.4 and 10.7 mg/l) and conductivity (990 and 1,040 µS/cm). This indicated slightly contaminated water though not consistent with landfill leachate and may have resulted from some local contamination on or within the clay capping layer adjacent to the haul road. There were no visual signs of contamination on the land surface or adjacent to the haul road. This does not appear to be affecting the surface water quality downstream from the landfill.

In overview, if one excludes the elevated conductivity results which appear to be a Winter phenomenon and a few minor exceedances (ammoniacal nitrogen at SW21 upstream of the site) and total suspended solids at two stations the general quality of the Scribblestown stream was reasonably good during Q1 2015.

Q2 April to June 2015 – Quarterly Sampling dated 13th May 2015

Surface water results during the Q2 2015 quarterly sampling round along the Scribblestown stream indicated generally good quality water at most sampling stations apart from a few slightly elevated levels of conductivity. The annual Winter rise in conductivity levels was repeated over 2014/2015 and elevated levels persisted at some monitoring stations through Q2.

A sample was collected from the surface water along the southern haul route (Lane Pond) on 09/04/15 and the results indicated contaminated water with elevated or high levels of total iron (1.548 mg/l), dissolved manganese (1.214 mg/l), total manganese (1.380 mg/l), potassium (7.8 mg/l), sulphate (89.1 mg/l), ammoniacal nitrogen (1.13 mg/l), total coliforms (40 cfu/100ml) and faecal coliforms (27 cfu/100ml). The level of fluoride was 0.3mg/l indicating a non-potable water source. The results indicated that while the water is contaminated the contamination is not at the same level that would be expected from municipal waste leachate. Contamination may be caused by localised or mild contamination in the clay cap or in the clay bund adjacent to the southern boundary of the lane. The spring source is only evident during heavy or prolonged rainfall periods and may result from perched conditions in the clay cap.

This does not appear to be affecting the surface water quality downstream from the landfill.

Q3 July to September 2015 – Annual Sampling dated 19th August 2015

Surface water results during the Q3 2015 annual sampling round indicated slightly contaminated water at most sampling stations. There were slight exceedances of the threshold values for ammoniacal nitrogen, BOD and total suspended solids at many of the stations and this indicated a slight deterioration in quality compared to 2014 results. While there were slight elevations in values at SW17 downstream of the site these were effected to an extent by elevated levels upstream of the site at SW21 and from the northern (Dunsoghly) tributary which are not influenced by the landfill.

It is noted that the sampling took place during very heavy rain and most stations showed a heavy flow of water. It is thought that the exceedances observed were linked to that heavy flow.

The results from 16/09/15 indicated generally good quality water in terms of the field parameters, ammoniacal nitrogen and total suspended solids indicating an improvement in quality compared to the August results.

Water quality results from the Lane Pond sampling station indicated slightly contaminated water during monitoring rounds in July and September. The station was dry during the August monitoring round.

Q4 October to December 2015- Quarterly Sampling dated 14th October 2015

The seasonal trend for conductivity levels (high in Winter and lower in Summer) was similar in the first nine months of 2015 however there has not been a significant increase in levels during the last quarter. The weather was generally mild over the months of October to December and therefore likely no gritting of the M50 and this may indicate that gritting is the main source of elevations in the Winter months. The elevated level of conductivity at SW21 on 11/11/15 was related to high conductivities in water emanating from a concrete tank upstream of SW21.

There were a number of exceedances of the threshold value for ammoniacal nitrogen (0.14 mg/l) over the fourth quarter including levels at SW19 (0.26 mg/l) on 14/10/15, at SW21 (0.69 mg/l) on 11/11/15, at SW21 (0.36 mg/l) and SW18 (0.4 mg/l) on 18/11/15 and at SW21 (0.23 mg/l), SW18 (0.14 mg/l), SW19 (0.21 mg/l) and SW17 (0.19 mg/l) on 09/12/15.

These exceedances were linked to an upstream source (SW21) and not reported as incidents.

Surface water results during the Q4 2015 sampling rounds indicated generally good or moderate quality water in the Scribblestown stream and tributaries. As discussed above there were some slight exceedances of the threshold value for ammoniacal nitrogen at some of the monitoring stations particularly during the December sampling round and isolated exceedances of conductivity at SW21 and SW11A. However, it is noted that in most cases, levels of ammoniacal nitrogen were higher at SW21 upstream of the site compared with the levels at SW17 downstream of the site.

Monthly Sampling for Ammoniacal Nitrogen

Sampling for ammoniacal nitrogen was carried out at SW21, SW18 and SW17 on a monthly basis during 2015.

Results from these three stations indicated elevated levels above the S.I. 272 of 2009 threshold value (0.14 mg/l) at SW21 on 5 of the 12 sampling events, at SW18 on 1 occasion and at SW17 on 3 of the 12 sampling events. The highest value was 0.69 mg/l at SW21 on 11/11/15.

The other surface water monitoring stations monitored on a quarterly basis indicated very few exceedances though there were slightly elevated levels at WWSW1 located on the northern (Dunsoghly) stream as it enters the site.

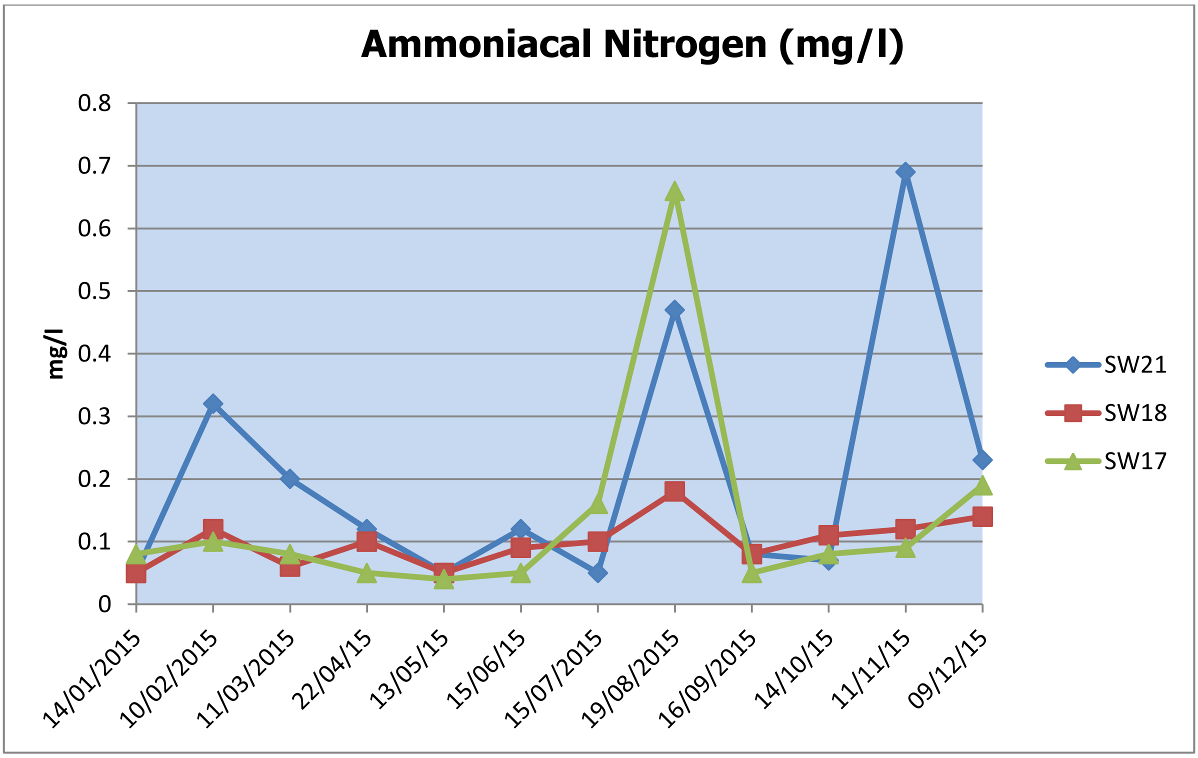


Figure 4: Ammoniacal Nitrogen Levels at SW21, SW18 & SW17 (2015)

Conductivity Results from Monthly Monitoring

Monthly Electrical Conductivity measurements at SW21, SW18 and SW17 for 2015 are shown on Figure 5 below. The results indicated generally elevated conductivity levels (> 1,000 µS/cm) at the three monitoring stations in January to March and decreasing in April with only slightly elevated levels above 1,000 µS/cm persisting at SW18 until June. Results remained relatively low at the three stations for the rest of the year apart from one elevated level at SW21 on 11/11/15. There has been a trend over recent years for elevated conductivity levels at these monitoring stations during the Winter months and lower levels during the rest of the year. This trend was repeated for the first ten months of the year. However, levels remained relatively low during November and December (apart from one elevated value at SW21 in November). The weather was generally mild over the months of October to December and therefore likely no gritting of the M50 and this may indicate that gritting is the main source of elevations in the Winter months.

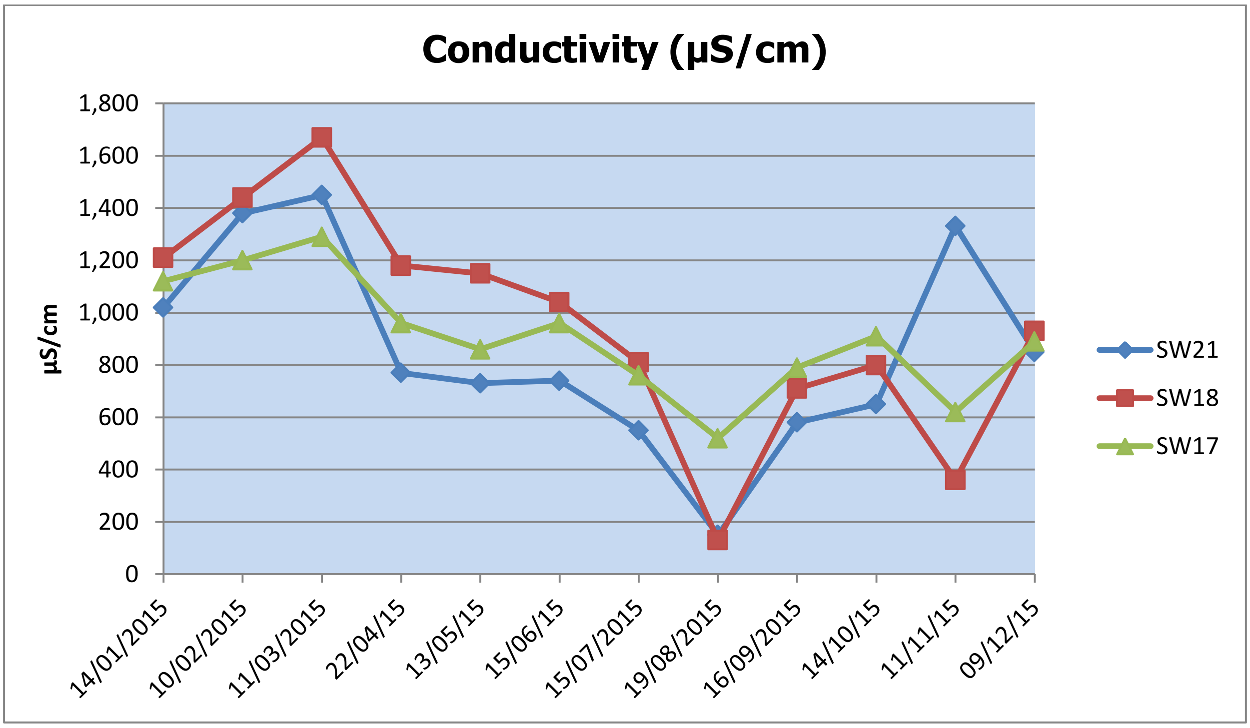


Figure 5: Conductivity measurements at SW21, SW18 & SW17 (2015)

Monthly Visual Inspections

Monthly visual inspections were carried out at all Surface Water Monitoring stations during 2015. The visual inspections included sampling of pH, temperature and conductivity as well as logging a description of the waters, colour, odour, cloudiness, the substrate, weed growth and algae. Conductivity results are discussed above. All temperature readings and pH measurements were within normal ranges for the water type and time of year.

Monthly Wheelwash Sampling

Monthly sampling ceased in November 2007 as it was agreed with *the Agency* that future sampling of WWSW1 and WWSW2 will occur on a needs be basis.

3.2.2 Conclusion & Annual Assessment

The 2015 annual assessment suggested a slight deterioration in water quality at Dunsink Landfill compared to 2014 with a slight increase in levels of ammoniacal nitrogen, BOD and suspended solids at many of the stations and some slight elevations in levels of specific parameters at some stations.

There were elevated levels of conductivity at many of the sampling stations on some occasions particularly during the Winter months early in the year though not in the latter part of the year. Elevated levels of ammoniacal nitrogen at SW17 in August were caused by an upstream pollution incident in the northern (Dunsoghly estate) stream at that time and by elevated levels at SW21 upstream of the site.

The leachate pumping infrastructure (pumps, sump and leachate valve configuration) commissioned in June 2005 and the leachate interceptor drains established to the West and South of the Lagoon along with the remedial works at SW21 in 2013 have significantly aided in the general improvement in water quality at the facility.

3.3 LEACHATE

Schedule D of the waste licence requires the monitoring of leachate at the station "north-east lagoon". A monitoring station which facilitates the obtaining of representative grab and / or continuous samples in accordance with Condition 8.4 is provided at the sump (see Table 6).

Table 6: Leachate Monitoring Locations 2015

Leachate Monitoring Location	Eastings	Northings
Northeast Lagoon	311323	239031
Sump	311417	238895

Table D.5.1 of Schedule D of the waste licence sets down the parameters and frequency for leachate monitoring. Table 7 below outlines the sampling programme for leachate undertaken in 2015.

Table 7: Leachate Monitoring Programme 2015

Leachate Monitoring Location	Q1	Q2	Q3	Q4	Annual
North East Lagoon	Sampled	Sampled	Sampled	Sampled	Sampled (Q3)
Sump	Sampled	Sampled	Sampled	Sampled	Sampled (Q3)

3.3.1 Leachate - Methodology

The monitoring of leachate was undertaken during 2015 using 2 methods – through a grab sample taken at 2 locations (sump and lagoon) at each quarter on one hand, and through continuous monitoring in the sump via a dissolved methane probe.

Refer to Schedule D.5 of waste licence 127-1 for the parameters and frequency of monitoring.

3.3.2 Leachate Monitoring – Results of Quarterly Sampling (See Appendix II)

Q1 January to March 2015 – Sampling dated 10th February 2015

Results from leachate sampling at the lagoon on 10th February 2015 recorded pH of 8.4, conductivity of 1,400 µS/cm and temperature of 4.3^{o}C. A dissolved methane concentration of <0.001 mg/l and ammoniacal nitrogen of 0.17mg/l were recorded.

Results from leachate sampling at the leachate sump recorded pH of 7.42, conductivity of 3,400 µS/cm and temperature of 10.9 ^{o}C. Dissolved methane was recorded at 6.054 mg/l and ammoniacal nitrogen of 155.44 mg/l. Table C.6 of the waste licence states that Emission Limits for Dissolved Methane in Leachate Being Discharged to Sewer as 0.14mg/l. The results indicated that emission limit values for dissolved methane were exceeded for leachate in the leachate sump.

Q2 April to June 2015- Sampling dated 13th May 2015

Results from leachate sampling at the lagoon on 13th May 2015 recorded pH of 9.1, conductivity of 2,175 µS/cm and temperature of 15.3^{o}C. A dissolved methane concentration of 0.015 mg/l and ammoniacal nitrogen of 70.26 mg/l were recorded.

Results from leachate sampling at the leachate sump recorded pH of 7.4, conductivity of 2,750 µS/cm and temperature of 13.9 ^{o}C. Dissolved methane was recorded at 2.256 mg/l and ammoniacal nitrogen of 97.05 mg/l. The results indicate that emission limit values for dissolved methane were exceeded for leachate in the leachate sump.

Q3 July to September 2015 – Annual Sampling dated 19th August 2015

Results from leachate sampling at the lagoon on 19th August 2015 recorded pH of 8.87, conductivity of 3,840 µS/cm and temperature of 19.1^{o}C. A dissolved methane concentration of 0.052 mg/l and ammoniacal nitrogen of 210.64 mg/l were recorded. Apart from Dissolved methane, these were significantly higher than concentrations recorded in 2014.

Results from leachate sampling at the leachate sump recorded pH of 6.1, conductivity of 2,820 µS/cm and temperature of 17.1^{o}C. Dissolved methane was recorded at 0.771 mg/l and ammoniacal nitrogen of 342.08 mg/l. The results indicate that emission limit values for dissolved methane were exceeded for leachate in the leachate sump.

There were elevated or high levels of many of the other parameters analysed as part of the annual round including chloride, potassium, sodium, COD and BOD as would be expected from landfill leachate.

Q4 October to December 2015- Sampling dated 14th October 2015

Results from leachate sampling at the lagoon on 14th October 2015 recorded pH of 8.9, conductivity of 3,480 µS/cm and temperature of 11.3 °C. A dissolved methane concentration of 0.177 mg/l and ammoniacal nitrogen of 146.77 mg/l were recorded.

Results from leachate sampling at the leachate sump recorded pH of 7.6, conductivity of 4,580 µS/cm and temperature of 12.9 °C. Dissolved methane was recorded at 0.524 mg/l and ammoniacal nitrogen at 261.37 mg/l. The results indicated that emission limit values (0.14 mg/l) for dissolved methane were exceeded for leachate in both the lagoon and the leachate sump.

Leachate – Discussion.

The results from monthly visual inspections and quarterly and annual chemical monitoring of the leachate lagoon and leachate sump indicated concentrations typical of leachate quality at both stations. The lagoon water is of higher quality than the leachate sump for most parameters (apart from COD and TON) and this may be due to the diluting effect of rainwater in the lagoon.

Weekly monitoring of Methane, Carbon dioxide and Oxygen is being carried out at the headspace of the sump and the point of discharge to public sewer in Finglas (See Figure 1). The results are being compiled for Dublin City Council. Dublin City Council may require further mitigation measures following a review of the results of these monitoring rounds.

3.3.3 Continuous Monitoring of Dissolved Methane in Leachate

Continuous monitoring of dissolved methane at the sump commenced during Q1 2006. Table C.6 of the waste licence states that Emission Limits for Dissolved Methane in Leachate Being Discharged to Sewer as 0.14mg/l. Continuous monitoring of dissolved Methane has been carried out from 3rd October 2006 to present. Reporting of incidents under this system is being undertaken through the quarterly environmental reports as the data has emerged and is analysed.

3.3.4 Results from Continuous Monitoring of Dissolved Methane in Leachate

This reporting is as per protocols specified in condition 6.3.3.1.

a) No 24 hour mean value shall exceed the ELV;

99.5% of 24 hour mean values exceeded the ELV of 0.14mg/L

b) 97% of all 30 minute mean values taken continuously over an annual period shall not exceed 1.2 times the emission limit value.

96.2% of 30 minute mean values exceeded 1.2 times the ELV (0.168mg/L)

c) No 30-minute mean value shall exceed twice the emission limit value.

81.7% of 30 minute mean values exceeded 2 times the ELV (0.28mg/L).

These results show that the ELV of 0.14mg/L has been continuously breached throughout 2015.

However these results mark an improvement on previous years. Fingal County Council undertook an extended trial of aerating the leachate in the lagoon prior to discharging it to sewer. The results showed that while the ELV was still not achieved the passive aeration significantly reduced the concentration. Discussions are taking place with Irish Water and Dublin City Council with a view to agree with them an ELV that can be achieved. A technical amendment of the licence will then be required to change the ELV.

Compliance investigation CI000399 has been open to monitor progress towards achieving compliance with the ELV.

3.3.5 Discussion of Results from Continuous Sampling of Dissolved Methane

The results indicate that the ELV is exceeded almost continuously at high levels.

Fingal County Council undertook an extensive passive aeration trial through the lagoon, and this achieved a reduction in the dissolved methane levels in the leachate pumped to sewer. Compliance with the ELV was not achieved, and discussions are taking place with Irish Water and Dublin City Council to agree a different ELV.

Compliance Investigation CI000399 is used to track progress on the issue.

Weekly monitoring of Methane, Carbon dioxide and Oxygen is being carried out at the headspace of the sump and the point of discharge to public sewer in Finglas. The results are being sent to The Agency through weekly notifications and are also being compiled for Dublin City Council.

3.4 NOISE

No noise survey was undertaken at Dunsink Landfill in 2015. This was addressed in Licence Audit Report for 2008 from the Agency W1027-01/08/AR08EM, observation No.5, on Environmental Monitoring.

3.5 DUST

No dust monitoring surveys were carried out at Dunsink Landfill in 2015. This was addressed in Licence Audit Report for 2008 from the Agency W1027-01/08/AR08EM, observation No.5, on Environmental Monitoring.

3.6 PM_{10} MONITORING

The Agency in correspondence referenced 127-1/GEN01EM stated that "The Agency, in accordance with Condition 8.2, does not require monitoring of PM_{10} as listed in Table D.3.1 of the waste licence unless otherwise instructed by the Agency."

3.7 BIOLOGICAL ASSESSMENT OF THE SCRIBBLESTOWN STREAM

Condition 8.8.1 of the Licence requires an annual biological assessment of the Scribblestown Stream. The Agency agreed for this assessment not to be carried out in 2015, based on the fact that the stream conditions (channels muddy and soft, heavily vegetated and devoid of a pool riffle habitat) would not allow for an improvement on past results and that improvements could not be brought to the stream as long as horses had free access to the stream. This was agreed under Licensee Return LR014567.

3.8 LANDFILL GAS

3.8.1 Landfill Gas Facility Monitoring

Since the 4^{th} Quarter (Q4) of 2006 measurements of landfill gas were carried out at twenty four locations at the perimeter of the landfill (See Figure 6 and Table 8).

During November 2007 (Q4) in agreement with the *Agency*, weekly gas monitoring decreased to six monitoring locations (G35 to G40) and the leachate sump and sewer, with the monthly monitoring round still consisting of all accessible gas monitoring locations (24 locations).

From September 2010 monitoring location G23 was also included in the weekly gas monitoring.

Gas monitoring station G41 was lost during site excavation work in September 2012 and a replacement borehole G41R was drilled adjacent to it on 5/12/2012.

At the end of October 2012 the Agency and Fingal County Council agreed to amend the monitoring programme from weekly to monthly with the following exceptions. The sewer at Finglas continues to be monitored weekly and in the event that monitoring at the landfill indicates any exceedances of methane above the trigger level, or unusually high levels of carbon dioxide relative to historical levels at the site, then monitoring should continue weekly until the gas levels subside or remedial action effected.

Table 8: Landfill Gas monitoring Locations and Programme 2015

Landfill Gas Monitoring Locations.	Monitoring Frequency Pre Nov. 2012	Monitoring Frequency Post Nov. 2012	Eastings	Northings
G3**	Monthly	Quarterly	311270	238670
G6**	Monthly	Quarterly	311180	239425
G7**	Monthly	Quarterly	311230	239375
G8**	Monthly	Quarterly	311300	239320
G9**	Monthly	Quarterly	311360	239260
G10**	Monthly	Quarterly	311410	239170
G12	Monthly	Quarterly	310040	238850
G13	Monthly	Quarterly	310560	238795
G18	Monthly	Quarterly	311150	238630
G21	Monthly	Quarterly	311380	238990
G23	Weekly	Monthly	310325	239265
G35	Weekly	Monthly	311265	238740
G36	Weekly	Monthly	311210	238740
G37	Weekly	Monthly	311290	238875
G38	Weekly	Monthly	311245	238880
G39	Weekly	Monthly	311195	238835
G40	Weekly	Monthly	311520	239090
G41R	Monthly	Monthly	311580	239020
G42**	Monthly	Quarterly	311410	238805
G43**	Monthly	Quarterly	311524	239088

G44**	Monthly	Quarterly	311516	239100
IPS inlet	Weekly	Monthly	310515	238849
Leachate Sump	Weekly	Monthly	311417	238895
Finglas Manhole	Weekly	Weekly	311909	238733

** (Changed to monthly monitoring during November 2007)

Gas levels were monitored using a GA2000 landfill gas analyser. The boreholes were monitored for Methane (CH_4), Carbon dioxide (CO_2), Oxygen (O_2), Hydrogen Sulphide, Carbon Monoxide (CO) and atmospheric pressure.

Gas trigger levels at monitoring boreholes outside the waste body have been set at 1% for methane and 1.5% for carbon dioxide in accordance with the waste licence.

The results of the gas monitoring are recorded in monthly landfill gas monitoring round sheets – these are available from the quarterly environmental monitoring reports.

Landfill Gas - Proximity of Buildings and Developments to the Site

There are a number of buildings and developments on site, which are identified in the risk analysis of the site from landfill gas, which have potential to expose receptors to risk from landfill gas (See Figure 6). These include the former Irish Power Systems (IPS) compound (now Fingal County Council) at the southern boundary to the site along Dunsink lane.

There are a number of buildings and developments close to the site which have potential to expose receptors to risk from landfill gas. Cappagh Hospital and a secondary school are located to the north of the landfill boundary. Dunsoghly estate lies to the east of Cappagh Hospital and north east of the landfill boundary. A halting site is established along the south-east boundary of the landfill (Figure 6).

South of Dunsink Lane, which marks the southern boundary of the site, there are a number of developments. From west to east these include; Elm Green Golf Course, Dunsink Observatory and a series of unauthorised halting sites (Figures 2 & 6).

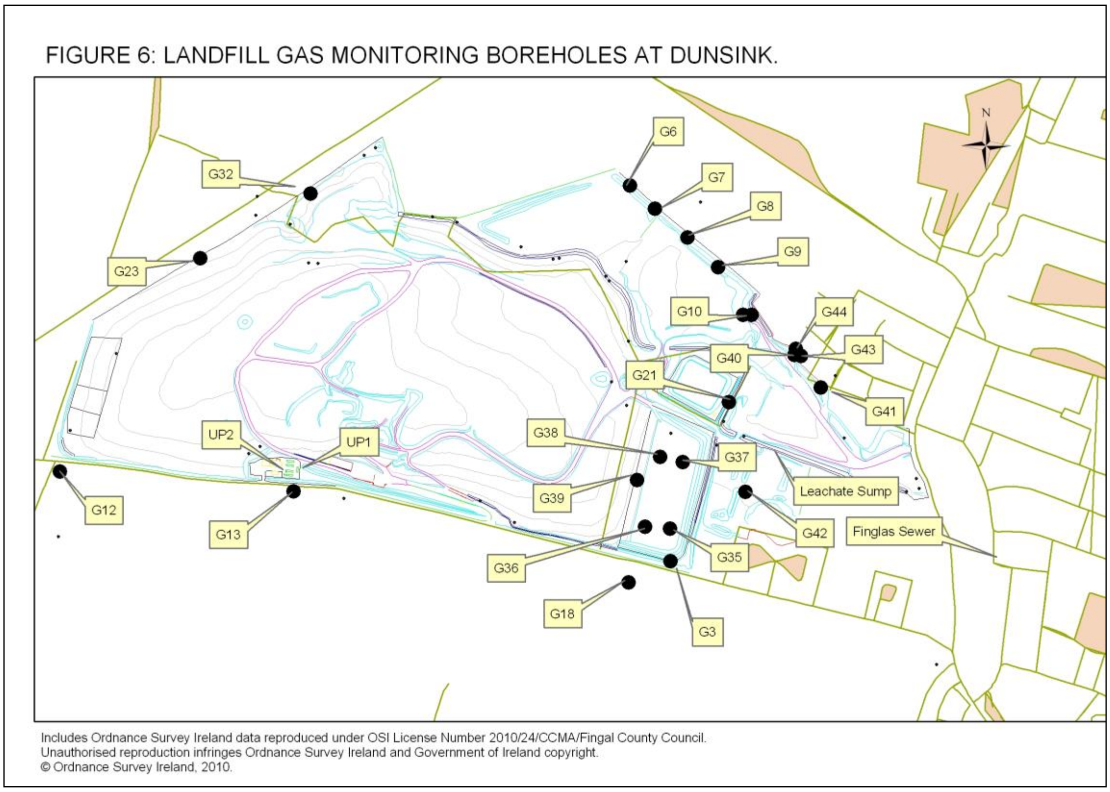


Figure 6: Landfill Gas Borehole Monitoring Locations

Locations of Trigger Level Exceedances

Q1 January to March 2015

The monthly monitoring boreholes (G23, G35, G36, G37, G38, G39, G40, G41R and the leachate sump) were monitored on 3 occasions (14/01/15, 10/02/15 and 11/03/15) during Q1 and monitoring was carried out at all boreholes on one occasion (quarterly monitoring round on 10/02/15). During Quarter 1 2015, there were no elevated levels of methane recorded above the threshold value of 1.0% v/v.

Elevated levels of carbon dioxide were recorded above the threshold value of 1.5% v/v on a regular basis at G35, G36, G37, G38, G39, G40, G41R and the leachate sump ranging from 1.5% to 11.8%. There were also elevated levels of carbon dioxide recorded at G6, G9, G10, G42, G43 and G44 ranging from 2.2% to 9.5% during the quarterly monitoring round (the only sampling event for these boreholes). No elevated levels were recorded at G23 (monthly) or at G3, G7, G8, G12, G13, G18 and G21 (quarterly).

No positive values for hydrogen sulphide were recorded during the 1st Quarter of 2015.

Weekly gas monitoring at the sewer in Finglas recorded methane levels ranging from 0.0% v/v to 0.1% v/v, carbon dioxide levels ranging from 0.1% v/v to 1.7% v/v and all hydrogen sulphide levels at 0 ppm.

Q2 April – June 2015

The monthly monitoring stations (G23, G35 to G39, G40, G41R and the leachate sump) were monitored on 3 occasions (22/04/15, 13/05/15 and 15/06/15) during Q2 2015 and the quarterly monitoring stations on 13/05/15.

No elevated concentrations of methane above the threshold value of 1.0% v/v and no positive values for hydrogen sulphide were recorded during the 2nd Quarter of 2015.

Elevated levels of carbon dioxide were recorded at G35, G36, G38, G39, and G40 on all 3 monitoring events, at the leachate sump and G37 on 2 of the 3 events and at G23 on 1 of the 3 events. Elevated levels were also recorded at G6, G9, G10, G43 and G44 during the quarterly monitoring round (the only monitoring event for these boreholes). The elevated levels ranged from 1.7% v/v to 11.8% v/v.

Results from the weekly monitoring at the Finglas sewer manhole during the second quarter indicated low methane levels ranging from 0 to 0.1% v/v and carbon dioxide levels ranging from 0.1 to 1.6% v/v.

Q3 July – September 2015

The monthly monitoring stations (G23, G35 to G39, G40, G41R and the leachate sump) were monitored on 3 occasions (15/07/15, 19/08/15 and 16/09/15) during Q3 2015 and the quarterly monitoring stations on 19/08/15 (apart from G18 which was inaccessible). No elevated concentrations of methane above the threshold value of 1.0% v/v were recorded at any of the monitoring boreholes during the 3rd Quarter of 2015. Elevated levels of methane were recorded at the leachate sump on all 3 occasions ranging from 1.2% v/v to 4.1% v/v.

Elevated levels of carbon dioxide were recorded at G35, G36, G37, G38, G39, G40, G41R and the leachate sump on all 3 monitoring events and at G23 on 2 of the 3 events. Elevated levels were also recorded at G9, G10, G21, G42, G43 and G44 during the quarterly monitoring event (the only time these wells were monitored). Carbon dioxide levels ranged from 2.2% v/v to 12.9% v/v at the monitoring boreholes and from 9.4% v/v to 17.1% v/v at the leachate sump.

Hydrogen sulphide levels were zero ppm at all monitoring stations throughout the quarter apart from a positive value of 1ppm at the leachate sump on 15/07/15.

Results from the weekly monitoring at the Finglas sewer manhole during the third quarter indicated all methane levels at 0.0% v/v and carbon dioxide levels ranging from 0.1 to 0.5 % v/v.

Q4 October – December 2015

The monthly monitoring stations (G23, G35 to G39, G40, G41R and the leachate sump) were monitored on 3 occasions during Q4 2015 (14/10/15, 11/11/15 and 09/12/15) and the quarterly monitoring stations on 14/10/15. All levels of methane were recoded below the threshold value of 1.0% v/v at the monitoring boreholes during Quarter 4 2015. Elevated levels above 1% v/v were recorded at the leachate sump on 2 of the 3 occasions ranging from 1.5% v/v to 4.6% v/v.

Elevated levels of carbon dioxide (>1.5% v/v) continued to be recorded at G36, G38, G39, G40 and G41R on all 3 occasions and at G23, G35 and G37 on 2 of the 3 occasions monitored and at G9, G10, G21, G42, G43 and G44 on 14/10/15 (the only occasion on which these boreholes were monitored). Levels ranged from 1.9 % to 14.2% v/v. Elevated levels were also recorded at the leachate sump on all 3 occasions ranging from 4.4% v/v to 12.1% v/v.

No elevated levels of hydrogen sulphide were recorded at any of the site monitoring boreholes and a value of 3ppm was recorded at the leachate sump on 09/12/15.

Results from the weekly monitoring at the Finglas sewer manhole during the third quarter indicated low methane levels ranging from 0 to 0.6% v/v and carbon dioxide levels ranging from 0.1 to 4.0% v/v.

Landfill Gas Monitoring – Summary

Landfill gas monitoring undertaken at Dunsink landfill in 2015 indicated a slight reduction in the number and level of exceedances in trigger levels compared to previous years. All methane levels recorded from the site monitoring boreholes were below the threshold value of 1.0% v/v throughout the year. However, there continues to be regular, though not continuous elevations of carbon dioxide at the sportsfield monitoring boreholes (G35 to G39), at G40, G41R and frequently at G6, G9, G10, G21, G42, G43 and G44 during the quarterly monitoring rounds.

Results from the leachate sump indicated elevated levels of carbon dioxide on all occasions monitored and elevated levels of methane on a regular (though not continuous) basis.

Exceedances in the monthly and quarterly monitoring of gas at the landfill are reported to the EPA in incident reports as they occur.

3.8.2 Landfill Gas Utilisation Plant Monitoring Equipment and Sampling points

Weekly monitoring at the inlet and continuous monitoring at the outlet commenced during Q1 2006. It was agreed by the Agency that reporting of incidents under this system could be done through the quarterly and annual environmental reports.

Inlet to Landfill Gas Utilisation Plant

A gas sampling system to include chilling and filtration for the protection of the portable infrared analyser was installed. This facilitates weekly monitoring of methane, carbon dioxide and oxygen using a portable landfill gas analyser, which is used for borehole monitoring. It also provides a sampling location for annual monitoring of Total Sulphur, Total Chlorine and Total Fluorine. The results from the weekly sampling at the inlet are reported in the weekly landfill gas monitoring round sheets. These sheets are available from the quarterly environmental monitoring reports.

Outlet from Landfill Gas Utilisation Plant

Carbon monoxide and nitrogen oxides are monitored continuously. Continuous monitors on the outlets of the two gas engines were installed. The analysers are proven to be effective on other landfill gas utilisation plants. An appropriate data management system has been installed and this provides for data logging and data storage.
Additionally, a gas sampling system to allow for annual monitoring of total VOCs as carbon, total non-methane VOCs and Particulates, Hydrochloric acid and Hydrogen fluoride, and, quarterly monitoring of nitrogen oxides has been installed.

Emission limit values for Landfill Gas Plant

The emission point reference numbers are proposed to be:

UP1 Utilisation Plant Input 1

UP2 Utilisation Plant Output Engine 1

UP3 Utilisation Plant Output Engine 2

The analysers are able to measure and report at a sufficient resolution to register the emission limit for Carbon monoxide (CO) (1400mg/m3).

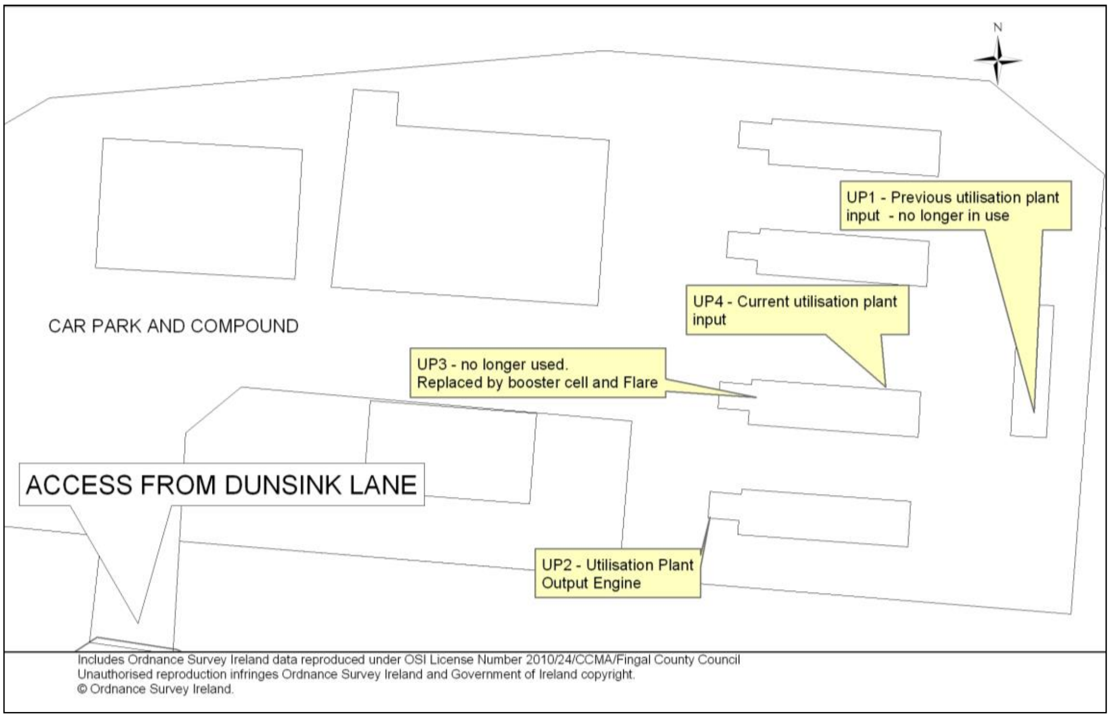


Figure 7: Dunsink Landfill Gas Utilisation Plant

3.8.3 Results from Continuous sampling of parameters at outlets from Landfill Gas Combustion Plant.

Continuous monitoring of outlet parameters at the Landfill Gas Combustion Plant was undertaken throughout 2015. The source of these emissions is the engine identified as UP2, Engine #2 was removed and UP3 is no longer used (see Figure 7 above).

Limit values as per Schedule C.5 of the governing waste licence 127-1 are outlined in the table below;

Table 9: Emission Limit Values for continuous monitoring parameters at outlets for utilisation plant

Parameter	Utilisation Plant Emission Limit Value
Nitrogen oxides (No_x)	500mg/m^3
CO	1400mg/m^3

Note 1: Dry gas referenced to 5% oxygen by volume for utilisation plants.

As per condition 1.6 b) of the waste licence 127-1, and Schedule C.5, specifying the Emission Limits Values (ELV) for Landfill Gas Plant (see Table 9 above) the following incidents occurred during 2015 at the IPS compound in Dunsink.

Condition 6.3.2 has been complied with in full as of 27-09-2006; "The concentration limits …..shall be based on gas volumes under standard conditions of:-

In the case of landfill gas combustion plant:
Temperature 273K, pressure 101.3kPa, dry gas; 5% oxygen".

Throughout 2015 reporting of continuous landfill gas monitoring was as per protocols specified in condition 6.3.3.1.

Results for full year 2015 of continuous emissions monitoring

(a) No 24 hour mean value shall exceed the ELV;

0 No. 24 hour means exceeded 500 mg/m3 for Nitrogen Oxides and 0 No. 24 hour means exceeded 1400 mg/m3 for Carbon monoxide.

(b) 97% of all 30 minute mean values taken continuously over an annual period shall not exceed 1.2 times the emission limit value.

Zero No. 30 minute mean values or 0% of samples taken continuously over this quarter for Carbon monoxide exceeded 1.2 times the 1400mg/m3 ELV at engine number 1. Two No. 30 minute mean values or 0.01% taken continuously over this quarter for Nitrogen Oxides exceeded 1.2 times the 500mg/m3 ELV at engine number 1.

(c) No 30-minute mean value shall exceed twice the emission limit value.

Zero No. or 0 % of 30 minute mean values taken continuously over this quarter for Carbon monoxide exceeded twice the 1400mg/m3 ELV at engine number 1. Zero No. or 0% of 30 minute mean values taken continuously over this quarter for Nitrogen Oxides exceeded twice the 500mg/m3 ELV at engine number 1.

The equipment experienced an 8-day downtime in September 2015, which was reported as an incident to the Agency upon discovery.

The results above show compliance with the ELV at all times when the monitoring equipment was in working order. There are no indications that the ELV was breached when the equipment was out of order.

3.8.4 Summary of Continuous Sampling of Emissions at Landfill Gas Combustion Plant

The available results from continuous sampling of parameters from outlets at landfill gas combustion plant throughout 2015 presented a general picture of compliance with emission limit values set in the licence.

3.9 METEOROLOGICAL MONITORING

Condition 8.6 and Schedule D.6 require daily monitoring of precipitation volume, temperature (min/max), wind force and direction, evapotranspiration, humidity and atmospheric pressure. This data is obtained from Met. Éireann's Dublin Airport Weather Station and is available in full tabular format at the facility offices. Table 10 below shows the monthly data – indicating a total rainfall of 878.4 mm.

Table 10: Dublin Airport Meteorological Data 2015

Year	Month	Mean Temperature (C)	Total Rainfall (mm)	Mean MSL Pressure (hpa)	Mean Wind Speed (Knots)	Mean Evaporation mm	PE mm	Mean Atmospheric Humidity %
2015	1	4.7	47.7	999	15.1	0.7	16.3	85.7
2015	2	4	34.6	1005	10.8	0.8	15.9	87.1
2015	3	5.8	57.5	1008	12.9	1.9	37.8	80.3
2015	4	7.4	43.9	1010	9.4	2.9	56.2	79.6
2015	5	9.6	90.5	1002	12.6	3.6	68.8	79.4
2015	6	12.9	14.1	1008	10.5	4.6	92.2	73.4
2015	7	13.8	69.2	1002	10.5	3.7	78.0	78.8
2015	8	14	100.1	1001	9.2	3.4	73.2	79.5
2015	9	11.8	56.6	1007	9	2.2	46.1	83.4
2015	10	10.2	49.1	1006	8.6	1.2	27.3	85.5
2015	11	8.7	121.6	1000	13.6	0.9	19.4	87.8
2015	12	8.6	193.5	998	14.9	0.8	20.1	85.1
Total			**878.4**					

4.0 RESOURCE & ENERGY CONSUMPTION

Resources consumed at Dunsink Landfill include diesel fuel, electricity and hydraulic oil. There were three main consumer entities operating on site:

Fingal County Council
Contractors
Bioverda Power Systems (BPS)

Resource	FCC	Contractors	BPS	Total 2015	Total 2014	Total 2013
Electricity MWh	25	Nil	13	38	56	132
Diesel Litres – (for Vehicles)	3,000*	6,885	Nil	9,885*	11,100*	11,100*
Hydraulic Oil (Litres)	Nil	150	Nil	150	60*	60*
Lubricating Oil (Litres)	Nil	40	1,320	1,360	2,950*	3700*

Table 11: Summary of Resources used on site for the reporting period

*Estimates

5.0 VOLUME OF LEACHATE PRODUCED AND DISCHARGED OFF-SITE

A flow metre measuring volumes of leachate produced from the facility or volumes of leachate discharged off-site was installed with the new pump house in June 2005. However, during 2004 efforts were made to get estimates for leachate production in Dunsink to determine the appropriate capacity of current and proposed leachate infrastructure. It was considered important in view of the daily discharge limit of 1,400m^3 imposed by the Sanitary Authority (Dublin City Council) to determine responses should this limit be breached.

5.1 METHODS FOR ESTIMATING LEACHATE PRODUCTION

An annual water balance calculation was performed to estimate leachate production in Dunsink. This figure is compared with figures measured as discharged offsite (See Table 12).

5.1.1 Water Balance Calculations

In calculating the water balance for Dunsink the formula used was taken from Environmental Protection Agency (EPA) guidelines (EPA 2000)[1]. Rainfall data from Dublin airport Meteorological station are used in this calculation. Data from 2015 is used in the average and scenario calculations.

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

Whereby;

ER = effective rainfall (m).
A = Area of active cell (m^2).
LW = Liquid waste (also includes excess water from sludges) M^3.
IRCA = Infiltration through restored and capped areas (m^3).
l = Surface area of lagoons (m^2).
a =absorptive capacity of waste M^3/t.
W = weight of waste deposited.

ER = Total Rainfall (R) minus Actual Evapotranspiration (AE).

For Dunsink landfill, following the guidance given in the EPA guidelines the ER is taken as R.

[1] Environmental Protection Agency (2000). Landfill Manuals; Landfill Site Design. EPA, Ireland. ISBN 1 84095 026 9

Total rainfall (R) for Dunsink in 2015 was 878.4 mm or **0.8784 m**.

A= The landfill area is 154 acres or 62.3 hectares or **623,000m^2**. No area is active, there has been no dumping of municipal waste for over twelve years.

ER(A)=0

LW = Liquid waste is not deposited in Dunsink – 0 m^3.

IRCA = In areas that have been temporarily capped / restored an infiltration rate of 25-30% of the annual rainfall should be used. In areas which have been restored an infiltration rate of 2-10% should be applied. Given that the landfill is now restored 10% will be used as the infiltration rate through restored and capped areas.
10% of ER = 0.08784. 623,000 m^2 X 0.08784m=54,724.32 m^3

IRCA= 54,724.32 m^3

l = In Dunsink the area of the lagoon is 6,000 m^2, ER=0.8784
ER(l) =5,270.4 m^3

aW = The total volume of waste has been calculated roughly, as 3.3 million m^3 on the basis of volume of three phases of landfill. It has also been roughly estimated that approximately 5,000,000 tonnes of waste have been deposited in Dunsink based on figures available from 1994 for annual inputs to the site. On this basis the roughly estimated waste density is 1.5 t/m^3. This is very high and may be due to compaction by its overburden of subsoil or fill. The absorptive capacity of waste falls to negligible or none per tonne of waste at densities greater than 1.2 t/m^3,
aW=0 m^3/tonne

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

Lo = [0 + 0 + 54,724.32 + 5,270.4] – [0]

Lo = 59,994.72 m^3 pa
Lo = 164.4 m^3 /d
Lo = 6.85 m^3 /hr

5.1.2 Scenario Building

This rough estimate should be viewed in the context of varying annual rainfall over an annual period. Water balance calculations should be carried out for a number of scenarios such as average monthly leachate volumes to be generated (See Table 12).

Table 12: Estimates of Leachate Production: Average Monthly rainfall recorded at Dublin Airport 2015 (Source: Met Éireann)

2015	Rain (mm)	Rainfall % Total	Estimated Monthly Leachate Production M^3
January	47.7	5.43%	3,257.91
February	34.6	3.94%	2,363.18
March	57.5	6.55%	3,927.25
April	43.9	5.00%	2,998.37
May	90.5	10.30%	6,181.15
June	14.1	1.61%	963.03
July	69.2	7.88%	4,726.36
August	100.1	11.40%	6,836.83
September	56.6	6.44%	3,865.78
October	49.1	5.59%	3,353.53
November	121.6	13.84%	8,305.28
December	193.5	22.03%	13,216.05
Total 2015	**878.4**	**100.00%**	**59,994.72**

The EPA guidelines (EPA, 2000) suggest a peak flow factor of 3 to 5 times the predicted average flow rate should be used when sizing plant / pipe work. Therefore using 2015 rain data and allowing for the now completed restoration of Dunsink, an adequate pump station should be able to handle about (6.85 * 3) to (6.85 * 5) or 20.55 m^3/hr to 34.25 m^3/hr during wet weather flow. During 2015, the volume of leachate discharged to public sewer was 157,106 m^3 which equates to 17.93 m^3/hr.

5.1.3 Results

Water balance calculations from EPA guidelines for Dunsink during peak wet conditions suggest that leachate production / discharge could be in the range of 493-822 m^3 /day.

5.1.4 Discussion

The results presented above are estimates only. The results from this exercise (EPA model), indicate that Dublin City Council's discharge limit of 1,400 m^3/day would not be breached and the leachate lagoon would not ordinarily be needed to deal with any excess leachate generated. The lagoon has a capacity of 26,700 m^3. The pump house design facilitates pumping a maximum of 20 litres/s or 72 m^3/hr or 1,728 m^3/day and the modelled leachate production is well below this.

The new pumping arrangements installed during June 2005 provide data for the volume of leachate generated at the facility (Table 13).

Table 13: Estimates of Leachate Production and Volumes Measured as Discharged from site

2015	Rain mm	%	Estimated Monthly Leachate Production M^3	Volume Discharged as Measured By Flow Metre
January	47.7	5.43%	3,257.91	21,822
February	34.6	3.94%	2,363.18	13,535
March	57.5	6.55%	3,927.25	14,430
April	43.9	5.00%	2,998.37	11,427
May	90.5	10.30%	6,181.15	19,785
June	14.1	1.61%	963.03	5,883
July	69.2	7.88%	4,726.36	8,476
August	100.1	11.40%	6,836.83	7,905
September	56.6	6.44%	3,865.78	6,079
October	49.1	5.59%	3,353.53	4,762
November	121.6	13.84%	8,305.28	10,179
December	193.5	22.03%	13,216.05	32,823
Total	**878.4**	**100.00%**	**59,994.72**	**157,106**

The estimated monthly leachate production is significantly and substantially less than the actual volumes measured as discharged from site. There may be a groundwater influence in leachate generation at the site which accounts for this anomaly. The EPA water balance calculation is based on rainfall contribution to leachate generation.

Since 2006 a significant rise in leachate pumped off-site has occurred and it is considered that this is partially explained by the emplacement of two major leachate interception drains at the north and south of the facility. These leachate interception drains are obviously harnessing significant amounts of leachate and contributing to the leachate load at Dunsink.

5.1.5 Conclusion

Given all the results presented above (the varied estimates for leachate production and the actual volumes discharged offsite), it is suggested that the pump house design, in conjunction with the option to use the lagoon periodically provides sufficient capacity for dealing with the estimated leachate generated in the landfill. The completion of the restoration of the site during 2008 and 2009 has led to a reduced estimate of the amount of leachate generated by the facility through the water balance calculations. However the progress in landfill restoration has ultimately resulted in greater leachate collection and consequent increased volumes of leachate being discharged offsite. Nevertheless, the data provided by the leachate flow metre continues to vindicate the capacity designed into the leachate infrastructure.

5.2 ANNUAL WATER BALANCE CALCULATIONS AND INTERPRETATIONS

5.2.1 Introduction

The actual water balance calculations are outlined in detail in Section 5.1.

5.2.2 Discussion and Interpretation

It must be stated that the results are estimates only and based on many assumptions, which may or may not be correct. Furthermore data from key variables, such as depth of waste, proximity of groundwater table and effect of springs within waste body, are unavailable.

(i) Previous estimates of the wet weather flow and dry weather flows for leachate were prepared by Fingal County Council in 2003 on the basis of direct measurements. These estimates calculated Wet Weather Flow leachate volumes in the range of 1,242-1,656 m^3/day and 414 m^3/day during dry weather flow.

(ii) Water balance calculations are presented in Section 5.1.1 from EPA guidelines for Dunsink during peak wet conditions. They suggest that peak leachate production / discharge could be 822 m^3/day during wet weather and 164 m^3/day during average Flow.

(iii) During 2015, the volume of leachate discharged to public sewer was 157,106 m^3 which equates to 17.9 m^3/hr. (See Table 13). This suggests that average leachate production/discharge over the year is 430 m^3/day.

These figures must be seen in the context of the bedrock geology and aquifer status of the site. The regional view of the vicinity of the Dunsink Landfill is of a low yielding aquifer.

5.2.3 Conclusion

The results from water balance calculations and from the pump house flow-metre are very different in terms of leachate modelled as generated on site and leachate volumes pumped off-site. However both sets of results validate the choice of leachate pump house design, which was based on empirical measurements of leachate flowing through the existing infrastructure. The pump house design facilitates pumping a maximum of 20 litres/s or 72 m^3/hr or 1,728 m^3/day. Dublin City Council allows a maximum discharge of 1,400 m^3/day.

The worst case scenario for Dunsink from wet weather flows derived from previous estimates at 1,656 m^3/day exceeds this limit. In instances when the pump-house cannot pump away volumes as they are generated from the facility the system is self-regulating. During Wet Weather Flow, peak flows in excess of the limit are rare and short in duration. When they do occur the automatic valve opens and closes to regulate the level of leachate in the sump and facilitate controlled discharge of leachate to public sewer or the lagoon. The lagoon has additional capacity of 26,700 m^3 and if empty would have capacity for 16+ days pumping to lagoon during wet weather flow. This contingency provides for scenarios whereby pumping to the public sewer would not be feasible for any reason.

The results suggest that the pump house design, in conjunction with the option to use the lagoon periodically provides sufficient capacity for dealing with the estimated leachate generated in the landfill.

5.3 ESTIMATED ANNUAL AND CUMULATIVE QUANTITY OF INDIRECT EMISSIONS TO GROUNDWATER

5.3.1 Emissions to Groundwater - Introduction

At present there are no estimates for annual and cumulative quantities of indirect emissions of leachate to groundwater.

Inferences are made from estimates in Sections 5.1.1 (estimates of leachate going through leachate management infrastructure during Wet Weather Flow) and 5.1.2 (estimates of leachate generated at the facility based on water balance calculations). At the outset, it must be stated that this is an exercise fraught with difficulties in that these estimates are based upon many assumptions, which may or may not be correct. Furthermore, data from key variables such as depth of waste, proximity of groundwater table and effect of springs within the facility, are unavailable.

Nevertheless the volumes of leachate discharged from the facility consistently and substantially exceed those estimated from water balance calculations.

5.3.1.1 Dry Weather Flow

The leachate infrastructure and discharge consents from Dublin City Council are more than adequate to deal with the volumes of leachate generated in Dunsink during dry weather flow. This suggests that there may be no indirect emissions to groundwater during Dry Weather Flow conditions.

5.3.1.2 Wet Weather Flow

The leachate infrastructure system seems to be “flashy” i.e. the amount of leachate going through the system rapidly increases following rainfall events. For all but the highest peaks in wet weather flow the leachate infrastructure and discharge consents from Dublin City Council are more than adequate to deal with the volumes of leachate generated in Dunsink and there is little risk of contamination of groundwater.

In instances when the pump-house cannot pump away volumes as they are generated from the facility the system is self-regulating. Peak discharges during Wet Weather Flow are rare and short in duration, the automatic valve opens and closes to regulate the level of leachate in the sump and facilitate controlled discharge of leachate to public sewer or the lagoon.

5.3.2 Bedrock Geology of the Site and Aquifer Status

The western half of the landfill is underlain by Waulsortian Limestones. The GSI classify the County Meath Waulsortian Limestones as ‘Ll’, bedrock which is moderately productive only in local zones and this can be assumed to be the case for Dunsink.

The central part of the landfill is underlain by the Tober Colleen formation. The thinly bedded mudstones of the Tober Colleen formation which underlie the Calp Limestone have been classified by the GSI as ‘Pl’, bedrock which is generally unproductive except for local zones.

The eastern part of the site is underlain by basinal limestones consisting of limestone turbidites with bioclastic and calcareous mudstones (Calp Limestone). The Calp Limestone of County Dublin has been classified in the GSI Groundwater Protection Scheme as a Ll aquifer, bedrock which is generally moderately productive only in local zones.

There is a minor faulting in the vicinity of the site and there is a minor fault running in a north-west south-east direction through the site.

The EPA designated flow regime is 'Poorly productive bedrock'.

A number of boreholes have been drilled into the bedrock on the site and a visual inspection of the drill chips from the monitoring boreholes indicated the site to be generally underlain by the soft black basinal (Calp) limestones and mudstones. These were recorded at all boreholes that were drilled to bedrock. The hardness and shade of the rock varied between boreholes and between different depths within the same borehole.

There is no site information available on the hydraulic conductivity of the bedrock units beneath the site. However, the GSI classification of Pl and Ll for the main geologic units at the site indicates generally low permeability. Published information for the Calp limestones of Dublin/Kildare/Meath indicated permeability ranging from 10^{-1} to 10^{-3} m/day (Creighton et al 1979; Cullen 1998). In addition, estimated yields from the wells drilled on site (flow estimates made at the time of drilling) indicated low productivity wells with well yields ranging from 1 m^3/day to 10 m^3/day. A slightly higher yield of 20 m^3/day was estimated at BH2. The monitoring well drilling programme confirmed the regional view that the area in the vicinity of Dunsink Landfill should be classified as a low to moderate yielding aquifer.

Groundwater levels from the deep bedrock boreholes showed confining conditions in many boreholes (e.g. BH16 & BH18 artesian) and this indicates an upward pressure on groundwater over much of the site. Where these conditions are present leachate is prevented from percolating into the bedrock aquifer and indeed indicates that groundwater may be contributing to leachate production at the site (or at least at parts of the site).

5.3.3 Conclusion

On the basis that:

(1) The underlying geology and overburden have produced a localised classification of the aquifer as generally low to moderate yielding and that there are confining conditions present over much of the site,

(2) Measured volumes of leachate discharged from the facility are consistently and substantially higher than those calculated through water balance calculations.

(3) The groundwater monitoring programme indicates that groundwater around the facility is generally of good quality;

It is considered that indirect discharges to groundwater are not significant in volumes or effect.

As per Technical Amendment to the Licence issued in January 2013, a hydrogeological Review / Technical Assessment Report has been prepared in accordance with the Guidance on the Authorisation of Discharges to Groundwater, and submitted to the Agency.

6.0 WORKS PROPOSED AND UNDERTAKEN & TIMESCALE FOR THOSE PROPOSED DURING THE COMING YEAR

6.1 WORKS UNDERTAKEN DURING 2015

The phased handover of the landfill and surrounding areas to the Parks (now Operations) Department was completed by December 2009.

The Environment Department continued with all monitoring obligations as set out in the landfill license for 2015.

The maintenance works related to the slope stability reports, which were scheduled for 2015 and did not take place. This will be carried out in 2016.

The progress on resolving Compliance Investigations CI000397 (landfill gas infrastructure remediation) has been slow due to the complexity and scale of the approach envisaged.

Work on resolving Compliance Investigation CI000399 (compliance with dissolved methane ELV) has been more productive, and an extended trial of leachate aeration through the lagoon has provided positive results, with levels of dissolved methane below 0.28mg/L achieved consistently in the second half of 2015 using passive aeration through the lagoon. Results have been presented to Dublin City Council in order to get the Sanitary Authority approval for a higher Emission Limit Value. If this approval is obtained, we will proceed in 2016 with seeking a technical amendment to the Licence to review the current ELV.

It was planned to install a new drain on the haulage road located above the attenuation pond, as identified in the slope stability report – however these works were not achieved in 2015.

It was also planned to reinstate the leachate interception trench located West of the lagoon, and similarly these works were not carried out in 2015.

In 2015, Fingal County Council Operations Department kept working closely with the Irish Horse Welfare Trust and local horse owners in Dunsink in an effort to address and regulate the situation with regard to the wandering horses in Dunsink. The Council, the Irish Horse Welfare Trust and the owners have now formed a club, which regulates the numbers of animals on the site, all of the horses are now microchipped and passported, and traceable to their owners.

6.2 WORKS PLANNED FOR 2016

In 2016, a new drain will be laid to drain the haulage road located above the attenuation pond, as identified in the slope stability report.

The leachate interception trench located West of the lagoon will be reinstated. It had been dug out in 2012 following flooding in the area and left as an open trench since. The works will seek to re-instate it to its original form.

Additional gas extraction will be put in place in the area close to G23 where grass discolouration was consistently observed and where Surface VOC Emissions have showed elevations above the 100ppm threshold.
Two surface VOC Emissions surveys will be commissioned.
Work on resolving Compliance Investigation CI000397 will be pursued in order to get a good understanding of the state of the gas extraction infrastructure, and where any deficiencies are identified to rectify these.

A meeting will be held with Irish Water to obtain their consent to a new discharge limit for the methane concentration in the leachate released to sewer, so that a technical amendment request can be submitted to the Agency to review that discharge.
If the consent and technical amendments are obtained, works will be required on the leachate pipeline infrastructure.

It is proposed to continue with the installation of internal paddocks to retain control of the equines on the site and to ensure the regular movement of the equines from one part of the site to another.

Continuing discussions and engagements will take place with the communities along Dunsink Lane and Finglas with a view to constructing a Motocross Track in the vicinity of Dunsink.

7.0 SITE SURVEY INDICATING EXISTING LEVELS OF THE FACILITY

Fingal County Council sought approval from the Environmental Protection Agency on the 13/08/2009, (letter Ref FCC-127-1-2009-010) not to undertake a topographic survey in 2009. This was due to the fact that there was no importation of soil into the restored landfill and no subsidence was anticipated. Approval was given by the EPA on the 20/08/2009 by telephone from Mr Eamonn Merriman. A telephone conversation with Mr Merriman on 28/01/2013 confirmed that an updated topographic survey was not required, and it is still considered that an updated survey would not be meaningful. Figure 8 below shows the topographic status of the landfill as established by the most recent topographic survey completed in 2007.

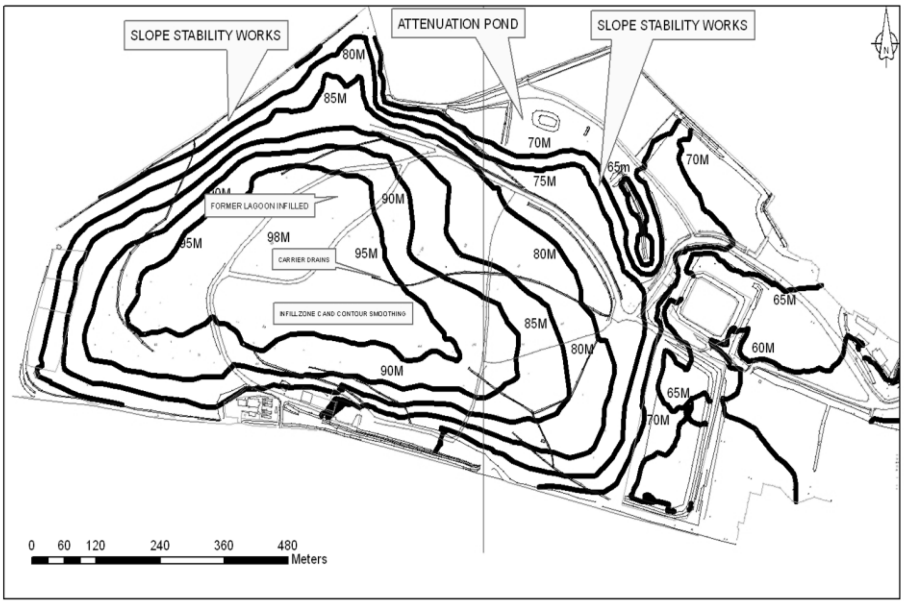


Figure 8: Simplified Topographical Map of Dunsink 2007

8.0 ESTIMATED ANNUAL & CUMULATIVE QUANTITY OF LANDFILL GAS EMITTED

In early 1996 a gas collection network was first configured throughout the whole landfilled portion of Dunsink. In 1999 the collection network was replaced by a larger more extensive arrangement.

It is comprised of a high-density polyethylene (HDPE) ring main around the site with a number of branch lines, which contains manifolds that connect to individual gas extraction wells.

There are approximately eighty-five gas extraction wells connected to manifolds throughout the site. Some of the wellheads are buried so it is not physically possible to confirm their condition or truly assess their performance. An additional thirteen gas wells were installed in Zone A and six additional gas wells were installed in Zone C during 2006.

There are ten branch lines off the main collection ring. These branches are 250mm in diameter and have multi-outlet manifolds configured to collect the gas from the wells in their vicinity. Each branch can be isolated where it connects to the main line. The manifold arrangement allows the line from the individual wells to be sampled and controlled. This has the effect of balancing the "good gas" with the bad to maintain the optimum quality to the utilisation plant.

The mainline ring is a 355mm HDPE pipe that completely encircles the landfill and finishes back at the utilisation plant compound. It has two dewatering chambers, one next to the old main landfill entrance and the other adjacent to the IPS compound, where the collected condensate is returned to the waste body via a disused extraction well. This ring main can be isolated in a number of locations to permit maintenance operations and still maintain operation of the utilisation plant.

The extraction pump which feeds the remaining generator (one was removed from site during 2006) is capable of collecting three thousand cubic metres of gas per hour at a maximum suction pressure of –150mbar. It is currently delivering approximately one hundred and eighty cubic metres per hour at a quality of 49%CH_4. In the unlikely event the engine is out of service for an extended duration, the integral flare can be run to maintain negative pressure on the landfill.

8.1 LANDFILL GAS CONSUMED BY UTILISATION PLANT 2015

Figures for landfill gas emitted from the facility are derived from data submitted by Bioverda Power Systems for the utilisation plant in Dunsink. The figures for 2015 are presented in Table 14.

8.2 LANDFILL GAS CONSUMED BY UTILISATION PLANT AND GENERATED BY FACILITY 1996-PRESENT

The amount of landfill gas utilised by the plant has continued to trend downwards as would be expected but utilisation is dropping less sharply in recent years than the period 2003-2005.

In the last five years the gas engine occasionally 'ran out of gas' at viable concentrations indicating that the gas field production is decreasing at an increasing rate. That trend continued in 2014 with the engine regularly 'running out of gas' and having to be restarted after giving the field an opportunity to recover, typically 48-60 hours. Bioverda installed remote control on the gas utilisation plant in 2015, resulting in a better control of the gas utilisation. The extraction rate has decreased from 260 to 225 cubic meters per hour, but this allowed the engine to run continuously, removing the previous requirement to let the field recover for 48-60 hours.

In August 2012, the engine was swapped for a smaller engine, more efficient to run with the amount and quality of landfill gas present in Dunsink. The new engine has been running since early August 2012.

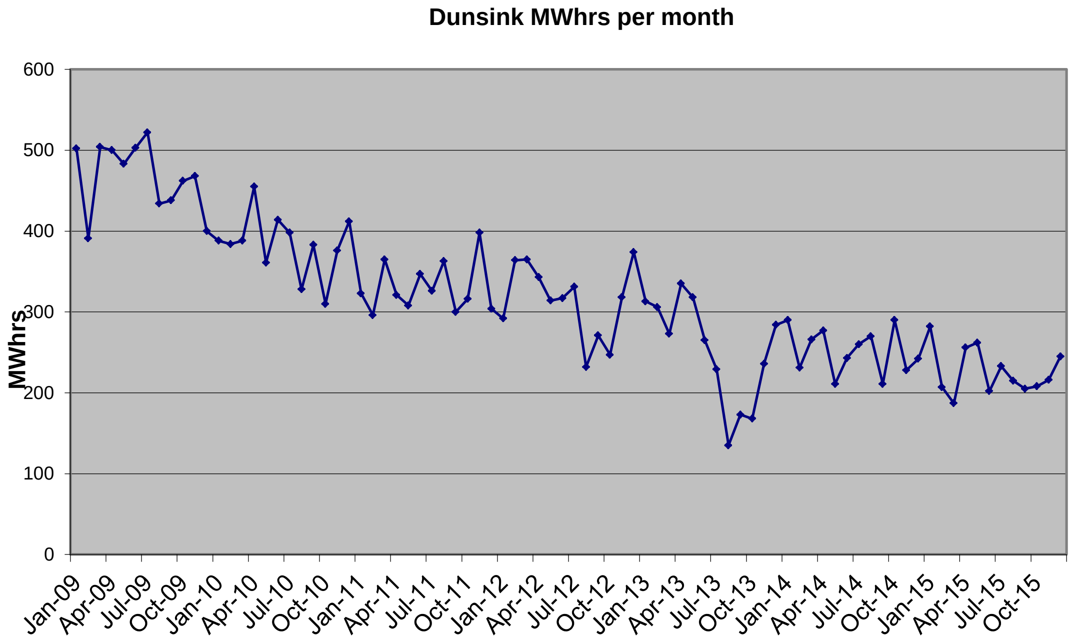


Figure 9 - MWhr exported per month at Dunsink.

Bioverda has reported that supply of gas has dropped sharply. It is considered that landfill gas migration is not an overwhelming issue at Dunsink and it is suggested that these figures reflect a downward pattern over time of landfill gas emitted from the facility. There are however issues of gas migration in the vicinity of G23 (exceedances previously reported in section 3.8.1, and evidence of grass discolouration observed in 2014 and 2015 in that area). Two surface VOC surveys were carried out in 2015, which confirmed a localised migration issue close to G23. They did not show a widespread issue of landfill gas migration on the landfill. The area of grass discolouration will be remediated in mid-2016 as part of the work undertaken through Compliance Investigation CI000397.

Bioverda
POWER SYSTEMS LTD

Table 14: landfill gas consumed by utilisation plant 2015

Dunsink	Units	Jan-15	Feb-15	Mar-15	Apr-15	May-15	Jun-15	Jul-15	Aug-15	Sep-15	Oct-15	Nov-15	Dec-15	Total
Diesel	litres													-
Electricity Consumed	kWh	1,374	2,440	2,343	2,000	167	2,535	554	57			902	902	**13,358**
Oil (Lubrication)	litres	350		200		350			420					**1,320**
Landfill Gas	m3	198,648	143,136	154,008	182,880	200,880	159,120	176,328	156,984	158,400	159,216	138,240	149,544	**1,977,384**
Average Monthly CH4	%CH4	44%	51%	44%	46%	45%	46%	43%	43%	43%	42%	52%	50%	
Electricity Exported	kWh	281,710	206,710	187,460	256,380	262,450	201,660	233,070	214,810	204,690	207,600	215,740	245,267	**2,717,547**

Data compiled by: Donal O'Cinneide, Bioverda Power Systems

9.0 REPORT ON PROGRESS TOWARDS ACHIEVEMENT OF ENVIRONMENTAL OBJECTIVES AND TARGETS CONTAINED IN PREVIOUS YEAR'S REPORT.

This is the twelfth AER under this Licence. In 2011 the majority of objectives for the facility nearing completion were fully completed and the Enclosed Flare was commissioned and handed over to Fingal County Council.

The phased handover of the landfill and surrounding areas to the Parks Department which began in 2008 was completed as of December 2009

Capping works, final landscaping and slope stability maintenance were completed in 2009.

Environmental Infrastructure Inspection, Maintenance and Monitoring were on-going in 2015.

Progress was made with Compliance Investigation CI000399 on the dissolved methane concentration of the leachate released to sewer. An extensive trial of passive aeration was carried out and is forming the basis of proposals to the Sanitary Authority to agree a different discharge limit.

The progress on resolving Compliance Investigations CI000397 on the landfill gas infrastructure remediation has been slow.

10.0 SCHEDULE OF ENVIRONMENTAL OBJECTIVES AND TARGETS 2016

The schedule of environmental objectives and targets for 2016 will be as follows:

Resolve the issue of the continuous breach of Emission Limit Value for Dissolved Methane in the leachate released to sewer (Compliance Investigation CI000399);

Work towards resolving the issues highlighted in Compliance Investigation CI000397 with the Gas Management Infrastructure – as per programme submitted to the EPA;

Continue the environmental monitoring to identity any potential sources of pollution coming from the landfill and resolve them as they happen.

11.0 PROCEDURES DEVELOPED RELATING TO THE FACILITY OPERATION

No new Standard operating procedures (SOP`s) were introduced in 2015.

12.0 TANK, PIPELINE AND BUND TESTING AND INSPECTION REPORT

Conditions 3.10.5 and 5.10.2 of the licence require that integrity tests be carried out on the leachate lagoon and oil bunds every three years by an independent and appropriately qualified chartered engineer.

12.1 LAGOON

An integrity test was carried out on the leachate lagoon in 2015 and it passed the test. The results of the integrity test were submitted to the Agency in December 2015 (Licensee Return LR020303).

12.2 OIL BUND IPS COMPOUND- DUNSINK

An integrity test was conducted during October 2007 on the oil bund in the IPS compound. The bund integrity was found to be good, it was watertight and found fit for its intended use. Oil is no longer stored in the compound – it is therefore proposed not to carry out further integrity test on the disused bund.

13.0 REPORTED INCIDENTS AND COMPLAINTS SUMMARIES

13.1 REPORTED ENVIRONMENTAL INCIDENTS

There were 11 reported incidents in 2015 reported under condition 1.6 c) "Any trigger level specified in this licence which is attained or exceeded"; and d) "Any indication that environmental pollution has, or may have, taken place." 6 of these were notified to the Inland Fisheries Ireland (IFI) during 2015.

In October 2012 the Agency agreed that any incidents relating to gas should only be notified to the Agency where methane levels exceeded 1% or where there were unusually high levels of carbon dioxide. Levels of carbon dioxide have regularly exceeded the 1.5% threshold and as per above agreement were not notified to the Agency. It was agreed that only unusually high levels for the site should be notified to the Agency from 1/11/12 onwards – which led to a considerable decrease of incidents notified compared to 2012.

Table 15: Summary of reported incidents during 2015

	Surface Water	Landfill Gas	Other
Month	**2015**	**2015**	**2015**
January	1		
February	2		1
March	1		1
April	1		
May			
June			
July			1
August	1		1
September			1
October			
November			
December			
Total	**6**	**0**	**5**

Incidents from monthly inspections of surface waters and gas monitoring were notified to Fingal County Council, the EPA and the IFI where relevant. Exceedances of groundwater and Dissolved methane were reported in the quarterly reports.

Surface water incidents in the main were caused by elevated levels of ammonia and/or conductivity during Winter months particularly at the upstream monitoring stations (SW21 and SW18) and these reflected off site sources of contamination.

The EPA was notified of all incidents. IFI were notified on all incidents pertaining to surface water and Dublin City Council continues to be informed in relation to Dissolved Methane.

13.2 REPORTED ENVIRONMENTAL COMPLAINTS

Condition 10.4 of Licence 127-1 requires that the licensee shall maintain a written record of all complaints relating to the operation of the facility. No complaints were received by FCC during 2015.

It is considered that with the closure and completed restoration and improvements to landfill infrastructure since the end of 2009, the landfill is now less of an issue for its surroundings. This is a continuation of the trend in recent years. There were no complaints in 2009 while in 2008 there were just two complaints, compared with five for 2004, one for 2005 and two for 2006.

14.0 REVIEW OF NUISANCE CONTROLS

Condition 7 of Waste Licence 127-1 requires that vermin, birds, flies, mud, dust, litter, noise and odours do not give rise to nuisance at the facility or in the immediate area of the facility.

Staff for the Operations Department access the landfill on a regular basis and tackle any nuisance as they arise. The site is also monitored every week by the landfill manager and any outstanding issues observed are reported to be addressed.

15.0 FINANCIAL PROVISION, MANAGEMENT, STAFFING STRUCTURE & PROGRAMME FOR PUBLIC INFORMATION

15.1 FINANCIAL PROVISION

Fingal County Council has made a financial provision of €3.23 million on its accounts (as of 31 December 2015) for the aftercare of Dunsink Landfil.
Aftercare costs continued to be paid for from the revenue account and in 2015 no recourse was made to the capital reserve. The reserve was increased compared to 2014 to cover any requirements for works as a result of the compliance investigations.

15.2 MANAGEMENT AND STAFFING STRUCTURE

The following comprised the current management structure for Dunsink Landfill in 2015.

Licence Compliance

TITLE	NAME	BASE	DUTIES AND RESPONSIBILITIES	QUALIFICATIONS	EXPERIENCE
Director of Services	Gilbert Power	Blanchardstown Office, Grove Road, Dublin 15	Responsible for Environment and Water Services Department.		38 years LA experience.
Senior Engineer, Environment Division	Mr Garry O'Brien	County Hall, Main Street Swords Co Dublin	Responsible for Waste Management and Enforcement.	BE Civil 1978, MIEI MBA in Local Government 2011	37 years LA experience in Civil Engineering and Management across a range of Departments.
Senior Executive Engineer	Mr James Walls	County Hall, Main Street Swords Co Dublin	Responsible for Waste Infrastructure and Deputy Facility Manager in the absence of the Facility Manager.	B.Eng. in Civil Engineering. 1984 C Eng. MIEI	13 years Water Service experience. 16 years LA experience
Assistant Scientist	Mr Alain Kerveillant	County Hall, Main Street Swords Co Dublin and Dunsink Landfill	Facility Manager in respect of Waste Licence Compliance, Supervision of Scientific Monitoring, Reporting and Liaison with the Environmental Protection Agency.	Masters in Environment 2002 F.Á.S. Waste Management Training Course.	12 years experience in waste management (recycling infrastructure) in local authorities.

Landfill Management

TITLE	NAME	BASE	DUTIES AND RESPONSIBILITIES	QUALIFICATIONS	EXPERIENCE
Senior Executive Officer	John O'Brien	Blanchardstown Offices	Manager for the Castleknock / Mulhuddart Operational Area	N/A	N/A
Senior Executive Parks Superintendent	Ruairi O'Dulaing	Blanchardstown Offices	Responsibility For Development and transition	N/A	N/A
Inspector	Eamonn Brady	Coolmine Depot	Inspector	N/A	N/A
Assistant Foreman	Paul Rattigan	Coolmine Depot	Management of Landfill maintenance operations	N/A	N/A

15.3 PROGRAMME FOR PUBLIC INFORMATION

Public information can be viewed at the **Council's Headquarters** between 9.30 a.m. and 12.45 p.m. and 2.00 p.m. and 4.00 p.m. Monday to Friday (excluding public holidays), unless otherwise arranged by prior appointment.

Facilities for viewing information from a computer or files are provided at Dunsink Facility office by prior arrangement with the Landfill Manager.

The website (www.fingal.ie) informs that the remediation and restoration phase is now complete.

Site visits to **Dunsink Landfill** can be arranged by applying in writing to the Landfill Manager requesting a date and time for the proposed visit and indicating the number of visitors and the purpose of such a visit and whether any presentation is required. The use of cameras and video equipment during the visit must be agreed in advance with Fingal County Council. Such requests will be accommodated where possible. Operational and security matters will take precedence and visits may be cancelled at short notice.

16.0 STAFF TRAINING REPORT

As activities at the landfill have gradually decreased since the closure and restoration phases during 2008 and 2009, training requirements have also decreased.

Mrs James Walls and Alain Kerveillant attended a Closed Landfill Workshop under the acumen project (Assessing, capturing and utilising methane from expired and Non-operational landfills) and co-organised by the Agency on 28/04/2015.

Mr Alain Kerveillant attended a five day course from the Construction Industry Federation on Managing Safely in Construction. He also attended a one-day course on lone working and risk assessment.

GLOSSARY

Aftercare	Any measures that are necessary to be taken in relation to the facility for the purposes of preventing environmental pollution following the cessation of the activity in question at a facility.
Annually	At approximately twelve monthly intervals.
Aquifer	A formation (e.g. body of rock, gravel or sand stratum) that is capable of storing significant quantities of water and through which groundwater moves.
Baseline monitoring	Monitoring in and around the location of a proposed facility so as to establish background environmental conditions prior to any development of the proposed facility.
Borehole	A shaft installed outside a waste area for the monitoring of and/or extraction of landfill gas/groundwater. Established by placing a casing and well screen into the boring. If installed within the waste area, it is called a well.
Bunding / Berm	A dike or mound usually of clay or other inert material used to define limits of cells or phases or roadways; or to screen the operation of a landfill from adjacent properties; reducing noise, visibility, dust and litter impacts.
Capping	The covering of a landfill, usually with low permeability material (landfill cap).
Condensate	The liquid which forms within the gas pipe work due to the condensation of water vapour from landfill gas.
Detection limit.	The concentration of the determinant for which there is a 95% probability of detection when a single analytical result is obtained, detection being defined as obtaining a result which is significantly greater ($p=0.05$) than zero. Also referred to as Limit of Detection.
Direct discharge	The introduction into groundwater of List I or II substances without percolation through the ground or subsoil.
Downgradient	The direction towards which groundwater or surface water flows.
Emission	Meaning assigned by the EPA Act of 1992.
Flare unit	A device used for the combustion of landfill gas thereby converting its methane content to carbon dioxide.

Gas wells	Wells installed during filling or retrofitted later within the waste area for the monitoring of and/or removal of landfill gas either actively through an extraction system or passively by venting.
Groundwater	Groundwater is that part of the subsurface water which is in the saturated zone.
Hydrogeology	The study of the interrelationships of the geology of soils and rocks with groundwater.
Indirect discharge	The introduction into groundwater of List I or II substances after percolation through the ground or subsoil.
Inert landfill	A landfill that accepts only inert waste that fulfils the criteria set out in the Agency's draft manual "Waste Acceptance".
Lagoon	A land area used to contain liquid, e.g.leachate collected from landfill.
Landfill	Waste disposal facility used for the deposit of waste on to or in to land.
Landfill gas (LFG)	All gases generated from the landfilled waste.
Leachate	Any liquid percolating through the deposited waste and emitted from or contained within a landfill as defined in Section 5(1) of the Waste Management Act.
Leachate Well	Well installed within the waste area for the monitoring and/or extraction of leachate as opposed to borehole, which is the term, used when located outside the waste deposition area.
List I/II substances	Substances referred to in the EU Directives on Dangerous Substances (76/464/EEC) and Groundwater (80/68/EC).
Lower explosive limit (LEL)	The lowest percentage concentration by volume of a mixture of flammable gas with air which will propagate a flame at 25^{o}C and atmospheric pressure.
Macroinvertebrate	Larger invertebrate animals visible to the eye. Usually defined as those that are retained by a net or sieve of mesh size 0.6mm.
Minimum reporting value	This is the lowest concentration of a substance that can be determined with a known degree of confidence. It is a matrix dependent and not necessarily equivalent to the Limit of Detection of the analytical system but is generally a multiple of that value which reflects the robustness and reproducibility of the test method as applied to the specific

	matrix. Also referred to as the limit of quantitation or practical reporting limit.
Noise Sensitive Location	(NSL) Any dwelling-house, hotel or hostel, health building, educational establishment, place of worship or entertainment, or any other facility or area of high amenity which for its proper enjoyment requires the absence of noise at nuisance levels.
Quarterly	At approximately three monthly intervals.
Receiving water	A body of water, flowing or otherwise, such as a stream, river, lake, estuary or sea, into which water or wastewater is discharged.
Restoration	Works carried out on a landfill site to allow planned afteruse.
Substrata	River bed or bottom on or in which invertebrates live.
Taxa	Named taxonomic groups. Usually family or species level in biotic indices.
Trigger level	A parameter value specified in the licence, the achievement or exceedance of which requires certain actions to be taken by the licensee.
Upper explosive limit (UEL)	The highest percentage concentration by volume of a mixture of flammable gas with air which will propagate a flame at 25^{o}C and atmospheric pressure.
Void space	Space available to deposit waste.
Water balance	A calculation to estimate a volume of liquid generated. In the case of landfills, water balance normally refers to leachate generation volume.

APPENDIX 1:

Groundwater Monitoring Results

Dunsink Landfill - Groundwater Quality Results Q1 2015

10/02/2015

Parameter	Unit	Threshold Value	BH3	BH3 Control Values	BH3 Trigger Values	BH4	BH4 Control Values	BH4 Trigger Values	BH16	BH16 Control Values	BH16 Trigger Values	BH27	BH27 Control Values	BH27 Trigger Values
pH	pH Units	**6.5 - 9.5** [1]	7.08	8	8.38	7.06	8.2	8.59	7.89	8.24	8.64	7.02	8.18	8.57
Conductivity	mS/cm	**1.875**	0.983	1.231	1.289	0.818	1.352	1.414	0.620	0.8379	0.8778	0.905	1.282	1.343
Temperature	°C	**-**	10.2	-	-	10.1	-	-	10	-	-	10.7	-	-
Ammoniacal Nitrogen	mg/l	**0.175**	0.02	0.42	0.44	0.02	0.31	0.33	0.02	0.21	0.22	0.03	1.89	1.98
Total Organic Carbon	mg/l	**N-A-C** [1]	<2	6.3	6.6	<2	6.3	6.6	<2	6.3	6.3	<2	5.25	5.5

Parameter	Unit	Threshold Value	BH31	BH31 Control Values	BH31 Trigger Values	BH32	BH32 Control Values	BH32 Trigger Values	BH33	BH33 Control Values	BH33 Trigger Values	BH34N	BH34 Control Values	BH34 Trigger Values	BH35	BH35 Control Values [2]	BH35 Trigger Values [2]
pH	pH Units	**6.5 - 9.5** [1]	7.19	8.39	8.79	7.15	8.18	8.6	7.26	8.58	8.99	7.43	8.61	9.02	7.22	-	-
Conductivity	mS/cm	**1.875**	0.650	0.791	0.828	0.704	1.227	1.286	0.744	0.852	0.892	0.604	0.998	1.045	0.700	830	869
Temperature	°C	**-**	10.9	-	-	11	-	-	10.6	-	-	10.1	-	-	10.7	-	-
Ammoniacal Nitrogen	mg/l	**0.175**	0.08	1.575	1.65	0.11	0.735	0.77	0.02	0.21	0.22	**0.22**	0.21	0.22	0.06	0.455	0.476
Total Organic Carbon	mg/l	**N-A-C** [1]	<2	8.4	8.8	<2	5.25	6	<2	5.25	5.5	<2	6.3	6.6	<2	-	-

Threshold value = Groundwater regulations SI 9 of 2010

[1] = Where no threshold value exists results are compared to EPA I.G.V. from Table 3.1 of EPA document "Towards Setting Guideline Values for the protection of Groundwater in Ireland"

Shading & Bold = Value has exceeded threshold value

Shading = Value has exceeded the Control Value

Shading = Value has exceeded Trigger Value

[2] = Proposed Trigger Values

Sampled on 10th February 2015

Analysis conducted by Jones Environmental Laboratory

Dunsink Landfill - Groundwater Quality Results Q2 2015

13/05/2015

Parameter	Unit	Threshold Value	BH3	BH3 Control Values	BH3 Trigger Values	BH4	BH4 Control Values	BH4 Trigger Values	BH16	BH16 Control Values	BH16 Trigger Values	BH27	BH27 Control Values	BH27 Trigger Values
pH	pH Units	**6.5 - 9.5 [1]**	7.14	8	8.38	7.12	8.2	8.59	7.55	8.24	8.64	7.7	8.18	8.57
Conductivity	mS/cm	**1.875**	0.813	1.231	1.289	1.005	1.352	1.414	0.580	0.8379	0.8778	1.030	1.282	1.343
Temperature	^{o}C	**-**	10.8	-	-	10.9	-	-	11.5	-	-	10.4	-	-
Ammoniacal Nitrogen	mg/l	**0.175**	<0.01	0.42	0.44	0.02	0.31	0.33	0.05	0.21	0.22	0.04	1.89	1.98
Total Organic Carbon	mg/l	**N-A-C[1]**	<2	6.3	6.6	<2	6.3	6.6	<2	6.3	6.3	<2	5.25	5.5

Parameter	Unit	Threshold Value	BH31	BH31 Control Values	BH31 Trigger Values	BH32	BH32 Control Values	BH32 Trigger Values	BH33	BH33 Control Values	BH33 Trigger Values	BH34N	BH34 Control Values	BH34 Trigger Values	BH35	BH35 Control Values[2]	BH35 Trigger Values[2]
pH	pH Units	**6.5 - 9.5[1]**	7.13	8.39	8.79	7.16	8.18	8.6	7.34	8.58	8.99	7.33	8.61	9.02	7.29	-	-
Conductivity	mS/cm	**1.875**	0.764	0.791	0.828	0.692	1.227	1.286	0.668	0.852	0.892	0.815	0.998	1.045	0.740	830	869
Temperature	^{o}C	**-**	10.8	-	-	11.1	-	-	11.0	-	-	10.9	-	-	10.3	-	-
Ammoniacal Nitrogen	mg/l	**0.175**	0.1	1.575	1.65	0.04	0.735	0.77	0.02	0.21	0.22	0.12	0.21	0.22	0.09	0.455	0.476
Total Organic Carbon	mg/l	**N-A-C[1]**	<2	8.4	8.8	<2	5.25	6	<2	5.25	5.5	<2	6.3	6.6	<2	-	-

Threshold value = Groundwater regulations SI 9 of 2010

[1] = Where no threshold value exists results are compared to EPA I.G.V. from Table 3.1 of EPA document "Towards Setting Guideline Values for the protection of Groundwater in Ireland"

Shading & Bold = Value has exceeded threshold value

Shading = Value has exceeded the Control Value

Shading = Value has exceeded Trigger Value

[2] = Proposed Trigger Values

Sampled on 13th May 2015

Analysis conducted by Jones Environmental Laboratory

Dunsink Landfill Annual Groundwater Results, 19/08/2015

Groundwater Results

PARAMETER	UNIT	Threshold Value	BH3	BH3 Control Values	BH3 Trigger Values	BH4	BH4 Control Values	BH4 Trigger Values	BH16	BH16 Control Values	BH16 Trigger Values	BH27	BH27 Control Value	BH27 Trigger Values	BH31	BH31 Control Values	BH31 Trigger Values	BH32	BH32 Control Values	BH32 Trigger Values	BH33	BH33 Control Values	BH33 Trigger Values	BH34N	BH34 Control Values	BH34 Trigger Values	BH35	BH35 Control Values[2]	BH35 Trigger Values[2]
pH Value	units	6.5 - 9.5	7.15	8	8.38	6.97	8.2	8.59	7.33	8.24	8.64	7.19	8.18	8.57	7.18	8.39	8.79	7.4	8.18	8.6	7.54	8.58	8.99	7.09	8.61	9.02	7.4	-	-
Conductivity	mS/cm	1.875	1.246	1.231	1.289	1.373	1.352	1.414	0.644	0.838	0.878	0.955	1.282	1.343	0.739	0.791	0.828	0.786	1.227	1.286	0.668	0.852	0.892	0.841	0.998	1.045	0.783	830	869
Temperature	°C	-	11.2	-	-	11.8	-	-	13.0	-	-	12.4	-	-	12.6	-	-	12.6	-	-	11.6	-	-	12			12.3	-	-
Ammonical Nitrogen as N	N mg/l	0.175	<0.03	0.42	0.44	<0.03	0.315	0.33	0.03	0.21	0.22	0.08	1.89	1.98	0.13	1.575	1.65	0.43	0.735	0.77	0.060	0.21	0.22	0.66	0.21	0.22	0.2	0.455	0.476
Chloride (Cl)	Cl mg/l	187.5	94.7	76.65	80.3	125.6	91.35	95.7	21.7	40.95	42.9	45.8	75.6	79.2	25.6	32.55	34.1	26.5	26.25	27.5	17.1	28.35	29.7	12	32.55	34.1	25	28.245	29.59
Potassium (K)	K mg/l	5 [1]	3.8	5.25	5.5	4.5	7.77	8.14	2.3	3.78	3.96	2.2	3.36	3.52	3.1	4.41	4.62	1.8	6.72	7.04	1.9	5.25	5.5	1.8	3.99	4.2	1.8	1.68	1.76
Sodium (Na)	Na mg/l	150	51.2	51.24	53.68	74.1	37.8	39.6	17.4	21	22	28.5	47.25	49.5	18.2	25.2	26.4	18.3	21.31	22.33	17.5	82.95	86.9	44.7	64.58	67.7	25.9	27.825	29.150
Fluoride (F)	F mg/l	1 [1]	<0.3	0.315	0.33	<0.3	0.315	0.33	<0.3	0.74	0.77	0.4	0.74	0.77	<0.3	0.945	0.99	<0.3	0.315	0.33	0.7	0.945	0.99	<0.3	0.32	0.3	0.9	-	-
Total Organic Carbon	C mg/l	N-A-C	6	6.3	6.6	4	6.3	6.6	<2	6.3	6.6	2	5.25	5.5	<2	8.4	8.8	2	5.25	6	2	5.25	5.5	<2	6.3	6.6	<2	-	-
Total Oxidised Nitrogen (water)	N mg/l	N-A-C	<0.2	-	-	1	-	-	0.7	-	-	<0.2	-	-	<0.2	-	-	<0.2	-	-	<0.2	-	-	<0.2	-	-	<0.2	-	-
Calcium (Ca)	Ca mg/l	200 [1]	169.2	-	-	185.4	-	-	69.7	-	-	116.3	-	-	104.4	-	-	121.4	-	-	87.3	-	-	120	-	-	89.8	-	-
Cadmium (Cd)	Cd mg/l	0.003	<0.0005	-	-	<0.0005	-	-	<0.0005	-	-	<0.0005	-	-	<0.0005	-	-	<0.0005	-	-	<0.0005	-	-	<0.0005	-	-	<0.0005	-	-
Chromium (Cr)	Cr mg/l	0.037	<0.0015	-	-	<0.0015	-	-	<0.0015	-	-	<0.0015	-	-	<0.0015	-	-	<0.0015	-	-	<0.0015	-	-	<0.0015	-	-	<0.0015	-	-
Copper (Cu)	Cu mg/l	1.5	<0.007	-	-	<0.007	-	-	<0.007	-	-	<0.007	-	-	<0.007	-	-	<0.007	-	-	<0.007	-	-	<0.007	-	-	<0.007	-	-
Total Cyanide (Cn)*	Cn mg/l	0.037	<0.01	-	-	<0.01	-	-	<0.01	-	-	<0.01	-	-	<0.01	-	-	<0.01	-	-	<0.01	-	-	<0.01	-	-	<0.01	-	-
Iron (Fe)	Fe mg/l	0.2 [1]	<0.02	0.018	0.019	<0.02	0.019	0.02	<0.02	0.03	0.028	<0.02	0.03	0.032	0.199	0.0441	0.0462	0.144	0.01365	0.0143	<0.02	0.0147	0.0154	0.694	0.0304	0.0319	0.09	0.114	0.12
Lead (Pb)	Pb mg/l	0.018	<0.005	-	-	<0.005	-	-	<0.005	-	-	<0.005	-	-	<0.005	-	-	<0.005	-	-	<0.005	-	-	<0.005	-	-	<0.005	-	-
Magnesium (Mg)	Mg mg/l	50 [1]	19.4	22.73	23.82	12.1	19.08	19.99	27.4	29.23	30.62	37.7	51.07	53.5	19.7	18.76	19.66	15	25.074	26.268	24.9	21.95	23.001	13.3	23.247	24.354	29.6	30.87	32.34
Manganese (Mn)	Mn mg/l	0.05 [1]	0.132	0.151	0.158	<0.002	0.0294	0.0308	<0.002	0.169	0.177	0.08	0.077	0.08	0.089	0.9135	0.957	0.72	0.0672	0.0704	0.127	0.0483	0.0506	0.32	0.391	0.4103	0.167	0.14	0.146
Nickel (Ni)	Ni mg/l	0.015	0.003	0.0116	0.0121	<0.002	0.042	0.044	<0.002	0.0021	0.0022	<0.002	0.063	0.066	<0.002	0.0105	0.011	<0.002	0.0105	0.011	<0.002	0.021	0.022	0.003	0.00525	0.0055	<0.002	0.002	0.002
Mercury (Hg)	Hg mg/l	0.00075	<0.001	-	-	<0.001	-	-	<0.001	-	-	<0.001	-	-	<0.001	-	-	<0.001	-	-	<0.001	-	-	<0.001	-	-	<0.001	-	-
Residue on Evaporation	mg/l	-	774	-	-	782	-	-	381	-	-	579	-	-	399	-	-	531	-	-	671	-	-	4470	-	-	467	-	-
Sulphate (soluble) (SO4)	SO4 mg/l	187.5	130.64	-	-	124.37	-	-	38.98	-	-	67.85	-	-	50.07	-	-	51.72	-	-	24.22	-	-	39.2	-	-	57.71	-	-
Zinc (Zn)	Zn mg/l	0.1 [1]	0.007	-	-	0.014	-	-	0.004	-	-	0.004	-	-	0.004	-	-	0.004	-	-	<0.003	-	-	0.006	-	-	0.011	-	-
Boron (B)	B mg/l	0.75	0.034	-	-	0.032	-	-	0.062	-	-	0.08	-	-	0.039	-	-	0.036	-	-	0.032	-	-	0.026	-	-	0.098	-	-
Alkalinity (as CaCO3)	CaCO3 mg/l	N-A-C	352	-	-	362	-	-	260	-	-	376	-	-	276	-	-	316	-	-	310	-	-	1380	-	-	316	-	-
Ortho Phosphate	P04 mg/l	-	<0.06	-	-	<0.06	-	-	<0.06	-	-	<0.06	-	-	<0.06	-	-	<0.06	-	-	<0.06	-	-	<0.06	-	-	<0.06	-	-

Threshold value = Groundwater regulations SI 9 of 2010

[1] = Where no threshold value exists results are compared to EPA I.G.V. from Table 3.1 of EPA document "Towards Setting Guideline Values for the protection of Groundwater in Ireland"

Shading = Value has exceeded threshold value

Shading = Value has exceeded the trigger/control value(s)

* Laboratory level of Detection is above threshold value

Laboratory level of Detection is in excess of trigger/control value

[2] = Proposed Control and trigger values

Sampling was undertaken on 19/08/2015

N-A-C= No abnormal change

Analysis conducted by Jones Laboratories, UK

Dunsink Landfill Annual Groundwater Quality Results,
Volatile Organic Compounds 19/08/2015

Compound	Unit	LOD	BH3	BH4	BH31	BH32	BH33	BH34N
Dichlorodifluoromethane	µg/l	<2	<2	<2	<2	<2	<2	<2
Methyl tertiary butyl ether (MTBE)	µg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Chloromethane	µg/l	<3	<3	<3	<3	<3	<3	<3
Vinyl chloride	µg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Bromomethane	µg/l	<1	<1	<1	<1	<1	<1	<1
Chloroethane	µg/l	<3	<3	<3	<3	<3	<3	<3
Trichlorofluoromethane	µg/l	<3	<3	<3	<3	<3	<3	<3
1,1-Dichloroethene	µg/l	<3	<3	<3	<3	<3	<3	<3
Dichloromethane	µg/l	<3	<3	<3	<3	<3	<3	<3
trans-1,2-Dichloroethene	µg/l	<3	<3	<3	<3	<3	<3	<3
1,1-Dichloroethane	µg/l	<3	<3	<3	<3	<3	<3	<3
cis-1,2-Dichloroethene	µg/l	<3	<3	<3	<3	<3	<3	<3
2,2-Dichloropropane	µg/l	<1	<1	<1	<1	<1	<1	<1
Bromochloromethane	µg/l	<2	<2	<2	<2	<2	<2	<2
Chloroform	µg/l	<2	<2	<2	<2	<2	<2	<2
1,1,1-Trichloroethane	µg/l	<2	<2	<2	<2	<2	<2	<2
1,1-Dichloropropene	µg/l	<3	<3	<3	<3	<3	<3	<3
Carbontetrachloride	µg/l	<2	<2	<2	<2	<2	<2	<2
1,2-Dichloroethane	µg/l	<2	<2	<2	<2	<2	<2	<2
Benzene	µg/l	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Trichloroethene	µg/l	<3	<3	<3	<3	<3	<3	<3
1,2-Dichloropropane	µg/l	<2	<2	<2	<2	<2	<2	<2
Dibromomethane	µg/l	<3	<3	<3	<3	<3	<3	<3
Bromodichloromethane	µg/l	<2	<2	<2	<2	<2	<2	<2
cis-1,3-Dichloropropene	µg/l	<2	<2	<2	<2	<2	<2	<2
Toluene	µg/l	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
trans-1,3-Dichloropropene	µg/l	<2	<2	<2	<2	<2	<2	<2
1,1,2-Trichloroethane	µg/l	<2	<2	<2	<2	<2	<2	<2
1,3-Dichloropropane	µg/l	<2	<2	<2	<2	<2	<2	<2
Tetrachloroethene	µg/l	<3	<3	<3	<3	<3	<3	<3
Dibromochloromethane	µg/l	<2	<2	<2	<2	<2	<2	<2
1,2-Dibromoethane	µg/l	<2	<2	<2	<2	<2	<2	<2
Chlorobenzene	µg/l	<2	<2	<2	<2	<2	<2	<2
1,1,1,2-Tetrachloroethane	µg/l	<2	<2	<2	<2	<2	<2	<2
Ethylbenzene	µg/l	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
m,p-Xylene	µg/l	<1	<1	<1	<1	<1	<1	<1
o-Xylene	µg/l	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Styrene	µg/l	<2	<2	<2	<2	<2	<2	<2
Bromoform	µg/l	<2	<2	<2	<2	<2	<2	<2
Isopropylbenzene	µg/l	<3	<3	<3	<3	<3	<3	<3
1,1,2,2-Tetrachloroethane	µg/l	<4	<4	<4	<4	<4	<4	<4
Bromobenzene	µg/l	<2	<2	<2	<2	<2	<2	<2
1,2,3-Trichloropropane	µg/l	<3	<3	<3	<3	<3	<3	<3
Propylbenzene	µg/l	<3	<3	<3	<3	<3	<3	<3
2-Chlorotoluene	µg/l	<3	<3	<3	<3	<3	<3	<3
1,3,5-Trimethylbenzene	µg/l	<3	<3	<3	<3	<3	<3	<3
4-Chlorotoluene	µg/l	<3	<3	<3	<3	<3	<3	<3
tert-Butylbenzene	µg/l	<3	<3	<3	<3	<3	<3	<3
1,2,4-Trimethylbenzene	µg/l	<3	<3	<3	<3	<3	<3	<3
sec-Butylbenzene	µg/l	<3	<3	<3	<3	<3	<3	<3
4-iso-Propyltoluene	µg/l	<3	<3	<3	<3	<3	<3	<3
1,3-Dichlorobenzene	µg/l	<3	<3	<3	<3	<3	<3	<3
1,4-Dichlorobenzene	µg/l	<3	<3	<3	<3	<3	<3	<3
n-Butylbenzene	µg/l	<3	<3	<3	<3	<3	<3	<3
1,2-Dichlorobenzene	µg/l	<3	<3	<3	<3	<3	<3	<3
1,2-Dibromo-3-chloropropane	µg/l	<2	<2	<2	<2	<2	<2	<2
1,2,4-Trichlorobenzene	µg/l	<3	<3	<3	<3	<3	<3	<3
Hexachlorobutadiene	µg/l	<3	<3	<3	<3	<3	<3	<3
Naphthalene	µg/l	<2	<2	<2	<2	<2	<2	<2
1,2,3-Trichlorobenzene	µg/l	<3	<3	<3	<3	<3	<3	<3

Dunsink Landfill Annual Groundwater Quality Results,

Semi-Volatile Organic Compounds, 19/08/2015

Compound	Unit	LOD	BH3	BH4	BH31	BH32	BH33	BH34N
Phenols								
2-Chlorophenol (aq)	µg/l	<1	<1	<1	<1	<1	<1	<1
2-Methylphenol (aq)	µg/l	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2-Nitrophenol (aq)	µg/l	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2,4-Dichlorophenol (aq)	µg/l	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2,4-Dimethylphenol (aq)	µg/l	<1	<1	<1	<1	<1	<1	<1
2,4,5-Trichlorophenol (aq)	µg/l	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2,4,6-Trichlorophenol (aq)	µg/l	<10	<1	<1	<1	<1	<1	<1
4-Chloro-3-methylphenol (aq)	µg/l	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
4-Methylphenol (aq)	µg/l	<1	<1	<1	<1	<1	<1	<1
4-Nitrophenol (aq)	µg/l	<10	<10	<10	<10	<10	<10	<10
Pentachlorophenol (aq)	µg/l	<1	<1	<1	<1	<1	<1	<1
Phenol (aq)	µg/l	<1	<1	<1	<1	<1	<1	<1
PAHs								
2-Chloronaphthalene (aq)	µg/l	<1	<1	<1	<1	<1	<1	<1
2-Methylnaphthalene (aq)	µg/l	<1	<1	<1	<1	<1	<1	<1
Naphthalene (aq)	µg/l	<1	<1	<1	<1	<1	<1	<1
Acenaphthylene (aq)	µg/l	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Acenaphthene (aq)	µg/l	<1	<1	<1	<1	<1	<1	<1
Fluorene (aq)	µg/l	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Phenanthrene (aq)	µg/l	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Anthracene (aq)	µg/l	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Fluoranthene (aq)	µg/l	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Pyrene (aq)	µg/l	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)anthracene (aq)	µg/l	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Chrysene (aq)	µg/l	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(bk)fluoranthene (aq)	µg/l	<1	<1	<1	<1	<1	<1	<1
Benzo(a)pyrene (aq)	µg/l	<1	<1	<1	<1	<1	<1	<1
Indeno(1,2,3-cd)pyrene (aq)	µg/l	<1	<1	<1	<1	<1	<1	<1
Dibenzo(a,h)anthracene (aq)	µg/l	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(g,h,i)perylene (aq)	µg/l	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Phthalates								
bis(2-Ethylhexyl) phthalate (aq)	µg/l	<5	<5	<5	<5	<5	<5	<5
Butylbenzyl phthalate (aq)	µg/l	<1	<1	<1	<1	<1	<1	<1
Di-n-Dibutyl phthalate (aq)	µg/l	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5
Di-n-Dioctyl phthalate (aq)	µg/l	<1	<1	<1	<1	<1	<1	<1
Diethyl phthalate (aq)	µg/l	<1	<1	<1	<1	<1	<1	<1
Dimethyl phthalate (aq)	µg/l	<1	<1	<1	<1	<1	<1	<1
Other SVOCs								
1,2,4-Trichlorobenzene (aq)	µg/l	<1	<1	<1	<1	<1	<1	<1
1,2-Dichlorobenzene (aq)	µg/l	<1	<1	<1	<1	<1	<1	<1
1,3-Dichlorobenzene (aq)	µg/l	<1	<1	<1	<1	<1	<1	<1
1,4-Dichlorobenzene (aq)	µg/l	<1	<1	<1	<1	<1	<1	<1
2,4-Dinitrotoluene (aq)	µg/l	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2,6-Dinitrotoluene (aq)	µg/l	<1	<1	<1	<1	<1	<1	<1
2-Nitroaniline (aq)	µg/l	<1	<1	<1	<1	<1	<1	<1
3-Nitroaniline (aq)	µg/l	<1	<1	<1	<1	<1	<1	<1
4-Bromophenylphenylether (aq)	µg/l	<1	<1	<1	<1	<1	<1	<1
4-Chloroaniline (aq)	µg/l	<1	<1	<1	<1	<1	<1	<1
4-Chlorophenylphenylether (aq)	µg/l	<1	<1	<1	<1	<1	<1	<1
4-Nitroaniline (aq)	µg/l	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Azobenzene (aq)	µg/l	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
bis(2-Chloroethyl)ether (aq)	µg/l	<1	<1	<1	<1	<1	<1	<1
bis(2-Chloroethoxy)methane (aq)	µg/l	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Carbazole (aq)	µg/l	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Dibenzofuran (aq)	µg/l	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Hexachlorobenzene (aq)	µg/l	<1	<1	<1	<1	<1	<1	<1
Hexachlorobutadiene (aq)	µg/l	<1	<1	<1	<1	<1	<1	<1
n-Nitroso-n-dipropylamine (aq)	µg/l	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Hexachloroethane (aq)	µg/l	<1	<1	<1	<1	<1	<1	<1
Nitrobenzene (aq)	µg/l	<1	<1	<1	<1	<1	<1	<1
Isophorone (aq)	µg/l	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Hexachlorocyclopentadiene (aq)	µg/l	<1	<1	<1	<1	<1	<1	<1

Dunsink Landfill, Annual Groundwater Quality Results - Pesticides, 19/08/2015

Parameter (µg/l)	BH3	BH4	BH31	BH32	BH33	BH34N
Organochlorine Pesticides						
Aldrin	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Alpha-HCH (BHC)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Beta-HCH (BHC)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Chlorothalonil	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
cis-Chlordane	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Delta-HCH (BHC)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Dieldrin	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Endosulphan I	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Endosulphan II	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Endosulphan sulphate	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Endrin	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Gamma-HCH (BHC)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Heptachlor	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Heptachlor Epoxide	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Hexachlorobenzene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Isodrin	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
o,p'-DDE	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
o,p'-DDT	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
o,p'-Methoxychlor	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
o,p'-TDE	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
p,p'-DDE	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
p,p'-DDT	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
p,p'-Methoxychlor	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
p,p'-TDE	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Pendimethalin	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Permethrin I	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Permethrin II	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Quintozene (PCNB)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Tecnazene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Telodrin	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
trans-Chlordane	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Triadimefon	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Triallate	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Trifluralin	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Organophosphorus Pesticides						
Azinphos ethyl	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Azinphos methyl	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
Carbophenothion	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Chlorfenvinphos	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Chlorpyrifos	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Chlorpyrifos-methyl	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Diazinon	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Dichlorvos	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Disulfoton	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Dimethoate	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Ethion	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Ethyl Parathion (Parathion)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Etrimphos	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Fenitrothion	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Fenthion	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Malathion	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Methyl Parathion	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Mevinphos	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Phosalone	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Pirimiphos Methyl	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Propetamphos	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Triazophos	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01

BH32 - 16/09/2015

Parameter	Units	Threshold Value	**BH32** 16/09/2015 (Resampled)	Control Values	Trigger Values
pH	units	6.5 - 9.5	8.15	8.18	8.6
Conductivity	mS/cm	1.875	0.73	1.227	1.286
Temp.	Deg.C	-	12.3	-	-
ammoniacal Nitrogen	mg/l	0.175	0.09	0.735	0.77

Threshold value = Groundwater regulations SI 9 of 2010
Shading = Value has exceeded threshold value
Shading = Value has exceeded the trigger/control value(s)
* Laboratory level of Detection is above threshold value
# Laboratory level of Detection is in excess of trigger/control value
Sampling was undertaken on 16/09/2015
N-A-C= No abnormal change

Analysis conducted by Jones Laboratories, UK

Dunsink Landfill - Groundwater Quality Results Q4 2015

14/10/2015

Parameter	Unit	Threshold Value	BH3	BH3 Control Values	BH3 Trigger Values	BH4	BH4 Control Values	BH4 Trigger Values	BH16	BH16 Control Values	BH16 Trigger Values	BH27	BH27 Control Values	BH27 Trigger Values
pH	pH Units	**6.5 - 9.5 [1]**	7.13	8.0	8.38	7.2	8.2	8.59	7.3	8.24	8.64	7.18	8.18	8.57
Conductivity	mS/cm	**1.875**	0.876	1.231	1.289	0.762	1.352	1.414	0.475	0.8379	0.8778	0.639	1.282	1.343
Temperature	°C	**-**	11.9	-	-	11.8	-	-	12.5	-	-	11.2	-	-
Ammoniacal Nitrogen	mg/l	**0.175**	0.03	0.42	0.44	0.04	0.31	0.33	**0.19**	0.21	0.22	0.07	1.89	1.98
Total Organic Carbon	mg/l	**N-A-C[1]**	<2	6.3	6.6	<2	6.3	6.6	<2	6.3	6.3	<2	5.25	5.5

Parameter	Unit	Threshold Value	BH31	BH31 Control Values	BH31 Trigger Values	BH32	BH32 Control Values	BH32 Trigger Values	BH33	BH33 Control Values	BH33 Trigger Values	BH34N	BH34 Control Values	BH34 Trigger Values	BH35	BH35 Control Values[2]	BH35 Trigger Values[2]
pH	pH Units	**6.5 - 9.5[1]**	7.28	8.39	8.79	7.27	8.18	8.6	7.55	8.58	8.99	7.38	8.61	9.02	7.31	-	-
Conductivity	mS/cm	**1.875**	0.485	0.791	0.828	0.521	1.227	1.286	0.464	0.852	0.892	0.518	0.998	1.045	0.520	830	869
Temperature	°C	**-**	11.5	-	-	11.2	-	-	11.6	-	-	11.7	-	-	11.1	-	-
Ammoniacal Nitrogen	mg/l	**0.175**	0.09	1.575	1.65	**0.22**	0.735	0.77	0.05	0.21	0.22	**0.97**	0.21	0.22	**0.18**	0.455	0.476
Total Organic Carbon	mg/l	**N-A-C[1]**	<2	8.4	8.8	<2	5.25	6	<2	5.25	5.5	<2	6.3	6.6	<2	-	-

Threshold value = Groundwater regulations SI 9 of 2010

[1] = Where no threshold value exists results are compared to EPA I.G.V. from Table 3.1 of EPA document "Towards Setting Guideline Values for the protection of Groundwater in Ireland"

Shading & Bold = Value has exceeded threshold value

Shading = Value has exceeded the Control Value

Shading = Value has exceeded Trigger Value

[2] = Proposed Trigger Values

Sampled on 14th October 2015

Analysis conducted by Jones Environmental Laboratory

Dunsink Landfill BH34N Groundwater Results

Groundwater Results								
PARAMETER	UNIT	Threshold Value SI 9, 2010	BH34N 19/08/2015	BH34N 14/10/2015	BH34N 11/11/2015	BH34N 09/12/2015	BH34 Control Values	BH34 Trigger Values
pH Value	units	6.5 - 9.5	7.09	7.38	7.35	7.19	8.61	9.02
Conductivity	mS/cm	1.875	0.841	0.518	0.82	0.64	0.998	1.045
Temperature	°C	-	12	11.7	11.9	10.4	-	-
Ammonical Nitrogen as N	N mg/l	0.175	0.66	0.97	0.64	0.36	0.21	0.22
Chloride (Cl)	Cl mg/l	187.5	12	-	14.5	11.2	32.55	34.1
Potassium (K)	K mg/l	5 [1]	1.8	-	2.9	1.6	3.99	4.2
Sodium (Na)	Na mg/l	150	44.7	-	50	33.1	64.58	67.7
Fluoride (F)	F mg/l	1 [1]	<0.3	-	-	-	0.32	0.3
Total Organic Carbon	C mg/l	N-A-C	<2	<2	-	-	6.3	6.6
Total Oxidised Nitrogen (water)	N mg/l	N-A-C	<0.2	-	-	-	-	-
Calcium (Ca)	Ca mg/l	200 [1]	120	-	-	-	-	-
Cadmium (Cd)	Cd mg/l	0.003	<0.0005	-	-	-	-	-
Chromium (Cr)	Cr mg/l	0.037	<0.0015	-	-	-	-	-
Copper (Cu)	Cu mg/l	1.5	<0.007	-	-	-	-	-
Total Cyanide (Cn)	Cn mg/l	0.037	<0.01	-	-	-	-	-
Iron (Fe)	Fe mg/l	0.2 [1]	0.694	-	<0.02	<0.02	0.0304	0.0319
Lead (Pb)	Pb mg/l	0.018	<0.005	-	-	-	-	-
Magnesium (Mg)	Mg mg/l	50 [1]	13.3	-	-	-	23.247	24.354
Manganese (Mn)	Mn mg/l	0.05 [1]	0.32	-	0.278	0.06	0.391	0.4103
Nickel (Ni)	Ni mg/l	0.015	0.003	-	-	-	0.00525	0.0055
Mercury (Hg)*	Hg mg/l	0.00075	<0.001	-	-	-	-	-
Residue on Evaporation	mg/l	-	4470	-	6,771	15,112	-	-
Sulphate (soluble) (SO4)	SO4 mg/l	187.5	39.2	-	40.35	32.45	-	-
Zinc (Zn)	Zn mg/l	0.1 [1]	0.006	-	-	-	-	-
Boron (B)	B mg/l	0.75	0.026	-	-	-	-	-
Alkalinity (as CaCO3)	CaCO3 mg/l	N-A-C	1380	-	742	906	-	-
Total Hardness as CaCO3	CaCO3 mg/l	-	-	-	-	297	-	-
Ortho Phosphate	P04 mg/l	-	<0.06	-	-	-	-	-

Threshold value = Groundwater regulations SI 9 of 2010

[1] = Where no threshold value exists results are compared to EPA I.G.V. from Table 3.1 of EPA document "Towards Setting Guideline Values for the protect

Shading = Value has exceeded threshold value

Shading = Value has exceeded the trigger/control value(s)

* Laboratory level of Detection is above threshold value

\# Laboratory level of Detection is in excess of trigger/control value

N-A-C= No abnormal change

Analysis conducted by Jones Laboratories, UK

APPENDIX 2:

Surface Water and Leachate Monitoring Results

Dunsink Landfill - Surface Water Quality Results, Q1 2015

10/02/2015

Parameter	Unit	SI 272 of 2009	Salmonid Regs	SW21	SW18	SW7	SW10	SW2	SW9	SW11A	WWSW2	SW17
									Dry			
pH	pH Units	6-9 (note 1)	≥6≤9	7.68	8.07	8.25	7.55	7.80		7.69	7.97	8.15
Conductivity	µS/cm	1,000 (note 2)	-	**1380**	**1440**	**1810**	**1460**	**1,230**		**1,070**	810	**1,200**
Temperature	^{o}C	-	<10^{o}C*	8.2	8.4	4.5	6.3	6.6		5.0	6.6	6.4
Dissolved Oxygen	%	80-120% saturation	50%>9mg/l	101.0	111.8	**150.7**	112.2	**133.3**		**120.1**	**130.4**	**127.9**
Ammoniacal Nitrogen#	mg/l	0.14	<1	**0.32**	0.12	0.06	0.10	0.09		0.06	0.11	0.10
BOD	mg/l	<=2.6 (note 3)	5	<1	1	**3**	2	<1		2	**3**	2
Total Suspended Solids	mg/l	-	25	25	18	13	39	134		<10	<10	22

SI 272 of 2009 = European Communities Environmental Objectives (Surface Water) Regulations 2009
Bold = Value has exceeded Surface Water Regulations
Salmonid Regs= European Communities (Quality of Salmonid Waters) Regulation , SI 293 of 1988.
Shading = Value has exceeded Salmonid Regulations
*=Second Schedule of Salmonid Regulations states " temperature must not exceed 10 degrees celsius during the period from 1 November to 30 April where species which need cold water for reproduction are present
Note 1 : Hard water - >100mg/l CACO3
Note 2 : In the absence of a standard for conductivity under SI 272 of 2009 or the Salmonid Regulations SI 293 of 1988, a threshold value from SI 294 of 1989 (Quality of SW Intended for Abstraction of Drinking Water) has been used (1,000 µS/cm)
Note 3 : 95 %ile for waters achieving good status

Sampled on 10th February 2015

Analysis conducted by Jones Environmental Laboratory

Dunsink Landfill - Total Suspended Solids results, 11/03/2015

11/03/2015

Parameter	Unit	SI 272 of 2009	Salmonid Regs	SW10	SW10A	SW2	SW17
pH	pH Units	6-9 (note 1)	≥6≤9	7.50	8.20	7.70	8.03
Conductivity	µS/cm	1,000 (note 2)	-	**1500**	410	**1320**	**1,290**
Temperature	^{o}C	-	<10^{o}C*	8.4	8.0	8.5	9.2
Total Suspended Solids	mg/l	-	25	<10	<10	<10	<10

SI 272 of 2009 = European Communities Environmental Objectives (Surface Water) Regulations 2009
Bold = Value has exceeded Surface Water Regulations
Salmonid Regs= European Communities (Quality of Salmonid Waters) Regulation , SI 293 of 1988.
Shading = Value has exceeded Salmonid Regulations
*=Second Schedule of Salmonid Regulations states " temperature must not exceed 10 degrees celsius during the period from 1 November to 30 April where species which need cold water for reproduction are present
Note 1 : Hard water - >100mg/l CACO3
Note 2 : In the absence of a standard for conductivity under SI 272 of 2009 or the Salmonid Regulations SI 293 of 1988, a threshold value from SI 294 of 1989 (Quality of SW Intended for Abstraction of Drinking Water) has been used (1,000 µS/cm)

Sampled on 11th March 2015

Analysis conducted by Jones Environmental Laboratory

Water quality results from Lane 1 sampling location.

Parameter		LANE1 14/01/2015	LANE1 10/02/2015
pH	**units**	6.83	7.35
Temperature	**°C**	9.0	6.5
Conductivity	µS/cm	990	1,040
Total Dissolved Iron	µg/l	<20	<20
Dissolved Manganese	µg/l	1080	600
Dissolved Potassium	mg/l	8.4	10.7
Dissolved Sodium	mg/l	23.4	23.9
Sulphate	mg/l	83.39	103.52
Chloride	mg/l	37.4	36.1
Total Oxidised Nitrogen as N	mg/l	<0.2	<0.2
Ammoniacal Nitrogen as N	mg/l	2.35	2.3

Dunsink Landfill - Surface Water Quality Results, Q2 2015

13/05/2015

Parameter	Unit	SI 272 of 2009	Salmonid Regs	SW21	SW18	SW7	SW10	SW2	SW9	SW11A	WWSW2	SW17
pH	pH Units	6-9 (note 1)	≥6≤9	8.23	7.67	8.35	8.08	8.17	8.23	7.80	8.22	8.21
Conductivity	µS/cm	1,000 (note 2)	-	730	**1,150**	570	790	760	530	**1,140**	910	860
Temperature	^oC	-	<10^oC*	13.9	11.5	13.6	13.3	12.8	16.1	12.1	12.4	16.0
Dissolved Oxygen	%	80-120% saturation	50%>9mg/l	109.9	107.3	**-**	103.8	**140**	-	106.0	**144**	**156**
Ammoniacal Nitrogen#	mg/l	0.14	<1	0.05	0.05	0.04	0.05	0.05	0.04	0.09	0.02	0.04
BOD	mg/l	<=2.6 (note 3)	5	<1	<1	**3**	2	2	<1	<1	<1	<1
Total Suspended Solids	mg/l	-	25	<10	16	<10	<10	22	<10	<10	<10	<10

SI 272 of 2009 = European Communities Environmental Objectives (Surface Water) Regulations 2009
Bold = Value has exceeded Surface Water Regulations
Salmonid Regs= European Communities (Quality of Salmonid Waters) Regulation , SI 293 of 1988.
Shading = Value has exceeded Salmonid Regulations
*=Second Schedule of Salmonid Regulations states " temperature must not exceed 10 degrees celsius during the period from 1 November to 30 April where species which need cold water for reproduction are present
Note 1 : Hard water - >100mg/l CACO3
Note 2 : In the absence of a standard for conductivity under SI 272 of 2009 or the Salmonid Regulations SI 293 of 1988, a threshold value from SI 294 of 1989 (Quality of SW Intended for Abstraction of Drinking Water) has been used (1,000 µS/cm)
Note 3 : 95 %ile for waters achieving good status

Sampled on 13th May 2015

Analysis conducted by Jones Environmental Laboratory

Water quality results from Surface Water on the southern lane.

Parameter	Units	LANE1 14/01/2015	LANE1 10/02/2015	TP1 31/03/2015	TP2 31/03/2015	TP3 31/03/2015	Lane Pond 09/04/2015
pH	units	6.83	7.35	7.33	7.51	7.29	8.7
Temperature	°C	9.0	6.5	7.9	8	6.9	10.6
Conductivity	µS/cm	990	1,040	880	560	1,050	810
Dissolved Oxygen	mg/l	-	-	1.41	9.55	7	18.01
Dissolved Oxygen	%	-	-	12.8	80	59	165
Total Dissolved Iron	µg/l	<20	<20	<20	<20	<20	<20
Total Iron	µg/l	-	-	548	5,389	922	1,548
Dissolved Manganese	µg/l	1080	600	1,058	<2	<2	1,214
Total Manganese	µg/l	-	-	1,090	364	29	1,380
Dissolved Potassium	mg/l	8.4	10.7	6.5	2.1	5.9	7.8
Dissolved Sodium	mg/l	23.4	23.9	19.4	18.5	19.3	22.1
Sulphate	mg/l	83.39	103.52	86	208.43	139.99	89.1
Chloride	mg/l	37.4	36.1	36	20.1	35.7	35.4
Total Oxidised Nitrogen as N	mg/l	<0.2	<0.2	<0.2	0.5	1.9	<0.2
Ammoniacal Nitrogen as N	mg/l	2.35	2.3	1.92	0.12	0.16	1.13
Flouride	mg/l	-	-	-	-	-	<0.3
Total Coliforms	cfu/100ml	-	-	0	0	19	40
Faecal Coliforms	cfu/100ml	-	-	0	0	10	27

Lane 1 - Surface water springs on the lane (near the source of surface water on the lane)
TP1 - Trench to the south of the lane near Lane 1 sampling point
TP2 - Trench on the northern side of the lane to the east of TP1 (on a concrete base)
TP3 - Trench on the southern side of the lane to the east of TP2
Lane Pond - depression in the land where combined surface water from the lane collects

Parameter	Units	SI 272 of 2009	Salmonid Regs	SW21 15/07/2015	SW18 15/07/2015	SW17 15/07/2015	LANE POND 15/07/2015
pH		6-9 (note 1)	≥6≤9	8.28	8.23	7.97	8.32
Conductivity	µS/cm	1,000 (note 2)	-	550	810	760	750
Temperature	°C	-	<10^{o}C*	15.1	16.0	15.5	20.7
Ammoniacal Nitrogen as N	mg/l	0.14	<1	0.05	0.10	**0.16**	**0.43**
Total Dissolved Iron	ug/l	-	-	-	-	-	<20
Dissolved Manganese	ug/l	-	-	-	-	-	<2
Dissolved Potassium	mg/l	-	-	-	-	-	8.2
Dissolved Sodium	mg/l	-	-	-	-	-	21.8
Total Iron	ug/l	-	-	-	-	-	320
Total Manganese	ug/l	-	-	-	-	-	75
EPH (C8-C40)	ug/l	-	-	-	-	-	<10
Sulphate	mg/l	-	-	-	-	-	71.18
Chloride	mg/l	-	-	-	-	-	35.4
Total Oxidised Nitrogen as N	mg/l	-	-	-	-	-	0.3

SI 272 of 2009 = European Communities Environmental Objectives (Surface Water) Regulations 2009

Bold = Value has exceeded Surface Water Regulations

Salmonid Regs= European Communities (Quality of Salmonid Waters) Regulation , SI 293 of 1988.

Shading = Value has exceeded Salmonid Regulations

*=Second Schedule of Salmonid Regulations states " temperature must not exceed 10 degrees celsius during the period from 1 November to 30 April where species which need cold water for reproduction are present

Note 1 : Hard water - >100mg/l CACO3

Note 2 : In the absence of a standard for conductivity under SI 272 of 2009 or the Salmonid Regulations SI 293 of 1988, a threshold value from SI 294 of 1989 (Quality of SW Intended for Abstraction of Drinking Water) has been used (1,000 µS/cm)

Note 3 : 95 %ile for waters achieving good status

Sampled on 15th July 2015

Analysis conducted by Jones Environmental Laboratory

Dunsink Landfill Annual Surface Water Quality Results, 19th August 2015

Surface Water Results

PARAMETER	UNIT	SI 272 of 2009	Salmonid	SW21	SW18	SW19	SW7	SW10	SW10A	SW2	SW17	SW11A	WWSW1	WWSW2
pH Value	units	6-9 (note 1)	6-9	8.76	**9.28**	7.99	7.66	7.39	8.27	8.43	8.01	7.84	7.99	7.98
Conductivity	mS/cm	1	-	0.150	0.130	0.120	0.760	**1.030**	0.430	0.520	0.520	0.880	0.380	0.300
Temperature	°C			17.2	16.7	16.0	17.0	15.5	15.2	16.1	16.0	14.0	16.6	16.7
Ammonical Nitrogen as N	N mg/l	0.14	1	**0.47**	**0.18**	**0.16**	**1.43**	0.05	-	0.09	**0.66**	0.06	**1.51**	**0.88**
Chloride (Cl)	Cl mg/l	-	-	4.7	7.5	7.6	42.1	38.4	-	33.8	24.6	44.9	25.5	14.7
Potassium (K)	K mg/l	-	-	1.7	17.0	1.2	4.8	4.7	-	1.3	6.1	8	3.2	2.5
Sodium (Na)	Na mg/l	-	-	7.2	18.9	9.3	40.4	30.5	-	9.6	18.7	27.6	22.3	12.7
COD	02 mg/l	-	-	25	33	29	72	7	-	41	36	43	30	24
BOD	02 mg/l	<=1.5 mean (note 2)	5	**3**	**5**	**3**	**17**	<1	-	**4**	**3**	**3**	**4**	**3**
Total Oxidised Nitrogen (water)	N mg/l	-	-	<0.2	0.3	0.3	<0.2	0.9	-	1.3	0.8	0.4	0.4	0.3
Total Suspended Solids	mg/l	-	25	57	164	146	19	<10	20	<10	30	10	88	24
Calcium (Ca)	Ca mg/l	-	-	24.3	74.9	15.8	126	178.3	-	13.8	83.7	152.3	57.5	46.6
Cadmium (Cd)	Cd mg/l	0.15	-	<0.005	<0.005	<0.005	<0.005	<0.005	-	<0.005	<0.005	<0.005	<0.005	<0.005
Chromium (Cr)	Cr mg/l	0.0047	-	<0.0015	0.0017	<0.0015	<0.0015	<0.0015	-	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015
Copper (Cu)	Cu mg/l	0.03 (Note 3)	-	<0.007	0.01	0.009	<0.007	<0.007	-	<0.007	<0.007	<0.007	<0.007	<0.007
Iron (Fe)	Fe mg/l	-	-	0.029	0.022	0.024	0.076	<0.02	-	0.028	<0.02	0.135	<0.02	<0.02
Lead (Pb)	Pb mg/l	0.0072	-	<0.005	<0.005	<0.005	<0.005	<0.005	-	<0.005	<0.005	<0.005	<0.005	<0.005
Magnesium (Mg)	Mg mg/l	-	-	1.1	6.4	0.7	10.9	13.5	-	0.6	6	14	3.5	2.6
Manganese (Mn)	Mn mg/l	-	-	0.028	0.017	0.021	1.455	0.082	-	0.027	0.049	0.214	0.067	0.036
Nickel (Ni)	Ni mg/l	0.02	-	<0.002	<0.002	<0.002	0.008	0.002	-	<0.002	<0.002	0.003	<0.002	<0.002
Mercury (Hg)	Hg mg/l	0.00005	-	<0.001	<0.001	<0.001	<0.001	<0.001	-	<0.001	<0.001	<0.001	<0.001	<0.001
Sulphate (soluble) (SO4)	SO4 mg/l	-	-	27.24	10.4	10.91	137.06	129.46	-	55.72	71.52	93.16	46.75	35.19
Zinc (Zn)	Zn mg/l	0.1	-	0.018	0.021	0.021	0.013	0.004	-	0.008	0.006	0.005	0.006	0.007
Alkalinity (as CaCO3)	CaCO3 mg/l	N-A-C	-	74	70	68	140	338	-	168	164	336	134	110
Boron (B)	B mg/l	-	-	<0.012	<0.012	<0.012	0.038	0.068	-	0.035	0.029	0.073	<0.012	0.015
ortho - phosphate	PO4 mg/l	-	-	<0.06	<0.06	<0.06	<0.06	<0.06	-	0.12	0.2	0.14	0.39	0.24

Legend:
SI 272 of 2009 = European Communities Environmental Objectives (Surface Water) Regulations 2009
Bold = Value has exceeded Surface water Regulations
Salmonid Regs= European Communities (Quality of Salmonid Waters) Regulation, 1988
Shading = Value has exceeded Salmonid Water Quality Standard
Sampling was undertaken on 19th August 2015
Note 1 : Hard water - >100mg/l CACO3
Note 2 : For waters achieving good status
Note 3 : The standard of 0.005mg/l applies where hardness <100mg/l CACO3; 0.03mg/l applies where hardness >100mg/l CACO3
N-A-C= No abnormal change

Analysis conducted by Jones Laboratories, UK

Marron Environmental
J102-01

Dunsink Landfill - Surface Water Quality Results, 16th September, 2015

16/09/2015

Parameter	Unit	SI 272 of 2009	Salmonid Regs	SW21	SW18	SW19	SW7	SW10	SW10a	SW2	SW11A	WWSW1	WWSW2	SW17	Lane Pond
pH	pH Units	6-9 (note 1)	≥6≤9	8.15	8.48	8.19	8.41	7.88	8.18	8.07	8.00	7.88	7.88	7.96	8.40
Conductivity	µS/cm	1,000 (note 2)	-	580	710	690	310	660	530	770	**1,000**	900	850	790	750
Temperature	°C	-	<10°C*	14.4	13.5	14.5	15.4	14.2	13.0	13.2	11.7	13.3	14.4	13.3	18.0
Ammoniacal Nitrogen#	mg/l	0.14	<1	0.08	0.08	**0.21**	0.05	0.09	0.02	0.03	0.06	0.13	0.07	0.05	**0.33**
Total Suspended Solids	mg/l	-	25	<10	<10	25	<10	<10	<10	<10	<10	<10	<10	10	<10

SI 272 of 2009 = European Communities Environmental Objectives (Surface Water) Regulations 2009
Bold = Value has exceeded Surface Water Regulations
Salmonid Regs= European Communities (Quality of Salmonid Waters) Regulation , SI 293 of 1988.
Shading = Value has exceeded Salmonid Regulations
*=Second Schedule of Salmonid Regulations states " temperature must not exceed 10 degrees celsius during the period from 1 November to 30 April where species which need cold water for reproduction are present
Note 1 : Hard water - >100mg/l CACO3
Note 2 : In the absence of a standard for conductivity under SI 272 of 2009 or the Salmonid Regulations SI 293 of 1988, a threshold value from SI 294 of 1989 (Quality of SW Intended for Abstraction of Drinking Water) has been used (1,000 µS/cm)
Note 3 : 95 %ile for waters achieving good status

Sampled on 16th September 2015

Analysis conducted by Jones Environmental Laboratory

Dunsink Landfill - Surface Water Quality Results, Q4 2015

14/10/2015

Parameter	Unit	SI 272 of 2009	Salmonid Regs	SW21	SW18	SW19	SW7	SW10	SW2	Lane Pond	SW11A	WWSW1	WWSW2	SW17
pH	pH Units	6-9 (note 1)	≥6≤9	8.25	7.63	7.67	7.58	7.38	8.04	Dry	7.56	7.45	7.64	7.56
Conductivity	μS/cm	1,000 (note 2)	-	650	800	750	390	870	840	Dry	**1,000**	750	800	910
Temperature	°C	-	<10°C*	13.9	13.2	12.0	10.6	12.1	12.2	Dry	11.7	12.4	11.0	11.0
Ammoniacal Nitrogen#	mg/l	0.14	<1	0.07	0.11	**0.26**	0.07	0.07	0.08	Dry	0.07	-	0.09	0.08
BOD	mg/l	<=2.6 (note 3)	5	**13**	1	**5**	**3**	<1	<1	Dry	<1	-	1	2
Total Suspended Solids	mg/l	-	25	<10	18	11	<10	<10	17	Dry	10	-	14	27

SI 272 of 2009 = European Communities Environmental Objectives (Surface Water) Regulations 2009
Bold = Value has exceeded Surface Water Regulations
Salmonid Regs= European Communities (Quality of Salmonid Waters) Regulation , SI 293 of 1988.
Shading = Value has exceeded Salmonid Regulations
*=Second Schedule of Salmonid Regulations states " temperature must not exceed 10 degrees celsius during the period from 1 November to 30 April where species which need cold water for reproduction are present
Note 1 : Hard water - >100mg/l CACO3
Note 2 : In the absence of a standard for conductivity under SI 272 of 2009 or the Salmonid Regulations SI 293 of 1988, a threshold value from SI 294 of 1989 (Quality of SW Intended for Abstraction of Drinking Water) has been used (1,000 μS/cm)
Note 3 : 95 %ile for waters achieving good status

Sampled on 14th October, 2015

Analysis conducted by Jones Environmental Laboratory

Dunsink Landfill - Surface Water Quality Results, 11th November, 2015

11/11/2015

Parameter	Unit	SI 272 of 2009	Salmonid Regs	SW21	SW18	SW19	SW7	SW10	SW2	Lane Pond	SW11A	WWSW1	WWSW2	SW17
pH	pH Units	6-9 (note 1)	≥6≤9	7.45	7.24	7.80	7.45	7.23	7.49	7.41	7.38	7.39	7.43	7.42
Conductivity	µS/cm	1,000 (note 2)	-	**1332**	360	140	370	500	470	460	880	650	680	620
Temperature	°C	-	<10°C*	12.3	13.9	12.7	13.7	12.7	12.8	13.80	11.8	12.5	12.7	12.6
Ammoniacal Nitrogen	mg/l	0.14	<1	**0.69**	0.12	0.12								0.09
Potassium	mg/l	-	-		3.3	1.8								
Sodium	mg/l	-	-		14.1	11.7								
Sulphate	mg/l	-	-		50.07	35.74								
Chloride	mg/l	-	-		13	9.6								
E.Coliforms	cfu/100ml	-	-		24									

SI 272 of 2009 = European Communities Environmental Objectives (Surface Water) Regulations 2009
Bold = Value has exceeded Surface Water Regulations
Salmonid Regs= European Communities (Quality of Salmonid Waters) Regulation , SI 293 of 1988.
Shading = Value has exceeded Salmonid Regulations
*=Second Schedule of Salmonid Regulations states " temperature must not exceed 10 degrees celsius during the period from 1 November to 30 April where species which need cold water for reproduction are present
Note 1 : Hard water - >100mg/l CACO3
Note 2 : In the absence of a standard for conductivity under SI 272 of 2009 or the Salmonid Regulations SI 293 of 1988, a threshold value from SI 294 of 1989 (Quality of SW Intended for Abstraction of Drinking Water) has been used (1,000
Note 3 : 95 %ile for waters achieving good status

Sampled on 11th November, 2015

Analysis conducted by Jones Environmental Laboratory

Dunsink Landfill - Surface Water Quality Results, 11th November, 2015

18/11/2015

Parameter	Unit	SI 272 of 2009	Salmonid Regs	SW21	SW18	SW19	SW7	SW10	SW10A	SW2	Lane Pond	SW11A	WWSW1	WWSW2 (Old)	WWSW2 (New)	SW17
pH	pH Units	6-9 (note 1)	≥6≤9	7.47	7.25	7.40	7.37	7.35	7.35	7.59	7.57	7.50	7.36	7.36	7.36	7.37
Conductivity	µS/cm	1,000 (note 2)	-	350	450	380	560	630	320	550	470	990	710	920	650	680
Temperature	°C	-	<10°C*	11.0	11.0	10.6	8.9	9.6	10.3	9.8	10.30	9.8	11.3	11.4	11.1	10.7
Ammoniacal Nitrogen	mg/l	0.14	<1	**0.36**	**0.40**											0.11

SI 272 of 2009 = European Communities Environmental Objectives (Surface Water) Regulations 2009
Bold = Value has exceeded Surface Water Regulations
Salmonid Regs= European Communities (Quality of Salmonid Waters) Regulation , SI 293 of 1988.
Shading = Value has exceeded Salmonid Regulations
*=Second Schedule of Salmonid Regulations states " temperature must not exceed 10 degrees celsius during the period from 1 November to 30 April where species which need cold water for reproduction are present
Note 1 : Hard water - >100mg/l CACO3
Note 2 : In the absence of a standard for conductivity under SI 272 of 2009 or the Salmonid Regulations SI 293 of 1988, a threshold value from SI 294 of 1989 (Quality of SW Intended for Abstraction of Drinking Water) has been used
Note 3 : 95 %ile for waters achieving good status

Sampled on 18th November, 2015

Analysis conducted by Jones Environmental Laboratory

Dunsink Landfill - Surface Water Quality Results, 09th December 2015

09/12/2015

Parameter	Unit	SI 272 of 2009	Salmonid Regs	SW21	SW18	SW19	SW7	SW10	SW10A	SW2	Lane Pond	SW11A	WWSW1	WWSW2 (Old)	WWSW2 (New)	SW17
pH	pH Units	6-9 (note 1)	≥6≤9	7.82	7.54	7.60	8.84	7.58	8.06	7.92	7.93	7.70	7.78	7.82	8.13	8.26
Conductivity	µS/cm	1,000 (note 2)	-	850	930	910	700	820	720	880	**1320**	**1,250**	810	**1,000**	890	890
Temperature	°C	-	<10°C*	11.7	10.8	10.5	7.1	8.4	8.9	8.9	9.10	8.5	11.0	10.3	10.7	9.1
Ammoniacal Nitrogen	mg/l	0.14	<1	**0.23**	**0.14**	**0.21**	-	-	-	-	-	-	-	-	-	**0.19**
Potassium	mg/l	-	-	-	5.7	5.2	-	-	-	-	-	-	-	-	-	-
Sodium	mg/l	-	-	-	31.5	31.3	-	-	-	-	-	-	-	-	-	-
Sulphate	mg/l	-	-	-	175.46	173.68	-	-	-	-	-	-	-	-	-	-
Chloride	mg/l	-	-	-	44.2	43.4	-	-	-	-	-	-	-	-	-	-
		-	-													

SI 272 of 2009 = European Communities Environmental Objectives (Surface Water) Regulations 2009
Bold = Value has exceeded Surface Water Regulations
Salmonid Regs= European Communities (Quality of Salmonid Waters) Regulation , SI 293 of 1988.
Shading = Value has exceeded Salmonid Regulations
*=Second Schedule of Salmonid Regulations states " temperature must not exceed 10 degrees celsius during the period from 1 November to 30 April where species which need cold water for reproduction are present
Note 1 : Hard water - >100mg/l CACO3
Note 2 : In the absence of a standard for conductivity under SI 272 of 2009 or the Salmonid Regulations SI 293 of 1988, a threshold value from SI 294 of 1989 (Quality of SW Intended for Abstraction of Drinking Water) has been used (1,000
Note 3 : 95 %ile for waters achieving good status

Sampled on 09th December 2015

Analysis conducted by Jones Environmental Laboratory

Table 1: Surface Water Quality Results -January 2015 to December 2015

Parameter	Unit	SI 272 of 2009	Salmonid Regs	SW21	SW21	SW21	SW21	SW21	SW21	SW21	SW21	SW21	SW21	SW21	SW21
				14/01/2015	10/02/2015	11/03/2015	22/04/15	13/05/15	15/06/15	15/07/2015	19/08/2015	16/09/2015	14/10/15	11/11/15	09/12/15
pH	pH Units	6-9 (note 1)	≥6≤9	7.41	7.68	7.53	8.12	8.23	8.32	8.28	8.76	8.15	8.25	7.45	7.82
Conductivity	μS/cm	1 ,000 (note 2)	-	1,020	1,380	1,450	770	730	740	550	150	580	650	1,332	850
Temperature	°C	-	<10°C*	8.8	8.2	9.5	11.0	13.9	12.8	15.1	17.2	14.4	13.9	12.3	11.7
Ammoniacal Nitrogen	mg/l	0.14	<1	0.05	0.32	0.2	0.12	0.05	0.12	0.05	0.47	0.08	0.07	0.69	0.23

Parameter	Unit	SI 272 of 2009	Salmonid Regs	SW18	SW18	SW18	SW18	SW18	SW18	SW18	SW18	SW18	SW18	SW18	SW18
				14/01/2015	10/02/2015	11/03/2015	22/04/15	13/05/15	15/06/15	15/07/2015	19/08/2015	16/09/2015	14/10/15	11/11/15	09/12/15
pH	pH Units	6-9 (note 1)	≥6≤9	6.79	8.07	7.2	7.45	7.67	8.02	8.23	**9.28**	8.48	7.63	7.24	7.54
Conductivity	μS/cm	1,000 (note 2)	-	1,210	1,440	1,670	1,180	1,150	1,040	810	130	710	800	360	930
Temperature	°C	-	<10°C*	3	8.4	9.6	11.7	11.5	12.3	16	16.7	13.5	13.2	13.9	10.8
Ammoniacal Nitrogen	mg/l	0.14	<1	0.05	0.12	0.06	0.1	0.05	0.09	0.1	0.18	0.08	0.11	0.12	0.14

Parameter	Unit	SI 272 of 2009	Salmonid Regs	SW17	SW17	SW17	SW17	SW17	SW17	SW17	SW17	SW17	SW17	SW17	SW17
				14/01/2015	10/02/2015	11/03/2015	22/04/15	13/05/15	15/06/15	15/07/2015	19/08/2015	16/09/2015	14/10/15	11/11/15	09/12/15
pH	pH Units	6-9 (note 1)	≥6≤9	7.82	8.15	8.03	8.28	8.21	8.48	7.97	8.01	7.96	7.56	7.42	8.26
Conductivity	μS/cm	1 ,000 (note 2)	-	1,120	1,200	1,290	960	860	960	760	520	790	910	620	890
Temperature	°C	-	<10°C*	4.2	6.4	9.2	13.2	16.0	14.2	15.5	16.0	13.3	11	12.6	9.1
Ammoniacal Nitrogen	mg/l	0.14	<1	0.08	0.1	0.08	0.05	0.04	0.05	0.16	0.66	0.05	0.08	0.09	0.19

Salmonid Regs= European Communities (Quality of Salmonid Waters) Regulation , SI 293 of 1988.

Bold = Value has exceeded Salmonid Regulations

SI 272 of 2009 = European Communities Environmental Objectives (Surface Water) Regulations 2009

Shading = Value has exceeded S.I 272 of 2009

Italics = Field reading

*=Second Schedule of Salmonid Regulations states " temperature must not exceed 10 degrees celsius during the period from 1 November to 30 April where species which need cold water for reproduction are present

Note 1 : Hard water - >100mg/l CACO3

Note 2: Trigger Level for Surface Waters

Note 3 : For waters achieving good status

Analysis conducted by Jones Environmental Forensics

Appendix 3

CONCENTRATIONS IN MILLIGRAMS/LITRE OF TOTAL AMMONIA IN FRESH WATER WHICH CONTAIN AN UN-IONISED AMMONIA CONCENTRATION OF 0.02 mg/l NH_3

pH Temp (° C)	6.0	6.5	7.0	7.5	8.0	8.5	9.0*	9.5*
5	160.	51.	16.	5.1	1.6	0.53	0.18	0.071
10	110.	34.	11.	3.4	1.1	0.36	0.13	0.054
15	73.	23.	7.3	2.3	0.75	0.25	0.09	0.043
20	50.	16.	5.1	1.6	0.52	0.18	0.07	0.036
25	35.	11.	3.5	1.1	0.37	0.13	0.055	0.031
30	25.	7.9	2.5	0.8	0.27	0.10	0.045	0.028

* *Criteria may be unduly low if there is low free carbon dioxide in the water.*

[NOTE that the value of 0.02 mg/l NH_3 is a *long-term toxic effect* level for fish, both salmonid and cyprinid. Lethal levels are about ten times greater].

References

European Inland Fisheries Advisory Commission, 1970. *Water Quality Criteria for European Freshwater Fish: Report on Ammonia and Inland Fisheries.* EIFAC Technical Paper No 11.

Thurston, R.V., et al., 1974. *Aqueous Ammonia Equilibrium Calculations.* Fisheries Bioassay Laboratory Technical Report No. 74 - 1, Montana State University.

Appendix 4

SATURATION INDEX - LANGELIER INDEX - CALCIUM CARBONATE SATURATION INDEX

Background

A water with a pH value under 7 may dissolve metals to an extent which, if not causing deterioration of storage tanks or distribution mains, may nonetheless give rise to undesirable metal concentrations. Such waters are also unlikely to deposit calcium carbonate as a protective scale in pipes. The interrelationship between pH, hardness and alkalinity was studied by Langelier who in 1936 proposed a means of calculating the corrosivity or scale-forming tendencies of a water.

Significance

Langelier took account of calcium concentration, alkalinity, pH, temperature and total dissolved solids [TDS] concentration in postulating the *saturation pH* or *pH_s*. This is the pH value at which the water would be just saturated with respect to calcium carbonate.

The Langelier Index is: pH - pH_s

actual pH   saturation pH [calculated].

Dunsink Landfill - Leachate Quality Results, Q1 2015

Parameter	Units	Leachate Sump	Lagoon
		10/02/2015	10/02/2015
pH	pH units	7.42	8.4
Conductivity	µS/cm	3,400	1,400
Temperature	^{o}C	10.9	4.3
Ammoniacal Nitrogen	mg/l	155.44	0.17
Dissolved Methane	mg/l	6.054	<0.001

Sampled on 10th February 2015

Analysis conducted by Jones Environmental Laboratory

Dunsink Landfill - Leachate Quality Results, Q2 2015

Parameter	Units	Leachate Sump	Lagoon
		13/05/2015	13/05/2015
pH	pH units	7.4	9.1
Conductivity	µS/cm	2,750	2,170
Temperature	^{o}C	13.9	15.3
Ammoniacal Nitrogen	mg/l	97.05	70.26
Dissolved Methane	mg/l	2.256	0.015

Sampled on 13th May 2015

Analysis conducted by Jones Environmental Laboratory

Dunsink Landfill Annual Leachate Results, 19th August 2015

Leachate Monitoring			
PARAMETER	**UNIT**	**Lagoon**	**Leachate Sump**
pH Value	units	8.87	6.1
Conductivity	mS/cm	3.84	2.82
Temperature	°C	19.1	17.1
Ammonical Nitrogen as N	N mg/l	210.64	342.08
Dissolved Methane	CH4 mg/l	0.052	0.771
Chloride (Cl)	Cl mg/l	516.8	590.9
Potassium (K)	K mg/l	209.8	211.3
Sodium (Na)	Na mg/l	436.3	459.8
COD	02 mg/l	249	229
BOD	02 mg/l	29	48
Total Oxidised Nitrogen (water)	N mg/l	0.9	<0.2
Calcium (Ca)	Ca mg/l	67.8	169.8
Cadmium (Cd)	Cd mg/l	<0.0005	0.0008
Chromium (Cr)	Cr mg/l	<0.0015	<0.0015
Copper (Cu)	Cu mg/l	<0.007	<0.007
Fluoride (F)	F mg/l	<0.3	<0.3
Iron (Fe)	Fe mg/l	0.123	4.596
Lead (Pb)	Pb mg/l	<0.005	<0.005
Magnesium (Mg)	Mg mg/l	58	66.7
Manganese (Mn)	Mn mg/l	0.066	0.857
Nickel (Ni)	Ni mg/l	0.034	0.033
Mercury (Hg)	Hg mg/l	<0.001	<0.001
Sulphate (soluble) (SO4)	SO4 mg/l	48.51	54.94
Zinc (Zn)	Zn mg/l	0.006	0.006
Boron (B)	B mg/l	1.471	1.574
ortho-phosphate	PO4 mg/l	<0.06	<0.06

Analysis conducted by Jones Laboratories, UK

Marron Environmental

J102-01

Dunsink Landfill - Leachate Quality Results, Q4 2015

Parameter	Units	Leachate Sump	Lagoon
		14/10/2015	14/10/2015
pH	pH units	7.6	8.9
Conductivity	µS/cm	4,580	3,480
Temperature	°C	12.9	11.3
Ammoniacal Nitrogen	mg/l	261.37	146.77
Dissolved Methane	mg/l	0.524	0.177

Sampled on 14th October, 2015

Analysis conducted by Jones Environmental Laboratory

APPENDIX 3:

PRTR Returns

Environmental Protection Agency

Guidance to completing the PRTR workbook

PRTR Returns Workbook

Version 1.1.19

REFERENCE YEAR	2015

1. FACILITY IDENTIFICATION

Parent Company Name	Fingal County Council
Facility Name	Dunsink Landfill aka Dunsink Civic Amenity
PRTR Identification Number	W0127
Licence Number	W0127-01

Classes of Activity

No.	class_name
-	Refer to PRTR class activities below

Address 1	Dunsink Lane
Address 2	Finglas
Address 3	
Address 4	
	Dublin
Country	Ireland
Coordinates of Location	-6.33899 53.3903
River Basin District	IEEA
NACE Code	3832
Main Economic Activity	Recovery of sorted materials
AER Returns Contact Name	Alain Kerveillant
AER Returns Contact Email Address	Alain.Kerveillant@fingal.ie
AER Returns Contact Position	Assistant Scientist
AER Returns Contact Telephone Number	087-9915832
AER Returns Contact Mobile Phone Number	087-9915832
AER Returns Contact Fax Number	
Production Volume	0.0
Production Volume Units	
Number of Installations	0
Number of Operating Hours in Year	0
Number of Employees	0
User Feedback/Comments	
Web Address	

2. PRTR CLASS ACTIVITIES

Activity Number	Activity Name
50.1	General
50.1	General

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

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

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) ?	

This question is only applicable if you are an IPPC or Quarry site

SECTION A : SECTOR SPECIFIC PRTR POLLUTANTS

RELEASES TO AIR					Please enter all quantities in this section in KGs			
POLLUTANT		METHOD				QUANTITY		
			Method Used					
No. Annex II	Name	M/C/E	Method Code	Designation or Description	Emission Point 1	T (Total) KG/Year	A (Accidental) KG/Year	F (Fugitive) KG/Year
					0.0	0.0	0.0	0.0

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

SECTION B : REMAINING PRTR POLLUTANTS

RELEASES TO AIR					Please enter all quantities in this section in KGs					
POLLUTANT		METHOD			QUANTITY					
			Method Used		Flare	Engine				
No. Annex II	Name	M/C/E	Method Code	Designation or Description	Emission Point 1	Emission Point 2	Emission Point 3	T (Total) KG/Year	A (Accidental) KG/Year	F (Fugitive) KG/Year
01	Methane (CH4)	C	OTH		154.6	10836.0	0.0	1050735.25	0.0	1039744.65
03	**Carbon dioxide (CO2)**	C	OTH		13643.55	1047889.0	0.0	6035685.73	0.0	4974153.18

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

SECTION C : REMAINING POLLUTANT EMISSIONS (As required in your Licence)

RELEASES TO AIR					Please enter all quantities in this section in KGs			
POLLUTANT		METHOD				QUANTITY		
			Method Used					
Pollutant No.	Name	M/C/E	Method Code	Designation or Description	Emission Point 1	T (Total) KG/Year	A (Accidental) KG/Year	F (Fugitive) KG/Year
					0.0	0.0	0.0	0.0

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

Additional Data Requested from Landfill operators

For the purposes of the National Inventory on Greenhouse Gases, landfill operators are requested to provide summary data on landfill gas (Methane) flared or utilised on their facilities to accompany the figures for total methane generated. Operators should only report their Net methane (CH4) emission to the environment under T(total) KG/yr for Section A: Sector specific PRTR pollutants above. Please complete the table below:

Landfill: Dunsink Landfill aka Dunsink Civic Amenity

Please enter summary data on the quantities of methane flared and / or utilised	**T (Total) kg/Year**	**M/C/E**	**Method Used** **Method Code**	**Designation or Description**	**Facility Total Capacity m3 per hour**	
Total estimated methane generation (as per site model)	1589274.24	C	other	Gassim Lite 1.5	N/A	
Methane flared	7576.0	E	other	Data from Bioverda Power S	2500.0	(Total Flaring Capacity)
Methane utilised in engine/s	530963.0	E	other	Data from Bioverda Power S	0.0	(Total Utilising Capacity)
Net methane emission (as reported in Section A above)	1050735.2	C	c	Total generated - flared - util	N/A	

4.2 RELEASES TO WATERS

Link to previous years emissions data

SECTION A : SECTOR SPECIFIC PRTR POLLUTANTS

Data on ambient monitoring of storm/surface water or groundwater, conducted as part of your licence requirements, should NOT be submitted under AER / PRTR Reporting as this only concerns Releases from your facility

RELEASES TO WATERS					Please enter all quantities in this section in KGs			
POLLUTANT					QUANTITY			
			Method Used					
No. Annex II	Name	M/C/E	Method Code	Designation or Description	Emission Point 1	T (Total) KG/Year	A (Accidental) KG/Year	F (Fugitive) KG/Year
					0.0	0.0	0.0	0.0

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

SECTION B : REMAINING PRTR POLLUTANTS

RELEASES TO WATERS					Please enter all quantities in this section in KGs			
POLLUTANT					QUANTITY			
			Method Used					
No. Annex II	Name	M/C/E	Method Code	Designation or Description	Emission Point 1	T (Total) KG/Year	A (Accidental) KG/Year	F (Fugitive) KG/Year
					0.0	0.0	0.0	0.0

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

SECTION C : REMAINING POLLUTANT EMISSIONS (as required in your Licence)

RELEASES TO WATERS					Please enter all quantities in this section in KGs			
POLLUTANT					QUANTITY			
			Method Used					
Pollutant No.	Name	M/C/E	Method Code	Designation or Description	Emission Point 1	T (Total) KG/Year	A (Accidental) KG/Year	F (Fugitive) KG/Year
					0.0	0.0	0.0	0.0

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

SECTION A : PRTR POLLUTANTS

OFFSITE TRANSFER OF POLLUTANTS DESTINED FOR WASTE-WATER TREATMENT OR SEWER					Please enter all quantities in this section in KGs			
POLLUTANT		METHOD			QUANTITY			
			Method Used					
No. Annex II	Name	M/C/E	Method Code	Designation or Description	Emission Point 1	T (Total) KG/Year	A (Accidental) KG/Year	F (Fugitive) KG/Year
					0.0	0.0	0.0	0.0

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

SECTION B : REMAINING POLLUTANT EMISSIONS (as required in your Licence)

OFFSITE TRANSFER OF POLLUTANTS DESTINED FOR WASTE-WATER TREATMENT OR SEWER					Please enter all quantities in this section in KGs			
POLLUTANT		METHOD			QUANTITY			
			Method Used					
Pollutant No.	Name	M/C/E	Method Code	Designation or Description	Emission Point 1	T (Total) KG/Year	A (Accidental) KG/Year	F (Fugitive) KG/Year
					0.0	0.0	0.0	0.0

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

4.4 RELEASES TO LAND

Link to previous years emissions data

SECTION A : PRTR POLLUTANTS

RELEASES TO LAND					Please enter all quantities in this section in KGs		
POLLUTANT		METHOD			QUANTITY		
			Method Used				
No. Annex II	Name	M/C/E	Method Code	Designation or Description	Emission Point 1	T (Total) KG/Year	A (Accidental) KG/Year
					0.0	0.0	0.0

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

SECTION B : REMAINING POLLUTANT EMISSIONS (as required in your Licence)

RELEASES TO LAND					Please enter all quantities in this section in KGs		
POLLUTANT		METHOD			QUANTITY		
			Method Used				
Pollutant No.	Name	M/C/E	Method Code	Designation or Description	Emission Point 1	T (Total) KG/Year	A (Accidental) KG/Year
					0.0	0.0	0.0

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

Please enter all quantities on this sheet in Tonnes

Transfer Destination	European Waste Code	Hazardous	Quantity (Tonnes per Year)	Description of Waste	Waste Treatment Operation	Method Used		Location of Treatment	Haz Waste : Name and Licence/Permit No of Next Destination Facility Non Haz Waste: Name and Licence/Permit No of Recover/Disposer	Haz Waste : Address of Next Destination Facility Non Haz Waste: Address of Recover/Disposer	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					
Within the Country	19 07 03	No	157106.0	landfill leachate other than those mentioned in 19 07 02	D9	M	Volume Calculation	Offsite in Ireland	Dublin City Council Waste Water Treatment Facility,D0034-01	.,Ringsend,Dublin 4,.,Ireland		

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

Link to previous years waste data
Link to previous years waste summary data & percentage change
Link to Waste Guidance