

**Comhairle Chontae Laois**  
**Laois County Council**



**Annual Environmental Report**  
**For Kyletalesha Landfill**  
**Waste Licence W0026-03**

Prepared By:  
Laois County Council  
County Hall  
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Co. Laois

**March 2011**

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## **1. Introduction.**

The contents of the report are based on Schedule H of the Waste License and the report format follows guidelines set in the “Draft Guidance on Environmental Management Systems and Reporting to the Agency” issued by the Environmental Protection Agency (the Agency). The proposed content and reporting format was discussed and agreed with the EPA before the preparation of the report.

This report discusses the findings of the monitoring events completed and reported on to the Agency since the last AER.

Laois County Council (the Council) operates the facility. The addressees of the facility and the operator are as follows: -

### **Landfill**

Kyletalesha Landfill,  
Portlaoise,  
County Laois.

### **Operator**

Laois County Council,  
County Hall,  
Portlaoise,  
County Laois.

## **2. Reporting Period.**

This is the Eleventh Annual Environmental Report (AER) for Kyletalesha Landfill, Clonsoughy, Kyleclonhobert, County Laois. The AER covers the period from 1<sup>st</sup> January 2010 to the 31<sup>st</sup> December 2010 and was prepared in compliance with Condition 11.6.2 of Waste Licence Register Number (W0026-3).

### 3. Waste Activities carried out at the Facility.

Waste Disposal and Recovery operations are carried out at the site in accordance with the schedule of licensed activities. The site is licensed to accept the following categories of waste for disposal; household, commercial, construction & demolition and industrial non-hazardous wastes. The site also accepts wastes for recovery at the civic amenity area, which include glass bottles, car batteries, household batteries, light bulbs, gas cylinders, white goods, metal, aluminum cans, waste oil, waste oil filters, cooking oil, DVD, cd and video tapes, fridges, textiles, hard plastics, cardboard, tyres, plate glass, polystyrene, household hazardous waste and the WEEE facility.

### 4. Quantity and Composition of Waste Received, Disposed of and Recovered during the Reporting period and each previous year.

A summary of the total quantity of each type of waste landfilled at the facility for the reporting period is presented in *Table 1.0* as specified in Schedule A.1 of Waste License (W0026-3 *Table 1.0*).

**Table 1.0**

<b>WASTE TYPE</b>	<b>Tonnage</b>
Household	25726.18
Commercial	14588.4
Industrial Non-Hazardous Solids	3688.4
Construction & Demolition	107.66
<b>Total</b>	<b>44,110.64</b>

A full breakdown of waste landfilled at the facility is presented in *Table 1.1* and a full breakdown of waste recovered at the Civic Amenity Facility is presented in *Table 1.2*.

**Table 1.1**

<b>Waste Type</b>	<b>Tonnes</b>	<b>Waste type (As per Schedule A.1)</b>	<b>Landfilled</b>	<b>Re-Used</b>
BUILDERS RUBBLE 170107	774.06	Reused		774.06
BUILDING WASTE 170107	107.66	Construction & Demolition	107.66	
COMMERCIAL WASTE 200301	548.4	Commercial	548.4	
COVERING MATERIAL 170504	13751.00	Reused		13751.00
DOMESTIC WASTE 200301	4823.42	Household	4823.42	
ILLEGAL DUMPING 200303	120.48	Other	120.48	
INDUSTRIAL WASTE 200301	352.64	Industrial	352.64	
HOUSEHOLD 200301	174.12	Household	174.12	
MUNICIPAL WASTE 200301	3343.88	Commercial	3343.88	
RUBBER 1912041	3.86	Industrial	3.86	
STONE 170107	374.78	Reused		374.78
STREET SWEEPINGS 200303	366.36	Other	366.36	
TRANSFER STATIONS 200301 Household Commercial Industrial	20728.64 10696.12 3331.90	Household Commercial Industrial		
			34,756.66	
<b>Total Tonnage</b>			<b>44597.48</b>	

**Table 1.2**

<b>Waste Type</b>	<b>Tonnes</b>
200140 ALUMINUM	25.66
200133 HOUSEHOLD BATTERIES	0
200101 CARDBOARD	212.62
030103 CAR TYRES	15.86
200339 PLASTIC BOTTLES	130
130204 OIL FILTERS	1.26
200307 GAS CYLINDERS	3.04
200201 GRASS	0
200201 HEDGE TRIMMINGS	317.12
200339 HARD PLASTICS	73.38
200101 MAGAZINES	0
200101 NEWSPAPERS	271.1
200102 PLATE GLASS	20.84
080121 PAINTS	19.94
200123 FRIDGES	4.42
200102 BOTTLE GLASS	183.3
200140 SCRAP METAL	187.36
200111 TEXTILES	51.56
200136 W.E.E.E.	167.34
200136 HOUSEHOLD APPLIANCES	56.78
130204 WASTE ENGINE OIL	21.96
<b>Total Tonnage</b>	<b>1763.54</b>

The total quantity of waste received for 2010 is recorded as being 44597.48 tonnes exclusive of that material recovered for landfill cover and maintenance

The total quantity of waste received for 2009 is recorded as being (42,446.66 + 638.03) = 43,084.69 tones exclusive of that material recovered for landfill cover and maintenance.

The total quantity of waste received for 2008 is recorded as being  $(49,362.60 + 546.50) = 49909.10$  tonnes exclusive of that material recovered for landfill cover and maintenance.

The total quantity of waste received for 2007 is recorded as being  $(41727.71 + 454.73) = 42182.458$  tonnes exclusive of that material recovered for landfill cover and maintenance.

The total quantity of waste received for 2006 is recorded as being  $(47550.47 + 747.74) = 48298.213$  tonnes exclusive of that material recovered for landfill cover and maintenance.

The total quantity of waste received for 2005 is recorded as being  $(47974.20 + 430.10) = 48404.3$  tonnes exclusive of that material recovered for landfill cover and maintenance.

The total quantity of waste received for 2004 is recorded as being 49835.90 tonnes exclusive of that material recovered for landfill cover and maintenance.

The total quantity of waste received for 2003 is recorded as being 34870.10 tonnes exclusive of that material recovered for landfill cover and maintenance.

The total quantity of waste received for 2002 is recorded as being 40510.80 tonnes exclusive of that material recovered for landfill cover and maintenance.

## **5. Calculated Remaining Capacity of the Facility and year in which Final Capacity is expected to be reached.**

It was originally anticipated that the site would have a waste capacity of 1,060,000 tonnes.

Based on estimates and records of waste inputs, approximately 430,876 tonnes was deposited to 10<sup>th</sup> May 2002. A further 24,434.7 tonnes was deposited to 31<sup>st</sup> December 2002. In total  $430,876 + 24,434.7 = 455,310.7$  tonnes were deposited to 31<sup>st</sup> December 2002. The total quantity of waste received since 31<sup>st</sup> December 2002 is recorded as being  $(34870.1 + 49835.9 + 48404.3 + 48298.21 + 42182.458 + 49,909.10 + 43,084.69 + 44,597.48) = 361,182.23$  tonnes exclusive of that material recovered for landfill cover and maintenance. This leaves a remaining capacity of  $(1,060,000 - 455,310.7 - 361,101.31) = 243,587.99$  tonnes. At a maximum filling rate of 47,100 tonnes per annum and maintaining the proposed final profile levels this leaves approximately 5 years capacity.

It is previously recorded that approximately 47,600 m<sup>2</sup> of the landfill has been filled with waste since 1996 comprising of Cells 1, 2, 3, 4 & 5.

It is estimated that the total plan area for Cell 12 is 9,562 m<sup>2</sup>.

It is estimated that the total plan area for Cell 13 is 19,006 m<sup>2</sup>.

It is estimated that the total plan area for Cell 14 is 25,000 m<sup>2</sup>.

It is estimated that the total plan area for Cell 15 A & B is 14,000 m<sup>2</sup>.



## **6. Methods of Deposition of Waste.**

Waste is normally deposited at the top of a waste face. The waste is placed in layers not greater than 0.5m thick and a waste face with an average gradient not steeper than 1:3 is maintained. A steel wheeled landfill compactor is used to level and compact the waste. Any large articles or hollow containers, likely to cause voids, are crushed and buried to a depth of not less than one meter from the surface of the waste and two meters from the flanks and face.

Volumetric surveys of the active cell are regularly undertaken to determine the remaining capacity and the performance of the compaction equipment.

The waste face is covered daily with a soil material. The soil weekly cover material is applied in 150mm thick layers and is free draining to prevent the development of perched water within the waste body. Sufficient stockpiles of soil are maintained on-site to meet all daily and weekly operational requirements.

Only one working face is operated at any time. The working face is maintained at less than 25 meters wide x 50 meters long and 2.5 meters in height after compaction with a slope of no greater than 1 in 3, as per Condition 5.4 of the Waste License.

## **7. Summary Report on Emissions.**

The Council carries out a comprehensive environmental monitoring programme in compliance with license conditions to assess the significance of emissions. The monitoring programme includes Surface Water Quality, Groundwater Quality, Landfill Gas, Leachate Level and Quality, Noise and Dust.

The full details of the monitoring were routinely submitted to the Agency during the reporting period and an overview of the monitoring results is presented in Section 8. The results are discussed in the context of the impact of the emissions on the environment and compared with available data on background and or ambient conditions.

## **8. Summary of results and interpretation of environmental monitoring.**

Since July 2004 monitoring results for the landfill facility have been inputted into the Labinfo Database as supported by the Local Government Computer Services Board.

**Appendix I** gives the six-digit grid reference for each monitoring location. Monitoring locations labeled G relate to Groundwater, monitoring locations labeled L relate to Leachate, monitoring locations labeled M relate to Landfill Gas, monitoring locations labeled S relate to Surface Water, monitoring locations labeled V relate to Visual Inspections, monitoring locations labeled BA relate to Biological Assessment, monitoring locations labeled D relate to Dust and monitoring locations labeled N relate to Noise.

### **Groundwater Monitoring**

In accordance with Waste Licence (W0026-3) the Council monitor's groundwater quality in 3 monitoring boreholes (G001, G002 & G008) located around the landfill at the southern section. The Council also conducts groundwater monitoring at locations G012, G013 and G015. Ground water monitoring began at G013 in March 2003 in order to obtain baseline data for the northern end of the site, i.e. down gradient of new-engineered Cells 12, 13 and 14. G012 and G015 are also located down-gradient of these engineered cells and were constructed during September 2010.

Monitoring is conducted by the EPA at quarterly intervals in accordance with licence conditions and includes in situ and laboratory analysis at EPA laboratory, Kilkenny. The Council also carries out groundwater monitoring where analysis is carried out by an Environmental technician in Laois County Council. The range of analysis is as specified in Schedule D.5 of Licence (W0026-3) includes pH, electrical conductivity, temperature, ammonia, total organic carbon (TOC), nitrate and orthophosphate. Other parameters as required by the license are performed by the EPA.

The sampling and analysis is carried out in accordance with recognised quality standards. The detailed monitoring results are presented in the quarterly monitoring reports submitted to the Agency during the reporting period and can also be viewed on the attached compact disc.

Groundwater level monitoring undertaken in the shallow bedrock indicates a groundwater divide trending east west across the site. Groundwater in the northern portion of the site



29/06/10	G002	22.9	31/12/10	G008	12.5			
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Date	ID	Depth (m)	Date	ID	Depth (m)	Date	ID	Depth (m)
30/09/10	G002	23.5						

## Groundwater Quality

Chloride is a conservative ion which remains in the aqueous phase, unaffected by subsurface geochemical transformations. This ion occurs at high concentrations in landfill leachate and is used as a tracer to disseminate potential leachate migration. At all monitoring locations the chloride level complied with the trigger limit of 250 mg l<sup>-1</sup> and generally complimented the EPA Guide Value of 30 mg l<sup>-1</sup> for background groundwater levels nationally (Table overleaf). Additionally, all other parametric trigger limits were conformed to at the groundwater monitoring wells. A more detailed account of groundwater quality is provided in the Quarterly Reports available on the disc attached.

**Table 8.2 Groundwater chloride levels**

Lab No.	Date	ID	Chloride mg l <sup>-1</sup>	Licence Trigger Limit	EPA Guide
0173	08/02/10	G001	17	250	30
0428	24/03/10	G001	22	250	30
0649	29/04/10	G001	20	250	30
0801	31/05/10	G001	20	250	30
1054	29/06/10	G001	15	250	30
1417	30/09/10	G001	38	250	30
1855	22/12/10	G001	60	250	30
0174	08/02/10	G002	2	250	30
0650	29/04/10	G002	3	250	30

0802	31/05/10	G002	1	250	30
1055	29/06/10	G002	7	250	30
1418	30/09/10	G002	7	250	30
0175	08/02/10	G008	6	250	30
0429	24/03/10	G008	6	250	30
0651	29/04/10	G008	5	250	30
0803	31/05/10	G008	8	250	30
1056	29/06/10	G008	3	250	30
1333	10/09/10	G008	11	250	30
1857	31/12/10	G008	8	250	30
1334	10/09/10	G012	26	250	30
1540	21/10/10	G012	28	250	30
0176	08/02/10	G013	12	250	30
0430	24/03/10	G013	15	250	30
0652	29/04/10	G013	16	250	30
0804	31/05/10	G013	20	250	30
1057	29/06/10	G013	10	250	30
1335	10/09/10	G013	17	250	30
1541	21/10/10	G013	32	250	30
1856	22/12/10	G015	18	250	30

### **Surface Water Quality Monitoring**

The Council monitors surface water quality in 14 locations (S001, S002, S003, S004, S005,

S007, S008, S009, S010, S011, S012, S029, S030 & S031). S001, S002, S003 & S007 are located on the Tip Stream. S004 is located on a surface water drain on the landfill site. S012, S011 and S008 are located upstream of the former leachate discharge point to the River Triogue. The leachate treatment plant was decommissioned in May 2007, and no leachate had been discharged from the plant since June 2006. S009 and S010 are located downstream of the former leachate discharge point. Surface water monitoring began at S030 in March 2003 in order to obtain baseline data for the northern end of the site, i.e. down gradient of new-engineered Cells 12, 13 and 14. Additional monitoring stations, S031 & S029 were established during this following direction from the Agency.

The monitoring is to be conducted at quarterly intervals in accordance with Licence conditions and includes in situ and laboratory testing. The range of analysis is as specified in Schedule D.5 of Licence (W0026-03) and includes dissolved oxygen, pH, electrical conductivity, and organic and inorganic parameters. The agency conducts surface water monitoring and analysis on a quarterly basis. Laois County Council carries out surface water quality monitoring and analysis in excess of licence requirements.

The sampling and analysis is carried out in accordance with recognized quality standards. The detailed monitoring results are presented in the quarterly monitoring reports submitted to the Agency during the reporting period and can also be viewed on the attached compact disc.

### **Biological Assessment**

Under the requirements of Condition 8.12 of the Licence, Laois County Council must carry out an annual biological assessment on the River Triogue. Details of assessment are given in Appendix V1.

### **Leachate Quality**

Leachate sampling from the inspection chambers on Cells 1-5 (at monitoring locations L021, L023, L025 and L026), Cell 12 (at monitoring location L016), Cell 13 (at monitoring location L018) Cell 14 (at monitoring location L019) and active Cell 15A (at monitoring location L015A) is required as part of the annual EPA monitoring for the site. The samples are analyzed for a range of organic and inorganic parameters defined in the Waste Licence. Leachate is also sampled at the lined lagoon (at monitoring location L017), the unlined lagoon (at monitoring location LT50), and the new storage tank (at monitoring location L028) and in

historically filled areas outside cells 1-5 (at monitoring locations L003 and L004). In addition to annual EPA leachate monitoring, the council conducts analysis in excess of licence requirements. This data will be used to model changes in leachate characteristics in relation to rainfall levels, seasonal temperature variations, age of waste, and type of waste, depth of fill and effectiveness of capping. The detailed monitoring results are presented in the quarterly monitoring reports submitted to the Agency during the reporting period and can also be viewed on the attached compact disc.

The onsite leachate treatment plant was decommissioned on the 21<sup>st</sup> of May 2007; therefore treated leachate quality monitoring is no longer required. Discharge of treated leachate to the River Triogue has not taken place since June 2006.

### **Leachate Levels**

Leachate levels are currently monitored manually in Cells 1-5 (at monitoring locations L021, L023, L025 and L026). Levels are continuously monitored in fully lined and capped Cells 12, 13 & 14 (at monitoring locations L016, L019, L015A and L018). Levels are also continuously monitored in the active cell 15.

All elevated leachate levels are reported to the agency as an incident and entered in to the relevant quarterly monitoring reports. The detailed monitoring results are presented in the quarterly monitoring reports submitted to the Agency during the reporting period and can also be viewed on the attached compact disc.

### **Toxicity**

Under the requirements of Condition 8.8.2 of the Licence, Laois County Council must carry out a bi-annual toxicity assessment on the treated leachate discharge. Following consultation with the EPA Licence Inspector, this assessment is no longer required due to the decommissioning of the onsite leachate treatment plant.

### **Landfill Gas**

The Council currently monitors landfill gas at 12 monitoring locations on a monthly basis around the perimeter of the landfill. The monitoring locations are positioned both inside and outside the landfill cells.

In compliance with condition 3.20.1(b) of Waste Licence (W0026-3), a permanent landfill gas

monitoring system has been installed in all site buildings and in compliance with condition 3.19.2(e) the data gathered from this system is recorded. The monitoring includes methane, carbon dioxide, oxygen, atmospheric pressure, and temperature. The detailed monitoring results are presented in the quarterly monitoring reports submitted to the Agency during the reporting period and can also be viewed on the attached compact disc.

Carbon dioxide concentration greater than 1.5% v/v was measured in trial pits M001, M002, M003, M004, M006, M015 and M016 during the monitoring period. Elevated gas levels in trial pits are, at the request of the agency on the 11/09/2001, treated as an incident. In all cases, Corrective Action Procedure CAP 5 was applied and the agency was notified.

Monitoring locations M001 to M004 & M007 are located within the body of waste.

Monitoring locations-M008 & M009 are located in the south western area of the site, while M015 & M016 are located in the northwestern area of the site. M014 is situated in the northeastern section. Site investigations involving excavation in the respective surrounding areas showed that all five locations are located in peat, which naturally emits CO<sub>2</sub>. "Report on Landfill Gas Monitoring at Laois County Council Kyletalesha Landfill Site" was submitted to the agency on 23/10/2002 and states that carbon dioxide levels above the trigger limit values in landfill gas monitoring locations outside the body of waste are attributable to natural background levels from the natural decay of peat.

Monitoring locations M001 to M004 are located inside the body of waste where carbon dioxide and methane levels above Exceedance Limit Values are expected and therefore are not a non-compliance issue.



## **Landfill Gas Control**

In accordance with condition 3.14.1 of Waste Licence (W0026-3), infrastructure for the collection and flaring of landfill gas from Cells 1 to 5 and Cells 12 , 13 ,14 a,b and c have been installed. The horizontal gas extraction system is currently being installed in cell 15(a). This is carried out with each lift of waste.

## **Noise Monitoring**

Noise monitoring is carried out at four locations, N1 to N4 in accordance with Schedule C.1 of Waste Licence (W0026-3). Full details of analysis may be found in the quarterly monitoring reports as submitted to the Agency and can also be found on Appendix V11

## **Dust Monitoring**

In accordance with schedule D.3.1, dust monitoring was carried out at monitoring locations D1, D2, D3 and D4. Full details of analysis may be found in the quarterly monitoring reports as submitted to the Agency and can also be found on the attached compact disc.

Dust monitoring was performed in accordance with Standard method VDI2119 - Determination of Dust fall using the Bergerhoff Instrument (German Engineering Institute). As outlined in Schedule D Table D.1.1 of the licence dust measurements are undertaken at four specified locations D1-D4 three times annually. All results were compatible with the maximum permissible value  $350 \text{ mg/m}^2/\text{day}$ . Full details of analysis may be found in the fourth quarterly monitoring report submitted to the Agency and can also be found on the attached compact disc.

## **Parameter Exceedances**

In 2010 a total of 400 samples for perimeter landfill gas, groundwater, surface water, and leachate, noise and dust deposition were taken and analyzed by either independent laboratories or the Council laboratory. This figure is exclusive of the comprehensive continuous monitoring which takes place on site. The maximum parameter values are those referred to in Schedule C of Waste Licence (W0026-3). Details of parameter exceedances are

presented in *Table 8.2*.

**Table 8.2 Parameter Exceedances (Schedule C)**

<b>Date</b>	<b>Code</b>	<b>Description</b>
15/12/10	151210	Landfill gas exceedance in monitoring well M016
29/10/10	291010	Landfill gas exceedance in monitoring wells M001, M002, M003, M004, & M016
27/09/10	270910	Landfill gas exceedance in monitoring wells M001, M003, M004, & M016
03/08/10	030810	Leachate level sensor dysfunction in cell 13
12/07/10	120710	Landfill gas exceedance in monitoring wells M001, M002, M003 & M004
08/07/10	080710	Flare temporarily not operating
14/06/10	140610	Carbon Monoxide emissions from the flare
12/06/10	120610	Carbon Monoxide emissions from the flare
06/06/10	060610	Carbon Monoxide emissions from the flare
26/04/10	260410	Carbon Monoxide emissions from the flare
26/04/10	260410A	Landfill gas exceedance in monitoring well M016
01/03/10	010310	Landfill gas exceedance in monitoring wells M015 & M016
13/01/10	130101	Flare temporarily not operating

## **9. Resource and energy consumption summary.**

The following resources were used on-site during the reporting period: -

### **• Electricity**

**22,296 kWhr.** Of electricity was used onsite throughout the reporting period

### **• Water**

Surface Water Lagoon:

Dust Suppression using a 9m<sup>3</sup> tanker, 8 weeks at 4 days per week at 3 passes per day

$$= 9 \times 8 \times 4 \times 3 = 864 \text{ m}^3$$

**Metered:**

A total of 1570m<sup>3</sup> was used from the mains supply throughout the reporting period.

**• Diesel,**

Approximately 20,000 liters were used throughout the reporting period for onsite machinery.

**• Stone**

A total of 1,000 tonnes was used for landfill roads throughout the reporting period

**10. Proposed development of the facility and timescale of such development.**

For the work undertaken in 2010 and work due for completion in 2011 please refer to chapter 12. There are no details available present for development works proposed for beyond the next reporting period.

**11. Volume of leachate produced and volume of leachate transported / discharged off-site.**

The historically filled areas, including Cells 1 to 5, and lined Cells 12, 13 and 14 have been permanently remediated. Incident rainfall on historical filled areas is now diverted to surface water source. Incident rainfall on the active fill area Cell 15 is collected via the leachate drainage blanket and pumped to on-site lined leachate storage lagoon prior to treatment at council wastewater treatment plant and discharge to surface water. Other potential sources of leachate such as groundwater and surface water run-off are prevented from entering the waste fill areas by cell design. Leachate collected from each unlined landfill cell is directed to the leachate storage tank located in the eastern area of the landfill. Leachate is tankered off site to waste water treatment plants for treatment. **Table 11** identifies the volume of leachate tankered off site for treatment during the reporting period.

The onsite leachate treatment plant has been decommissioned since the 21<sup>st</sup> of May 2007; therefore discharge of treated leachate to the River Triogue is no longer taking place. The last discharge of treated leachate took place in June 2006. A new leachate storage tank has been installed near to the unlined lagoon and is now fully commissioned. The unlined lagoon will be decommissioned over a phased period.

**Table 11.0 – Volume of Leachate Tankered Off-Site**

Mass of Leachate Removed (Tonnes)	Volume of Leachate Removed (m <sup>3</sup> )	Month
1684.3	1684.3	Jan
877.42	877.42	Feb
		March
719.04	719.04	April
607.2	607.2	May
		June
317.98	317.98	July
917.98	917.98	Aug
1243.86	1243.86	Sept
216.5	216.5	Oct
280.26	280.26	Nov
332.24	332.24	Dec
<b>7196.78</b>	<b>7196.78</b>	<b>Grand Total</b>

**12. Report on development works undertaken during the reporting period and a timescale for those proposed during the coming year.**

***Developments Undertaken in 2010:***

1. In compliance with condition 4 of waste licence W0026-3 works on the capping of mini cell 14(c) commenced in 2010

In May 2010 Laois county council Landfill staff undertook the job of capping cell14c , The capping works were carried out in three phases, due to the fact that the cell was not completely full for phase one. The capping process commenced in May during phase one which took approximately 3 week we capped the northern slope and a portion of the western slope. The second phase was the drilling of the gas wells in compliance with condition 3.14.3 of waste licence W0026-3, this phase commenced

in early August and took 1 week; details are outline in point two. The third phase commenced Late August, this phase was completed in approximately 6weeks during which time they capped the remainder of the western slope and the top of the cell.

2. In compliance with condition 3.14.3 of waste licence W0026-3 landfill gas extraction wells were installed by Dempsey Drilling and supervised by Laois County Council Landfill staff into the lined Cell 14(c) to match the phased development of the Cell. A total of 8 vertical well were constructed by drilling to a depth of approximately 10m using a 600mm auger. Perforated HDPE pipes of 160mm diameter were placed in the borehole and backfilled with a suitable pea gravel material. The top of the well consists of a 160mm solid HDPE pipe which is connected to a well head. The boreholes were sealed with a bentonite material to prevent passive venting of landfill gas. Each well head is connected to the main gas line using a 125mm solid HDPE pipe.
3. In compliance with condition 3.5.1 of waste licence W0026-3 site roads were provided and maintained to ensure the safe movement of vehicles within the facility. The main access road through the landfill was resurfaced on a regular basis from a location past the wheel wash to the lined lagoon. This work was carried out using a clause 804 material sourced from a nearby quarry.
4. As part of our continuous improvement of the gas net work system the main gas pipeline was relocated over the top cell 12, 13&14. This allows us easier access to the main line, less condensation buildup due to reduced pipe lengths. Will allow future access easier.

### **Proposed Development work for 2011**

1. Commence Capping of mini Cell 15(a) to the requirements of condition 4.3 of the waste licence (W0026-3) before year end, exact date will depend on waste supply
2. Construction of the remainder of cell 15 and a portion of cell 11 to the requirements of condition 3.12 and 3.16 of the waste license (W0026-3) is to commence before year end.

Which include an upgrade of the Scada system and the Leachate line.

3. Horizontal landfill gas extraction wells to be provided in cell 15a These works will be carried out to the requirements of condition 3.14.3 of the waste licence (W0026-3).
4. Site road resurfacing to the requirements of condition 3.5.1 of the waste licence W0026-3 will be ongoing throughout 2011
5. Permanent landfill gas extraction wells to be provided in the active cell 15(a) to the requirements of condition 3.14.3 of the waste licence (W0026-3) again exact date will depend on waste supply
6. Servicing of boundary tree line will take place in accordance with maintenance contract.

### **13. Report on Restoration of Completed Cells**

In compliance with condition 4 of waste licence (W0026-3) final capping of mini cell 14(c) was completed in September 2010, the capping of cell 15(a) shall commence in 2011. Cells 12, 13 and 14 a,b and c are now fully capped and restored.

### **14. Site survey showing existing levels of the facility at the end of the reporting period. :**

Site Survey can be viewed in **Appendix 1V**

**15. Estimated annual and cumulative quantities of landfill gas emitted from the facility.**

**Landfill Gas Volumes**

The Council prepared a report entitled “Proposal for Utilisation of Landfill Gas as an Energy Source” which was submitted and accepted by the Agency in compliance with Condition 4.17.7 of the waste licence 26-1. This report estimated that approximately 1,941 m<sup>3</sup> of landfill gas would be generated on-site in the year 2000. The results of this assessment indicated that the feasibility for utilisation of landfill gas as an energy source in the short to medium term (10 years) was not viable. A repeat assessment is currently being carried out by RPS Consultants on the feasibility of utilising landfill gas as an energy source.

The exceedances recorded in **Table 15** are due to the fact that trial pits M001, M002, M003 and M004 are situated in waste which was historically deposited at the edge of the site. M015 and M016 are located in peat, which naturally emits CO<sub>2</sub>. A gas assessment report was submitted to the Agency in October 2002 to confirm this entitled “Report on Landfill Gas Monitoring at Laois County Council Kyletalesha Landfill Site”.

**Table 15: Average Landfill Gas Concentrations for 2011.**

<b>ID</b>	<b>Avg CO<sub>2</sub> %</b>	<b>Avg CH<sub>4</sub>%</b>	<b>Avg O<sub>2</sub>%</b>	<b>Pressure (mb)</b>
M001	1.4	0	18.2	1008
M002	1.3	0	18.5	1008
M003	1.5	0	18.1	1008
M004	1.6	0.9	17.6	1009
M005	0.3	0	19.5	1006
M006	0.6	0	19.1	1006
M007	0.7	0	19.1	1008
M008	0.2	0	19.7	1012
M009	0.2	0	19.9	1012
M014	0.1	0	19.4	1008
M015	2.4	0	17.0	1008
M016	3.4	0.1	16.2	1008

**16. Estimated annual and cumulative quantity of indirect emissions to groundwater.**

The historically filled areas, including Cells 1 to 5, and lined Cells 12 and 13 have been permanently restored and vegetated. Incident rainfall on the active fill areas is collected in the leachate collection drains and treated in a council waste water treatment plant.

The landfill is designed to utilise the natural ground conditions to mitigate environmental impacts associated with leachate. The design incorporates leachate collection facilities using internal and perimeter drains to direct leachate and leachate contaminated surface water to the on-site leachate lagoon.

The peat and the underlying boulder clays have a low permeability, which inhibits the percolation of leachate downward to limestone bedrock beneath the site. A comprehensive site investigation at the site completed in 2000 established that the thickness of the peat ranges from 3 - 7 m and the boulder clay from 7.5 - 10 m across the site. The permeability of the peat ranges from  $1.9 \times 10^{-9}$  m/s to  $9.8 \times 10^{-10}$  m/s. The underlying till has variable permeability depending on composition. In some sand and gravel zones permeability of  $1 \times 10^{-4}$  m/s can be expected. The till is however, more silt dominated and in these areas permeabilities ranging from  $2.41 \times 10^{-8}$  m/s to  $4.78 \times 10^{-10}$  m/s have been recorded.

The groundwater level monitoring indicates that the bedrock aquifer is confined by the



overlying boulder clays and peats across much of the site. These conditions also inhibit the percolation of leachate to the bedrock due to differences in pressure head.

There is the potential for the indirect discharge of leachate to groundwater in the bedrock aquifer either by percolation through the underlying peat and boulder clay, or through recharge by contaminated surface water.

Using Darcy's equation which calculates groundwater flow and assuming a permeability of  $1.9 \times 10^{-9}$  m/s, an average depth of 5 m of underlying peat, a 1 m head of leachate and a fill area of  $186,600 \text{ m}^2$ , it is estimated that the theoretical potential percolation through the basal peats and boulder clays is approximately  $48.54 \text{ m}^3/\text{acre}/\text{year}$  which is less than 1.5% of the total annual rainfall. The calculation does not take into consideration the pressure head in the bedrock aquifer, which would inhibit the discharge to the bedrock aquifer.

The peat has a proven capability, as demonstrated in the leachate treatment plant, to effectively reduce the concentration level of contaminants in the leachate. Any leachate that does percolate to groundwater will have undergone significant attenuation. This is confirmed by the groundwater quality monitoring at the site which shows that the landfill is not impacting on groundwater quality.

## **17. Annual water balance calculation and interpretation.**

The water balance calculations are based on the methodology specified in the EPA's Landfill Site Design Manual. The calculation used is as follows:

$$Lo = [ER(A) + LW + IRCA + ER(l)] - [aw]$$

Lo	leachate produced (M3)
ER	effective rainfall (m) (Use actual rainfall (R) for active cells)
A	Area of cell (M2)
LW	liquid waste (also includes excess water from sludges) (M3)
IRCA	infiltration through restored and capped areas (m)
l	surface area of lagoon (M2)
a	absorptive capacity of waste (m <sup>3</sup> /t)
W	weight of waste deposited (t/a)

The meteorological data used was from the Johnstown castle, Co kilkenny weather station. The meteorological reports for both the Birr and Mullingar weather stations can be found in *Appendix III*. The landfill areas included in the calculations were the active fill area and the temporary restored area of Cell 15. The calculations in *Table 17.0* are based on the Actual Rainfall and do not allow for Evapotranspiration. An absorptive capacity of 0.06 m<sup>3</sup> per tonne was assumed based on a compacted waste density of 0.85 tonnes/m<sup>3</sup>. *Table 17.1* compares Leachate produced and Leachate tankered off site for treatment.

**Table 17.0: Water Balance Calculations**

Cell	14 for 0.75 of 2010 & 15 for 0.25 of 2010
ER	0.896
Area of cell (A)	25000
Area Infiltration (ER x A)	14 = 10,000 15= 12000
Liquid Waste (LW)	0m3 (2)
l	200m2
A	0.06 (m <sup>3</sup> /t)
W	83734 tonne
Absorptive Capacity	83734 x 0.06 = 5024.04m3
	<b>Lo = [ER(A) + LW + IRCA + ER(l)] - [aw]</b>
Leachate Produced Lo	9036.96

**Table 17.1 Leachate produced and Leachate Tankered Offsite**

Leachate Tankered Off site	<b>7196.78m<sup>3</sup></b>
Estimated Leachate Volumes	<b>9036.96m<sup>3</sup></b>

**18. Report on the progress towards achievement of the Environmental Objectives and Targets contained in previous year's report.**

<b>OBJECTIVE</b>	<b>TARGET</b>	<b>PROGRESS</b>
<p>1. To communicate effectively to all users of the landfill the Environmental Policy Statement.</p>	<p>Policy to be communicated on an ongoing annual basis in conjunction with seasonal waste minimization and recycling campaigns.</p>	<p>Policy to be communicated on an ongoing annual basis in conjunction with seasonal waste minimization and recycling campaigns.</p>
<p>2. Increase public awareness on waste issues and encourage reduction, recovery and recycling on a county wide basis as well as at the landfill in accordance with the Waste Management Plan for the Midland Region.</p>	<p>Maintain seasonal public information campaigns to encourage reduction, and recycling.</p> <p>Complete and distribute public information leaflets to promote waste reduction and recycling.</p> <p>Environmental Awareness Officer: Host public information evenings for community groups Host waste mgt seminars for the business community Promote sustainable waste mgt practices via schools education programme. Provide householders in County Laois with relevant information on reducing, reusing and recycling their waste (A5 brochure) Deliver national waste programmes</p> <p>At a local level e.g. Race Against Waste programme Update <a href="http://www.laois.ie">www.laois.ie</a> with relevant information.</p> <p>Signage on site to encourage recycling.</p>	<p>Ongoing public information campaigns to encourage reduction, and recycling. Ongoing tours of landfill facility given to schools, public representatives and community groups.</p> <p>Ongoing distribution of public information leaflets to promote waste reduction and recycling.</p> <p>On going on an annual Basis</p> <p>Ongoing on an annual Basis</p> <p>Ongoing on an annual Basis</p>

OBJECTIVE	TARGET	PROGRESS
<p><b>3. Improvements to Site Infrastructure.</b></p>	<p>Installation of a telemetry system for the recording of all specified monitoring data as per licence condition 3.19.2 (c).</p> <p>Installation and maintenance of new camera system</p>	<p>Installed initially in 2008 Being up graded as part of the development of Cell 15</p> <p>Ongoing</p>
<p><b>4. Landfill Gas Management.</b></p>	<p>Horizontal extraction system in place in cell 14 and is being updated as the cell fills with waste.</p>	<p>Completed in Cell 14,</p>
<p><b>5. Landfill Site Restoration</b></p>	<p>Continue works in Cell 14 in compliance with condition 4 of waste licence (W0026-3)</p> <p>Installation of Horizontal gas extraction system</p>	<p>Capping works completed in cell 14</p> <p>Gas extraction system completed in cell 14</p>
<p><b>6. Staff Training.</b></p>	<p>Review and update if necessary landfill staff training manuals and training matrix to represent waste licence (W0026-3).</p>	<p>Ongoing</p>
<p><b>7. Landfill Site Information Brochures</b></p>	<p>Distribute landfill site and waste information brochures as follows.</p> <ul style="list-style-type: none"> <li>• Landfill site design and operation.</li> <li>• Waste Disposal at Laois County Council landfill site.</li> <li>• Waste reduction and recycling.</li> </ul>	<p>Ongoing</p>
<p><b>8. Prepare and Implement Written Procedures.</b></p>	<p>Complete review of all written procedures.</p>	<p>Ongoing, Landfill environmental plan and accident prevention policy is complete and a copy is attached to 2010 AER</p>

**19. Schedule of Environmental Objectives and Targets for the forthcoming year.**

See appendix VIII: The Environmental management plan for a schedule of environmental objectives and targets for 2011

**20. Full title and a written summary of any procedures developed by the licensee in the year which relates to the facility operation.**

- The environmental Management Plan has been updated see appendix VIII
- The Accident prevention Policy has been updated see appendix IX
- Odour management plan has been prepared see appendix X

**21. Tank, pipeline and bund testing and inspection report.**

In Compliance with condition 3.11.5 of Waste Licence W0026-3 the integrity and water tightness of all the bunds and leachate/contaminated waste storage tanks were carried out and reported in the 2008 AER. These tests will be carried out again in 2011

**22. Report on the performance and compatibility of the septic tank (and associated percolation area) with the Agency's Wastewater Treatment manual: Treatment Systems for Single Houses.**

The new site facility office has been connected to the existing septic tank which has proven to be in good working order

### 23. Reported incidents and Complaints summaries.

The Council maintains a comprehensive register of incidents and complaints received in accordance with Condition 3.13 of the waste licence. **Table 23** lists the incidents and complaints throughout the reporting period.

**Table 23: Incident and Complaints for 2010**

15/12/10	151210	Landfill gas exceedance in monitoring well M016
29/10/10	291010	Landfill gas exceedance in monitoring wells M001, M002, M003, M004, & M016
27/09/10	270910	Landfill gas exceedance in monitoring wells M001, M003, M004, & M016
03/08/10	030810	Leachate level sensor dysfunction in cell 13
12/07/10	120710	Landfill gas exceedance in monitoring wells M001, M002, M003 & M004
08/07/10	080710	Flare temporarily not operating
14/06/10	140610	Carbon Monoxide emissions from the flare
12/06/10	120610	Carbon Monoxide emissions from the flare
06/06/10	060610	Carbon Monoxide emissions from the flare
26/04/10	260410	Carbon Monoxide emissions from the flare
26/04/10	260410A	Landfill gas exceedance in monitoring well M016
28/04/10	28042010	Odour Complaint, On inspection no Odour detected
01/03/10	010310	Landfill gas exceedance in monitoring wells M015 & M016
13/01/10	130101	Flare temporarily not operating

## **24. Review of Nuisance Controls.**

### ***Condition 7.1.***

To control landfill odours, vermin, dust, litter and noise in compliance with condition 7.1 of Waste Licence W0026-3 the following is carried out.

- Each evening once work completes, a layer of soil is placed over the entire working face of the active cell to reduce odour emissions and littering.
- At the end of each week a layer of 150mm minimum of soil is place on the working face.
- The use of Rentokill for vermin control.
- During the dry weather water is sprayed continuously on the road way to reduce dust levels
- Netting is placed around the active cell to reduce littering
- Daily litter patrols are carried out around the site.
- Installation of the flaring system.

### ***Condition 7.3.4.***

In compliance with condition 7.3.4 :

Litter nets are installed and maintained around the peimeter of the active cell area.

Litter control infrastructure is inspected on a daily basis.

Loose litter is removed in accordance with condition 7.3.3.

Also in co-operation with the Waste Enforcement Section of Laois County Council the use of CCTV is utilised in identifying vehicles from which litter is emanating due to poor or lack of covering.

### ***Condition 7.6.1.***

In compliance with condition 7.6.1 the use of Falcons has proven to be a significant factor in bird and vermin control.

**25. Reports on financial provision made under this licence, management and staffing structure of the facility, and a programme for public information.**

**Management and Staffing Structure:**

<b>Grade</b>	<b>Name</b>	<b>Responsibility</b>
Executive Engineer	B Cuddy	Landfill Manager
Exec. Technician	K. Farrell	Executive Technician
Technician Grade 1	M. Chawke	Monitoring Technician
Gen. Services Supervisor	N. Farrell	Overseer
Ganger	L. Dunne	Domestic Waste Area
Light Equip. Operator	M. Brennan	Nuisance Control
General Operator	D. O'Rourke	Weighbridge Operator
General Operator	P. Thompson	Civic Amenity Site

**Public Information:**

- School and community tours held on an ongoing basis.
- Seasonal public informational campaigns to encourage reusing, reduction and recycling.
- Deliver national waste programmes at local level e.g. Race Against Waste.
- Public Information File kept at Landfill Site Office for public viewing which contains Monitoring Results, Waste Licence, Complaints and Environmental Incidents.
- Regular Monitoring Committee Meetings with local residents.



**Budget for 2010:**

Reduction in Capital Balances	€340,000
Loan Charges/Transfer Capital	€254,000
Aftercare/reinstatement Fund	€100,000 additional money will be added to average €200,000 per year for future operating period of the landfill

**26. Report on Training of Staff:**

Details of training undertaken in 2010 are given in *Table 27.0*. All operatives hold Safepass cards.

**Table 26.0 Training of Staff**

<b>Name</b>	<b>Grade</b>	<b>Course Description</b>	<b>Start</b>	<b>Finish</b>
Michael Brennan	Ganger	Banks man training	July 2010	

**27. Certification:**

The Annual Environmental Report for the monitoring period 2010 has been certified by the undersigned.

*Brenda Cuddy*

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Ms. Brenda Cuddy  
Landfill Manager

*Ken Farrell*

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Mr. Ken Farrell  
Facility Manager

*Brendan Condron*

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Mr. Brendan Condron  
S.E.E. - Waste Management

**Appendix I:**  
**Monitoring Locations**

Kyletalesha Landfill Site,			
Monitoring Point Co-ordinates. December, 2008.			
Monitoring Point and Location	Easting	Northing	Elevation
G001 Coillte Bog	245276.297	202051.548	83.160
G002 Bog Opposite M. Delaney	245493.769	202652.424	83.700
G008 Forestry on Kyle Road	245830.707	202293.324	82.600
G012 North of Cell 14	244914.829	203750.783	83.220
G013 C. Delaney Road	245143.274	203758.123	81.150
L002 Car Area	245349.146	202481.016	87.780
L003 West Cell 1/2	245224.700	202576.797	89.490
L004 East Cell1/2	245302.633	202656.523	87.770
L026 Cell 3	245164.459	202809.927	90.920
L025 Cell 1/2	245250.818	202820.125	90.280
L021 Cell 4	245133.942	202908.157	89.450
L014 Cell 5	245374.306	202968.346	84.730
L016 Cell 12	245043.862	203352.234	80.440
L017 Lined Lagoon	244996.000	203758.000	N/A
L018 Cell 13	245088.552	203579.564	N/A
L019 Cell 14	245087.719	203699.593	N/A
LT50 Unlined Lagoon	245354.525	202706.213	N/A
L028 New Storage Tank	245407.940	202681.259	N/A
M001 East boundary at Entrance Gate	245285.054	202154.880	85.930
M002 East boundary at Civic Amenity Site	245344.234	202233.743	85.560
M003 East boundary opposite Inspection Area	245412.795	202311.501	84.270
M004 Old Treatment Plant	245431.280	202641.448	81.470
M005 West boundary opposite cell 1/2	245129.299	202613.733	87.780
M006 West boundary opposite cell 3	245115.839	202736.261	87.260
M007 South boundary at N80 junction	245173.954	202119.558	84.350
M008 West boundary along N80	245176.566	202332.268	84.670
M009 West boundary along N80	245191.119	202381.412	84.670
M012 North boundary opposite Cell 14	244914.829	203750.783	83.220
M013 North boundary on C. Delaney road	245143.274	203758.123	81.150
M014 West boundary opposite Cell 12	245096.519	203456.821	80.990
M015 Road to trial Cell	244871.945	203662.372	84.880
M016 Trial Cell car park.	244832.730	203772.661	84.330
M017 Delaneys' Road.	245119.237	203656.902	80.710
M018 (M007)	245175.707	202121.219	83.570
S001 Tip Stream inside Landfill	245453.400	202776.186	80.340
S002 Tip Stream inside Landfill	245488.317	202588.450	78.790
S003 Tip Stream at AES	245587.877	202468.201	78.000
S004 N80 Junction	245207.622	202057.848	81.970
S007 Tip Stream in Finns Field	246216.612	202046.316	77.280
S008 Triouge at leachate discharge point	246286.558	202035.313	76.250
S009 Triouge downstream of discharge point	246299.190	202084.446	75.580
S010	247830.300	197111.400	N/A
S011	246377.100	200609.100	N/A
S012	247471.400	204177.600	N/A
S025 Triouge upstream of discharge point	246270.206	201971.565	76.490

S030 North of Cell 14	245082.117	203791.502	78.780
V001	245565.937	202466.326	83.280
V002	245243.256	202069.332	85.190
V003	245188.327	202023.141	84.810
V004	245020.419	202752.557	86.300
V005	244997.180	202874.102	86.000
V006	244916.769	203234.828	87.090
V007	244864.027	203477.183	87.860
V008	244821.238	203668.547	87.590
BA1 Broughlone Stream	246216.612	202046.316	N/A
BA2 Kyle Bridge	246380.572	200610.343	N/A
BA3 Two-Mile Bridge	247340.617	203600.149	N/A
D1 Old Treatment Plant	245416.139	202706.222	N/A
D2 Beside Civic Amenity Site	245406.201	202305.031	N/A
D3 Beside N80 Opposite Cell5	245052.436	202704.550	N/A
D4 Bog between Cell5 and Cell 12	245091.845	203063.692	N/A
N1 Old Treatment Plant	245416.139	202706.222	N/A
N2 Beside Civic Amenity Site	245406.201	202305.031	N/A
N3 Beside N80 Opposite Cell 5	245052.436	202704.550	N/A
N4 Bog between Cell 5 and Cell 12	245091.845	203063.692	N/A

**Appendix II:**  
**Volumetric Survey**



Independent Land  
& Mineral Surveys Ltd

Cell 15(A) SURFACE TO SURFACE VOLUME REPORT

Project: Independent Land & Mineral Survey Ltd. Volume  
Survey\Volume.pro  
Report Generated: 20 January 2011 11:12:11  
Survey Date: 14 December 2010 10:26:58

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-----  
Shrinkage/swell factors:      Excavation      1.0000           Fill  
1.0000

First Surface Number Layer Name of Points	Number of Points	Second Surface Layer Name
----------------------------------------------------	---------------------	------------------------------

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-----  
OGL MODEL           120      SURVEY  
261

Volume limited to that within the constraining boundary - Object 1962  
Area within boundary: 8,396.84 Sq. m. (0.8397 Hectares)  
Total triangulated area: 8,042.76 Sq. m. (0.8043 Hectares)

Fill Volume (Cu. m.)

-----  
23,734.30

**Appendix III:**  
**Weather Data**



Total rainfall in millimetres for Mullingar

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
2010	45.0	41.9	82.0	53.8	41.3	48.6	149.9	47.4	164.4	59.4	125.2	37.2	896.1
mean	92.4	66.3	72.6	59.0	70.9	67.0	61.2	82.9	85.1	94.1	87.9	92.2	931.5

Mean temperature in degrees Celsius for Mullingar

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
2010	1.5	2.2	4.8	8.6	10.5	15.0	15.2	13.6	13.0	9.5	4.7	-1.1	8.1
mean	4.0	4.2	5.7	7.6	10.1	13.0	14.7	14.2	12.3	9.7	5.9	4.8	8.8

Total rainfall in millimetres for Johnstown Castle

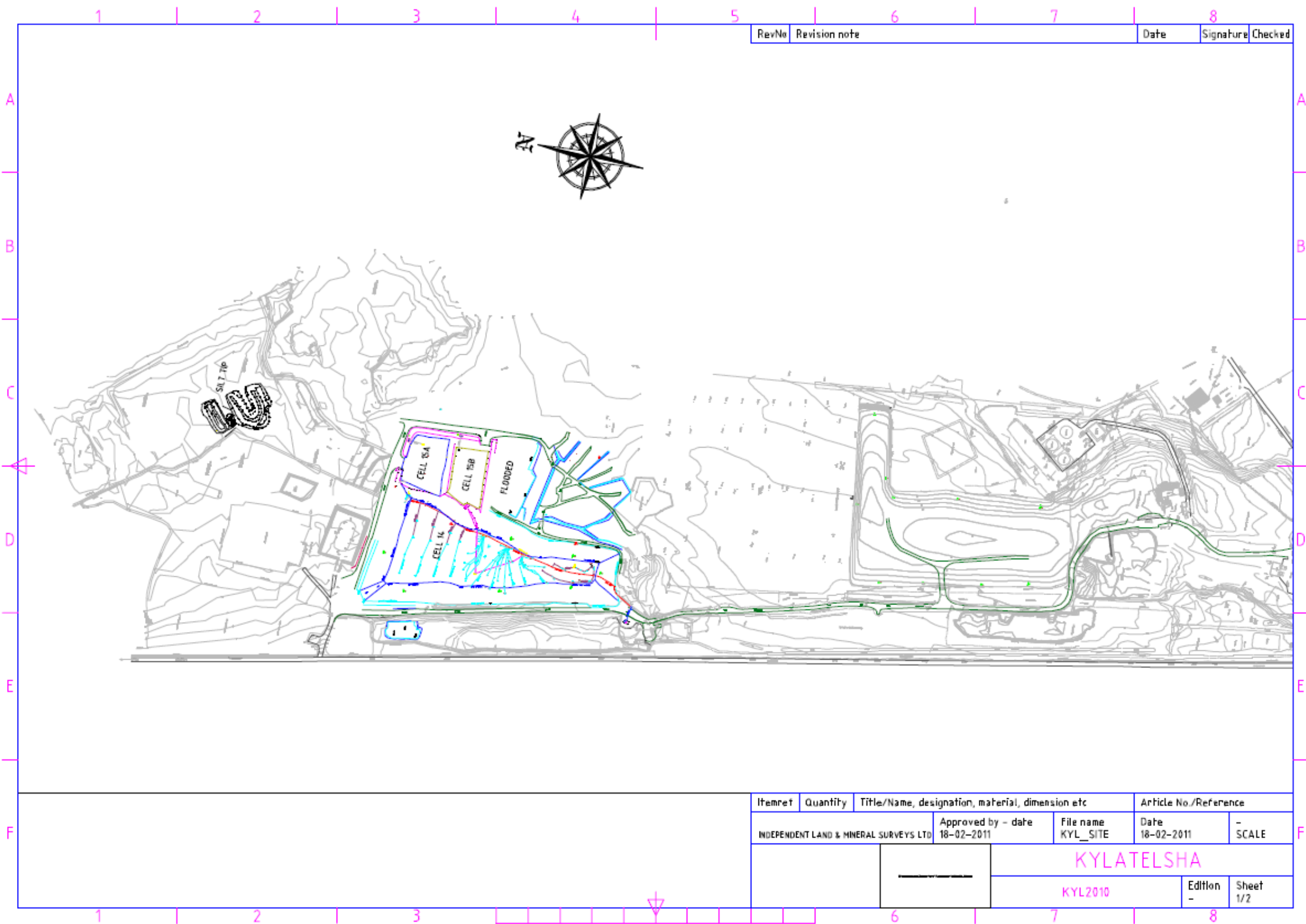
Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
2010		70.7	75.0	27.9	71.5	41.6	144.3	29.7	119.1		121.9	81.0	
mean	108.0	79.0	75.0	63.0	67.0	58.0	70.0	86.0	93.0	103.0	110.0	111.0	1022.0

Mean temperature in degrees Celsius for Johnstown Castle

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
2010	3.4	4.2	6.1	8.5	10.7	14.8	15.5	14.9	13.7	11.2	6.3	2.3	9.3
mean	5.3	5.2	6.4	7.9	10.3	13.1	14.8	14.8	13.0	10.8	7.5	6.1	9.6

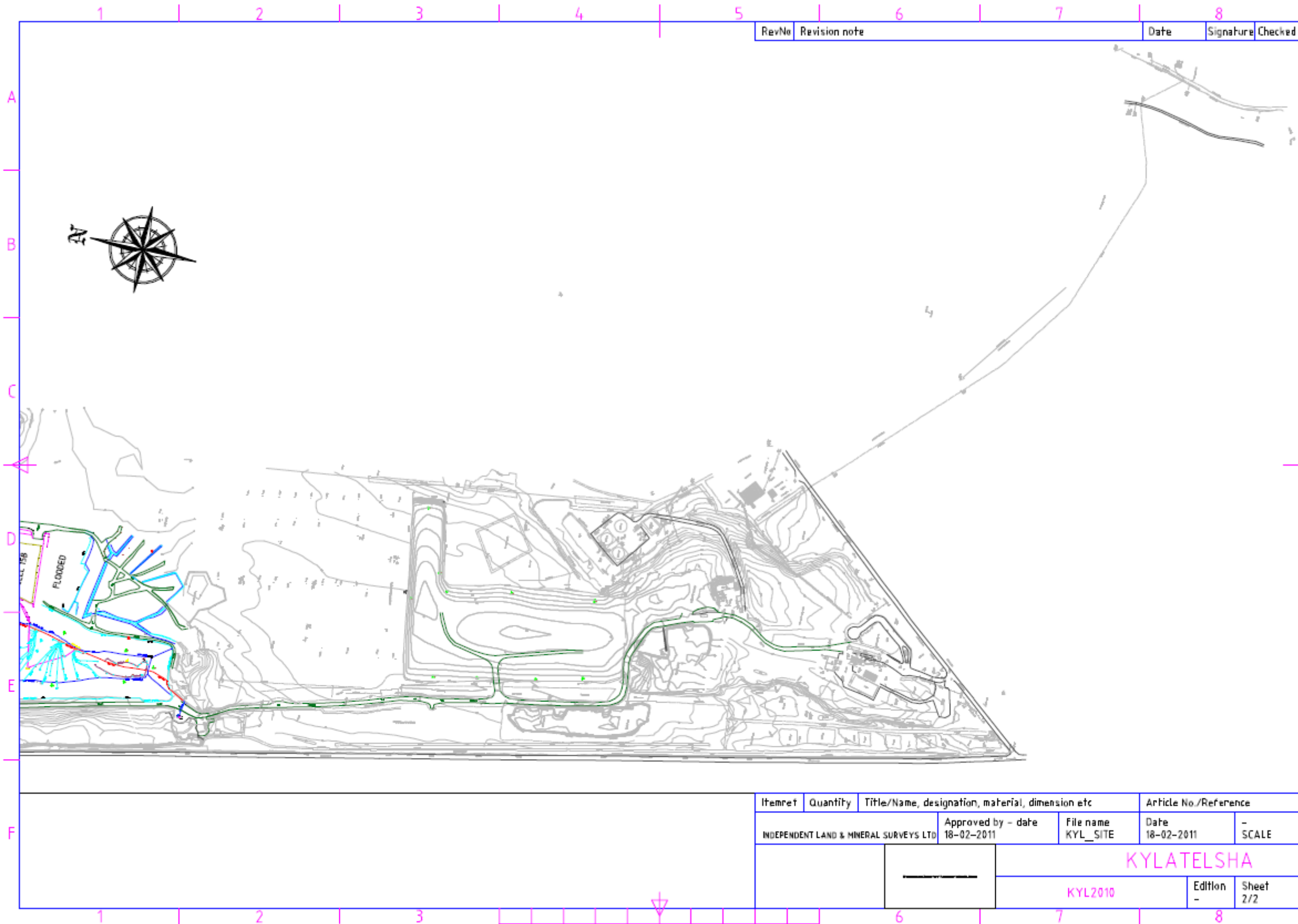
# **Appendix IV**

## **Site Survey**

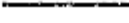


RevNo	Revision note	Date	Signature	Checked

Itemref	Quantity	Title/Name, designation, material, dimension etc	Article No./Reference		
INDEPENDENT LAND & MINERAL SURVEYS LTD		Approved by - date 18-02-2011	File name KYL_SITE	Date 18-02-2011	- SCALE
		<b>KYLATELSHA</b>			
		KYL2010		Edtion -	Sheet 1/2



RevNo	Revision note	Date	Signature	Checked

Itemref	Quantity	Title/Name, designation, material, dimension etc	Article No./Reference		
INDEPENDENT LAND & MINERAL SURVEYS LTD		Approved by - date 18-02-2011	File name KYL_SITE	Date 18-02-2011	- SCALE
<div style="text-align: center;">  </div>			KYLATELSHA		
			KYL2010	Edtion -	Sheet 2/2

**Appendix V**

**Slope stability Test**

**Independent Land and Mineral survey limited carried out the slope stability test. The initial survey was carried out on December the 15<sup>th</sup> with the second survey carried out on January 7<sup>th</sup>. The survey was carried out using GPS which will account for the very slight changes in elevation, easting's & Northing readings.**

Independent Land & Mineral Survey Ltd.  
December 15th 14:52:41

PROJECT: Documents\Jobs\Portlaoise\CSV\Stabilisation.pro

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Point Coordinates Listing

Point East North Elev Name

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2642	244983.61800	203690.89100	89.969	C14N
2643	244931.41700	203647.14600	90.011	C14W
2644	244964.18600	203500.47700	90.961	C13W
2809	244994.21500	203392.68800	91.457	C12W
2810	245025.63300	203352.01900	90.717	C12S
2826	245048.37100	203499.97800	89.001	C13E
2856	245042.41400	203399.65000	89.998	C12E
2816	245268.11600	202948.11700	88.354	C5S
2817	245362.62600	202986.85000	86.422	C5E
2818	245218.69000	202983.05700	89.131	C5N
2819	245106.79200	202922.36600	87.705	C5W
2815	245241.68500	202930.05900	87.761	C4E
2821	245119.71700	202855.44900	87.329	C4W
2822	245137.26700	202765.47500	87.576	C3W
2825	245260.64100	202831.00600	88.103	C3E
2823	245154.94700	202693.97100	88.132	C2-1W
2824	245276.42500	202701.41400	88.946	C2-1E

Independent Land & Mineral Survey Ltd.  
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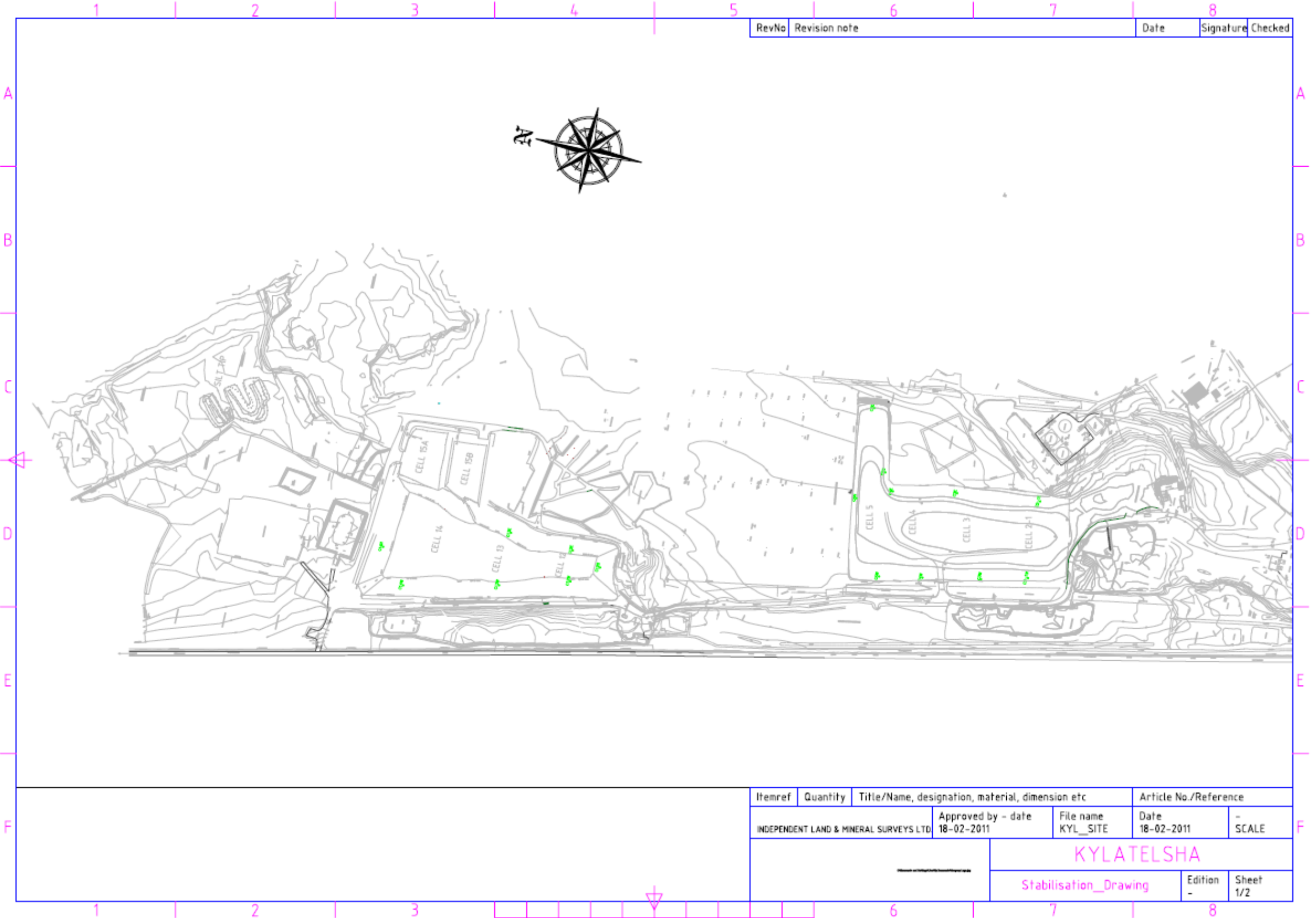
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Point Coordinates Listing

Point East North Elev Name

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1101	244983.61000	203690.85600	89.967	C14N
1102	244931.41400	203647.13200	90.009	C14W
1103	244964.18100	203500.45500	90.959	C13W
1104	244994.20800	203392.66500	91.454	C12W
1105	245025.62700	203352.01700	90.715	C12S
1106	245048.35900	203499.94700	88.998	C13E
1107	245042.40300	203399.65700	89.997	C12E
1108	245268.10500	202948.10300	88.351	C5S
1109	245362.61700	202986.84400	86.422	C5E
1110	245218.67400	202983.03900	89.130	C5N
1111	245106.78300	202922.35700	87.705	C5W
1112	245241.67800	202930.05000	87.756	C4E
1113	245119.70200	202855.43800	87.324	C4W
1114	245137.25000	202765.45800	87.574	C3W
1115	245260.63200	202831.00000	88.100	C3E
1116	245154.93500	202693.95300	88.128	C2-1W
1117	245276.41800	202701.41000	88.943	C2-1E



RevNo	Revision note	Date	Signature	Checked

Itemref	Quantity	Title/Name, designation, material, dimension etc	Article No./Reference		
INDEPENDENT LAND & MINERAL SURVEYS LTD		Approved by - date 18-02-2011	File name KYL_SITE	Date 18-02-2011	SCALE
<p style="text-align: center;">KYLATELSHA</p>			Stabilisation_Drawing	Edition -	Sheet 1/2



**Biological Monitoring Report**  
**Appendix VI**



Laois County Council Landfill Site  
Waste Licence Register No. W026-03

## **Biological Monitoring Report**

**Compiled by:** Mr. Marc Chawke BSc MScEng  
Environmental Technician, Laois County Council

**Monitoring Date:** 1<sup>st</sup> of April 2010

## **1.0 Summary**

In accordance with Condition 8.12 of Waste Licence Register No. W026-02, Laois County Council are required to conduct an annual biological assessment at Kyle Bridge (S-2) and Two Mile Bridge (S-3) located along the River Triogue. These locations are situated upstream and downstream respectively of the Tip Stream discharge point which is adjacent to the now terminated leachate discharge point. Environmental Technicians Mr Mark Rochford and Mr Marc Chawke from Laois County Council conducted a biological survey on 1<sup>st</sup> April 2010. The results of in-situ physico-chemical determinations (pH, conductivity, dissolved oxygen and temperature) indicated favourable chemical water quality along the stretch of the River Triogue. The overall bio-diversity of macroinvertebrate samples collected was poor at both upstream and downstream of the Tip stream discharge point. The upstream monitoring location at Kyle Bridge (S-2) received a rating of Q1-2 and the downstream location at Two Mile Bridge (S-3) also received a rating of Q1-2. Both S-2 and S-3 were dominated by organisms from Group D, which are species that are classed as tolerant of organic pollution. No organisms considered sensitive to organic pollution (Group A) were identified at any of these sampling locations.

## **2.0 Introduction**

In accordance with the monitoring requirements of Waste Licence Register No. W026-03, an annual biological assessment is to be carried out on the River Triogue. Environmental personnel from Laois County Council visited the river stretch on the 1<sup>st</sup> April 2010 for the purpose of conducting a benthic macroinvertebrate survey. In addition to macroinvertebrate identification physio-chemical parameters were measured in-situ

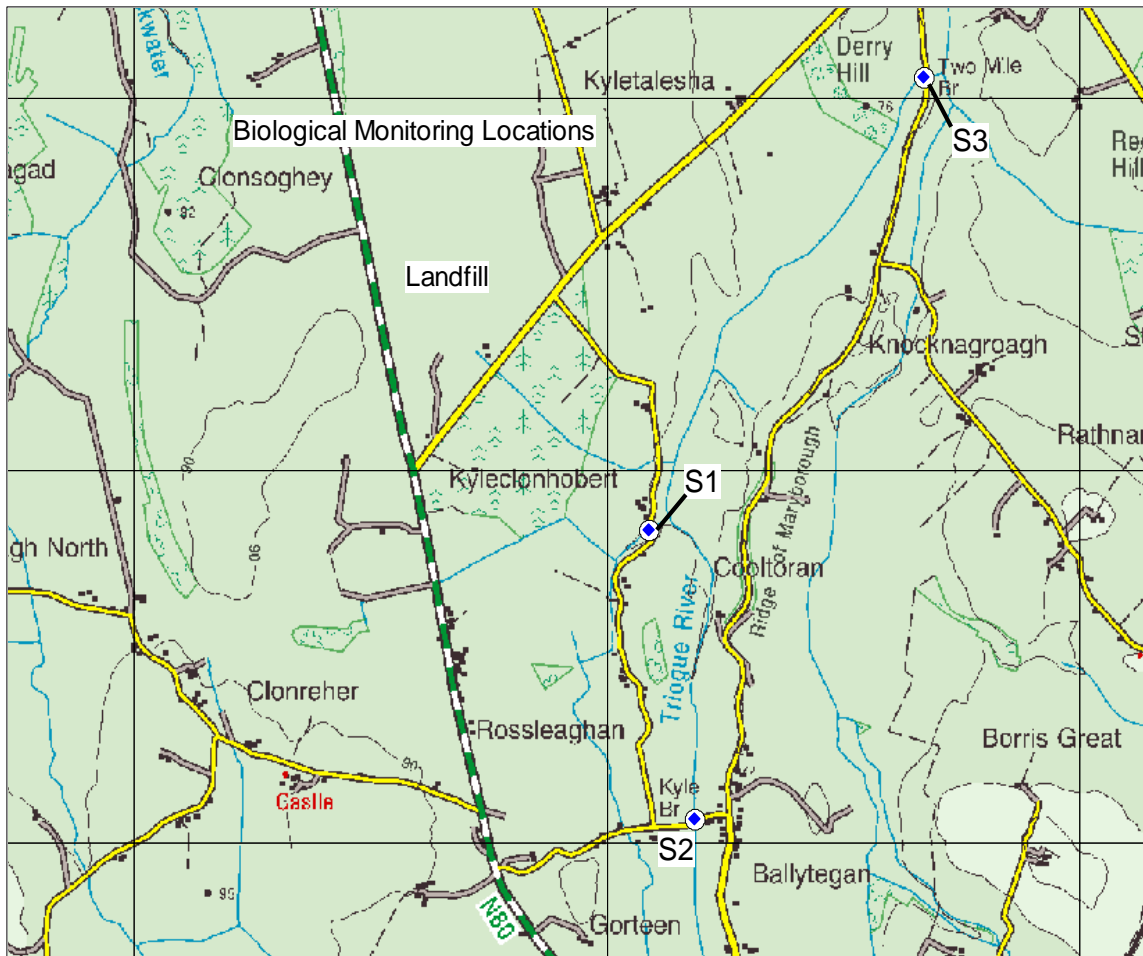
namely temperature, pH, dissolved oxygen and conductivity based on AWWA Standard Methods for the Examination of Water and Wastewater (1989). Biological assessment was performed based on the EPA Q-Rating system for the assessment of streams and rivers. This report details the sampling methodologies and subsequent taxonomic procedures followed. Results are related to established numerical scales of values (Biological Indices) and are discussed.

### **3.0 Methodology**

#### **Sample Locations**

A sampling protocol was designed in order to assess the impact of surface water discharge from Kyletalesha landfill on the River Triogue. In order to give a representative indication of surface water quality of the main surface water body in the vicinity of the discharge two sampling locations are regularly monitored. Table 1 describes the sampling locations and the map overleaf illustrates their geographical relationship.

<b>TABLE 1 : Location of assessment points</b>		
<b>Sample Point</b>	<b>Location</b>	<b>Justification</b>
S-2	Triogue River Kyle Bridge	To assess quality of watercourse prior to Tip Steam discharge
S-3	Triogue River Two-Mile Bridge	To assess quality of watercourse post discharge on the River



**Fig 1 Biological Monitoring stations**

### **In-situ Physio-Chemical Assessments**

In-situ measurements of pH, conductivity, and temperature were taken with a WTW portable Schott multi-meter. Dissolved oxygen was measured using a WTW portable Oxi 330 meter. All measurements were in coherence with AWWA Standard Methods for the Examination of Water and Wastewater (1989).

### **Biological Field Sampling Procedures**

Field sampling procedures were conducted in accordance with the USEPA 'Revision to Rapid Bioassessment Protocols for Use in Streams and Rivers (1997)' in addition to procedures detailed in S.I No. 258 of 1998, an amendment to the Local Government (Water Pollution) Act, 1977. A D-frame dip net was used to sample benthic macroinvertebrates at the three sampling locations. Dimensions of the frame were 0.3 m square and shaped as a "D" where the frame attaches to a long pole. The net has a cone shape for capture of organisms. A kick sample was taken at each location for a two-minute period. Each collected sample was assessed after collection. Habitat, as structured by in-stream and surrounding topographical features, is a major determinant of aquatic community potential. Both the quality and quantity of available habitat affect the structure and composition of resident biological communities. As such, on site habitat characteristics were recorded and referenced to results obtained from the individual sampling locations.

### **Biological Quality Rating (Q-Rating)**

This is a Pollution Rating Index, which has been developed to measure the response of certain key macroinvertebrate species or groups to pollution. The Q Rating system has been implemented by the Environmental Protection Agency in Ireland as the standard means to assess the quality of any part of a river based principally on the composition of macroinvertebrate communities/faunal groups present and their general sensitivity to organic pollution. The Biological Quality Rating forms part of S.I No. 258 of 1998, an

amendment to the Local Government (Water Pollution) Act, 1977. The rating system recognises five macroinvertebrate groups (Table 2) ranging from A to E (i.e. most sensitive to most tolerant) and relates their relative abundance, from a standard 2 minute sample, to a quality rating known as a Q Index. The part of the stream or river surveyed may subsequently assigned a Q rating from 5 to 1 (i.e. pristine, unpolluted to gross polluted).

**Table 2 Biological Quality Rating: indicator groups**

<b>Group A Sensitive</b>	<b>Group B Less Sensitive</b>	<b>Group C Tolerant</b>	<b>Group D Very Tolerant</b>	<b>Group E Most Tolerant</b>
Perlidae	Leuctridae	Tricladida	Hirudinea	Tubificidae
Chloroperlidae	Nemouridae	Ancylidae	Mollusca <i>excluding</i> Ancylidae	<i>Chironomus</i>
Capniidae	Taeniopterygidae	Neritidae	Margaritiferidae	
Perlodidae	Baetidae	Unionidae	Neritidae	
Heptageniidae	Leptophlebiidae	Astacidae	Unionidae	
Siphonuridae	Ephemerellidae	<i>Gammarus</i>	<i>Asellus</i>	
Margaritiferidae	Ephemeridae	Caenidae	Chironomidae <i>excluding</i> <i>Chironomus</i> <i>Rheotanytarsus</i>	
	Potamanthidae	Limnephilidae		
	Cased Trichoptera <i>excluding</i> Limnephilidae	Hydroptilidae		
	Hydroptilidae	Glossosomatidae		
	Glossosomatidae	Uncased Trichoptera		
	Odonata ( <i>not</i> Coenagriidae)	Coleoptera		
	Aphelocheirus	Sialidae		
	<i>Rheotanytarsus</i>	Tipulidae		
		Simuliidae		

		Hemiptera <i>excluding</i> Aphelocheirus Hydracarina		
--	--	---------------------------------------------------------------	--	--

#### 4.0 Results

The results of physio-chemical analysis and biological assessment are detailed in Tables 3, 4 & 5 below.

<b>Table 3 Physio-chemical characteristics</b>				
<b>Sample Location</b>	<b>pH (pH units)</b>	<b>Conductivity (µS/cm)</b>	<b>Dissolved Oxygen (mg/l)</b>	<b>Temperature (°C)</b>
S-2	7.5	894	9.3	11.8
S-3	7.6	865	9.6	12.0

<b>Table 4 Macroinvertebrate taxa</b>		
<b>Invertebrate Taxa</b>	<b>S-2 (Kyle Bridge)</b>	<b>S-3 (Two Mile Bridge)</b>
Mollusca	*	*
Tipulidae	*	*
Asellus	* +	*+
Chironomus	*	*
Gammarus	*	*
Hirudinea	*	*

\* = present + = dominant



<b>Table 5 Q-Rating</b>	
<b>Monitoring Station</b>	<b>Biological Quality Rating (Q- Rating)</b>
S-2 (Kyle Bridge)	Q1-2
S-3 (Two Mile Bridge)	Q1-2

**Discussion:**

S-2 located at Kyle Bridge received a rating of Q1-2. Faunal groups from Group C, D and E only were present within the macroinvertebrates collected. Organisms within Group D are classified as very tolerant to organic pollution while organisms from Group E are classified as the most tolerant to organic pollution. Group D was dominant and Group E was present in high abundances. S-3 located at Two-Mile Bridge received a rating of Q1-2. Group D was dominant and overall the kick sample yielded a low diversity. Group C and E were the only other groups represented in the sample and these were in very low abundance. S-2 and S-3 had a similar river habitat. The River at each location was wide (7-10m) with a good flow. Both sampling locations had suitable riverbed substrata to support macroinvertebrates assemblages. There was evidence that each site is under strain from bank erosion caused by livestock. Bank erosion has caused siltation but is not severe in either locations. The overall bio-diversity noted within this stretch of the River Triogue was poor.

## **Appendix VII:**

### **Noise Survey**

**Laois County Council**  
Aras an Chontae, Portlaoise, Co. Laois

**Kyletalesha Landfill – W0026-3**  
**Annual Noise Report**

**Report Date: 14th March 2011**

**Fitz Scientific**

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

Report No. 3670/M16

## 1.0 Introduction

Fitz Scientific were commissioned to carry out an environmental noise survey by Laois County Council at Kyletalesha Landfill, Clonsoughy, Kyleclonhobert, Co. Laois. Four noise locations around the facility were monitored during the course of the survey. Lisa Doyle of Fitz Scientific conducted the survey on the 18<sup>th</sup> February 2011.

According to the Waste License, W0026-03 activities on site shall not give rise to noise levels, at noise sensitive locations, which exceed the sound pressure limits of 55 dB(A) during day-time hours and 45Db(A) during the night-time hours. Only day-time noise was requested for this site.

The noise survey was commissioned by Marc Chawke to monitor compliance with the noise conditions assigned in the Waste License W0026-03 from the Environmental Protection Agency. The nearest noise sensitive locations are the houses on the N80 approximately 410 metres (m) west of the facility.

There was audible tonal impulsive component in the noise emission from the facility at one of the noise monitoring locations.

## 2.0 Duration and Measurements of Surveying

The daytime broadband noise survey was carried out between 11:57 and 17:39 on the 18<sup>th</sup> February 2011. The following measurements were carried out at all locations:

- Broadband measurements  $L(A)_{eq}$ ,  $L(A)_{10}$ ,  $L(A)_{90}$ , and  $LC_{peak}$  over a 30 minute period.
- Third Octave over a set period of time (30 minutes).

## 3.0 Weather Conditions

Weather conditions for the day-time survey on the 18<sup>th</sup> February were moderate for noise monitoring.. Conditions were generally overcast and cold. The wind was generally moderate to strong. Wind speeds varied between 5 and 30mph. Temperatures ranged from 7- 10 °C.

## 4.0 Environmental Noise Terminology:

Decibel (dB): Is the unit of sound pressure levels, calculated as a logarithm of the intensity of sound. 0 dB represents the threshold of hearing and 140 dB the threshold of pain. An increase in 10 dB is generally perceived as a doubling of loudness.

dB(A): An 'A-weighted decibel' is the measure of the noise level of sound across the audible frequency range (20 Hz – 20 kHz) with A-frequency weighting.

$L_{Aeq T}$ : This is the equivalent continuous sound pressure level. A measure of the average sound pressure level during a period of time, t, in dB with 'A' weighting.

$L_{A10}$ : This is the sound pressure level recorded for 10% of the monitoring period.

$L_{A90}$ : This is the sound pressure level recorded for 90% of the monitoring period. When noise is

continuous with diminutive oscillation the  $L_{Aeq}$  will more or less be the same as the  $L_{A90}$ .

1:3 Octave Band Filters: Single 1:1 Octave bands divided into three parts.

A Weighting: A standard weighting of the audible frequencies designed to reflect the response of the human ear to noise.

Fast Time Weighting: A standard time weighting applied by the Sound Level Meter.

Integrating Time Weighting: A sound level meter, which accumulates the total sound energy over a measurement period and calculated an average.

## **5.0 Location and Position of Monitoring Points**

### **5.1 N1**

This monitoring position was located to the south-east of the facility. The meter was positioned on hard ground, beside large tanks at the landfill.

### **5.2 N2**

This monitoring position was located to the south of the landfill facility, beside the recycling centre. . The meter was placed on hard ground.

### **5.3 N3**

This monitoring point was located close to the west of the landfill facility. The noise meter was placed on soft ground.

### **5.4 N4**

This monitoring point was located to the north and centre of the landfill facility, in the area of Cell 6. The noise meter was placed on soft ground.

## **6.0 Activities on Site**

Activities on the site continued as normal during the noise survey. These included heavy vehicles moving on the landfill access roads to deposit waste on site. Banging noise was audible as loads were deposited. Reverse alarms were heard as vehicles moved about. Empty trailers moving at speed over uneven ground contributed to increased noise levels. The civic amenity centre generated noise as people deposited their recyclable items.

Off site noise consisted primarily of vehicle movement on the N80 and surrounding access roads.

## **7.0 Methodology**

The noise survey was carried out in accordance with ISO 1996/1/2/3 - Acoustics -Description and Measurement of Environmental Noise.

Reference was also made with the European Communities (Protection of Workers (Exposure to Noise) Regulations, 1990 and BS 5228 Part 1, Noise and vibration control on construction and open sites and Guidance Noise issued by the EPA on Environmental Noise Surveys.

Broadband measurements and 1/3 octave measurements were analysed for 30-minute intervals.

## **8.0 Equipment**

The equipment used was a Cirrus CR: 831A serial No. B14907FF Type 1 integrating averaging sound level meter, with selective 1:1 or 1:3 octave band measurements.

The meter was fixed to a tripod 1.3 meters above the ground level and the microphone was protected using a windshield. The microphone cartridge type was an MK224, serial number 2990785 with open circuit sensitivity level of 45.4 mV per Pa.

## **8.1 Calibration**

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

## 9.0 Noise Measurements

Monitoring Point	Date/ Time	Sampling Interval minutes	L(A)eq	L(A) <sub>10</sub>	L(A) <sub>90</sub>	Comments
N1	18/02/11 11:57	30	48.4	50.5	44.4	Audible noise included: Machinery from the maintenance yard. Cars passing on the adjacent minor road to the landfill. Vehicles on the facility reverse beeping. Heavy traffic on the N80 30 m away. Vehicles moving in recycling centre and on the landfill. Intermittent banging, breaking of glass and engine noise was also audible.
N2	18/02/11 15:02	30	54.5	76.4	40.3	Vehicles moving on the landfill, reversing alarms. Hum of traffic on the N80. Wind in the nearby trees and birds singing.
N3	18/02/11 15:37	30	60.9	61.6	50.0	Main source of noise was traffic on the access road within the landfill, primarily a tractor and trailer. Banging noise emitted from the trailer as it was empty. Hum of traffic on the N80 was also audible. Wind was strong at this monitoring location.
N4	18/02/11 17:39	30	36.6	39.1	31.1	Main source of noise was traffic on the access road in the landfill. Cars and jeeps were passing on this road. Hum of traffic from NJ80 was audible. Wind was strong at this point also.

## 10.0 Noise Measurements – 1/3 Octave

Monitoring Point	Date/ Time	Sampling Interval minutes	Range	Comments
N1	18/02/11 12:30	30	50-110 dB	No tonal component detected at N1.
N2	18/02/11 14:31	30	50-110 db	Tonal component detected at 125 Hz (65.9 Db).
N3	18/02/11 15:37	30	50-110 dB	No tonal component detected at N3.
N4	18/02/11 16:08	30	50-110 dB	Tonal component detected at 1 Hz (57.2 Db).



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## **11.0 Interferences**

*Elevated noise levels from traffic on the N80 caused slight interference with the noise locations. Increased wind speeds during the monitoring of N3 and N4 caused interference at these locations.*

## **12.0 Conclusions**

The EPA Waste License W0026-03 specifies in Condition C1 of Schedule C, that noise emissions from the site shall not exceed daytime noise limits  $L_{Aeq}$  30 min. of 55 dB during the daytime and limits  $L_{Aeq}$  30 min. of 45 dB during the night time.

Tonal components were detected during the noise survey at N2 and N4. The source of the tonal component at N2 was a banging noise from a passing tractor with an empty trailer. Gusting winds at n3 and N4 have contributed to elevated noise levels on the Leq broadband level.

Elevated broadband measurements at N3 were due to interference from passing traffic on the minor road adjacent to the boundary of the site. Approximately 15 vehicles were recorded passing during the monitoring period, the majority of with were HGVs.

From the noise recordings it is evident that none of the noise locations exceeded the daytime noise levels.

N1 Baseline – 54.8 d(B)A  
N1 Operational- 44.3 d(B)A

None of the monitoring locations recorded excessive noise levels. Traffic movements on the access road during the day were moderate.

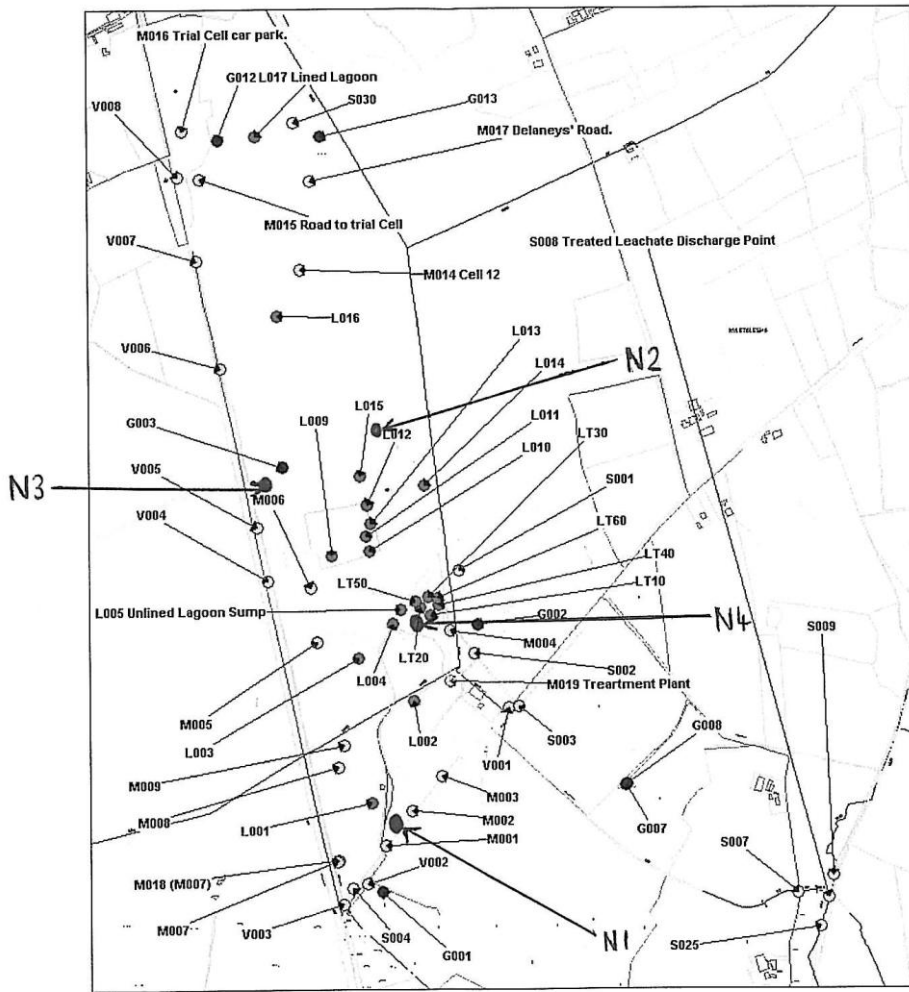
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Lisa Doyle  
Environmental Technician

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Aadil Khan  
Environmental Technical Manager

10<sup>th</sup> March 2011



**Fig 1 Noise monitoring locations (N1, N2, N3 & N4)**

# **Appendix VIII:**

## **Environmental Management Plan**

**Submitted by:**

**SNC-Lavalin Environment  
Purcellsinch Business Park  
Carlow Road  
Kilkenny**

**ISSUE/REVISION INDEX**

Revision				Pages Revised	Remarks
#	Prep.	Rev.	Date		
PA	JR		07-01-2011		Issue Draft for Internal Review
PB	JR	TT	25-01-2011	All	Issue Draft for Client's Review
PC	JR	TT	21-03-2011	All	Issue Final Document

*Prepared by :* John Rea, B.Sc.

*Reviewed by :* Ted Taylor, P. Eng.



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### APPENDICES

Appendix I – Climate Data

Appendix II – Waste Acceptance Procedure

Appendix III – Site Drawings

Appendix IV – Final Landfill Topographical Drawing

Appendix V – Emergency Contact Information



## INTRODUCTION

SNC-Lavalin Inc., Environment Division (SLE) was retained by Laois County Council (Laois) to complete a landfill environmental management plan (LEMP) for their landfill site located at Kyletalesha, Co. Laois. The LEMP was prepared with reference to the EPA guidance manual on “*Landfill Operational Practices*” as required by sub-section 2.3.2.2 of the site waste licence Reg. No. W0026-03 (waste licence) issued by the Environmental Protection Agency (EPA) in March 2010.

SLE understands that The LEMP will supersede any previous environmental management plans completed for the site.

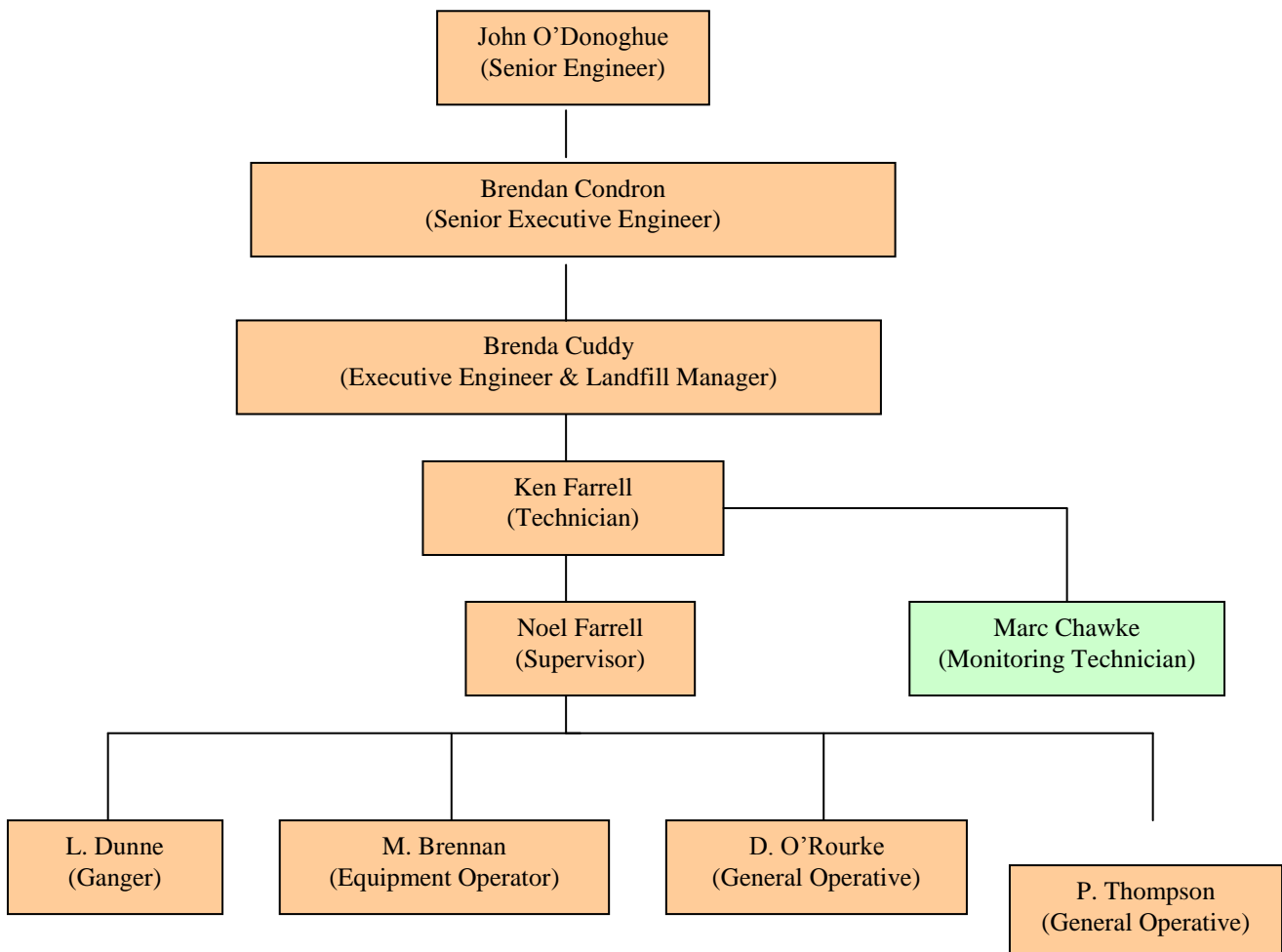
## Site AND Operator Details

The Site and Operator details and contact names are provided below.

**Operator Name:** Laois County Council  
**Address:** Aras an Chontae, Portlaoise Co. Laois.  
**Telephone:** (057) 8664000

**Site Name:** Kyletalesha Landfill Site  
**Site Address:** Clonsoughy, Kyleclonhobert, Co. Laois  
**Site Telephone Number:** (057) 8620653  
**Waste Licence Number:** W0026-03  
**Contact Name:** Ms. Brenda Cuddy (Landfill Manager)

The following is the site management structure for Kyletalesha Landfill Site:



The training and responsibilities of each staff member at the landfill site is provided in Table A.

**TABLE A: Staff Qualifications and Responsibility**

<b>Name</b>	<b>Grade</b>	<b>Responsibility</b>
Brenda Cuddy	Executive Engineer	Landfill Manager
Ken Farrell	Executive Technician	Executive Technician
Marc Chawke	Technician Grade 1	Monitoring Technician
N. Farrell	General Services Supervisor	Overseer
L. Dunne	Ganger	Domestic Waste Area
M. Brennan	Light Equipment Operator	Nuisance Control
D. O'Rourke	General Operator	Weighbridge Operator
P. Thompson	General Operator	Civic Amenity Site

All staff have completed SafePass and three staff members (Landfill Manager, Executive Technician and the Monitoring Technician) have completed the FAS Waste Management Training Programme.

## Site Description

Kyletalesha is a non-hazardous, municipal waste landfill site located off the N80, approximately 5 kilometres north of Portlaoise, Co. Laois. The site consists of a civic amenity area for waste diversion and recovery by members of the public and a landfill site for the disposal of municipal solid waste by the public and private commercial waste operators. The landfill site covers an area of approximately 79.3 hectares in total. The landfill can be mainly divided into older and newer landfill areas. The older area (i.e. waste cells 1, 2, 3, 4 and 5) has been filled and capped without the benefit of current engineering standards, but has been partially retrofitted to allow leachate and landfill gas extraction and treatment. The waste cells in the newer area of the landfill (i.e., waste cells 12, 13 and 14) have been fully designed and constructed to meet current engineering standards, with the inclusion of a liner system and leachate and landfill gas collection systems. To date, waste cells 1, 2, 3, 4, 5, 12, 13 and 14 have been capped.

A covered and lined leachate lagoon is located in the northern area of the landfill site. Leachate is pumped to the holding lagoon for subsequent transport to the Portlaoise wastewater treatment plant. Landfill gas is pumped to the landfill gas flare located at the north section of the site for destruction.

### ***Site Boundaries and Topography***

The site topography is generally level, typical of bogland, with the waste mound creating a raised section in the centre of the site. The site is bounded to the west by the N80 roadway, to the north by cutaway bog land, to the east by virgin bog land and to the south by an unnamed road that leads to Kyletalesha woods.

### ***Site Geology***

Based on an historical site investigation completed in 2000, the thickness of the underlying peat ranges from 3 - 7 m and the underlying boulder clay till varies in thickness from 7.5 - 10 m across the site. The underlying clay till has variable permeability depending on composition and alluvial and glacial intrusions and overlies limestone bedrock. The limestone bedrock is described by the Geological Survey of Ireland (GSI) as a dark grey fossiliferous, muddy limestone with intermittent shale of the Ballysteen formation.

## ***Site Hydrogeology***

Groundwater level monitoring completed in the shallow bedrock over previous site monitoring programmes indicates a groundwater divide trending east west across the site. Groundwater in the northern portion of the site flows to the northwest while groundwater in the southern portion of the site flows to the southeast.

A comprehensive site investigation completed at the site in 2000 indicated that the thickness of the underlying peat ranges from 3 - 7 m and the underlying boulder clay varies in thickness from 7.5 - 10 m across the site. The hydraulic conductivity of the peat layer ranges from  $1.9 \times 10^{-9}$  m/s to  $9.8 \times 10^{-10}$  m/s. The underlying clay till has variable permeability depending on composition and alluvial and glacial intrusions. In some sand and gravel zones, permeability of  $1 \times 10^{-4}$  m/s can be expected. The till is however, more silt dominated and hydraulic conductivity typically ranges between  $2.41 \times 10^{-8}$  m/s to  $4.78 \times 10^{-10}$  m/s.

Historical groundwater monitoring indicated that the bedrock aquifer is confined by the overlying till and peat across much of the site. There is the potential for the indirect discharge of leachate to groundwater in the bedrock aquifer either by percolation through the underlying peat and boulder clay, or through recharge by contaminated surface water. Using Darcy's equation which calculates groundwater flow and assuming a hydraulic conductivity of  $1.9 \times 10^{-9}$  m/s, an average depth of 5 m of underlying peat, a 1 m head of leachate and a fill area of 186,600 m<sup>2</sup>, it was estimated that the theoretical potential percolation through the basal peats and boulder clays was approximately 48.54 m<sup>3</sup>/acre/year which is less than 1.5% of the total annual rainfall indicating limited percolation potential to the underlying aquifer. It has not been established if the pressure head in the aquifer would produce an upward groundwater flow. If an upward groundwater flow were present it would eliminate the potential percolation of impacted shallow groundwater to the aquifer.

## ***Site Meteorology***

The closest operational Met Eireann meteorological weather station to the site was based at Mullingar, Co. Westmeath. Based on data provided by Met Eireann, the mean monthly temperature and rainfall levels between 1961 and 1990 are provided in Table B. Climate Data from Met Eireann is provided in Appendix I.

**TABLE B: Mean Monthly Temperature & Rainfall at Mullingar Met Station  
1961-1990**

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Temp. (°C)	4.0	4.2	5.7	7.5	10.1	13.0	14.7	14.2	12.3	9.7	5.9	4.8
Rainfall (mm)	92.4	66.3	72.6	59.0	70.9	67.0	61.2	82.9	85.1	94.1	87.9	92.2

### ***Waste Materials Accepted on Site***

In accordance with Waste Licence W0026-03 and the Third Schedule of the Waste Management Act, 1996 to 2010, the following waste disposal activities are licensed at Kyletalesha Landfill.

**Class 2: Land treatment, including biodegradation of liquid or sludge discards in soils:**

This activity is limited to the treatment of leachate at the on-site treatment plant.

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

This activity is limited to the storage of leachate in lagoons or tanks.

**Class 5: Specially engineered landfill, including placement into lined discrete cells which are capped and isolated from one another and tile environment:**

This activity is limited to the placement of waste into lined cells.

**Class 6: Biological treatment not referred to elsewhere in this Schedule which results in final compounds or mixtures which are disposed of by means of any activity referred to in paragraphs 1 to 10 of this Schedule:**

This activity is limited to the treatment of leachate at the on-site treatment plant.

**Class 7: Physico-chemical treatment not referred to elsewhere in this Schedule (including evaporation, drying and calcination) which results in final compounds or mixtures which are disposed of by means of any activity referred to in paragraphs 1 to 10 of this Schedule:**

This activity is limited to the treatment of leachate at the on-site treatment plant and the flaring of landfill gas.

**Class 11: Blending or mixture prior to submission to any activity referred to in a preceding paragraph of this Schedule:**

This activity is limited to the mixing of waste types prior to disposal into lined cells.

**Class 13: Storage prior to submission to any activity referred to in a preceding paragraph of this Schedule, other than temporary storage, pending collection, on the premises where the waste concerned is produced:**

This activity is limited to the temporary storage of waste at the facility prior to its disposal at the landfill or at an alternative appropriate disposal facility.

In accordance with Waste Licence W0026-03 and the Fourth Schedule of the Waste Management Act, 1996 to 2010, the following waste diversion activities are licensed at Kylaletasha Landfill.

**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 biodegradable waste.

**Class 3: Recycling or reclamation of metals and metal compounds:**

This activity is limited to the recycling of metals at the Civic Waste Facility

**Class 4: Recycling or reclamation of other inorganic materials:**

This activity is limited to the recycling of waste at the Civic Waste Facility and for the recovery/reclamation of inert waste for the restoration of the facility.

**Class 9: Use of any waste principally as a fuel or other means to generate energy**

This activity is limited to the possible future use of landfill gas as an energy source.

**Class 11: Use of waste obtained from any activity referred to in a preceding paragraph of this Schedule:**

This activity is limited to the use of inert waste, peat or composted materials at the facility.

**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 collection and storage of recyclable and reusable wastes at the facility prior to their use on-site or their removal off-site for recycling/recovery.

Waste Disposal and Recovery operations are carried out at the site in accordance with the schedule of licensed activities outlined in Part 1 of the waste licence. The waste materials accepted at the site and their corresponding European Waste Catalogue (EWC) numbers are outlined in Table C.



**TABLE C: Materials Landfilled and Recovered at Kyletalesha Facility**

<b>Landfill Disposal</b>				
<b>Material Type</b>	<b>EWC Number</b>	<b>Tonnage 2008</b>	<b>Tonnage 2009</b>	<b>Tonnage 2010</b>
Household Waste	20 03 01		4,797.23	
Commercial Waste	20 03 01		38,246.46	
Construction & Demolition Waste	17 01 17		33.74	
Industrial Non-Hazardous Waste	19 12 04		7.26	
<b>Waste Recovery (CA Site)</b>				
<b>Material Type</b>	<b>EWC Number</b>	<b>Tonnage 2008</b>	<b>Tonnage 2009</b>	<b>Tonnage 2010</b>
Glass Bottles	20 01 02	213.80	255.18	183.3
Car batteries	16 06 01	N/A	N/A	N/A
Household Batteries	20 01 33	1.84	2.88	0
CD/DVD/Videos	20 03 39	2.86	4.92	N/A
Gas Cylinders	20 03 07	2.00	0	3.04
White Goods	20 01 36	92.26	119.4	56.78
Metals	20 01 40	275.92	286.62	187.36
Aluminium Cans	20 01 40	18.10	33.8	25.66
Waste Oil	13 02 04	17.82	18.68	21.96
Waste Oil Filters	13 02 04	1.40	3.22	1.26
Cooking Oil	20 01 25	N/A	N/A	N/A
Plastic Bottles	20 03 39	109.12	127.56	130
Fridges	20 01 23	38.94	62.62	4.42
Textiles	20 01 11	105.64	87.12	51.56
Hard Plastics	20 03 39	68.46	94.06	73.38
Paper/Cardboard	20 01 01	639.44	623.16	483.72
Tyres	03 01 03	24.1	22.88	15.86
Sheet Glass	20 01 02	20.96	16.12	20.84
Polystyrene	20 01 39	0.72	N/A	N/A
Household Hazardous Waste	08 01 21	24.78	12.6	19.94
Green Waste	200201	700.4	204.84	317.12
Waste Electrical and Electronic Equipment	20 01 36	165.34	249.62	167.34

### ***Waste Acceptance Procedures***

All waste deliveries are visually inspected by equipment operators and banksman at the landfill working face immediately after deposit to ensure that only waste materials permitted for acceptance at the landfill site are disposed of. Any waste materials that are considered not to be acceptable are removed and transported to the waste quarantine area. If unacceptable waste material is observed in a deposited load of waste material, the load may be rejected and

the name and address of the waste producer and waste transport company will be recorded along with the date and time. The landfill manager will be notified immediately upon a waste load being rejected at the site.

A copy of the full waste acceptance procedure for the site is provided in Appendix II.

## Site Infrastructure

The location of site infrastructure is provided on Drawings MDR0615/DG0401 and MDR0615/DG0402 in Appendix III. The main site infrastructure consists of the following:

- **Facility Notice Board** – A facility notice board is located at the site entrance and provides site information including; The name and telephone number, normal hours of opening, name of the licence holder, emergency out of hours contact telephone number, licence reference number and where environmental information relating to the facility can be obtained.
- **Site Weighbridge and Office** - The site weighbridge was installed in 1996 by DGS Systems. The weighbridge data is automatically input to a computer database tailored for site specific use, the upkeep of the database is provided by Precia Molen Group. Annual calibration of the weighbridge is completed by Precia Molen Group.
- **Site Office Buildings** – There are two main office buildings on site. The landfill site administration office is located in a pre-fab building located to the southwest of the weighbridge and the civic amenity office building is located at the entrance to the CA site. The buildings are serviced by overhead power lines and have an on-site septic system.
- **Civic Amenity Area** - The civic amenity site is a flat asphalt yard area and consists of labelled bins for the separation, collection and recovery of recyclable materials from members of the public. The CA site covers an area of approximately 3,600 m<sup>2</sup>.
- **Wheel Cleaning** - A Wesley automatic wheel wash facility is located approximately 300 m north of the landfill site entrance to prevent vehicles leaving site depositing mud on the public highway, see Photo 1 in Appendix IV. The wash water is recycled within the wheel wash system. Sludge is removed from the wheel wash system on a monthly basis and disposed of within the fill area.
- **Landfill Gas Flaring System** - A landfill gas collection system has been installed in completed waste cells. Each landfill gas well head is connected to the main gas line using a 125 mm solid HDPE pipe. The gas is flared off in accordance with condition 3.14.1 of the waste licence at a flaring system located in the northeast area of the site.
- **Leachate Lagoon** – A fenced and covered leachate storage lagoon is located in the northern area of the site. Each leachate well head is connected to the main leachate line and is pumped to the lagoon for storage prior to being tankered to a wastewater treatment facility operated by Laois for treatment.

## Site operations

The site has two main areas of operation; the landfill site and the civic amenity site. Waste Disposal and Recovery operations are carried out at the site in accordance with the licensed activities outlined in Part I of the waste licence.

### ***Civic Amenity Site***

The civic amenity site is located at the site entrance and consists of labelled bins for the separation, collection and recovery of recyclable materials. The CA site covers an area of approximately 3,600 m<sup>2</sup>. The materials accepted at the CA site are outlined in Table C. The CA site is open from 8.00 a.m. to 4.30 p.m. from Monday to Saturday. The CA site is supervised at all times by a site operative.

### ***Landfill***

The site's landfill is approximately 79 hectares in area and is divided into a number of site waste cells, see Drawings in Appendix III. An outline of the landfill capacity and landfill operations are outlined below.

#### *Landfill Capacity*

The original site capacity calculation for cells that have already reached capacity and for cells 11 and 15 was approximately 1,060,000 tonnes. Records of waste inputs indicate that approximately 455,310 tonnes was deposited in the landfill up to the end of 2002 (Laois have calculated that approximately 47,600 m<sup>3</sup> of landfill void space has been filled in cells 1 through 5) with an estimated remaining tonnage capacity at the end of 2002 of 604,690 tonnes. The tonnage of waste received on site since 2002 is outlined in Table D below.

**TABLE D: Waste Disposed in Kyletalsha Landfill up to 2009**

Year	Deposited Tonnage	Estimated Remaining Capacity (tonnes)
2003	34,870	569,820
2004	49,836	519,984
2005	48,404	471,580
2006	48,298	423,282
2007	42,182	381,099
2008	49,909	331,190
2009	43,085	288,105

Waste cells 11 and 15 have capacity to receive waste for six years (i.e., reaching capacity in 2015) assuming a maximum filling rate allowable under the EPA waste licence of 47,100 tonnes per annum and maintaining the proposed final site topographical profile, Appendix V.

### *Waste Deposition*

Waste is deposited at the top of the landfill working face, which is maintained at an average gradient less than 1:3 (i.e., 1 vertical to 3 horizontal) to provide a more stable working area. Waste deposition vehicles (e.g., trucks and site tractors and trailers) are directed to the working face by the site banksman to avoid trucks backing down the working face slope and becoming stuck. Truck drivers and site tractor operators are instructed by the banksman when they are at the correct location for waste deposition; they then exit the vehicle and open the trailer tailgate. The waste is pushed into layers not greater than 0.5 m thickness using a site bulldozer. A steel wheeled landfill compactor is used to level and compact the waste. Any large articles or hollow containers, likely to cause voids, are crushed and buried to a depth of not less than one meter from the surface of the waste and two meters from the flanks and face.

Volumetric surveys of the active cell are regularly undertaken to determine the remaining capacity and the performance of the compaction equipment.

The waste face is covered daily with a soil material to reduce impacts from vermin and windblown litter. The soil weekly cover material is applied in 150mm thick layers and is free draining to prevent the development of perched water within the waste body. Sufficient stockpiles of soil are maintained on-site to meet all daily and weekly operational requirements.

Only one working face is operated at any time. The working face is maintained at less than 25 meters wide by 50 meters long and 2.5 meters in height after compaction with a slope of no greater than 1 in 3, as per Condition 5.4 of the Waste License.

### *Phased Waste Filling*

The waste deposition to the landfill is completed over a phased basis in engineered containment cells. Each engineered cell consists of a composite liner system of compacted clay and geomembrane.

Typical construction details for each containment cell are provided below and are based on the construction validation report for cell 12.

Prior to construction, surface peat and underlying glacial till material are excavated to the requisite cell elevation base level. Excavated till is used to construct perimeter bunds for the cell and is reinforced with geogrid.

The containment lining system of each cell consists of a 1.0 m thick engineered clay liner overlain by a 2 mm thick high density polyethylene (HDPE) flexible membrane liner (FML) and a protective geotextile. The engineered clay liner material is tested for shear strength, density and moisture content prior to being approved for installation in the cell.

A 500 mm thick aggregate leachate drainage layer (i.e., 20 to 40 mm gravel) is installed across the base area of the cell where leachate collection pipework is installed that is directed to a purpose built leachate collection chamber.

#### *Site Engineering Works*

The main engineering work completed at the site to provide for site operations and environmental protection is detailed in Table E below.

**TABLE E: General Engineering Works 2008-2010**

Year	Licence Condition	Engineering work Completed
2009	4.0	Completed the capping of Cell 14 A, and commenced the capping of Cell 14B (i.e., capped the northern slope of the cell and part of the top of the cell). Capping of Cell 14B was completed in July 2009.
2009	3.5.1	Site road construction and maintenance was completed to ensure safe movement of vehicles within the facility. The main access road through the landfill was resurfaced on a regular basis from a location past the wheel wash to the lined lagoon. This work was completed using a clause 804 material sourced from a nearby quarry. The existing site haul road was extended to the rear of Cell 14 north and around the new cell 15, to provide access for construction of Cell 15. When construction is completed it will be the new access road for Cell 15
2009	3.14.3	Provision of landfill gas extraction wells by Irish Bio-Tech in lined Cell 14(b) to match the phased development of the Cell. A total of 7 vertical well were constructed by drilling to a depth of 10m using a 600mm auger. Perforated HDPE pipes of 160mm diameter were placed in the borehole and backfilled with a suitable pea gravel material. The top of the well consists of a 160mm solid HDPE pipe which is connected to a well head. The boreholes were sealed with a bentonite material to prevent passive venting of landfill gas. Each well head is connected to the main landfill gas control pipeline by a 125mm solid HDPE pipe. Horizontal landfill gas extraction wells were also placed in the active cell 14(c) in November 2009 to satisfy the requirements of condition 3.14.3.
2009		Construction of the New Cell 15 - Construction work consists of the construction of a new 14,000m <sup>2</sup> lined landfill cell, split into two smaller Cells, 15A, and 15B, with composite liner systems and leachate collection systems. Cell site preparation was completed by Mathew Mahon (contractor) and consisted of removal of peat material and clay till from the base of the Cell 15 area. There was also some drain diversions around the proposed Cell 15 area. PCL (Contractor) mobilised to site on the 27th of October 2009, and commenced their works. Initially PCL had to drain out the cell, On the 9th of November, 2009 PCL commenced the bulk excavation of Cells 15 A & B and stockpiled the excavated material at a location north of Cell 14. Layers of silt and marl deep beneath the cell 15 area contained large volumes of dry material. These were stockpiled for berm construction material. Construction will continue into 2010.
2010	4.3	Capping of mini Cell 14(c) was completed in October 2010.
2010	3.12 & 3.16	Construction of Cell 15, to include connection to existing leachate collection and Scada systems.
2010	3.14.3	Horizontal landfill gas extraction wells to be provided in the remainder of active cell 14(c) and in the new Cell 15. Installation of permanent landfill gas extraction wells in cell 14(c) by November 2010.
2010	3.5.1	Re-surfacing and maintenance of site haul roads.

## ***Site Preparation***

Peat deposits underlying waste cells are excavated prior to the construction of lined cells and the formation levels of the liner in each cell is agreed with the Agency prior to construction. Each engineered cell contains a composite liner consisting of a 1 m thick layer of compacted soil with a hydraulic conductivity of less than or equal to  $1 \times 10^{-9}$  m/s or equivalent.

Geotechnical testing on the 1 m thick engineered clay liner is completed to ensure a permeability coefficient (k) or hydraulic conductivity of  $1 \times 10^{-9}$  m/s. This requires that the liner is constructed in compacted lifts not exceeding 300 mm thick. A geotechnical engineer is employed to complete field tests and collect samples of the liner system for classification and triaxial cell permeability tests.

## ***Site Containment***

In compliance with condition 3.11.5 of the waste licence, testing to ensure that the integrity and water tightness targets of all the bunds and leachate/contaminated waste storage tanks are completed every three years and reported to the EPA as part of the annual environmental report (AER) for that year. In addition to completing integrity testing, engineered control systems are in place on site for management of leachate and landfill gas produced on site.

### ***Leachate Control***

The completed waste cells (i.e., Cells 1 to 5, and lined Cells 12, 13 and 14) have been capped and vegetated. Rainfall on the active fill areas is collected in the leachate collection drains and treated in a council waste water treatment plant. The landfill is designed to utilise the natural ground conditions (i.e., peat) to mitigate environmental impacts associated with leachate. An historical pilot project completed at the site in 2001 by Laois indicated that treatment of leachate through a peat bed system resulted in the reduction of ammonia, BOD and nitrate that met surface water quality objectives. outlining the potential mitigation benefits of the underlying stratigraphy. The design incorporates leachate collection facilities using internal and perimeter drains to direct leachate and leachate contaminated surface water to the on-site leachate lagoon.

Any leachate that does seep through the base of the landfill will undergo natural attenuation mechanisms as it percolates through the underlying peat beds. This is confirmed by the results of the monitoring program which indicate that the landfill is not impacting



groundwater quality.

#### *Landfill Gas Control*

All completed and newly constructed waste cells within the landfill have been integrated with the landfill gas collection and management system that pipes landfill gas to the site gas flare system and controls landfill gas migration and emissions. In accordance with condition 3.14.1 of Waste Licence (W0026-2), infrastructure for the collection and flaring of landfill gas from cells 1 to 5 (un-lined) and cells 12, 13, 14 (engineered lined cells) have been installed.

Boreholes are advanced to an average depth of 10m below ground surface (i.e., from top of landfill cell) and landfill gas collection pipes consisting of perforated HDPE pipes of 160mm diameter are placed in completed boreholes and backfilled with a suitable pea gravel material. The top of the well consists of a 160mm solid HDPE pipe which is connected to a well head. The boreholes were sealed with a bentonite material to prevent passive venting of landfill gas around the annulus. Each well head is connected to the main gas line using a 125mm solid HDPE pipe and is then directed to the gas flaring system. The landfill gas extraction system is balanced on a weekly basis to prevent overdraw and avoid oxygen being drawn into the landfill body.

#### *Surface Water Control*

A series of surface water ditches along the boundaries of the site directs surface water away from the main landfill body towards the Triogue River. The surface water control system is outlined on Drawings MDR0615DG0401 and MDR0615DG0402 in Appendix III. A naturally occurring surface water pond is present in the northern area of the site, however it is not directly linked to the surface water control system.

### ***Site Stability***

Municipal waste landfilling can lead to differential settlement due to the heterogeneous nature of the material. Settlement within the landfill can result in surface water ponding, surface erosion, slippage and potential failure of the cap system. All landfill cell caps and side slopes are observed on a monthly basis to determine surface condition (e.g., any visible evidence of slumping, erosion, cracks or slippage). The results of site observations are recorded on site observation sheets.

A topographical survey of the landfill is completed annually to determine the volume of

remaining capacity of the landfill site. Based on the results of the topographical survey the level of settlement can also be calculated for areas that have been in-active (i.e., comparison of elevation levels in a capped landfill cell year on year will determine the level of settlement within the cell).

### ***Site Security***

Site security is provided by KR Security Services (on-site security guard) during, and outside, site operational hours. The site is secured along its southern boundary by a double metal fence, the outside fence is a 2 m high concrete pillar and chain link fence and the inside fence is a 2.5 m high palisade fence. The fence also extends from the southeast to the southwest corner of the site and along the western boundary. The site hedgerows, drainage channels and site gates prevent access from the northern and eastern boundaries.

### ***Site Infrastructure***

#### *Site Access and Internal Roads*

The site is accessed from a local access road of the N80 approximately 5km north of Portlaoise. The site access is approximately 100m from the junction of the local access road and the N80 to avoid issues with vehicle queuing back to the N80. The site access is controlled by a main site gate and a system of automated on-site barriers. Roads at the site entrance and the CA site are asphalt and have surface line markings for traffic control. There is room on site for queuing of approximately 10 cars on site which is never exceeded.

The CA site has a lined road for vehicle separation and marked parking areas for private vehicles to use while unloading recyclables to the various waste receptacles. The traffic is then directed to a roundabout area where they can turn and exit the site.

The internal road to the landfill face is a compacted gravel surface oriented along the western area of the landfill. Waste consignments from commercial customers (and municipal waste material deposited at the public area) which have been segregated from the public vehicles are transported along the internal road for waste disposal at the landfill working face. Surface water control ditches are situated immediately west of the internal landfill road.

The internal road system conditions are monitored on a daily basis and areas requiring

maintenance (e.g., filling potholes) are completed as soon as possible. Site perimeter roads are also monitored to ensure that impacts to the roads from the site are minimized (e.g., litter removal) and to ensure that site security is maintained (e.g., checking site fencing).

#### *Offices, Fuel Storage etc.*

There are two main office buildings on site. The landfill site administration office is located in a pre-fab building located to the southwest of the weighbridge and the civic amenity office building is located at the entrance to the CA site. The pre-fab building is located above ground that allows ventilation beneath the building. All other buildings on site are constructed at ground surface grade (i.e., no vented clearance beneath) and are fitted with landfill gas detectors to alert site staff in the event the landfill concentrations may exceed trigger levels as set out in Schedule C.2 of the Licence.

There is no fuel storage on site, a mobile tanker contractor is used to provide fuelling on site and is called on site when required.

The locations of site offices are provided in Appendix III.

#### *Site Landscaping*

Landscaping on landfill cells is undertaken in a staged process following completion of each cell cap. In 2008, a 10m wide boundary ditch (consisting of trees and shrubs) was completed between the Derryguile Road and the landfill site. Typical landscaping work on site is completed following the capping of waste cells (i.e., grass and wildflower) as part of the landfill's final cap installation.

#### *Waste Quarantine Area*

A bunded and secure waste quarantine area is situated to the northeast of the site weighbridge. The area has a concrete surface that drains to a collection sump. The area is approximately 64 m<sup>2</sup> and is surrounded by a 3m high palisade fence and has a lockable gate to provide restricted access. Any waste materials determined to be not acceptable at the site (Landfill or CA site) are placed in the waste quarantine area until they can be appropriately disposed of by a permitted or licensed contractor.

### *Wheel Cleaning & Weighbridge*

A wheel cleaning system is in place on site to prevent vehicles leaving site depositing mud on the public highway. A Wesley automatic wheel wash facility is located approximately 300 m north of the landfill site entrance. The wash water is recycled within the wheel wash system. Sludge is removed from the wheel wash system on a monthly basis and disposed of at the landfill's tipping face.

The site weighbridge was installed in 1996 by DGS Systems. The weighbridge data is automatically input to a computer database tailored for site specific use, the upkeep of the database is provided by the Precia Molen Group. The location of the weighbridge is indicated on Drawing MDR0615/DG0402, Appendix III. Annual calibration of the weighbridge is also completed by the Precia Molen Group.

## Leachate Collection and Treatment

The containment lining system of each engineered waste cell (i.e., cells 12, 13 and 14) consists of a 1.0 m thick engineered clay liner overlain by a 2 mm thick high density polyethylene (HDPE) flexible membrane liner (FML) and a protective geotextile. The engineered clay liner material is tested for shear strength, density and moisture content prior to being approved for installation in the cell. A 500 mm thick aggregate leachate drainage layer (i.e., 20 to 40 mm gravel) is installed across the basal area of the cell where leachate collection pipework is installed that is directed to a purpose built leachate collection chamber.

The cell design ensures that the potential migration of leachate from the engineered cells is minimized to reduce impacts to the environment. The leachate extraction system prevents the build up of leachate head within the landfill and allows for appropriate collection, storage and transport for off-site disposal.

All completed and newly constructed waste cells within the landfill have a leachate collection and management system that directs leachate to the covered site leachate collection lagoon. The leachate management system at the landfill is being continually monitored to ensure that any failure of the system is detected and repaired as soon as possible. The system is connected to a supervisory control and data acquisition (SCADA) system that alerts the site executive technician (or designate) by text message of any failure in the system. Any failures in the system (e.g., seal or pump failures) are reported automatically to the landfill site management and repairs to the system are completed as soon as possible to avoid loss or build-up of leachate in the cell.

The landfill is designed to utilise the natural ground conditions to mitigate environmental impacts associated with leachate. The design incorporates leachate collection facilities using internal and perimeter drains to direct leachate and leachate contaminated surface water to the covered on-site leachate lagoon.

Visual checks of the landfill areas and site slopes are completed to determine if visible leachate seeps are observed that might indicate a problem with the leachate collection system due to lateral migration of leachate from the landfill area. Similarly, groundwater monitoring wells in the vicinity of waste deposition areas are monitored and sampled on a quarterly basis to assess groundwater quality and assess vertical and lateral migration of leachate.

Leachate collected in the leachate lagoon is transported off site for treatment at Portlaoise waste water treatment facility. The lagoon acts only as a storage areas and it has not been investigated if the storage of leachate in the lagoon reduces the concentration of certain contaminants in the leachate.

## Landfill Gas Collection and Treatment

The main impacts from landfill gas include; migration of explosive and toxic gas and greenhouse gas emissions to the environment, as well as combustion of gas within the landfill causing fire. To prevent issues from uncontrolled gas migration from the landfill or gas build up within the landfill, Laois have installed a landfill gas collection and flaring system.

A landfill gas collection system was constructed in completed waste cells by drilling to a depth of approximately 10 m using a 600 mm auger. Perforated HDPE pipes of 160 mm diameter were placed in the borehole and backfilled with a suitable pea gravel material. The top of the well consists of a 160 mm solid HDPE pipe which is connected to a well head. The boreholes were sealed with a bentonite material to prevent passive venting of landfill gas around the annulus. Each well head is connected to the main gas line using a 125 mm solid HDPE pipe.

In accordance with condition 3.14.1 of Waste Licence (W0026-2), infrastructure for the collection and flaring of landfill gas from cells 1 to 5 (un-lined) and cells 12, 13 and 14 (engineered lined cells) have been installed.

Laois currently monitors landfill gas concentrations at 16 monitoring locations around the perimeter of the landfill on a monthly basis. The monitoring locations are positioned both inside and outside the landfill cells. As outlined in Schedule D.2 of the site waste licence, monthly landfill gas monitoring is also completed at designated site buildings. All site buildings are also fitted with landfill gas monitors that continuously monitor landfill gas concentrations.

All completed and newly constructed waste cells within the landfill have a landfill gas collection and management system that transports landfill gas to the site gas flare system. The landfill gas management system at the landfill is being constantly monitored to ensure that any failure of the system is detected and repaired as soon as possible. The system is connected to a SCADA system that alerts the site executive technician (or designate) by text message of any failure in the system. Any failures with the system are reported automatically to the landfill site management and repairs to the system are completed as soon as possible to avoid uncontrolled venting or build-up of landfill gas on site.

A preventative maintenance programme is completed on the landfill gas flaring system

whereby the system is checked and balanced on a monthly basis to reduce instances of equipment failure.

### Surface water Control

Surface water management ditches and storm water drains are provided and maintained at the landfill facility. A system of surface water ditches aids in diverting surface water away from the landfill waste cells and preventing surface water ingress to the waste cells. The ditches also divert surface run-off from capped areas. The surface water drainage ditches are designed and constructed to minimise erosion, stagnation and under capacity.

Surface water run-off arising from the impermeable surfaces located between the facility entrance and the public tipping area (i.e., site yard and CA site) is diverted to a silt trap and oil interceptor prior to discharge from the facility. All silt traps and the oil interceptor has been adequately sized and complies with European Standard EN 858 (installations for the separation of light liquids). Laois maintains all silt traps and completes required inspections on the oil interceptor.

Drawings showing the direction of surface water flow and the location of on-site controls are provided in Appendix III.



## Environmental Monitoring

Laois Co. Co. completes a comprehensive environmental monitoring programme to comply with EPA license conditions and to assess the significance of site emissions. The environmental monitoring completed at the Kyletalhasa landfill site includes:

- Surface water quality;
- Groundwater quality;
- Landfill gas emissions in monitoring wells and site buildings;
- Leachate levels and quality;
- Noise;
- Dust deposition; and
- Environmental nuisance.

All monitoring and sampling is completed with reference to the EPA Manual on Landfill Monitoring, 2<sup>nd</sup> Edition, 2003 and all analysis is completed by a competent laboratory using standard accepted procedures. As part of the monitoring program, all monitoring locations are assessed to determine if any damage or changes have occurred that may impact the monitoring locations capacity to provide representative data (e.g., silt build up in a monitoring well may indicate a damaged well screen). Any reported impacts to the environmental monitoring system will be repaired as soon as possible (or at the latest, before the next monitoring programme) by the Landfill Manager or the Executive Technician to ensure representative data is collected for the site.

### ***Surface Water***

In compliance with Schedule D (Tables D.1.1 and D.5.1) of the waste licence, Laois completes surface water monitoring and sampling at 13 locations. Table D.5 in Schedule D of the waste licence outlines the parameters and sampling frequency required at each location, see Appendix IV. Surface water monitoring locations are detailed in Table F, and on Drawing MDR0403/DG0006, Appendix III.

**TABLE F: Surface Water Monitoring Locations**

Location ID	Sample Location	Easting	Northing
S001	Tip Stream	245453.400	202776.186
S002	Tip Stream	245488.317	202588.450
S003	Tip Stream	245587.877	202468.201
S004	Site Surface Water Ditch – southern area of site	245207.622	202057.848
S007	Tip Stream	246216.612	202046.316
S008	Triogue River - beside former leachate treatment plant discharge point.	246286.558	202035.313
S009	Triogue River – downstream from former leachate treatment plant discharge point.	246299.190	202084.446
S010	Triogue River - upstream of former leachate treatment plant discharge.	247830.300	197111.400
S011		246377.100	200609.100
S012		247471.400	204177.600
S025	Upstream of former leachate treatment plant discharge	246270.206	201971.565
S030	Site Surface Water Ditch – northern area of site.		
S031			

The range of analyses for surface water samples are specified in Schedule D.5 of the Licence and include; dissolved oxygen, pH, electrical conductivity, and organic and inorganic parameters.

#### *Emission Limit Values*

Schedule C of the waste licence outlines the emission limit values (ELV) for each environmental monitoring parameter. The ELVs for surface water are outlined in section C.5 of Schedule C, and are provided in Appendix IV.

#### *Biological Assessment*

Annual biological assessment of the Triogue River is completed to comply with condition 8.12 of the Licence. Based on completed biological assessments between 2008 and 2009, the Q rating for the Triogue River ranged between Q2-3 to Q1 (i.e., moderately polluted to polluted).

## ***Groundwater***

In compliance with Schedule D (Tables D.1.1 and D.5.1) of the waste licence, Laois monitors groundwater quality in 4 monitoring wells located around the landfill site. Ground water monitoring began at G013 in March 2003 to obtain baseline data for the northern end of the site, i.e., down gradient of new-engineered Cells 12, 13 and 14. Groundwater monitoring locations are detailed in Table G, and on Drawing MDR0403/DG0006, attached.

**TABLE G: Groundwater Monitoring Locations**

<b>Location ID</b>	<b>Sample Location</b>	<b>Easting</b>	<b>Northing</b>
G001	Coillte Bog	245276.297	202051.548
G002	Bog Opposite M. Delaney Residence	245493.769	202652.424
G008	Forest area on Kyle Road	245830.707	202293.324
G013	C. Delaney Road	245143.274	203758.123

Monitoring is completed by the EPA at quarterly intervals in accordance with licence conditions set down in Schedule D of the waste licence and includes laboratory analysis at the EPA laboratory, Kilkenny. Laois also carries out groundwater monitoring where analysis is carried out by an Environmental Technician within Laois; including; pH, electrical conductivity, temperature, ammonia, total organic carbon (TOC), nitrate and orthophosphate. In addition to the above groundwater monitoring completed on-site, Laois also complete groundwater sampling and analysis at up to three private wells in the vicinity of the site. Detailed monitoring results are presented in the quarterly monitoring reports submitted to the Agency.

### *Emission Limit Values*

Under section 6.4.2 of the licence, Laois will determine groundwater monitoring trigger levels in accordance with the requirements of Directive 1999/3 IEC. The groundwater trigger levels for each monitoring location are based on previous groundwater monitoring results from those locations.

## ***Landfill Gas Monitoring***

In compliance with Schedule D (Tables D.1.1 and D.2.1) and condition 3.20.1(b) of the waste licence, landfill gas monitoring is completed in site buildings, within lined cells and at perimeter locations on a monthly basis. The monitoring locations are positioned both inside and outside the landfill cells. The monitoring includes methane, carbon dioxide, oxygen, atmospheric pressure, and temperature. Detailed monitoring results are presented in the

quarterly monitoring reports submitted to the Agency. Landfill gas monitoring locations are detailed in Table H.

**TABLE H: Landfill Gas Monitoring Locations**

Location ID	Sample Location	Easting	Northing
M001	Eastern Boundary (Site Entrance)	245285.054	202154.880
M002	Eastern Boundary (CA Site)	245344.234	202233.743
M003	Eastern Boundary (Opposite Inspection Area)	245412.795	202311.501
M004	Old Leachate Treatment Plant	245431.280	202641.448
M005	Western Boundary (opposite cell 1/2)	245129.299	202613.733
M006	Western Boundary (opposite cell 3)	245115.839	202736.261
M007	Southern Boundary (N80 junction)	245173.954	202119.558
M008	Southern Boundary (N80)	245176.566	202332.268
M009	Southern Boundary (N80)	245191.119	202381.412
M012	Northern Boundary (opposite cell 14)	244914.829	203750.783
M013	Northern Boundary (on C. Delaney Road)	245143.274	203758.123
M014	Western Boundary (opposite cell 12)	245096.519	203456.821
M015	Road to trial cell	244871.945	203662.372
M016	Trial cell car park	244832.730	203772.661
M017	Delaney's Road	245119.237	203656.902
M018		245175.707	202121.219
Gas Flare	Gas Flare / Utilisation Plant		

### *Emission Limit Values*

Landfill gas monitoring completed in site buildings and at areas adjacent to the facility are compared to emission limit values provided in Table C.2, and emissions from the landfill gas flaring system are compared to emission limit values provided in Table C.4 of Schedule C of the waste licence, see Appendix IV.

Trace concentrations of methane and carbon dioxide have been detected in all site buildings (i.e. site office, weighbridge office and civic amenity building), however, the concentrations detected were all well below the trigger level of 1.0% v/v and 1.5% v/v respectively.

### ***Leachate***

In compliance with Schedule D.5 and Table D.1.1 of the waste licence, Laois completes leachate monitoring and sampling at 12 locations on a continuous, weekly, quarterly, biannual and annual basis in compliance with Tables D.5.1, D.5.2. and D.6.1 of the waste licence. Leachate monitoring locations are detailed in Table I.

**TABLE I: Leachate Monitoring Locations**

Location ID	Sample Location	Easting	Northing
L021	Inspection chamber – Cell 4	245133.942	202908.157
L023	Inspection chamber – Cell 4		
L025	Inspection chamber – Cell 3	245250.818	202820.125
L026	Inspection chamber – Cell 3	245164.459	202809.927
L016	Inspection chamber – Cell 12	245043.862	203352.234
L018	Inspection chamber – Cell 13	245088.552	203579.564
L019	Inspection chamber – Cell 14	245087.719	203699.593
L02	Historically filled area outside waste cells	245349.146	202481.016
L03	Historically filled area outside waste cells	245224.700	202576.797
L04	Historically filled area outside waste cells	245302.633	202656.523
LT50	Unlined leachate lagoon	245354.525	202706.213
L017	Lined leachate lagoon	244996.000	203758.000

Laois no longer treats leachate on site (i.e., discontinued in 2007) and there has been no discharges to surface water (i.e., River Triogue) since 2006. Laois completes sampling and analysis for treated and non-treated leachate in compliance with sections D.5 and D.6 of Schedule D of the waste licence.

#### *Emission Limit Values*

Under section 6.4.2 of the licence, Laois will determine leachate monitoring trigger levels in accordance with the requirements of Directive 1999/3 IEC and the EPA guideline trigger values set out in the Interim report published by the EPA in 2003. The leachate trigger levels for each monitoring location are based on previous leachate monitoring results from those locations.

#### *Environmental Noise*

In accordance with Schedule D.3 and Table D.1.1 of the waste licence, noise monitoring is completed at four locations (i.e., N1 to N4) annually. Noise monitoring locations are detailed in Table J.

**TABLE J: Noise Monitoring Locations**

Location ID	Sample Location	Easting	Northing
N1	Former Leachate Treatment Plant	245416.139	202706.222
N2	Beside Civic Amenity Site	245406.201	202305.031
N3	Beside N80 Opposite Cell 5	245052.436	202704.550
N4	Bog area between Cell 5 and Cell 12	245091.845	203063.692

Noise monitoring is completed in accordance with “*ISO 1996/1/2/3 – Acoustics – Description and Measurement of Environmental Noise*”, and the Guidance document for Noise in Relation to Scheduled Activities issued by the EPA.

*Emission Limit Values*

Noise monitoring completed at noise sensitive locations at and around the site are compared to emission limit values provided in Table C.1, of Schedule C of the waste licence, see Appendix IV.

***Dust Deposition***

In accordance with schedule D.3 and Table D.1.1 of the waste licence, dust monitoring is completed at four monitoring locations (i.e., D1, D2, D3 and D4) three times per year. Dust deposition monitoring locations are detailed in Table K.

**TABLE K: Dust Deposition Monitoring Locations**

<b>Location ID</b>	<b>Sample Location</b>	<b>Easting</b>	<b>Northing</b>
D1	Former Leachate Treatment Plant	245416.139	202706.222
D2	Beside Civic Amenity Site	245406.201	202305.031
D3	Beside N80 Opposite Cell 5	245052.436	202704.550
D4	Bog area between Cell 5 and Cell 12	245091.845	203063.692

Dust monitoring is completed in accordance with Standard method VDI2119 - Determination of Dust fall using the Bergerhoff Instrument (German Engineering Institute).

*Emission Limit Values*

Dust deposition monitoring completed at designated locations on site are compared to emission limit values provided in Table C.3, of Schedule C of the waste licence, see Appendix IV.

***Environmental Nuisance Controls***

Environmental nuisance control (e.g., landfill odour, vermin, dust, litter and noise) is completed as required under conditions 7.1 and 7.3.4 of Waste Licence W0026-2. The control measures implemented on site include the following:

- Day cover (i.e., a layer of soil) is placed over the landfill area so that no waste is visible at the end of each working day. Placement of daily cover reduces odour emissions and windblown litter.
- Litter netting is in place around the active working cell to collect and control windblown litter from the working face.
- Daily litter patrols are completed by landfill staff to assess and control litter around the site. Any loose litter observed is removed and disposed of in compliance with condition 7.3.3 of the waste licence.
- At the end of each working week a layer of soil (minimum 150 mm thickness) is placed over the working face.
- A vermin control contractor (i.e., Rentokil) is contracted to control vermin on site.
- During periods of dry weather, water is sprayed on the site roads using a bowser to mitigate airborne dust levels;
- The Installation of the on-site landfill gas flaring system controls the emissions of landfill gas and associated malodours.
- Laois County Council employ CCTV to identify vehicles with poor waste covering that may have caused a litter issue.

In compliance with condition 7.6.1 the use of Falcons has proven to be a significant factor in bird and vermin control. Falcons are used between 08:00 and 16:00 on Weekdays, and 08:00 to 13:00 on Saturdays.

## Emergencies

The purpose of the emergency response procedure (ERP) is to address emergency situations and minimise potential impacts on the environment. The landfill manager is responsible for ensuring that site procedures are followed.

### ***Procedures***

The emergency response procedures are predicated by the types of emergency that may occur at this facility and are discussed individually below.

### ***Health and Safety***

In the event of any serious injury or health incidents to personnel on site the emergency number for the ambulance service is clearly posted adjacent to all telephones on site. The Landfill Manager and or Executive Technician will be notified of any incidents immediately and will assume charge in order to handle the emergency as swiftly and efficiently as possible. For minor injuries the number of the local doctor will be posted beside the telephone in the site office. In addition, first aid kits are available in the site offices. At least one member of staff will be trained in First Aid. Accidents/injuries will be reported to the EPA and the Health & Safety Authority.

### ***Oil / Leachate Spill***

In the unlikely event of an oil/diesel or leachate spill from a tanker truck the following procedure will be followed:

- 1) The source of the spill will be closed off immediately if possible. The landfill manager or assistant manager will be notified immediately;
- 2) Shut off valves will be closed off where appropriate;
- 3) The liquid will be contained as far as is practicable by employing containment booms and absorbent mats and/or suitable absorbent material to contain and absorb any spillage at the facility. Suitable booms and mats are stored at the site office;
- 4) A waste oil tanker (or tankers) will be contracted immediately to pump any liquid spill;
- 5) The following authorities will be notified by telephone at the earliest opportunity, i.e., the EPA, Laois County Council and the Eastern Regional Fisheries Board;



- 6) All oil/leachate will be removed from the surface by either pumping or use of absorbent materials. All waste oils and materials will be disposed to an appropriate facility;
- 7) Once used the absorbent material shall be disposed of at an appropriate facility;
- 8) All staff will be informed as to the location and use of the absorbent materials and will be proficient in their use; and
- 9) All significant spills will be recorded on an Incident Report Form.

### ***Equipment Failure***

In the event of breakdown of essential equipment, back-up equipment will be available on site, or if required, will be hired from an alternative source. The break-down of any number of machines should not affect waste acceptance at the site. Equipment will be repaired as soon as possible.

### ***Fire***

The emergency telephone number for the fire brigade is clearly posted adjacent to all site telephones and is included in Appendix VI. In the unlikely event of a fire the following procedure will be employed:

- 1) All staff will be evacuated from the site buildings or from the immediate area of the fire;
- 2) The fire brigade will be notified immediately;
- 3) The Landfill Manager will be informed immediately;
- 4) It may be possible for site staff to extinguish small fires using the fire extinguishers and fire hoses located throughout the facility. This procedure will be restricted to small fires only and the decision will be made by the Landfill Manager;
- 5) All incoming vehicles will be directed to an alternative facility and the site entrance kept clear of traffic and machinery;
- 6) The EPA, Laois County Council and the Eastern Regional Fisheries Board will be notified at the earliest opportunity; and
- 7) All fires will be recorded on an Incident Report Form.

## ***Slope Failure***

Slope stability assessments are completed annually to highlight and remedy areas of concern.

In the event of a slippage, the following measures will be taken:

- evacuate all personnel from the proximity and prevent access;
- In the event of injury contact the emergency services;
- Halt all machinery operation;
- Congregate at Assembly Point;
- Damage to be assessed by Landfill Manager / Senior Engineer;
- Remedial action must be completed before access is permitted to affected area; and
- All slope failures will be recorded on an Incident Report Form.

### ***Site Life Span***

The original site calculation for the landfill site was for a capacity of approximately 1,060,000 tonnes of municipal solid waste (MSW), this included all waste cells that have reached capacity and waste cells 11 and 15. Records of waste inputs indicate that approximately 455,310 tonnes was deposited in the landfill up to the end of 2002 with an estimated remaining tonnage capacity of 604,690 tonnes. Between 2002 and 2009, 316,585 tonnes of MSW was deposited at the landfill resulting in an estimated remaining landfill capacity for 288,105 tonnes.

Assuming a maximum filling rate allowable under the EPA waste licence of 47,100 tonnes per annum and maintaining the proposed final site topographical profile, cells 11 and 15 have the capacity to receive waste for approximately five to six years (i.e., reaching capacity in 2015). The final topographical contours for the site are provided in Appendix V.

**TABLE L: Projected Filling of Remaining Capacity in Cells 11 and 15**

<b>Year</b>	<b>Deposited Tonnage</b>	<b>Estimated Remaining Capacity (tonnes)</b>
2003	34,870	569,820
2004	49,836	519,984
2005	48,404	471,580
2006	48,298	423,282
2007	42,182	381,099
2008	49,909	331,190
2009	43,085	288,105
2010	47,100	241,005
2011	47,100	193,905
2012	47,100	146,805
2013	47,100	99,705
2014	47,100	52,605
2015	47,100	5,505

### ***Site Closure and Restoration Plan***

The historically filled areas, including Cells 1 to 5, and lined Cells 12, 13 and 14 have been filled, capped and vegetated. The cell capping system used during each phase of site closure to date is outlined below.

### *Landfill Cap System*

The final capping system for waste cells conforms with the requirements set out under section 4.3 of the waste licence. All capping systems installed on site are pre-approved by the EPA prior to installation.

Based on the expected compaction and hydraulic conductivity, the final cap will act as a low permeability layer reducing surface water infiltration to the landfill thereby minimizing leachate production.

Surface water drainage ditches surrounding the landfill will be maintained to reduce surface water infiltration into the landfill area.

### *Site Drainage and Erosion Control*

Surface water drainage will be managed at the landfill by directing surface water runoff around the landfill area using existing drainage ditches and soil berms. The drainage system will reduce surface water infiltration into the landfill material and reduce the potential for erosion of the cap surface. Surface water ditches on site drain to the Triogue River. Site drawings (MDR0615/DG0401 and MDR0615/DG0402) provided in Appendix III show the existing drainage system for the landfill.

To reduce the potential for erosion after closure, the sides of each landfill cell will be contoured to maintain a stable slope and will be completed with a layer of topsoil (0.15 m) that is subsequently seeded with a mixture of non-invasive plants.

### *Leachate Control*

Landfill leachate is the traditional term given to water that has come in contact with soil, fill or waste, resulting in some of the material dissolving into the water. The predominant source of landfill leachate is infiltration of precipitated water through the landfill cap followed by percolation through the waste.

Dissolved material in leachate may be inorganic and/or organic. It may be conservative (i.e., not further degradable, such as chlorides), or non-conservative (i.e., indicating future removal from the dissolved phase may be expected via processes such as sorption, natural decay or chemical dissolution). Non-conservative leachate typically contains organic parameters. Factors that affect the quantity of leachate produced include climatic conditions, landfill configuration, hydrogeological conditions beneath the landfill, and distance to receptor. The potential leachate production is estimated by conducting a water balance for the landfill.

Precipitation and evaporation are the primary climatic conditions that influence the quantity of leachate produced. Local climatic conditions determine the amount of precipitation that falls directly onto the landfill. Seasonal and annual variations in precipitation influence leachate generation and should be considered when determining the most effective leachate control measures. The Met Eireann climate normals for the Mullingar area are provided in Appendix I. Based on the climatic conditions and the history of the site, the potential for leachate production is high and will require on-going management after site closure.

The cap system has been designed utilizing a low permeability material (hydraulic conductivity of less than  $1 \times 10^{-9}$  cm/s) which significantly controls the potential for infiltration of precipitation with the goal of reducing the ultimate quantity of leachate generated at the landfill.

Removal and treatment of leachate produced in the landfill, post-closure, will continue until approval has been received from the EPA that volumes and quality of leachate produced within the landfill are at a level whereby pumping and treatment is no longer required.

#### *Landfill Gas Control*

Landfill gases generated at this site are controlled to minimise;

- 1) emissions; and
- 2) the subsurface migration potential of toxic and greenhouse gases.

When appropriately operated (i.e., regular balancing of the extraction system to avoid drawing oxygen into the landfill), landfill gas control can reduce the potential for the combustion of gas within the landfill causing fire. Factors that affect the quantity of landfill gas produced include climatic conditions, landfill configuration, age and composition of waste and conditions within the landfill, and whether aerobic or anaerobic conditions exist (among other factors). Methane generation typically peaks within one year of anaerobic conditions (following cover application), and then decreases over an extended period. Landfill extraction volumes are continuously recorded on-site and reported to the agency.

Once completed, all waste cells at Kyletalesha landfill will have a landfill gas collection system installed, as per section 7 of this report. The landfill gas flare / utilisation plant will continue to flare landfill gas as long as the quality and quantity of gas produced is sufficient. The flare system will continue to be monitored by the SCADA system and on-going preventative maintenance of the flare system will be completed.

### *Aftercare Monitoring*

Aftercare monitoring will be completed in accordance with the *EPA Landfill Manual, Landfill Restoration and Aftercare, 1999*. Aftercare monitoring will be required to identify potential impacts to groundwater and surface water quality from leachate migration and to air quality from landfill gas emissions. The aftercare monitoring program will include sample collection for leachate, groundwater, surface water and landfill gas at existing monitoring locations in the vicinity of the landfill as outlined in Schedule D of the waste licence. Aftercare monitoring will be completed on an agreed schedule with the EPA until the potential contaminants from the landfill site are at a concentration that surrender of the waste licence is accepted by the EPA.

Based on a long term monitoring plan, all monitoring and analysis results will be reviewed on an annual basis. The data review will allow for re-assessment of the monitoring programme and the potential reduction of monitoring requirements on site, pending approval by the EPA.

In addition to environmental monitoring it is proposed that annual site inspections of the landfill be completed to assess reclamation progress and any settlement or erosion concerns that would require maintenance. A summary of post-closure inspection and monitoring scheduling is provided in Table M below.

**TABLE M: Post Closure Inspection and Monitoring Schedule**

<b>Activity</b>	<b>Objective</b>	<b>Schedule</b>
Initial Site Inspection	Monitor post-closure conditions for signs of erosion, vegetation growth, drainage system integrity, and maintenance issues.	Monthly for the first year
Annual Site Inspection	Monitor post-closure conditions for signs of erosion, vegetation growth, drainage system integrity, and maintenance issues.	Annually after the first year up to licence surrender.

### *Annual Reporting*

Within the closure plan, Laois would prepare an annual post-closure monitoring and inspection report that will summarize the environmental monitoring data, site inspections and any proposed revisions to the monitoring and inspection programme.

## Objectives and Targets

Under section 2.3.2.1 of the waste licence, Laois “*shall prepare and maintain a Schedule of Environmental Objectives and Targets. The schedule shall, as a minimum, provide for a review of all operations and processes, including an evaluation of practicable options, for energy and resource efficiency, the use of cleaner technology (including emissions prevention/reduction), and the beneficial recovery/recycling of waste in subsequent landfill engineering operations. The schedule shall include time frames for the achievement of set targets and shall address a five-year period as a minimum. The schedule shall be reviewed annually and amendments thereto notified to the Agency for agreement as part of the Annual Environmental Report (AER)*”.

A detailed Schedule of Environmental Objectives and Targets for the period 2010 to 2015 is presented below, including responsibility and method of target achievement.

**This register of environmental objectives and targets has been prepared in accordance with Laois County Council's environmental management system (EMS) as required by Condition 2 of waste licence W0026-03.**

This register provides a schedule of the facility's objectives and targets highlighting areas for work on a year by year basis. It also allows for the tracking and checking of a wide range of management and site issues. The register should be referenced quarterly to check the targets to be achieved and alert the relevant parties. It should also be referenced at the end of each quarter to ensure that tasks have been completed. Anything not completed should be carried on to the next target phase.

**The register details the following information:**

**Objective -**

An environmental objective is an overall environmental goal, arising from the environmental policy, that an organisation sets itself to achieve, and which is quantified where practicable.

**Target -**

An environmental target is a detailed performance requirement, quantified where practicable, applicable to the organisation or parts of thereof, that arises from the environmental objectives and that needs to be set and met in order to achieve those objectives.

**Tasks -**

These outline the means by which the targets are going to be met. These provide step by step instructions which should be followed to ensure that the objectives and targets are met.

**Responsibility -**

This column designates where the landfill manager or other staff member is designated with overseeing that a particular task has been completed.

**Target Date -**

This sets out the date by which the target should be met. Targets that are not met by the target date should be re-assessed and the date re-adjusted to accommodate completion.

**Extent to Which Targets are Achieved -**

This is a scoring system and outlines the level to which the target has been achieved.

The landfill manager should strive to complete tasks to a high degree i.e. 5. The scoring system is rated from a level of 1 – 5 where 1 is rated as not carried out at all to 5 where the task has been totally completed to a high level.

**Comments -**

The comments section allows the landfill manager to make additional notes as required for the specific task.

**Sign -**

This is the system which is used to indicate that the tasks have been adequately carried out. The Facility Manager or relevant party signs off the tasks once they have been completed.

(Empty pages are left at the end of each month so that the Facility Manager can add any additional objectives and targets as they arise.)

Additional objectives and targets may be identified during team meetings, as a result of audits, non-compliances or instruction from the Agency.



**2010 / 2011**

<b>Ref No.</b>	<b>Objective</b>	<b>Target</b>	<b>Tasks</b>	<b>Responsibility</b>	<b>Target Date</b>	<b>To what extent have you achieved targets? <sup>1</sup></b>	<b>Comments</b>	<b>Sign</b>
01	Staff Training & Environmental Awareness	Refresher training for site staff on: - Acceptable Wastes - New BMW Regs. - Housekeeping - Site Safety	Arrange 1-hr course over lunchtime with staff.	Landfill Manager	June 30 <sup>th</sup> 2011			
02	Communication	Website update	- acceptable wastes - monitoring reports					
03	Site records	Keep bound copies of monitoring reports in library folder and 1 copy in EPA correspondence folder`	Copy and bind all monitoring reports submitted to EPA and file on site.	Landfill Manager	December 31 <sup>st</sup> 2010			
04	Communication	Review and update waste acceptance procedures.	New acceptance procedures to be drafted with reference to limits on BMW content of waste accepted at site.	Landfill Manager	December 31 <sup>st</sup> 2010			

<sup>1</sup> (Score 1-5; 5=absolutely, 1=not at all)

## 2010 / 2011

Ref No.	Objective	Target	Tasks	Responsibility	Target Date	To what extent have you achieved targets? <sup>1</sup>	Comments	Sign
05	Groundwater protection: Licence Compliance, (Condition No. 3.11)	To carry out testing to determine the integrity of the waste oil tank bund	1. Bund testing 2. Submit report to the EPA on findings	Landfill Manager				
06	Accident Prevention Policy (Licence Condition 9.5)	Prepare Accident Prevention Policy to address potential accidents that could have an environmental impact.	1. Identify on-site hazards 2. assess the controls required for the prevention of site accidents 3. Report to the agency in AER	Landfill Manager	March 31 <sup>st</sup> 2011			
07	Landfill Environmental Management Plan Review (Licence Condition 2.3.2.2)	Review and update the existing environmental management plan	1. Prepare environmental management plan with reference to EPA guidance manual on "Landfill Operational Practices"	Landfill Manager	March 31 <sup>st</sup> 2011			
08	Environmental Liabilities Risk Assessment (Licence Condition 12.2)	Prepare a costed report on environmental liabilities on site.	Prepare ELRA with reference to EPA guidance document entitled <i>Environmental Liabilities Risk Assessment and Residual Management Plan</i>	Landfill Manager	March 31 <sup>st</sup> 2011			

**2010 / 2011**

<b>Ref No.</b>	<b>Objective</b>	<b>Target</b>	<b>Tasks</b>	<b>Responsibility</b>	<b>Target Date</b>	<b>To what extent have you achieved targets? <sup>1</sup></b>	<b>Comments</b>	<b>Sign</b>
09	Meteorological Monitoring Licence Compliance (Condition No. 8.8)	Meteorological monitoring	1. Tabulate and record data – report as part of AER.	Landfill Manager	March 31st 2011			
10	Monitoring: Licence Compliance, Schedule D	To complete dust monitoring at four locations three times per year (twice between May and September)	1. Monitor 2. Report to the Agency	Monitoring Technician / Landfill Manager	March 31st 2011 June 30th 2011 Sept. 30th 2011			
11	Monitoring: Licence Compliance, Schedule D	To complete quarterly and annual leachate monitoring and sampling.	1. Monitor / Sample 2. Report to Agency	Monitoring Technician / Landfill Manager	March 31st 2011 June 30th 2011 Sept. 30th 2011 Dec. 31st 2011			
12	Monitoring: Licence Compliance, Schedule D	To complete quarterly and annual groundwater monitoring and sampling.	1. Monitor / Sample 2. Report to Agency	Monitoring Technician / Landfill Manager	March 31st 2011 June 30th 2011 Sept. 30th 2011 Dec. 31st 2011			

**2010 / 2011**

<b>Ref No.</b>	<b>Objective</b>	<b>Target</b>	<b>Tasks</b>	<b>Responsibility</b>	<b>Target Date</b>	<b>To what extent have you achieved targets? <sup>1</sup></b>	<b>Comments</b>	<b>Sign</b>
13	Monitoring: Licence Compliance, Schedule D	To complete continuous monitoring of landfill gas in site buildings and monthly monitoring in site wells and boreholes.	1. Monitor / Sample 2. Report to Agency	Monitoring Technician / Landfill Manager	End of each month.			
14	Monitoring: Licence Compliance, Schedule D	To complete annual noise monitoring.	1. Monitor 2. Report to Agency	Monitoring Technician / Landfill Manager	December 31st 2011			
15	Reporting & Communication, Licence Compliance, (Condition No. 11.4)	AER completed by the end of March	1. Compile and collate 2010 site works and monitoring results. 2. Report to the EPA	Landfill Manager	31st March 2011			
16	Increase Public Awareness on Waste Minimisation and Recycling and BMW.	Encourage waste reduction, reuse and recycling in accordance with the Waste management Plan for the Midland Region	Reduce volumes of recyclable and BMW material being landfilled.	Landfill Manager	June 30th 2011			

**2010 / 2011**

<b>Ref No.</b>	<b>Objective</b>	<b>Target</b>	<b>Tasks</b>	<b>Responsibility</b>	<b>Target Date</b>	<b>To what extent have you achieved targets? <sup>1</sup></b>	<b>Comments</b>	<b>Sign</b>
17	Improvements to site infrastructure	Installation of a telemetry system for the recording of all specified monitoring data as per licence condition 3.19.2 (c.).	Installation and maintenance of new on-site camera system	Landfill Manager	March 31st 2011			
18	Improvements to Site Infrastructure.	Review of wastewater treatment system.  Construction of Cell 15  Continued upgrade of scada system  Improvement to existing Haul Road	Prepare cell 15 site for liner installation	Landfill Manager / Executive Technician				
19	Landfill Gas Management	To ensure that preventative maintenance is completed on the gas flaring system.	Monthly balancing of the flare system to ensure optimum performance and reduced downtime due to breakdown.	Landfill Manager / Executive Technician	Recorded at the end of each month.			
20	Landfill Site Restoration	To complete phased closure on completed waste cells.	Complete cap system on sub-cell 14c	Landfill Manager / Executive Technician	October 31 <sup>st</sup> 2010			

**2010 / 2011**

<b>Ref No.</b>	<b>Objective</b>	<b>Target</b>	<b>Tasks</b>	<b>Responsibility</b>	<b>Target Date</b>	<b>To what extent have you achieved targets? <sup>1</sup></b>	<b>Comments</b>	<b>Sign</b>
21	To prevent contamination of ground / surface water	To ensure that the silt traps and oil / water separator is clean and working efficiently	1. To inspect the silt traps and Oil/ water separator.  2. To clean if necessary	Executive Technician	June 30 <sup>th</sup> 2011			
22	Review site operational procedures.	Ensure that all procedures are up to date and accurately reflect the site operations.	Review site operational procedures and edit / reformat to include any relevant updated procedure tasks or regulatory requirements.	Landfill Manager	March 31 <sup>st</sup> 2011			
23	Waste Recovery Report (Licence Condition 11.3)	To assess further waste recovery options at the landfill site to meet EU waste policy recovery targets	1. Review Waste Acceptance Procedures 2. Complete Waste Characterisation Assessment 3. Submit report to the EPA as part of the AER	Landfill Manager	31 <sup>st</sup> March 2011			
24	Introduce quarterly safety assessments on site	To ensure that site staff, contractors and customers are operating and working in a safe manner.	Observation of site operations and completion of Site Audit sheet on Quarterly basis with feedback.	Landfill Manager	March 31st 2011  June 30th 2011  Sept. 30th 2011  Dec. 31st 2011			

**2010 / 2011**

<b>Ref No.</b>	<b>Objective</b>	<b>Target</b>	<b>Tasks</b>	<b>Responsibility</b>	<b>Target Date</b>	<b>To what extent have you achieved targets? <sup>1</sup></b>	<b>Comments</b>	<b>Sign</b>
25	Complete Calibration of Site Weighbridge	Ensure that weights of all vehicles crossing site weighbridge are accurately recorded	Have Precia Molen Group complete weighbridge calibration and provide report	Landfill Manager	December 31 <sup>st</sup> 2010			
26	To prevent contamination of groundwater or surface water through oil or other spillages	Ensure that containment booms / adsorbents are adequate	1. Conduct on site inspection 2. Order replacements where required	Landfill Manager	Jan 31 <sup>st</sup> 2011			
27	To maintain site security	Ensure that site is secure to prevent unauthorised access.	1. Carry out an inspection of site boundaries and liaise with security contractor on any possible improvements	Landfill Manager	June 30 <sup>th</sup> 2011			
28	Prevent the contamination of ground / surface water through spills / leakages from inadequate tank and drum storage	Ensure that tanks and drums are stored safely and that spills will be contained	1. Conduct an inspection of storage areas and ensure drums etc. are labelled correctly	Landfill Manager	June 30 <sup>th</sup> 2011			

**2010 / 2011**

<b>Ref No.</b>	<b>Objective</b>	<b>Target</b>	<b>Tasks</b>	<b>Responsibility</b>	<b>Target Date</b>	<b>To what extent have you achieved targets? <sup>1</sup></b>	<b>Comments</b>	<b>Sign</b>
29	Site Topographical Assessment for Licence Compliance, (Condition No. 8.10)	Carry out annual topographical assessment at the site	1. Conduct a topographical survey at the site 2. Report to the Agency	Landfill Manager	December 31 <sup>st</sup> 2010			
30	Encourage management commitment to environmental improvement	Ensure that management are aware of their roles and responsibilities	1. Carry out a review of the management structure 2. Complete updates where required	Landfill Manager	June 30 <sup>th</sup> 2011			
31	Improve site operations and minimise nuisance to neighbours	To ensure that complaints are dealt with satisfactorily	1. Conduct a review of all complaints to ensure that there are no outstanding issues	Landfill Manager	March 31 <sup>st</sup> 2011			
32	Assess the Biodegradable Municipal Waste content of waste deposited at the Public Disposal Area.	Ensure that the BMW content conforms with limits set in Condition 5.14.1 of the Waste Licence	1. Complete Waste Characterisation and BMW content assessment	Landfill Manager				



**2010 / 2011**

<b>Ref No.</b>	<b>Objective</b>	<b>Target</b>	<b>Tasks</b>	<b>Responsibility</b>	<b>Target Date</b>	<b>To what extent have you achieved targets? <sup>1</sup></b>	<b>Comments</b>	<b>Sign</b>
33	To prevent any accidents caused by instability of site slopes (Condition No. 8.14)	Carry out annual stability assessments at the site	1. Conduct annual slope stability assessment 2. Report to the Agency	Landfill Manager / Executive Technician	Dec. 31 <sup>st</sup> 2010			
34	To ensure comprehensive monitoring of groundwater	Ensure that monitoring infrastructure is in order	1. Inspect monitoring infrastructure 2. Repair where necessary	Monitoring Technician	Quarterly			
35	To prevent legislative non compliances at the site	Ensure that the site is complying with all relevant and up to date legislation	1. Review the register of legislation	Landfill Manager	Dec 31 <sup>st</sup> 2011			
36	Update Site EMS (Licence Condition 2.3.1)	Update the current EMS to include update objectives and targets, corrective action procedures and awareness programme training.	1. prepare outline for submission to EPA for approval. 2. Update EMS based on EPA approval	Landfill Manager	June 30 <sup>th</sup> 2011			

# **APPENDIX I**

## **CLIMATE DATA**



Friday, 15 October 2010 | Laois



19 NW Moderate

Search:



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30 Year Averages

Please choose a 30 year average report from any station by clicking on the map or one of the links below:

- |                                  |                                    |
|----------------------------------|------------------------------------|
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| 2 <a href="#">Birr</a>           | 9 <a href="#">Malin Head</a>       |
| 3 <a href="#">Casement</a>       | 10 <a href="#">Mullingar</a>       |
| 4 <a href="#">Claremorris</a>    | 11 <a href="#">Roches Point</a>    |
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| 6 <a href="#">Cork Airport</a>   | 13 <a href="#">Shannon Airport</a> |
| 7 <a href="#">Dublin Airport</a> | 14 <a href="#">Valentia</a>        |



**BIRR**

**monthly and annual mean and extreme values**

**1961-1990**

**TEMPERATURE (degrees Celsius)**

	jan	feb	mar	apr	may	jun	jul	aug	sep	oct	nov	dec	year
<i>mean daily max.</i>	7.5	7.9	9.8	12.2	14.9	17.7	19.2	18.8	16.6	13.6	9.7	8.2	13.0
<i>mean daily min.</i>	1.8	1.8	2.5	3.5	5.9	8.7	10.7	10.3	8.5	6.7	3.1	2.5	5.5
<i>mean</i>	4.6	4.8	6.1	7.9	10.4	13.2	14.9	14.6	12.6	10.1	6.4	5.4	9.3
<i>absolute max.</i>	13.8	15.0	19.7	23.7	25.7	31.2	30.8	29.3	24.5	22.3	17.5	15.3	31.2
<i>absolute min.</i>	-14.6	-10.5	-10.5	-4.6	-2.2	-0.3	3.1	1.2	-1.0	-3.4	-7.2	-9.4	-14.6
<i>mean no. of days with air frost</i>	9.0	7.7	7.0	4.2	1.0	0.1	0.0	0.0	0.3	1.5	7.1	7.8	45.7
<i>mean no. of days with ground frost</i>	17.0	15.1	13.6	11.8	6.1	1.2	0.1	0.2	2.0	4.9	13.0	15.0	99.9

**RELATIVE HUMIDITY (%)**

<i>mean at 0900UTC</i>	90	89	87	82	77	78	80	84	86	89	90	90	85
<i>mean at 1500UTC</i>	83	76	71	65	64	66	67	68	71	76	80	84	73

**SUNSHINE (hours)**

<http://www.met.ie/climate/birr.asp>

15/10/2010

**APPENDIX II**  
**WASTE ACCEPTANCE PROCEDURE**

## Kyletalesha Landfill W0026-3

Licence condition 5.2.1

Waste acceptance and Characterisation procedure:

### **Commercial Contractors:**

As of the end of June all existing commercial contractors received a letter from Laois County Council asking them for the following information: All new contractors will have to supply this information prior to using the Landfill.

- Name of company
- Name of site(S) , licence / permit number
- Type of waste
- How they are going to comply with the new Limit on acceptance of biodegradable municipal waste. (what treatment they carry out as all waste must be pre treated,)
- What municipal waste stream they classify their waste under.

All this information for each Contractor is then pre loaded on to our system and once they swipe their keyfob it shows up on our data base in the weighbridge.

If the contractor only supplies one type of waste from one facility then all information is accepted and the operator will weigh the vehicle, and our system automatically assigns the BMW content, and treatment type associated with that load

If the contractor has a number of sites and a number of waste streams then the operator must initially insert the site reference and then the waste type. Once this is inserted it will automatically assign the preloaded BMW content and the treatment type associated with that Load

The system also records

- EWC code
- Date
- Time
- Initial weight
- Final weight
- Amount charged
- Vehicle Registration

## **Accepting waste on site:**

### **Commercial:**

All commercial Customers use a pre credited fob system

All fobs are pre assigned the information as outlined above.

When commercial customer arrives on site he will call to the weighbridge with his documentation outlining where the waste is from, type of waste and its EWC code.

Weighbridge operator checks paperwork and agrees to either accept or reject the load of waste

If accepted then the Customer will proceed to swipe his fob, all information on the fob will appear on the system in the weighbridge.

The customer will proceed onto the weighbridge to be weighed

The weighbridge operator will periodically check loads of waste, to confirm it matches documentation.

The commercial customer then proceeds to the tipping area to tip the waste, at this stage all waste is checked by our Banks Man and can still be rejected.

The commercial customer then returns to the weighbridge and weigh out, where he receives a receipt showing Date, weight & amount paid

### **Domestic Customers:**

All domestic customers use the pre paid fob system.

A Minimum credit of €15.00 must be on all fobs prior to access.

All their information is pre assigned to the fob.

All domestic customers must pre treat their waste.

All recyclable material must be deposited at the civic amenity site.

All biodegradable municipal waste must be stored in a Laois county compostable bin bag and disposed at the civic amenity site.

All waste going to the Landfill has now been subjected to the three bin separation process and therefore categorised as the 3 bin residual waste with a BMW content of 0.47.

When accepting hedge trimmings trailers/cars must be checked and confirmed that there are hedge trimmings only. These should be then directed to the compost area at the back of the main office.

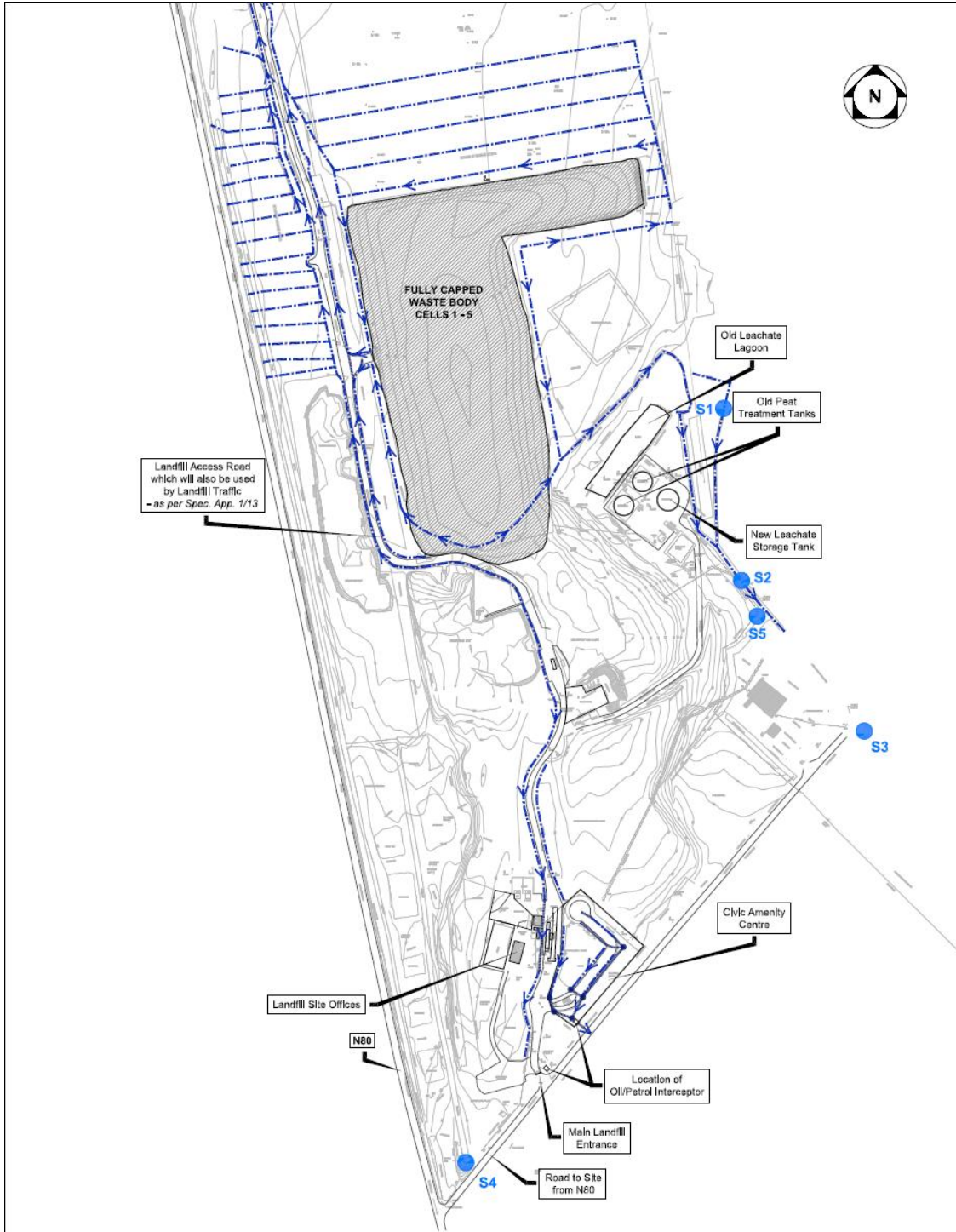
When accepting material as cover material (i.e. builders rubble, clay, stone etc) each load must be checked and confirm that it contains only cover material. Note: Gypsum is not accepted at the landfill.

EWC code is assigned once the waste type has been confirmed

## **APPENDIX III**

### **SITE PLAN**





Landfill Access Road which will also be used by Landfill Traffic - as per Spec. App. 1/13

- NOTES**
1. This drawing is the property of RPS. It is a confidential document and must not be copied, used, or its content divulged without prior written consent.
  2. All Levels refer to Ordnance Survey Datum, Mean High.
  3. DO NOT SCALE, use figured dimensions only. If in doubt ask.

● Surface Water Monitoring Points


No.	Date	Amendment / Issue	App
A01	11.04.20	Issue for Approval	

**RPS**

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 Camille de Chirose Lacroix  
 LAOIS COUNTY COUNCIL  
 Áras an Chiontae,  
 Portlaoise, Co. Laois

**Project**

KYLETALESHA  
 LANDFILL

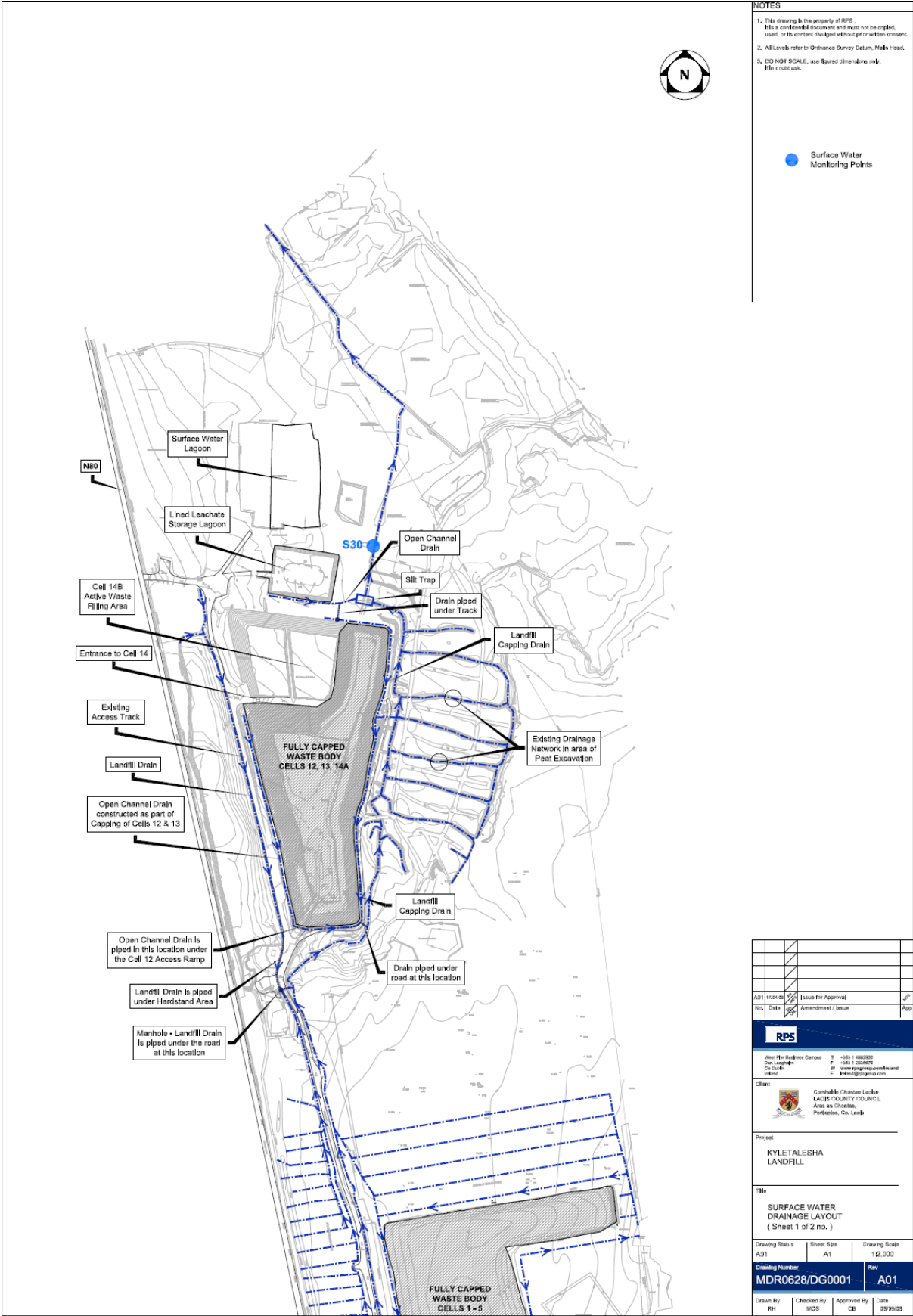
**Title**

SURFACE WATER  
 DRAINAGE LAYOUT  
 ( Sheet 2 of 2 no. )

Drawing Status	Sheet Size	Drawing Scale
A01	A1	1:2,000

**Drawing Number** MDR0615/DG0402 **Rev** A01

Drawn By	Checked By	Approved By	Date
RH	MD'S	MD'S	17/04/20



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- Surface Water Monitoring Points

AD	17/04/09	Issue for Approval	
No.		Amendment / Issue	App
<b>RPS</b>			
West Hill Business Campus Dea Lodge Clonsilla Ireland		T +353 1 4822000 F +353 1 2825272 W www.rpsgroup.com/ireland E info@rpsgroup.com	
Client: <b>County Wick</b> Lough Currane Lough Area an Chaitin, Portlaoise, Co. Wick			
Project: <b>KYLETALESHA LANDFILL</b>			
Title: <b>SURFACE WATER DRAINAGE LAYOUT (Sheet 1 of 2 no.)</b>			
Crawing Status A01	Sheet Size A1	Crawing Scale 1:2,000	
Crawing Number <b>MDR0628/DG0001</b>	Rev <b>A01</b>		
Drawn By RH	Checked By MDE	Approved By CB	Date 08/26/09

MDR0628/DG0001 - DRAINAGE SURVEILLANCE



**APPENDIX IV**  
**FINAL LANDFILL TOPOGRAPHICAL DRAWING**



Final Contours (Waste Licence)

Proposed Final Contours



NOTES  
 1. The contours shown on this plan are based on the data provided in the site investigation report and are not to be used for any other purpose.  
 2. The contours shown on this plan are not to be used for any other purpose.  
 3. The contours shown on this plan are not to be used for any other purpose.

Rev	Description	Date
1	As Issued	

Project: KYLETALESHA LEACHATE DESIGN & REMEDIATION

Final Contours (Waste Licence) & Proposed Final Contours

Drawn By	Checked By	Date	Scale
Fig. 1.2			

**APPENDIX V**  
**EMERGENCY CONTACT INFORMATION**

**Emergency**

<b>Name</b>	<b>Address</b>	<b>Telephone Number</b>
Landfill Manager	Kyletalesha, Portlaoise, Co. Laois	(057) 862 0653
Senior Engineer	Mr. John O'Donoghue	(057) 867 4318
Portlaoise Hospital	Midland Regional Hospital, Dublin Road, Portlaoise, Co. Laois	(057) 862 1364
Fire Services	Portlaoise Fire Station	999
Ambulance	Ambulance Control Centre Portlaoise Co. Laois.	• (057) 862 1364 999
Garda Station	Portlaoise Garda Station	(057) 862 1105 999
Electric Company	Electricity Supply Board	1850 372 999
Water Services	Laois Co. Co., County Offices, Portlaoise, Co. Laois	(057) 867 4365
Health and Safety Authority	James Joyce Street, Dublin 1	(01) 614 7000
Environmental Protection Agency	Seville Lodge Callan Road Kilkenny	(056) 779 6700
Eastern Regional Fisheries Board	15a Main Street Blackrock. Dublin	(01) 278 7022

# **Appendix IX:**

## **Accident prevention policy**



**ACCIDENT PREVENTION  
POLICY FOR  
KYLETALESHA LANDFILL  
(WASTE LICENCE NO. W0026-03)**

**Prepared for:  
LAOIS COUNTY COUNCIL  
ÁRAS AN CHONTAE  
PORTLAOISE CO. LAOIS**

**Prepared By:**

---

**John Rea, B.Sc.  
Project Manager**

**Reviewed By:**



---

**Ted Taylor, P.Eng.  
Project Manager**



**506145  
March 18, 2011**

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A: Kyletalesha Landfill Management Structure	2
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## APPENDICES

- I Emergency Contact Information
- II Proposed Site Safety Checklist Form

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## INTRODUCTION

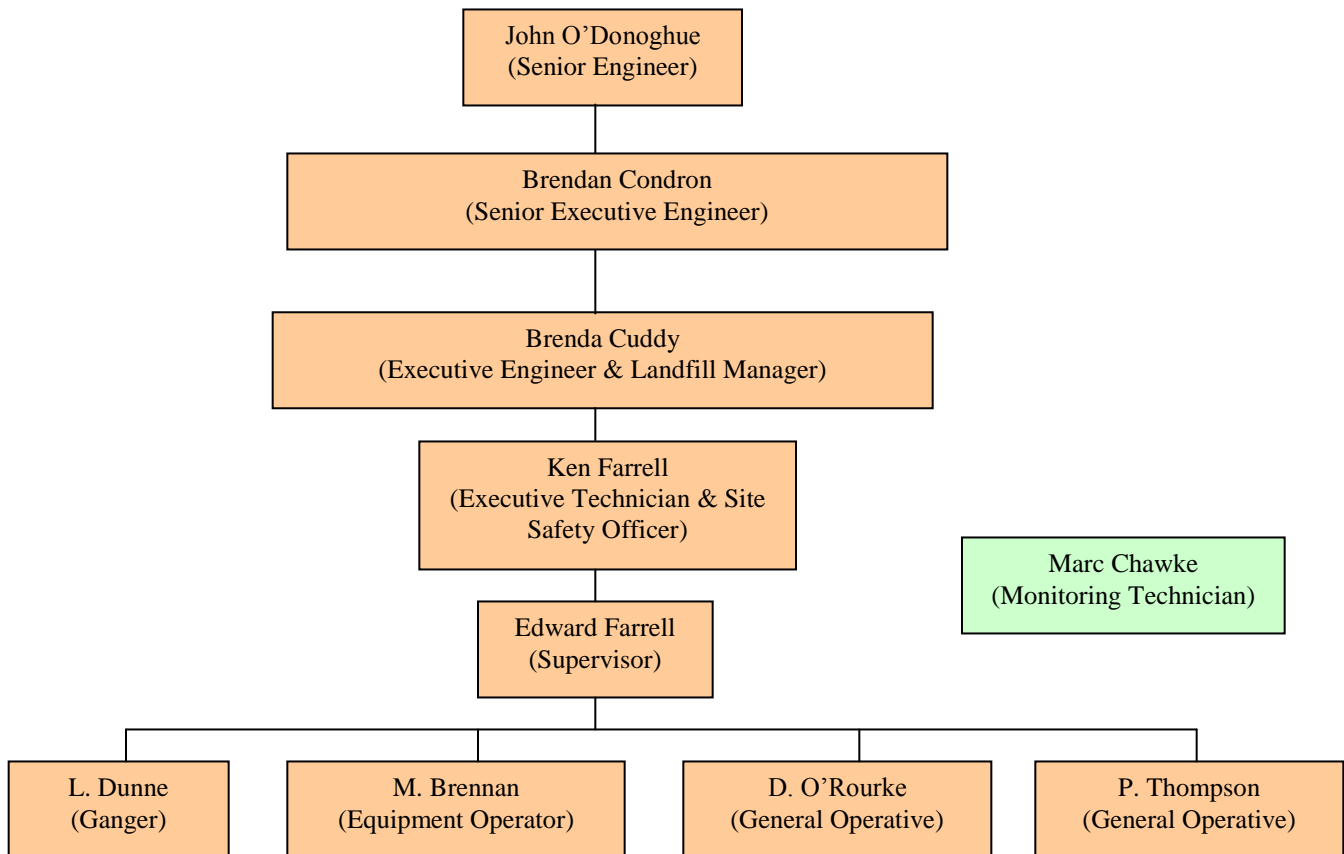
Laois County Council (Laois) has completed an accident prevention policy (APP) in compliance with section 9.5 of EPA waste licence No. W0026-03 (waste licence). The APP is designed to address on-site hazards at the landfill and to assess the controls on site for the mitigation and prevention of accidents that could result in negative impacts to the health of, or cause injury to: site operatives; contractors; and/or members of the public and/or may have an impact on the local environment. As part of the APP preparation a site walkover and interviews with all site operatives was completed on September 9, 2010. The APP has been prepared with reference to Section 8 of the EPA Landfill Manual – Landfill Operational Practices (4/500/97) and relevant National and European Union (EU) safety legislation, including:

- Safety, Health and Welfare at Work Act 2005;
- Safety, Health and Welfare at Work (General Application) Regulations 2007 (S.I. No. 732 of 2007);
- The Occupiers Liability Act 1995;
- Safety, Health and Welfare at Work (Signs) Regulations 1995 (S.I. No )32/1995);
- 1989 EU Framework Directive "The 9 Principles of Prevention"; and
- The Road traffic Act 2006.

## Site management

The management structure for the landfill site is provided in Figure A.

**FIGURE A: Kyletalesha Landfill Management Structure**



Site Management will ensure that environmental health and safety measures at the site are implemented and managed by:

- Identification of hazards on site and assessing the risks associated with identified hazards;
- Minimization, mitigation and/or elimination of identified hazards where practicable;
- Provide resources and facilities to ensure that any accidents are minimised, mitigated or eliminated;
- Revision and updating of the accident prevention policy to reflect changes in site conditions, where required;

- Ensure that a copy of the accident prevention policy is available to all members of staff and is relayed to contractors entering the site;
- Ongoing monitoring of the program to ensure proper implementation; and
- Reporting of the success/failure of the program to appropriate authorities.

### ***Site Safety Officer***

The executive technician is the designated site safety officer (SSO) and will ensure that all staff and persons using the landfill and civic waste site conduct themselves, and work in a manner that is protective of Laois staff, contractors, the public and the environment. In addition to their responsibility to protect the overall general health and safety of all personnel working at and visitors to the site, the SSO will also be responsible for ensuring the following:

- All site staff, as well any new staff, are provided with appropriate instruction and training with respect to Health & Safety;
- The APP and Emergency Response Plan is posted in a conspicuous location on-site;
- All site personnel and contractors are following the procedures laid out in the previously referenced documents;
- Routine inspections with respect to Health & Safety are carried out and documented;
- Incident reports are prepared with follow-up action as necessary;
- Results of the APP are relayed to site management;
- Daily inspections of areas of secondary containment provide at the Civic Amenity Site; and
- Plans are updated as necessary.

## Site Accident Prevention Policy

Laois will ensure that all site operations will be completed with a high regard for accident prevention. The safety and welfare of site operatives, commercial contractors, members of the public and environmental protection is a priority at the site. The Safety, Health and Welfare at Work Act, 2005 places requirements on employers to provide a safe work environment. There are also requirements for employees to take reasonable care of their own safety, and co-operate with the employer when implementing required safety measures. The measures to be taken by Laois and the site operatives are outlined below:

Laois is committed to providing a safe work environment for all workers on site by:

- Providing safe work equipment and material storage;
- Ensuring that employees are made aware of potential hazards at work;
- Controlling and mitigating identified hazards at work through regular consultation with site staff;
- Ensuring that all employees have appropriate training for operating site equipment or handling controlled substances;
- Providing and maintaining suitable personal and protective equipment on-site;
- Preparing, posting and updating (as necessary) emergency response plans;
- Providing adequate welfare facilities and first aid kits for staff on-site; and
- Confirming that site staff has access to tetanus immunization and boosters while working at the landfill.

Employees are required to:

- Take reasonable care of their own safety and the safety of other employees and take due care for possible environmental impacts associated with their activities;

- Comply with all workplace safety measures;
- Where necessary, wear personal protective equipment and clothing;
- Attend all safety & environmental training provided by Laois;
- Report to their immediate supervisor, any equipment defects, spillages or potential hazard that could result in injury or an environmental impact;
- Use all work equipment or personal protective equipment as instructed and for the proper uses;
- Prevent taking unnecessary risks or work in an unsafe way;
- Not work while under the influence of alcohol or narcotics;
- Obey all hazard warning signs and notices;
- Notify the supervisor of any accidents or other incidents resulting in potential health and safety or environmental impact; and
- Notify supervisor of any illness or problem that may increase the level of risk of any work operation.



## Staff Training

Laois ensures that all site staff (full and part-time) are mature individuals that have the required internal and external training, work experience and/or qualifications required to complete their tasks. All County employees have completed an internal health and safety programme at County Hall at the start of their employment that outlines the general potential hazards of working on various council projects. All operatives at the landfill site hold Safepass certification.

Laois have an internal safety statement document that outlines the procedures for completing general tasks on behalf of the council. All County staff are required to read the safety statement and attend internal training on safety in the work place.

Landfill specific site training, including instruction on site operations and emergency response procedures will be provided for new employees, followed (if deemed necessary) by a period of mentorship and supervision. Training will take account of the workplace hazards and the potential risks associated with waste management facilities. The main instances where there may be a need for training have been identified as the following:

- Recruitment of new employees;
- Change in job description that results in different hazards that an employee may be exposed to in their daily work;
- A change of site equipment or the introduction of new equipment or technology;
- Change to list of acceptable household hazardous waste products at the site; and
- Changes in safety or environmental legislation that may require new information to be imparted to site staff.

The training program should include, but not be limited to: identification of all landfill and on-site waste management related hazards and risks to health and safety as well as the environment, personal protective equipment and procedures, highlights of the Health & Safety Plan (i.e., the APP), as well as the Emergency Response Plan in the case of accidents, fire, spills or other emergencies.

## SITE OPERATIONS

A number of operations take place at the Kyletalesha landfill site that could potentially result in site accidents with impacts on individuals or the environment. Laois recognizes that aspects of the following site operations could result in accidents that could have health and safety or environmental impacts:

- Commercial waste haulage vehicles using the site;
- Small vehicles used by private residents to deliver their waste and recyclable materials to the site;
- Servicing of civic amenity site (non-landfill waste operations) by private contractor;
- Storage of waste material on site;
- Operation and maintenance of landfill and other waste management facility equipment;
- Operation of construction equipment, as required on-site for ongoing site development;
- By-products of waste (leachate and landfill gas) and the operation and servicing of their associated control systems (i.e., confined space entry); and
- Movements of site staff over sections of the landfill pose a tripping hazard and injury as a result of uneven surface and a variety of potentially exposed waste types.

## Civic Amenity Site

A number of health and safety issues exist for the Civic Amenity (CA) site that may have the potential for injury or impact to the environment, although the risk for such impacts is considered to be low.

### ***Paper/Cardboard Compactors***

A number of compactor systems are provided in the CA site for members of the public to dispose of paper and cardboard for recycling. The chamber to the compactor is open to allow the deposit of materials. To prevent any accident or injury, the keys to operate the compactors are removed and held by the site operatives. Also, sensors on the compactor doors prevent operation of the compactor system while the door is open thus preventing potential injury to site operatives of members of the public.

### ***Waste Oil Storage***

A double walled above ground tank for the storage of waste oil is located in the CA site and is used by members of the public for the disposal of waste oil. Secondary containment is provided in this area to prevent any loss of waste oil to the environment, by surrounding the tank with a watertight bund area. The bund is a minimum 110% capacity of the waste oil tank and in the unlikely event of the tank failure or rupture, all contents of the tank would be contained within the bund.

The surface of the CA site is hard standing which will prevent migration of any contaminants from the site to underlying soils or groundwater. All areas are sloped to storm water drains that are directed to the on-site oil water separator.

### ***Material Spillages***

In addition to waste oil, a number of household hazardous waste materials are accepted and stored at the CA site, including; paints, solvents, bleaches and household cleaners. As with the waste oil area, secondary containment has also been provided to prevent potential spills from causing environmental impacts. To this end all household hazardous wastes are stored in a bunded and covered area and any spills would be cleaned up using the on-site spill kits with

reference to section 9.5 of this document. The condition of the bund areas are observed daily by the site operatives to ensure their integrity.

Material Safety Data Sheets (MSDS) for household hazardous wastes accepted at the CA site are held by Greenstar Recycling (waste handling company). Laois will request MSDS from Greenstar for household hazardous wastes handled at the site and hold details on file in the site office.

### ***Fires***

The highest risk areas for fire at the CA site include the cardboard and paper compactors and oil and HHW storage areas, however, the potential for fire is considered low. A fire extinguisher is situated in the CA site office in the event of a small fire. If a larger fire were to take place then the site operative would call the fire brigade on 999 (see section Appendix I for emergency contact information). Water hydrant connections are located at the road side of the CA site to provide water for fire suppression. Any fire water run-off would be collected by the site surface water collection system and directed to the site oil/water separator.

Flammable materials are removed from site on a regular basis to avoid storage of large volumes of material. All flammable materials are isolated in individual receptacles in order to minimise the spread of fire should one occur.

### ***Public and Service Vehicles***

Members of the public enter the CA site by private vehicle to deposit recyclables and wastes not accepted in the landfill. To provide a safe traffic area, a speed limit is enforced on site. A one way traffic system with signage results in vehicles moving around the site while avoiding reversing, which minimizes the potential for accidents that could damage site property and/or injure site personnel or other members of the public. Trained site personnel are present at the site to aid members of the public with disposal of materials to the appropriate receptacles. The deposit area is physically delineated from the site service yard and storage areas to limit access to site personnel only.

All service vehicles collecting materials from the CA site are directed to the service yard. The

service vehicles are kept separated from members of the public at all times to avoid potential accidents. During changeover of compactor containers, the CA site is temporarily closed while the full waste containers are removed and empty containers are put in place.

landfill

Although the potential for accidents to occur at the landfill site relating to waste disposal operations are considered to be low, due to the controls in place at the site, potential concerns are outlined below.

### ***Site Equipment/Vehicle Operation***

The transports of waste on the site as well as the site equipment operation have the potential to cause accidents. Below are the main areas of site operation that could cause potential accidents.

#### ***Fuel Storage***

There is no fuel storage on site, therefore all fuel for site machinery is transported onto site as needed by a fuel contractor. All fuelling of site equipment is completed under supervision of the equipment operator to ensure no overflow of fuel occurs. In the event of a fuel spillage the site spill procedure outlined in Section 9.5 will be followed. There is no designated area for refuelling vehicles on site. Vehicle refuelling is typically completed away from site work areas (e.g., working face or tipping areas). If vehicles cannot be removed from the works area (e.g., compactor) then all site operations are suspended in that area while re-fuelling is being completed to reduce risks from vehicle impacts. All fuel trucks are equipped with back-up warning sounds. When truck drivers exit their cab to refuel site vehicles, they must only exit when instructed to do so by the site vehicle operator. All fuel delivery drivers exiting their cabs on site must wear appropriate PPE, including a high visibility jacket and steel toed boots.

Fuel deliveries are constantly monitored by the delivery driver to ensure that vehicle tanks are not over filled and cause spillage. Only when the refuelling truck has pulled away should the site vehicles move, this will avoid site vehicles moving from the refuelling area with a hose still attached resulting in a fuel spillage.

#### ***Waste Trucks Entering Site***

All commercial waste trucks entering the landfill site are weighed on the site weighbridge and then directed to the landfill working face. All trucks must observe the on-site speed limit and avoid excess speed on site. Drivers observed speeding on site will be reprimanded by the landfill site manager. Following two warnings, that driver may be suspended or banned from delivering

to the landfill.

When a truck arrives at the landfill working face, all compaction and waste moving equipment in the immediate vicinity of the working face is powered down. The truck is directed to the disposal area by the on-site banksman who ensures that the truck unloads in the designated area of the landfill working face. All trucks are to be equipped with back-up warning sounds. When truck drivers exit their cab to open the tail board of the truck, they must only exit when instructed to do so by the banksman. All drivers exiting their cabs on site must wear a high visibility jacket and steel toed boots.

Only when a truck has pulled away from the working face should the compaction and waste moving equipment be powered up and operated. The site operations are restricted to daylight hours only to avoid potential risks associated with working in dark conditions.

#### *Bulldozer Operation*

A bulldozer operates at the working face of the landfill to spread layers of waste prior to compaction. To ensure that individuals working at the landfill face are not injured, the bulldozer is turned off during waste load ejection to the cell. The equipment is not started up again until the truck driver has vacated the area and the banksman is clearly visible to the operator, and is clear of the work area. All persons working in the vicinity of the bulldozer must wear the appropriate PPE to ensure that they are visible to the equipment operator. All site equipment is equipped with a back-up alarm to alert site operatives and other site equipment workers when a site vehicle is reversing and avoid potential impacts.

#### *Waste Compaction*

Waste compaction equipment operating at the working face of the landfill has the potential to injure site personnel, truck drivers and to damage waste cell containment systems (e.g., tear a liner).

To ensure that individuals working at the landfill face are not injured, the compactor equipment is turned off during waste load ejection to the cell. The equipment is not started up again until the truck driver has vacated the area and the banksman is clearly visible from the compactor cab and

is clear of the work area. All persons working in the vicinity of the compactor must wear the appropriate PPE to ensure that they are visible to equipment operators.

Care is taken by the compactor operator when compacting the initial layers of waste in newly completed waste cells to ensure that there is no damage to the containment liner. The waste acceptance procedures state that all loads of waste be visibly inspected for materials that may not be suitable for disposal to the landfill. Similarly, during the initial compaction of waste layers, any material that may cause damage to the cell liner (e.g., long metal bars) when compacted are removed prior to waste compaction. The compactor and bulldozer will not typically be operated at the same time within the cell, avoiding potential collisions.

### *Equipment Fires*

Laos operate a number of different types of equipment on site that have the potential to catch fire. The risk of fire from the site equipment is considered very low but a plan for the unlikely occurrence has been included. All site machinery have emergency shut off switches and fire extinguishers located inside the cab, however, if a larger fire were to take place then the site operative would call the fire brigade on 999 (see section Appendix I for emergency contact information). A fire water collection pond is located to the north of the site if water for fire suppression is required.

It is considered that most equipment fires would be small and localized and not result in environmental impact.

## ***Landfill Operations***

### *Leachate*

All completed and newly constructed waste cells within the landfill have a leachate collection and management system that conveys leachate to the site leachate collection lagoon. The leachate management system at the landfill is continually monitored to ensure that any failure of the system is detected and repaired as soon as possible. The system is connected to a supervisory control and data acquisition (SCADA) system that alerts the site executive technician (or designate) by text message of any failure in the system. Any failure in the system (e.g., seal or



pump failures) is reported automatically to the landfill site management and repairs to the system are completed as soon as possible to avoid build-up of leachate in the cell.

The landfill design incorporates leachate collection facilities using internal and perimeter drains to direct leachate and leachate contaminated surface water to the on-site leachate lagoon.

Visual checks of the landfill areas and site slopes are completed to determine if leachate seeps are observed as this would indicate that lateral migration of leachate from the fill area is occurring and may represent a failure within the leachate collection system. Similarly, groundwater monitoring wells in the vicinity of waste deposition areas are monitored and sampled on a quarterly basis to assess groundwater quality and assess vertical and lateral migration of leachate.

#### Confined Space and Restricted Access Areas

Manholes and pumping stations associated with the leachate management system will be fitted with warning signs of hazards associated with their entry. No site personnel or contractors will enter a confined space without appropriate training. A written confined space entry method statement will be prepared by any person prior to entering a confined space (i.e., entry into sumps or manholes) on site. A buddy system and contingency plan should be employed as part of the method statement to ensure that persons entering a confined space can be safely extracted if they experience difficulties.

#### Leachate Lagoon Access

Access to the leachate lagoon is restricted to authorized personnel only. The lagoon area is surround by a 2 m high chainlink fence and locked gate. The gate is only unlocked to allow entry of tanker trucks for the removal of leachate to the waste water treatment plant in Portlaoise. The lagoon is covered with a high density plastic cover to limit rainfall infiltration and also will act as a barrier to prevent any person that may fall into the lagoon from submerging. A lifebouy is located at the edge of the lagoon in the event that a person may require assistance in exiting the lagoon area in the unlikely event that they may fall in.

## Non-Engineered Landfill Areas

The older areas of the landfill (i.e., cells 1 to 5) were developed without the incorporation of site containment or leachate management systems. In recent years Laois began a retro-installation of a leachate collection system on all historical areas of the landfill to collect and store (in the covered leachate lagoon) leachate, prior to off-site transport and disposal at the waste water treatment facility in Portlaoise. The on-going management of leachate, and site monitoring ensures that controls are in place to minimise the migration of leachate from the waste to the environment.

## Engineered Landfill Areas

The containment lining system of each engineered waste cell (i.e., cells 12, 13 and 14) consists of a 1.0 m thick engineered clay liner overlain by a 2 mm thick high density polyethylene (HDPE) flexible membrane liner (FML) and a protective geotextile. The engineered clay liner material is tested for shear strength, density and moisture content prior to being approved for installation in the cell. A 500 mm thick aggregate leachate drainage layer (i.e., 20 mm to 40 mm gravel) is installed across the basal area of the cell where leachate collection pipework is installed that is directed to a purpose built leachate collection chamber.

The cell design ensures the minimal potential for the migration of leachate from engineered cells and minimal impact on the environment. The leachate extraction system reduces the build up of leachate head within the landfill and allows for appropriate collection, storage, transport and off-site disposal.

## Groundwater and Surface Water Quality

Sampling programmes completed on site as part of the waste licence compliance requirements indicate that there is no negative impact on the surface water and groundwater quality in the vicinity of the landfill. The low environmental impacts from leachate production indicate that the preventative measures and controls in place on site are currently effective.

The chemical parameters, sampling and monitoring locations and frequency of sampling is outlined in Schedule D of the site waste licence. To the present date, the quality of surface water

and groundwater has been in compliance with the appropriate regulations and the site does not currently have set trigger levels for groundwater and surface water quality as part of a contingency action plan. In the event that a chemical parameter may cause significant environmental impacts, the results will be forwarded to the EPA within 24 hours of receipt of the result as part of an incident report procedure. As part of the incident management, an action plan will be developed between Laois and the EPA to contain and manage the impacts.

### *Landfill Gas*

The main identified impacts from landfill gas include; migration of toxic and greenhouse gas emissions to the environment and combustion of gas within the landfill causing fire. Landfill gas can also accumulate in structures and cause oxygen depleted environments that are a hazard to site workers. To prevent issues from uncontrolled gas migration from the landfill or gas build up within the landfill, Laois have installed a landfill gas collection and flaring system.

A landfill gas collection system was constructed in completed waste cells by drilling to a depth of approximately 10 m using a 600 mm auger. Perforated HDPE pipes of 160 mm diameter were placed in the borehole and backfilled with a suitable pea gravel material. The top of the well consists of a 160 mm solid HDPE pipe which is connected to a well head. The boreholes were sealed with a bentonite material to prevent passive venting of landfill gas around the annulus. Each well head is connected to the main gas line using a 125 mm solid HDPE pipe.

In accordance with condition 3.14.1 of the waste licence, infrastructure for the collection and flaring of landfill gas from cells 1 to 5 (un-lined) and cells 12 , 13 ,14 (engineered lined cells) have been installed. Laois currently monitors landfill gas at 16 monitoring locations on a monthly basis around the perimeter of the landfill. The monitoring locations are positioned both inside and outside the landfill cells to ensure that gas concentrations are within acceptable limits.

All site buildings are equipped with landfill gas detectors, (i.e., methane, CO<sub>2</sub> and CO) to assess landfill gas concentrations within site buildings and protect site operatives. If excessive concentrations of landfill gas are determined in site buildings consideration will be given to subsurface passive venting that can be converted to an active venting system if necessary.

### *Landfill Fires*

The ongoing extraction and management of landfill gas from all areas of the landfill ensures that the potential for a landfill explosion is minimal. The landfill gas extraction system is balanced on a weekly basis to prevent excessive oxygen intrusion from overdrawing any area and creating a potential fire hazard.

### Gas Flaring Equipment Failure

All waste cells are incorporated in the landfill gas collection and management system which is designed to transport landfill gas to the site's gas flaring system. The landfill gas management system at the landfill is being continually monitored to ensure that any failure of the system is detected and repaired as soon as possible. The system is connected to a SCADA system that alerts the site executive technician (or designate) by text message of any failure in the system. Any failure in the system is reported automatically to the landfill site management and repairs to the system are completed as soon as possible to avoid uncontrolled venting or build-up of landfill gas on site.

A preventative maintenance programme is completed on the landfill gas flaring system whereby the system is checked and balanced on a monthly basis to reduce instances of equipment failure.

### ***Slope Stability***

An annual topographical survey is completed on the landfill site to determine the waste cell elevations and to assess the waste cell slope gradients. To assess the slope stability, comparison of each annual survey is compared to previous survey results to determine the stability of slopes on site. Any slopes that are deemed to be subject to slippage will be immediately subject to remedial work under the supervision of a qualified engineer.

### ***Stormwater Management***

The main stormwater pond on site is located in the northern section of the site and is far removed from all site operations. Even though the pond is far removed from all site activities and would permit egress for an adult if they had entered or slipped, it is unfenced and consideration will be given to erecting a safety notice board to warn of dangers and/or installing a lifebuoy at the pond bank in case of an emergency.

## Contingency and Mitigation Measures

In cases where potential incidents could occur that might result in injury or environmental impacts, Laois have measures in place to minimise potential impacts.

### ***Personal Protective Equipment***

All persons entering the landfill area must wear appropriate personal protective equipment (PPE) consisting of at a minimum, a high visibility vest and steel toed safety boots. Additional PPE is required to complete certain tasks on site, including:

- Hearing protection when working in the vicinity of noisy equipment;
- Protective gloves for manual handling and manual activities (e.g., use of shovels, sweeping brushes etc.);
- Hard hats in areas where the potential for falling objects or for objects to become airborne is elevated (i.e., working closely around site equipment or working beneath a raised platform;
- Eye protection in circumstances where a potential for airborne material to affect eyes is encountered (i.e., dusty conditions); and
- Respiratory protective equipment (e.g., dust masks or HEPA filter masks) when there is a potential for exposure to dusts or other airborne contaminants that may affect breathing.

If a truck driver delivering waste material to the landfill site or servicing the civic amenity site, has to exit their cab, they must as a minimum be wearing a high visibility vest and steel toe capped boots.

Laois have PPE available at the site office for all site operatives, it is the responsibility of site operatives to request the PPE they require prior to completing a task on site. The site Landfill manager will complete informal site safety inspections on a weekly basis with a monthly formal inspection to document site safety measures at the landfill and civic amenity site.

### ***Signage***

Signage is in place on various areas of the site to control site traffic flow and speed and to

prevent mixing of incompatible waste materials. Areas within the CA site have specific signage outlining the types of materials to be deposited to each individual receptacle to reduce instances of mixing non-compatible wastes.

In the event of an emergency the site emergency assembly locations are identified with appropriate signage.

### ***Equipment Operations***

All persons operating in the vicinity of site equipment must wear appropriate personal protective equipment (PPE) to make themselves visible.

### ***Contingency in the Case of Equipment Failure***

The site equipment used for transport, spreading and compaction of waste material is rented from a heavy equipment hire company (Laois Hire). In the event that a piece of equipment is damaged or non-operational, it is the responsibility of the hire company to replace the equipment as soon as possible.

The landfill gas and leachate pumping and flare systems are connected to a SCADA system whereby any issue is reported through a text messaging system to the site executive technician or designate. The response time for a site representative to be on site dealing with the issue is 60 minutes. A preventative maintenance programme is in place for the landfill gas flare whereby it is balanced on a monthly basis which greatly reduces the number of downtime incidents.

### ***Contingency for Environmental Impacts Noted During Site Monitoring***

Environmental technicians completing environmental site monitoring will note any observed impacts at the site. Impacts will be noted by the technicians and the information relayed to the site executive technician or landfill manager. Significant impacts will become a site incident and be reported directly to the EPA. Contingency measures put in place will be dependant on the impacts noted and may include, use of absorbent booms for surface water protection (impacts on surface water), re-balancing of the gas extraction and/or flare system (odours and/or elevated

landfill gas emissions), application of intermediate cover in areas of windblown litter etc. Any contingency measures will be included on the incident report forwarded to the EPA for their approval prior to implementation.

## Emergency Response

### ***Emergency Telephone Numbers:***

All emergency contact numbers are provided in Appendix I.

### ***Purpose and Responsibility***

The purpose of the emergency response procedure (ERP) is to address emergency situations and minimise potential impacts on the environment. The landfill manager is responsible for ensuring that site procedures are followed.

### ***Procedures***

The emergency response procedures are predicated by the types of emergency that may occur at this facility and are discussed individually below.

### ***Health and Safety***

In the event of any serious injury or health incidents to personnel on site the emergency number for the ambulance service is clearly posted adjacent to all telephones on site. The Landfill Manager and or Executive Technician will be notified of any incidents immediately and will assume charge in order to handle the emergency as swiftly and efficiently as possible. For minor injuries the number of the local doctor will be posted beside the telephone in the site office. In addition, first aid kits are available in the site offices. At least one member of staff will be trained in First Aid. Any accidents/injuries will be reported to the EPA and the Health & Safety Authority and an Incident Report prepared and submitted by the Site Safety Officer.

### ***Oil / Leachate Spill***

In the unlikely event of an oil/diesel or leachate spill from a tanker truck the following procedure will be followed:

- 10) The source of the spill will be closed off immediately if possible. The landfill manager or assistant manager will be notified immediately;



- 11) Shut off valves will be closed off where appropriate;
- 12) The liquid will be contained as far as is practicable by employing containment booms and absorbent mats and/or suitable absorbent material to contain and absorb any spillage at the facility. Suitable booms and mats are stored at the site office;
- 13) A waste oil tanker (or tankers) will be contracted immediately to pump any liquid spill;
- 14) The following authorities will be notified by telephone at the earliest opportunity, i.e., the EPA, Laois County Council and the Eastern Regional Fisheries Board;
- 15) All oil/leachate will be removed from the surface by either pumping or use of absorbent materials. All waste oils and materials will be disposed to an appropriate facility;
- 16) Once used the absorbent material shall be disposed of at an appropriate facility;
- 17) All staff will be informed as to the location and use of the absorbent materials and will be proficient in their use; and
- 18) All significant spills will be recorded on an Incident Report Form.

### ***Equipment Failure***

In the event of breakdown of essential equipment, back-up equipment will be available on site, or if required, will be hired from an alternative source. The break-down of any number of machines should not affect waste acceptance at the site. Equipment will be repaired as soon as possible.

### ***Fire***

The emergency telephone number for the fire brigade is clearly posted adjacent to all site telephones and is included in Appendix I. In the unlikely event of a fire the following procedure will be employed:

- 1) All staff will be evacuated from the site buildings or from the immediate area of the fire;
- 2) The fire brigade will be notified immediately;

- 3) The Landfill Manager will be informed immediately;
- 4) It may be possible for site staff to extinguish small fires using the fire extinguishers and fire hoses located throughout the facility. This procedure will be restricted to small fires only and the decision will be made by the Landfill Manger;
- 5) All incoming vehicles will be directed to an alternative facility and the site entrance kept clear of traffic and machinery;
- 6) The EPA, Laois County Council and the Eastern Regional Fisheries Board will be notified at the earliest opportunity;
- 7) All fires will be recorded on an Incident Report For; and
- 8) Slope Failure.

Slope stability assessments are completed annually to highlight and remedy areas of concern.

In the event of a slippage, the following measures will be taken:

- Evacuate all personnel from the proximity and prevent access;
- In the event of injury contact the emergency services;
- Halt all machinery operation;
- Congregate at Assembly Point;
- Damage to be assessed by Landfill Manager / Senior Engineer;
- Remedial action must be completed before access is permitted to affected area; and
- All slope failures will be recorded on an Incident Report Form.

## Actions

Laois are considering implementing an internal site safety assessment programme whereby the activities on site are observed and any unsafe activities are noted. The programme would be completed weekly on an informal basis and a formal record of site conditions completed monthly. The assessment results will be made available to the site operatives to ensure that constant improvement of site safety is maintained. An example of the site safety form is provided in Appendix II. Where an activity or operation is deemed to be a potentially high hazard to human health or the environment then mitigation measures will be implemented to eliminate, or reduce risk to the lowest practicable level.

Existing controls and site behaviour will be constantly assessed, reviewed and updated, to ensure that standards of health, safety and welfare in the workplace comply with legal requirements.

## General Conditions

This document contains the expression of the professional opinion of SNC-Lavalin International Limited (SNC-Lavalin) as to the matters set out herein, using its professional judgment and reasonable care. It is to be read in the context of the agreement dated August 20, 2010 (the “Agreement”) between SNC-Lavalin and Laois County Council (Client), and the methodology, procedures and techniques used, SNC-Lavalin’s assumptions, and the circumstances and constraints under which its mandate was performed. This document is written solely for the purpose stated in the Agreement, and for the sole and exclusive benefit of the Client, whose remedies are limited to those set out in the Agreement. This document is meant to be read as a whole, and sections or parts thereof should thus not be read or relied upon out of context.

SNC-Lavalin has, in completing the required services, followed methodology and procedures, and exercised due care consistent with the intended level of accuracy, using its professional judgment and reasonable care, and is thus of the opinion that there is a high probability that actual values will be consistent with the estimate(s). However, no warranty should be implied as to the accuracy of estimates. Unless expressly stated otherwise, assumptions, data and information supplied by, or gathered from other sources (including the Client, other consultants, testing laboratories and equipment suppliers, etc.) upon which SNC-Lavalin’s opinion as set out herein is based has not been verified by SNC-Lavalin; SNC-Lavalin makes no representation as to its accuracy and disclaims all liability with respect thereto.

To the extent permitted by law, SNC-Lavalin disclaims any liability to the Client and to third parties in respect of the publication, reference, quoting, or distribution of this report or any of its contents to and reliance thereon by any third party.

## APPENDIX I

### Emergency Contact Information

Name	Address	Telephone Number
Landfill Manager	Kyletalesha, Portlaoise, Co. Laois	(057) 862 0653
Senior Engineer	Mr. John O'Donoghue	(057) 867 4318
Portlaoise Hospital	Midland Regional Hospital, Dublin Road, Portlaoise, Co. Laois	(057) 862 1364
Fire Services	Portlaoise Fire Station	999
Ambulance	Ambulance Control Centre Portlaoise Co. Laois.	(057) 862 1364 999
Garda Station	Portlaoise Garda Station	(057) 862 1105 999
Electric Company	Electricity Supply Board	1850 372 999
Water Services	Laois Co. Co., County Offices, Portlaoise, Co. Laois	(057) 867 4365
Health and Safety Authority	James Joyce Street, Dublin 1	(01) 614 7000
Environmental Protection Agency	Seville Lodge Callan Road Kilkenny	(056) 779 6700
Eastern Regional Fisheries Board	15a Main Street, Blackrock. Dublin	(01) 278 7022

### Emergency Contact Information

**APPENDIX II**

**Proposed Site Safety Checklist Form**

Risk Assessed – Procedures, Work Area, Equipment and/or Tools	Potential Hazards	Low Risk	Medium Risk	High Risk
<b>GENERAL HAZARDS (Cont'd)</b>				
Lift-Twist or Strain Related Back Injury	• Back injury due to improper lifting technique	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Equipment / Hand Tool Inspection	• Injury or equipment / tool failure	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Housekeeping (Slip / Trip / Fall)	• Various injuries as a result of slip / trip / fall	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Cuts and Blisters	• Injury as a result of being cut using hand tools, sharp objects in soil samples, broken sample containers or other sharp objects	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Using Hand Tools	• Hand injury such as pinch, crush, cut knuckles while using hand tools	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Working at Height, Ascending and Descending Using a Ladder	• Injury due to personnel not being trained using elevated working platforms (EWP)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	• Falling from height (roof, canopy or equipment)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	• Injury due to improper use of step or extension ladders	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	• Objects falling from above	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Access	• Difficult terrain	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>POTENTIAL TRAFFIC HAZARDS</b>				
Work on Roadway or Areas with On-site Traffic	• Worker struck by vehicle/traffic	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Vehicle Operations	• Vehicle accidents	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	• Vehicle becomes stuck, requires a tow	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>ABOVE GROUND AND UNDERGROUND UTILITIES / STRUCTURES</b>				
Underground Utilities Related Hazards	• Injury or damage due to contact with underground utilities	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Overhead Utilities Related Hazards	• Injury or damage due to contact with overhead power lines and/or other utilities/structures	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>ELECTRICAL HAZARDS</b>				
Working with Electric Hand Tools	• Electrical shock while using power tools	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Isolating Electrical Components	• Injury due to contact with live electrical equipment	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>HEAVY EQUIPMENT OPERATIONS (General)</b>				
Heavy Equipment Operations	• Worker struck by machinery	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	• Injury to public entering work area	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	• Crush type injuries from dropped loads during lifting operations	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Risk Assessed – Procedures, Work Area, Equipment and/or Tools	Potential Hazards	Low Risk	Medium Risk	High Risk
	<ul style="list-style-type: none"> <li>Vehicle roll over due to over extending load or side slopes</li> </ul>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Heavy Equipment Related Environmental Concerns	<ul style="list-style-type: none"> <li>Discharge of hydraulic fluid or fuel to the environment as a result of equipment failure or accident</li> </ul>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>FUELING TRUCK OPERATIONS</b>				
Truck Position	<ul style="list-style-type: none"> <li>Potential contact with other site vehicles</li> </ul>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Refuelling Operations	<ul style="list-style-type: none"> <li>Fuel Contact with Operator</li> </ul>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	<ul style="list-style-type: none"> <li>Release of fuel to Environmental Receptor – Nozzle dislodge</li> </ul>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	<ul style="list-style-type: none"> <li>Spillage from Receiving Vehicle Moving before Re-fuelling completed</li> </ul>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>ENVIRONMENTAL DRILLING OPERATIONS</b>				
Drilling Operations	<ul style="list-style-type: none"> <li>Personnel injured by catastrophic failure of the rig</li> </ul>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	<ul style="list-style-type: none"> <li>Fire and/or explosion (equipment failure) during drilling operations</li> </ul>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	<ul style="list-style-type: none"> <li>Lift cable failure causing crush injury</li> </ul>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	<ul style="list-style-type: none"> <li>Drill stem or casing dropped causing crush type injuries</li> </ul>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	<ul style="list-style-type: none"> <li>Pinch injury when dealing with drill stem</li> </ul>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	<ul style="list-style-type: none"> <li>Injury to non-essential workers and/or entering drilling area</li> </ul>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	<ul style="list-style-type: none"> <li>Worker injured by impact from cobbles or other material being extruded from core barrel</li> </ul>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	<ul style="list-style-type: none"> <li>Clothing caught on rotating equipment</li> </ul>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Environmental Concerns	<ul style="list-style-type: none"> <li>Environmental impact from spilled wash water, or other contaminated water</li> </ul>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	<ul style="list-style-type: none"> <li>Discharge of contaminated soils to environment</li> </ul>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>DECONTAMINATION OF SITE EQUIPMENT</b>				
Decontamination Operations	<ul style="list-style-type: none"> <li>Burns from hot water or steam during decontamination</li> </ul>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	<ul style="list-style-type: none"> <li>Eye or facial injury from spray back from pressurized water to operator or near-by workers</li> </ul>	<input type="checkbox"/>		
	<ul style="list-style-type: none"> <li>Contaminants released to environment</li> </ul>	<input type="checkbox"/>		
<b>MONITORING, WATER SAMPLING,</b>				
Leachate Monitoring Wells	<ul style="list-style-type: none"> <li>Contact with contaminants in monitoring well</li> </ul>	<input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/>
Moving Purge Water Containers	<ul style="list-style-type: none"> <li>Back injury from lifting or moving buckets or containers full of water</li> </ul>	<input type="checkbox"/>		



Risk Assessed – Procedures, Work Area, Equipment and/or Tools	Potential Hazards	Low Risk	Medium Risk	High Risk
Monitor and Sample Groundwater Wells, and Hydraulic Conductivity Tests	<ul style="list-style-type: none"> <li>Contact with contaminants in monitoring well</li> </ul>	<input type="checkbox"/>		
<b>REMEDATION SYSTEMS OPERATION (Leachate &amp; Landfill Gas)</b>				
System Start Up	<ul style="list-style-type: none"> <li>Pressurization of equipment</li> </ul>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	<ul style="list-style-type: none"> <li>Rotating equipment</li> </ul>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	<ul style="list-style-type: none"> <li>Flame/burner ignition</li> </ul>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Operation	<ul style="list-style-type: none"> <li>Over pressurization of process equipment</li> </ul>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	<ul style="list-style-type: none"> <li>Over heating of process equipment</li> </ul>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	<ul style="list-style-type: none"> <li>Excessive noise from operating equipment</li> </ul>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Shut Down	<ul style="list-style-type: none"> <li>Improperly shut in equipment</li> </ul>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	<ul style="list-style-type: none"> <li>Pressure maintained in process equipment</li> </ul>	<input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>
	<ul style="list-style-type: none"> <li>Incomplete shut down of operating equipment</li> </ul>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Site Access	<ul style="list-style-type: none"> <li>Unauthorized access to site</li> </ul>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Environmental Concerns	<ul style="list-style-type: none"> <li>Leaking of process flow equipment</li> </ul>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>REMEDATION SYSTEMS MAINTENANCE</b>				
Electrical Lock Out	<ul style="list-style-type: none"> <li>Electrically energized equipment</li> </ul>	<input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>
Mechanical Lock Out	<ul style="list-style-type: none"> <li>Unintended equipment start up</li> </ul>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Process Flow Disconnection/Pressure Equalization	<ul style="list-style-type: none"> <li>Release of high-pressure fluids/gases</li> </ul>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Greasing and Adding/Changing Oil on Equipment	<ul style="list-style-type: none"> <li>Contact with oil and/or grease</li> </ul>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>REMEDATION SYSTEMS MAINTENANCE (Cont'd)</b>				
System Troubleshooting	<ul style="list-style-type: none"> <li>Improper adjustment of system</li> </ul>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Excavation/Trenching	<ul style="list-style-type: none"> <li>Open excavation</li> </ul>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Piping Installation	<ul style="list-style-type: none"> <li>Connection of piping in trench</li> </ul>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	<ul style="list-style-type: none"> <li>Pressure testing</li> </ul>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Risk Assessed – Procedures, Work Area, Equipment and/or Tools	Potential Hazards	Low Risk	Medium Risk	High Risk
Electrical Installation	<ul style="list-style-type: none"> <li>• Energized electrical service</li> </ul>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Pad Construction	<ul style="list-style-type: none"> <li>• Heavy equipment</li> </ul>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Hoisting	<ul style="list-style-type: none"> <li>• Elevated loads</li> </ul>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Fencing	<ul style="list-style-type: none"> <li>• Underground utilities</li> </ul>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	<ul style="list-style-type: none"> <li>• Pinches, impacts, cuts</li> </ul>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>REMEDIATION (LEACHATE &amp; LANDFILL GAS) SYSTEMS COMMISSIONING</b>				
Electrical Commissioning	<ul style="list-style-type: none"> <li>• Energized equipment</li> </ul>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Mechanical Commissioning	<ul style="list-style-type: none"> <li>• Rotating equipment</li> </ul>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	<ul style="list-style-type: none"> <li>• Pressurized equipment</li> </ul>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Well head Commissioning	<ul style="list-style-type: none"> <li>• Pressurized/evacuated piping</li> </ul>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>Location:</b>				<b>Date:</b>
<b>Name of Contractors/Subcontractor on Site (if any):</b>			<b>Weather:</b>	
<b>Activities Observed:</b>				
<b>Check Applicable Area / Activity of Inspection: <i>Check Applicable Box</i></b>		<b><u>CRITICAL PROCEDURES:</u></b>		
<input type="checkbox"/> Civic Amenity Site	<input type="checkbox"/> Landfill Gas Control (pumps, pipework etc.)	<input type="checkbox"/> Work at heights above 1.5 m (5 ft- includes excavations)		
<input type="checkbox"/> Weighbridge	<input type="checkbox"/> Equipment Re-Fuelling	<input type="checkbox"/> Confined Space Entry (includes tank cleaning)		
<input type="checkbox"/> Activities in traffic areas	<input type="checkbox"/> Gas Flare System	<input type="checkbox"/> Electrical/Mechanical Lockout (live, isolation, lock out/tag out)		
<input type="checkbox"/> Borehole drilling/monitoring well installation	<input type="checkbox"/> Leachate Lagoon	<input type="checkbox"/> Heavy Equipment Lifting (cranes, boom trucks, excavators)		
<input type="checkbox"/> Environmental Investigation Work and Monitoring	<input type="checkbox"/> Other: _____	<input type="checkbox"/> Entry into excavations or confined spaces > 1.2 m (4 ft) deep		
<input type="checkbox"/> Leachate Control System (pumps, pipework etc.)	(Includes clearing brush/trees, reactive chemical handling, working in proximity to deep water, etc.)	<input type="checkbox"/> Hot Work (in a potentially explosive atmosphere)		
<b>Ensure that all hazards identified are addressed below</b>				

Risk Assessed – Procedures, Work Area, Equipment and/or Tools	Potential Hazards	Low Risk	Medium Risk	High Risk
<b>GENERAL HAZARDS</b>				
Sharp Objects/Biohazard	<ul style="list-style-type: none"> <li>• Puncture wound from sharp objects</li> </ul>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Cellular Phone Use	<ul style="list-style-type: none"> <li>• Injuries due to lack of attention</li> </ul>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	<ul style="list-style-type: none"> <li>• Fire explosion hazard</li> </ul>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Exposure Related Injuries	<ul style="list-style-type: none"> <li>• Possible heat / cold stress</li> </ul>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	<ul style="list-style-type: none"> <li>• Dehydration</li> </ul>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	<ul style="list-style-type: none"> <li>• Hearing loss due to noise exposure</li> </ul>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Extreme Weather	<ul style="list-style-type: none"> <li>• Injury due to working under extreme weather conditions</li> </ul>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Working in the Dark	<ul style="list-style-type: none"> <li>• Increased slip/trip/fall hazards</li> </ul>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Site Security	<ul style="list-style-type: none"> <li>• Theft or vandalism</li> </ul>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Jewellery and Loose Clothing	<ul style="list-style-type: none"> <li>• Injury due to jewellery, loose clothing or long hair getting caught in moving parts</li> </ul>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Fatigue	<ul style="list-style-type: none"> <li>• Injury resulting from lack of proper attention due to fatigue</li> </ul>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Contact with Contaminants	<ul style="list-style-type: none"> <li>• Inhalation of dust</li> </ul>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	<ul style="list-style-type: none"> <li>• Inhalation of landfill gas or other vapours</li> </ul>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	<ul style="list-style-type: none"> <li>• Dermal/eye contact with contaminants</li> </ul>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	<ul style="list-style-type: none"> <li>• Ingestion of contaminants</li> </ul>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**Any Additional Hazards Noted During Site Observations Not Included Above**

<b>Work / Activity Being Completed</b>	<b>Potential Hazards</b> <i>(Examples: underground services, hazardous zone area, contaminated ground, overhead power lines, adjacent works, etc)</i>	<b>Safety Controls to Reduce or Eliminate Hazard</b> <i>(Describe the precautions that will be taken)</i>
1.		
2.		
3.		
4.		
5.		

PREPARED BY:		POSITION:		DATE:	
Persons(s) Carrying out Inspection: Name(s):		SIGNED:		DATE:	

# **Appendix X:**

## **Odour Management Plan**



ODOUR & ENVIRONMENTAL ENGINEERING CONSULTANTS

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2010 odour management plan (omp) for kyletalesha landfill facility, Clonsoughy,

Kyleclonhobert, co. laois.

performed by odour monitoring ireland on the behalf of laois county council.

<b>REPORT PREPARED BY:</b>	Dr. John Casey
<b>REPORT VERSION:</b>	Document Ver.1
<b>ATTENTION:</b>	Ms. Brenda Cuddy
<b>DATE:</b>	29 <sup>th</sup> September 2010
<b>REPORT NUMBER:</b>	2010A268(1)
<b>REVIEWERS:</b>	


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## Document Amendment Record

**Client:** Laois County Council

**Project:** Year 2010 Odour Management Plan (OMP) for Kyletalesha landfill facility, Clonsoughy, Kyleclonhobert, Co. Laois

<b>Project Number:</b> 2010A268(2)			<b>Document Reference:</b> Year 2010 Odour Management Plan (OMP) for Kyletalesha landfill facility, Clonsoughy, Kyleclonhobert, Co. Laois		
2010A268(1)	Draft Document for review	B.A.S.	JMC	B.A.S	29/09/2010
2010A268(2)	Minor Edits	BC		JWC	11/02/2011
<b>Revision</b>	<b>Purpose/Description</b>	<b>Originated</b>	<b>Checked</b>	<b>Authorised</b>	<b>Date</b>
					



## **Acknowledgments**

The author would like to acknowledge the technical and engineering guidance, provided by Ms. Brenda Cuddy, Facility Manager in the development of this document.

## **1. Introduction and scope**

### **1.1 Introduction**

Odour Monitoring Ireland was commissioned by Kyletalesha landfill facility, Clonsoughy, Kyleclonhobert, Co. Laois to compile an Odour Management Plan with current practices to be carried out within the landfill facility. The practices to be carried out within the landfill facility represent advancements in the area of odour control over the past years and therefore are considered Best Available Techniques in terms of odour control at landfill facilities in general. The primary areas of advancements include:

1. The monitoring of odours and landfill gas releases from the active landfill facility,
2. Specific engineering works to control the release of odours from the active landfill facility,
3. Management tools and techniques to provide an integrated approach in odour control and management throughout the operating facility.

Each individual aspect for the monitoring and management of odours will be discussed in detail. *Section 4* will provide a synopsis of the overall approach for the control of odours within the landfill facility and risk assessment matrix and management approach to be used at the facility.

These control techniques and management tools are implemented within the active facility and the beneficial effects of such tools can be observed through the recent surface emission monitoring reporting system.

It is concluded that when the overall control and management tools for odours are implemented, greater control of odours are achieved. This can be observed through the significant reduction in odour generated complaints at the facility.

### **1.2 Scope of the work**

The main aims of the study include:

1. Assessment of monitoring methodologies to be implemented at the operating landfill facility,
2. Assessment of specific engineering works to control the release of odours from the active landfill facility,
3. Assessment of management tools and techniques to provide an integrated approach in odour control and management throughout the operating facility.

## **2. Release of odours from landfill facilities in general**

This section will describe in general the release mechanism of odours from landfill facilities in general.

### **2.1 Overview of odour emission generation at landfill sites.**

The release of odours from land filling activities is generally associated with one or more of the following activities. Each activity is separated in three risk categories including low, medium and high depending on their potential to cause odour complaint at distances from the landfill facility.

- Immediate term emissions from waste during arrival to the facility associated with waste handling activities and deposition within the active face. These emissions are associated with the release of odorous volatile organic compounds (VOC) from the putrescible fraction of the waste, which is generated during the collection and subsequent handling before arrival to the facility. The landfill facility in general has little control on the septicity of the waste during transport. The landfill facility has control over the methods used to transport the waste to the active face and to incorporate the waste within the active face. In general, this active face has a low risk potential and only localised impacts occur (e.g. within 200 metres of the active face).
- Immediate to long term emissions from leachate breakout, gas collection, handling, and treatment systems. (e.g. leachate well risers, leachate storage tanks and treatment systems, etc.). These emissions are associated with the release of odorous VOCs formed and entrained within the leachate and will occur where leachate is exposed to air. The main source of odorous VOC's is due to the absorption of landfill gas and its water soluble derivatives that occurs within the waste mass. Non-quiescence conditions at the leachate holding and treatment tanks exacerbate any odour issues. This source has a medium to high risk potential in terms of odour complaint potential but is easily controllable through engineering.
- Medium to long-term emissions of immature and mature landfill gas from the active cell (i.e. operational area and filling cell), temporary capped and flanked areas within the operating landfill. These emissions are associated with the incomplete and complete methanogenesis cycle within the waste body forming landfill gas impurities. Two distinct odours are related to such activities including a mature waste odour (i.e. sour, rotten, fecal, etc.) and landfill gas odour (i.e. intense rubber, rotten eggs, rotten cabbage). The main source of such odours is related to insufficient extraction of gas and failure to connect existing wells to gas infrastructure, failure of the gas abstraction plant, insufficient cover, insufficient application of extraction capacity through the waste cell, etc.) This source is considered the highest risk category due to the complexities in ensuring complete extraction and treatment.
- Short-term emissions of odorous landfill gas from the treatment technology due to restarting of landfill gas combustion infrastructure and incomplete combustion due to short residence times/low temperature. Such emissions are easily remedied through alarm and sensor techniques and standby capacity within the gas abstraction system.

The magnitude of the emissions will depend upon the quantity and nature of material received by the site, and the specific operational controls in place for waste deposition, leachate, gas collection and treatment of leachate. The extent of odour impact of site operations will be

directly related to the magnitude of odour emissions from the various odour sources identified at the site, and the level of dilution and dispersion these odorous emissions undergo as they are transported from the point of release to nearby sensitive receptors.

## 2.2 Characteristics of Landfill odours

Odours from landfills may arise due to:

- Fugitive landfill gas emission from active, intermediate and/or temporary cover on waste;
- Uncontrolled landfill gas leakages from side embankments (flanked areas) and/or top surface within landfill;
- Uncontrolled landfill gas leakage from around leachate header pipe work along gravel layer,
- Uncontrolled landfill gas leakage from side of cell from gravel layer due to insufficient cover/capping,
- Uncontrolled landfill gas leakage from untapped landfill gas extraction wells,
- Insufficient gas abstraction from entire waste body,
- Uncontrolled landfill gas leakage from landfill gas flux hotspots within the intermediate and temporarily capped cells,
- Insufficient cover material upon active and intermediate capped cell,
- In correct material choice during intermediate and temporary capping (i.e. porous and high permeability with many large stones),
- Fugitive gas emissions from active cell due to insufficient gas abstraction,
- Volatilisation and air flow stripping of odourous gases from active face/active cell;
- Puff odour emissions from tipping and spreading of waste,
- Uncontrolled emissions from landfill flaring system and leachate treatment facility, etc.
- This is a non-exhaustive list.

Over 300 compounds have been identified as contributors to landfill odours. These compounds are either components of waste placed in the landfills or are degradation products. Carbon dioxide and methane make up the main constituent percentage of landfill gas and are essentially non-odorous. Other odourous compounds include organic acids (acetic acid, butyric acid; Hexanoic acid), terpenes (limonene, alpha Pinene, alpha Carene), mercaptans (methanethiol, ethanethiol, etc.), amines (ethanolamine, dimethylamine, trimethylamine, etc.) and Hydrogen sulphide (Sheridan, 2003). Most of these compounds have very low odour threshold concentrations as illustrated in *Table 2.1*. Different concentrations and mixtures of these compounds can intensify or reduce odour threshold concentration, determined as synergism and antagonism, respectively.

**Table 2.1.** Odour threshold concentration of various odourous compounds commonly found in the air streams of landfill gas.

Compound name	Molecular Formula	Odour description	Odour threshold (ppm (v/v))
<b>Mercaptans</b>	-	-	-
Allyl mercaptan	CH <sub>2</sub> CHCH <sub>2</sub> SH	Disagreeable, garlic	0.0001
Methyl mercaptan	CH <sub>3</sub> SH	Rotten cabbage	0.0005
Propyl mercaptan	C <sub>3</sub> H <sub>7</sub> SH	Unpleasant	0.0005
Ethyl mercaptan	C <sub>2</sub> H <sub>5</sub> SH	Decayed cabbage	0.0003
<b>Sulphides</b>	-	-	-
Hydrogen sulphide	H <sub>2</sub> S	Rotten eggs	0.0005
Dimethyl di sulphide	C <sub>2</sub> H <sub>6</sub> S <sub>2</sub>	Rotten cabbage/vegetables	0.0003- 0.0068
Carbon disulphide	CS <sub>2</sub>	Intense Rubber/skunk	0.006-0.010
<b>Amines</b>	-	-	-
Trimethyl amine	(CH <sub>3</sub> ) <sub>3</sub> N	Pungent, fishy	0.0004
n-Butyl amine	CH <sub>3</sub> (CH <sub>2</sub> )NH <sub>2</sub>	Sour, ammonia	0.080
<b>Organic acids</b>	-	-	-
Acetic acid	CH <sub>3</sub> COOH	Sour	1.0
Butyric acid	CH <sub>3</sub> (CH <sub>2</sub> ) <sub>2</sub> COOH	Sweet rancid	0.0004
Valeric acid	CH <sub>3</sub> (CH <sub>2</sub> ) <sub>4</sub> COOH	Rancid	0.0008

### **3. Methodologies for the assessment of odour in Kyletalesha Landfill facility**

This section will describe the existing and new methodologies to be employed at the operating facility for the assessment of odour release from the landfill facility.

#### **3.1 Landfill gas leakage survey and advancements in the area**

Kyletalesha landfill facility currently carry out Flame ionisation detector (FID) and Photo ionisation detector (PID) surveys of the landfill cap in order to identify areas of potential leakage/flux of odourous landfill gas.

A Photo-ionisation Detector (PID) uses an Ultraviolet (UV) light source (*photo*) to ionise a gas sample and detect its concentration. Ionisation occurs when a molecule absorbs the high energy UV light, ejecting a negatively charged electron and forming of positively charged molecular ion. The gas becomes electrically charged. These charged particles produce a current that is easily measured at the sensor electrodes. Only a small fraction of the VOC's molecules are ionised. Therefore, PID measurements are non-destructive and therefore maintain sample integrity where samples can be bagged and used for further analysis (Sheridan, 2004). The PID instrument does not react to methane, which is odourless and can generally not be biodegraded efficiency through the intermediate cap. Therefore using an instrument that responds to methane can lend it self to over generation of leakage areas and therefore dilute the efforts of the landfill manager to control odourous leakage areas (i.e. generally methane will be detected in the ambient air of a landfill and specific leakage areas generating odourous landfill gas containing the reduced sulphur compounds and amines that do not respond sensitively on a FID will not necessarily be determined during the survey).

An FID operates on the principle where influent contaminated gas is mixed with hydrogen and the mixture is burned at the tip of a jet with air or oxygen. Ions and free electrons are formed in the flame and enter a gap between two electrodes, the flame jet and a collector, mounted 0.5-1.0 centimetres above the flame tip. A potential (400 volts) is applied across the two electrodes and with the help of produced ions, a very small current flows between the two electrodes. When an organic substance is introduced this is burned in the flame; a complex process takes place in which positively charged carbon species and electrons are formed. The current is greatly increased and therefore the sample is detected. The FID is a mass flow detector, its response depending directly on the flow rate of the carrier gas. Its response also varies with applied voltage and the temperature of the flame.

As part of this survey technique, areas of potential leakage are geo-referenced upon a landfill map for remediation. While onsite, the leakage survey team and the landfill facility manager interpret the results of the survey and outline generally a remediation strategy to mitigate the potential areas of leakage.

In recent time, the leakage survey team has advanced the current survey technique through constructive development with equipment suppliers to develop a specific leakage-monitoring tool in order to improve the assessment technique.

The existing technique of PID survey although useful in determining leakage areas does not lend itself to providing sensitive geo-referencing as direct communication between the PID and GPS is not achievable. In addition the sample acquisition rate is generally less than 500 mls/min and therefore long time periods are required to provide a refresh rate from the sensor. In conclusion

there was a general requirement to provide both methane based leakage detection in general through Flame ionisation detector (FID) to determine methane leakage hotspots and not necessarily odourous compounds (i.e. as methane is not odourous and not very biodegradable or soluble) and odourous compound detection through PID (i.e. as it responds greater to reduced sulphur compounds, organic acids and amines in comparison to a FID), integrated kinematics GPS to centimetre accuracy and a high refresh rate on the sample line (greater than 1.2 litres per minute).

Odour Monitoring Ireland has developed such a system of monitoring whereby continuous FID/PID with high refresh rate/integrated GPS is now be performed upon Kyletalesha landfill. Screening of the landfill cap will occur in accordance with AG6 "*Surface VOC emissions monitoring on landfill facilities*". Thereby providing identification of localised landfill gas leakage. Through subsequent layering of both FID and PID contour mapping, the most significant leakage areas are mapped across the landfill surface. The system is backpack mounted and has an operating capacity of 8 hours. A specially integrated digital probe and wand allows the operator to survey the landfill surface accurately and fast thereby providing greater efficiency through the survey period.

Kyletalesha Landfill facility currently carries out bi-annual monitoring of the landfill cap in accordance with Irish EPA AG6 "*Surface VOC emissions monitoring on landfill facilities*" guidance.

### **3.2 Off site monitoring techniques and complaint response mechanism and advancements.**

Upon arrival to site each morning, the landfill management team perform an ambient odour survey in the vicinity of the landfill. This process is repeated three times during the day. A Sniff assessment technique in accordance with Air Guidance Note 5 (AG5) "Odour Impact Assessment Guidance for EPA Licensed Site" is followed.

The daily odour-recording sheet and survey route are included in *Appendix I*. If an odour complaint is made a full investigation should be carried out. Complaints can be submitted in a few ways,

- The complainant may contact county hall and the complaint is e-mailed to the site, in this case nominated staff from Kyletalesha landfill site will return a call if details are left by the complainant and assess if a call out is necessary,
- The complainant may call Brenda Cuddy (Facility Manager) directly or Ken Farrell (Deputy Manager), our mobile numbers. These numbers are available via the monitoring committee, if the call is about an odour that is present at the time we will go straight out and investigate, if the odour was from the previous night after closing hours then we will check all systems on site to see if anything happened during the evening or night, we would then report the complaint to the EPA.
- If the complaint is more than 24 hours old then we don't investigate as it is not possible to do so.



## 4. Methodologies for the control of odours in Kyletalesha Landfill facility

This section will describe the general odour release risks at Kyletalesha landfill facility and the control techniques to be used to control such releases. The general odour risk matrix is contained in *Table 4.1* of this document.

### 4.1 Existing methodologies for the control of odours in Kyletalesha Landfill facility

*Table 4.1 and 4.2* illustrates the existing odour source categories and methodologies to control odour release at Kyletalesha landfill facility. *Section 5* describes the additional BAT techniques to be used at the facility (i.e. when they become available) to improve on existing odour control techniques. The odour emission source categories identified within the landfill boundary are illustrated in *Table 4.1*. All operational sources have the risk of causing odour complaint beyond the boundary of the landfill facility.

**Table 4.1.** Identified odour emission categories within the operating Kyletalesha landfill.

<b>Identity</b>	<b>Potential Odour Source</b>
Source category 1	Accepted municipal solid waste (MSW) material
Source category 2	Transport of MSW to active face
Source category 3	Operation of Active face and operational area
Source category 4	Operation of Active temporary covered cell (Active cell)
Source category 5	Operation of Temporary capped cells
Source category 6	Operation of Permanent capped cells
Source category 7	Landfill gas extraction, flaring and management
Source category 8	Landfill leachate pumping
Source category 9	Landfill phase management

Each odour emission source category is considered an odour complaint risk within the Odour Management Plan (OMP) and discussed in detail in *Table 4.2*.

## **4.2 Assessment of odour risks**

*Table 4.2.* outlines those areas within the operating landfill that are potential sources of odours. Each source is identified; the risks of odour impact assessed and preventative measures are recorded to reduce such odour impact risks. Each odour source is discussed, the preferred monitoring protocol identified and suggested odour control and minimisation strategy presented. By implementing such odour control techniques the overall release of odours from the landfill facility can be reduced and controlled thereby minimising complaints.

**Table 4.2.** Assessment of odour impact risks and control strategies for Kyletalesha landfill.

Odourous source categories	Risks of odour emissions	BAT Principle of odour control	Monitoring technique for assessment of risk	Status
<b>Accepted municipal solid waste material (MSW) and Transport of MSW to active face</b>	<p>Exposed waste in incoming transport vessel or damaged transport trailers.</p> <p>External contaminated with odourous material of transportation vessel</p>	<p>Visual inspection of transportation vessel by weigh bridge operator before acceptance of MSW into facility.</p> <p>Frequent cleaning of external surfaces of transportation vessel and repair of any defective surfaces (i.e. paintwork, sheet metal).</p> <p>All MSW is brought to the active face immediately.</p>	<p>Visual and odour sniff inspection of incoming transportation vessel by weight bridge operator.</p>	<p>Currently implemented into the OMP at Kyletalesha Landfill as per Waste licence 26-3</p> <p>The weighbridge operator refuses access of the transportation vessel to the landfill facility</p> <p>Any odour impacts outside the landfill boundary associated with this stage of landfilling MSW are recorded and remediation is implemented immediately.</p>

**Table 4.2 continued.** Assessment of odour impact risks and control strategies for Kyletalesha landfill.

Odourous source categories	Risks of odour emissions	BAT Principle of odour control	Monitoring technique for assessment of risk	Status
<b>Operation of Active face/Operational area</b>	<p>Excessive exposed areas of MSW within the active face</p> <p>Handling of very odourous MSW material at the active face</p>	<p>Depositing and covering of very odourous materials immediately within the active face</p> <p>Covering of active face at end of each working day using clay to prevent emissions during non-operational events.</p> <p>Reduce operational/active face size to a working minimum in accordance with the landfill manual guidelines.</p>	<p>Visual and odour sniff inspection of MSW been deposited at active face.</p> <p>Analysis of meteorological data, directional analysis of resident location and subjective analysis of resident odour character following odour complaint.</p> <p>Sniff odour survey at the boundary of the landfill following odour complaint.</p>	<p>Currently implemented into the OMP at Kyletalesha Landfill as per Waste licence 26-3.</p>

**Table 4.2 continued.** Assessment of odour impact risks and control strategies for Kyletalesha landfill.

Odourous source categories	Risks of odour emissions	BAT Principle of odour control	Monitoring technique for assessment of risk	Status
<p><b>Operation of Active temporary covered cell (Active cell)</b></p>	<p>Insufficient cover material facilitating exposed areas of waste.</p> <p>Inappropriate Cover material with high permeability facility leakage of mature waste gas.</p> <p>Insufficient vacuum pressure within the temporary and sacrificial gas abstraction field.</p>	<p>Installation of sacrificial horizontal gas extraction technique to maintain active cell under negative pressure to prevent leakage of mature waste gas (<i>see sample on Appendix II</i>).</p> <p>Monitoring of O<sub>2</sub>, CH<sub>4</sub>, CO<sub>2</sub>, vacuum pressure and volumetric airflow rate of horizontal gas extraction system and mature landfill gas as decision-making process for diversion to flaring systems.</p> <p>Install sufficient self emptying condensate pots to eliminate condensate carryover and combustion plant failure and gas abstraction rate.</p> <p>Burning of mature waste gas in landfill flare system.</p>	<p>Visual and odour sniff inspection of active cell. The landfill manager performs daily checks around the landfill. When a leakage area is encountered, it is remediated by means of an extra clay cover or by tapping of a temporary suction vent, which is connected to the landfill extraction system.</p> <p>Bi-annual leakage survey utilising FID/PID analyser to identify leakage hotspots.</p> <p>Monitoring and balancing of horizontal landfill gas extraction system.</p>	<p>Currently implemented into the OMP at Kyletalesha Landfill as per Waste licence 26-3.</p> <p>Active FID/PID survey within active cell to isolate zones of landfill gas leakage</p>

**Table 4.2 continued.** Assessment of odour impact risks and control strategies for Kyletalesha landfill.

Odourous source categories	Risks of odour emissions	BAT Principle of odour control	Monitoring technique for assessment of risk	Status
<p><b>Operation of Temporary capped cells</b></p>	<p>Insufficient cover material facilitating exposed areas of waste.</p> <p>Inappropriate Cover material with high permeability facility leakage of mature waste gas.</p> <p>Positive pressure within the active cell facilitating leaking of mature waste gas from active cell</p>	<p>Installation of vertical and horizontal gas extraction technique to maintain temporary capped cell under negative pressure to prevent leakage of landfill gas (<i>see sample on Appendix II</i>).</p> <p>Monitoring of O<sub>2</sub>, CH<sub>4</sub>, suction pressure and volumetric airflow rate of landfill gas extraction system and continuous balancing.</p> <p>Tracking of appropriate cover materials into temporary cap.</p> <p>Burning of landfill gas in landfill flare burning system and gas utilisation plant.</p>	<p>Visual and odour sniff inspection of temporary capped cells.</p> <p>Bi-annual leakage survey using FID/PID to identify any leakage hotspots</p> <p>Assessment and balancing of landfill gas extraction system to maintain negative pressure on installed landfill gas extraction wellheads.</p>	<p>Visual, sniff and FID/PID leakage gas survey currently implemented as part of OMP.</p> <p>Weekly monitoring and balancing of landfill gas extraction system.</p> <p>Landfill gas burned in landfill flares.</p>

**Table 4.2 continued.** Assessment of odour impact risks and control strategies for Kyletalesha landfill.

Odourous source categories	Risks of odour emissions	BAT Principle of odour control	Monitoring technique for assessment of risk	Status
<p><b>Operation of Permanent capped cells</b></p>	<p>Insufficient capping integrity facilitating the leakage of landfill gas from permanently capped cells.</p> <p>Inappropriate sealing and completion of permanent capping facilitating leakage of landfill gas</p> <p>Leakage zones of landfill gas from around leachate pots and leachate pumping sumps.</p>	<p>Sealing around leachate header pipes and pots using bentonite and fully welded HDPE liner.</p> <p>Repair of defective capping material with non-defective capping material.</p>	<p>Bi-annual leakage survey using FID/PID to identify any leakage hotspots.</p> <p>Provision of sufficient extraction to prevent positive pressure within landfill waste cell</p>	<p>Visual, sniff and FID/PID leakage gas survey currently implemented as part of OMP.</p> <p>Landfill gas burned in landfill flares.</p>

**Table 4.2 continued.** Assessment of odour impact risks and control strategies for Kyletalesha landfill.

Odourous source categories	Risks of odour emissions	BAT Principle of odour control	Monitoring technique for assessment of risk	Status
<p><b>Landfill gas management extraction and flaring</b></p>	<p>Incorrect spacing of extraction wells providing extraction of landfill gas from waste cell.</p> <p>Insufficient extraction of landfill gas resulting in landfill gas release from landfill cell.</p> <p>Incorrect balancing of landfill gas extraction system.</p> <p>Insufficient vacuum pressure within the gas field.</p> <p>Insufficient sealing of landfill gas vents before connection to landfill gas extraction system.</p> <p>Insufficient methane concentrations and high oxygen concentrations causing landfill flare failure.</p> <p>Insufficient condensate removal from installed landfill gas infrastructure.</p> <p>Insufficient servicing of landfill gas flares.</p>	<p>Gas vents are connected to the LG extraction system.</p> <p>Those gas vents that are not connected to the landfill gas extraction system are covered with rubber cap and clipped to prevent egress of landfill gas and ingress of Oxygen</p> <p>Landfill gas extraction well spacing 30 metre Cartesian grid network.</p> <p>Sacrificial horizontal gas extraction system installed to improve extraction from within the waste pile.</p> <p>Landfill gas extraction system balanced to optimise the extraction of landfill gas from the waste cell and directed to the landfill gas utilisation system.</p> <p>Install sufficient self emptying condensate pots to eliminate condensate carryover and combustion plant failure and gas abstraction rate. Remove condensate as necessary from installed landfill gas infrastructure.</p> <p>Non-continuous landfill gas supply resulting in landfill flares failure.</p> <p>Excess moisture carry over to landfill gas extraction pipe work and flare engine resulting in extraction and plant failure</p> <p>Service contract placed with operators of landfill flaring system to prevent breakdown.</p> <p>Breakdown alarm system SCADA controlled and alarmed to alert facility manager of breakdown.</p>	<p>Monitoring of O<sub>2</sub>, CH<sub>4</sub>, suction pressure and volumetric airflow rate of landfill gas extraction system and continuous balancing.</p> <p>Connection of landfill gas well to landfill gas extraction system when appropriate.</p> <p>Moisture drop out pots emptied in accordance with site procedures.</p> <p>Diversion of appropriate landfill gas to appropriate landfill flare.</p> <p>The landfill flare plant should be operated 24 hours per day/7 days per week.</p> <p>Landfill flares serviced regularly. See <i>service contract Appendix III</i>.</p> <p>Landfill manager responds to breakdown SCADA</p>	<p>Currently implemented into the OMP at Kyletalesha Landfill as per Waste licence 26-3.</p>

**Table 4.2 continued.** Assessment of odour impact risks and control strategies for Kyletalesha landfill.

Odourous source categories	Risks of odour emissions	BAT Principle of odour control	Monitoring technique for assessment of risk	Status
<p><b>Landfill leachate pumping</b></p>	<p>All leachate tanks are covered</p> <p>Pumping leachate above the working weight of the tank will lead to turbulent conditions and odour emissions.</p> <p>Insufficient Oxygen levels in the leachate liquor will lead to anaerobic conditions and odour emissions.</p> <p>Irregular desludging will lead to anaerobic conditions, long raw liquor retention times and odour emissions.</p> <p>Leachate breakout on flanked temporary capped areas.</p> <p>Insufficient sealing of leachate collection devices</p>	<p>The leachate-holding tank and lagoon are covered.</p> <p>All leachate is removed under working height of leachate surface to maintain quiescence conditions.</p> <p>Ensure that any pumping or tankering of anaerobic leachate is performed in enclosed system whereby exhaust odourous air from tanker is ducted under vacuum to operating leachate tank.</p> <p>Remove contaminated temporary soil and replace with clean soil.</p> <p>Ensure all access hatches, sumps etc. are sealed adequately</p>	<p>Visual inspection of leachate plant operation.</p> <p>SCADA control of Oxygen concentration levels and alarm system.</p> <p>Bi-annual leakage survey utilising FID/PID analyser to identify leakage hotspots.</p>	<p>Currently implemented into the OMP at Kyletalesha Landfill as per Waste licence 26-3.</p> <p>FID/PID survey of features within landfill facility.</p>



**Table 4.2 continued.** Assessment of odour impact risks and control strategies for Kyletalesha landfill.

Odourous source categories	Risks of odour emissions	BAT Principle of odour control	Monitoring technique for assessment of risk	Status
<p><b>Landfill management phase</b></p>	<p>Operation of large flanked areas within active cells</p> <p>Operation of large areas of active cells and temporary capped area will lead to significant odour emissions from the site.</p>	<p>Phase management refers to the management of landfill gas extraction well construction, active cell cover, temporary capping and permanent capping. This will eliminate the potential for odour release.</p> <p>All sacrificial horizontal gas abstraction wells should be connected into the temporary flaring system immediately. Balancing of gas abstraction rate should be performed on a pressure basis for ease. Flow divert and control valves should be installed at strategic points in the temporary gas field to ensure sufficient gas abstraction at the bottom of the gas field.</p> <p>Continuous input of data into the landfill gas management database and provision of sufficient gas extraction capacity within the combustion plant. Easy diversion of good quality gas should be designed into the extraction system where applicable.</p> <p>The landfill site management should maintain detailed records of odour complaints, meteorology and site operator knowledge to investigate any odour complaints/potential odour complaints and implement remedial action using a developed common sense strategy.</p> <p>Interaction with community to facility accurate reporting of odours.</p>	<p>Site management in accordance with Environmental Management Plan</p> <p>Liaison between leakage survey team and facility management following surveys.</p> <p>Reassessment of the effectiveness of mitigation measures applied and quantification of effectiveness.</p> <p>Prevention and immediate remediation of odour sources significantly odour exposure to the community in the vicinity of the landfill facility.</p>	<p>Currently implemented into the OMP at Kyletalesha Landfill as per Waste licence 26-3.</p> <p>Overall holistic landfill management techniques are essential to providing an low odour impact in the vicinity of the landfill.</p>

## **5. Odour management plan for Kyletalesha Landfill facility**

In recent times, new landfill odour management techniques have become available for the assessment and control of odour release from operating landfills. These techniques will provide greater control of emissions and now represents advancement in BAT (*see Table 5.1*). The odour management plan will be continued to be reviewed and improvements will be applied where possible.

*Table 5.1* illustrates the advancement in BAT techniques in addition to *Table 4.2* to be used holistically at Kyletalesha Landfill facility in order to provide an integrated management solution to odour control.

**Table 5.1.** Advancements in BAT odour control at Kyletalesha landfill facility.

Considered BAT technique for odour minimisation and control	Area for application	BAT effect	Status
Emergency call out and response procedures	Landfill management team to respond within 20 minutes if on site to remedy plant failure. In addition, response where applicable should be performed to complainants.	Management of Temporary landfill gas abstraction combustion plant through 24-hour standby callout service thereby providing response to flare plant malfunction on site out of hours.	This is in operation.
Surface emissions PID/FID surveying with integrated GPS in accordance with AG6.	Active, Temporary and permanent capped landfill cells	Provides more sensitive monitoring of leakage area in terms of odours and methane. This approach in conjunction with the auditing of vacuum pressure and landfill facility manager liaison will provide immediate mitigation strategy to leakage areas.	This is in operation.
Monitoring of total gas volume and vacuum pressure abstracted on both temporary and permanent gas abstraction system	Temporary and permanent gas abstraction system	Provide quantifiable volume measurements of total landfill gas abstracted and combusted on landfill gas field. Reduction in volume flow and pressure will allow for the general auditing of the gas abstraction system capacity.	This is in operation.
Pressure auditing of temporary and sacrificial gas abstraction system	Active and temporary capped cells	Provide quantitative data and confirmation that temporary abstraction system is achieving sufficient vacuum pressure throughout the gas field.	This is in operation.
Installation of automatic emptying condensate pots on temporary abstraction system	Temporary landfill abstraction gas system	Provide automatic emptying of condensate from condensate collection system and therefore provide greater control of the temporary gas collection system and preventive breakdown due to condensate carryover (i.e. due to wet waste and high face velocities in gas collection pipe work).	This is in operation.

**Table 5.1 continued.** Advancements in BAT odour control at Kyletalesha landfill facility.

Considered BAT technique for odour minimisation and control	Area for application	BAT effect	Status
<p>Installation of flow control valves on temporary abstraction system in order to control volume flow at major control in the abstraction system.</p>	<p>Temporary landfill abstraction gas system</p>	<p>Provide greater control on the diversion of abstraction to dedicated zones within the temporary gas abstraction system. Excess vacuum capacity in the temporary gas abstraction system will be directed to those areas identified as leakage areas from the leakage survey. The temporary gas abstraction system should essentially designed to allow such zoning and application/control of vacuum capacity.</p> <p>The flow control valves should be designed in such a way to allow for reuse on subsequent waste lifts. Interchangeable ductwork will allow for easy connection of installed vertical well into the temporary gas management system with easy.</p>	<p>This is in operation.</p>
<p>Immediate connection of temporary and sacrificial gas abstraction well heads to temporary gas abstraction system and balancing</p>	<p>Temporary landfill abstraction gas system</p>	<p>The immediate connection of temporary gas well heads has many operational issues due to plant and machinery. If reusable header connections are designed then immediate connection of well heads can occur and control of abstraction volume can also be controlled with ease. This will allow for methanogenesis conditions to develop within the waste and control the influx of ambient air into the temporary gas abstraction system. Inter connectable connection pipe work should be considered in the design due the ease of movement and flexibility.</p>	<p>This is in operation.</p>
<p>Investigation into the assessment of vacuum pressure within waste body in conjunction with leakage survey and pressure monitoring techniques</p>	<p>Temporary landfill abstraction gas system</p>	<p>Following leakage survey and vacuum pressure monitoring of temporary abstraction system, abstraction volume to particular leakage zone will be increased. The area will be resurveyed to determine effect. If sufficient leakage remediation is not achieved the vacuum pressure within this zone will be investigated in order to allow for determination of most effective areas to locate new temporary wellhead.</p>	<p>This is in operation.</p>

**Table 5.1 continued.** Advancements in BAT odour control at Kyletalesha landfill facility.

Considered BAT technique for odour minimisation and control	Area for application	BAT effect	Status
Installation of new abstraction wells into identified leakage hotspots	Temporary capped cells	Additional wells will be placed at the request of the Facility Manager and following the identification of leakage area via surface emissions monitoring.	This is in operation.
Installation of additional landfill gas abstraction capacity	Landfill gas extraction system	Currently there are 1 landfill flare on the facility. The total abstractive capacity of the landfill flares is 750 m <sup>3</sup> /hr. It is proposed to have a second 750m <sup>3</sup> /hr in place by the end of April 2011	This is in operation.

**7. *Appendix I*-Daily odour record sheet and survey route**

General		Your Reference	Site Licence No.	Assessment by		Date of Assessment																				
		Your name: (other Investigator(s) present):																								
Pre-Assessment Preparation	Observer is free from medical conditions (cold, sore throat, sinus trouble)?	Observer abstinence (30 min) from smoking, flavoured drinks, scented toiletries and deodorisers?	Reason for odour assessment – Complaint verification; routine; other (specify).	Map – Has a map showing assessment locations been attached?	Weather Conditions Note 3 (record wind info on page 2):																					
	Yes No	Yes No	Yes No	Yes No																						
<p><b>Note 1: Observation point Sensitivity (assuming detectable, if not then 0)</b></p> <ol style="list-style-type: none"> <li>Remote (no housing, commercial/industrial premises or public area within 500m of observation point)</li> <li>Low sensitivity (no housing, commercial/industrial premises or public area within 100m of observation point)</li> <li>Moderate sensitivity (housing commercial/industrial premises or public area within 100m of observation point)</li> <li>High sensitivity (housing, commercial/industrial premises or public area within area of observation point)</li> <li>Extra sensitive (complaints arising from residents, business and users of public area within area of observation point)</li> </ol>																										
<p><b>Note 2: Wind Strength</b></p> <table border="0"> <tr> <td>0 Calm</td> <td>Smoke rises vertically</td> </tr> <tr> <td>1 Light air</td> <td>Direction of wind shown by smoke drift, but not wind vanes</td> </tr> <tr> <td>2 Light Breeze</td> <td>Wind felt on face; leaves rustle, ordinary vane moved by wind</td> </tr> <tr> <td>3 Gentle Breeze</td> <td>Leaves and small twigs in constant motion</td> </tr> <tr> <td>4 Moderate Breeze</td> <td>Raises dust and loose paper; small branches are moved</td> </tr> <tr> <td>5 Fresh Breeze</td> <td>Small trees in leaf begin to sway</td> </tr> <tr> <td>6 Strong Breeze</td> <td>Large branches in motion; umbrellas used with difficulty against the wind</td> </tr> <tr> <td>7 Near Gale</td> <td>Whole trees in motion; inconvenience felt when walking against wind</td> </tr> <tr> <td>8 Gale</td> <td>Twigs break off trees; progress generally impeded</td> </tr> <tr> <td>9 Strong Gale</td> <td>Slight structural damage occurs (chimney pots and slates removed)</td> </tr> </table>							0 Calm	Smoke rises vertically	1 Light air	Direction of wind shown by smoke drift, but not wind vanes	2 Light Breeze	Wind felt on face; leaves rustle, ordinary vane moved by wind	3 Gentle Breeze	Leaves and small twigs in constant motion	4 Moderate Breeze	Raises dust and loose paper; small branches are moved	5 Fresh Breeze	Small trees in leaf begin to sway	6 Strong Breeze	Large branches in motion; umbrellas used with difficulty against the wind	7 Near Gale	Whole trees in motion; inconvenience felt when walking against wind	8 Gale	Twigs break off trees; progress generally impeded	9 Strong Gale	Slight structural damage occurs (chimney pots and slates removed)
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<p><b>Note 3: Weather Conditions</b></p> <p>Precipitation – dry, rained recently, drizzle, raining, foggy Temperature – cold, cool, warm, hot</p> <p><b>Note 4: Odour Persistence</b></p> <ol style="list-style-type: none"> <li>No Odour</li> <li>Intermittent (detected intermittently during the period of assessment)</li> <li>Persistent (detected throughout the period of assessment)</li> </ol> <p><b>Note 5: Odour Intensity</b></p> <ol style="list-style-type: none"> <li>No Detectable Odour</li> <li>Faint Odour (barely detectable, need to stand still and inhale facing into wind)</li> <li>Moderate Odour (easily detectable while walking and breathing normally, possibly offensive)</li> <li>Strong Odour (bearable but offensive – might make clothes / hair smell?)</li> <li>Very Strong Odour (unbearable, difficult to remain in area affected by odour)</li> </ol>																										
Notes (the ranking systems in these notes must be used when completing the field observations table overleaf)		Start Time:		Do any of the odours experienced on-site match in character those recorded during the off-site survey?		List areas Inspected:																				
Finish Time:		Potential on-site odour sources identified:				What relevant activities were occurring on-site during the off-site odour assessment?																				

Field observations	Observer Location		Wind (nd = if not detectable)			Time		Odour Rating		Odour Description Comments
	Name of household / commercial site (describe so that location can be easily identified again by a third party)	Sensitivity (1-5) Note 1	Direction from which wind blows	Orientation (Observer Vs facility)	Strength Note 2	Start Time (24hr clock)	Period of observation	Odour Persistence (0-2) Note 4	Odour Intensity (0-4) Note 5	
	...	≥ 3	...	Down-Wind Approx DW or not detectable etc	...	...	...	1 or 2	≥ 2	<p><b>Guide-</b> A location where the score meets or exceeds all the threshold values may be deemed subject to nuisance/significant impairment, particularly if the observations are supported by public complaints on impact, frequency and duration of odours.</p>

Brief details of any meeting with local residents/complaints received during assessment (include names/addresses/telephone numbers etc):



## Odour Log

Name: \_\_\_\_\_

Address: \_\_\_\_\_

Address of Suspected Odour Source: \_\_\_\_\_

Date	Start Time	Finish Time	Description of Odour (e.g. smelled like Bakery, Coffee, Paint, Mothballs, Wet Dog etc)	Other Comments (e.g. Intensity, or if odour detected at location other than your above address)

Do not forget to complete the declaration of record details (below).

Declaration of True Record

I (Name) \_\_\_\_\_ confirm that the above list is a true record of events recorded

from (Date) \_\_\_\_\_ to (Date) \_\_\_\_\_.

Signature: \_\_\_\_\_ Date: \_\_\_\_\_

I am/am not\* prepared to appear in court to give evidence if required (\*please delete as appropriate).

**Appendix II** -Sample SEW's submitted for additions to LFG system

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## Introduction

Condition 3.2.1 of Waste Licence 26-2 requires Laois County Council to submit a proposal to the Agency for agreement for Specified Engineering Works as outlined in Schedule B of the Waste Licence. The following sections outline Laois Co. Co.'s proposal the construction of the horizontal gas extraction system in cell 14c in accordance with conditions 3.14.3

### ***Cell 14 c horizontal gas extraction system***

The proposed works will comprise the following elements:

- Preparation of area for excavation.
- Excavation of trenches for horizontal gas extraction pipe work.
- Placement of the horizontal gas extraction pipe work and drainage stone.

The pipe work will consist of three rows of 160mm dia pipe, starting 10m from the outer edge of the cell .( See attached Drawing) there will be 3 layers of pipe work placed in the body of waste.

- Refilling of trenches with excavated waste.
- Cover of works area with soil layer
- Connection of pipes to the gas extraction system.

### ***Programme of Works***

It is anticipated that the works will commence in November 2009 and will continue over the life time of the cell as waste lifts are placed.

Laois county council propose to notify verbally the EPA one week prior to commencement of each portion of the works and the extent of the works proposed.

### ***Supervision of Works***

The works will be overseen by Laois County Council Landfill Staff.

### ***Agency's Agreement***

This proposal is submitted to allow the Agency to review the proposal, seek clarification or additional information if necessary and provide agreement to Laois Co. Co. for the works before the proposed commencement date in November 2009

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Should the Agency require any further information or clarification of any issues, it is requested that this be obtained as soon as possible to ensure that agreement can be reached. Contact persons for this purpose are:

- Brenda Cuddy Landfill Manager, 087 6295556
- Ken Farrell Facility Manager 087799994

**Proposal**

**for**

**Specified Engineering Works**

**Landfill gas extraction system.**

**Cell 14(C)**

## **Introduction:**

Condition 3.2.1 of Waste Licence 26-03 requires Laois County Council to submit a proposal to the Agency for agreement for Specified Engineering Works as defined in Schedule B for the installation of Landfill Gas Management Infrastructure at Kyletalesha Landfill Site. These works will include the drilling of 8 no Landfill Gas Extraction wells in mini cell 14 (C). Following on from drilling works the Landfill Gas Extraction wells will be connected to the main landfill gas line in order to minimise gas emissions from the site.

## **Preparatory Works:**

As discussed the works will be carried out prior to the capping of the top section of cell 14c.

Laois County Council are to be advised at least 5 working days before any drilling is due to commence, to allow suitable time for preparation. The position of the proposed well will be indicated by a wooden stake, driven into the ground. (Appendix I: Proposed Gas Well and Gas Line Design). The stake will be clearly marked in such a way that it can be easily identified as a proposed well position.

## **Drilling:**

All drilling will stop by 15:30 each day. This is to allow LCC to remove any waste from the drilling area before leaving site. No well drilling will commence if the well cannot be completed by 15.30 and each well will be capped off once drilled in order to prevent odour nuisance from the site.

The drilling rig is positioned over the proposed location and leveled using hydraulic outriggers. A 600mm diameter continuous flight auger is driven into the ground in a clockwise fashion while the machine controller regulates the torque applied. As the auger is making its way down it transports the drilled material to the top of the borehole and this material will be removed to the active cell at the end of the working day. When the required depth is reached the auger is slowly removed in a counter clockwise fashion. HDPE 160mm slotted pipe is then placed into the drilled cavity up to approximately 2m from ground level where solid pipe is attached to the slotted to take it to 1m above ground level. 20mm washed stone (not crushed) is then carefully allow to pour down the outside of the 160mm well pipe filling the cavity to within two meters of ground level. A saturated bentonite plug is then installed to totally seal the top of the individual well. Immediately after completion the well is capped off awaiting connection to the main Landfill Gas line.

## **Capping of top portion of cell 14c**

On completion of the drilling operation and installation of the Landfill Gas Extraction well, Laois Co Co will organize through a suitably qualified contractor for the capping of remainder of cell 14c (North slope and South slope previously capped). This will include for the wells to be welded to the capping through a boot system ensuring no fugitive gas emissions.

## **Landfill Gas Well Connections:**

A 160mm well head c/w a regulatory valve and 90mm outlet is placed on top of the Landfill Gas Extraction well. A 110mm solid line will be branched from the existing Landfill Gas lines on cell 14b and surfaced laid. (Appendix I: Proposed Gas Well and Gas Line Design). The top of the 110mm Landfill Gas line will be bored using a 2" hole saw and a saddle placed over this with a 90mm outlet. Using a 90mm flexible hose the 90mm outlet on the saddle is connected to the 90mm outlet on the well head. Suction is then applied to each well in turn and the quality measured using the onsite GA2000 Gas Analyzer.

## **Programme of Works:**

It is anticipated that the works will commence in August 2010

**Supervision of Works:**

The works will be overseen by Laois County Council Engineer/Landfill Manager/Facility Manager in accordance with condition 3.2.2 of Waste Licence 26-2.

**Agency's Agreement:**

This proposal is submitted to allow the Agency to review the proposal, seek clarification or additional information if necessary and provide agreement to Laois County Council for the works before the proposed commencement date in Aug 2010. Should the Agency require any further information or clarification please contact Brenda Cuddy, Landfill Manager, Kyletalesha Landfill Site, Portlaoise, Co. Laois.  
087 6295556 bcuddy@laoiscoco.ie

**Appendix I**

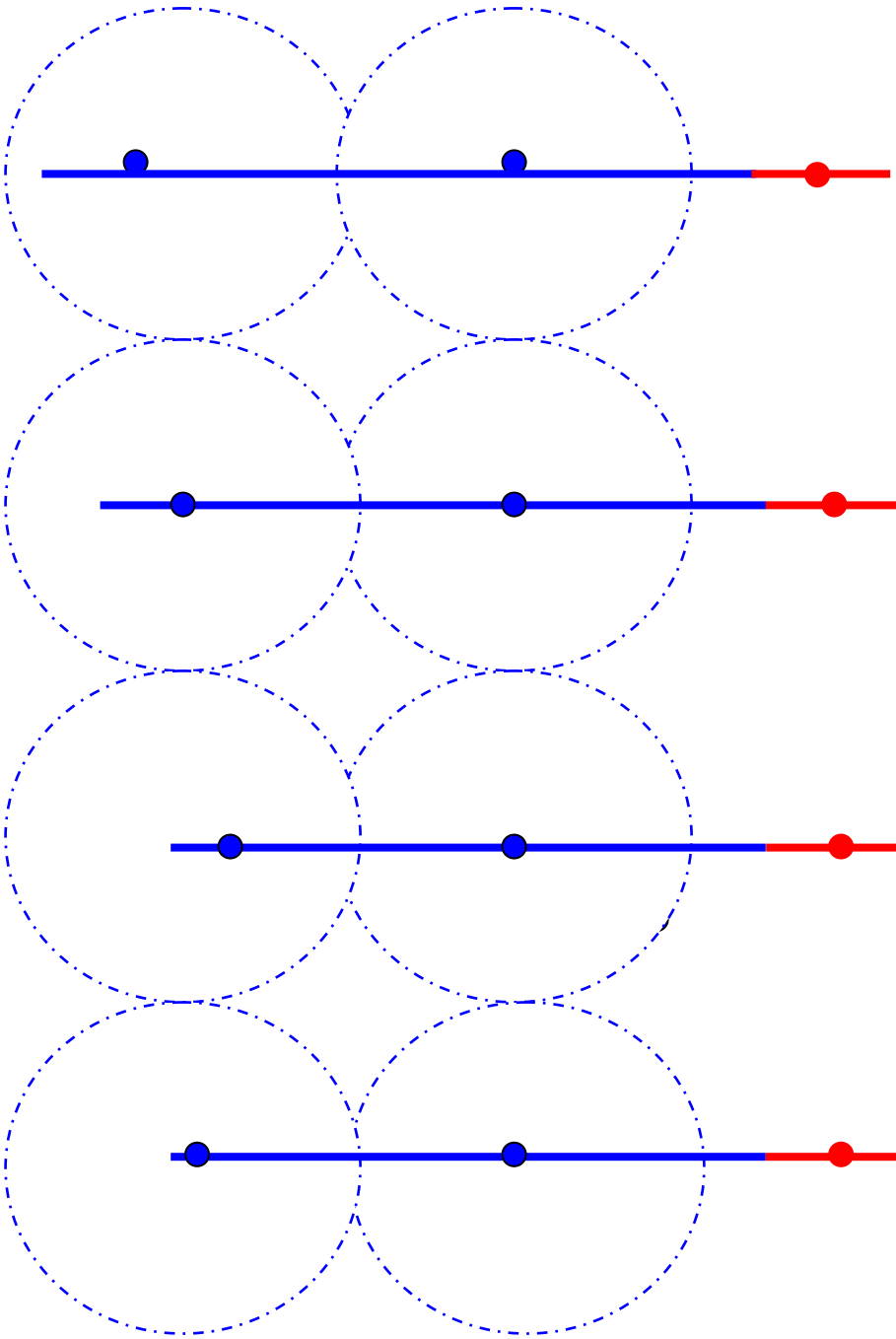
**Proposed Gas Well**

**and**

**Gas Line Design**







**Legend:**



= Existing 160mm Gas Line



= Proposed 110mm reduced to 90mm Gas Line



= Proposed Gas Extraction Suction Area (35m diameter)



= Existing 160mm Gas Extraction Well



= Proposed 160mm Gas Extraction Well

### Appendix III Flare Service Contract.



I  
E

Unit W10C  
Tougher  
Business Park,  
Naas, Co.  
Kildare.  
Tel: +353(0)45  
409 314  
Fax: +353(0)1  
6865 012

### Contract

**Job #:** QA\_009\_BC\_LCC **Date:** Nov.26<sup>th</sup> '10  
**Location:** Kyletalesha Landfill **Validity :** 30 days  
**Customer:** Laois County Council

Item	Unit Cost	Qty Req.	Totals
001	<b>Quarterly Flare Service</b>		
	As Agreed	4	
	General service of all major components as per the attached inspection sheet		
i)	Analyser Calibration CH <sub>4</sub> - CO <sub>2</sub> - O <sub>2</sub>		
ii)	Carbon Monoxide Analyser Calibration		
iii)	Emergency Call-Out (24hour response)		
iv)	Service requirements of AP3 Pneumatic leachate extraction pump currently installed on-site		
	<p><b>Note:</b> This contract is based on but not limited to the items detailed on</p>		

the attached Inspection/Service Record.

IBS commits to maintaining this equipment to the highest standard possible to minimise its downtime between service intervals

All failed or unservicable parts will be charged @ cost.

All prices valid for 30 days

<b>Total</b>	0.00
<b>Vat @ 13.5%</b>	0.00
<b>Nett €</b>	0.00