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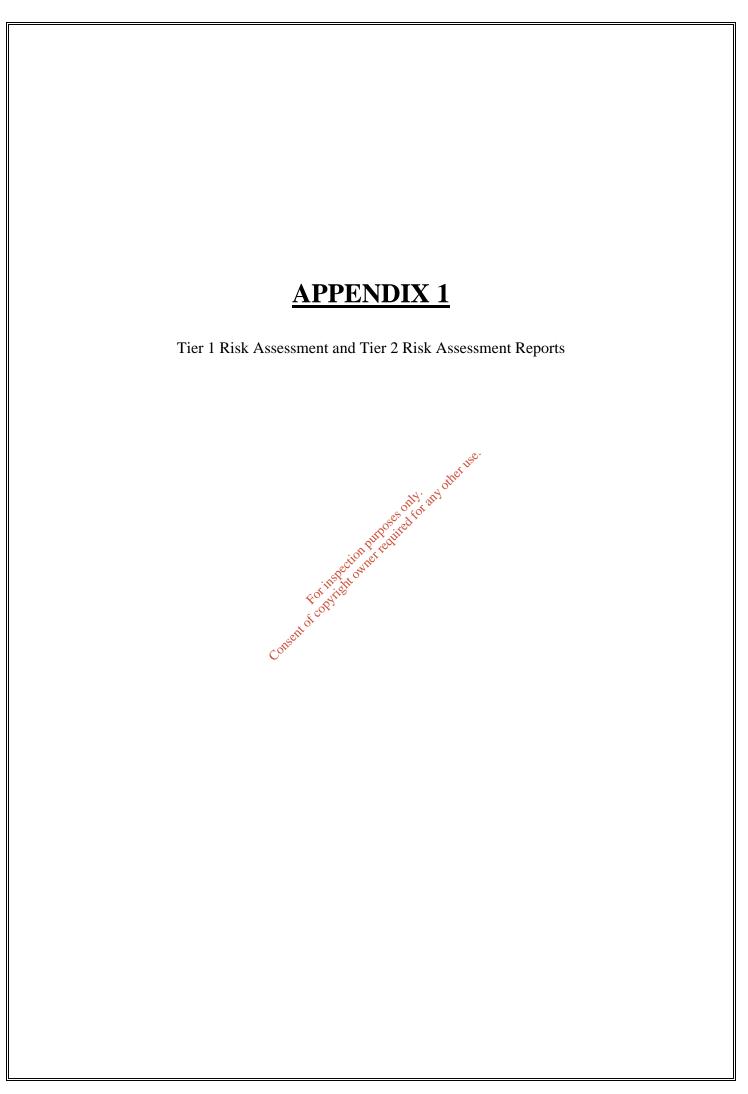
# **TIER 3 RISK ASSESSMENT** FORMER LANDFILL **GOWRAN COUNTY KILKENNY VOL 2 APPENDICES**

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O'Callaghan Moran & Associates, Unit 15, Melbourne Business Park, Model Farm Road, Cork.

# December 2017

O'Callaghan Moran & Associates Registration/VAT Number: 8272844



# TIER 1 RISK ASSESSMENT

# For

Historical Landfill, Gowran, Kilkenny.

Class B – Medium Risk Site

Prepared in accordance with the EPA's Code of Practice for Environmental Risk Assessment for Unregulated Waste Disposal Sites.

Prepared by: Michael Nugent Environment Section Kilkenny County Council

07/11/2013 (rev.3)

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## **SUMMARY**

#### Introduction

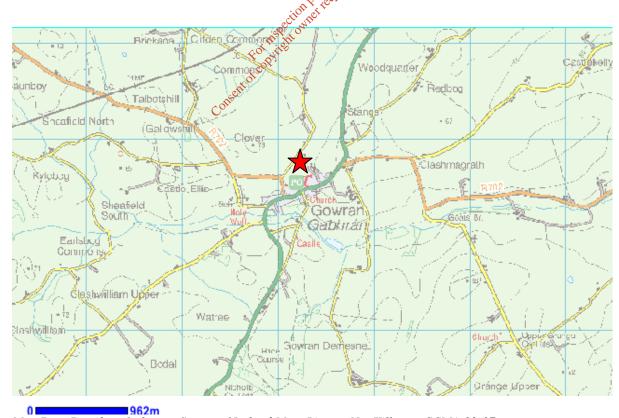
Gowran landfill is located at Gowran, Co. Kilkenny at coordinates X: 263207, Y: 153721. The site was used by Kilkenny County Council for the disposal of municipal waste. The site originally consisted of an old quarry. The council filled the pit and covered the site with soil. The site is owned by Kilkenny County Council.

#### Walkover

The site is currently in use as a storage yard by the Council. The surrounding area is used for residential and agricultural purposes. The site is approximately 0.09 hectares in area. The land falls in a south westerly direction. There is a new housing estate to the east of the site, the closest house being approximately 17m from the site. There is a well approximately 150m SW of the site. There are no surface water features in the vicinity of the site. There are no visible sources of contamination. There are no visible signs of impact to the environment.

# **Desk study**

The closest surface water feature is a river 524m south of the site. There is a public water supply 2.57Km North West of the site. The aquifer is classified as extremely vulnerable. The aquifer is regionally important and karstified. The subsoil is mainly derived from sandstone and shale tills.



Map Data Based on Ordnance Survey of Ireland Map, License No. Kilkenny CCMA 03-07

# **PHOTOGRAPHS**





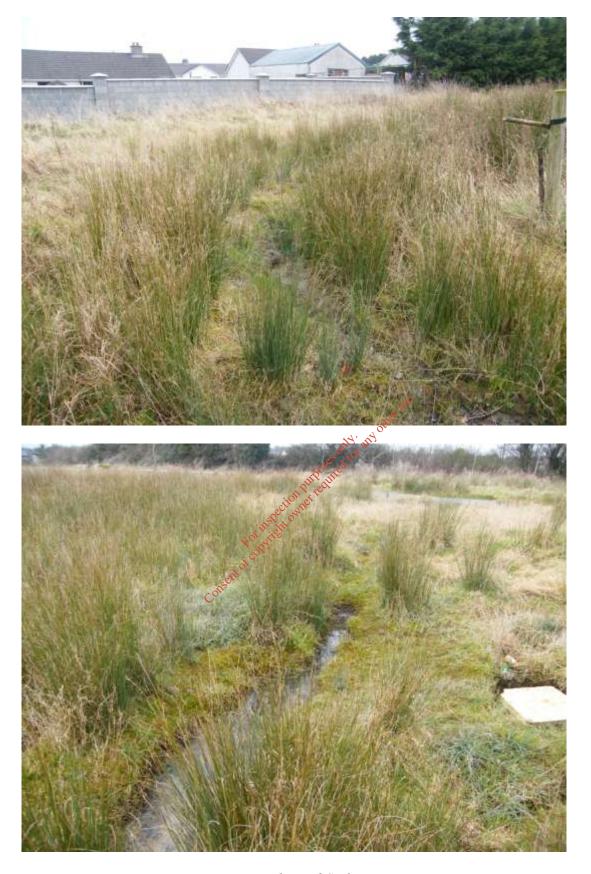
 ${\it Tier~1~Risk~Assessment-Historical~Landfill,~Gowran}$ 





Site outlined in red.

Tier 1 Risk Assessment – Historical Landfill, Gowran



Waterlogged Soil

 $Tier\ 1\ Risk\ Assessment-Historical\ Land fill,\ Gowran$ 

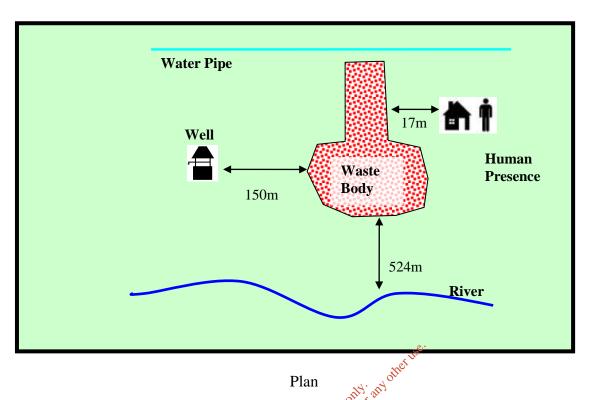


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# **CONCEPTUAL MODEL**



Well

Well

Waste

Body

P4

P2

Subsoil

Rock

Table

**Cross Section** 

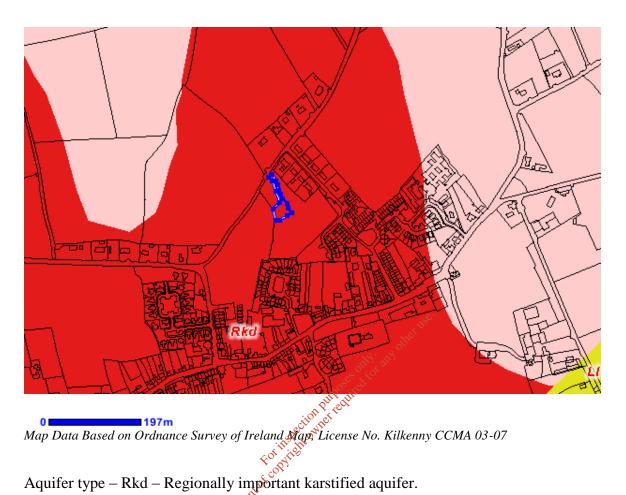
- P1 Landfill Gas
- P2 Leachate Migration unsaturated zone
- P3 Leachate Migration saturated zone
- P4 Landfill Gas Migration.

# WALKOVER SURVEY CHECKLIST

Information	Checked	<b>Comment</b> (include distances from site boundary)
1. What is current Land Use?	✓	Residential/sports/storage yard
2. What are the neighbouring Land Uses?	✓	Residential/agricultural
Land Oses!		
3. What is the size of the site?	<b>√</b>	0.087ha
e. What is the size of the size.		olo o / Na
<b>4</b> . What is the topography?	✓	Gentle slope to south west
		•
<b>5</b> . Are there potential receptors (if	✓	
yes, give details)?		
• Houses	✓	17m east of site
<ul> <li>Surface water features (if yes, distance and direction of flow)</li> </ul>	<b>✓</b>	River 524m south of site
Any wetland or protected areas	<b>✓</b>	None
Public Water Supplies	√ ·	2572m north-west of site
Private Wells	√ ·	150m (150m)
Services	√ ·	Water pipe north of site
Other buildings	<i>√</i>	Residential
Other buildings     Other	√ 05°	n/a
	Qui edil	n/a
6. Are there any potential sources of contamination (if yes, give details)?	Widthowhet Eers.	
• Surface waste (if yes, what type?)	<b>✓</b>	No (some fly-tipped waste not associated with landfill)
Surface ponding of leachate	<b>✓</b>	No
Leachate seepage	✓	No
Landfill gas odours	✓	No
7. Are there any outfalls to	✓	No
surface water? (If yes, are		
there discharges and what is		
the nature of the		
discharge?)		
2 Arathara any signs of	<b>✓</b>	No
<b>8.</b> Are there any signs of impact on the environment?	•	INO
(If yes, take photographic		
evidence)		
Vegetation die off, bare	<b>✓</b>	Yes – some patches of bare ground. See
ground		Photo.
Leachate seepages	✓	No
Odours	✓	No
Litter	✓	Yes – not associated with landfill

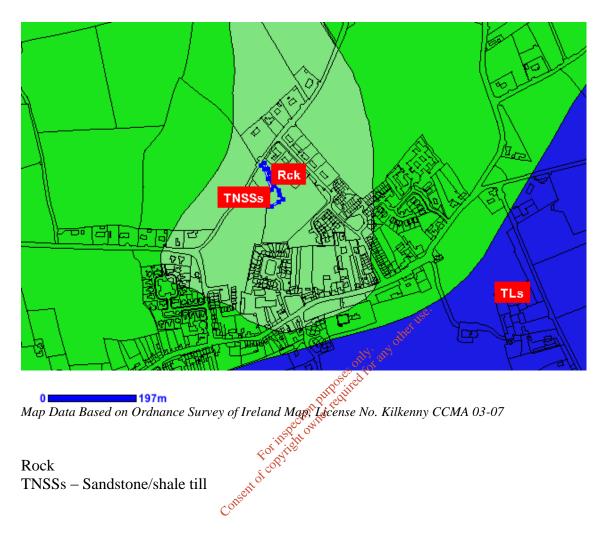
Information	Checked	<b>Comment</b> (include distances from site
		boundary)
Gas bubbling through water	✓	No
• Signs of settlement, subsidence, water	<b>√</b>	No
logged areas		
Drainage or hydraulic issues	<b>✓</b>	Some waterlogged soil on site – most likely due to capping material. See Photo.
Downstream water quality appears poorer than upstream water quality	<b>✓</b>	Not tested
9. Are there any indications of remedial measures? (Provide details)	<b>√</b>	
<ul> <li>Capping</li> </ul>	✓	Capped with soil.
Landfill gas collection	✓	No
Leachate collection	✓	No 🚜 .
		neit
<b>10</b> . Describe fences and	✓	Fence present – not adequate.
security features (if any)	ي	of tot of
	170°5	8
Any other relevant information?	on Physical	
Any other relevant information?	Shigh own	

# **AQUIFER**

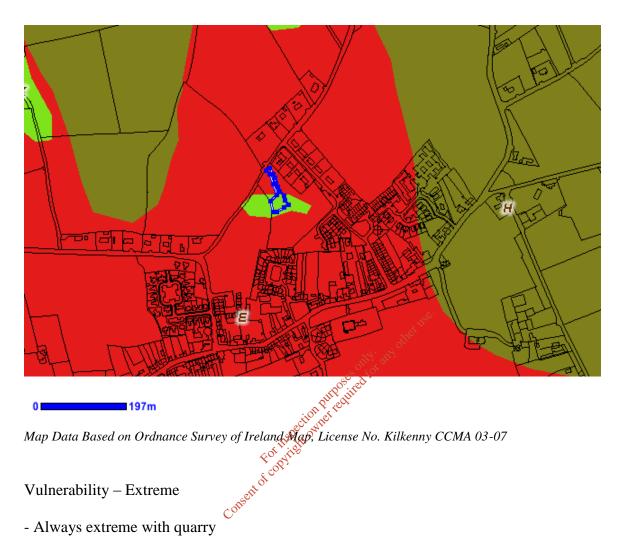


Aquifer type – Rkd – Regionally important karstified aquifer.

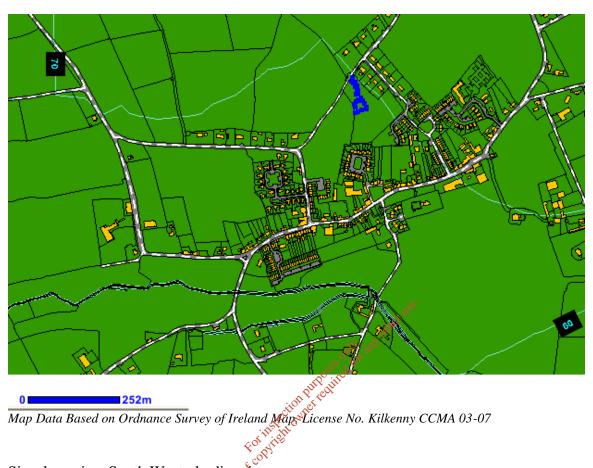
# **SUBSOIL**



# **GROUNDWATER VULNERABILITY**

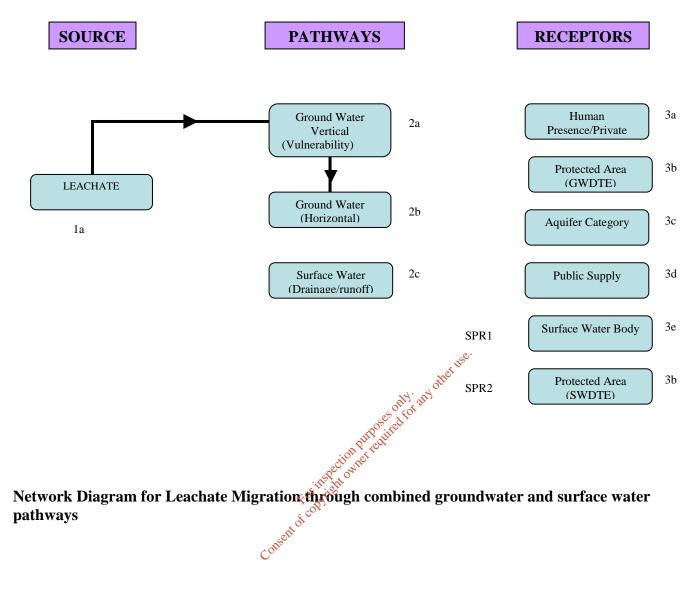


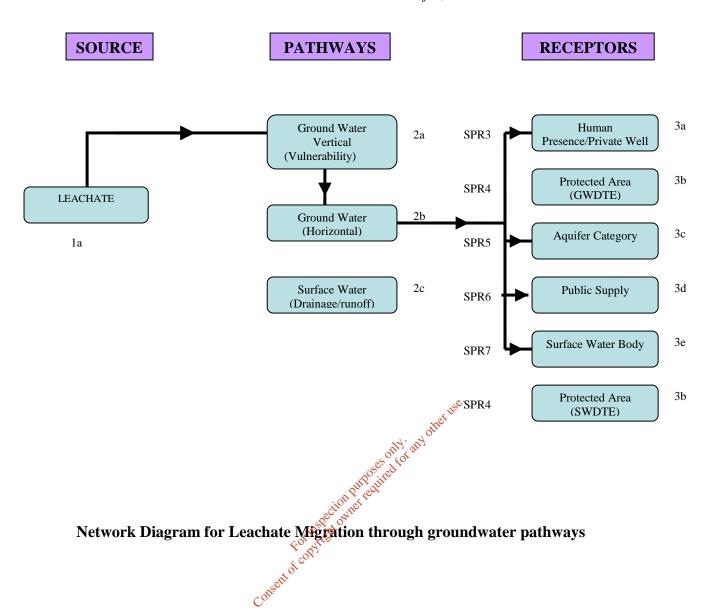
# **HEIGHT CONTOURS**

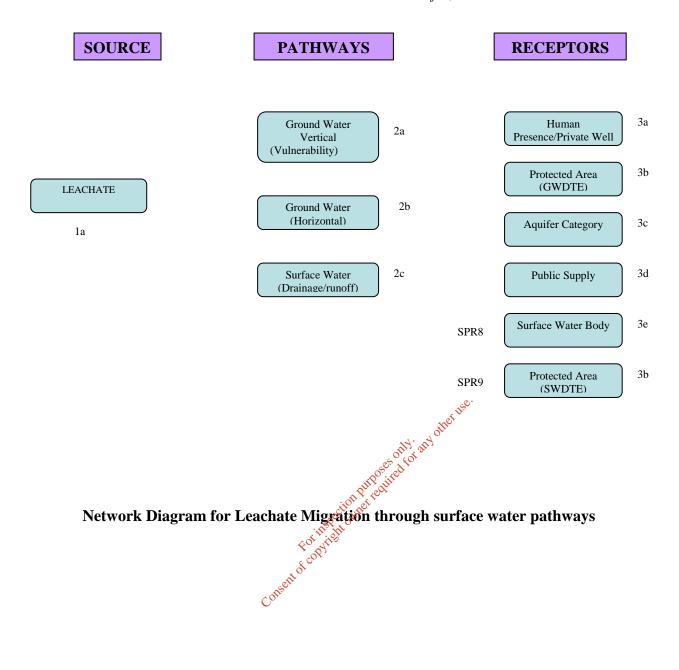


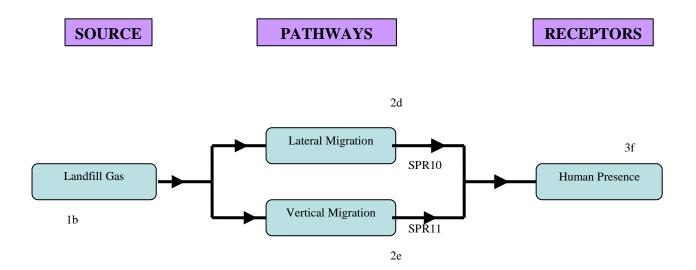
Site slopes in a South Westerly direction.

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Network Diagram for Landfill Gas Migration (Lateral and Vertical)

For inspection produced by the control of th

# **RISK SCORING MATRICES**

#### **Source**

Table 1a: LEACHATE: SOURCE/HAZARD SCORING MATRIX

	WASTE FOOTPRINT (ha)		
WASTE TYPE	≤ 1 ha	> 1 ≤ 5 ha	> 5 ha
C&D <sup>20</sup>	0.5	1	1.5
Municipal <sup>21</sup>	5	7	10
Industrial <sup>22</sup>	5	7	10
Pre 1977 sites <sup>23</sup>	1	2	3
	•	MAX	10

Table 1b: LANDFILL GAS: SOURCE/HAZARD SCORING MATRIX

	WASTE FOOTPRINT (ha)		
WASTE TYPE	≤ 1 ha	> 1 ≤ 5 ha	> 5 ha
C&D <sup>20</sup>	0.5	0.75	1
Municipal <sup>21</sup>	5	7	10
Industrial <sup>22</sup>	3	5	7
Pre 1977 sites <sup>23</sup>	0.5	0.75	1
		MAX	10

# **Pathways**

LEACHATE MIGRATION: PATHWAYS Table 2a:

е	2a: LEACHATE MIGRATION: <i>PATHWAYS</i>	Alise.
	Parameters	Point
		available
	GROUNDWATER VULNERABILITY	of the
	(Vertical pathway) メデット	۶
	Extreme Vulnerability III	3
	High Vulnerability	2
	Moderate Vulnerability	1
	Low Vulnerability	0.5
	High – Low Vulnerability	2
	Fr Off	

Table 2b: LEACHATE MIGRATION: PATHWAYS

Parameters	Points available
GROUNDWATER FLOW REGIME (Horizontal pathway)	
Karstified Groundwater Bodies (Rk) <sup>25</sup>	5
Productive Fissured Bedrock Groundwater Bodies (Rf and Lm) <sup>25</sup>	3
Gravel Groundwater Bodies (Rg and Lg) 25	2
Poorly Productive Bedrock Groundwater Bodies (LI, PI, Pu) 25	1

Rk Regionally Important Karstified Aquifers

Rf Regionally Important Fissured Bedrock Aquifers

Regionally Important Extensive Sand/Gravel Aquifers

Rg Ll Locally Important Sand/Gravel Aquifers

Lm Locally Important Bedrock Aquifers - Generally Moderately Productive

Locally Important Bedrock Aquifers - Moderately Productive only in Local Lg

Zones Pl

Poor Bedrock Aquifers - Generally Unproductive except for Local Zones

Pu Poor Bedrock Aquifers - Generally Unproductive Table 2c: LEACHATE MIGRATION: PATHWAYS

ZC. ELACITATE MIGHATION. TATTIVATO		
Parameters	Points	
	available	
SURFACE WATER DRAINAGE <sup>26</sup> (surface water		
pathway)		
Is there a direct connection between drainage	2	
ditches associated with the waste body and		
adjacent surface water body? Yes		
If no direct connection	0	

Table 2d: LANDFILL GAS: PATHWAY assuming receptor within 250m of source

Parameters	Points
	available
LANDFILL GAS LATERAL MIGRATION	
POTENTIAL	
Sand and Gravel, Made ground, urban, karst	3
Bedrock	2
All other Tills (including limestone, sandstone etc	1.5
- moderate permeability)	
All Namurian or Irish Sea Tills (low permeability)	1
Clay, Alluvium, Peat	1

Table 2e: LANDFILL GAS: PATHWAY assuming receptor located above source.

	- V
Parameters	Points
a di	available
LANDFILL GAS VERTICAL (UPWARDS)	O.
MIGRATION POTENTIAL	
Sand and Gravel, Made ground, urban, kar	5
Bedrock	3
All other Tills (including limestone, sandstone etc -	2
moderate permeability)	
All Namurian or Irish Sea Tills (Jow permeability)	1
Clay, Alluvium, Peat	1
X	

# Receptors

Table 3a: LEACHATE MIGRATION: RECEPTORS

ou. ELACHATE MIGHTATION. TILOLI TOTIO	
Parameters	Points available
HUMAN PRESENCE (presence of a house indicates potential private wells)	
On or within 50m of the waste body	3
Greater than 50m but less than 250m of the waste body	2
Greater than 250m but less than 1km of the waste body	1
Greater than 1 km of the waste body	0

Table 3b: LEACHATE MIGRATION: RECEPTORS

Parameters	Points available
PROTECTED AREAS (SWDTE or GWDTE)	
Within 50m of the waste body	3
Greater than 50m but less than 250m of the waste body	2
Greater than 250m but less than 1km of waste body	1

# Tier 1 Risk Assessment – Historical Landfill, Gowran

Greater than 1 km of the waste body	0
Undesignated sites <sup>27</sup> within 50m of site of the waste body	1
Undesignated sites <sup>27</sup> greater than 50m but less than 250m of	0.5
the waste body	
Undesignated sites <sup>27</sup> greater than 250m of the waste body	0

#### LEACHATE MIGRATION: RECEPTORS Table 3c:

Parameters	Points available
AQUIFER CATEGORY 28 (resource potential)	
Regionally Important Aquifers (Rk, Rf, Rg)	5
Locally Important Aquifers (LI, Lm, Lg)	3
Poor Aquifers (PI, Pu)	1

Rk Regionally Important Karstified Aquifers

Rf

Regionally Important Fissured Bedrock Aquifers Regionally Important Extensive Sand/Gravel Aquifers Rg

LI Locally Important Sand/Gravel Aquifers

Locally Important Bedrock Aquifers - Generally Moderately Productive Lm

Lg Locally Important Bedrock Aquifers - Moderately Productive only in Local

Zones

ΡI Poor Bedrock Aquifers - Generally Unproductive except for Local Zones

Pu Poor Bedrock Aquifers - Generally Unproductive

Table 3d: LEACHATE MIGRATION: RECEPTORS

PUBLIC WATER SUPPLIES (other than private wells)	
Within 100m of site boundary	7
Greater than 100m but less than 300m or within	5
Inner SPA (SI) for GW supplies	
Greater than 300m but less than 1km of within	3
Outer SPA (SO) for GW supplies	
Greater than 1km (karst aquifer)	3
Greater than 1km (no karst aquifer)	0

LEACHATE MIGRATION: RECEPTORS Table 3e:

Parameters	Points available
SURFACE WATER BODIES	
Within 50m of site boundary	3
Greater than 50m but less than 250m	2
Greater than 250m but less than 1km	1
Greater than 1km	0

Table 3f: LANDFILL GAS: RECEPTOR

Parameters	Points available
	available
HUMAN PRESENCE	
On site or within 50m of site boundary	5
Greater than 50m but less than 150m	3
Greater than 150m but less than 250m	1
Greater than 250m	0.5

# RISK SCREENING

**SITE:** Gowran

**RISK: Medium Risk** 

TABLE		SCORE	RATIONALE
Source			
Leachate Hazard	1a	5	0.09 ha, municipal
Landfill Gas Hazard	1b	5	0.09 ha
Pathways			
Leachate Migration – Ground Water Vulnerability	2a	3	Extreme Vulnerability
Leachate Migration – Ground Water Flow Regime	2b	5	Regionally Important Karstified GW body
Leachate Migration – Surface Water Drainage	2c	0	No direct connection
Landfill Gas – Lateral Migration	2d	3	Karst  Assuming recentor above
Landfill Gas – Vertical Migration	2e	5 piro	Assuming receptor above.
Receptors		30,04	
Leachate Migration – Human Presence	3a 💸	or pride 2	Well at 150m.
Leachate Migration – Protected Areas	3bx ox	0	None in vicinity of site
Leachate Migration – Aquifer Category	3c	5	Regionally important Aquifer
Leachate Migration – Public Water Supplies	3d	3	Greater than 1km – karst aquifer
Leachate Migration – Surface Water Bodies	3e	1	River 524m from site
Landfill Gas – Human Presence	3f	5	House 17m from site

	SPR LINKAGE SCORE	Ξ	MAX LINKAGE SCORE	NORMALISED SCORE
SPR 1	$1a \times (2a + 2b + 2c) \times 3e$	40	300	13.3%
SPR 2	5(3+5+0)1 1a X (2a + 2b + 2c) X 3b (SWDTE)	0	300	0%
SPR 3	5(3+5+0)0 1a X (2a + 2b) X 3a	80	240	33.3%
SIKS	5(3+5)2	80	240	33.370
SPR 4	1a X (2a + 2b) X 3b 5(3+5)0	0	240	0%
SPR 5	1a X (2a + 2b) X 3c 5(3+5)5	200	400	50%
SPR 6	1a X (2a + 2b) X 3d 5(3+5)3	120	560	21.4%
SPR 7	1a X (2a + 2b) X 3e 5(3+5)1	40	240	16.67%
SPR 8	1a X 2c X 3e 5(0)1	0	60	0%
SPR 9	1a X 2c X 3b (SWDTE) 5(0)0	0	only any dire 60	0%
SPR	1b X 2d X 3f	70 S	150	50%
SPR	5(3)5 1b X 2e X 3f	70 se	250	50%
11	5(5)5	in the ow,		

This site scored a maximum linkage score of 50%. This classifies the site as Class B Medium Risk.

This is due to the size and importance of the underlying aquifer, which is karstified and regionally important.

The presence of the house at 17m poses a medium risk due to lateral migration of landfill gas.



# TIER 2 RISK ASSESSMENT GOWRAN HISTORIC LANDFILL, CO. KILKENNY May 2014





# **TIER 2 RISK ASSESSMENT**

# GORAN HISTORIC LANDFILL, CO. KILKENNY

# User is Responsible for Checking The Revision Status Of This Document

Rev. Nr.	<b>Description of Changes</b>	Prepared by:	Checked by:	Approved by:	Date:
0	Issue to Client	NM/MT	ME	٠.	12.05.2014

Client: Kilkenny County Council

Keywords: Site Investigation, environmental risk assessment, waste, leachate, soil samples

This report presents the findings of a Tier 2 assessment in accordance with the EPA Abstract:

Code of Practice for inregulated landfill sites site investigation conducted at

Gowran, Co. Kilkenny

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#### **PREAMBLE**

Fehily Timoney & Co. (FTC) was appointed by Kilkenny County Council (KCC) to complete a Tier 2 risk assessment of a site in accordance with the Environmental Protection Agency (EPA) Code of Practice (CoP) (2007): Environmental Risk Assessment for Unregulated Waste Disposal Sites.

The site is located a short distance outside Gowran village, Co. Kilkenny in a rural location, surrounded by agricultural pasture land.

A Tier 1 study was conducted by KCC in 2013 and this concluded that in accordance with the EPA CoP the risk rating was 'Moderate' with potential for environmental contamination. This is due to the size and importance of the underlying aquifer, which is karstified and classified as regionally important as well as the proximity of residential dwellings.

A site walkover was conducted on 21 January 2014 prior to the commencement of the Tier 2 site investigations. Ten trial pits were also excavated on that date and logged by FTC personnel. The trial pit locations were chosen to ascertain the overall extent of the fill material and confirm the initial assumptions of the Tier 1 Assessment. Soil and leachate samples were also taken during trial pitting. Temporary gas monitoring wells were installed whilst backfilling three of the trial pits. Two groundwater wells were subsequently drilled outside of the waste body on the week commencing 24 February 2014 with sampling of the groundwater from these and a number of private wells undertaken 19 March 2014.

At present there are no Irish or EU soil contamination remediation or disposal standards. In the absence of this legislation a best practice approach was adopted for this analysis. This was based upon the EPA's landfill acceptance criteria, the Interim Guideline Values for Groundwater and the *Dutch List*.

The Tier 2 assessment determined that a moderate risk classification (Class B) can be assigned to the site. For such a site, the EPA CoP directs that the site be regularised/authorised in accordance with current waste management legislation.

#### **METHODOLOGY** 1.

# 1.1. Background

KCC, are obliged under Section 22 of the Waste Management Acts 1996 as amended, to carry out an inventory and risk assessment of all non-licensed closed landfills (i.e. historic unregulated waste disposal sites) in their county. KCC, having identified all unregulated waste disposal sites in Kilkenny county, began a process of undertaking environmental risk assessments (Tier 1 assessments) of each site in accordance with EPA Code of Practice (CoP) (2007): Environmental Risk Assessment for Unregulated Waste Disposal Sites. KCC are in the process of carrying out Tier II investigations at those sites with the highest risk rating and requiring further investigation.

The site at Gowran was identified as one of the sites in Kilkenny with the highest risk rating assigned to it. The subject site area was originally used as a quarry during the early and mid 1900s. Throughout the 1970s, 1980s and 1990s the site, operated by KCC, was backfilled with domestic, commercial and industrial waste arising from the Gowran and Kilkenny City areas. Since its closure in the 1990s, the site has been used as a council yard, with an area reserved for storage of gravel stockpiles, piping and lampposts.

The Tier 1 study was conducted by KCC in 2013 and this concluded that in accordance with the EPA CoP the risk rating was 'Moderate' with potential for environmental contamination. This is due to the size and importance of the underlying aguifer, which is karstified and classified as regionally important as well as the proximity of residential dwellings.

The Tier 1 assessment is included as an appendix to this document.

# 1.2. Scope of Works and Project Objectives of the scope of work was to undertake the Tier 2 associate see A Fifther House of the scope of work was to undertake the Tier 2 associate see a first part of the scope of work was to undertake the Tier 2 associate see a first part of the scope of work was to undertake the Tier 2 associate see a first part of the scope of work was to undertake the Tier 2 associate see a first part of the scope of work was to undertake the Tier 2 associate see a first part of the scope of work was to undertake the Tier 2 associate see a first part of the scope of work was to undertake the Tier 2 associate see a first part of the scope of work was to undertake the Tier 2 associate see a first part of the scope of work was to undertake the Tier 2 associate see a first part of the scope of work was to undertake the Tier 2 associate see a first part of the scope of work was to undertake the Tier 2 associate see a first part of the scope of the sc

The scope of work was to undertake the Tier 2 assessment in accordance with the EPA CoP and included:

sampling
as monitoring
Groundwater well drilling
Groundwater monitoring.

he initial desk study
eview of the follow As part of the initial desk study, a preliminary assessment of available information was undertaken which included a review of the following literature sources:

- EPA 2003, Landfill Manuals: Landfill monitoring (2<sup>nd</sup> Edition)
- EPA 1999, Landfill Manuals: Site Investigations
- CLR Report No. 4 1994 Sampling Strategies for Contaminated Land, DoE, Contaminated Land Research (CLR) Report
- BS 5930: 1999, Code of Practice for Site Investigations
- BS 10175: 2000, Investigation of Potentially Contaminated Sites Code of Practice
- BS 6068 Water Quality: Sampling (parts 6.1-6.6 and 6.11-6.12, 6.14)
- BS 8855 Soil analysis (all parts)
- CLM: Ready Reference 2002, Section 3.1 Soil Sampling Strategies
- CLM: Ready Reference 2002, Section 3.2 Groundwater Sampling/Monitoring Strategies
- CLM: Ready Reference 2002, Section 3.3 Gas Sampling/Monitoring Strategies

The Teagasc and Geological Survey of Ireland (GSI) online databases were reviewed to assess the following:

- Aquifer type
- Groundwater bodies
- Vulnerability (full national coverage of extreme vulnerable areas)
- Soil and Subsoil type
- Bedrock type

The National Parks and Wildlife Service (NPWS) online data abase was reviewed to assess the following:

- Proximity of Special Protected Areas (SPAs)
- Proximity Special Areas of Conservation (SACs)

KCC provided details of the site history, location of private wells and OSI maps of the area.

The desktop study was followed by a site walkover. The information gathered from these steps was used to determine the locations of the intrusive investigation.

The intrusive investigations included the excavation of a number of trial pits. The objective of the trial pits was to provide a preliminary assessment of the volume, extent and type of waste infilled at the subject site. Following this, two groundwater boreholes were installed for water quality monitoring purposes.

#### 1.3. Desk Study

This section of the report presents the findings of the desk study.

#### 1.3.1. Site Description & On-Site Conditions

The location of the site is shown on Figure 2.1.

The site is surrounded by agricultural, residential and recreational amenity land.

KCC stated that the deposited waste was progressively covered with a layer of clay which has left the site prone to water logging, extensive growth of reeds and poor grass growth differing from the rest of the immediate surrounding land. There is evidence of fly tipping on the site including the burnt out remains of a caravan and bags of general household rubbish.

The site is bound to the south east by a disused playing fields. To the south west is a greenfield land parcel which has received planning permission for a residential development. The lands to the north west of the site are agricultural pasture. Lands to the north and north east of the site are residential. There are further residential properties to the east, south and west, all within 200m of the site boundary. The site is accessed from Rockfield road which runs along the north western boundary of the site.

The nearest houses lie within 20 m of the north eastern site boundary where the border between the property and site consists of a fence and wall and a line of deciduous trees.

The foul sewer servicing the residential development to the east of the site runs along the north eastern boundary of the site and connects into the foul sewer running along the Rockfield road. There are a number of manhole covers along the sewer line within the site.

The closest surface water feature is a stream that lies approximately 0.5km to the south west of the site.

The site slopes falls from south to north with the low point occurring at the entrance of the site.

## 1.3.2. Geology

The solid geology of the site is described, by GSI website, as visean limestone and calcareous shale with a solid rock outcrop within the Ballyadams Formation of crinoidal whackestone/packstone limestone that lies on the boundary of the Butlersgrove Formation of dolomitised agillaceous limestone.

Teagasc mapping of the area describes the soils as alluvium and till derived chiefly from limestone.

#### 1.3.3. Hydrogeology

An examination of the national bedrock aquifer map published by the GSI identifies that the aquifer underlying the site as a Regionally Important Aquifer - Karstified (diffuse) - Bedrock aquifer, that is capable of supplying regionally important abstractions (e.g. large public water supplies), or 'excellent' yields (>400  $\,$ m³/d). The continuous aquifer unit generally has an area of >25  $\,$ km² with groundwater flow predominantly occurring through fractures, fissures and joints.

#### 1.3.4. Details from borehole logs

The log from a deep aquifer water extraction well bored in 2006 for a housing scheme 150 m south east of the site describes a topsoil of red-brown clay and limestone boulders underlain by a bed of weathered dolomite and then dark grey weathered limestone typical of the Butlersgrove Formation.

#### 1.3.5. Groundwater Vulnerability

Groundwater vulnerability, as defined by the GSI, is the term used to represent the intrinsic geological and hydrogeological characteristics that determine the case with which groundwater may be contaminated by human activities. The factors used in assessing groundwater vulnerability include subsoil type and thickness and recharge type as indicated in Table 2.1. The GSI procedure whereby groundwater protection is assessed is outlined in the EPA-GSI publication *Groundwater Protection Schemes* (DELG/EPA/GSI, 1999). The procedure proposes a matrix, which relates vulnerability, source and resource such that a particular site is given a Response (R) to specific activities.

The GSI Online mapping data set identifies that, the groundwater vulnerability for the site is classified as 'Extreme'.

Table 1.1: GSI Guidelines – Aquifer Vulnerability Mapping

	Hydrogeological Conditions			
Vulnarahility Dating	Subsoil Permeability (Type) and Thickness			
Vulnerability Rating	High Permeability (Sand/gravel)	Moderate Permeability (e.g. Sandy soil)	Low Permeability (e.g. Clayey subsoil, clay, peat)	
Extreme (E)	0 - 3.0 m	0 - 3.0 m	0 - 3.0 m	
High (H)	>3.0 m	3.0 -10.0 m	3.0 - 5.0 m	
Moderate (M)	N/A	>10.0 m	5.0 - 10.0 m	
Low (L)	N/A	N/A	>10 m	

Notes:

N/A = Not Applicable

Precise permeability values cannot be given at present

#### 1.3.6. Hydrology

The nearest open watercourse is a small, unnamed, stream that lies approximately 0.5 km to the south. The village of Gowran lies between the site and the stream. The stream is a tributary of the River Barrow, joining the main channel of the Barrow approximately 5 km downstream of the site in an easterly direction.

#### 1.3.7. Designated Sites

The closest Natura 2000 site is the Barrow and River Nore Special Area of Conservation (SAC 002162).

#### 1.4. Site Investigations

Priority Geotechnical Ltd. (Priority) was retained by FTC to carry out the trial pitting and groundwater well drilling elements of the work. Supervision of the trial pitting and drilling works was undertaken by FTC personnel. A Priority Geothechnical engineer was on site to log details of the trial pits and groundwater wells.

#### 1.4.1. Site Walkover

The site walkover was conducted on 21 January 2014 to assess ground conditions and identify suitable locations for the intrusive investigations and drilling of groundwater monitoring wells. The site walkover checklist is included in Appendix 1.

The profile of the site was seen to have the characteristics of made ground with an unnatural variation of the overall topography evident.



Figure 1.2: Site Topography

The site was seen to be of poor quality and poorly drained grass-land with evidence of water logging. At the highest point of the site an area of hardcore can be seen to be used over time by the council as a storage area (Figure 2.3).



Figure 1.3: Subject Site

Based on the information gathered and on the topography of the surrounding area and the unnatural immediate variations of gradient and land quality, a subject site area was established which was assumed to comprise made ground due to the infilling of waste.

#### 1.4.2. Trial Pit Excavations

The objective of the trial pit excavations was to provide an assessment of the type of waste deposited, it's approximate age, the volume as well as determining if the soil surrounding and underlying the waste was contaminated.

Ten trial pits were excavated by a 13T Hitachi excavator on 21 January 2014. The trial pit sample locations were chosen to help establish the trial pits along with a description of the excavation is presented in Section 3.

FTC personnel supervised all excavations, recording the ground conditions and noting any staining, waste or odours.

Photographs of the trial pits are presented in Figure 2.4 to Figure 2.22.





Figure 1.4: Trial Pit 1





Figure 1.6: Trial Pit 2



Figure 1.7: Trial Pit 3



Figure 1.8: Trial Pit 4



Figure 1.9: Trial Pit 5





Figure 1.11: Trial Pit 6



Figure 1.12: Waste removed Trial Pit 6





Figure 1.13: Trial Pit 7



Figure 1.15: Trial Pit 8



Figure 1.16: Trial Pit 9



Figure 1.17: Waste removed Trial Pit 9



Figure 1.18: Trial Pit 10



Figure 1.19: Waste removed Trial Pit 10



Figure 1.20: Trial Pit 11



Figure 1.21: Trial Pit 12



Figure 1.22: Waste removed Trial Pit 12

#### Gas Monitoring Wells

Temporary gas wells were installed at the extent of the waste body to determine if the waste was generating landfill gas and if so, was the gas migrating away from the waste body.

Temporary gas monitoring wells were installed at trial pits 8, 11 and 12. The wells, which were installed as the pits were being backfilled, consisted of 1.5m of 50mm slotted HDPE pipe and 1.5m of 50mm solid HDPE pipe. The top 0.2m to 0.5 m of slotted section was left above ground and sealed using a rubber bung and gas sampling tap.

Photographs of the installed gas wells are presented in Figure 2.23 to Figure 2.25.



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Figure 1.25: Gas Well Trial Pit 12

#### Soil Sampling

All samples were taken in the field by FTC personnel using standard sampling methods. Samples where then appropriately containerised, labelled and stored for dispatch to Alcontrol Laboratories under appropriate chain-of-custody procedures. According are an accredited and certified laboratory.

A representative waste sample was taken during the trial pit excavation. This sample was tested in accordance with BS EN 12457- 3 with a liquid to solid ratio (L/S) of 10 litres of leachate per dry kilogram of waste (10 l/kg) to determine the composition and leaching behaviour of the sampled material. The analysis results are contained in the Alcontrol Laboratories results presented in Appendix 4.

#### Leachate Sampling

A grab sample of leachate was undertaken in Trial Pit 12. The liquid was allowed to intrude into the trial pit from the surrounding waste and a sample was taken using an extendable sampling pole. The sample was appropriately bottled (using pre-prepared laboratory bottle ware), labelled and packaged for submission to the laboratory submitted for leachate indicator testing. The analysis results from Alcontrol Laboratories are presented in Appendix 4.

#### Gas Monitoring

Readings of gas were taken using a GEM5000 Landfill Gas Analyser. The analyser was allowed to run for a 60 second cycle or until the readings stabilised. Readings were noted by FTC for the following:

- Methane (CH<sub>4</sub>) levels
- Carbon Dioxide (CO<sub>2</sub>) levels
- Oxygen (O<sub>2</sub>) levels.

#### 1.4.3. Borehole and monitoring well installation

The results of the Tier 1 assessment and the initial exploratory investigation (the tril pit excavations) informed the placement of the boreholes for the main investigation. Two boreholes were placed outside the known extent of the waste material to assess any potential lateral migration of leachate; that is, to assess the potential for pathway linkages from the waste (source) to receptors.

Drilling took place on the 21 January 2014 using shell and auger. However, due to underlying rock less than 3 m below ground level, drilling could not successfully continue to groundwater level using this method.

Drilling took place on the 25, 26 and 28 of February 2014, using an air rotary drill. Drilling at each location continued until groundwater was encountered. Groundwater strikes were recorded, and are presented in the results section, Table 3.2. Wells were installed in each of the boreholes drilled, to facilitate groundwater sampling and assess potential leaching from the site.

The borehole logs well installation specifications are included in Appendix 3. The locations of the boreholes are shown in Appendix 2. BH1 is located at the south western boundary of the site, outside of the waste body. BH2 is located to the north of the site, inside a field adjacent to the site, again outside the waste body. BH1 is located downstream of the waste body and BH1 upstream of the waste body.

Photographs of the installed groundwater wells are presented in Figure 2.26 to Figure 2.27.



And a little introductions.

Figure 1.26: Groundwater Well BH1

Figure 1.27: Groundwater Well BH2

#### Water Sampling

The groundwater level in each borehole was recorded. This was carried out after installation, when groundwater levels had recovered and stabilised. The recorded water levels are presented in the results section in Table 3.2.

A single round of groundwater sampling was undertaken. Purging of groundwater wells was conducted by pumping approximately three borehole volumes of water. Each well was sampled using dedicated tubing installed in each well. This was to prevent cross-contamination of wells during monitoring and sampling.

After purging of groundwater from the wells, groundwater samples were collected in clean plastic and glass bottles, as appropriate for the analysis required. Laboratory analysis of groundwater samples was undertaken by Alcontrol Laboratories. The test parameters for the soil and groundwater samples were determined based on the findings of the preliminary site investigation.

Further samples were taken from three deep private wells within 500 m of the subject site to compliment those taken from the drilled wells. The locations of these wells can be seen in Appendix II.

#### 1.5. Method of Assessment

#### 1.5.1. Remediation and Disposal Criteria

#### Chemical Assessment Criteria

Cognisance was taken of the following legislative/guidance documents as part of this assessment:

- Dutch Guideline Values (Dutch List) 1
- European Communities, Environmental Objectives (Groundwater) Regulations, 2010 (S.I. No. 9 of 2010)
- European Communities Environmental Objectives (Surface Waters) (Amendment) Regulations, 2012 (S.I. No. 327 of 2012)
- European Communities Environmental Objectives (Surface Waters) Regulations, 2009 (S.I No. 272
- European Communities (Quality of Surface Water Intended for the Abstraction of Drinking Water) Regulations, 1989 (S.I. No. 294/1989).

Other Guidance - Groundwater Interim Guideline Values in the Market Interim Co. Where applicable, surface water and groundwater quality results have been compared with the relevant Interim Guideline Values, (IGV) set out in the EPAS Groundwater Towards Setting the Guideline Values for the Protection of Groundwater in Ireland. This document was published in 2003 to provide an interim framework for groundwater quality assessments. Other criteria also used, as outlined above were:

- Irish Drinking Water Regulations, 2007 (S.I. No. 278 of 2007)
- Water Quality (Dangerous Substances) Regulations, 2001 (S.I. No. 12 of 2001)

#### **Dutch List**

The Dutch List of parameters for the assessment of soil contamination is a comprehensive set of standards devised by the Dutch Government. Although this guidance is specific to conditions in Holland, it is often used elsewhere in Europe as a useful indicator of the relative significance of contamination. The guideline values were derived for both soils and groundwater by the Dutch government research agency (RIVM) using a toxicological risk-based approach (i.e. based on determining the maximum tolerable risk from available toxicity and exposure data). This approach takes into account the risk to the ecosystem as well as risks to human health.

They are not site end-use specific. Nevertheless, they are a useful screening tool for determining the significance of contamination: if a site is found to be uncontaminated with respect to Dutch Guideline Values, further screening is not considered necessary.

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Directorate General for Environmental Protection "Intervention Values and Target Values - Soil Quality Standards", Department of Soil Protection, The Ministry of Housing, Spatial Planning and Environment, The Netherlands. (a.k.a. The New Dutch List).

#### 2. RESULTS OF SITE INVESTIGATIONS

#### 2.1. Introduction

This section of the reports presents the results of the site investigation.

#### 2.2. Ground Conditions

The trial pit investigations across the site confirm that general ground conditions encountered consisted of made ground. The made ground comprises of municipal solid waste (MSW) of varying composition and degrees of degradation overlain by a very shallow layer of topsoil/clay cover material. The depth of waste varied across the site from 2 m to >5 m.

The details of the trial pit logs are included in Appendix 3 and summarised in Table 3.1.

**Table 2.1: Summary Description of Trial Pits** 

Trial Pit No	TP co-ordinates	Brief Description
1	IO 263213.438:153702.558	<ul> <li>Capping material of gravel soil and clay from 0 - 0.5mbgl</li> <li>Waste encountered from 0.5mbgl - 2.3mbgl</li> <li>Bedrock at 2.3mbgl</li> <li>Waste – Odorous, dry, mixed domestic and commercial including plastic, glass, burnt material</li> </ul>
2	IO 263224.803:153696.395	- Natural Ground from 0-0.7mbgl - Bedrock at 0.7mbgl
3	IO 263227.661:153715.284	- Watural Ground from 0-0.4mbgl - Bedrock at 0.4mbgl
4	IO 263202.753:153694.569	Natural Ground from 0-0.4mbgl Bedrock at 0.5mbgl
5	IO 263200.123:153712.658	<ul> <li>Capping material of gravel, soil and clay from 0 – 1.2mbgl (permeable membrane at 0.3m)</li> <li>Waste encountered from 1.2mbgl - 5.1mbgl</li> <li>Bedrock at 5.1mbgl</li> <li>Waste – Odorous, dry, mixed domestic and commercial including plastic, glass, newspapers, tyres, burnt material</li> </ul>
6	IO 263186.995:153710.404	<ul> <li>Capping material of soil and clay from 0 – 1.2mbgl</li> <li>Waste encountered from 1.2mbgl - 2.8mbgl</li> <li>Bedrock at 2.8mbgl</li> <li>Waste – Odorous, dry, mixed domestic and commercial including plastic, glass, textiles, sanitary waste</li> </ul>
7	IO 263221.483:153740.700	<ul> <li>Capping material of soil and clay from 0 - 0.6mbgl</li> <li>Waste encountered from 0.6mbgl - 3mbgl</li> <li>Bedrock at 3mbgl</li> <li>Waste – Strong odorous, dry, mixed domestic and commercial including plastic, glass, wood, textiles, sanitary waste</li> </ul>
8	IO 263202.531:153766.540	<ul> <li>Capping material of soil and clay from 0 - 0.7mbgl</li> <li>Waste encountered from 0.7mbgl - 2.3mbgl</li> <li>Bedrock at 2.3mbgl</li> <li>Waste – Dry, mixed domestic and commercial including plastic, glass, wood and gravels</li> </ul>

Trial Pit No	TP co-ordinates	Brief Description
9	IO 263182.626:153782.560	<ul> <li>Capping material of soil and clay from 0 - 0.7mbgl</li> <li>Waste encountered from 0.7mbgl - 1.5mbgl</li> <li>Natural ground at 1.5mbgl</li> <li>Leachate/surface water from 1.4mbgl</li> <li>Waste - Odorous, wet, mixed domestic and commercial including plastic, textiles</li> </ul>
10	IO 263167.640:153757.567	<ul> <li>Capping material of soil and clay from 0 - 0.4mbgl</li> <li>Waste encountered from 0.4mbgl - 4mbgl</li> <li>Natural ground at 2.3mbgl</li> <li>Waste – Odorous, wet, mixed domestic and commercial including plastic, textiles, leather and tyres</li> </ul>
11	IO 263170.802:153736.452	<ul> <li>Capping material of stone, soil and clay from 0 – 2.4mbgl</li> <li>Waste encountered from 2.4mbgl – 3.2mbgl</li> <li>Bedrock at 3.2mbgl</li> <li>Waste – Dry, mixed domestic and commercial including plastic, tyres, textiles, glass, newspapers, sanitary waste</li> </ul>
12	IO 263182.398:153741.194	<ul> <li>Capping material of soil and clay from 0 - 0.5mbgl</li> <li>Waste encountered from 0.5mbgl – 5.5mbgl (could dig no deeper with excavator)</li> <li>Leachate/surface water from 5mbgl</li> <li>Waste – Odorous, wet mixed domestic and commercial including plastic glass, burnt material, tyres, textiles, glass, newspapers, santary waste</li> </ul>

<sup>\* =</sup> mbgl = metres below ground level

The edges of the waste was found at boreholes TP2, TP3, TP4, TP6, TP7, TP8, TP9 and TP11 and the maximum depth of waste was found to be approximately 5 mbgl.

The extent of waste is defined based on an area of approximately 4,000 m<sup>2</sup> and a presumed maximum depth of 5 m of waste and other inert infill material. In so far as can be determined, the volume of waste is approximately 20,000 m<sup>3</sup>. The is a conservative estimation as the depth of waste determined through trial pits is considerably less in some areas of the site and greater in other areas.

#### 2.3. Groundwater levels

The levels at which groundwater was initially encountered during drilling is recorded on the boreholes logs in Appendix 3. Following installation of the groundwater wells, the wells were left for a period of time to recover and the groundwater levels were subsequently recorded again. The results are presented in Table 3.2.

Table 2.2: Groundwater levels

Borehole ID	Total Well Depth	Casing Height	Total Well Depth	Water level (Drilling)	Water level 27/02/2014	Water level 10/03/2014	Water level 19/03/2014
	mBGL*	m	mBTOC†	mBTOC	mBTOC	mBTOC	mBTOC
BH1	10.02	0.34	9.68	7.40	7.29	7.73	8.52
BH2	11.13	0.26	10.87	19.6	-	5.19	6.02

<sup>\* =</sup> mBGL = metes below ground level

<sup>† =</sup> mBTOC - meters below top of casing

#### 2.4. Results of Laboratory Analysis

This section of the reports presents the results of the chemical analysis of samples taken during the site investigation.

#### 2.4.1. Chemical Results for Soil Samples

Soil samples are assessed against the *Dutch List – soil criteria* and are presented in Tables 3.2.

A representative soil sample intermixed with waste was collected from TP5 and TP10 and tested for leachability analysis in accordance with BS EN 12457- 3 at L/S 10 l/kg. This was to determine the composition and leaching behaviour of the infill material. Results of analysis are compared to the landfill waste acceptance criteria for an inert landfill for benchmarking purposes. Results are presented in Table 3.3.

Table 2.3: Soil Sampling Results - Solid Waste analysis

Parameter	Units	Inert Waste Units Landfill		ality Dutch t	Sampling Results - Sample ID		
		Criteria	Optimum	Action	TP5	TP10	
Benzene	mg/kg		0.05	2 15	<0.0010	<0.0010	
Toluene	mg/kg		0.05	130	0.00615	0.0116	
Ethylbenzene	mg/kg		0.05 01	of all 50	0.0283	0.276	
Xylene	mg/kg		0,05 itel	25	0.0345	0.426	
BTEX (sum of above)	mg/kg	6	tion of real		0.069	0.714	
Total Organic Carbon	%	3 1115	oct own		5.12	2.52	
Moisture Content	%	-Forty					
Moisture Content ratio	%	a-of C			19	23	
Mineral Oil	mg/kg	Consess	50	5,000	212	247	
MTBE	ug/kg				<5	<5	
PCBs (Sum of 7)	mg/kg	1	0.02	1	<0.021	<0.021	
PAH (Sum of 17)	mg/kg	*	1	40	<10	<10	
рН	pH units	>6 or <9			8.11	7.84	

Table 2.4: Soil Sampling Results - Leachability Analysis Results compared to Article 16 of Annex II to Directive 1999/31/EC

Parameter	Units	Inert	Sampling Results - Sample ID		
(CEN 10:1 Leachate)	L/S = 10 <i>I/kg</i>	Landfill Criteria	TP5	TP10	
Arsenic	mg/kg	0.5	0.0728	0.0524	
Chromium	mg/kg	0.5	0.0343	0.0223	
Copper	mg/kg	2	0.0939	0.024	
Nickel	mg/kg	0.4	0.114	0.0135	
Zinc	mg/kg	4	0.0685	0.0273	
Mercury	mg/kg	0.01	0.00154	<0.001	
Lead	mg/kg	0.5	0.0211	0.00359	
Barium	mg/kg	20	0.136	0.268	
Cadmium	mg/kg	0.04	<0.001	< 0.001	
Selenium	mg/kg	0.1	0.0327	0.0203	
Antimony	mg/kg	0.06	0.088	0.0694	
Chloride	mg/kg	800	ي·         1360	150	
Fluoride	mg/kg	10 mer	<5	<5	
Sulphate	mg/kg	7/000	431	566	
Molybdenum	mg/kg	10 He 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	0.868	0.346	
Dissolved Organic Carbon	mg/kg 💉	odified 500	502	180	
Total Dissolved Solids	mg/kglonie	N	5990	3140	
Total Monohydric Phenols	mg/kg	1	<0.16	<0.16	

### 2.4.2. Chemical Results for Leachate Sample

The results of the chemical analysis for the leachate sample taken from TP12 is presented in Table 3.5 and are compared to the "Typical Leachate Composition of 30 Samples from UK/Irish Landfills accepting mainly domestic waste" published in Landfill Operational Practices by Environmental Protection Agency, 1997.

Table 2.5: Leachate Sampling Results

Parameter	Units		Overall Ran	Sampling Results - Sample ID	
		Min	Max	Mean	LI-FT-TP3
Suspended Solids, Total	mg/l	-	-	-	-
Ammoniacal Nitrogen	mg/l	<0.2	1700	491	382
Biological oxygen demand	mg/l	4.5	>4800	798	588
Chloride	mg/l	27	3410	1256	434
Conductivity	μs/cm	503	19200	7789	4,370
Sulphate	mg/l	<5	739	136	<2
Sodium	mg/l	12	3000	904	285
Potassium	mg/l	2.7	1480	491	291
рН	pH units	6.4	8.0	7.2	7.94

<sup>&</sup>lt;sup>1</sup>Typical Leachate Composition of 30 Samples from UK/Irish Landfills accepting mainly domestic Waste, Landfill Operational Practices, Environmental Protection Agency, 1997

#### 2.4.3. Chemical Results for Groundwater Samples

The results of the chemical analysis for the groundwater samples taken from the installed boreholes and private wells sampling analysis are presented in Table 3.65 Results of analysis are compared to the relevant Interim Guideline Values, (IGV) set out in the EPA (2003) Towards Setting the Guideline Values for the Protection of Groundwater in Ireland. In the absence of IGV levels the European Communities Environmental Objectives (Groundwater) Regulations 2010 and the Quality of Surface Water Intended for the Abstraction of Drinking Water Regulations 1989 are referred to.

**Table 2.6: Groundwater Sampling Results** 

			Sampling Results - Sample ID				
Parameter	Units	Units IGV Criteria*		вн2	Farm	Housing Estate	Nursing Home
рН	Ph Units	<u>&gt;</u> 6.5 and <u>&lt;</u> 9.5	7.42	7.38	7.79	7.89	7.48
pH (in situ)	Ph Units	≥ 6.5 and <u>&lt; 9</u> .5	7.15	7.12	7.42	7.64	7.52
Conductivity	ms/cm	1	0.965	0.696	0.806	0.621	0.643
Conductivity (in-situ)	μs/cm	1 differing	1.217	0.778	0.894	0.683	0.715
Ammoniacal Nitrogen	mg/l	(0.2 mg/l for A1 water) to 4mg/l for A3 water) Note 2	<0.2	<0.2	3.78	<0.2	<0.2
Biological oxygen demand	mg/l	5 Note 2 pure quite	<1	<1	<1	<1	<1
Chloride	mg/l	30 mg/l (18 <sup>3</sup> ) 5 (Note 1)	11.7	28.9	50.3	17.9	21.6
Sulphate	mg/l	250 mg/l	115	22.9	18.1	26.8	11.5
Sodium	mg/l	Y 50 mg/l	9.54	13.2	19.7	9.23	10.8
Potassium	mg/l	ूर्ठ 12 mg/l	<1	7.48	25.9	3.34	<1

<sup>\* =</sup> IGV criteria = EPA, 2003. Interim Guideline Values, (IGV) – Towards Setting The Guideline Values for the Protection of Groundwater in Ireland

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Note 1: European Communities, Environmental Objectives (Groundwater) Regulations 2010 (S.I. No. 9 of 2010);

Note 2: S.I. No. 294/1989 — European Communities (Quality of Surface Water Intended for the Abstraction of Drinking Water) Regulations, 1989.

#### 2.5. Landfill Gas Sampling Results

Landfill gas monitoring was also conducted at the three trial pit monitoring locations (TP8, TP11 and TP12).

Results of landfill gas monitoring conducted at these three locations are presented in Tables 3.7 and 3.8. No landfill gas was detected.

Table 2.7: Landfill gas sampling results (26/02/2014)

Borehole ID	Methane % v/v	Carbon Dioxide % v/v	Oxygen % v/v
TP8	0.0	6.0	13.7
TP11	0.0	2.8	17.8
TP12	0.0	0.1	11.3

Table 2.8: Landfill gas sampling results (19/03/2014)

Borehole ID	Methane % v/v	Carbon Dioxide % v/v	Oxygen % v/v
TP8	0.0	0.0	net lise 20.3
TP11	0.0	0.0	20.3
TP12	0.0	0.0 ses afforts	20.3

#### 2.6. Interpretation of Results

#### 2.6.1. Solid Soil Analysis

The soil samples collected from TP5 and TP10 were submitted for laboratory analysis. All levels are within the inert landfill acceptance criteria with the exception of Total Organic Carbon (TOC) at TP5. TOC was however below the hazardous limit for landfills (6%). TOC is the carbon (C) stored in soil organic matter. Organic carbon enters the soil through the decomposition of plant and animal residues, root exudates, living and dead microorganisms, and soil biota and would therefore indicate that the waste mass is stable and that the rate of decay for any organic material is minimal.

The results of the analysis therefore indicate that if this soil was excavated it would require disposal at a non-hazardous MSW licensed landfill.

#### 2.6.2. Leachabiliity Analysis

The results of leachability analysis indicated that antimony was detected at levels of 0.088 mg/kg and 0.0694 mg/kg in TP5 and TP10 respectively. These levels are above the inert landfill criteria of 0.06 mg/kg for antimony. Antimony can be released in water from the break down of a number of waste materials, including PET bottles, electrical products and batteries, all of which were found in the landfilled waste from the site.

Chloride was detected at a level of 1,360 mg/kg in TP5. This is above the inert landfill criteria of 800 mg/kg for Chloride. The level at TP10 was below the inert landfill criteria. Chloride is highly soluble in water and originates in most forms of domestic and commercial wastes, especially in the form of cleaning and processing agents, food preservatives and fertilisers.

Molybdenum was detected at a level of 0.868 mg/kg in TP5. This is above the inert landfill criteria of 0.5 mg/kg for molybdenum. The level at TP10 was below the inert landfill criteria. Molybdenum is not easily dissolved in water and originates from the steel alloy industry and is also found in fertilisers.

Dissolved organic carbon was detected at a level of 502 mg/kg in TP5. This is above the inert landfill criteria of 500 mg/kg for dissolved organic carbon. The level at TP10 was below the inert landfill criteria. Dissolved organic carbon compounds are a result of decomposition processes from dead organic matter such as plants and in landfills originate from decaying food and garden green waste and other organic sources.

Total dissolved solids (TDS) were detected at a level of 5,990 mg/kg in TP5. This too is above the inert landfill criteria of 4,000 mg/kg for TDS. Total dissolved solids (TDS) comprise the total mass of contaminating, organic and inorganic, substances contained in the soil/waste, including trace heavy metals.

It is clear from the leachability analysis that the material deposited does not meet the waste acceptance criteria for inert landfills. This is backed up by the visual examination of the waste during the trial pit investigations.

#### 2.6.3. Groundwater Analysis

Ammoniacal nitrogen was detected at levels of 3.78 mg/l at the Farm well (off-site private well), over the limit of 0.2 mg/l derived from S.I. No. 294/1989 — European Communities (Quality of Surface Water Intended for the Abstraction of Drinking Water) Regulations, 1989 for A1 water boodies, but below the limit of 4 mg/l for A3 water bodies. Recorded levels of ammoniacal nitrogen at all other locations were below the IGVs.

Chloride levels over the IGV level of 30 mg/l was also recorded at this location, but under the European Communities, Environmental Objectives (Groundwater) Regulations 2010 level of 187.5 mg/l Cl. Recorded levels of chloride at all other locations were below the IGVS.

Potassium levels over the IGV level of 12 mg/l was recorded at the Farm well. Recorded levels of potassium at all other locations were below the IGVs.

Recorded levels for pH, conductivity, biological oxygen demand, sulphate and sodium were below the IGVs at all locations.

Overall the groundwater results would suggest that the site is not impacting on groundwater quality. Elevated levels of ammoniacal nitrogen, chloride and potassium at the Farm well are not likely to be as a result of contamination from the subject site due to the distance from the site (500 m), the depth of the well (approximately 100 m) and the the farm well is upgradient of the site. Therefore, the minor contamination at the farm well is likely to be influenced by a localised source.

#### 2.6.4. Landfill Gas Analysis

Levels of carbon dioxide were detected in TP8 and TP11 monitoring wells during the February sampling event. These levels are most likely as a result of the wet, water logged soils and the decaying vegetation on account of the disturbance of the soils during digging of the trial pits. These levels had returned to 0% during the March sampling event.

No methane gas was detected in the boreholes during sampling. This indicates that there is no landfill gas migration from the site to the boreholes.

#### 3. RISK ASSESSMENT

#### 3.1. Introduction

Risk assessment considers the likelihood of occurrence and the consequence of occurrence of an event (Royal Society 1992 <sup>2</sup>). It is based on a conceptual model which is used to determine the exposure to a vulnerable receptor in relation to waste as the Source – Pathway – Receptor model (Daly 2004 <sup>3</sup>), or S-P-R.

This conceptual model takes the <u>source</u> of the contamination as the material making up the made ground. The <u>pathway</u> in the model involves landfill gas and groundwater, with the ultimate <u>receptor</u> being the underling aquifer and surrounding residential dwellings.

#### 3.2. Potential Pathways and Receptors

A pathway is a mechanism or route by which a contaminant comes into contact with, or otherwise affects, a receptor. The potential pathways associated with the site are:

- Groundwater/leachate migration
- Landfill gas migration

#### 3.2.1. Groundwater/Leachate Migration

According to the EPA CoP, there are three main pathways for leachage migration. These are:

- Vertically to the water table or top of an aquifer, where groundwater is the receptor
- Vertically to an aquifer and then horizontally in the aquifer to a receptor such as a well, spring or stream
- Horizontally at the ground surface or at shallow depth to a surface receptor

The migration and attenuation of leachate from the site depends on the permeability and thickness of subsoil and on both the bedrock permeability value and type. These elements are encompassed in groundwater vulnerability, groundwater flow regime and surface water drainage. The main receptors to leachate migration from this site are:

- Aquifer
- Drinking water supplies within 1,000 m
- Protected areas, such as groundwater dependent or surface water dependent ecosystems, flood plains, Special Protected Areas (SPAs), Natural Heritage Areas (NHAs)
- Special Areas of Conservation (SACs), and bathing waters within 1,000 m of the site boundary
- Wetlands
- Surface water bodies

#### 3.2.2. Landfill Gas Migration

Landfill gas migration can move along pathways of least resistance. In the case of old rock quarries such as the subject site at Gowran, these pathways can include subsoil and bedrock. Other relevant pathways include underground services, drainage systems and manholes.

Human Presence is considered to be the principal sensitive receptor in respect of landfill gas due to the potential for the build up of gas within confined areas such as schools, houses, etc.

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<sup>&</sup>lt;sup>2</sup> Royal Society 1992, Risk: Analysis, Perception and Management. The Royal Society, London (ISBN 0-85403-467-6).

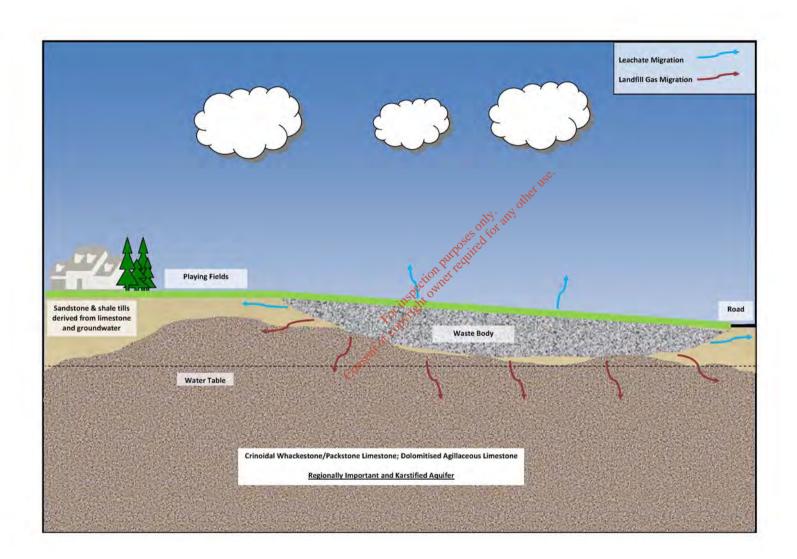
<sup>&</sup>lt;sup>3</sup> Daly, D. 2004, Groundwater at Risk in Ireland - Putting Geoscientific Information and Maps at the Core of Land Use and Environmental Decision-making, John Jackson Memorial Lecture, Royal Dublin Society, November 2004.

#### 3.3. Conceptual Site Model

The investigations are designed to enable an assessment of the risk to be made and to confirm the source – pathway – receptor (S-P-R) linkages identified in the preliminary investigation. Based on the results and analysis of the investigation a conceptual model is presented as Figure 4.1.

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Figure 3.1: Conceptual Site Model



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#### 3.4. Risk Prioritisation

Risk prioritisation enables resources to be prioritised on the highest risk facilities and on the highest source – pathway – receptor linkage potential.

The risk prioritisation process assigns a score to each linkage and the overall score is the maximum of the individual linkages for the site. The higher the score a site/linkage receives the higher the risk.

In order to classify the risk, scores will be applied to the information obtained during the site investigation. Where there is insufficient information available (i.e. where there is a high degree of uncertainty) the highest score is assumed.

In accordance with the EPA CoP (2007) the scoring matrixes are as follows:

- Leachate: source/hazard scoring matrix, based on waste footprint
- Landfill gas: Source/hazard scoring matrix based on waste footprint
- Leachate migration: Pathway (Vertical)
- Leachate migration: Pathway (Horizontal)
- Leachate migration: Pathway (Surface water drainage)
- Landfill gas: Pathway (Surface water drainage)
- Landfill gas: Pathway (Lateral migration potential)
- Landfill gas: Pathway (Upwards migration potential)
- Leachate migration: Receptor (Surface water drainage)
- Leachate migration: Receptor (Human presence)
- Leachate migration: Receptor (Protected areas SWDTE or GWDTE) (Surface water/groundwater dependent terrestrial ecosystems)
- Leachate migration: Receptor (Aquifer category Resource otential)
- Leachate migration: Receptor (Public water supplies other than private wells)
- Leachate migration: Receptor (Surface water bodies)
- Landfill gas: Receptor (Human presence)

Table 4.1, Risk classification calculation, calculates the points awarded to each of the headings listed above. The following are the risk classifications applied:

Highest Risk (Class A)
 Greater trân 70 for any individual SPR linkage

Moderate Risk (Class B)
 41-69 or any individual SPR linkage

Lowest Risk (Class C)
 Less than 40 for any individual SPR linkage

Table 3.1: Risk Classification Calculation

EPA Ref	Risk	Points	Rationale
1a	Leachate; source/hazard scoring matrix, based on waste footprint.	5	Based on waste footprint of <1 ha and predominance of typically non hazardous domestic waste with potentially small hazardous waste fraction.
1b	Landfill gas; source/hazard scoring matrix, based on waste footprint.	5	Based on waste footprint of <1 ha and predominance of typically non hazardous domestic waste with potentially small hazardous waste fraction.
2a	Leachate migration: Pathway (Vertical)	3	GSI describes the groundwater vulnerability as Extremely Vulnerable

EPA Ref	Risk	Points	Rationale
2b	Leachate migration: Pathway (Horizontal)	5	The bedrock is classified by the GSI as a Regionally Important Karstified Groundwater Body
2c	Leachate migration: Pathway (Surface water drainage)	0	No direct connection between the waste body and surface waters.
2d	Landfill gas: Pathway (Lateral migration potential)	3	Made ground, Karst
2e	Landfill gas: Pathway (Upwards migration potential)	0	No buildings or enclosed spaces above waste body.
3a	Leachate migration: Receptor (Human presence)	2	Domestic wells located at 150m, 400m and 500m.
3b	Leachate migration: Receptor (Protected areas – SWDTE or GWDTE) (Surface water/ groundwater dependent terrestrial ecosystems)	0	None in vicinity of site.
3c	Leachate migration: Receptor (Aquifer category – Resource potential)	5	The aquifer is classified by the GSI as a Regionally Important Aquifer.
3d	Leachate migration: Receptor (Public water supplies – other than private wells)	3	Greater than 1 km, karstified aquifer.
3e	Leachate migration: Receptor (Surface water bodies)	1 mg	Surface water bodies >500m of site.
3f	Landfill Gas: Receptor (Human presence)	aspect 5 where	Houses within 20 m of the site boundary.

Table 4.2 shows the maximum S-P-R scoring for the site is 50%. Based on this the site can be classified as a moderate risk Class B risk classification of the site is 50%.

Table 3.2: Normalised Score of S-P-R Linkages

	Calculator	S-P-R Values Maximum Score		Linkage	Normalised Score			
Leachate migration through combined groundwater and surface water pathways								
SPR1	1a x (2a + 2b + 2c) x 3e	5 x (3+5+0) x 1 = <b>40</b>	300	Leachate => surface water	13.3%			
SPR2	1a x (2a + 2b + 2c) x 3b	$5 \times (3+5+0) \times 0$ = <b>0</b>	300	Leachate => SWDTE	0%			
Leachate migration through groundwater pathway								
SPR3	1a x (2a + 2b) x 3a	5 x (3+5) x 2 = <b>80</b>	240	Leachate => human presence	33.3%			

	Calculator	S-P-R Values	Maximum Score	Linkage	Normalised Score						
SPR4	1a x (2a + 2b) x 3b	5 x (3+5) x 0 = <b>0</b>	240	Leachate => GWDTE	0%						
SPR5	1a x (2a + 2b) x 3c	5 x (3+5) x 5 = <b>200</b>	400	Leachate => Aquifer	50%						
SPR6	1a x (2a + 2b) x 3d	5 x (3+5) x 3 = <b>120</b>	560	Leachate => Surface Water	21.4%						
SPR7	1a x (2a + 2b) x 3e	5 x (3+5) x 1 = <b>40</b>	240	Leachate => SWDTE	16.67%						
Leacha											
SPR8	1a x 2c x 3e 5 x 0 x 1 = <b>0</b>		60	Leachate => Surface Water	0%						
SPR9	1a x 2c x 3b	5 x 0 x 0 = <b>0</b>	60	0%							
Landfil											
SPR10	1b x 2d x 3f	5 x 3 x 5 = <b>75</b>	150	Landfill Gas => Human Presence	50%						
SPR11	1b x 2e x 3f	5 x 0 x 5 = <b>0</b>	250	0%							
Site ma	aximum S-P-R Score		oses offici	8	50%						
Risk Cl	B - Moderate										
	Site maximum S-P-R Score  Site Maximum S-P-R Score  Risk Classification  5 x 0 x 5 = 0  250  Presence  50%  B - Moderate										

#### 4. CONCLUSIONS & RECOMMENDATIONS

The Tier 1 study conducted by KCC concluded that the Risk Rating for the site was 'Moderate' based on the findings of the initial risk assessment with little potential for environmental contamination.

A Tier 2 assessment was subsequently conducted by FTC which included the excavation of trial pits, soil, groundwater, leachate and gas sampling.

Site observations indicated that there were no buildings or enclosed spaces above the assumed area of the waste body and the landfill gas risk (assigned in the Tier 1 assessment) was subsequently revised. This reduced the SPR score for SPR11.

The results of the Tier 2 assessment and the refined SPR conceptual model indicate that the site is a Class B - **Moderate Risk**. For a moderate risk site the CoP directs that the site be regularised/authorised in accordance with current waste management legislation (i.e. a waste licence or permit).

Following this Tier 2 Assessment it is the opinion of FTC that a Tier 3 Assessment of this site should be undertaken based cumulatively on the risk classification as presented.

FTC recommend that the Tier 3 investigation include further site investigations and sampling including, but not limited to, installation of further shallow upstream and downstream groundwater boreholes. The results of the investigation should further inform the development of the quantitative risk assessment model for the site and remediation measures if required.

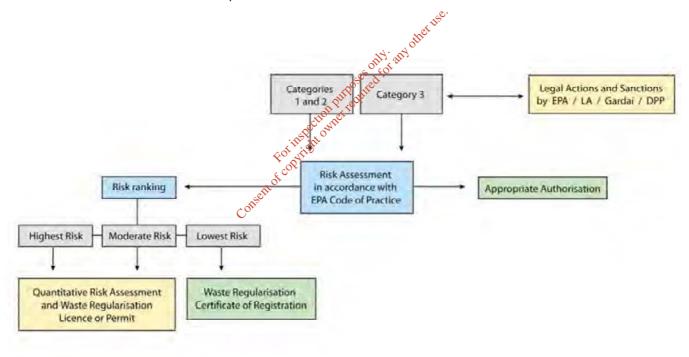


Figure 4.1: Extract from Section 1.3 of the EPA Code of Practice

# **Appendix I**

### Site Walkover Checklist

Site Site







#### **Walkover Survey Checklist**

#### 21st January 2014

Walkover Survey Checklist										
Information	Checked	Comment (include distances from Site Boundary)								
What is the current land use?	<b>~</b>	Council storage yard								
2. What are the neighbouring land uses?	<b>✓</b>	Agricultural Lands Residential Recreational								
3. What is the size of the site?	✓	Circa 0.087ha								
4. What is the topography?	✓	Gentle slope from south to north								
Are there potential receptors (if yes, give details)?	<b>~</b>	Groundwater, open watercourses adjoining, nearby residence								
Houses	<b>√</b>	17m to north east of site boundary, 50m to north of site and further larger developments within 200m of east, south and west of site								
Surface water features (if yes, distance and direction of flow)?	ingection purpos	Small river on far side of Gowran village, approximately 500 to the South of the site flowing from West to East towards river Barrow								
Any wetland or protected areas?	in ght	None								
Any wetland or protected areas?  Public water supplies?  Private wells?	<b>√</b>	Mains water supply to nearby residence Main supply 2.5km north west of site								
Private wells?	✓	One 150m to south west of site								
Services?	<b>✓</b>	Foul sewer 5m inside north east boundary of site  Overhead power lines along north west boundary								
Other buildings?	✓	None								
Other?	✓	None								
Are there any potential sources of contamination (if yes, give details)?	<b>✓</b>	Possible buried waste								
Surface waste (if yes, what type)?	✓	Some fly tipped waste and burnt out remains of caravan								
Surface ponding of leachate	✓	None								
Leachate seepage	✓	None								
Landfill gas odours	✓	None								
7. Are there any outfalls to surface water? (If yes, are there discharges and what is the nature of the discharge?)	<b>√</b>	No evidence								

### Walkover Survey Checklist

21st January 2014

8. Are there any signs of impact on the environment? (if yes, take photographic evidence)	<b>✓</b>	Photos in main report
Vegetation die off, bare ground	<b>~</b>	Some evidence of bare ground in north west corner of site
Leachate seepages	✓	None noted
Odours	✓	None Noted
Litter	✓	Yes – as per question 6, evidence of fly tipping
Gas bubbling through water	✓	None noted
Signs of settlement	✓	None noted
Subsidence, water logged areas	<b>~</b>	Water logging evident in areas – poor drainage
Drainage or hydraulic issues	✓	Channels dug in places to improve run-off
Downstream water quality appears poorer than upstream water quality	<b>✓</b>	Not tested
<ol><li>9. Are there any indications of remedial measures? (Provide details)</li></ol>	<b>✓</b>	Yes
Capping	✓	Capped with clay/soil
Landfill gas collection	✓	No – not applicable
Leachate collection	✓	No – nor applicable
		Olly att,
10. Describe fences and security features (if any)	THE COUNTY PER LEGI	
	Speciowii	
Any other relevant information?	in all	NA

## **Appendix II**

Site Investigation & Monitoring Location Map

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## **Appendix III**

Site Investigation – Trial Pit & Borehole Logs

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PRIORITY Fax: 0						/ Geoted 21 46316 21 4638 priorityge	690 690			Drilled By  WD  Logged By	Borehole No <b>GW01</b> Sheet 1 of 2	
Pro	ject N	lame:			Pro	ject No	).				Hole Type	
Go	wran L	andfill			P14	P14004			Co-ords: -		RO	
Clie	ent: K	ilkenny Co	Со		Dates:				Level: -		Scale	
					25/0	2/2014			LCVCI.		1:50	
Well / Backfil	Water Strikes	Sam Depth (m)	Type	Results		Casing / Flush	Level (m AOD	Depth (m)	Strati	ım Description	Legend	
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								2.70	and other tree.	er described: BOULDEF	2. 0 0 0 3 0	
	ightharpoons				Consi	For of cot	nspection with the	4.20g	Open hole boring. Dril  Open hole boring. Dril  Open hole boring. Dril	er described: BOULDER	2. 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	
								7.20 7.40 8.00	CLAY.	ler described: BOULDEF	7	
								8.20	Open hole boring. Dril			
									Open note boring. Drii	er described: BOULDEF		
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Remarks: Borehole terminated at required depth. 50mm dia standpipe installed, response zone from 11.8m to 6.0m.  Equipment & Methods: Soil Mech PSM 8G								Shift [	- 2 10.80m 2 6.85m 2	fft (dd/mm/yyyy) Casing (5/02/2014 0.00m 5/02/2014 11.00m 6/02/2014 11.80m 6/02/2014 11.80m	depth Remarks Start of Borehole End of shift Start of shift End of Borehole	

	PRIORITY						chnical L 300 690 otechni			Borehole No <b>GW01</b> Sheet 2 of 2			
	ject N	lame:			Project No.				Co-ords: -	:-		Hole Type RO	
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		Depth (m)	Туре	Results			(1117100)	9.80	Open hole boring. Driller  Open hole boring. Driller  Open hole boring. Driller	described: CLAY.		000	-10
								11.00	Open hole boring. Driller boulder content.		Ċ		·11
						11.80		11.80	End of Bore	nole at 11.80 m			-12
	Water	,	Туре	Results	Court	Casing e Info	Level	Depth	·	Hi-o-a			-14
Struc 5.80n			iter Se	ealed Comment - See shift data.	Hole	Depth	Hole Di		Casing Diameter 131mm Chise Depths	(m) Time (hhr	mm)	ГооІ	To Take age
Remarks: Borehole terminated at required depth. 50mm dia standpipe installed, response zone from 11.8m to 6.0m.  Equipment & Methods: Soil Mech PSM 8G							stalled,	Shift [	- 25/0	(dd/mm/yyyy) Casing o 12/2014 0.00m 12/2014 11.00m 12/2014 11.00m 12/2014 11.80m	depth Rem Start ( End o Start ( End o	arks of Boreho of shift of shift of Boreho	ole le

PRIORITY						21 4631 21 4638				Drilled By  WD  Logged By	Borehole No <b>GW02</b> Sheet 1 of 2	
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Gov	vran L	andfill			P14	004			Co-ords: -		RO	
Clie	ent: K	ilkenny Co	Со		Dates:				Level: -		Scale	
					28/02/2014				1		1:50	
Well / Backfill	Water Strikes	Depth (m)	Type	& In Situ Testing  Results		Casing / Flush	Level (m AOD)	Depth (m)	Str	atum Description	Legend	
								1.50	CLAY with boulder	Oriller described: Gravelly content.  Oriller described: CLAY with		
								3.00	Open hole boring. Driller described: CLAY.		2	
	09 XO CO CO CO COX COX COX							3.40	M. and other use	Oriller described: BOULDER	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 4	
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								7.00	Open hole boring. [	Oriller described: Rock.	7	
								8.50	Open hole boring. [	Oriller described: CLAY.	233	
								8.70		Oriller described: Rock.	1 1 1	
	Water	Depth (m)	Type	Results		Casing	l evel	Depth	Co	ntinued next sheet		
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	PRIORITY GEOTECHNICAL					1 46316 21 4638	chnical L 600 690 eotechnic			Drilled By  WD  Logged By -		Borehole No <b>GW02</b> Sheet 2 of 2	
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Gov	wran L	andfill			P14004				Co-ords: -		RO		
Clie	Client: Kilkenny Co Co					<b>Dates:</b> 28/02/2014			Level: -		<b>Scale</b> 1:50		
Well /	/ Water Samples & In Situ Testing			-	Casing /	Level	Depth	Stratun	n Description	Le	egend		
es EN		Depth (m)	Туре	Results		Flush	(m AOD)	(m)	Open hole boring. Driller	described: Rock.	4		
	$\Box$							9.70	Open hole boring. Driller				
								10.00	Open hole boring. Driller	described: Rock.		10	
						11.00		11.00	End of Bore	hole at 11.00 m	T T T T T T T T T T T T T T T T T T T	11	
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					Cour	or the second se						-15	
Cra	Water		Туре	Results	יבט	Casing	Level	Depth	·		_		
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			Co Kilkenny					Dimensions:	3.20m	s	cale	1
LUCA	tion.	Jowran,	Co Klikenny					Depth ∈		]   1	1:25	
Clien	ı <b>t:</b> Kilke	nny Co	Co					Depth E 09.		Log	<b>iged By</b>	
Water D		Samples Type	& In Situ Testing Results	Level (m AOD)	Depth (m)			Stratum D	escription		Legend	
					2.30	Sand is fir subrounded  Waste: So low cobble coarse. Given subant subrounded	oft, light conterravel is gular to ed, 200-	brown, slightly sandy sl tr, low boulder content a fine to coarse, subangu	ightly gravelly SILT with nd MSW. Sand is fine to lar to subrounded. Cobbles n dia. Boulders are subangi			1 2 WANG
Water De	epth (m)	Туре	Results	Level	Depth						+ +	thed 27th
Stability: Poor Plant: Tracked Excavator Backfill: Arisings.							Groui	ndwater: None en	countered.			Sandard Trialnit Loo v 2 da
Remarks: Trial pit terminated due to obstruction.										HoleBASE III (Bld 42658)		

PRIORITY GEOTECHNICAL		Priority Geotechnical Ltd. Tel: 021 4631600 Fax: 021 4638690 www.prioritygeotechnical.ie			Trial Pit No <b>TP02</b> Sheet 1 of 1	
Project Name:	Pro	oject No.	Co-ords: -			ate
Gowran Landfill	P14	4004	Level: -		20/0	1/2014
Location: Gowran, Co Kilkenny			Dimensions:	3.00m		cale
			Depth & 0.70m 0.70m			:25
Client: Kilkenny Co Co			0.70m %		Log	<b>ged By</b> ID
Samples & In Situ Test Water   Depth (m)   Type   Result			Stratum D	Description	•	Legend
	0.20	Topsoil: Light be occasional cob subangular to s	rown, slightly sandy slight bles. Sand is fine to medioubrounded.	tly gravelly SILT with um. Gravel is fine to medium,		* * * * * *
		cobble content.	n, slightly sandy slightly gr Sand is fine to coarse. G ubrounded. Cobbles are s	ravelly SILT with low ravel is fine to coarse, subangular to subrounded,		
	0.70		Trial pit complete			****
		For inspection of the sent of copyright own	Indoses only any other use			-1
Water Depth (m) Type Results  Stability: Moderate	Level Depth	Gro	<b>undwater:</b> None en	countered.		0.00
Plant: Tracked Excavator  Backfill: Arisings.						
Remarks: Trial pit terminated due t	o obstruction.					OF STATE OF

PRIORITY						Priority Geotechi Tel: 021 463160 Fax: 021 463869 www.prioritygeot		Trial Pit No <b>TP03</b> Sheet 1 of 1			
	ject Nan	4 100			Pro	ject No.	Co-ords: -		_	ate	-
	ran Landf					1004	Level:			1/2014	ı
Loc	ation:	Gowran.	, Co Kilkenny		•		Dimensions:	2.80m		cale	
							Depth E		-	:25	
Clie	ent: Kilke						Depth E 09:		Log	ged By	
Water	Depth (m)		Results	Level (m AOD)	Depth (m)			escription		Legend	
					0.20	Topsoil: Dark occasional ro subangular to	s brown, slightly sandy slight ootlets. Sand is fine to mediu o subrounded.	ly gravlly SILT with im. Gravel is fine to coarse,			
						Light brown,	slightly sandy SILT with low	cobble content. Sand is fine		****	
				Cari	For its petion	Trial pit complete					
\\/otor	Donth (m)	Туре	Results	Level	Depth						7 27th Mov
Water Depth (m) Type Results Level Depth Stability: Moderate Plant: Tracked Excavator Backfill: Arisings.							roundwater: None en	countered.			to the least of th
Rema	<b>arks:</b> Tri	al pit ter	minated due to obsti	uction.		1					O (03 909 Mg) III JON GOOD

	PRIORIT					Priority Geotechnical Ltd. Tel: 021 4631600 Fax: 021 4638690 www.prioritygeotechnical.ie			Trial Pit No  TP04  Sheet 1 of 1		
Pro	ject Nan	ne:			Pro	ject No.	Co-ords: -			ate	-
	ran Landf				P14	1004	Level: -		20/0	1/2014	
Loc	ation:	Gowran,	Co Kilkenny				Dimensions:	3.00m		<b>cale</b> :25	
							Depth ε 0.50m 0.50m		-	ged By	-
Clie	ent: Kilke	enny Co	Co				0.50m 9:		Log	ID	ı
Water	Depth (m)		& In Situ Testing Results	Level (m AOD)	Depth (m)		Stratum D	escription		Legend	
					0.20	Topsoil: Brown rootlets. Sand i to subrounded.	, slightly sandy slightly gra s fine to ocarse. Gravel is	velly SILT with occasional fine to ocarse, subangular			
					0.50	Soft, light brow	n, slightly sandy slightly gr Sand is fine to coarse. Gr ubrounded. Cobbles are s	avelly SILT with low ravel is fine to coarse, ubangular to subrounded,		****	
Water	Water Depth (m) Type Results Level Stability: Moderate			For in Section of For in Section of the Control of	Trial pit complete				-1 - 1		
			Results	Level	Depth	Gro	undwater: None en	countered.			- Comment
Plant	Plant: Tracked Excavator  Backfill: Arisings.										o History
Rema	lemarks: Trial pit terminated due to obstruction.										

	PRIORIT					Priority Geotechnica Tel: 021 4631600 Fax: 021 4638690 www.prioritygeotech			TI	P05 eet 1 of 2
Proj	ect Nan	ne:			Pro	oject No.	Co-ords: -			ate
	ran Landf					1004	Level: -		20/0	01/2014
Loca	ation:	Gowran,	Co Kilkenny		•		Dimensions:	3.00m		<b>cale</b> :25
Clie	<b>nt:</b> Kilke	enny Co	Co				Depth E 09 5.10m		Log	<b>ged By</b> ID
Water	Depth (m)	•	& In Situ Testing Results	Level (m AOD)	Depth (m)		Stratum D	escription		Legend
						fine to ocarse. G	ndy gravelly SILT with me ravel is fine to coarse, su ular to subangular, 60-10	dium cobble content. Sand is bangular to subrounded. Omm dia.		
					0.30	cobble content. S	lightly sandy slightly grav Sand is fine to ocarse. Gr brounded, 60-200mm dia ane.	avel is fine to coarse,		-1
				1.20 Con	MSW (Municipal	Solid Waste).  Reses only any other use required for any		-2		
	Depth (m)		Results	Level	Depth		Continued nex			ر مود د
Plant:	ity: Poo Tracked ill: Arisi	I Excavat	tor			Grou	ndwater: None en	countered.		Possessing Trapility
Rema	<b>rks:</b> Tri	al pit terr	minated at required o	depth.		,				א פר היים א מיירים איני איני איני איני איני איני איני אי

PRIORITY GEOTECHNICAL	Priority Geotechnica Tel: 021 4631600 Fax: 021 4638690 www.prioritygeotech		Trial Pit No <b>TP05</b> Sheet 2 of 2
Project Name:	Project No.	Co-ords: -	Date
Gowran Landfill	P14004	Level: -	20/01/2014
Location: Gowran, Co Kilkenny		Dimensions: 3.00m	<b>Scale</b> 1:25
Client: Kilkenny Co Co		Depth ε 99.	Logged By
Samples & In Situ Testing Leve Water Depth (m) Type Results (m AC	el Depth DD) (m)	Stratum Description	Legend
	5.10	Trial pit completed at 5.10 m	-5
Water Depth (m) Type Results Leve  Stability: Poor Plant: Tracked Excavator Backfill: Arisings.		Indwater: None encountered.	Sundard Tiblell And 2 Asset
Remarks: Trial pit terminated at required depth.			(1972Z PB) II 35749747

	PRIORIT					Priority Geotechnical Ltd. Tel: 021 4631600 Fax: 021 4638690 www.prioritygeotechnical.ie				Trial Pit No <b>TP06</b>	
	or of the									eet 1 of 1	4
	<b>ject Nan</b> ran Landf					pject No.	Co-ords: - Level: -			<b>Date</b> 01/2014	ı
					F14	1004	Dimensions:	5.00m	_	cale	$\dashv$
Loc	ation:	Gowran,	Co Kilkenny					5.00111		:25	ı
Clie	e <b>nt:</b> Kilke	enny Co	Со				Depth E 07:			ged By	1
Water	Depth (m)		& In Situ Testing Results	Level (m AOD)	Depth (m)		Stratum D	escription		Legend	1
					0.20	Topsoil:Soft, lig occasional root subangular to s		ightly gravelly SILT with m. Gravel is fine to ocarse,	A		
			Soft, light brown, slightly sandy slightly gravelly SILT with low cobble content and low boulder content. Sand is fine to coarse. Grave is fine to coarse, subangular to subrounded. Cobbles are subangular to subrounded, 60-200mm dia. Boulders are subangular to subrounded 200-500mm dia.								-1
1.20  MSW (Municipal Solid Waste).  MSW (Municipal Solid Waste).  Trial pit completed at 2.80 m								.2			
					2.80 Car	ert.	Trial pit complete	d at 2.80 m			33
Water	Depth (m)	Туре	Results	Level	Depth						lated 27t
Stability: Poor Plant: Tracked Excavator Backfill: Arisings.						Gro	undwater: None en	countered.			Standard Trialpit Log v 2 d
Rema	emarks: Trial pit terminated at required depth.										HoleBASE III (Bld 426.58)

Project Name: Gowran Landfill  Location: Gowran, Co Kilkenny  Project No. P14004  Co-ords: - Level: -  Dimensions: 8.70m  Depth	Sheet 1 of 1  Date 20/01/2014  Scale
Gowran Landfill P14004 Level: -  Location: Gowran, Co Kilkenny Dimensions: 8.70m	20/01/2014
Location. Gowian, Co Nikenny	Scale
Denth   c	, I
	1:25
Client: Kilkenny Co Co  Depth 3.00m	Logged By
Samples & In Situ Testing Level (m AOD) Depth (m) Type Results (m AOD) Stratum Description	Legend
Topsoil: Soft, light brown, slightly sandy slightly gravelly SILT with some rootlets. Sand is fine to medium. Gravel is fine to coarse, subangular to subrounded.	
Light brown, slightly sandy SILT with low cobble content. Sand is fine to coarse. Cobbles are subangular to subrounded, 60-200mm dia.	
0.60 MSW (Municipal Solid Waste).	
Constant of the state of the st	-1
Water Depth (m) Type Results Level Depth  Stability: Poor Groundwater: None encountered.	
Plant: Tracked Excavator  Backfill: Arisings.	
Remarks: Trial pit terminated at required depth.	

Priority G						Priority Geotechnic	al Ltd.		Trial	Pit No
	PRIORIT					Fax: 021 4638690	onical in		TF	P08
GE	OTECHN	ICAL				www.prioritygeotecl	inical.ie		She	et 1 of 1
Pro	ject Nan	ne:				ject No.	Co-ords:			ate
Gov	ran Landf	ill			P14	-004	Level: -		_	1/2014
Loc	ation:	Gowran,	Co Kilkenny				Dimensions:	5.80m		:25
Clie	ent: Kilke	enny Co	Со				2.30m 8			<b>ged By</b> ID
Water	Depth (m)		& In Situ Testing Results	Level (m AOD)	Depth (m)		Stratum D	escription		Legend
					0.20	occasional rootle	ht brown, slightly sandy s ets. Sand is fine to mediu lar to subrounded.	lightly gravelly SILT with m. Gravel is fine to		
					0.20	Soft, light brown cobble content.	, slightly sandy slightly gr Sand is fine to coarse. Gr	avelly SILT with low avel is fine to coarse, ubangular to subrounded,		
					0.70	MSW (Municipa	Colid Woots			XXXX
Msw						For its petion pure	those outh any other use.  Trial pit completed	d at 2.30 m		-2
	Depth (m)	Туре	Results	Level	Depth					
Plant	lity: Poo : Tracked fill: Arisi	I Excavat	tor			Grou	ındwater: None end	countered.		
Rema	arks: Tri	al pit terr	minated at required	depth. Gas	s well in	stalled.				

	PRIORIT					Priority Geotechnical Ltd. Tel: 021 4631600 Fax: 021 4638690 www.prioritygeotechnical.ie			Trial Pit No <b>TP09</b> Sheet 1 of 1		
	ject Nan				Pro	ject No.	Co-ords: -			ate	$\dashv$
	ran Landfi				P14	004	Level: -		20/0	1/2014	
Loc	ation:	Gowran	, Co Kilkenny				Dimensions:	6.20m		cale	
							Depth			:25	4
Clie	ent: Kilke	enny Co	Со				1.50m <sup>9</sup> .		Log	<b>ged By</b> ID	١
Water	Depth (m)		& In Situ Testing Results	Level (m AOD)	Depth (m)		Stratum D	escription	<b>I</b>	Legend	
					0.00	occasional ro	light brown, slightly sandy s otlets. Sand is fine to mediu ngular to subrounded.	lightly gravelly SILT with m. Gravel is fine to			
					0.20	Soft, light bro	wn, slightly sandy slightly gr nt. Sand is fine to coarse. Gr subrounded. Cobbles are s	avel is fine to coarse.		* * * * * * * * * * * * * * * * * * * *	
					0.70	MSW (Munici	pal Solid Waste).				- -
	1.40	EW									
					1.50		Trial pit complete	d at 1.50 m		^^^^	
					Cons	For its fection	Trial pit complete				-2
	Depth (m)	Туре	Results	Level	Depth						
Plant Back	lity: Poo : Tracked fill: Arisi	l Excava ngs.				Gr	oundwater: None en	countered.			
Rema	<b>ırks:</b> Tri	al pit ter	minated at required	depth.		•					

	PRIORIT					Priority Geotechnica Tel: 021 4631600 Fax: 021 4638690 www.prioritygeotech		Trial Pit No TP10		
	OTECHN	6.00					,		Sheet 1 of 1	
	ject Nan					ject No.	Co-ords: - Level: -		Date	
Gow	ran Landfi	II			P14	.004			20/01/2014	
Loc	ation:	Gowran,	Co Kilkenny				Dimensions:	5.20m	<b>Scale</b> 1:25	
Clie	ent: Kilke						Depth E 99:		Logged By	
Water	Depth (m)	Samples Type	& In Situ Testing Results	Level (m AOD)	Depth (m)		Stratum D	Description	Legend	
Water	0.20	В	results	(	0.20	Topsoil: Soft, lig some rootlets. S subangular to su	nt brown, slightly sandy sand is fine to medium. G	slightly gravelly SILT with cravel is fine to coarse,		
	0.20	J				Dark grey, slight	y sandy slightly gravelly fine to coarse. Gravel is	fine to coarse, subangular		
					0.40	to subrounded. ( MSW (Municipal	Cobbles are subangular t	to subrounded, 60-120mm dia.		
					Con. 4.00	For inspection put	Trial pit complete		-2	
							rriai pit complete	ou at 4.00 m		
	Depth (m)	Туре	Results	Level	Depth					
Plant	lity: Poo : Tracked fill: Arisi	Excava	tor			Grou	ndwater: None en	countered.		
Remarks: Trial pit terminated at required depth.										

PRIO GEOTEC				Priority Geotechnical Ltd. Tel: 021 4631600 Fax: 021 4638690 www.prioritygeotechnical.ie				Trial Pit No <b>TP11</b> Sheet 1 of 1		
Project I	100 - 4000			Pro	ject No.	Co-ords: -			Date	┨
Gowran La					1004	Level: -		20/0	01/2014	
Location	1: Gowr	an, Co Kilkenny		'		Dimensions:	4.80m		cale 1:25	1
Client:	Kilkenny (	Со Со				Depth E 99.			ged By	1
		oles & In Situ Testing	Level	Depth		Stratum D	occintion .		ID Legend	┨
Water Depth	ı (m) Typ	e Results	(m AOD)	(m)	Topsoil: Soft, lig	ght brown, slightly sandy s Sand is fine to medium. G	lightly gravelly SILT with		Legend	١
Water Depth (m) Type Results Level [		2.40 Cons 3.20	cobble content is fine to coarse to subrounded, 200-1000mm d	n, slightly sandy slightly grand low boulder content. So, subangular to subrounde 60-100mm dia. Boulders a a.	Sand is fine to coarse. Grave ad. Cobbles are subangular are subangular to subrounde			.1		
Water Denth	(m) Tvo	e Results	l evel	Depth					+	-4 27th Nov
Stability: Moderate Plant: Tracked Excavator Backfill: Arisings.						undwater: None end	countered.			Monday Tables
Remarks:	Trial pit	terminated at required	l depth. Ga	s well in:					0 (03 90% MG/III 10 % G-1	

<b>■</b> PRIORI				•	Priority Geotechnica Tel: 021 4631600 Fax: 021 4638690 www.prioritygeotech		Trial Pit No <b>TP12</b>				
GEOTECH	IICAL	1			www.prioritygeotecn	niicai.ie		She	eet 1 of 2		
Project Na					ject No.	Co-ords: -			Date		
Gowran Land	fill			P14	.004	Level: -			)1/2014		
Location:	Gowran	, Co Kilkenny		Dimensions: 4.50m				<b>Scale</b> 1:25			
						Depth E09:					
Client: Kill	enny Co	Со					Logged By				
		& In Situ Testing Results	Level (m AOD)	Depth (m)		Stratum D		Legend			
Water Depth (m	) Type	results	(	0.20	Topsoil: Soft, light some rootlets. So subangular to su	15.870					
				0.50	content. Sand is	fine to coarse. Gravel is	relly SILT with low cobble fine to coarse, subangular subrounded, 60-200mm dia.				
	0.50 -					Continued next sheet					
Water Depth (m	Туре	Results	Level	Depth		Continued nex	t sheet		AAAAX		
Stability: Poor Plant: Tracked Excavator Backfill: Arisings.  Groundwater: None encountered.											
Remarks: T	rial pit ter	minated at required o	depth. Ga	s well ins	stalled.						

3	PRIORIT	<b>Y</b>				Tel: 021 4631600 Fax: 021 4638690					
GE	OTECHN	ICAL				www.prioritygeotec	hnical.ie		She	et 2 of 2	
Pro	ject Nan	ne:			Pro	ject No.	Co-ords: -		D	ate	
Gow	ran Landf	ill			P14	1004	Level: -		20/0	1/2014	
Loc	ation:	Gowran,	Co Kilkenny		•		Dimensions:	4.50m	<b>Scale</b> 1:25		
Clie	ent: Kilke	enny Co	Со				Depth E 05:			ged By	
Motor	Depth (m)		& In Situ Testing Results	Level (m AOD)	Depth (m)		Stratum D	escription		Legend	
water	Deptii (iii)	i ype	Results	(III / IOD)	(111)	MSW (Municipa		oulder content. Boulders are ia.		*****	
					5.50 Can		Trial pit complete	d at 5.50 m		-6	
Water	Depth (m)	Туре	Results	Level	Depth						
Stabi Plant	lity: Poo : Tracked fill: Arisi	or I Excavat	tor			Gro	undwater: None en	countered.		,	
Rema	<b>arks:</b> Tri	al pit terr	minated at required	depth. Gas	s well ins	stalled.					

# **Appendix IV**

Laboratory Analysis Certificates

Consent of copyright owner required for any other use.





c/o Aramex Bellinstown Ballyboughal Co Dublin

Tel: +353 (0)184 33033 (Opt 2)

Fehily Timoney Core House Pouladuff Road Cork

Attention: Neil Menzies

#### PRELIMINARY/INTERIM REPORT

28 January 2014 Date: D\_FTIM\_CRK **Customer:** Sample Delivery Group (SDG): 140121-33 Your Reference: LW13-112-01 Location: Gowran Landfill Report No: 257997

We received 4 samples on Monday January 20, 2014 and 4 of these samples were scheduled for analysis which was completed on Tuesday January 28, 2014. Accredited laboratory tests are defined within the report, but opinions, interpretations and on-site data expressed herein are outside the scope of ISO 17025 acceeditation.

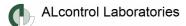
Should this report require incorporation into client reports, it must be used in its entirety and not simply with the data EQL SUS sections alone.

All chemical testing (unless subcontracted) is performed at ALcontrol Hawarden Laboratories.

This is a preliminary report which has not had final authorisation the report which had been also at the r

Approved By:





Preliminary

 SDG:
 140121-33

 Job:
 D\_FTIM\_CRK-43

 Client Reference:
 LW13-112-01

Location: Customer: Attention: Gowran Landfill Fehily Timoney Neil Menzies Order Number: Report Number: Superseded Report: 5734 257997

**Received Sample Overview** 

Lab Sample No(s)	Customer Sample Ref.	AGS Ref.	Depth (m)	Sampled Date
8719227	LEACHATE 1		0.00 - 0.00	20/01/2014
8719228	LEACHATE 2		0.00 - 0.00	20/01/2014
8719221	TP5		0.00 - 0.00	20/01/2014
8719226	TP10		0.00 - 0.00	20/01/2014

Only received samples which have had analysis scheduled will be shown on the following pages.



Preliminary

Gowran Landfill 5734 SDG: 140121-33 Location: Order Number: Job: D\_FTIM\_CRK-43 Fehily Timoney 257997 **Customer:** Report Number: Client Reference: LW13-112-01 Attention: Neil Menzies Superseded Report:

LIQUID Results Legend  X Test  No Determination Possible  Customer Sample Reference  Depth (m)  Container  Container  Container  Depth (m)  Depth (m)  Container  Container  Container  Depth (m)  Acid Herbicides (W)  All  All  All  NDPs: 0 Tests: 1  Anions by Kone (w)  All  NDPs: 0 Tests: 1  COD Unfiltered  All  NDPs: 0 Tests: 1  Conductivity (at 20 deg. C)  All  NDPs: 0 Tests: 1  Conductivity (at 20 deg. C)  All  NDPs: 0 Tests: 1  Conductivity (at 20 deg. C)  All  NDPs: 0 Tests: 1  Conductivity (at 20 deg. C)  All  NDPs: 0 Tests: 1  Conductivity (at 20 deg. C)  All  NDPs: 0 Tests: 1  Conductivity (at 20 deg. C)  All  NDPs: 0 Tests: 1  Conductivity (at 20 deg. C)  All  NDPs: 0 Tests: 1  Conductivity (at 20 deg. C)  All  NDPs: 0 Tests: 1  Conductivity (at 20 deg. C)  All  NDPs: 0 Tests: 1  Conductivity (at 20 deg. C)  All  NDPs: 0 Tests: 1  Conductivity (at 20 deg. C)  All  NDPs: 0 Tests: 1  Conductivity (at 20 deg. C)  All  NDPs: 0 Tests: 1  Tests: 1  All  NDPs: 0 Tests: 1  Tests: 1  All  NDPs: 0 Tests: 1  Tests	
AGS Reference  Depth (m)  Container  Container  Acid Herbicides (W)  All  NDPs: 0 Tests: 1  Anions by Kone (w)  All  NDPs: 0 Tests: 1  COD Unflitered  All  NDPs: 0 Tests: 1  Conductivity (at 20 deg C)  All  NDPs: 0 Tests: 1  Conductivity (at 20 deg C)  All  NDPs: 0 Tests: 1  All  NDPs: 0 Tests: 1  All  NDPs: 0 Tests: 1  Conductivity (at 20 deg C)  All  NDPs: 0 Tests: 1  All  NDPs: 0 Tests: 1  Comp/Free/Total/Thiocyanate	
Depth (m)  Container	
Acid Herbicides (W)  All  NDPs: 0 Tests: 1  Ammoniacal Nitrogen  All  NDPs: 0 Tests: 1  Anions by Kone (w)  All  NDPs: 0 Tests: 1  All  NDPs: 0 Tests: 1  X  COD Unfiltered  All  NDPs: 0 Tests: 1  X  Conductivity (at 20 deg.C)  All  NDPs: 0 Tests: 1  X  Cyanide Comp/Free/Total/Thiocyanate	
Acid Herbicides (W)  All  NDPs: 0 Tests: 1  Ammoniacal Nitrogen  All  NDPs: 0 Tests: 1  Anions by Kone (w)  All  NDPs: 0 Tests: 1  X  BOD True Total  All  NDPs: 0 Tests: 1  X  COD Unfiltered  All  NDPs: 0 Tests: 1  X  Conductivity (at 20 deg.C)  All  NDPs: 0 Tests: 1  X  Cyanide Comp/Free/Total/Thiocyanate  All  NDPs: 0 Tests: 1  X  X  X  X  X  X  X  X  X  X  X  X  X	
Acid Herbicides (W)  All  NDPs: 0 Tests: 1  Ammoniacal Nitrogen  All  NDPs: 0 Tests: 1  Anions by Kone (w)  All  NDPs: 0 Tests: 1  X  BOD True Total  All  NDPs: 0 Tests: 1  X  COD Unfiltered  All  NDPs: 0 Tests: 1  X  Conductivity (at 20 deg.C)  All  NDPs: 0 Tests: 1  X  Cyanide Comp/Free/Total/Thiocyanate  All  NDPs: 0 Tests: 1  X  X  X  X  X  X  X  X  X  X  X  X  X	
Cyanide Comp/Free/Total/Thiocyanate  All  NDPs: 0 Tests: 1  X	ۍ.
Cyanide Comp/Free/Total/Thiocyanate  All  NDPs: 0 Tests: 1  X	
Cyanide Comp/Free/Total/Thiocyanate  All  NDPs: 0 Tests: 1  X	
Cyanide Comp/Free/Total/Thiocyanate  All  NDPs: 0 Tests: 1  X	
Cyanide Comp/Free/Total/Thiocyanate  All  NDPs: 0 Tests: 1  X	
Comp/Free/Total/Thiocyanate Tests: 1	
D	
Dissolved Metals by ICP-MS  All  NDPs: 0 Tests: 1  X	
Fluoride All NDPs: 0 Tests: 1	
Mercury Dissolved All NDPs: 0 Tests: 1	
Metals by iCap-OES Dissolved (W)  All  NDPs: 0 Tests: 1	
OC, OP Pesticides and Triazine Herb  All NDPs: 0 Tests: 1	
Organotins in Aqueous Samples All NDPs: 0 Tests: 1	
PAH Spec MS - Aqueous (W)  All  NDPs: 0 Tests: 1	
pH Value All NDPs: 0 Tests: 1	

140121-33

SDG:

#### PRELIMINARY/INTERIM REPORT

Gowran Landfill

Location:

Preliminary

5734

Order Number:

D\_FTIM\_CRK-43 257997 Job: **Customer:** Fehily Timoney Report Number: Client Reference: LW13-112-01 Attention: Neil Menzies Superseded Report: **LIQUID** 8719228 Results Legend Lab Sample No(s) X Test No Determination Possible **LEACHATE 2** Customer Sample Reference **AGS Reference** 0.00 - 0.00 Depth (m) NaOH (ALE245)
H2SO4 (ALE244)
Dissolved Metals Pr
11plastic (ALE221) Container Egelian burdese only any other use. Phenols by HPLC (W) All NDPs: 0 Tests: 1 SVOC MS (W) - Aqueous All NDPs: 0 Tests: 1 Total Metals by ICP-MS All NDPs: 0 Tests: 1 VOC MS (W) All NDPs: 1 Tests: 0 Consent of copy

Preliminary

Gowran Landfill 5734 SDG: 140121-33 Location: Order Number: D\_FTIM\_CRK-43 LW13-112-01 Job: Fehily Timoney 257997 **Customer:** Report Number: Client Reference: Attention: Neil Menzies Superseded Report:

Chefit Reference. LW15-112	_ 01	Attention	. '	10	II IVIC	/I IZ	100
SOLID Results Legend	Lab Sample I	No(s)		8719221		8719226	
N No Determination Possible	Custome Sample Refe			TP5		TP10	
	AGS Refere						
	Depth (m			0.00 - 0.00		0.00 - 0.00	
	Containe	r	400g Tub (ALE214) 250g Amber Jar (AL	60g VOC (ALE215)	250g Amber Jar (AL 1kg TUB	60g VOC (ALE215)	
ANC at pH4 and ANC at pH 6	All	NDPs: 0 Tests: 2	X		X		ion burdeseried for any other
Anions by Kone (w)	All	NDPs: 0 Tests: 2	X		X		off distribution
Asbestos ID in Solid Samples	All	NDPs: 0 Tests: 2	x		X		on Purposes edited he
CEN 2:1 Readings	All	NDPs: 0 Tests: 2	x	. 6	XIS	900 1000 1000	somet
CEN 8:1 Readings	All	NDPs: 0 Tests: 2	X X	ر د د	X 26 <sub>3</sub> ,		
Dissolved Metals by ICP-MS	All	NDPs: 0 Tests 2	X		X		
Dissolved Organic/Inorganic Carbon	All	NDPs: 0 Tests: 2	X		X		
Fluoride  GRO by GC-FID (S)	All	NDPs: 0 Tests: 2 NDPs: 0	X		X		
Loss on Ignition in soils	All	Tests: 2	N	X	N	X	
Mercury Dissolved	All	Tests: 0  NDPs: 0					
Mineral Oil	All	Tests: 2	X		X		-
PAH Value of soil	All	NDPs: 0 Tests: 2	X		X		
PCBs by GCMS	All	NDPs: 0 Tests: 2	X		X		
pH	All	NDPs: 0 Tests: 2	X		X		_
			X		X		]

Preliminary

140121-33 Gowran Landfill 5734 SDG: Location: Order Number: D\_FTIM\_CRK-43 Fehily Timoney 257997 Job: **Customer:** Report Number: Client Reference: LW13-112-01 Attention: Neil Menzies Superseded Report:

Client Reference: LW13-112	2-01	Attention	. INE	II ivienz	100
SOLID Results Legend X Test	Lab Sample I	No(s)	8719221	8719226	
No Determination Possible	Custome Sample Refer		TP5	TP10	
	AGS Refere	nce			
	Depth (m		0.00 - 0.00	0.00 - 0.00	
	Containe	r	60g VOC (ALE215) 400g Tub (ALE214) 250g Amber Jar (AL	60g VOC (ALE215) 250g Amber Jar (AL 1kg TUB	
Phenois by HPLC (W)	All	NDPs: 0 Tests: 2	x	x	J. Use.
Sample description	All	NDPs: 0 Tests: 2	X	×	ally any other
Total Dissolved Solids	All	NDPs: 0 Tests: 2	×	x	on Purpose required to
Total Organic Carbon	All	NDPs: 0 Tests: 2	X	i i <mark>X</mark> jý	owner required for any offer use.
		Cons	x po	or,	

Preliminary

 SDG:
 140121-33

 Job:
 D\_FTIM\_CRK-43

 Client Reference:
 LW13-112-01

Location: Customer: Attention: Gowran Landfill Fehily Timoney Neil Menzies Order Number: Report Number: 5734 257997

Superseded Report:

### **Sample Descriptions**

#### **Grain Sizes**

very fine <0.063mm		Bmm	fine	0.063mm - 0.1mm	medium	edium 0.1mm - 2mm		coarse	coarse 2mm - 1		very coarse	>10m
Lab Sample	e No(s)	Custom	er Sample Ref	. Depth (m)	Co	lour	Descrip	tion	Grain size	Inclu	usions	Inclusions 2
871922	21		TP5	0.00 - 0.00	В	lack	Sandy ( Loar	,	0.1 - 2 mm	Sto	ones	Fibres
871922	8719226 TP10		TP10	0.00 - 0.00	В	lack	Sandy ( Loar	,	0.1 - 2 mm	Fil	ores	Stones

These descriptions are only intended to act as a cross check if sample identities are questioned, and to provide a log of sample matrices with respect to MCERTS validation. They are not intended as full geological descriptions.

We are accredited to MCERTS for sand, clay and loam/topsoil, or any of these materials - whether these are derived from naturally ocurring soil profiles, or from fill/made ground, as long as these materials constitute the major part of the sample.

Other coarse granular materials such as concrete, gravel and brick are not accredited if they comprise the major part of the sample.

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Gowran Landfill 5734 SDG: 140121-33 Location: Order Number: D\_FTIM\_CRK-43 Fehily Timoney 257997 Job: **Customer:** Report Number:

Client Reference: LW13-112-01 Attention: Neil Menzies Superseded Report:

Results Legend # ISO17025 accredited. M mCERTS accredited. aq Aqueous / settled sample.	C	ustomer Sample R	LEACHATE 2	TP5	TP10		
diss.filt Dissolved / filtered sample. tot.unfilt Total / unfiltered sample. * Subcontracted test.		Depth (m) Sample Type Date Sampled	0.00 - 0.00 Water(GW/SW) 20/01/2014	0.00 - 0.00 Soil/Solid 20/01/2014	0.00 - 0.00 Soil/Solid 20/01/2014		
** % recovery of the surrogate standa check the efficiency of the method.		Sample Time	20/01/2014	20/01/2014	20/01/2014		
results of individual compounds wi samples aren't corrected for the rec	ithin	Date Received SDG Ref	140121-33	140121-33	140121-33		
(F) Trigger breach confirmed		Lab Sample No.(s)	8719228	8719221	8719226		
1-4&+§@ Sample deviation (see appendix)  Component	LOD/Units	AGS Reference Method					
BOD, unfiltered	<1 mg/l	TM045	588	ŧ .			
Ammoniacal Nitrogen as N	<0.2 mg/	I TM099	382	ŧ			
Fluoride	<0.5 mg/	I TM104	<0.5 #	ŧ			
COD, unfiltered	<7 mg/l	TM107	20800 #	#			
Conductivity @ 20 deg.C	<0.005 mS/cm	TM120	4.37 ‡	<b>#</b>			
Arsenic (diss.filt)	<0.12 µg/	/I TM152	30.1 #	<b>#</b>			
Boron (diss.filt)	<9.4 µg/l		906 #	ŧ			
Cadmium (diss.filt)	<0.1 µg/l		<0.1 ‡	ŧ			
Copper (diss.filt)	<0.85 µg/		1.83 #	ŧ			
Lead (diss.filt)	<0.02 µg/		0.864 #	ŧ	refuse.		
Manganese (diss.filt)	<0.04 µg/		131	#	on other rec.		
Nickel (diss.filt)	<0.15 µg/		28.1	# Society	edior		
Zinc (diss.filt)	<0.41 µg/		3.52 #	t ion puricul			
Mercury (diss.filt)	<0.01 µg/		<0.01	# Inspect Owine			
Sulphate	<2 mg/l	TM184		, 05,			
Chloride	<2 mg/l		434	<i>‡</i>			
Phosphate (ortho) as P	<0.02 mg/l	TM184	0.0365	ŧ			
Total Oxidised Nitrogen as N	<0.1 mg/			ŧ			
Chromium (tot.unfilt)	<3 µg/l	TM191	10800	<u> </u>			
Cyanide, Total	<0.05 mg/l	TM227	<0.05	#			
Calcium (diss.filt)	<0.012 mg/l	TM228	38.2	#			
Sodium (diss.filt)	<0.076 mg/l	TM228	285 	#			
Magnesium (diss.filt)	<0.036 mg/l	TM228	72.1	<b>#</b>			
Potassium (diss.filt)	<1 mg/l		291	<u> </u>			
Iron (diss.filt)	<0.019 mg/l	TM228	3.84	<u> </u>			
pH	<1 pH Units	TM256	7.94	<u> </u>			
Phenols, Total Detected monohydric	<0.016 mg/l	TM259	<0.016	ŧ			
Dibutyl tin	<5 ng/l	TM328	1670				
Tributyl tin	<1 ng/l	TM328	9940				
Tetrabutyl tin	<2 ng/l	TM328	<600				
Triphenyl tin	<1 ng/l	TM328	<300				
Surrogate	%	TM328	50.4				



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 SDG:
 140121-33
 Location:
 Gowran Landfill
 Order Number:
 5734

 Job:
 D\_FTIM\_CRK-43
 Customer:
 Fehily Timoney
 Report Number:
 257997

Client Reference: LW13-112-01 Attention: Neil Menzies Superseded Report:

		_					
Results Legend # ISO17025 accredited.	Cus	stomer Sample R	LEACHATE 2	TP5	TP10		
# ISO17025 accredited.  M mCERTS accredited.							
aq Aqueous / settled sample.		Depth (m)	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00		
diss.filt Dissolved / filtered sample.		Sample Type	Water(GW/SW)	Soil/Solid	Soil/Solid		
tot.unfilt Total / unfiltered sample.  * Subcontracted test.		Date Sampled	20/01/2014	20/01/2014	20/01/2014		
** % recovery of the surrogate standa	ard to	Sample Time					
check the efficiency of the method.		Date Received	20/01/2014	20/01/2014	20/01/2014		
results of individual compounds with samples aren't corrected for the re-		SDG Ref	140121-33	140121-33	140121-33		
(F) Trigger breach confirmed	Li	ab Sample No.(s)	8719228	8719221	8719226		
1-4&+§@ Sample deviation (see appendix)		AGS Reference					
Component	LOD/Units	Method					
Moisture Content Ratio	%	PM024		19	23		
Mineral oil >C10-C40	<1 mg/kg	TM061		212	247		
Willional Oil + O To O To	- Ting/itg	1111001		#	#		
Organic Carbon, Total	<0.2 %	TM132		5.12	2.52		
				#	#		
pH	1 pH	TM133		8.11	7.84		
P	Units			М	М		
DOD 00		T14400					
PCB congener 28	<3 µg/kg	TM168		4.96	3.73		
				M	M		
PCB congener 52	<3 µg/kg	TM168		<3	<3		
	~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~	55		M	М		
DOD 15:							
PCB congener 101	<3 µg/kg	TM168		<3	<3		
	<u> </u>			M	М	 	
PCB congener 118	<3 µg/kg	TM168		<3	<3		
22 33351101 110	β μα/κα			М	M		
DOD 107							
PCB congener 138	<3 µg/kg	TM168		<3	<3		
	<u></u>			M	М		
PCB congener 153	<3 µg/kg	TM168		<3	M <3 IB. M		
. ob congener rec	o pg///g			М	N N		
					NO IVI		
PCB congener 180	<3 µg/kg	TM168		<3	√3°		
				M	M Kits Kits		
Sum of detected PCB 7	<21 µg/kg	TM168		0.213170011 0.213170011	21 <21		
Congeners	pg///g			~ ~ ~ ~	9, -		
				2 2 2 2 3	0		
ANC @ pH 4	<0.03	TM182		0.2130	0.2		
	mol/kg			ion of the			
ANC @ pH 6	< 0.03	TM182		0.0824	0.0724		
1 1 1 6 P 1 1 1	mol/kg			0.0824 :150 0.0824	****		
5.1 "		T14040		Mite <10	-10		
Polyaromatic	<10	TM213	<b>₽</b> (	10 × 10	<10		
hydrocarbons, Total 17	mg/kg		· ·	જ,			
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Preliminary

 SDG:
 140121-33
 Location:
 Gowran Landfill
 Order Number:
 5734

 Job:
 D\_FTIM\_CRK-43
 Customer:
 Fehily Timoney
 Report Number:
 257997

Client Reference: LW13-112-01 Attention: Neil Menzies Superseded Report:

Acid Herbicides (W)							
Results Legend # ISO17025 accredited.	Cus	stomer Sample R	LEACHATE 2				
M mCERTS accredited.  aq Aqueous / settled sample.							
diss.filt Dissolved / filtered sample. tot.unfilt Total / unfiltered sample.		Depth (m) Sample Type	0.00 - 0.00 Water(GW/SW)				
* Subcontracted test.		Date Sampled	20/01/2014				
check the efficiency of the method	. The	Sample Time Date Received	20/01/2014				
results of individual compounds w samples aren't corrected for the re	covery	SDG Ref	140121-33 8719228				
(F) Trigger breach confirmed 1-4&+§@ Sample deviation (see appendix)	Li	ab Sample No.(s) AGS Reference	07 19220				
Component	LOD/Units	Method	0.0700				
Phenoxyacetic acid (PAA)	<0.031 µg/l	TM186	0.0709 #				
Dicamba	<0.033	TM186	<1.87				
2.0020	μg/l		#				
Phenoxypropionic acid	<0.023	TM186	<0.0508				
(PPA)	μg/l						
4-Chlorophenoxyacetic	<0.037	TM186	<0.074				
acid (4-CPA)  4-Phenoxybutyric acid	μg/l <0.019	TM186	0.115				
4-Frierioxybutyric acid	νο.019 μg/l	1101100	0.115				
Bentazone	<0.018	TM186	<0.036				
	μg/l		#				
Bromoxynil	<0.022	TM186	<0.044				
0.4 Piable	μg/l	T11100	0.055				
2,4-Dichlorophenoxy acetic acid (2,4-D)	<0.026 µg/l	TM186	<0.052 #				
2-methyl-4-Chlorophenoxy	μg/i <0.03 μg/l	TM186	0.00				
acetic acid (MCPA)	σ.σο μg/ι		~0.00 #	of triffed owner teams			
2-methyl-4,6-Dinitrophenol	<0.041	TM186	<0.082		38.		
	μg/l				reiv		
Triclopyr	<0.022	TM186	<0.044		1. A Ott.		
lovemil	μg/l <0.017	TM186	<0.034		OHY OHY		
loxynil	νο.στ <i>γ</i> μg/l	1101100	<b>\0.034</b>	3505	dio		
2,4-Dichlorophenoxy	<0.015	TM186	0.745	all all	0		
propanoic acid (2,4-DP)	μg/l		#	on Proces			
2,4,5-Trichlorophenol	<0.029	TM186	<0.058	ection in the			
(2,4,5-T)	μg/l	T14400	#	195PHO			
Mecoprop (MCPP)	<0.025 µg/l	TM186	9.41	a trafty			
4-(2,4-Dichlorophenoxy)	<0.022	TM186	<0.0944 💃	tox,			
butyric acid (2,4-DB)	μg/l		×*#				
4-(4-Chloro-o-tolyloxy)	<0.029	TM186	<0.09				
butyric acid (MCPB)	μg/l	T14400					
2-(2,4,5-Trichlorophenoxy) proprionic acid	<0.024 µg/l	TM186	<0.048 #				
Dinoseb	<0.027	TM186	<0.054				
	μg/l						
Pentachlorophenol	<0.032	TM186	<0.064				
	μg/l						



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Gowran Landfill 5734 SDG: 140121-33 Location: Order Number: Fehily Timoney D\_FTIM\_CRK-43 257997 Job: **Customer:** Report Number: Superseded Report:

Client Reference: LW13-112-01 Attention: Neil Menzies

GRO by GC-FID (S)									
Results Legend # ISO17025 accredited.	Cu	stomer Sample R	TP5		TP10				
M mCERTS accredited.  aq Aqueous / settled sample.									
diss.filt Dissolved / filtered sample. tot.unfilt Total / unfiltered sample.		Depth (m) Sample Type	0.00 - 0.00 Soil/Solid		0.00 - 0.00 Soil/Solid				
* Subcontracted test.		Date Sampled	20/01/2014		20/01/2014				
check the efficiency of the method.	. The	Sample Time Date Received	20/01/2014		20/01/2014				
results of individual compounds with samples aren't corrected for the re-	covery	SDG Ref	140121-33 8719221		140121-33 8719226				
(F) Trigger breach confirmed 1-4&+§@ Sample deviation (see appendix)		ab Sample No.(s) AGS Reference	07 13221		07 13220				
CDO Currente 0/	LOD/Units %		52	_	49				
GRO Surrogate % recovery**	70	TM089	52		49				
Methyl tertiary butyl ether (MTBE)	<5 µg/kg	TM089	<5	М	<5	М			
Benzene	<10 µg/kg	TM089	<10	М	<10	М			
Toluene	<2 µg/kg	TM089		М	11.6	М			
Ethylbenzene	<3 µg/kg	TM089	28.3	М	276	М			
m,p-Xylene	<6 µg/kg	TM089	28.3	М	383	М			
o-Xylene	<3 µg/kg	TM089	6.15	М	42.6	М			
sum of detected mpo xylene by GC	<9 µg/kg		34.5		426				
sum of detected BTEX by GC	<24 µg/kg	TM089	69		714		ony, any other ree.		
							Let lise.		
							aly any oth		
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Preliminary

Gowran Landfill 5734 SDG: 140121-33 Location: Order Number: Fehily Timoney Job: D\_FTIM\_CRK-43 257997 **Customer:** Report Number:

Client Reference: LW13-112-01 Attention: Neil Menzies Superseded Report:

Client Reference: LVV13	-112-01		Attention: N	eli Menzies		Superseded Re	port.	
OC, OP Pesticides and	Triazine Ho	erb						
Results Legend	Cus	tomer Sample R	LEACHATE 2					
# ISO17025 accredited.  M mCERTS accredited.								
aq Aqueous / settled sample.		Depth (m)	0.00 - 0.00					
diss.filt Dissolved / filtered sample. tot.unfilt Total / unfiltered sample.		Sample Type	Water(GW/SW)					
* Subcontracted test.		Date Sampled	20/01/2014					
** % recovery of the surrogate standa check the efficiency of the method.		Sample Time						
results of individual compounds wi	thin	Date Received SDG Ref	20/01/2014 140121-33					
samples aren't corrected for the red (F) Trigger breach confirmed	covery	ab Sample No.(s)	8719228					
1-4&+§@ Sample deviation (see appendix)		AGS Reference						
Component	LOD/Units	Method						
Atrazine	<1 µg/l	TM231	<10					
Simazine	<1 µg/l	TM231	<10					
o,p-DDE	<0.01 µg/l	TM231	<0.1					
"								
p,p-DDE	<0.01 µg/l	TM231	<0.1					
F,F	515 1 p.3.1							
o,p-TDE (DDD)	<0.01 µg/l	TM231	<0.1					
0,p 102 (000)	чо.от рул	TWIZOT	10.1					
o,p-DDT	<0.01 µg/l	TM231	<0.1					
0,0-001	~υ.υ ι μ <b>y</b> /l	I IVIZO I	~0.1					
TOE (DDD)	40.04 "	TM004	40.4	-				
p,p-TDE (DDD)	<0.01 µg/l	TM231	<0.1					
	0.51	70.000						
p,p-DDT	<0.01 µg/l	TM231	<0.1					
o,p-Methoxychlor	<0.01 µg/l	TM231	<0.1	of hereiton purposes				
p,p-Methoxychlor	<0.01 µg/l	TM231	<0.1		æ.			
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Gowran Landfill 5734 SDG: 140121-33 Location: Order Number: D\_FTIM\_CRK-43 Fehily Timoney 257997 Job: **Customer:** Report Number: Client Reference: LW13-112-01 Attention: Neil Menzies Superseded Report:

	PAH Spec MS - Aqueou	s (W)						
Content   Cont	Results Legend		stomer Sample R	LEACHATE 2				
Secretary Horse Secretary   Secretary Horse Secretary   Secretary Horse Secretary   Secretary Horse Secretar	M mCERTS accredited.							
Date Sample de Decembrance trait.   Date Sample de Dete Sample de Dete Received particular de conjunction particular de la conjunc								
Secretary of the survey state state of the received puls methods to the								
Supple distribution (component with control for the formation (control fo	** % recovery of the surrogate standa		Sample Time					
99   179ger treach continued   124454   Semple rechire (receive greater)   124454   Semple rechired (receive greater)   124454   12454   Semple rechired (receive greater)   124454   Semple rechired (receive greater)   1244544   Semple rechired (rece	results of individual compounds w	ithin						
Component   Color   Color   TM178   16.7	(F) Trigger breach confirmed		ab Sample No.(s)					
Naphthalene (aq)		I OD/Unite						
Acenaphthene (aq)				16.7				
Acenaphthylene (aq)				#	ŧ			
Acenaphthylene (aq)	Acenaphthene (aq)		TM178					
Fluoranthene (aq)					<u> </u>			
Fluoranthene (aq)	Acenaphthylene (aq)		IM178		<u>,</u>			
Phenanthrene (aq)	Fluoranthene (ag)		TM178		<u>,                                     </u>			
Anthracene (aq)	r radianatione (aq)		1		<u></u>			
Phenanthrene (aq)	Anthracene (aq)		TM178					
Fluorene (aq)					ŧ			
Fluorene (aq)	Phenanthrene (aq)		TM178					
Pyrene (aq)	Fluerone (ce)		TN4470		<del>‡</del>			
Chrysene (aq)	riuorene (aq)		I M178		<u>.</u>			
Pyrene (aq)	Chrysene (ag)		TM178		-			
Pyrene (aq)         <0.015 μg/l	,sss (uq)				<u> </u>			
μg/l	Pyrene (aq)		TM178	00.0				
μg/l		μg/l		#	ŧ			
μg/l	Benzo(a)anthracene (aq)		TM178	24.5		1150.		
μg/l	D (1)(1)		T14470	#	<i>‡</i>	net "		
μg/l	Benzo(b)fluoranthene (aq)		IM178	26.3	<u>,</u>	14: 24 Of		
μg/l	Renzo(k)fluoranthene (ag)		TM178	35.6	+	Oly all,		
μg/l	Denzo(k)ndorantnene (aq)		1101170	55.0	t Sec	dio		
μg/l	Benzo(a)pyrene (aq)		TM178	31.4	alif ali			
μg/l		μg/l		#	# on Price of			
μg/l			TM178	4.26	ectionie			
μg/l				#	1050 0			
Indeno(1,2,3-ca)pyrene	Benzo(g,h,ı)perylene (aq)		IM178	21.6	of with			
PAH, Total Detected <0.344 TM178 4276	Indeno(1.2.3-cd)nyrene		TM178	15.1	, 100°,			
PAH, Total Detected <0.344 TM178 4276			1	10.1	į į			
USEPA 16 (aq)	PAH, Total Detected		TM178	427				
	USEPA 16 (aq)	μg/l		<u> </u>				
			+		1			
			+					
			+					
					1			
			+ -		+			



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5734 SDG: 140121-33 Location: Gowran Landfill Order Number: D\_FTIM\_CRK-43 Fehily Timoney 257997 Job: **Customer:** Report Number: Client Reference: LW13-112-01 Attention: Neil Menzies Superseded Report:

SVOC MS (W) - Aqueous

SVOC MS (W) - Aqueous		rataman Campla D	LEAGUATEO				
Results Legend # ISO17025 accredited.	Ci	ustomer Sample R	LEACHATE 2				
M mCERTS accredited.  aq Aqueous / settled sample.							
diss.filt Dissolved / filtered sample.		Depth (m)	0.00 - 0.00				
tot.unfilt Total / unfiltered sample.  * Subcontracted test.		Sample Type Date Sampled	Water(GW/SW) 20/01/2014				
** % recovery of the surrogate standard		Sample Time	20/01/2014				
check the efficiency of the method. I results of individual compounds with		Date Received	20/01/2014				
samples aren't corrected for the reco	overy	SDG Ref	140121-33				
(F) Trigger breach confirmed 1-4&+§@ Sample deviation (see appendix)	·   I	Lab Sample No.(s)	8719228				
Component	LOD/Units	AGS Reference Method					
1,2,4-Trichlorobenzene	<1 µg/l	TM176	<4				
(aq)	\ 1 μg/1	1101170		,			
· · · ·	4 "	71470		•			
1,2-Dichlorobenzene (aq)	<1 µg/l	TM176	<4	.			
			-	;			
1,3-Dichlorobenzene (aq)	<1 µg/l	TM176	<4				
			1	ŧ			
1,4-Dichlorobenzene (aq)	<1 µg/l	TM176	<4				
2,4,5-Trichlorophenol (aq)	<1 µg/l	TM176	<4				
, ,,	1.3		;	<u> </u>			
2,4,6-Trichlorophenol (aq)	<1 µg/l	TM176	<4				
2,4,0 111011010001101101 (44)	11 µg/1	1101170		,			
C. 4 Diable as about 1 (a.s.)	.4	T14470		•			
2,4-Dichlorophenol (aq)	<1 µg/l	TM176	<4	. ]			
		1	i	‡ <u> </u>			
2,4-Dimethylphenol (aq)	<1 µg/l	TM176	<4				
			i	ŧ			
2,4-Dinitrotoluene (aq)	<1 µg/l	TM176	<4				
` "	. 0	1	1	<u> </u>	ofto, str, offertieg.		
2,6-Dinitrotoluene (aq)	<1 µg/l	TM176	<4		′۰.		
2,0 2 0.00.00.00 (04)	. 49			<u>.</u>	(112		
2-Chloronaphthalene (aq)	<1 ua/l	TM176	<4		Her		
2-Chloronaphthalene (aq)	<1 µg/l	TIVITO			1. A		
				·	Jaly our,		
2-Chlorophenol (aq)	<1 µg/l	TM176	<4	O C	0,601		
			1	4	e <sup>©</sup>		
2-Methylnaphthalene (aq)	<1 µg/l	TM176	<4	alif all			
			-	1 20 / 100 x			
2-Methylphenol (aq)	<1 µg/l	TM176	<4	citone			
, , , , , , , , , , , , , , , , , , , ,	1.3			E SON OTH			
2-Nitroaniline (aq)	<1 µg/l	TM176	<4	or tright			
2 Millourilline (aq)	11 µg/1	1101170	4	or it ight			
0.1111	4 #	71470	1				
2-Nitrophenol (aq)	<1 µg/l	TM176	<4	<b>Υ</b>			
			<4 (4) (4) (4) (4) (4) (4) (4) (4) (4) (4	‡			
3-Nitroaniline (aq)	<1 µg/l	TM176	<47150				
				ŧ			
4-Bromophenylphenylethe	<1 µg/l	TM176	<4				
r (aq)			1	ŧ			
4-Chloro-3-methylphenol	<1 µg/l	TM176	<4				
(aq)	. 1-3			ŧ			
4-Chloroaniline (aq)	<1 µg/l	TM176	<4				
4-Officioarilline (aq)	\ 1 μg/1	1101170	~~				
4 Obligation I I I I I I I		T111=2		+		-	
4-Chlorophenylphenylethe	<1 µg/l	TM176	<4	.			
r (aq)		1		<u> </u>			
4-Methylphenol (aq)	<1 µg/l	TM176	<4				
				ŧ			
4-Nitroaniline (aq)	<1 µg/l	TM176	<4				
	-	1	;	ŧ			
4-Nitrophenol (aq)	<1 µg/l	TM176	<4				
	י יש"י		•				
Azobenzene (aq)	<1 µg/l	TM176	<4				
Azobenzene (aq)	\ 1 μg/1	1101170		<u> </u>			
A bible days ()	.4	T14470		•			
Acenaphthylene (aq)	<1 µg/l	TM176	<4	,			
			-	‡ <u> </u>			
Acenaphthene (aq)	<1 µg/l	TM176	<4				
				ŧ			
Anthracene (aq)	<1 µg/l	TM176	<4				
\	. 0	1	1	<u> </u>			
bis(2-Chloroethyl)ether	<1 µg/l	TM176	<4				
(aq)	11 µg/1	1101170		<u> </u>			
bis(2-Chloroethoxy)metha	~1 ··~//	TM176	<4			1	
	<1 µg/l	1101170		.			
ne (aq)			i	-			
bis(2-Ethylhexyl) phthalate	<2 µg/l	TM176	67.6				
(aq)			1	ŧ			
Butylbenzyl phthalate (aq)	<1 µg/l	TM176	<4				
' "	=	1	1	ŧ			
		-		-			



Preliminary

Gowran Landfill 5734 SDG: 140121-33 Location: Order Number: D\_FTIM\_CRK-43 Fehily Timoney 257997 Job: **Customer:** Report Number: Client Reference: LW13-112-01 Attention: Neil Menzies Superseded Report:

SVOC MS (W) - Aqueous	s						
Results Legend		stomer Sample R	LEACHATE 2				
M mCERTS accredited.							
aq Aqueous / settled sample. diss.filt Dissolved / filtered sample.		Depth (m) Sample Type	0.00 - 0.00 Water(GW/SW)				
tot.unfilt Total / unfiltered sample.  * Subcontracted test.		Date Sampled	20/01/2014				
** % recovery of the surrogate standa check the efficiency of the method.	The	Sample Time Date Received	20/01/2014				
results of individual compounds wi samples aren't corrected for the re-	covery	SDG Ref	140121-33 8719228				
(F) Trigger breach confirmed 1-4&+§@ Sample deviation (see appendix)		ab Sample No.(s) AGS Reference	07 19220				
Component	LOD/Units	Method	-1				
Benzo(a)anthracene (aq)	<1 µg/l	TM176	<4 #				
Benzo(b)fluoranthene (aq)	<1 µg/l	TM176	<4 #				
Benzo(k)fluoranthene (aq)	<1 µg/l	TM176	<4 #				
Benzo(a)pyrene (aq)	<1 µg/l	TM176	<4 #				
Benzo(g,h,i)perylene (aq)	<1 µg/l	TM176	<4 #				
Carbazole (aq)	<1 µg/l	TM176	<4 #				
Chrysene (aq)	<1 µg/l	TM176	<4 #				
Dibenzofuran (aq)	<1 µg/l	TM176	<4 #				
n-Dibutyl phthalate (aq)	<1 µg/l	TM176	<4 #				
Diethyl phthalate (aq)	<1 µg/l	TM176	<4 #	inspection purposes	ther use.		
Dibenzo(a,h)anthracene (aq)	<1 µg/l	TM176	<4 #		ally arry or		
Dimethyl phthalate (aq)	<1 µg/l	TM176	<4 #	1005°	edfor		
n-Dioctyl phthalate (aq)	<5 μg/l	TM176	<20	ion pit jedir			
Fluoranthene (aq)	<1 µg/l	TM176	<4 #	·HSP OWIT			
Fluorene (aq)	<1 µg/l	TM176	#	or yright			
Hexachlorobenzene (aq)	<1 µg/l	TM176	<4 of				
Hexachlorobutadiene (aq)	<1 µg/l	TM176	<b>240</b> #				
Pentachlorophenol (aq)	<1 µg/l	TM176	<4				
Phenol (aq)  n-Nitroso-n-dipropylamine	<1 µg/l	TM176	<4				
(aq)  Hexachloroethane (aq)	<1 µg/l	TM176	*4 *4				
Nitrobenzene (aq)	<1 µg/l	TM176	** *** *4				
Naphthalene (aq)	<1 μg/l <1 μg/l	TM176	<4 # <4				
Isophorone (aq)	<1 μg/l	TM176	*4 *4				
Hexachlorocyclopentadien	<1 μg/l	TM176	*4 *4				
e (aq)  Phenanthrene (aq)	<1 μg/l	TM176	<4				
Indeno(1,2,3-cd)pyrene	<1 μg/l	TM176	**************************************				
(aq)  Pyrene (aq)	<1 μg/l	TM176	<4 #				
i yielie (aq)	~ 1 μg/1	1 101 1 / 0	#				

Preliminary

140121-33 Gowran Landfill 5734 SDG: Location: Order Number: Job: D\_FTIM\_CRK-43 **Customer:** Fehily Timoney Report Number: 257997 Client Reference: LW13-112-01 Superseded Report: Attention: Neil Menzies

#### **CEN 10:1 CUMULATIVE TWO STAGE BATCH TEST**

# WAC ANALYTICAL RESULTS Client Reference Site Location Gowran Landfill

Mass Sample taken (kg) 0.262 Natural Moisture Co
Mass of dry sample (kg) 0.175 Dry Matter Content (
Particle Size <4mm >95%

0.0824

0.213

Site Location Gowran Landfill

Natural Moisture Content (%) 49.5

Dry Matter Content (%) 66.9

Case			Landfi	II Waste Acce	pta
SDG	140121-33			Criteria Limits	S
Lab Sample Number(s)	8719221				Ī
Sampled Date	20-Jan-2014			Stable Non-reactive	l
Customer Sample Ref.	TP5		Inert Waste Landfill	Hazardous	l
Depth (m)	0.00 - 0.00		Landilli	Waste in Non- Hazardous	
Solid Waste Analysis				Landfill	l
Total Organic Carbon (%)	5.12		3	5	i
Loss on Ignition (%)	-		-	-	
Sum of BTEX (mg/kg)	0.069		6	-	
Sum of 7 PCBs (mg/kg)	<0.021		1	-	
Mineral Oil (mg/kg)	212		500	-	
PAH Sum of 17 (mg/kg)	<10		100	-	
pH (pH Units)	8.11	. Use.	-	<6 or >9	

Eluate Analysis	C2 Conc <sup>n</sup> in 2:1 eluate	C8 Conc <sup>n</sup> in 8:1	A2 2:10 control	A2-10 Cumulative conc <sup>n</sup> leached	Limit values for compliance leaching		
Arsenic	0.0229	0.00532	√0.0458	0.0728	0.5	2	25
Barium	0.0205	0.0127		0.136	20	100	300
Cadmium	0.000764	<0.0001	0.00153	<0.001	0.04	1	5
Chromium	0.0104	0.00258	0.0208	0.0343	0.5	10	70
Copper	0.0314	0.00664	0.0627	0.0939	2	50	100
Mercury Dissolved (CVAF)	0.0000104	0.000172	0.0000208	0.00154	0.01	0.2	2
Molybdenum	0.503	0.0346	1	0.868	0.5	10	30
Nickel	0.0668	0.00444	0.133	0.114	0.4	10	40
Lead	0.00439	0.00183	0.00876	0.0211	0.5	10	50
Antimony	0.0139	0.00817	0.0277	0.088	0.06	0.7	5
Selenium	0.0104	0.00238	0.0208	0.0327	0.1	0.5	7
Zinc	0.026	0.00445	0.052	0.0685	4	50	200
Chloride	196	128	392	1360	800	15000	25000
Fluoride	<0.5	<0.5	<0.999	<5	10	150	500
Sulphate (soluble)	337	6.2	673	431	1000	20000	50000
Total Dissolved Solids	1840	443	3670	5990	4000	60000	100000
Total Monohydric Phenols (W)	0.02	<0.016	0.04	<0.16	1	-	-
Dissolved Organic Carbon	238	24.8	475	502	500	800	1000

Leach Test Information	2:1	8:1
Date Prepared	22-Jan-2014	22-Jan-2014
pH (pH Units)	8.116	7.984
Conductivity (µS/cm)	2,430.00	581.00
Temperature (°C)	20.30	18.90
Volume Leachant (Litres)	0.263	1.400
Volume of Eluate VE1 (Litres)	0.195	

Solid Results are expressed on a dry weight basis, after correction for moisture content where applicable Stated limits are for guidance only and ALcontrol cannot be held responsible for any discrepancies with current legislation Mcerts Certification does not apply to leachates 28/01/2014 16:29:33

ANC to pH 6 (mol/kg) ANC to pH 4 (mol/kg)

Preliminary

140121-33 Gowran Landfill 5734 SDG: Location: Order Number: 257997 Job: D\_FTIM\_CRK-43 **Customer:** Fehily Timoney Report Number: Client Reference: LW13-112-01 Superseded Report: Attention: Neil Menzies

#### **CEN 10:1 CUMULATIVE TWO STAGE BATCH TEST**

# WAC ANALYTICAL RESULTS REF: BS EN 12457/3 Client Reference Site Location Gowran Landfill

Mass Sample taken (kg) 0.243

Mass of dry sample (kg) 0.175

Particle Size <4mm >95%

Site Location Gowran Landfill
Natural Moisture Content (%) 39

Dry Matter Content (%) 72

Case			Landf	ill Waste Acce	ptance
SDG	140121-33			Criteria Limits	i
Lab Sample Number(s)	8719226				
Sampled Date	20-Jan-2014			Stable Non-reactive	
Customer Sample Ref.	TP10		Inert Waste Landfill	Hazardous	Hazardous Waste Landfill
Depth (m)	0.00 - 0.00		Landilli	Waste in Non- Hazardous	waste Landfill
Solid Waste Analysis				Landfill	
Total Organic Carbon (%)	2.52		3	5	6
Loss on Ignition (%)	-		-	-	-
Sum of BTEX (mg/kg)	0.714		6	-	-
Sum of 7 PCBs (mg/kg)	<0.021		1	-	-
Mineral Oil (mg/kg)	247		500	-	-
PAH Sum of 17 (mg/kg)	<10		100	-	-
pH (pH Units)	7.84	115°E.	-	<6 or >9	-
ANC to pH 6 (mol/kg)	0.0724	diteruse.	-	-	-
ANC to pH 4 (mol/kg)	0.2	A. Aoli	-	-	-

Eluate Analysis	C2 Conc <sup>n</sup> in 2:1	C8 Conc <sup>n</sup> in 8:1	A2 2:1 conce	Cumulative A2-10 conc <sup>n</sup> leached		for compliance lea EN 12457-3 at L/S	
	m	ıg/l	DUIT CHILD mg	/kg	using B3 LN 12437-3 at L/3 10		10 i/ kg
Arsenic	0.0106	0.00451	₹ 0.0212	0.0524	0.5	2	25
Barium	0.052	0.0234	0.104	0.268	20	100	300
Cadmium	0.000227	<0.0001	0.000454	<0.001	0.04	1	5
Chromium	0.0049	0.00187	0.0098	0.0223	0.5	10	70
Copper	0.02	<0.00085	0.0401	0.024	2	50	100
Mercury Dissolved (CVAF)	<0.00001	<0.00001	<0.00002	<0.0001	0.01	0.2	2
Molybdenum	0.13	<b>%</b> .0216	0.261	0.346	0.5	10	30
Nickel	0.0113	<0.00015	0.0225	0.0135	0.4	10	40
Lead	0.001	0.000272	0.002	0.00359	0.5	10	50
Antimony	0.00509	0.00719	0.0102	0.0694	0.06	0.7	5
Selenium	0.00606	0.00148	0.0121	0.0203	0.1	0.5	7
Zinc	0.0166	0.000838	0.0333	0.0273	4	50	200
Chloride	69.6	7.5	139	150	800	15000	25000
Fluoride	<0.5	<0.5	<1	<5	10	150	500
Sulphate (soluble)	54.8	56.8	110	566	1000	20000	50000
Total Dissolved Solids	788	249	1580	3140	4000	60000	100000
Total Monohydric Phenols (W)	<0.016	<0.016	<0.032	<0.16	1	-	-
Dissolved Organic Carbon	72.7	10.5	146	180	500	800	1000

Leach Test Information	2:1	8:1
Date Prepared	22-Jan-2014	22-Jan-2014
pH (pH Units)	8.270	8.118
Conductivity (µS/cm)	970.00	349.00
Temperature (°C)	20.40	19.20
Volume Leachant (Litres)	0.282	1.400
Volume of Eluate VE1 (Litres)	0.210	

Solid Results are expressed on a dry weight basis, after correction for moisture content where applicable
Stated limits are for guidance only and ALcontrol cannot be held responsible for any discrepancies with current legislation
Mcerts Certification does not apply to leachates
28/01/2014 16:29:33

16:29:25 28/01/2014



Preliminary

5734 SDG: 140121-33 Gowran Landfill Location: Order Number: D\_FTIM\_CRK-43 257997 Job: **Customer:** Fehily Timoney Report Number: Client Reference: LW13-112-01 Attention: Neil Menzies Superseded Report:

## Notification of NDPs (No determination possible)

Date Received: 21/01/2014 10:12:30

Sample No	Customer Sample Ref.	Depth (m)	Test	Comment
8719221	TP5	0.00 - 0.00	Loss on Ignition in soils	Unsuitable for analysis due to potential Asbestos
8719226	TP10	0.00 - 0.00	Loss on Ignition in soils	Unsuitable for analysis due to potential Asbestos
8719228	LEACHATE 2	0.00 - 0.00	VOC MS (W)	Insufficient Sample



Preliminary

 SDG:
 140121-33

 Job:
 D\_FTIM\_CRK-43

 Client Reference:
 LW13-112-01

Location:Gowran LandfillCustomer:Fehily TimoneyAttention:Neil Menzies

Order Number: Report Number: Superseded Report:

5734 257997

### **Table of Results - Appendix**

Method No	Reference	Description	Wet/Dry	Surrog
ASB_PREP			Sample <sup>1</sup>	Correct
PM024	Modified BS 1377	Soil preparation including homogenisation, moisture screens of		
-		soils for Asbestos Containing Material		
PM114		Leaching Procedure for CEN Two Stage BatchTest 2:1/8:1		
T14040	DO 1077 D 10 1000	Cumulative		
TM018	BS 1377: Part 3 1990	Determination of Loss on Ignition		
TM045	MEWAM BOD5 2nd Ed.HMSO 1988 / Method	Determination of BOD5 (ATU) Filtered by Oxygen Meter on		
	5210B, AWWA/APHA, 20th Ed., 1999; SCA Blue Book 130	liquids		
TM048	HSG 248, Asbestos: The analysts' guide for	Identification of Asbestos in Bulk Material		
	sampling, analysis and clearance procedures			
TM061	Method for the Determination of	Determination of Extractable Petroleum Hydrocarbons by		
TMOOO	EPH, Massachusetts Dept. of EP, 1998	GC-FID (C10-C40)		
TM089	Modified: US EPA Methods 8020 & 602	Determination of Gasoline Range Hydrocarbons (GRO) and BTEX (MTBE) compounds by Headspace GC-FID (C4-C12)		
TM090	Method 5310, AWWA/APHA, 20th Ed., 1999 /	Determination of Total Organic Carbon/Total Inorganic Carbon		
	Modified: US EPA Method 415.1 & 9060	in Water and Waste Water		
TM099	BS 2690: Part 7:1968 / BS 6068: Part2.11:1984	Determination of Ammonium in Water Samples using the Kone		
TN4404	Mathad 45005 AVARAMA (ADULA COM 51, 4005	Analyser		
TM104	Method 4500F, AWWA/APHA, 20th Ed., 1999	Determination of Fluoride using the Kone Analyser		
TM107	ISO 6060-1989	Determination of Chemical Oxygen Demand using COD Dr Lange Kit		
TM120	Method 2510B, AWWA/APHA, 20th Ed., 1999 /	Determination of Electrical Conductivity using a Conductivity		
	BS 2690: Part 9:1970	Meter		
TM123	BS 2690: Part 121:1981	The Determination of Total Dissolved Solids in Water		
TM132	In - house Method	ELTRA CS800 Operators Guide		
TM133	BS 1377: Part 3 1990;BS 6068-2.5	Determination of pH in Soil and Water using the GLpH pH		
		Meter Analysis of Aqueous Samples by ICP-MS		
TM152	Method 3125B, AWWA/APHA, 20th Ed., 1999	Analysis of Aqueous Samples by ICP-MS		
TM168	EPA Method 8082, Polychlorinated Biphenyls by	Determination WHO12 and EC7 Polychlorinated Biphenyl		
TM176	Gas Chromatography EPA 8270D Semi-Volatile Organic Compounds	Congeners by GC-MS in Soils		
TWITTO	by Gas Chromatography/Mass Spectrometry	Determination of SVOCs in Water by GCMS		
	(GC/MS)	geot wife		
TM178	Modified: US EPA Method 8100	***Operation of Polynuclear Aromatic Hydrocarbons (PAH) by		
	₹ <sup>6</sup>	♦ GC-MS in Waters		
TM182	CEN/TC 292 - WI 292046-chacterization of waste-leaching Behaviour Tests- Acid and Base	O Determination of Acid Neutralisation Capacity (ANC) Using Autotitration in Soils		
	Neutralization Capacity Test	Autouration in Soils		
TM183	BS EN 23506:2002, (BS 6068-2.74:2002) ISBN	Determination of Trace Level Mercury in Waters and Leachates		
	0 580 38924 3	by PSA Cold Vapour Atomic Fluorescence Spectrometry		
TM184	EPA Methods 325.1 & 325.2,	The Determination of Anions in Aqueous Matrices using the		
TN4400	Determination of Astalta Hawkinski	Kone Spectrophotometric Analysers		
TM186	Determination of Acidic Herbicides in Groundwater and Potable Water by LC/MSD	The Determination of Acid Herbicides in Environmental Water Samples and Leachates by LC/MS QQQ.		
	Using Selective Ion Monitoring. Agilent	campios and Ecachates by Echino QQQ.		
	Technologies Inc. Application Note			
	5988-5882EN.			
TM191	Standard Methods for the examination of waters	Determination of Unfiltered Metals in Water Matrices by		
	and wastewaters 16th Edition, ALPHA,	ICP-MS		
TM208	Washington DC, USA. ISBN 0-87553-131-8.  Modified: US EPA Method 8260b & 624	Determination of Volatile Organic Compounds by Headspace /		
250		GC-MS in Waters		
TM213	In-house Method	Rapid Determination of PAHs by GC-FID		
TM227	Standard methods for the examination of waters	Determination of Total Cyanide, Free (Easily Liberatable)		
	and wastewaters 20th Edition, AWWA/APHA	Cyanide and Thiocyanate		
TMOOO	Method 4500.	Determination of Major Cations in Water by iCan 0500 D		
TM228	US EPA Method 6010B	Determination of Major Cations in Water by iCap 6500 Duo ICP-OES		
TM231	Agilent 6890 Gas Chromatograph system using	Determination of Organochlorine and Organophosphorus		
=•.	an Agilent 5973 Mass Selective Detector (MSD)	Pesticides and Triazine Herbicides by GCMS		
TM256	The measurement of Electrical Conductivity and	Determination of pH in Water and Leachate using the GLpH pH		
	the Laboratory determination of pH Value of	Meter		
	Natural, Treated and Wastewaters. HMSO,			
	1978. ISBN 011 751428 4.	Determination of Phenols in Waters and Leachates by HPLC		
TM259	by HPLC			

Applies to Solid samples only. DRY indicates samples have been dried at 35°C. NA = not applicable.

Preliminary

Gowran Landfill 5734 SDG: 140121-33 Location: Order Number: D\_FTIM\_CRK-43 Fehily Timoney 257997 Job: Customer: Report Number: Client Reference: LW13-112-01 Attention: Neil Menzies Superseded Report:

**Test Completion Dates** 

Lab Sample No(s)	8719228	8719221	8719226
Customer Sample Ref.	LEACHATE 2	TP5	TP10
Customer Sample Ref.			
AGS Ref.			
Depth	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00
•			
Туре	LIQUID	SOLID	SOLID
Acid Herbicides (W)	28-Jan-2014		
Ammoniacal Nitrogen	27-Jan-2014		
ANC at pH4 and ANC at pH 6		27-Jan-2014	27-Jan-2014
Anions by Kone (w)	27-Jan-2014	27-Jan-2014	27-Jan-2014
BOD True Total	26-Jan-2014		
CEN 2:1 Leachate (2 Stage)		22-Jan-2014	22-Jan-2014
CEN 2:1 Readings		24-Jan-2014	24-Jan-2014
CEN 8:1 Leachate (2 Stage)		24-Jan-2014	24-Jan-2014
CEN 8:1 Readings		24-Jan-2014	24-Jan-2014
COD Unfiltered	22-Jan-2014		
Conductivity (at 20 deg.C)	24-Jan-2014		
Cyanide Comp/Free/Total/Thiocyanate	28-Jan-2014		
Dissolved Metals by ICP-MS	27-Jan-2014	27-Jan-2014	27-Jan-2014
Dissolved Organic/Inorganic Carbon		27-Jan-2014	27-Jan-2014
Fluoride	27-Jan-2014	27-Jan-2014	27-Jan-2014
GRO by GC-FID (S)		27-Jan-2014	27-Jan-2014
Mercury Dissolved	27-Jan-2014	28-Jan-2014	28-Jan-2014
Metals by iCap-OES Dissolved (W)	24-Jan-2014		
Mineral Oil		28-Jan-2014	28-Jan-2014
OC, OP Pesticides and Triazine Herb	28-Jan-2014		
Organotins in Aqueous Samples	24-Jan-2014		
PAH Spec MS - Aqueous (W)	28-Jan-2014		
PAH Value of soil		28-Jan-2014	28-Jan-2014
PCBs by GCMS		28-Jan-2014	28-Jan-2014
pH		24-Jan-2014	24-Jan-2014
pH Value	24-Jan-2014		
Phenols by HPLC (W)	28-Jan-2014	28-Jan-2014	28-Jan-2014
Sample description		22-Jan-2014	22-Jan-2014
SVOC MS (W) - Aqueous	28-Jan-2014		
Total Dissolved Solids		27-Jan-2014	27-Jan-2014
Total Metals by ICP-MS	28-Jan-2014		2516
Total Organic Carbon		28-Jan-2014	28-Jan-2014
		Conset	27-Jan-2016 28-Jan-2016 28-Jan-2016

# ALcontrol Laboratories

#### PRELIMINARY/INTERIM REPORT

Location: Gowran Landfill SDG 140121-33 Order Number: 5734 D FTIM CRK-43 Fehily Timoney 257997 Job: **Customer:** Report Number: Client Reference: LW13-112-01 Attention: Neil Menzies Superseded Report:

# Appendix General

- 1. Results are expressed on a dry weight basis (dried at  $35^{\circ}$ C) for all soil analyses except for the following: NRA and CEN Leach tests, flash point LOI, pH, ammonium as NH4 by the BRE method, VOC TICS and SVOC TICS.
- 2. Samples will be run in duplicate upon request, but an additional charge may be incurred.
- 3. If sufficient sample is received a sub sample will be retained free of charge for 30 days after analysis is completed (e-mailed) for all sample types unless the sample is destroyed on testing. The prepared soil sub sample that is analysed for asbestos will be retained for a period of 6 months after the analysis date. All bulk samples will be retained for a period of 6 months after the analysis date. All samples received and not scheduled will be disposed of one month after the date of receipt unless we are instructed to the contrary. Once the initial period has expired, a storage charge will be applied for each month or part thereof until the client cancels the request for sample storage. ALcontrol Laboratories reserve the right to charge for samples received and stored but not analysed.
- 4. With respect to turnaround, we will always endeavour to meet client requirements wherever possible, but turnaround times cannot be absolutely guaranteed due to so many variables beyond our control.
- 5. We take responsibility for any test performed by sub-contractors (marked with an asterisk). We endeavour to use UKAS/MCERTS Accredited Laboratories, who either complete a quality questionnaire or are audited by ourselves. For some determinands there are no UKAS/MCERTS Accredited Laboratories, in this instance a laboratory with a known track record will be utilised.
- 6. When requested, the individual sub sample scheduled will be analysed in house for the presence of asbestos fibres and asbestos containing material by our documented in house method TM048 based on HSG 248 (2005), which is accredited to ISO17025. If a specific asbestos fibre type is not found this will be reported as "Not detected". If no asbestos fibre types are found all will be reported as "Not detected" and the sub sample analysed deemed to be clear of asbestos. If an asbestos fibre type is found it will be reported as detected (for each fibre type found). Testing can be carried out on asbestos positive samples, but, due to Health and Safety considerations, may be replaced by alternative tests or reported as No Determination Possible. The quantity of asbestos present is not determined unless specifically requested.
- 7. If no separate volatile sample is supplied by the client, or if a headspace or sediment is present in the volatile sample, the integrity of the data may be compromised. This will be flagged up as an invalid VOC on the test schedule and the result marked as deviating on the test certificate.
- 8. If appropriate preserved bottles are not received preservation will take place on receipt. However, the integrity of the data may be compromised.
- $9.\ \mbox{NDP}$  -No determination possible due to insufficient/unsuitable sample
- 10. Metals in water are performed on a filtered sample, and therefore represent dissolved metals -total metals must be requested separately.
- 11. Results relate only to the items tested.
- 12. LODs for wet tests reported on a dry weight basis are not corrected for moisture content.
- 13. **Surrogate recoveries** -Most of our organic methods include surrogates, the recovery of which is monitored and reported. For EPH, MO, PAH, GRO and VOCs on soils the result is not surrogate corrected, but a percentage recovery is quoted. Acceptable limits for most organic methods are 70 -130 %.
- 14. Product analyses -Organic analyses on products can only be semi-quantitative due to the matrix effects and high dilution factors employed.
- 15. Phenols monohydric by HPLC include phenol, cresols (2-Methylphenol, 3-Methylphenol and 4-Methylphenol) and Xylenols (2,3 Dimethylphenol, 2,4 Dimethylphenol, 2,5 Dimethylphenol, 2,6 Dimethylphenol, 3,4 Dimethylphenol, 3,5 Dimethylphenol).
- 16. Total of 5 speciated phenols by HPLC includes Phenol, 2,3,5-Trimethyl Phenol, 2-Isopropylphenol, Cresols and Xylenols (as detailed in 15).
- 17. Stones/debris are not routinely removed. We always endeavour to take a representative sub sample from the received sample.
- 18. In certain circumstances the method detection limit may be elevated due to the sample being outside the calibration range. Other factors that may contribute to this include possible interferences. In both cases the sample would be diluted which would cause the method detection limit to be raised.
- 19. Mercury results quoted on soils will not include volatile mercury as the analysis is performed on a dried and crushed sample.

- 20. For the BSEN 12457-3 two batch process to allow the cumulative release to be calculated, the volume of the leachate produced is measured and filtered for all tests. We therefore cannot carry out any unfiltered analysis. The tests affected include volatiles GCFID/GCMS and all subcontracted analysis.
- 21. For all leachate preparations (NRA, DIN, TCLP, BSEN 12457-1, 2, 3) volatile loss may occur, as we do not employ zero headspace extraction.
- 22. We are accredited to MCERTS for sand, clay and loam/topsoil, or any of these materials whether these are derived from naturally occurring soil profiles, or from fill/made ground, as long as these materials constitute the major part of the sample. Other coarse granular material such as concrete, gravel and brick are not accredited if they comprise the major part of the sample.
- 23. Analysis and identification of specific compounds using GCFID is by retention time only, and we routinely calibrate and quantify for benzene, toluene, ethylbenzenes and xylenes (BTEX). For total volatiles in the C5-C12 range, the total area of the chromatogram is integrated and expressed as ug/kg or ug/l. Although this analysis is commonly used for the quantification of gasoline range organics (GRO), the system will also detect other compounds such as chlorinated solvents, and this may lead to a falsely high result with respect to hydrocarbons only. It is not possible to specifically identify these non-hydrocarbons, as standards are not routinely run for any other compounds, and for more definitive identification, volatiles by GCMS should be utilised.

### Sample Deviations

	XY.
1	Container with Headspace provided for volatiles analysis
2	Incorrect container received
3	Deviation from method
4	Holding time exceeded before sample received
<b>§</b> 55	Sampled on date not provided
200°. 30	Sample holding time exceeded in laboratory
(%)	Sample holding time exceeded due to sampled on date
<b>*</b> &	Sample Holding Time exceeded - Late arrival of instructions.

#### **Asbestos**

Identification of Asbestos in Bulk Materials & Soils

The results for identification of asbestos in bulk materials are obtained from supplied bulk materials which have been examined to determine the presence of asbestos fibres using Alcontrol Laboratories (Hawarden) in-house method of transmitted/polarised light microscopy and central stop dispersion staining, based on HSG 248 (2005).

The results for identification of asbestos in soils are obtained from a homogenised sub sample which has been examined to determine the presence of asbestos fibres using Alcontrol Laboratories (Hawarden) in-house method of transmitted/polarised light microscopy and central stop dispersion staining, based on HSG 248 (2005).

Asbestos Type	Common Name
Chrysofile	White Asbestos
Amoste	Brown Asbestos
Orodobite	Blue Asbestos
Fibrous Adinoite	=
Florous Anthophylite	=
Fibrous Trendile	-

#### Visual Estimation Of Fibre Content

Estimation of fibre content is not permitted as part of our UKAS accredited test other than:

Trace -Where only one or two asbestos fibres were identified.

Further guidance on typical asbestos fibre content of manufactured products can be found in HSG 264.

The identification of asbestos containing materials and soils falls within our schedule of tests for which we hold UKAS accreditation, however opinions, interpretations and all other information contained in the report are outside the scope of UKAS accreditation.

Unit 7-8 Hawarden Business Park Manor Road (off Manor Lane) Hawarden

Deeside CH5 3US Tel: (01244) 528700

Fax: (01244) 528701 email: mkt@alcontrol.com Website: www.alcontrol.com

Fehily Timoney 3rd Floor North Park Offices North Park Business Park North Road Dublin Dublin 11

Attention: Neil Menzies

#### **CERTIFICATE OF ANALYSIS**

 Date:
 01 April 2014

 Customer:
 D\_FTIM\_DUB

 Sample Delivery Group (SDG):
 140320-70

 Your Reference:
 LW13-112-01

Location: Tier II Assesment, Gowran, Co. Kilkenny

**Report No:** 265147

This report has been revised and directly supersedes 264487 in its entirety.

We received 5 samples on Wednesday March 19, 2014 and 5 of these samples were scheduled for analysis which was completed on Wednesday March 26, 2014. Accredited laboratory tests are defined within the report, but opinions, interpretations and on-site data expressed herein are outside the scope of ISO 17025 accreditation.

Should this report require incorporation into client reports it must be used in its entirety and not simply with the data sections alone.

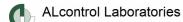
All chemical testing (unless subcontracted) is performed at ALcontrol Hawarden Laboratories.

Approved By:

Sonia McWhan
Operations Manager







Validated

SDG: 140320-70 Location: Tier II Assesment, Gowran, Co. Kilkenny Order Number: 5776 D\_FTIM\_DUB-116 265147 Job: **Customer:** Fehily Timoney Report Number: Client Reference: LW13-112-01 Attention: Neil Menzies Superseded Report: 264487

### **Received Sample Overview**

Lab Sample No(s)	Customer Sample Ref.	AGS Ref.	Depth (m)	Sampled Date
9010354	BH1			19/03/2014
9010359	BH2			19/03/2014
9010362	Farm			19/03/2014
9010367	Housing Estate			19/03/2014
9010364	Nursing Home			19/03/2014

Only received samples which have had analysis scheduled will be shown on the following pages.



Validated

SDG:140320-70Location:Tier II Assesment, Gowran, Co. KilkennyOrder Number:5776Job:D\_FTIM\_DUB-116Customer:Fehily TimoneyReport Number:265147Client Reference:LW13-112-01Attention:Neil MenziesSuperseded Report:264487

Client Reference: LW13-112-0	1 Atter	ntion		Neil M	enzies	3				
LIQUID Results Legend X Test	Lab Sample No(s)		9010354	9010359	9010362	9010367	9010364			
No Determination Possible	Customer Sample Reference		BH1	BH2	Farm	Housing Estate	Nursing Home			
	AGS Reference									
	Depth (m)									
	Container		H2SO4 (ALE244) 1lplastic (ALE221)	H2SO4 (ALE244) 1lplastic (ALE221)	H2SO4 (ALE244) 1lplastic (ALE221)		H2SO4 (ALE244) 1lplastic (ALE221)			
Ammoniacal Nitrogen	All NDPs Tests		X	x	×	×	×	es only is	4	15°
Anions by Kone (w)	All NDPs Tests		X	x	x	x	X	cotily of	ny othe	,
BOD True Total	All NDPs Tests		×	X	×	X	X ec	itiedie		
Conductivity (at 20 deg.C)	All NDPs Tests		×	X	X SS	X Optil	X S			
Metals by iCap-OES Dissolved (W)	All NDPs Tests		X, C	X X	×	×	X			
pH Value	All NDPs Tests	s: 0 or s	x x	x	×	×	×			

Validated

SDG: 140320-70 Location: Tier II Assesment, Gowran, Co. Kilkenny Order Number: 5776 Job: D\_FTIM\_DUB-116 Fehily Timoney 265147 **Customer:** Report Number: Client Reference: LW13-112-01 Attention: Neil Menzies Superseded Report: 264487

Results Legend # ISO17025 accredited.		Customer Sample Ref.	BH1	BH2	Farm	Housing Estate	Nursing Home	
M mCERTS accredited.								
aq Aqueous / settled sample. diss.filt Dissolved / filtered sample.		Depth (m)						
tot.unfilt Total / unfiltered sample.  * Subcontracted test.		Sample Type Date Sampled	Water(GW/SW) 19/03/2014	Water(GW/SW) 19/03/2014	Water(GW/SW) 19/03/2014	Water(GW/SW) 19/03/2014	Water(GW/SW) 19/03/2014	
** % recovery of the surrogate standa		Sample Time	19/03/2014	19/03/2014	19/03/2014	19/03/2014	19/03/2014	
check the efficiency of the method. results of individual compounds wi		Date Received	19/03/2014	19/03/2014	19/03/2014	19/03/2014	19/03/2014	
samples aren't corrected for the red		SDG Ref Lab Sample No.(s)	140320-70 9010354	140320-70 9010359	140320-70 9010362	140320-70 9010367	140320-70 9010364	
(F) Trigger breach confirmed 1-5&+§@ Sample deviation (see appendix)		AGS Reference						
Component	LOD/Units							
BOD, unfiltered	<1 mg/l	TM045	<1	<1	<1	<1	<1	
			#	#	#	#	#	
Ammoniacal Nitrogen as NH3	<0.2 mg/l	TM099	<0.2	<0.2	3.78	<0.2	<0.2	
			#	#	#	#	#	
Conductivity @ 20 deg.C	<0.005	TM120	0.965	0.696	0.806	0.621	0.643	
	mS/cm		#	#	#	#	#	
Sulphate	<2 mg/l	TM184	115	22.9	18.1	36.8	11.5	
			#	#	#	#	#	
Chloride	<2 mg/l	TM184	11.7	28.9	50.3	17.9	21.6	
			#	#	#	#	#	
Sodium (diss.filt)	<0.076 mg	g/I TM228	9.54	13.2	19.7	9.23	10.8	
D. ( ) ( ) ( ) ( )			#	#	#	#	#	
Potassium (diss.filt)	<1 mg/l	TM228	<1	7.48	25.9	3.34	<1	
			#	#	#	#	#	
рH	<1 pH Uni	ts TM256	7.42	7.38	7.79	7.89	7.48	
			#	#	#	#	#	
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Validated

SDG: 140320-70 Location: Tier II Assesment, Gowran, Co. Kilkenny Order Number: 5776 D\_FTIM\_DUB-116 265147 Job: **Customer:** Fehily Timoney Report Number: Client Reference: LW13-112-01 Attention: Neil Menzies Superseded Report: 264487

**Table of Results - Appendix** 

Method No	Reference	Description	Wet/Dry Sample <sup>1</sup>	Surrogate Corrected
TM045	MEWAM BOD5 2nd Ed.HMSO 1988 / Method 5210B, AWWA/APHA, 20th Ed., 1999; SCA Blue Book 130	Determination of BOD5 (ATU) Filtered by Oxygen Meter on liquids		
TM099	BS 2690: Part 7:1968 / BS 6068: Part2.11:1984	Determination of Ammonium in Water Samples using the Kone Analyser		
TM120	Method 2510B, AWWA/APHA, 20th Ed., 1999 / BS 2690: Part 9:1970	Determination of Electrical Conductivity using a Conductivity Meter		
TM184	EPA Methods 325.1 & 325.2,	The Determination of Anions in Aqueous Matrices using the Kone Spectrophotometric Analysers		
TM228	US EPA Method 6010B	Determination of Major Cations in Water by iCap 6500 Duo ICP-OES		
TM256	The measurement of Electrical Conductivity and the Laboratory determination of pH Value of Natural, Treated and Wastewaters. HMSO, 1978. ISBN 011 751428 4.	Determination of pH in Water and Leachate using the GLpH pH Meter		

Applies to Solid samples only. DRY indicates samples have been dried at 35°C. NA = not applicable.

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Validated

SDG: 140320-70 Location: Tier II Assesment, Gowran, Co. Kilkenny Order Number: 5776 D\_FTIM\_DUB-116 Fehily Timoney 265147 Job: **Customer: Report Number:** Client Reference: LW13-112-01 Attention: Neil Menzies Superseded Report: 264487

### **Test Completion Dates**

				p. 0 t. 0 .	
Lab Sample No(s)	9010354	9010359	9010362	9010367	9010364
Customer Sample Ref.	BH1	BH2	Farm	Housing Estate	Nursing Home
AGS Ref.					
Depth					
Туре	LIQUID	LIQUID	LIQUID	LIQUID	LIQUID
Ammoniacal Nitrogen	24-Mar-2014	24-Mar-2014	24-Mar-2014	24-Mar-2014	24-Mar-2014
Anions by Kone (w)	26-Mar-2014	25-Mar-2014	25-Mar-2014	25-Mar-2014	25-Mar-2014
BOD True Total	26-Mar-2014	26-Mar-2014	26-Mar-2014	26-Mar-2014	26-Mar-2014
Conductivity (at 20 deg.C)	24-Mar-2014	24-Mar-2014	24-Mar-2014	24-Mar-2014	24-Mar-2014
Metals by iCap-OES Dissolved (W)	26-Mar-2014	26-Mar-2014	26-Mar-2014	26-Mar-2014	26-Mar-2014
pH Value	21-Mar-2014	21-Mar-2014	24-Mar-2014	24-Mar-2014	21-Mar-2014



### **ALcontrol Laboratories**

#### **CERTIFICATE OF ANALYSIS**

SDG: 140320-70 Location: Tier II Assesment, Gowran, Co. Kilkenny Order Number: 5776 D FTIM DUB-116 Fehily Timoney 265147 Job: **Customer:** Report Number: Client Reference: LW13-112-01 Attention: Neil Menzies Superseded Report: 264487

### **Appendix** General

- 1. Results are expressed on a dry weight basis (dried at 35°C) for all soil analyses except for the following: NRA and CEN Leach tests, flash point LOI, pH, ammonium as NH4 by the BRE method, VOC TICS and SVOC TICS.
- 2. Samples will be run in duplicate upon request, but an additional charge may be incurred.
- 3. If sufficient sample is received a sub sample will be retained free of charge for 30 days after analysis is completed (e-mailed) for all sample types unless the sample is destroyed on testing. The prepared soil sub sample that is analysed for asbestos will be retained for a period of 6 months after the analysis date. All bulk samples will be retained for a period of 6 months after the analysis date. All samples received and not scheduled will be disposed of one month after the date of receipt unless we are instructed to the contrary. Once the initial period has expired, a storage charge will be applied for each month or part thereof until the client cancels the request for sample storage. ALcontrol Laboratories reserve the right to charge for samples received and stored but not analysed.
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- 8. If appropriate preserved bottles are not received preservation will take place of receipt However, the integrity of the data may be compromised.

  9. NDP No determination possible due to incufficient formulation to the place of the provided by the place of the pl
- 9. NDP -No determination possible due to insufficient/unsuitable sample
- 10. Metals in water are performed on a filtered sample, and therefore represent dissolved metals -total metals must be requested separately.
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- 14. Product analyses -Organic analyses on products can only be semi-quantitative due to the matrix effects and high dilution factors employed
- 15. Phenols monohydric by HPLC include phenol, cresols (2-Methylphenol, 3-Methylphenol 4-Methylphenol) and Xylenols (2,3 Dimethylphenol, 2,4 Dimethylphenol. Dimethylphenol, 2,6 Dimethylphenol, 3,4 Dimethylphenol, 3,5 Dimethylphenol).
- 16. Total of 5 speciated phenols by HPLC includes Phenol, 2,3,5-Trimethyl Phenol, 2-Isopropylphenol, Cresols and Xylenols (as detailed in 15).
- 17. Stones/debris are not routinely removed. We always endeavour to take a representative sub sample from the received sample.
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- 19. Mercury results quoted on soils will not include volatile mercury as the analysis is performed on a dried and crushed sample.

- 20. For the BSEN 12457-3 two batch process to allow the cumulative release to be calculated, the volume of the leachate produced is measured and filtered for all tests. We therefore cannot carry out any unfiltered analysis. The tests affected include volatiles GCFID/GCMS and all subcontracted analysis.
- 21. For all leachate preparations (NRA, DIN, TCLP, BSEN 12457-1, 2, 3) volatile loss may occur, as we do not employ zero headspace extraction.
- 22. We are accredited to MCERTS for sand, clay and loam/topsoil, or any of these materials - whether these are derived from naturally occurring soil profiles, or from fill/made ground, as long as these materials constitute the major part of the sample. Other coarse granular material such as concrete, gravel and brick are not accredited if they comprise the major part of the sample.
- 23. Analysis and identification of specific compounds using GCFID is by retention time only, and we routinely calibrate and quantify for benzene, toluene, ethylbenzenes and xylenes (BTEX). For total volatiles in the C5 -C12 range, the total area of the chromatogram is integrated and expressed as ug/kg or ug/l. Although this analysis is commonly used for the quantification of gasoline range organics (GRO), the system will also detect other compounds such as chlorinated solvents, and this may lead to a falsely high result with respect to hydrocarbons only. It is not possible to specifically identify these non-hydrocarbons, as standards are not routinely run for any other compounds, and for more definitive identification, volatiles by GCMS should be utilised.

#### Sample Deviations

		<u> </u>
1		Container with Headspace provided for volatiles analysis
2	2	Incorrect container received
3	3	Deviation from method
4		Holding time exceeded before sample received
į	ಶ್ರ	Samples exceeded holding time before presevation was performed
0		Sampled on date not provided
1	7	Sample holding time exceeded in laboratory
Zee C	0	Sample holding time exceeded due to sampled on date
8		Sample Holding Time exceeded - Late arrival of instructions.

#### Asbestos

Identification of Asbestos in Bulk Materials & Soils

The results for identification of asbestos in bulk materials are obtained from supplied bulk materials which have been examined to determine the presence of asbestos fibres using Alcontrol Laboratories (Hawarden) in-house method of transmitted/polarised microscopy and central stop dispersion staining, based on HSG 248 (2005).

The results for identification of ashestos in soils are obtained from a homogenised subsample which has been examined to determine the presence of asbestos fibres using Alcontrol Laboratories (Hawarden) in-house method transmitted/polarised microscopy and central stop dispersion staining, based on HSG 248 (2005).

Asbe stos Type	Common Name
Chrysof le	White Asbestos
Amosite	Brown Asbestos
Cro a dolite	Blue Asbe stos
Fibrous Act nolite	-
Fib to us Anthop hyll ite	-
Fibrous Tremol ite	-

#### Visual Estimation Of Fibre Content

Estimation of fibre content is not permitted as part of our UKAS accredited test other than:

Trace -Where only one or two asbestos fibres were identified.

Further guidance on typical asbestos fibre content of manufactured products can be found in HSG 264.

The identification of asbestos containing materials and soils falls within our schedule of tests for which we hold UKAS accreditation, however opinions, interpretations and all other information contained in the report are outside the scope of UKAS accreditation.

# **Appendix V**

## Tier 1 Assessment

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### TIER 1 RISK ASSESSMENT

### For

Historical Landfill, Gowran, Kilkenny.

Class B – Medium Risk Site

Prepared in accordance with the EPA's Code of Practice for Environmental Risk Assessment for Unregulated Waste Disposal Sites.

Prepared by: Michael Nugent Environment Section Kilkenny County Council

07/11/2013 (rev.3)

#### **Contents**

- Page 1 : Summary
- Page 2 5 : Photographs of site
- Page 6 : Conceptual model
- Page 7 8 : Walkover survey checklist
- Page 9 : Aquifer Map
- Page 10 : Subsoil map
- Page 11: Groundwater vulnerability map
- Page 12 : Height contour map
- Page 13: Network Diagram for Leachate Migration through combined groundwater and surface water pathways
- Page 14: Network Diagram for Leachare Migration through groundwater pathways
- Page 15: Network Diagram for Leachate Migration through surface water pathways
- Page 16: Network Diagram for Landfill Gas Migration (Lateral and Vertical)
- Page 17 19 : Risk Scoring Matrices
- Page 20 21 : Risk Screening

#### **SUMMARY**

#### Introduction

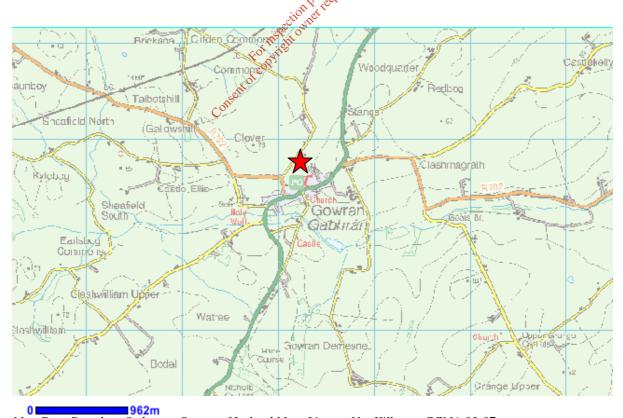
Gowran landfill is located at Gowran, Co. Kilkenny at coordinates X: 263207, Y: 153721. The site was used by Kilkenny County Council for the disposal of municipal waste. The site originally consisted of an old quarry. The council filled the pit and covered the site with soil. The site is owned by Kilkenny County Council.

#### Walkover

The site is currently in use as a storage yard by the Council. The surrounding area is used for residential and agricultural purposes. The site is approximately 0.09 hectares in area. The land falls in a south westerly direction. There is a new housing estate to the east of the site, the closest house being approximately 17m from the site. There is a well approximately 150m SW of the site. There are no surface water features in the vicinity of the site. There are no visible sources of contamination. There are no visible signs of impact to the environment.

#### **Desk study**

The closest surface water feature is a river 524m south of the site. There is a public water supply 2.57Km North West of the site. The aquifer is classified as extremely vulnerable. The aquifer is regionally important and karstified. The subsoil is mainly derived from sandstone and shale tills.



Map Data Based on Ordnance Survey of Ireland Map, License No. Kilkenny CCMA 03-07

### **PHOTOGRAPHS**





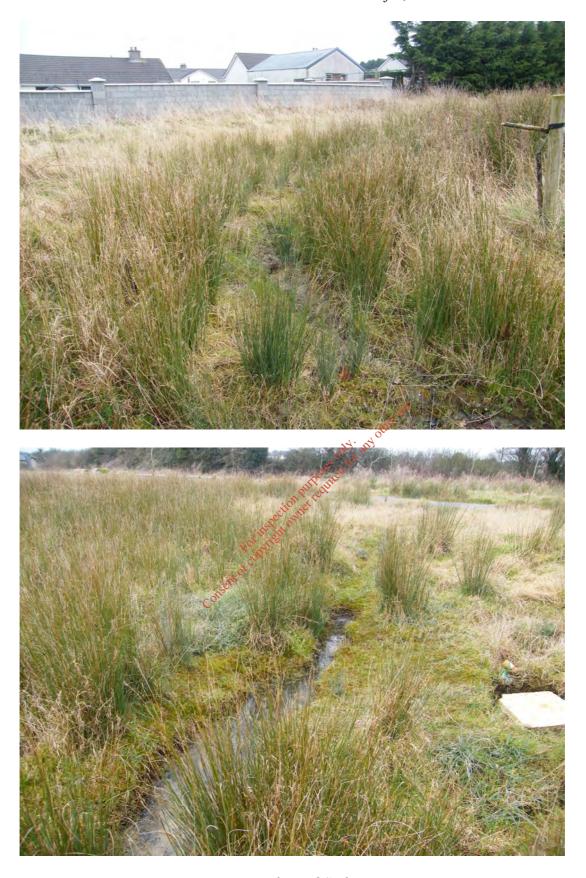
Tier 1 Risk Assessment – Historical Landfill, Gowran





Site outlined in red.

Tier 1 Risk Assessment – Historical Landfill, Gowran



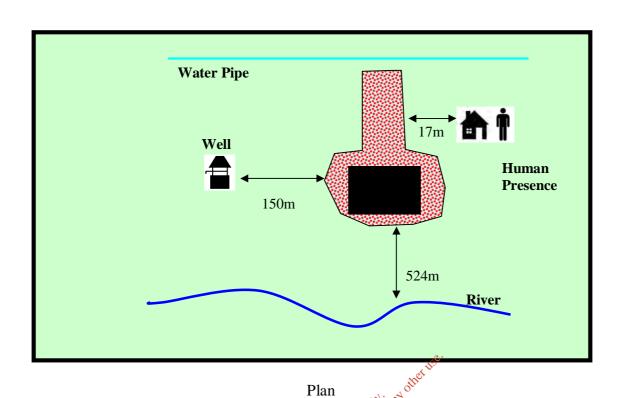
Waterlogged Soil

Tier 1 Risk Assessment – Historical Landfill, Gowran



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#### **CONCEPTUAL MODEL**



Well

River

Waste

Body

P1

Presence

Waste

Body

P2

Subsoil

P2

Rock

Rock

Rock

**Cross Section** 

- P1 Landfill Gas
- P2 Leachate Migration unsaturated zone
- P3 Leachate Migration saturated zone
- P4 Landfill Gas Migration.

### WALKOVER SURVEY CHECKLIST

1. What is current Land Use?  2. What are the neighbouring Land Uses?  3. What is the size of the site?  4. What is the topography?  5. Are there potential receptors (if yes, give details)?  • Houses  • Surface water features (if yes, distance and direction of flow)  • Any wetland or protected areas  • Public Water Supplies  • Private Wells  • Services  • Other buildings  • Other  • Other  • Surface water (if yes, what type?)  • Surface water (if yes, what type?)  • Surface water (if yes, what type?)  • No  • Leachate seepage  • Landfill gas odours  7. Are there any outfalls to surface water? (if yes, are there discharges) and what is the nature of the discharge?  8. Are there any signs of impact on the environment? (If yes, take photographic evidence)  • Vegetation die off, bare ground  • Leachate seepage  • Voo  • Leachate seepage  • Vegetation die off, bare ground  • Leachate seepage  • Vegetation die off, bare ground  • Leachate seepage  • Vegetation die off, bare ground  • Leachate seepage  • Voo  • Vegetation die off, bare ground  • Leachate seepage  • No  • Odours	Information	Checked	<b>Comment</b> (include distances from site boundary)
Land Uses?  3. What is the size of the site?  4. What is the topography?  5. Are there potential receptors (if yes, give details)?  • Houses  • Surface water features (if yes, distance and direction of flow)  • Any wetland or protected areas  • Public Water Supplies  • Private Wells  • Private Wells  • Other buildings  • Other  6. Are there any potential sources of contamination (if yes, give details)?  • Surface waste (if yes, what type?)  • Surface waste (if yes, what type?)  • Leachate seepage  • Landfill gas odours  7. Are there any outfalls to surface water? (If yes, are there discharges and what is the nature of the discharge?)  8. Are there any signs of impact on the environment? (If yes, take photographic evidence)  • Vegetation die off, bare ground  • Leachate seepages  • Odours  7. No  8. Are there any signs of impact on the environment? (If yes, take photographic evidence)  • Vegetation die off, bare ground  • Leachate seepages  • Odours	1. What is current Land Use?	✓	• *
4. What is the topography?  4. What is the topography?  5. Are there potential receptors (if yes, give details)?  • Houses  • Surface water features (if yes, distance and direction of flow)  • Any wetland or protected areas  • Public Water Supplies  • Private Wells  • Services  • Other buildings  • Other  6. Are there any potential sources of contamination (if yes, give details)?  • Surface waste (if yes, what type?)  • Surface ponding of leachate  • Leachate seepage  • Landfill gas odours  7. Are there any soutfalls to surface water? (if yes, are there discharges and what is the nature of the discharge?)  8. Are there any signs of impact on the environment? (If yes, take photographic evidence)  • Vegetation die off, bare ground  • Leachate seepage  • Vodours  7. No  • Leachate seepage  • Vegetation die off, bare ground  • Leachate seepages  • No  • Leachate seepage  • Vodours  • Ves – some patches of bare ground. See Photo.  • Odours	2. What are the neighbouring Land Uses?	<b>✓</b>	Residential/agricultural
5. Are there potential receptors (if yes, give details)?  • Houses  • Surface water features (if yes, distance and direction of flow)  • Any wetland or protected areas  • Public Water Supplies  • Private Wells  • Services  • Other buildings  • Other  • Other   • Surface waste (if yes, what type?)  • Surface ponding of leachate  • Leachate seepage  • Landfill gas odours  7. Are there any signs of impact on the environment? (If yes, take photographic evidence)  • Vegetation die off, bare ground  • Leachate seepages  • Odours  • Vegetation die off, bare ground  • Cachate seepages  • Odours  • Odours  • Vegetation die off, bare ground  • Odours  • Odours  • Variace vater of site  River 524m south of site  None	3. What is the size of the site?	<b>✓</b>	0.087ha
yes, give details)?  • Houses  • Surface water features (if yes, distance and direction of flow)  • Any wetland or protected areas  • Public Water Supplies  • Private Wells  • Services  • Other buildings  • Other  • Other water (if yes, what type?)  • Surface wate (if yes, what type?)  • Surface ponding of leachate  • Leachate seepage  • Landfill gas odours  7. Are there any outfalls to surface water? (If yes, are there discharges and what is the nature of the discharge?)  8. Are there any signs of impact on the environment? (If yes, take photographic evidence)  • Vegetation die off, bare ground  • Leachate seepages  • Odours  7. No  17m east of site  River 524m south of site  None  2572m north-west of site  150m  Water pipe north of site  Residential  **V  **No (some fly-tipped waste not associated with landfill)  **No (some fly-tipped waste not associated with landfill)  **No  **	<b>4</b> . What is the topography?	<b>√</b>	Gentle slope to south west
Surface water features (if yes, distance and direction of flow)  Any wetland or protected areas Public Water Supplies Private Wells Private Wells Services Other buildings Other  Surface waste (if yes, what type?)  Surface ponding of leachate Leachate seepage Landfill gas odours  No  No  No  No  No  No  No  No  No  N	5. Are there potential receptors (if yes, give details)?		
distance and direction of flow)  Any wetland or protected areas Public Water Supplies Private Wells Services Other buildings Other  Other  Surface awaste (if yes, what type?) Surface ponding of leachate Leachate seepage Landfill gas odours  No  No  No  No  No  No  No  No  No  N	• Houses	✓	
Public Water Supplies Public Water Supplies Private Wells Services Other buildings Other  Other  Character any potential sources of contamination (if yes, give details)? Surface waste (if yes, what type?) Surface ponding of leachate Leachate seepage Landfill gas odours  No  Are there any outfalls to surface water? (If yes, are there discharges and what is the nature of the discharge?)  Are there any signs of impact on the environment? (If yes, take photographic evidence) Vegetation die off, bare ground Leachate seepages Vegetation die off, bare ground Vegetation die off, bare ground Leachate seepages Vegetation die off, bare ground			River 524m south of site
Private Wells Private Wells Services Other buildings Other  Other  Other  Other  Other  No (some fly-tipped waste not associated with landfill)  Surface waste (if yes, what type?) Surface ponding of leachate Leachate seepage Landfill gas odours  No  No  No  No  No  No  No  No  No  N	Any wetland or protected areas		
<ul> <li>Services</li> <li>Other buildings</li> <li>Other</li> <li>Other</li> <li>Are there any potential sources of contamination (if yes, give details)?</li> <li>Surface waste (if yes, what type?)</li> <li>Surface ponding of leachate</li> <li>Leachate seepage</li> <li>Landfill gas odours</li> <li>No</li> <li>No</li> <li>Are there any outfalls to surface water? (If yes, are there discharges and what is the nature of the discharge?)</li> <li>Are there any signs of impact on the environment? (If yes, take photographic evidence)</li> <li>Vegetation die off, bare ground</li> <li>Leachate seepages</li> <li>No</li> <li>Yes – some patches of bare ground. See Photo.</li> <li>No</li> <li>Leachate seepages</li> <li>No</li> </ul>	<ul> <li>Public Water Supplies</li> </ul>	· .	
Other buildings Other Other Other  Other  Other  Other  Other  No (some fly-tipped waste not associated with landfill)  Surface waste (if yes, what type?)  Surface ponding of leachate  Leachate seepage  Landfill gas odours  No  Landfill gas odours  No  No  No  No  No  No  No  No  No  N	Private Wells		ey .
Other  O	• Services	·	
6. Are there any potential sources of contamination (if yes, give details)?  • Surface waste (if yes, what type?)  • Surface ponding of leachate  • Leachate seepage  • Landfill gas odours  7. Are there any outfalls to surface water? (If yes, are there discharges and what is the nature of the discharge?)  8. Are there any signs of impact on the environment? (If yes, take photographic evidence)  • Vegetation die off, bare ground  • Leachate seepages  • Odours  Vois (some fly-tipped waste not associated with landfill)  No  No  No  No  No  No  Yes – some patches of bare ground. See Photo.  No  No	Other buildings	<b>√</b>	, vo
type?)  Surface waste (if yes, what type?)  Leachate seepage  Landfill gas odours  No  Leachate seepage  Landfill gas odours  No  No  No  No  No  No  No  No  No  N	Other	√ gose	n/a
<ul> <li>Surface ponding of leachate</li> <li>Leachate seepage</li> <li>Landfill gas odours</li> <li>No</li> <li>No</li> <li>No</li> <li>No</li> <li>Are there any outfalls to surface water? (If yes, are there discharges and what is the nature of the discharge?)</li> <li>Are there any signs of impact on the environment? (If yes, take photographic evidence)</li> <li>Vegetation die off, bare ground</li> <li>Leachate seepages</li> <li>Odours</li> <li>No</li> <li>No</li> <li>Yes – some patches of bare ground. See Photo.</li> <li>No</li> <li>No</li> </ul>	Surface waste (if yes, what	Pright onto	¥ 11
<ul> <li>Leachate seepage</li> <li>Landfill gas odours</li> <li>No</li> <li>No</li> <li>No</li> <li>No</li> <li>Are there any outfalls to surface water? (If yes, are there discharges and what is the nature of the discharge?)</li> <li>Are there any signs of impact on the environment? (If yes, take photographic evidence)</li> <li>Vegetation die off, bare ground</li> <li>Leachate seepages</li> <li>Odours</li> <li>No</li> </ul>			,
<ul> <li>Landfill gas odours</li> <li>✓ No</li> <li>7. Are there any outfalls to surface water? (If yes, are there discharges and what is the nature of the discharge?)</li> <li>8. Are there any signs of impact on the environment? (If yes, take photographic evidence)</li> <li>✓ Vegetation die off, bare ground</li> <li>✓ Leachate seepages</li> <li>✓ Odours</li> <li>✓ No</li> </ul>		<b>v</b>	
7. Are there any outfalls to surface water? (If yes, are there discharges and what is the nature of the discharge?)  8. Are there any signs of impact on the environment? (If yes, take photographic evidence)  • Vegetation die off, bare ground  • Leachate seepages  • Odours  No  No  No  No  No  No  No  No  No  N	1 0	<b>v</b>	
surface water? (If yes, are there discharges and what is the nature of the discharge?)  8. Are there any signs of impact on the environment? (If yes, take photographic evidence)  • Vegetation die off, bare ground  • Leachate seepages  • Odours	Landill gas odours	•	NO
impact on the environment?  (If yes, take photographic evidence)   • Vegetation die off, bare ground  • Leachate seepages  • Odours   Ves − some patches of bare ground. See Photo.  No  No	there discharges and what is the nature of the	<b>√</b>	No
ground Photo.  • Leachate seepages ✓ No  • Odours ✓ No	(If yes, take photographic	<b>✓</b>	No
<ul> <li>Leachate seepages</li> <li>✓ No</li> <li>Odours</li> <li>✓ No</li> </ul>		✓	_
• Odours ✓ No		✓	No
• Litter ✓ Yes – not associated with landfill		✓	No
	• Litter	✓	Yes – not associated with landfill

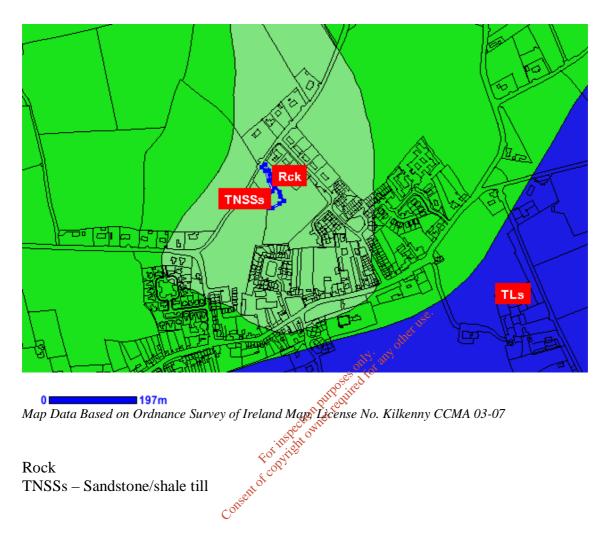
Information	Checked	Comment (include distances from site boundary)
Gas bubbling through water	<b>√</b>	No
Signs of settlement,     subsidence, water     logged areas	<b>√</b>	No
Drainage or hydraulic issues	<b>√</b>	Some waterlogged soil on site – most likely due to capping material. See Photo.
Downstream water quality appears poorer than upstream water quality	<b>√</b>	Not tested
9. Are there any indications of remedial measures? (Provide details)	<b>✓</b>	
Capping	✓	Capped with soil.
Landfill gas collection	✓	No
Leachate collection	✓	No Se.
10. Describe fences and security features (if any)	✓	Fence present – not adequate.
Any other relevant information?	on Pure ledin	

### **AQUIFER**



Map Data Based on Ordnance Survey of Ireland Map License No. Kilkenny CCMA 03-07 Aquifer type – Rkd – Regionally important karstified aquifer.

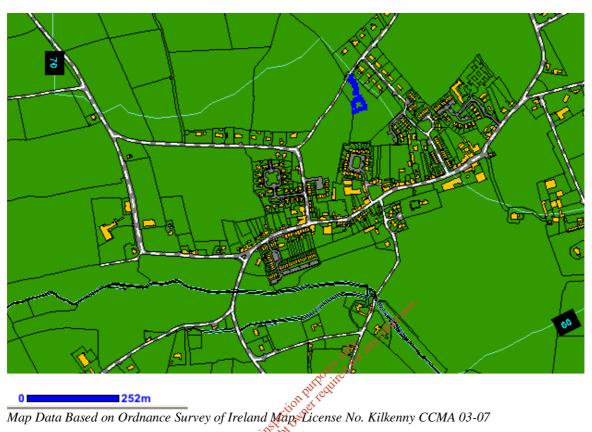
### **SUBSOIL**



### **GROUNDWATER VULNERABILITY**

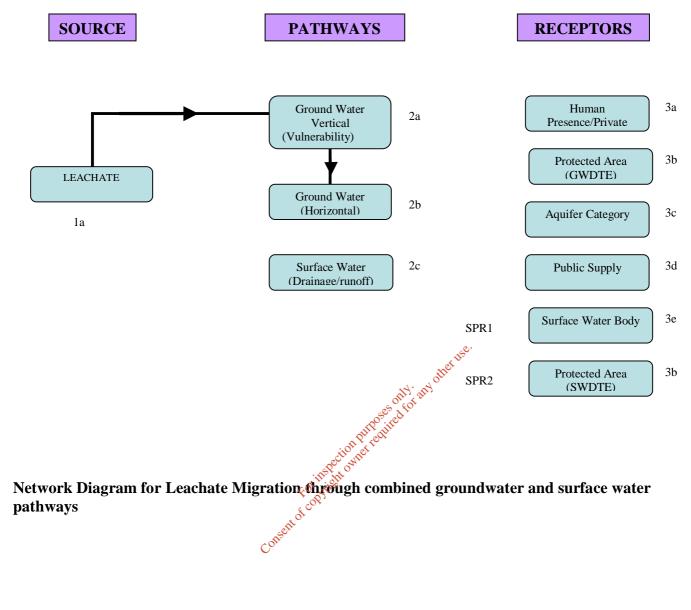


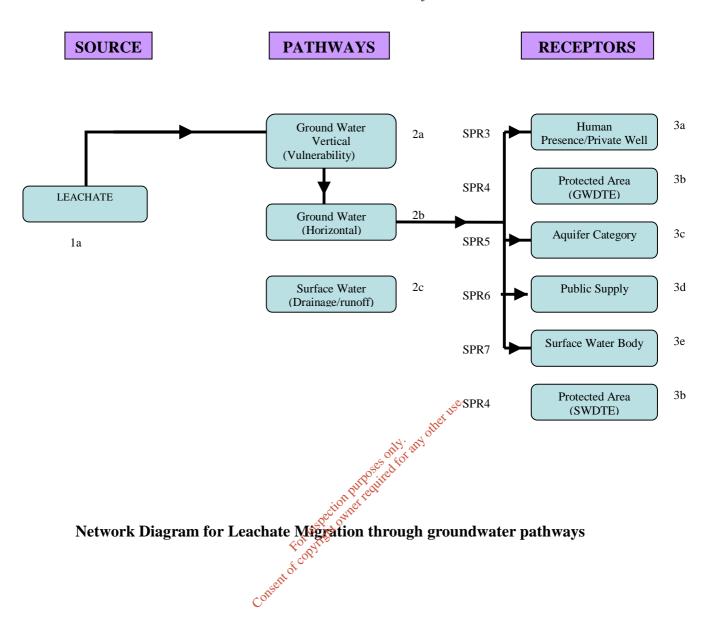
### **HEIGHT CONTOURS**

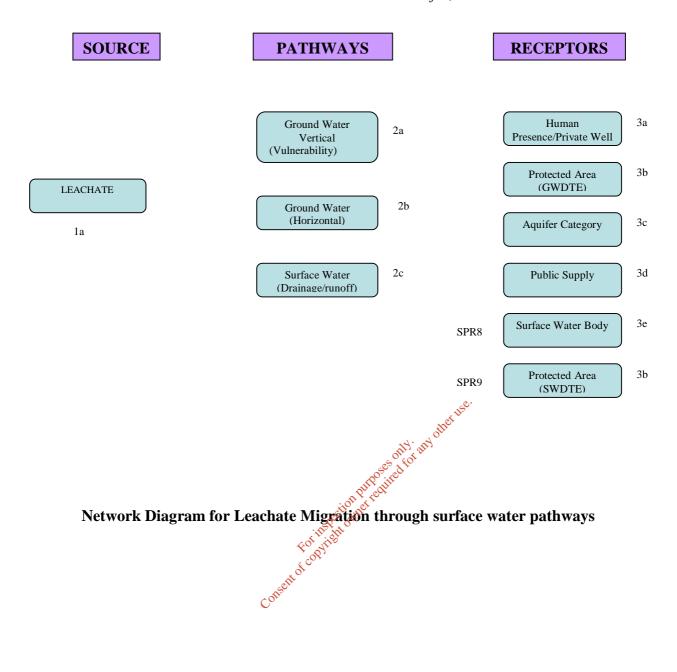


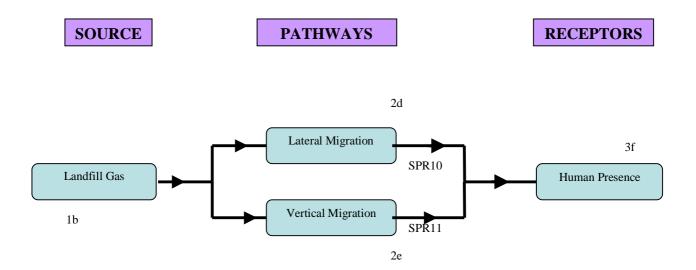
Site slopes in a South Westerly direction.

Consent of copyright owner required for any other use.











#### **RISK SCORING MATRICES**

#### Source

Table 1a: LEACHATE: SOURCE/HAZARD SCORING MATRIX

	WASTE FOO		
WASTE TYPE	≤ 1 ha	> 1 ≤ 5 ha	> 5 ha
C&D <sup>20</sup>	0.5	1	1.5
Municipal <sup>21</sup>	5	7	10
Industrial <sup>22</sup>	5	7	10
Pre 1977 sites <sup>23</sup>	1	2	3
		MAX	10

Table 1b: LANDFILL GAS: SOURCE/HAZARD SCORING MATRIX

	WASTE FOO		
WASTE TYPE	≤ 1 ha	> 1 ≤ 5 ha	> 5 ha
C&D <sup>20</sup>	0.5	0.75	1
Municipal <sup>21</sup>	5	7	10
Industrial <sup>22</sup>	3	5	7
Pre 1977 sites <sup>23</sup>	0.5	0.75	1
	·	MAX	10

#### **Pathways**

LEACHATE MIGRATION: PATHWAYS Table 2a:

arameters	Points available
GROUNDWATER VULNERABILITY C	Tri St. St.
Vertical pathway)	8
Extreme Vulnerability III	3
High Vulnerability	2
Moderate Vulnerability	1
ow Vulnerability	0.5
ligh – Low Vulnerability	2

Table 2b: LEACHATE MIGRATION: PATHWAYS

Parameters	Points available	
GROUNDWATER FLOW REGIME		
(Horizontal pathway)		
Karstified Groundwater Bodies (Rk) <sup>25</sup>	5	
Productive Fissured Bedrock Groundwater Bodies (Rf and Lm) <sup>25</sup>	3	
Gravel Groundwater Bodies (Rg and Lg) 25	2	
Poorly Productive Bedrock Groundwater Bodies (LI, PI, Pu) <sup>25</sup>	1	

Rk Regionally Important Karstified Aquifers

Regionally Important Fissured Bedrock Aquifers Rf

Regionally Important Extensive Sand/Gravel Aquifers Locally Important Sand/Gravel Aquifers

Rg Ll

Locally Important Bedrock Aquifers - Generally Moderately Productive Lm

Locally Important Bedrock Aquifers - Moderately Productive only in Local Lg

Zones

PI Poor Bedrock Aquifers - Generally Unproductive except for Local Zones

Pu Poor Bedrock Aquifers - Generally Unproductive Table 2c: LEACHATE MIGRATION: PATHWAYS

Parameters	Points available
SURFACE WATER DRAINAGE <sup>26</sup> (surface water pathway)	
Is there a direct connection between drainage ditches associated with the waste body and adjacent surface water body? Yes	2
If no direct connection	0

Table 2d: LANDFILL GAS: PATHWAY assuming receptor within 250m of source

Parameters	Points available
LANDFILL GAS LATERAL MIGRATION POTENTIAL	
Sand and Gravel, Made ground, urban, karst	3
Bedrock	2
All other Tills (including limestone, sandstone etc – moderate permeability)	1.5
All Namurian or Irish Sea Tills (low permeability)	1
Clay, Alluvium, Peat	1

Table 2e: LANDFILL GAS: PATHWAY assuming receptor located above source.

Parameters	Points available
LANDFILL GAS VERTICAL (UPWARDS)	60,
MIGRATION POTENTIAL	
Sand and Gravel, Made ground, urban, karet	5
Bedrock 301 of 1	3
All other Tills (including limestone, sandstone etc – moderate permeability)	2
All Namurian or Irish Sea Tills (low permeability)	1
Clay, Alluvium, Peat	1

### Receptors

Table 3a: LEACHATE MIGRATION: RECEPTORS

Parameters	Points available
HUMAN PRESENCE (presence of a house indicates potential private wells)	
On or within 50m of the waste body	3
Greater than 50m but less than 250m of the waste body	2
Greater than 250m but less than 1km of the waste body	1
Greater than 1 km of the waste body	0

Table 3b: LEACHATE MIGRATION: RECEPTORS

Parameters	Points available	
PROTECTED AREAS (SWDTE or GWDTE)		
Within 50m of the waste body	3	
Greater than 50m but less than 250m of the waste body	2	
Greater than 250m but less than 1km of waste body	1	

#### Tier 1 Risk Assessment – Historical Landfill, Gowran

Greater than 1 km of the waste body	0
Undesignated sites <sup>27</sup> within 50m of site of the waste body	1
the waste body	0.5
Undesignated sites <sup>27</sup> greater than 250m of the waste body	0

LEACHATE MIGRATION: RECEPTORS Table 3c:

Parameters	Points available
AQUIFER CATEGORY 28 (resource potential)	
Regionally Important Aquifers (Rk, Rf, Rg)	5
Locally Important Aquifers (LI, Lm, Lg)	3
Poor Aquifers (PI, Pu)	1

Regionally Important Karstified Aquifers Rk Rf

Regionally Important Fissured Bedrock Aquifers Regionally Important Extensive Sand/Gravel Aquifers

Rg

LI Locally Important Sand/Gravel Aquifers

Locally Important Bedrock Aquifers - Generally Moderately Productive Lm Lg Locally Important Bedrock Aquifers - Moderately Productive only in Local

Zones

PI Poor Bedrock Aquifers - Generally Unproductive except for Local Zones

Pu Poor Bedrock Aquifers - Generally Unproductive

Table 3d: LEACHATE MIGRATION: RECEPTORS

PUBLIC WATER SUPPLIES (other than private wells)	7
Within 100m of site boundary	7
Greater than 100m but less than 300m or withint Inner SPA (SI) for GW supplies	5
Greater than 300m but less than 1km of within	3
Outer SPA (SO) for GW supplies	
Greater than 1km (karst aquifer)	3
Greater than 1km (no karst aquifer)	0

LEACHATE MIGRATION: RECEPTORS Table 3e:

Parameters	Points available
SURFACE WATER BODIES	
Within 50m of site boundary	3
Greater than 50m but less than 250m	2
Greater than 250m but less than 1km	1
Greater than 1km	0

Table 3f: LANDFILL GAS: RECEPTOR

Parameters	Points available
HUMAN PRESENCE	
On site or within 50m of site boundary	5
Greater than 50m but less than 150m	3
Greater than 150m but less than 250m	1
Greater than 250m	0.5

### RISK SCREENING

**SITE:** Gowran

**RISK: Medium Risk** 

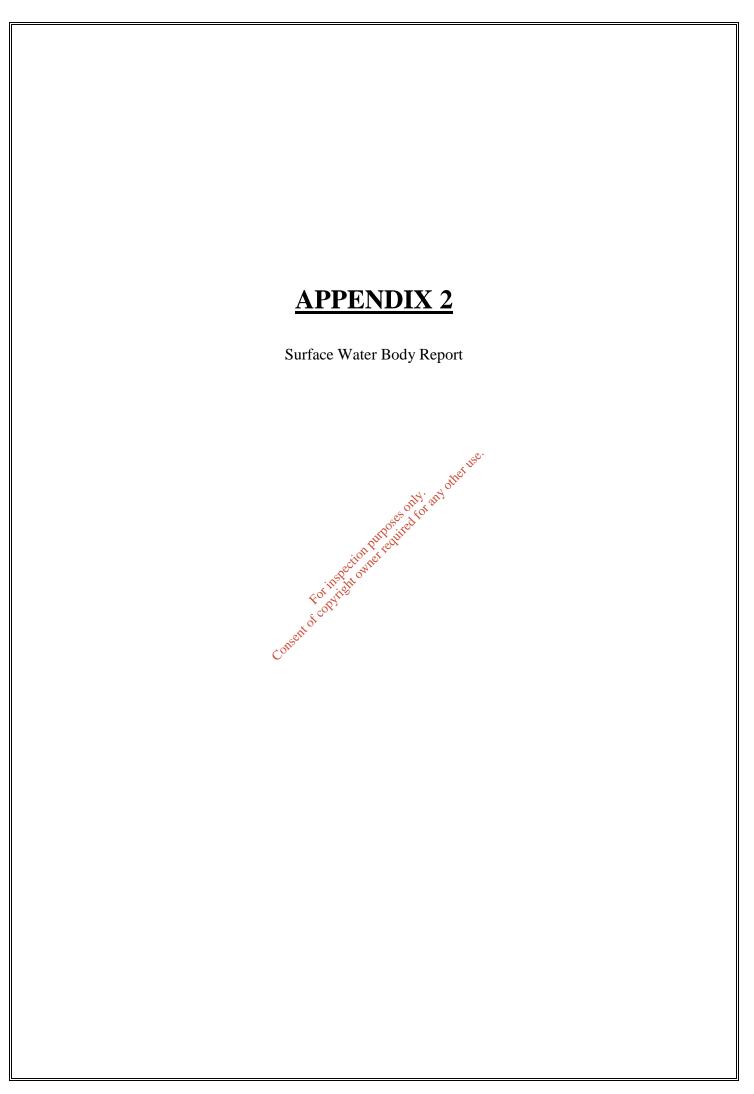
TABLE		SCORE	RATIONALE
Source			
Leachate Hazard	1a	5	0.09 ha, municipal
Landfill Gas Hazard	1b	5	0.09 ha
Pathways			
Leachate Migration – Ground Water Vulnerability	2a	3	Extreme Vulnerability
Leachate Migration – Ground Water Flow Regime	2b	5	Regionally Important Karstified GW body
Leachate Migration – Surface Water Drainage	2c	0	No direct connection
Landfill Gas – Lateral Migration	2d	3	Karst  See of lot and the lot of
Landfill Gas – Vertical Migration	2e	5 purple to the state of the st	Assuming receptor above.
Receptors		20 02	
Leachate Migration – Human Presence	3a ∢	of high 2	Well at 150m.
Leachate Migration – Protected Areas	3bx of	0	None in vicinity of site
Leachate Migration – Aquifer Category	3c	5	Regionally important Aquifer
Leachate Migration – Public Water Supplies	3d	3	Greater than 1km – karst aquifer
Leachate Migration – Surface Water Bodies	3e	1	River 524m from site
Landfill Gas – Human Presence	3f	5	House 17m from site

SPR LINKAGE SCORE			MAX LINKAGE SCORE	NORMALISED SCORE
SPR 1	$ \begin{array}{c c} 1a X (2a + 2b + 2c) X 3e \\ 5(3+5+0)I \end{array} $	40	300	13.3%
SPR 2	1a X (2a + 2b + 2c) X 3b (SWDTE) 5(3+5+0)0	0	300	0%
SPR 3	1a X (2a + 2b) X 3a 5(3+5)2	80	240	33.3%
SPR 4	1a X (2a + 2b) X 3b 5(3+5)0	0	240	0%
SPR 5	1a X (2a + 2b) X 3c 5(3+5)5	200	400	50%
SPR 6	1a X (2a + 2b) X 3d 5(3+5)3	120	560	21.4%
SPR 7	1a X (2a + 2b) X 3e 5(3+5)1	40	240	16.67%
SPR 8	1a X 2c X 3e 5(0)1	0	60	0%
SPR 9	1a X 2c X 3b (SWDTE) 5(0)0	0	offy, 1919 office 60	0%
SPR 10	1b X 2d X 3f 5(3)5	70 se	150	50%
SPR 11	1b X 2e X 3f 5(5)5	usper out 25	250	50%

This site scored a maximum linkage score of 50%. This classifies the site as Class B Medium Risk.

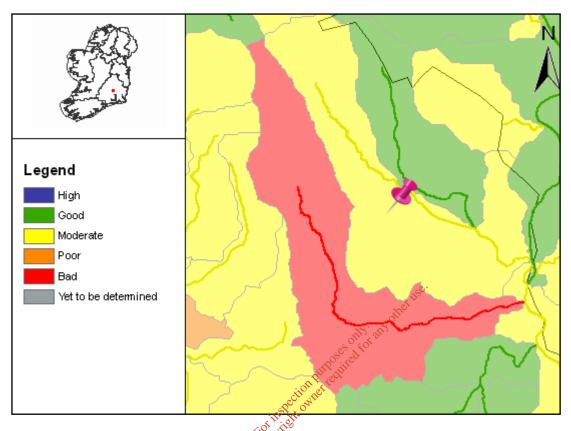
This is due to the size and importance of the underlying aquifer, which is karstified and regionally important.

The presence of the house at 17m poses a medium risk due to lateral migration of landfill gas.





#### **Full Report for Waterbody Gowran, Trib of Barrow**



River Basin Management Plans (RBMPs) have been published for all River Basin Districts in Ireland in accordance with the requirements of the Water Framework Directive. The WaterMaps viewer is an integral part of the River Basin Management Plan and provides access to information at individual waterbody level and at Water Management Unit level for all the River Basin Districts in Ireland.

The following report provides summary plan information about the selected waterbody (indicated by the pin in the map above) relating to its status, risks, objectives, and measures proposed to retain status where this is adequate, or improve it where necessary. Waterbodies can relate to surface waters (these include rivers, lakes, estuaries [transitional waters], and coastal waters), or to groundwaters. Other relevant information not included in this report can be viewed using the WaterMaps viewer, including areas listed in the Register of Protected Areas.

You will find brief notes at the bottom of some of the individual report sheets that will help you in interpreting the information presented. More detailed information can be obtained in relation to all aspects of the RBMPs at www.wfdireland.ie.

Date Reported to Europe:July 2010

Date Report Created 08/12/2017





**Summary Information:** 

Water Management Unit: IE\_SE\_BarrowMain

**WaterBody Category:** River Waterbody

WaterBody Name: Gowran, Trib of Barrow

WaterBody Code: IE\_SE\_14\_1879

Overall Status: Bad

Overall Objective: Restore\_2021
Overall Risk: 1a At Risk

**Heavily Modified:** No

Report data based upon final RBMP, 2009-2015.

The information provided above is a summary of the principal findings related to the selected waterbody. Further details and explanation of individual elements of the report are outlined in the following pages:

Consent of contributed to the second contrib

Date Reported to Europe:July 2010

Date Report Created 08/12/2017

# water matters



**Status Report** 

**Water Management Unit:** IE SE BarrowMain

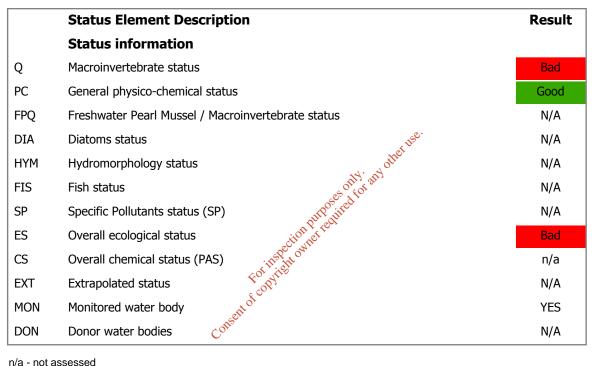
WaterBody Category: River Waterbody

**WaterBody Name:** Gowran, Trib of Barrow

WaterBody Code: IE SE 14 1879

**Overall Status Result:** Bad

**Heavily Modified:** No



n/a - not assessed

By 'Status' we mean the condition of the water in the waterbody. It is defined by its chemical status and its ecological status, whichever is worse. Waters are ranked in one of 5 status classes: High, Good, Moderate, Poor, Bad. However, not all waterbodies have been monitored, and in such cases the status of a similar nearby waterbody has been used (extrapolated) to assign status. If this has been done the first line of the status report shows the code of the waterbody used to extrapolate.

You can read more about status and how it is measured in our RBMP Document Library at www.wfdireland.ie (Directory 15 Status).

Date Reported to Europe: July 2010

Date Report Created 08/12/2017

# water matters



# **Risk Report**

Water Management Unit: IE\_SE\_BarrowMain

WaterBody Category: River Waterbody

**WaterBody Name:** Gowran, Trib of Barrow

WaterBody Code: IE\_SE\_14\_1879

Overall Risk Result: 1a At Risk

**Heavily Modified:** No



	Risk Test Description		Risk
	Diffuse Risk Sources		
RD1	EPA diffuse model (2008)	1a	At Risk
RD2a	Road Wash - Soluble Copper	2b	Not At Risk
RD2b	Road Wash - Total Zinc		Not At Risk
RD2c	Road Wash - Total Hydrocarbons		Not At Risk
RD3	Railways		Not At Risk
RD4a	Forestry - Acidification (2008)		Not At Risk
RD4b	Forestry - Suspended Solids (2008)		Not At Risk
RD4c	Forestry - Eutrophication (2008)	2a	Probably Not At Risk
RD5	Road Wash - Total Zinc  Road Wash - Total Hydrocarbons  Railways  Forestry - Acidification (2008)  Forestry - Suspended Solids (2008)  Forestry - Eutrophication (2008)  Overall Unsewered (2008)  Unsewered Areas - Pathogens (2008)  Unsewered Phosphorus (2008)  Arable  Sheep Dip  Consent of Consent	2b	Not At Risk
RD5a	Unsewered Areas - Pathogens (2008)	2a	Probably Not At Risk
RD5b	Unsewered Phosphorus (2008)	2b	Not At Risk
RD6a	Arable	2a	Probably Not At Risk
RD6b	Sheep Dip Control	2b	Not At Risk
RD6c	Forestry - Dangerous Substances		Not At Risk
RDO	Diffuse Overall -Worst Case (2008)	1a	At Risk
	Hydrology		
RHY1	Water balance - Abstraction		Not At Risk
	Morphological Risk Sources		
RM1	Channelisation (2008)		Not At Risk
RM2	Embankments (2008)		Not At Risk
RM3	Impoundments		Not At Risk
RM4	Water Regulation		Not At Risk
RM5	Intensive Landuse		N/A
RMO	Morphology Overall - Worst Case (2008)		Not At Risk
	Overall Risk		
RA	Rivers Overall - Worst Case (2008)	1a	At Risk





	Point Risk Sources		
RP1	WWTPs (2008)	1a	At Risk
RP2	CSOs	2b	Not At Risk
RP3	IPPCs (2008)		Not At Risk
RP4	Section 4s (2008)		Not At Risk
RP5	WTPs/Mines/Quarries/Landfills		N/A
RPO	Overall Risk from Point Sources - Worst Case (2008)	1a	At Risk
	Q Value		
Q	EPA Q rating and Margaritifera Assessment		N/A
	Q/RDI or Point/Diffuse		
QPD	Q class/EPA Diffuse Model or worst case of Point and Diffuse (2008)	1a	At Risk
	Rivers Direct Impacts		
RDI1	Rivers Direct Impacts - Dangerous Substances		N/A

#### Risk

By 'risk' we mean the risk that a waterbody will not achieve good ecological or good chemical status/potential at least by 2015. To examine risk the various pressures acting on the waterbody were identified along with any evidence of impact on water status. Depending on the extent of the pressure and its potential for impact, and the amount of information available, the risk to the water body was placed in one of four categories: 1a at risk; 1b probably at risk; 2a probably not at risk; 2b not at risk. Note that '2008' after the risk category means that the risk assessment was revised in 2008. All other risks were determined as part of an earlier risk assessment in 2005.

You can read more about risk assessment in our 'WFD Risk Assessment Update' document in the RBMP document library, and other documents at www.wfdireland.ie (Directory 31 Risk Assessments).





# **Objectives Report**

Water Management Unit: IE\_SE\_BarrowMain

**WaterBody Category:** River Waterbody

**WaterBody Name:** Gowran, Trib of Barrow

WaterBody Code: IE\_SE\_14\_1879

Overall Objective: Restore\_2021

**Heavily Modified:** No



	Objectives Description	Result
	Extended timescale information	
E1	Extended timescales due to time requirements to upgrade WWTP discharges	No Status
E2	Extended timescales due to delayed recovery of chemical pollution and chemical status failures	No Status
E3	Extended timescales due to delayed recovery following reduction in agricultural nutrient losses	No Status
E4	Extended timescales due to delayed recovery from physical modifications and physical damage	No Status
E5	Extended timescales due to delayed recovery following implementing forestry acidification measures	No Status
E6	Extended timescales due to physical recovery timescales at mines and contaminated sites	No Status
E7	Extended timescales due to delayed recovery of highly impacted sites	No Status
E8	Extended timescales due to delayed recovery following reduction in agricultural nutrient losses	2021
E9	Extended timescales due to delayed recovery from nitrogen losses to estuaries	2021
E10	Extended timescales due to delayed recovery following reduction in agricultural nutrient losses	2021
E11	Extended timescales due to delayed recovery from physical modifications and physical damage (overgrazing)	No Status
E12	Extended timescales due to delayed recovery from physical modifications and physical damage (channelisation)	No Status
E13	Extended timescales from Northern Ireland Environment Agency	No Status
EOV	Overall extended timescale - combination of all extended timescales fields	2021
E14	Extended timescales due to the presence of Freshwater Pearl Mussel populations	No Status
EX15	Extended timescales due to highly impacted sites	No Status





	Objectives information	
OB1	Prevent deterioration objective	No Status
OB2	Restore at least good status objective	No Status
ОВ3	Reduce chemical pollution objective	No Status
OB4	Protected areas objective	Restore_2021
OB5	Northern Ireland Environment Agency objective	No Status
ОВО	Overall objectives	Restore_2021

#### **Extended timescales**

Extended timescales have been set for certain waters due to technical, economic, environmental or recovery constraints. Extended timescales are usually of one planning cycle (6 years, to 2021) but in some cases are two planning cycles (to 2027).

#### **Objectives**

In general, we are required to ensure that our waters achieve at least good status/potential by 2015, and that their status does not deteriorate. Having identified the status of waters (this is given earlier in this report), the next stage is to set objectives for waters. Objectives consider waters that require protection from deterioration as well as waters that require restoration and the timescales needed for recovery. Four default objectives have been set initially:-

Prevent Deterioration Restore Good Status Reduce Chemical Pollution Achieve Protected Areas Objectives

These objectives have been refined based on the measures available to achieve them, the latter's likely effectiveness, and consideration of cost-effective combinations of measures. Where it is considered necessary extended deadlines have been set for achieving objectives in 2021 or 2027.

Consent of Consent





# **Measures Report**

Water Management Unit: IE\_SE\_BarrowMain

**WaterBody Category:** River Waterbody

WaterBody Name: Gowran, Trib of Barrow

WaterBody Code: IE\_SE\_14\_1879

**Heavily Modified:** No



	Measures Description	Applicable
BC	Total number of basic measures which apply to this waterbody	22
BW	Directive - Bathing Waters Directive	No
BIR	Directive - Birds Directive	No
HAB	Directive - Habitats Directive	No
DW	Directive - Drinking Waters Directive	No
MAE	Directive - Major Accidents and Emergencies Directive	Yes
EIA	Directive - Environmental Impact Assessment Directive	Yes
SS	Directive - Sewage Sludge Directive	Yes
UWT	Directive - Urban Waste Water Treatment Directive	Yes
PPP	Directive - Plant Protection Products Directive	Yes
NIT	Directive - Environmental Impact Assessment Directive  Directive - Sewage Sludge Directive  Directive - Urban Waste Water Treatment Directive  Directive - Plant Protection Products Directive  Directive - Nitrates Directive  Directive - Integrated Pollution Prevention Control Directive  Other Stipulated Measure - Cost recovery for water use  Other Stipulated Measure - Promotion of efficient and sustainable water use  Other Stipulated Measure - Protection of drinking water sources  Other Stipulated Measure - Control of abstraction and impoundment	Yes
IPC	Directive - Integrated Pollution Prevention Control Directive	Yes
CR	Other Stipulated Measure - Cost recovery for water use	Yes
SUS	Other Stipulated Measure - Promotion of efficient and sustainable water use	Yes
DWS	Other Stipulated Measure - Protection of drinking water sources	Yes
ABS	Other Stipulated Measure - Control of abstraction and impoundment	Yes
POI	Other Stipulated Measure - Control of point source discharges	Yes
DIF	Other Stipulated Measure - Control of diffuse source discharges	Yes
PS	Other Stipulated Measure - Control of priority substances	Yes
MOD	Other Stipulated Measure - Controls on physical modifications to surface waters	Yes
OA	Other Stipulated Measure - Controls on other activities impacting on water status	Yes
AP	Other Stipulated Measure - Prevention or reduction of the impact of accidental pollution incidents	Yes
TP1	WSIP - Agglomerations with treatment plants requiring capital works	Yes
TP2	$\ensuremath{WSIP}$ - Agglomerations with treatment plants requiring further investigation prior to capital works	No
TP3	WSIP - Agglomerations requiring the implementation of actions identified in Shellfish PRPs	No
TP4	WSIP - Agglomerations with treatment plants requiring improved operational performance	No
TP5	WSIP - Agglomerations requiring investigation of CSOs	No

Date Reported to Europe:July 2010

Date Report Created 08/12/2017



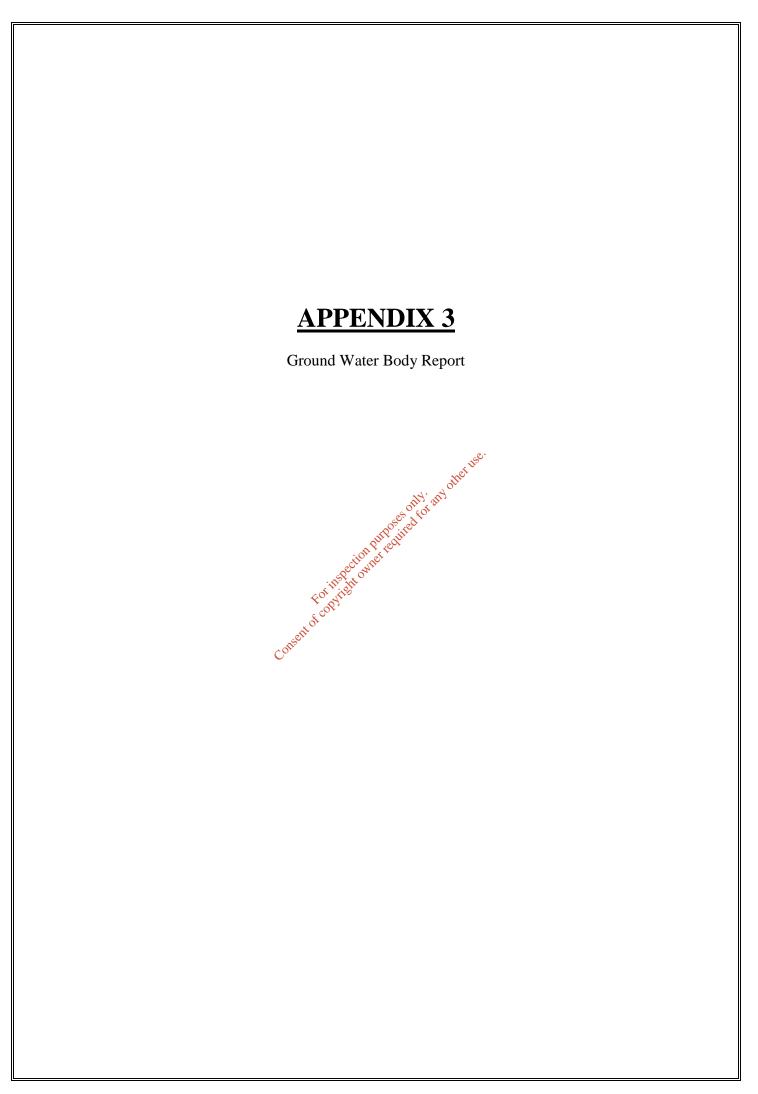


TP6	$\mbox{WSIP}$ - Agglomerations where exisitng treatment capacity is currently adequate but predicted loadings would result in overloading	Yes
OTS	On-site waste water treatment systems	Yes
FPM	Freshwater Pearl Mussel sub-basin plan	No
SHE	Shellfish Pollution Reduction Plan	No
IPR	IPPC licences requiring review	No
WPR	Water Pollution Act licences requiring review	Yes
FOR	Forestry guidelines and regulations	Yes
CH1	Chanelisation measures	No
CH2	Chanelisation investigations	No
OG	Overgrazing measures	No
HQW	Protect high quality waters	No

#### Measures

Measures are necessary to ensure that we meet the objectives set out in the previous page of this report. Many measures are already provided for in national legislation and must be implemented. Other measures have been recently introduced or are under preparation. A range of additional potential measures are also being considered but require further development. Any agreed additional measures can be introduced through the update of Water Management Unit Action Plans during the implementation process.

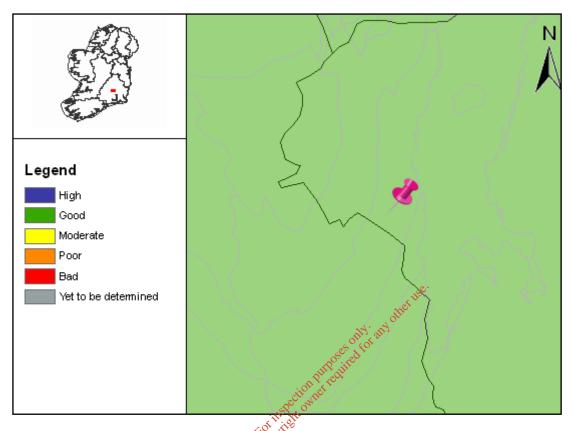
You can read more about Basic Measures in 'River Basin Planning Guidance' and the other documents in our RBMP Document Library at www.wfdireland.ie.







# Full Report for Waterbody Bagenalstown\_3



River Basin Management Plans (RBMPs) have been published for all River Basin Districts in Ireland in accordance with the requirements of the Water Framework Directive. The WaterMaps viewer is an integral part of the River Basin Management Plan and provides access to information at individual waterbody level and at Water Management Unit level for all the River Basin Districts in Ireland.

The following report provides summary plan information about the selected waterbody (indicated by the pin in the map above) relating to its status, risks, objectives, and measures proposed to retain status where this is adequate, or improve it where necessary. Waterbodies can relate to surface waters (these include rivers, lakes, estuaries [transitional waters], and coastal waters), or to groundwaters. Other relevant information not included in this report can be viewed using the WaterMaps viewer, including areas listed in the Register of Protected Areas.

You will find brief notes at the bottom of some of the individual report sheets that will help you in interpreting the information presented. More detailed information can be obtained in relation to all aspects of the RBMPs at www.wfdireland.ie.





**Summary Information:** 

Water Management Unit: N/A

**WaterBody Category:** Groundwater Waterbody

**WaterBody Name:** Bagenalstown\_3

**WaterBody Code:** IE\_SE\_G\_004

Overall Status: Good

Overall Objective: Protect

Overall Risk: 1a At Risk

**Heavily Modified:** No

Report data based upon final RBMP, 2009-2015.

The information provided above is a summary of the principal findings related to the selected waterbody. Further details and explanation of individual elements of the report are outlined in the following pages:

Consent of contributed to the second are outlined in the following page





# **Chemical and Quantitative Status Report**

Water Management Unit: N/A

WaterBody Category: Groundwater Waterbody

**WaterBody Name:** Bagenalstown\_3

WaterBody Code: IE\_SE\_G\_004

Overall Status Result: Good

**Heavily Modified:** No



	Status Element Description	Result
	Status information	
INS	Status associated with saline intrusion into groundwater	GS-HC
DWS	Status associated with exceedances of water quality above specific standards	GS-LC
DS	Chemical status of groundwater due to pressure from diffuse sources of pollution	GS-LC
CLS	Chemical status of groundwater due to pressure from contaminated soil or land.	GS-HC
MS	Chemical status of groundwater due to pressure from mine sites (active or closed).	GS-HC
UAS	Chemical status of groundwater due to pressures from urban areas	GS-HC
GWS	General groundwater quality status	GS-LC
RPS	Status associated with MRP loading to rivers to the status associated with MRP loading to rivers to the status associated with MRP loading to rivers to the status associated with MRP loading to rivers to the status associated with MRP loading to rivers to the status associated with MRP loading to rivers to the status associated with MRP loading to rivers to the status associated with MRP loading to rivers to the status associated with MRP loading to rivers to the status associated with MRP loading to rivers to the status associated with MRP loading to rivers to the status associated with MRP loading to rivers to the status associated with the status associated with the status as	GS-LC
TNS	Status associated with nitrate loading to transitional and coastal waters	GS-LC
SWS	Overall status associated with nutrient loadings to rivers and transitional and coastal waters	GS-LC
SQS	Status associated with dependant surface water quantitative status	GS-HC
GDS	Groundwater dependant terrestrial ecosystems status	GS-HC
QSO	Quantitative status overall	GS-HC
CSO	Chemical status overall	GS-LC
os	Overall status	Good

GS -HC : Good status High Confidence GS- LC : Good status Low Confidence

n/a - not assessed

#### **Status**

By 'Status' we mean the condition of the water in the waterbody. It is defined by its chemical status and quantitative status, whichever is worse. Groundwaters are ranked in one of 2 status classes: Good or Poor.

You can read more about status and how it is measured in our RBMP Document Library at www.wfdireland.ie (Directory 15 Status).

Date Reported to Europe:July 2010

Date Report Created 08/12/2017

# water matters



# **Risk Report**

Water Management Unit: N/A

**WaterBody Category:** Groundwater Waterbody

**WaterBody Name:** Bagenalstown\_3

**WaterBody Code:** IE\_SE\_G\_004

Overall Risk Result: 1a At Risk

**Heavily Modified:** No



	Risk Test Description	Risk
	Groundwater Dependent Terrestrial Ecosystems	
TE	GWDTE Risk	N/A
	Groundwater Quality	
DIF	Diffuse Elements (General) Risk	N/A
DW	Drinking Waters Risk	N/A
INT	Intrusions Risk	N/A
WB	Water Balance Risk	N/A
	Drinking Waters Risk  Intrusions Risk  Water Balance Risk  Groundwater Quality (General)  General Groundwater Quality (Point Risk)  Contaminated Land Risk  Landfill Risk  Mine Risk  Quarry Risk  Lirban Risk	
GQ	General Groundwater Quality Risk	N/A
	Groundwater Quality (Point Risk)	
CL	Contaminated Land Risk	N/A
LF	Landfill Risk	N/A
MI	Mine Risk	N/A
QY	Quarry Risk Contra	N/A
UR	Urban Risk	N/A
UW	UWWT Risk	N/A
	GW Diffuse Risk Sources	
WB3	Mobile Nutrients (NO3)	N/A
WB4	Mobile Chemicals	N/A
WB5	Clustered OSWTSs and leaking urban sewerage systems	N/A
	GW Hydrology	
WB1	Water balance - Abstraction	N/A
WB2	Abstraction - Intrusion	N/A





WB10 Risk WB11 Risk WB12 Risk WB6 Risk WB7 Risk WB8 Risk WB9 Risk Ove RA Gro Ris CLR Con DR Risk	k from Point sources of pollution - Contaminated Land k from Point sources of pollution - Trade Effluent Discharges k from Point sources of pollution - Urban Wastewater Discharges k from Point sources of pollution - Mines k from Point sources of pollution - Quarries k from Point sources of pollution - Landfills k from Point sources of pollution - Oil Industry Infrastructure erall Risk bundwater Overall - Worst Case sk information		N/A N/A N/A N/A N/A N/A
WB11 Risk WB12 Risk WB6 Risk WB7 Risk WB8 Risk WB9 Risk Ove RA Gro Ris CLR Con DR Risk	k from Point sources of pollution - Trade Effluent Discharges k from Point sources of pollution - Urban Wastewater Discharges k from Point sources of pollution - Mines k from Point sources of pollution - Quarries k from Point sources of pollution - Landfills k from Point sources of pollution - Oil Industry Infrastructure erall Risk bundwater Overall - Worst Case		N/A N/A N/A N/A
WB12 Risk WB6 Risk WB7 Risk WB8 Risk WB9 Risk Ove RA Gro Ris CLR Con DR Risk	k from Point sources of pollution - Urban Wastewater Discharges k from Point sources of pollution - Mines k from Point sources of pollution - Quarries k from Point sources of pollution - Landfills k from Point sources of pollution - Oil Industry Infrastructure erall Risk oundwater Overall - Worst Case		N/A N/A N/A
WB6 Risk WB7 Risk WB8 Risk WB9 Risk Ove RA Gro Ris CLR Con DR Risk	k from Point sources of pollution - Mines k from Point sources of pollution - Quarries k from Point sources of pollution - Landfills k from Point sources of pollution - Oil Industry Infrastructure erall Risk oundwater Overall - Worst Case		N/A N/A N/A
WB7 Risk WB8 Risk WB9 Risk Ove RA Gro Ris CLR Con DR Risk	k from Point sources of pollution - Quarries k from Point sources of pollution - Landfills k from Point sources of pollution - Oil Industry Infrastructure erall Risk oundwater Overall - Worst Case		N/A N/A
WB8 Risk WB9 Risk Ove RA Gro Ris CLR Con DR Risk	k from Point sources of pollution - Landfills k from Point sources of pollution - Oil Industry Infrastructure erall Risk oundwater Overall - Worst Case		N/A
WB9 Risk Ove RA Gro Ris CLR Con DR Risk DWR Risk	k from Point sources of pollution - Oil Industry Infrastructure  erall Risk  oundwater Overall - Worst Case		·
RA Gro Ris CLR Con DR Risk	erall Risk oundwater Overall - Worst Case		N/A
RA Gro Ris CLR Con DR Risk	oundwater Overall - Worst Case		
Ris CLR Con DR Risk			
CLR Con	sk information		N/A
DR Risk			
DWR Risk	ntaminated land risk		Not At Risk
DWR Risk star	k of groundwater due to pressure from diffuse sources of pollution	1a	At Risk
GDP Gro	k associated with exceedances of water quality above specific ndards	1a	At Risk
GDIC GIO	oundwater dependant terrestrial ecosystems risk		Not At Risk
GWR Gen	neral groundwater quality risk	1a	At Risk
INR Risk	k associated with saline intrusion into groundwater	2b	Not At Risk
LR Risk	k due to landfills sites/old closed dump sites pure difference		Not At Risk
MR Min	nes risk		Not At Risk
NULL Diff	fuse nitrates from agriculture risk		N/A
QR Risk	k due to quarries		Not At Risk
RA Rev	vised risk assessment	1a	At Risk
RPR Risk	ndards bundwater dependant terrestrial ecosystems risk neral groundwater quality risk k associated with saline intrusion into groundwaters of the saline int	1b	Probably At Risk
SQR Risk	k associated with dependant surface water quantitative status	2b	Not At Risk
1	erall risk associated with nutrient loadings to rivers and transitional d coastal waters	1a	At Risk
TNR Risk	k associated with nitrate loading to transitional and coastal waters	1a	At Risk
UAR Risk	k of groundwater due to pressures from urban areas	2b	Not At Risk
UWR Risk			Not At Risk

#### Risk

By 'risk' we mean the risk that a waterbody will not achieve good ecological or good chemical status/potential at least by 2015. To examine risk the various pressures acting on the waterbody were identified along with any evidence of impact on water status. Depending on the extent of the pressure and its potential for impact, and the amount of information available, the risk to the water body was placed in one of four categories: 1a at risk; 1b probably at risk; 2a probably not at risk; 2b not at risk. Note that '2008' after the risk category means that the risk assessment was revised in 2008. All other risks were determined as part of an earlier risk assessment in 2005.

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**Objectives Report** 

Water Management Unit: N/A

**WaterBody Category:** Groundwater Waterbody

**WaterBody Name:** Bagenalstown\_3

WaterBody Code: IE\_SE\_G\_004

Overall Objective: Protect

**Heavily Modified:** No



	Objectives Description	Result
	Extended timescale information	
E1	Extended deadlines due to agricultural P	No Status
E2	Extended deadlines due to agricultural N	No Status
E3	Extended deadlines due to mines	No Status
E4	Extended deadlines due to urban areas	No Status
E5	Extended deadlines due to contaminated lands	No Status
EO	Extended deadlines - overall	No Status
	Objectives information The Property of the Control	
OB1	Prevent deterioration objective	Protect
OB2	Restore at least good status objectives the	No Status
ОВ3	Reduce chemical pollution objectives	No Status
OB4	Protected areas objective	No Status
ОВО	Extended deadlines due to urban areas  Extended deadlines due to contaminated lands  Extended deadlines - overall  Objectives information  Prevent deterioration objective  Restore at least good status objectives the deadline objective of the contaminated lands  Reduce chemical pollution objective of the contaminated lands  Protected areas objective  Overall objectives - objective	Protect

#### **Extended timescales**

Extended timescales have been set for certain waters due to technical, economic, environmental or recovery constraints. Extended timescales are usually of one planning cycle (6 years, to 2021) but in some cases are two planning cycles (to 2027).

#### **Objectives**

In general, we are required to ensure that our waters achieve at least good status/potential by 2015, and that their status does not deteriorate. Having identified the status of waters (this is given earlier in this report), the next stage is to set objectives for waters. Objectives consider waters that require protection from deterioration as well as waters that require restoration and the timescales needed for recovery. Four default objectives have been set initially:-

Prevent Deterioration Restore Good Status Reduce Chemical Pollution Achieve Protected Areas Objectives

These objectives have been refined based on the measures available to achieve them, the latter's likely effectiveness, and consideration of cost-effective combinations of measures. Where it is considered necessary extended deadlines have been set for achieving objectives in 2021 or 2027.

Date Reported to Europe:July 2010

Date Report Created 08/12/2017





# **Measures Report**

Water Management Unit: N/A

**WaterBody Category:** Groundwater Waterbody

**WaterBody Name:** Bagenalstown\_3

**WaterBody Code:** IE\_SE\_G\_004

**Heavily Modified:** No



	Measures Description	Applicable
ВС	Total number of basic measures which apply to this waterbody	24
BW	Directive - Bathing Waters Directive	No
BIR	Directive - Birds Directive	No
HAB	Directive - Habitats Directive	Yes
DW	Directive - Drinking Waters Directive	Yes
MAE	Directive - Major Accidents and Emergencies Directive	Yes
EIA	Directive - Environmental Impact Assessment Directive	Yes
SS	Directive - Sewage Sludge Directive	Yes
UWT	Directive - Urban Waste Water Treatment Directive	Yes
PPP	Directive - Plant Protection Products Directive	Yes
NIT	Directive - Nitrates Directive	Yes
IPC	Directive - Environmental Impact Assessment Directive  Directive - Sewage Sludge Directive  Directive - Urban Waste Water Treatment Directive  Directive - Plant Protection Products Directive  Directive - Nitrates Directive  Directive - Integrated Pollution Prevention Control Directive  Other Stipulated Measure - Cost recovery for water use  Other Stipulated Measure - Promotion of efficient and sustainable water use  Other Stipulated Measure - Protection of drinking water sources  Other Stipulated Measure - Control of abstraction and impoundment	Yes
CR	Other Stipulated Measure - Cost recovery for water use	Yes
SUS	Other Stipulated Measure - Promotion of efficient and sustainable water use	Yes
DWS	Other Stipulated Measure - Protection of drinking water sources	Yes
ABS	Other Stipulated Measure - Control of abstraction and impoundment	Yes
POI	Other Stipulated Measure - Control of point source discharges	Yes
DIF	Other Stipulated Measure - Control of diffuse source discharges	Yes
GW	Other Stipulated Measure - Authorisation of discharges to groundwaters	Yes
PS	Other Stipulated Measure - Control of priority substances	Yes
MOD	Other Stipulated Measure - Controls on physical modifications to surface waters	Yes
OA	Other Stipulated Measure - Controls on other activities impacting on water status	Yes
AP	Other Stipulated Measure - Prevention or reduction of the impact of accidental pollution incidents	Yes
OTS	On-site waste water treatment systems	Yes
FPM	Freshwater Pearl Mussel sub-basin plan	No
SHE	Shellfish Pollution Reduction Plan	No
IPR	IPPC licences requiring review	Yes
WPR	Water Pollution Act licences requiring review	No
FOR	Forestry guidelines and regulations	Yes

Date Reported to Europe:July 2010

Date Report Created 08/12/2017





HQW Protect high quality waters

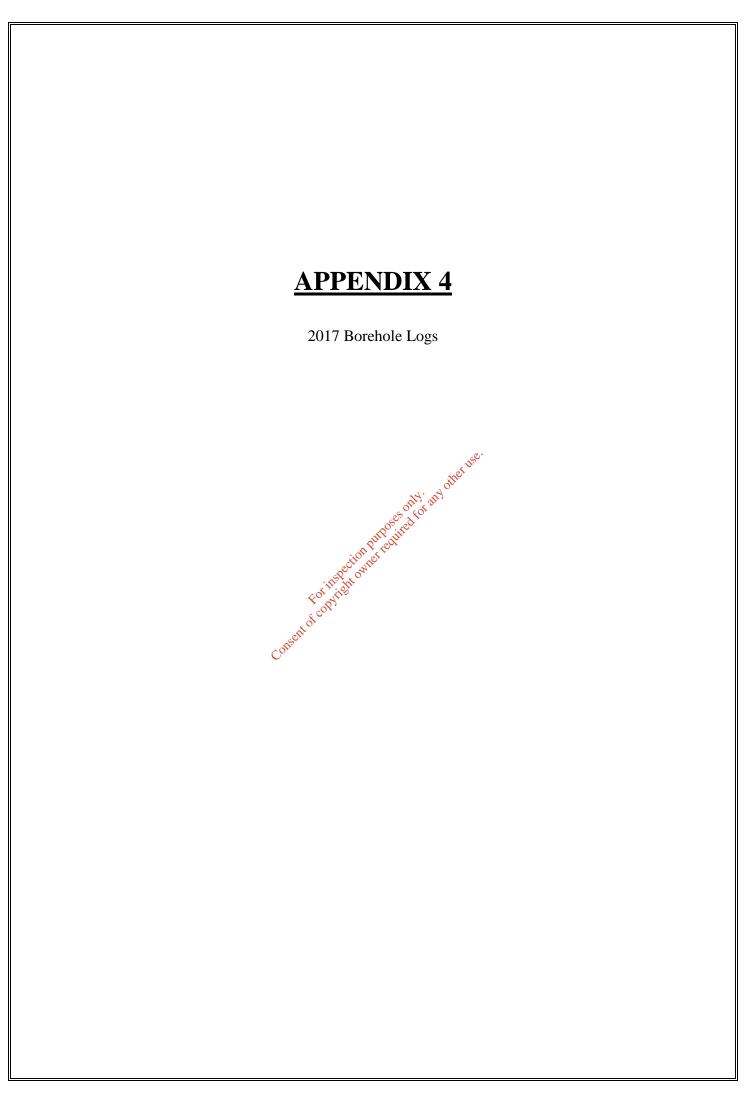
Yes

#### Measures

Measures are necessary to ensure that we meet the objectives set out in the previous page of this report. Many measures are already provided for in national legislation and must be implemented. Other measures have been recently introduced or are under preparation. A range of additional potential measures are also being considered but require further development. Any agreed additional measures can be introduced through the update of Water Management Unit Action Plans during the implementation process.

You can read more about Basic Measures in 'River Basin Planning Guidance' and in other documents in our RBMP Document Library at www.wfdireland.ie.





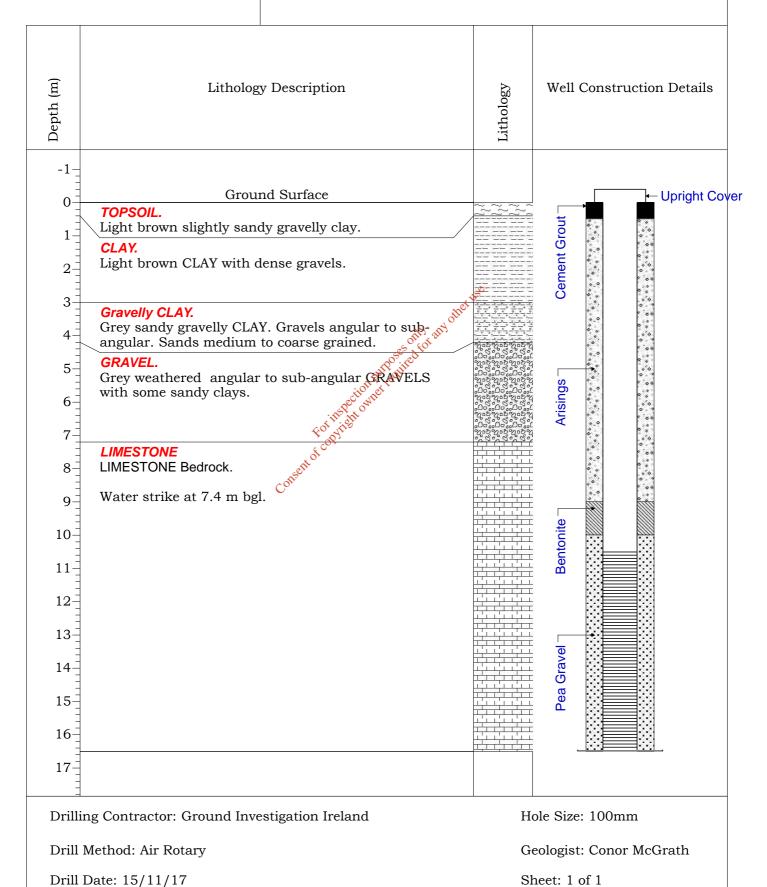


Borehole I.D. BH-1A

Project: Tier 3 Investigation

Client: Kilkenny County Council Borehole Depth: 16.5

Location: Gowran Borehole Type: Monitoring Well



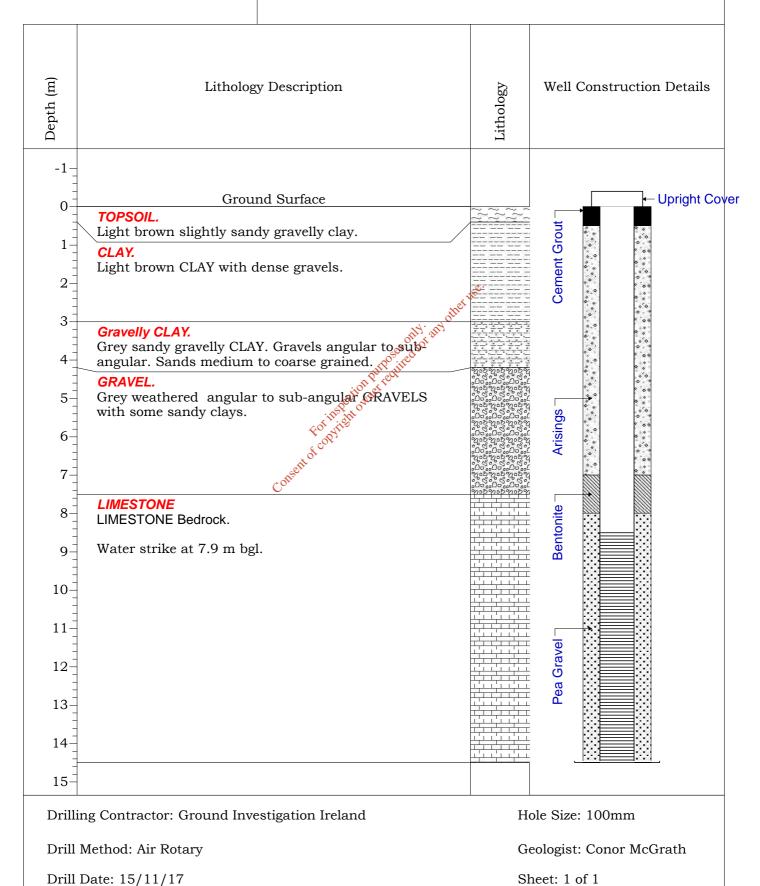


Borehole I.D. BH-3

Project: Tier 3 Investigation

Client: Kilkenny County Council Borehole Depth: 14.5

Location: Gowran Borehole Type: Monitoring Well





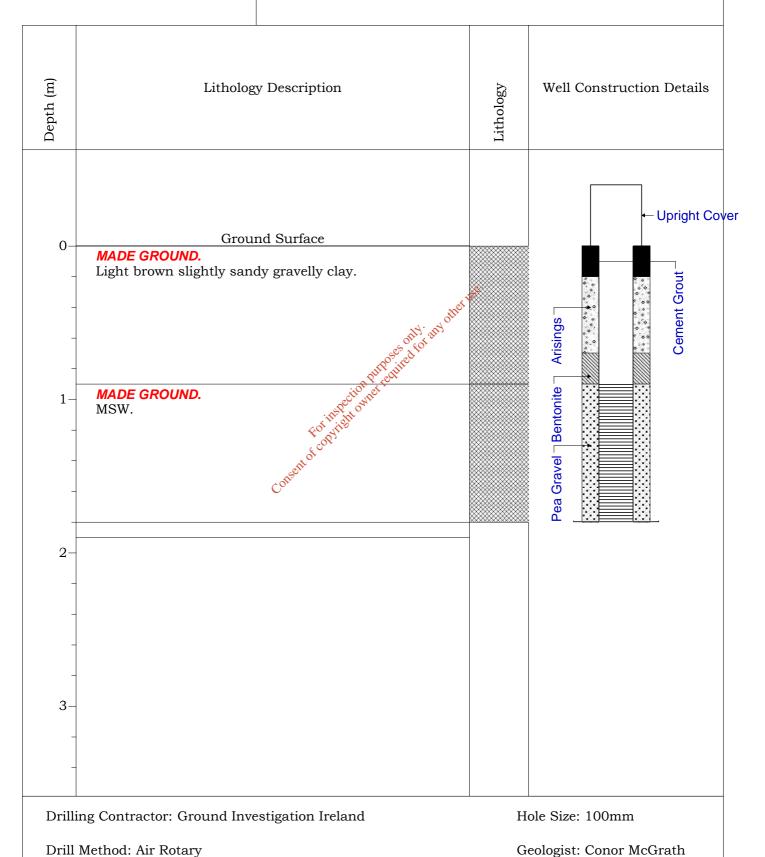
Drill Date: 15/11/17

Borehole I.D. GW-1

Project: Tier 3 Investigation

Client: Kilkenny County Council Borehole Depth: 1.8

Location: Gowran Borehole Type: Monitoring Well



Sheet: 1 of 1



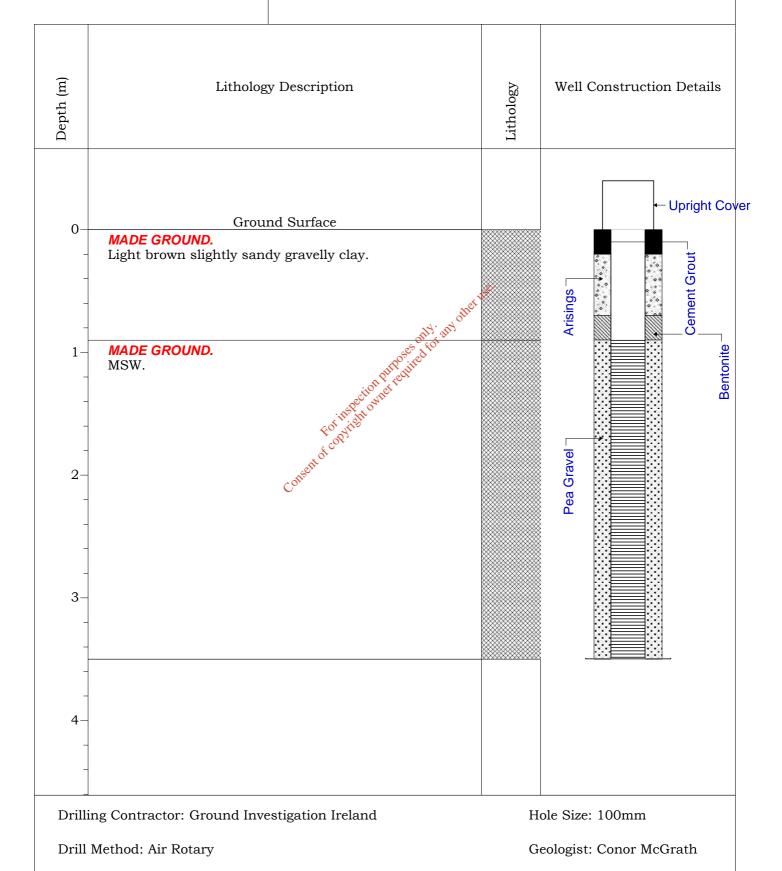
Drill Date: 15/11/17

Borehole I.D. GW-2

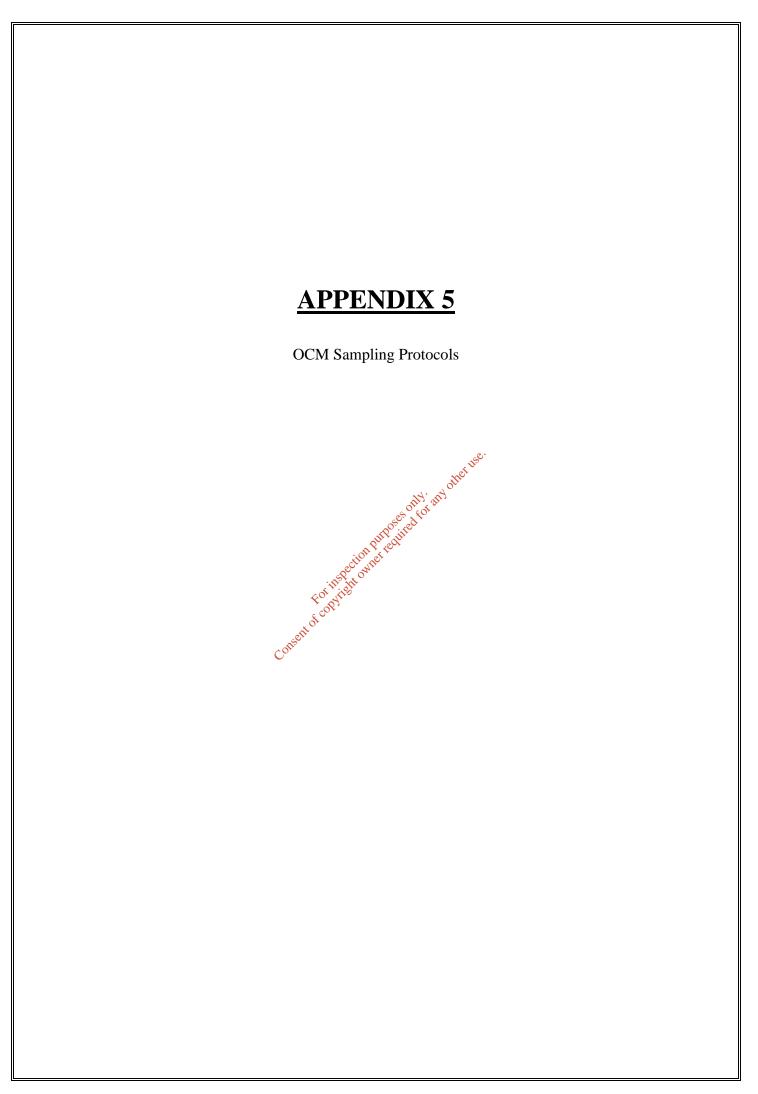
Project: Tier 3 Investigation

Client: Kilkenny County Council Borehole Depth: 1.8

Location: Gowran Borehole Type: Monitoring Well



Sheet: 1 of 1





#### STANDARD OPERATING PROCEDURE

#### **GROUNDWATER SAMPLING**

The primary objective of groundwater sampling is to evaluate whether the potential contaminant sources at a site have impacted the quality of the groundwater in the underlying aquifer. The additional objective is to measure hydraulic gradient, or slope, of the water table in the shallow aguifer in an effort to evaluate the direction of groundwater flow.

The purpose of this procedure is to ensure that representative samples of groundwater are collected and documented using consistent methods to ensure sample integrity.

#### 1.0 SAMPLING PROCEDURES

# Well Operating and Purging Procedures of the land with the 1.1

All groundwater sampling will be conducted after the installed and developed wells have been allowed to equilibrate for at least 2 to 3 days. A Field Data Sheet for Well Sampling will be completed for each well.

Groundwater sampling teams will use to following procedure for approaching, opening, purging and sampling all wells unless directed otherwise by the workplan.

- Prior to placing any equipment into the well, decontaminate the sampling equipment 1) according to standard decontamination protocol.
- 2) Approach the well with a working FID/PID, a well key, and a depth-to-water meter.
- 3) Unlock and open the well cap just enough to insert the probe of the OVA or HNu. Take and record a reading. A decision to upgrade PPE may be necessary based on the FID/PID readings in the breathing zone.
- Where practical, the surface water column will be visually examined for the presence of 4) hydrocarbons, if present or suspected, the thickness of the hydrocarbon layer will be measured using an oil/water interface probe prior to taking the depth-to-water measurement.
- 5) Insert the water level probe into the well and measure and record the static water level to the nearest 0.01 m with respect to the established survey point on top of the well casing.

- 6) Decontaminate the water level probe with DDI water (Do not rinse with any solvents unless product was encountered).
- 7) Calculate and record the minimum volume of water to be purged according to the following conversion factors: -

1 well volume = water column in metres x litres/linear metre

2 inch casing = 2.0 LPM

4 inch casing = 8.1 LPM

6 inch casing = 18.2 LPM

8 inch casing = 32.4 LPM

- Purge the well of at least 3 casing volumes by pumping or bailing with a decontaminated submersible pump or PVC bailer equipped with a bottom filling check valve (if the purge volume is low, generally less than 100 litres, the sampling team might find it more efficient to purge with a bailer than a pump). Use a graduated bucket to track the amount of water removed from the well. Periodically determine the pH, temperature and specific conductance of the purged water. Continue purging until the well has been completely evacuated or until the pH and specific conductance measurements have stabilised for at least one well-volume. Wells that become dewatered prior to producing three casing volumes wall be sampled as soon as practical once they recover sufficiently.
- 9) Dispose of purge water collected in the graduated bucket by dumping onto the ground at a distance of 50 to 60 metres from the vicinity of the well. If the water is known or suspected to be significantly contaminated, it may be necessary to store the purge water in a secure container, such as a drum pending proper disposal.
- 10) Be aware and record any unusual occurrence during purging such as cascading (a shallow water entry zone that trickles into the borehole).

## 1.2 Field Parameter Measurement

Measurements of field parameters of pH, temperature and electrical conductivity are collected and organic vapour screening is conducted while the well is purged. To facilitate the collection of basic field parameters, the field team needs to: -

- Purge three well volumes of water from the well and measure field parameters for each well volume removed.
- Collection of water samples should take place after stabilisation of the following parameters: -
  - Temperature +/- 1°C
  - pH (meter or paper) +/- 0.2 units
  - Specific conductivity +/- 5%

- If the aforementioned parameters do not stabilise within three purge volumes, the well will be purged up to a maximum of six borehole volumes unless two consecutive sets of stabilised parameters are obtained.
- Note any observations in the field logbook.

# 1.3 Collection of Water Samples

All samples or chemical analysis will be placed in laboratory prepared bottles. The types of sample containers and preservative required for each type of analysis are described in the workplan. If required, preservatives will be placed in the sample containers prior to collecting the samples.

The following procedure will be used to sample a well: -

- 1) After the well has been purged and allowed to recover, sample the well using a properly decontaminated or dedicated disposable bailer. Gently lower the bailer into the water column. Allow the bailer to sink and fill with a minimum of surface disturbance.
- 2) Slowly raise the bailer out of the well. Do not allow the bailer line to contact the ground, either by coiling it on a clean plastic sheet or by looping it from arm to arm as the line is extracted from the well.
- Samples will be collected for VOCs analysis immediately after purging is complete and before other samples are collected. Four the samples slowly into the laboratory prepared 40 ml glass vial. Overfill each vial slightly to eliminate air bubbles, a convex meniscus should be present at the top of the vial. Ensure that the Teflon liner of the septum cap is facing inward and that no bubbles are entrapped. After capping securely, turn bottle upside-down, tap it against your other hand, and observe sample water for bubbles. If bubbles are observed, remove the cap, overfill the vial and reseal. Repeat this step for each vial until the samples with no bubbles are obtained.
- 4) Place a label on the container and enter the following information: -

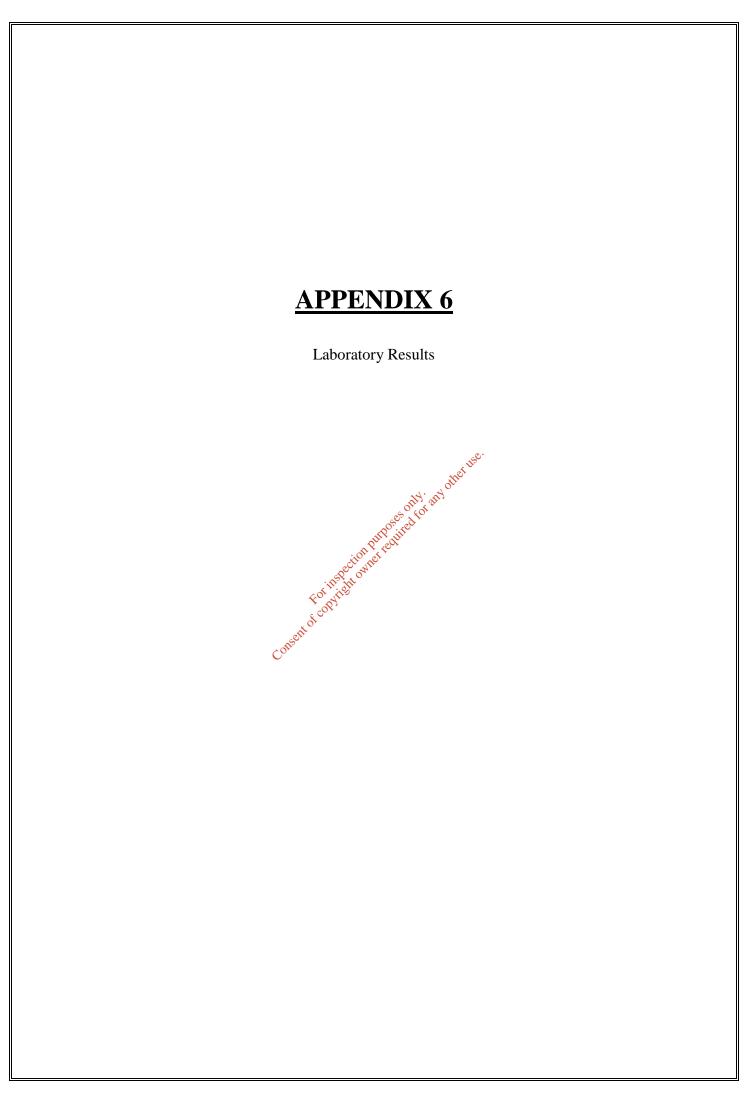
Client/Site Name
Date Collected
Time Collected
Analysis
Preservative
Sample Identification Number

- 5) Record pertinent information in the field logbook and on the Field Data Sheet for Well Sampling. Complete chain-of-custody form.
- 6) Place custody seals on the container caps. As soon as possible, place sample containers in a cooler with bagged ice and maintain at 4°C until extraction. Surround the bottles with vermiculite.

- 7) Obtain the semi-volatile compound/pesticides/PCBs sample(s) by transferring the water to a laboratory prepared 1000 ml amber glass bottle with Teflon-lined cap. Fill the bottle to the bottom of the neck and follow steps 4, 5 and 6 above.
- 8) Dissolved metals (if necessary) requires the team to filter the sample water through a .45 micron filter. The water is collected in a 1 litre, unpreserved, plastic or glass bottle with HNO<sub>3</sub> preservative. Filtering must be done within 15 minutes of sample collection.
- 9) Obtain the total metals sample by directly transferring the water from the bailer into a laboratory prepared 1000 ml plastic or glass bottle with HNO<sub>3</sub> preservative.
- 10) Be sure the pH of the metals sampled is less than 2 by pouring off an aliquot in a clean jar and testing for pH using litmus paper. Dispose of this water and rinse the jar.
- 11) Collect and prepare Field QA/QC samples in accordance with separate SOP.
- 12) Be sure to record all data required on the Field Data Sheet or Well Sampling and appropriate entries into the field logbook.
- 13) Secure the well cap and replace the locking cover.
- 14) Decontaminate all sampling equipment according to procedure.
- 15) Decontaminate submersible pumps as follows: -

Scrub pump and cord in a tab of Liquinox and potable water Pump at least 80 litres of soapy water through pump Rinse with potable water Pump at least 80 litres of rinse water through the pump Rinse with D1 water before lowering pump into the next well.

END.





Unit 3 Deeside Point

Zone 3

Deeside Industrial Park

Deeside CH5 2UA

O'Callaghan Moran & Associates Melbourne Business Park Model Farm Cork Ireland

Tel: +44 (0) 1244 833780 Fax: +44 (0) 1244 833781





Attention: Sean Moran

Date: 4th December, 2017

Your reference: 17.238.02

Our reference:

Location:

Gowran

Date samples received:

Status:

Final report IT/19137 Batch 1

Issue:

1

Four samples were received for analysis on 21st November, 2017 of which four were scheduled for analysis. Please find attached our Test Report which should be read with notes at the end of the report and should include all sections if reproduced. Interpretations and opinions are outside the which should be read with notes at the end of the report and should include all sections if reproduced. Interpretations and opinions are outside the scope of any accreditation, and all results relate only to samples supplied.

All analysis is carried out on as received samples and reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected.

Compiled By:

irlaumed.

**Lucas Halliwell** 

**Project Co-ordinator** 

Client Name: O'Callaghan Moran & Associates

 Reference:
 17.238.02

 Location:
 Gowran

 Contact:
 Sean Moran

 JE Job No.:
 17/19137

Report : Liquid

Liquids/products: V=40ml vial, G=glass bottle, P=plastic bottle

H=H<sub>2</sub>SO<sub>4</sub>, Z=ZnAc, N=NaOH, HN=HNO<sub>3</sub>

JE Job No.:	17/19137						H=H <sub>2</sub> SO <sub>4</sub> , 2	∠=∠nAc, N=	NaOH, HN=	HN0 <sub>3</sub>	_		
J E Sample No.	1-12	13-21	22-33	34-45									
Sample ID	BH-1A	BH-2	BH-3	TP-12									
Depth													
COC No / misc												e attached nations and a	
Containers	V H HNUF HCL N Z P BOD G	V H HNUF N P G	V H HNUF HCL N Z P BOD G	V H HNUF HCL N Z P BOD G									
Sample Date	20/11/2017	20/11/2017	20/11/2017	20/11/2017									
Sample Type	Ground Water	Ground Water	Ground Water	Ground Water									
Batch Number	1	1	1	1									Method
Date of Receipt	21/11/2017	21/11/2017	21/11/2017	21/11/2017							LOD/LOR	Units	No.
Dissolved Arsenic #	13.0	5.9	7.5	10.9							<2.5	ug/l	TM30/PM14
Dissolved Boron	217	29	26	219							<12	ug/l	TM30/PM14
Dissolved Cadmium #	<0.5	<0.5	<0.5	<0.5							<0.5	ug/l	TM30/PM14
Total Dissolved Chromium#	<1.5	<1.5	<1.5	<1.5							<1.5	ug/l	TM30/PM14
Dissolved Copper#	<7	<7	<7	<7							<7	ug/l	TM30/PM14
Dissolved Lead #	<5	<5	<5	<5							<5	ug/l	TM30/PM14
Dissolved Manganese #	157	<2	<2	466 <1 22 27.3 <3 23.5 6 4238  <0.1 <0.013 <0.013 <0.013 <							<2	ug/l	TM30/PM14
Dissolved Mercury#	<1	<1	<1	<1				se.			<1	ug/l	TM30/PM14
Dissolved Nickel #	9	<2	<2	22			,	net il.			<2	ug/l	TM30/PM14
Dissolved Potassium#	61.6	6.3	3.1	27.3			1. 40	d.			<0.1	mg/l	TM30/PM14
Dissolved Selenium#	<3	<3	<3	<3		(	My all,				<3	ug/l	TM30/PM14
Dissolved Sodium* Dissolved Zinc*	39.7 9	12.2 6	13.9	23.5		Ses	geo.				<0.1 <3	mg/l	TM30/PM14 TM30/PM14
Total Phosphorus	9112 <sub>AB</sub>	269	3064	4238		alif alif					<5 <5	ug/l ug/l	TM30/PM14
Total Filospilorus	SIIZAB	209	3004	4230	:.6	y Di Yell					ζ3	ug/i	110130/1 10114
PAH MS					aec'tie	MIL							
Naphthalene #	<0.1	<0.1	<0.1	<0.1	inspire						<0.1	ug/l	TM4/PM30
Acenaphthylene #	<0.013	<0.013	<0.013	<0.013	of Title						<0.013	ug/l	TM4/PM30
Acenaphthene #	<0.013	<0.013	<0.013	<0.013	COA						<0.013	ug/l	TM4/PM30
Fluorene #	<0.014	<0.014	<0.014	<0.014							<0.014	ug/l	TM4/PM30
Phenanthrene #	<0.011	<0.011	<0.011	<0.014 <0.011							<0.011	ug/l	TM4/PM30
Anthracene #	<0.013	<0.013	<0.013	<0.013							<0.013	ug/l	TM4/PM30
Fluoranthene #	<0.012	<0.012	<0.012	<0.012							<0.012	ug/l	TM4/PM30
Pyrene #	<0.013	<0.013	<0.013	<0.013							<0.013	ug/l	TM4/PM30
Benzo(a)anthracene #	<0.015	<0.015	<0.015	<0.015							<0.015	ug/l	TM4/PM30
Chrysene#	0.027	<0.011	0.015	0.018							<0.011	ug/l	TM4/PM30
Benzo(bk)fluoranthene #	<0.018	<0.018	<0.018	<0.018							<0.018	ug/l	TM4/PM30
Benzo(a)pyrene #	<0.016	<0.016 <0.011	<0.016	<0.016 <0.011							<0.016 <0.011	ug/l	TM4/PM30 TM4/PM30
Indeno(123cd)pyrene # Dibenzo(ah)anthracene #	<0.011	<0.011	<0.011 <0.01	<0.011							<0.011	ug/l ug/l	TM4/PM30 TM4/PM30
Benzo(ghi)perylene #	<0.01	<0.01	<0.01	<0.01							<0.01	ug/l	TM4/PM30
PAH 16 Total #	<0.195	<0.195	<0.195	<0.195							<0.195	ug/l	TM4/PM30
Benzo(b)fluoranthene	<0.01	<0.01	<0.01	<0.01							<0.01	ug/l	TM4/PM30
Benzo(k)fluoranthene	<0.01	<0.01	<0.01	<0.01							<0.01	ug/l	TM4/PM30
PAH Surrogate % Recovery	74	86	71	76							<0	%	TM4/PM30
		<u> </u>	<u> </u>										

Client Name: O'Callaghan Moran & Associates

 Reference:
 17.238.02

 Location:
 Gowran

 Contact:
 Sean Moran

 JE Job No.:
 17/19137

Report : Liquid

Liquids/products: V=40ml vial, G=glass bottle, P=plastic bottle

H=H<sub>2</sub>SO<sub>4</sub>, Z=ZnAc, N=NaOH, HN=HNO<sub>3</sub>

JE Job No.:	17/19137						H=H <sub>2</sub> SO <sub>4</sub> , Z	Z=ZnAc, N=	:NaOH, HN=	HN0 <sub>3</sub>	_		
J E Sample No.	1-12	13-21	22-33	34-45							Ì		
Sample ID	BH-1A	BH-2	BH-3	TP-12									
Depth											Diana		-+ fII
COC No / misc												e attached n ations and a	
	V H HM E HCL N Z P ROD G	V H HNUF N P G	V H HNUF HCL N Z P BOD G	V H HNUF HCL N Z P BOD G									
Sample Date													
Sample Type	Ground Water	Ground Water	Ground Water	Ground Water									
Batch Number	1	1	1	1							LOD/LOR	Units	Method
Date of Receipt	21/11/2017	21/11/2017	21/11/2017	21/11/2017									No.
Pesticides													
Organochlorine Pesticides		0.01											
Aldrin	<0.01	<0.01	<0.01	<0.01							<0.01	ug/l	TM149/PM30 TM149/PM30
Alpha-HCH (BHC) Beta-HCH (BHC)	<0.01 <0.01	<0.01 <0.01	<0.01 <0.01	<0.01 <0.01							<0.01 <0.01	ug/l ug/l	TM149/PM30
Delta-HCH (BHC)	<0.01	<0.01	<0.01	<0.01							<0.01	ug/l	TM149/PM30
Dieldrin	<0.01	<0.01	<0.01	<0.01							<0.01	ug/l	TM149/PM30
Endosulphan I	<0.01	<0.01	<0.01	<0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01 <0.01				.01*			<0.01	ug/l	TM149/PM30
Endosulphan II	<0.01	<0.01	<0.01	<0.01				21150			<0.01	ug/l	TM149/PM30
Endosulphan sulphate	<0.01	<0.01	<0.01	<0.01			. 0	ne,			<0.01	ug/l	TM149/PM30
Endrin	<0.01	<0.01	<0.01	<0.01			मात्र आत्र				<0.01	ug/l	TM149/PM30
Gamma-HCH (BHC)	<0.01	<0.01	<0.01	<0.01		_ces	2 for				<0.01	ug/l	TM149/PM30
Heptachlor	<0.01	<0.01	<0.01	<0.01		110° 111°	5				<0.01	ug/l	TM149/PM30
Heptachlor Epoxide	<0.01	<0.01	<0.01	<0.01		d bir ledt					<0.01	ug/l	TM149/PM30
o,p'-Methoxychlor	<0.01 <0.01	<0.01 <0.01	<0.01 <0.01	<0.01	ctio	Milex					<0.01 <0.01	ug/l	TM149/PM30 TM149/PM30
p,p'-DDE p,p'-DDT	<0.01	<0.01	<0.01	<0.01	insputo						<0.01	ug/l ug/l	TM149/PM30
p,p'-Methoxychlor	<0.01	<0.01	<0.01	<0.02	of Title						<0.01	ug/l	TM149/PM30
p,p'-TDE	<0.01	<0.01	<0.01	<0.01 🐒	ob.						<0.01	ug/l	TM149/PM30
Organophosphorus Pesticides				<0.01 of (									
Azinphos methyl	<0.10 <sub>AC</sub>	<0.10 <sub>AC</sub>	<0.10 <sub>AC</sub>	€ 60.10 <sub>AC</sub>							<0.01	ug/l	TM149/PM30
Diazinon	<0.01	<0.01	<0.01	<0.01							<0.01	ug/l	TM149/PM30
Dichlorvos	<0.01	<0.01	<0.01	<0.01							<0.01	ug/l	TM149/PM30
Disulfoton	<0.01	<0.01	<0.01	<0.01							<0.01	ug/l	TM149/PM30
Ethion	<0.01	<0.01	<0.01	<0.01							<0.01	ug/l	TM149/PM30
Ethyl Parathion (Parathion)	<0.01	<0.01	<0.01	<0.01							<0.01	ug/l	TM149/PM30 TM149/PM30
Fenitrothion  Malathion	<0.01 <0.01	<0.01 <0.01	<0.01 <0.01	<0.01 <0.01							<0.01 <0.01	ug/l ug/l	TM149/PM30
Methyl Parathion	<0.01	<0.01	<0.01	<0.01							<0.01	ug/l	TM149/PM30
Mevinphos	<0.01	<0.01	<0.01	<0.01							<0.01	ug/l	TM149/PM30
Benazolin	<0.1	<0.1	<0.1	<0.1							<0.1	ug/l	TM42/PM30
Bentazone	<0.1	<0.1	<0.1	<0.1							<0.1	ug/l	TM42/PM30
Bromoxynil	<0.1	<0.1	<0.1	<0.1							<0.1	ug/l	TM42/PM30
Clopyralid	<0.1	<0.1	<0.1	<0.1							<0.1	ug/l	TM42/PM30
4 - CPA	<0.1	<0.1	<0.1	<0.1							<0.1	ug/l	TM42/PM30
2,4 - D	<0.1	<0.1	<0.1	<0.1							<0.1	ug/l	TM42/PM30
2,4 - DB Dicamba	<0.1 <0.1	<0.1 <0.1	<0.1 <0.1	<0.1 <0.1							<0.1 <0.1	ug/l ug/l	TM42/PM30 TM42/PM30
Dichloroprop	<0.1	<0.1	<0.1	<0.1							<0.1	ug/l ug/l	TM42/PM30
Dichloroprop	<0.1	<0.1	<0.1	<0.1							<0.1	ug/l	TM42/PM30
Fenoprop	<0.1	<0.1	<0.1	<0.1							<0.1	ug/l	TM42/PM30
Flamprop	<0.1	<0.1	<0.1	<0.1							<0.1	ug/l	TM42/PM30
			1	1	1	1		1	1				TM42/PM30

Client Name: O'Callaghan Moran & Associates

 Reference:
 17.238.02

 Location:
 Gowran

 Contact:
 Sean Moran

 JE Job No.:
 17/19137

Report : Liquid

Liquids/products: V=40ml vial, G=glass bottle, P=plastic bottle

H=H<sub>2</sub>SO<sub>4</sub>, Z=ZnAc, N=NaOH, HN=HNO<sub>3</sub>

JE Job No.:	17/19137						H=H <sub>2</sub> SO <sub>4</sub> , 2	Z=ZNAC, N=	inaon, nin=	:HINU3	_		
J E Sample No.	1-12	13-21	22-33	34-45									
Sample ID	BH-1A	BH-2	BH-3	TP-12									
Depth											Please se	e attached n	otos for all
COC No / misc												ations and a	
Containers	V H HNUF HCL N Z P BOD G	V H HNUF N P G	V H HNUF HCL N Z P BOD G	V H HNUF HCL N Z P BOD G									
Sample Date													
Sample Type													
Batch Number	1	1	1	1							LOD/LOR	Units	Method No.
Date of Receipt													
loxynil	<0.1	<0.1	<0.1	<0.1							<0.1	ug/l	TM42/PM30
MCPA MCPB	<0.1 <0.1	<0.1	<0.1 <0.1	<0.1 <0.1							<0.1	ug/l	TM42/PM30 TM42/PM30
Mecoprop	<0.1	<0.1 <0.1	<0.1	<0.1							<0.1 <0.1	ug/l ug/l	TM42/PM30
Picloram	<0.1	<0.1	<0.1	<0.1							<0.1	ug/l	TM42/PM30
Pentachlorophenol	<0.1	<0.1	<0.1	<0.1							<0.1	ug/l	TM42/PM30
2,4,5 - T	<0.1	<0.1	<0.1	<0.1							<0.1	ug/l	TM42/PM30
2,3,6 - TBA	<0.1	<0.1	<0.1	<0.1				.01*			<0.1	ug/l	TM42/PM30
Triclopyr	<0.1	<0.1	<0.1	<0.1	n inspection			et use			<0.1	ug/l	TM42/PM30
Resorcinol	<0.01	<0.01	<0.01	-0.01			· 4. 24.				<0.01	ma/l	TM26/PM0
Catechol	<0.01	<0.01	<0.01	<0.01		. (	ally all,				<0.01	mg/l mg/l	TM26/PM0
Phenol #	<0.01	<0.01	<0.01	<0.01		- OS 16	gro				<0.01	mg/l	TM26/PM0
m/p-cresol	<0.02	<0.02	<0.02	<0.02		OH Chil					<0.02	mg/l	TM26/PM0
o-cresol	<0.01	<0.01	<0.01	<0.01	أكن	y Street					<0.01	mg/l	TM26/PM0
Total cresols #	<0.03	<0.03	<0.03	<0.03	Joech C	WITE					<0.03	mg/l	TM26/PM0
Xylenols #	<0.06	<0.06	<0.06	<0.06	instruction of						<0.06	mg/l	TM26/PM0
1-naphthol	<0.01	<0.01	<0.01	<0.01 🕏	20 ALLE						<0.01	mg/l	TM26/PM0
2,3,5-trimethyl phenol	<0.01	<0.01	<0.01	<0.01	004						<0.01	mg/l	TM26/PM0
2-isopropylphenol	<0.01	<0.01	<0.01	<0.01							<0.01	mg/l	TM26/PM0
Total Speciated Phenols HPLC	<0.1	<0.1	<0.1	<0.01 of <0.							<0.1	mg/l	TM26/PM0
Sulphate as SO4 #	51.0	20.5	15.9	61.8							<0.5	mg/l	TM38/PM0
Chloride #	40.8	21.4	28.7	22.5							<0.3	mg/l	TM38/PM0
Nitrate as NO3#	131.0	22.6	23.2	1.5							<0.2	mg/l	TM38/PM0
Nitrite as NO2#	1.48	<0.02	<0.02	0.03							<0.02	mg/l	TM38/PM0
Ortho Phosphate as P#	<0.03	<0.03	<0.03	<0.03							<0.03	mg/l	TM38/PM0
Total Oxidised Nitrogen as N #	30.0	5.1	5.2	0.4							<0.2	mg/l	TM38/PM0
Total Cyanide #	<0.01	<0.01	<0.01	<0.01							<0.01	mg/l	TM89/PM0
Ammoniacal Nitrogen as N#	17.49	0.08	0.10	10.07							<0.03	mg/l	TM38/PM0
BOD (Settled)#	<1	1	1	13							<1	mg/l	TM58/PM0
COD (Settled) #	27	50	19	46							<7	mg/l	TM57/PM0
Total Organic Carbon #	<2	<2	<2	22							<2	mg/l	TM60/PM0
Total Dissolved Solids #	832	528	380	911							<35	mg/l	TM20/PM0
													1

Client Name: O'Callaghan Moran & Associates

 Reference:
 17.238.02

 Location:
 Gowran

 Contact:
 Sean Moran

 JE Job No.:
 17/19137

SVOC Report : Liquid

JE Job No.:	17/19137											
J E Sample No.	1-12	13-21	22-33	34-45								
Sample ID	BH-1A	BH-2	BH-3	TP-12								
Depth										Please se	e attached n	otos for all
COC No / misc											ations and a	
Containers	V H HNUF HCL N Z P BOD G	V H HNUF N P G	V H HNUF HCL N Z P BOD G	V H HNUF HCL N Z P BOD G								
Sample Date	20/11/2017	20/11/2017	20/11/2017	20/11/2017								
Sample Type	Ground Water	Ground Water	Ground Water	Ground Water								
Batch Number	1	1	1	1						LOD/LOR	Units	Method
Date of Receipt	21/11/2017	21/11/2017	21/11/2017	21/11/2017						LOD/LOR	Units	No.
SVOC MS												
Phenols												
2-Chlorophenol#	<1	<1	<1	<1						<1	ug/l	TM16/PM30
2-Methylphenol #	<0.5	<0.5	<0.5	<0.5						<0.5	ug/l	TM16/PM30
2-Nitrophenol	<0.5	<0.5	<0.5	<0.5						<0.5	ug/l	TM16/PM30
2,4-Dichlorophenol #	<0.5	<0.5	<0.5	<0.5						<0.5	ug/l	TM16/PM30
2,4-Dimethylphenol	<1 <0.5	<1 <0.5	<1 <0.5	<1 <0.5						<1 <0.5	ug/l	TM16/PM30 TM16/PM30
2,4,5-Trichlorophenol # 2,4,6-Trichlorophenol	<0.5	<0.5	<0.5	<0.5						<0.5	ug/l ug/l	TM16/PM30
4-Chloro-3-methylphenol #	<0.5	<0.5	<0.5	<0.5						<0.5	ug/l	TM16/PM30
4-Methylphenol	<1	<1	<1	<1						<1	ug/l	TM16/PM30
4-Nitrophenol	<10	<10	<10	<10						<10	ug/l	TM16/PM30
Pentachlorophenol	<1	<1	<1	<1						<1	ug/l	TM16/PM30
Phenol	<1	<1	<1	<1						<1	ug/l	TM16/PM30
PAHs												
2-Chloronaphthalene #	<1	<1	<1	<1						<1	ug/l	TM16/PM30
2-Methylnaphthalene <sup>#</sup> Phthalates	<1	<1	<1	<1	s inspection			est use.		<1	ug/l	TM16/PM30
Bis(2-ethylhexyl) phthalate	<5	<5	<5	<5			. 8	(I)		<5	ug/l	TM16/PM30
Butylbenzyl phthalate	<1	<1	<1	<1			14. M			<1	ug/l	TM16/PM30
Di-n-butyl phthalate #	<1.5	<1.5	<1.5	<1.5		۵.	N. O. W			<1.5	ug/l	TM16/PM30
Di-n-Octyl phthalate	<1	<1	<1	<1		<b>-0</b> 5.48	9,			<1	ug/l	TM16/PM30 TM16/PM30
Diethyl phthalate # Dimethyl phthalate	<1 <1	<1 <1	<1 <1	<1 <1		aliferial				<1 <1	ug/l	TM16/PM30
Other SVOCs  1,2-Dichlorobenzene #	<1	<1	<1	<1	cito	iner jeux				<1	ug/l ug/l	TM16/PM30
1,2,4-Trichlorobenzene #	<1	<1	<1	<1	250,0	4				<1	ug/l	TM16/PM30
1,3-Dichlorobenzene #	<1	<1	<1	<1	illight					<1	ug/l	TM16/PM30
1,4-Dichlorobenzene #	<1	<1	.4	<1	201/1					<1	ug/l	TM16/PM30
2-Nitroaniline	<1	<1	<1	<1 of (1) (1) (1) (1) (1) (1) (1) (1) (1) (1)	0,					<1	ug/l	TM16/PM30
2,4-Dinitrotoluene #	<0.5	<0.5	<0.5	<0.5						<0.5	ug/l	TM16/PM30
2,6-Dinitrotoluene	<1	<1	<1	75E1						<1	ug/l	TM16/PM30
3-Nitroaniline	<1	<1	<1 (	<b>1 20 1</b>						<1	ug/l	TM16/PM30
4-Bromophenylphenylether #	<1	<1	~ '	`'						<1	ug/l	TM16/PM30
4-Chloroaniline	<1	<1	<1	<1						<1	ug/l	TM16/PM30
4-Chlorophenylphenylether #	<1	<1	<1	<1						<1	ug/l	TM16/PM30
4-Nitroaniline	<0.5	<0.5	<0.5	<0.5						<0.5	ug/l	TM16/PM30
Azobenzene #	<0.5 <0.5	<0.5 <0.5	<0.5 <0.5	<0.5 <0.5						<0.5 <0.5	ug/l	TM16/PM30 TM16/PM30
Bis(2-chloroethoxy)methane   Bis(2-chloroethyl)ether   #	<0.5 <1	<0.5 <1	<0.5 <1	<0.5 <1						<0.5 <1	ug/l ug/l	TM16/PM30 TM16/PM30
Carbazole #	<0.5	<0.5	<0.5	<0.5						<0.5	ug/I ug/I	TM16/PM30
Dibenzofuran #	<0.5	<0.5	<0.5	<0.5						<0.5	ug/l	TM16/PM30
Hexachlorobenzene#	<1	<1	<1	<1						<1	ug/l	TM16/PM30
Hexachlorobutadiene #	<1	<1	<1	<1						<1	ug/l	TM16/PM30
Hexachlorocyclopentadiene	<1	<1	<1	<1						<1	ug/l	TM16/PM30
Hexachloroethane #	<1	<1	<1	<1						<1	ug/l	TM16/PM30
Isophorone #	<0.5	<0.5	<0.5	<0.5						<0.5	ug/l	TM16/PM30
N-nitrosodi-n-propylamine #	<0.5	<0.5	<0.5	<0.5						<0.5	ug/l	TM16/PM30
Nitrobenzene #	<1	<1	<1	<1						<1	ug/l	TM16/PM30
Surrogate Recovery 2-Fluorobiphenyl	108	119	117	105						<0	%	TM16/PM30
Surrogate Recovery p-Terphenyl-d14	107	119	105	103						<0	%	TM16/PM30

Client Name: O'Callaghan Moran & Associates

 Reference:
 17.238.02

 Location:
 Gowran

 Contact:
 Sean Moran

 JE Job No.:
 17/19137

VOC Report : Liquid

JE Job No.:	17/19137											
J E Sample No.	1-12	13-21	22-33	34-45								
Sample ID	BH-1A	BH-2	BH-3	TP-12								
Depth										Please se	e attached n	notes for all
COC No / misc											ations and a	
Containers	V H HNUF HCL N Z P BOD G	V H HNUF N P G	V H HNUF HCL N Z P BOD G	V H HNUF HCL N Z P BOD G								
Sample Date	20/11/2017	20/11/2017		20/11/2017								
Sample Type	Ground Water	Ground Water		Ground Water								1
Batch Number Date of Receipt	1 21/11/2017	1 21/11/2017	1 21/11/2017	1 21/11/2017						LOD/LOR	Units	Method No.
VOC MS	21/11/2017	21/11/2017	21/11/2017	21/11/2017								110.
Dichlorodifluoromethane	<2	<2	<2	<2						<2	ug/l	TM15/PM10
Methyl Tertiary Butyl Ether #	<0.1	<0.1	<0.1	<0.1						<0.1	ug/l	TM15/PM10
Chloromethane #	<3	<3	<3	<3						<3	ug/l	TM15/PM10
Vinyl Chloride #	<0.1	<0.1	<0.1	<0.1						<0.1	ug/l	TM15/PM10
Bromomethane Chloroethane #	<1	<1	<1	<1 <3						<1	ug/l	TM15/PM10 TM15/PM10
Chioroethane Trichlorofluoromethane#	<3 <3	<3 <3	<3 <3	<3 <3						<3 <3	ug/l ug/l	TM15/PM10
1,1-Dichloroethene (1,1 DCE) #	<3	<3	<3	<3						<3	ug/l	TM15/PM10
Dichloromethane (DCM)#	<5	<5	<5	<5						<5	ug/l	TM15/PM10
trans-1-2-Dichloroethene #	<3	<3	<3	<3						<3	ug/l	TM15/PM10
1,1-Dichloroethane #	<3	<3	<3	<3						<3	ug/l	TM15/PM10
cis-1-2-Dichloroethene #	<3	<3	<3	<3						<3	ug/l	TM15/PM10
2,2-Dichloropropane  Bromochloromethane #	<1 <2	<1 <2	<1 <2	<1 <2						<1 <2	ug/l ug/l	TM15/PM10 TM15/PM10
Chloroform#	<2	<2	2	<2						<2	ug/l	TM15/PM10
1,1,1-Trichloroethane #	<2	<2	<2	<2				్డం.		<2	ug/l	TM15/PM10
1,1-Dichloropropene#	<3	<3	<3	<3	ringedio oprieta			exti		<3	ug/l	TM15/PM10
Carbon tetrachloride #	<2	<2	<2	<2			ď	ne		<2	ug/l	TM15/PM10
1,2-Dichloroethane#	<2	<2	<2	<2			475. 612			<2	ug/l	TM15/PM10
Benzene # Trichloroethene (TCE) #	<0.5 <3	<0.5 <3	<0.5 <3	<0.5 <3		چ	) for			<0.5 <3	ug/l ug/l	TM15/PM10 TM15/PM10
1,2-Dichloropropane #	<2	<2	<2	<2		205,00	,			<2	ug/l	TM15/PM10
Dibromomethane #	<3	<3	<3	<3		DILLEGIII				<3	ug/l	TM15/PM10
Bromodichloromethane #	<2	<2	2	<2	;o	i si io				<2	ug/l	TM15/PM10
cis-1-3-Dichloropropene	<2	<2	<2	<2	Secre	NITE				<2	ug/l	TM15/PM10
Toluene #	<5	<5	<5	<5	Hight					<5	ug/l	TM15/PM10
trans-1-3-Dichloropropene 1,1,2-Trichloroethane#	<2 <2	<2 <2	<2 <2	<2 <2 <b>\$</b>	of Alice					<2 <2	ug/l ug/l	TM15/PM10 TM15/PM10
Tetrachloroethene (PCE) #	<3	<3	<3	<3 of ( ) ( ) ( ) ( ) ( ) ( ) ( ) ( ) ( ) (	os.					<3	ug/l	TM15/PM10
1,3-Dichloropropane #	<2	<2	<2	<201						<2	ug/l	TM15/PM10
Dibromochloromethane #	<2	<2	3	~£2						<2	ug/l	TM15/PM10
1,2-Dibromoethane #	<2	<2	<2 (	<b>101</b> <2						<2	ug/l	TM15/PM10
Chlorobenzene #	<2	<2	<2	<2						<2	ug/l	TM15/PM10
1,1,1,2-Tetrachloroethane #	<2 <1	<2 <1	<2 <1	<2 <1						<2	ug/l	TM15/PM10 TM15/PM10
Ethylbenzene # p/m-Xylene #	<2	<2	<2	<2						<1 <2	ug/l ug/l	TM15/PM10
o-Xylene #	<1	<1	<1	<1						<1	ug/l	TM15/PM10
Styrene	<2	<2	<2	<2						<2	ug/l	TM15/PM10
Bromoform#	<2	<2	<2	<2						<2	ug/l	TM15/PM10
Isopropylbenzene #	<3	<3	<3	<3						<3	ug/l	TM15/PM10
1,1,2,2-Tetrachloroethane Bromobenzene#	<4 <2	<4	<4	<4						<4	ug/l	TM15/PM10 TM15/PM10
Bromobenzene " 1,2,3-Trichloropropane #	<2 <3	<2 <3	<2 <3	<2 <3						<2 <3	ug/l ug/l	TM15/PM10
Propylbenzene #	<3	<3	<3	<3						<3	ug/l	TM15/PM10
2-Chlorotoluene #	<3	<3	<3	<3						<3	ug/l	TM15/PM10
1,3,5-Trimethylbenzene #	<3	<3	<3	<3						<3	ug/l	TM15/PM10
4-Chlorotoluene #	<3	<3	<3	<3						<3	ug/l	TM15/PM10
tert-Butylbenzene #	<3	<3	<3	<3						<3	ug/l	TM15/PM10
1,2,4-Trimethylbenzene * sec-Butylbenzene *	<3 <3	<3 <3	<3 <3	<3 <3						<3 <3	ug/l ug/l	TM15/PM10 TM15/PM10
4-Isopropyltoluene #	<3	<3	<3	<3						<3	ug/l	TM15/PM10
1,3-Dichlorobenzene #	<3	<3	<3	<3						<3	ug/l	TM15/PM10
1,4-Dichlorobenzene #	<3	<3	<3	<3						<3	ug/l	TM15/PM10
n-Butylbenzene #	<3	<3	<3	<3						<3	ug/l	TM15/PM10
1,2-Dichlorobenzene #	<3	<3	<3	<3						<3	ug/l	TM15/PM10
1,2-Dibromo-3-chloropropane 1,2,4-Trichlorobenzene	<2 <3	<2 <3	<2 <3	<2 <3						<2 <3	ug/l ug/l	TM15/PM10 TM15/PM10
Hexachlorobutadiene	<3 <3	<3	<3 <3	<3 <3						<3 <3	ug/l	TM15/PM10
Naphthalene	<2	<2	<2	<2						<2	ug/l	TM15/PM10
1,2,3-Trichlorobenzene	<3	<3	<3	<3						<3	ug/l	TM15/PM10
Surrogate Recovery Toluene D8	92	89	91	92						<0	%	TM15/PM10
Surrogate Recovery 4-Bromofluorobenzene	107	104	106	106						<0	%	TM15/PM10

Exova Jones Environmental Notification of Deviating Samples

Client Name: O'Callaghan Moran & Associates

Reference: 17.238.02 Location: Gowran Contact: Sean Moran

J E Job No.	Batch	Sample ID	Depth	J E Sample No.	Analysis	Reason
					No deviating sample report results for job 17/19137	
					het he	
					Off A state of	
					Consent of copyright owner tearing for any other tise.	
					cition Pic teals	
					at its fet on "	
					K CODY	
					a meent o	

Please note that only samples that are deviating are mentioned in this report. If no samples are listed it is because none were deviating. Only analyses which are accredited are recorded as deviating if set criteria are not met.

#### NOTES TO ACCOMPANY ALL SCHEDULES AND REPORTS

JE Job No.: 17/19137

SOILS

Please note we are only MCERTS accredited (UK soils only) for sand, loam and clay and any other matrix is outside our scope of accreditation.

Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation has been performed on clay, sand and loam, only samples that are predominantly these matrices, or combinations of them will be within our MCERTS scope. If samples are not one of a combination of the above matrices they will not be marked as MCERTS accredited

It is assumed that you have taken representative samples on site and require analysis on a representative subsample. Stones will generally be included unless we are requested to remove them.

All samples will be discarded one month after the date of reporting, unless we are instructed to the contrary.

If you have not already done so, please send us a purchase order if this is required by your company.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

All analysis is reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected. Samples are dried at 35°C ±5°C unless otherwise stated. Moisture content for CEN Leachate tests are dried at 105°C ±5°C.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

Where a CEN 10:1 ZERO Headspace VOC test has been carried out, a 10:1 ratio of water to wet (as received) soil has been used.

% Asbestos in Asbestos Containing Materials (ACMs) is determined by reference to HSG 264 The Survey Guide - Appendix 2 : ACMs in buildings listed in order of ease of fibre release.

Negative Neutralization Potential (NP) values are obtained when the volume of NaOH (0.1N) titrated (pH 8.3) is greater than the volume of HCI (1N) to reduce the pH of the sample to 2.0 - 2.5. Any negative NP values are corrected to 0.

The calculation of Pyrite content assumes that all oxidisable sulphides present in the sample are pyrite. This may not be the case. The calculation may be an overesitimate when other sulphides such as Barite (Barium Sulphate) are present.

#### **WATERS**

Please note we are not a UK Drinking Water Inspectorate (DWI) Approved Laboratory .

ISO17025 accreditation applies to surface water and groundwater and usually one other matrix which is analysis specific, any other liquids are outside our scope of accreditation. 00 fot

As surface waters require different sample preparation to groundwaters the land a surface waters require different sample preparation to groundwaters the land a surface waters require different sample preparation to groundwaters the land a surface waters require different sample preparation to groundwaters the land a surface water sample preparation to groundwaters the land a surface water sample preparation to groundwaters the land a surface water sample preparation to groundwaters the land a surface water sample preparation to groundwaters the land a surface water sample preparation to groundwaters the land a surface water sample preparation to groundwaters the land a surface water sample preparation to groundwaters the land a surface water sample preparation to groundwaters the land a surface water sample preparation to groundwaters the land a surface water sample preparation to groundwaters the land a surface water sample preparation to groundwaters the land a surface water sample preparation to groundwaters and the land a surface water sample preparation to groundwaters and the land a surface water sample preparation to groundwaters and the land a surface water sample preparation to groundwaters and the land a surface water sample preparation to groundwaters and the land a surface water sample preparation to groundwaters and the land a surface water sample preparation to groundwaters and the land a surface water sample preparation to groundwaters and the land a surface water sample preparation to groundwaters and the land a surface water sample preparation to groundwaters and the land a surface water sample preparation to groundwaters and the surface water sample prepara

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

#### **DEVIATING SAMPLES**

For Samples must be received in a condition appropriate to the equested analyses. All samples should be submitted to the laboratory in suitable containers with sufficient ice packs to sustain an appropriate temperature for the requested analysis. If this is not the case you will be informed and any test results that may be compromised highlighted on wur deviating samples report.

#### **SURROGATES**

Surrogate compounds are added during the preparation process to monitor recovery of analytes. However low recovery in soils is often due to peat, clay or other organic rich matrices. For waters this can be due to oxidants, surfactants, organic rich sediments or remediation fluids. Acceptable limits for most organic methods are 70 - 130% and for VOCs are 50 - 150%. When surrogate recoveries are outside the performance criteria but the associated AQC passes this is assumed to be due to matrix effect. Results are not surrogate corrected.

#### **DILUTIONS**

A dilution suffix indicates a dilution has been performed and the reported result takes this into account. No further calculation is required.

#### **BLANKS**

Where analytes have been found in the blank, the sample will be treated in accordance with our laboratory procedure for dealing with contaminated blanks.

#### NOTE

Data is only reported if the laboratory is confident that the data is a true reflection of the samples analysed. Data is only reported as accredited when all the requirements of our Quality System have been met. In certain circumstances where all the requirements of the Quality System have not been met, for instance if the associated AQC has failed, the reason is fully investigated and documented. The sample data is then evaluated alongside the other quality control checks performed during analysis to determine its suitability. Following this evaluation, provided the sample results have not been effected, the data is reported but accreditation is removed. It is a UKAS requirement for data not reported as accredited to be considered indicative only, but this does not mean the data is not valid.

Where possible, and if requested, samples will be re-extracted and a revised report issued with accredited results. Please do not hesitate to contact the laboratory if further details are required of the circumstances which have led to the removal of accreditation.

#### REPORTS FROM THE SOUTH AFRICA LABORATORY

Any method number not prefixed with SA has been undertaken in our UK laboratory unless reported as subcontracted.

## **ABBREVIATIONS and ACRONYMS USED**

# ISO17025 (JUKAS Ref No. 4225) accredited - UK.  SA ISO17025 (SANAS Ref No. 10729) accredited - South Africa.  B Indicates analyte found in associated method blank.  DR Dilution required.  M MCERTS accredited.  NA Not applicable  NAD No Asbestos Detected.  ND None Detected (usually refers to VOC and/SVOC TICs).  NDP No Determination Possible  SS Calibrated against a single substance  SV Surrogate recovery outside performance criteria. This may be due to a matrix effect.  W Results expressed on as received basis.  + AQC failure, accreditation has been removed from this result, if appropriate, see "Note" on previous page.  ++ Result outside calibration range, results should be considered as indicative only and are not accredited.  * Analysis subcontracted to a Jones Environmental approved laboratory.  AD Samples are dried at 35°C ±5°C  CO Suspected carry over  LOD/LOR Limit of Detection (Limit of Reporting) in line with ISO 17025 and MCERTS  ME Matrix Effect  NFD No Fibres Detected  BS AQC Sample  LB Blank Sample  OC Outside Calibration Range  AA ×2 Dilution  AG x10 Dilution		
B Indicates analyte found in associated method blank.  DR Dilution required.  M MCERTS accredited.  NA Not applicable  NAD No Asbestos Detected.  ND None Detected (usually refers to VOC and/SVOC TICs).  NDP No Determination Possible  SS Calibrated against a single substance  SV Surrogate recovery outside performance criteria. This may be due to a matrix effect.  W Results expressed on as received basis.  + AQC failure, accreditation has been removed from this result, if appropriate, see 'Note' on previous page.  ++ Result outside calibration range, results should be considered as indicative only and are not accredited.  * Analysis subcontracted to a Jones Environmental approved laboratory.  AD Samples are dried at 35°C ±5°C  CO Suspected carry over  LOD/LOR Limit of Detection (Limit of Reporting) in line with ISO 17025 and MCERTS	#	ISO17025 (UKAS Ref No. 4225) accredited - UK.
DR Dilution required.  M MCERTS accredited.  NA Not applicable  NAD No Asbestos Detected.  ND None Detected (usually refers to VOC and/SVOC TICs).  NDP No Determination Possible  SS Calibrated against a single substance  SV Surrogate recovery outside performance criteria. This may be due to a matrix effect.  W Results expressed on as received basis.  + AQC failure, accreditation has been removed from this result, if appropriate, see 'Note' on previous page.  ++ Result outside calibration range, results should be considered as indicative only and are not accredited.  * Analysis subcontracted to a Jones Environmental approved laboratory.  AD Samples are dried at 35°C ±5°C  CO Suspected carry over  LOD/LOR Limit of Detection (Limit of Reporting) in line with ISO 17025 and MCERTS	SA	ISO17025 (SANAS Ref No.T0729) accredited - South Africa.
M MCERTS accredited.  NA Not applicable  NAD No Asbestos Detected.  ND None Detected (usually refers to VOC and/SVOC TICs).  NDP No Determination Possible  SS Calibrated against a single substance  SV Surrogate recovery outside performance criteria. This may be due to a matrix effect.  W Results expressed on as received basis.  + AQC failure, accreditation has been removed from this result, if appropriate, see 'Note' on previous page.  ++ Result outside calibration range, results should be considered as indicative only and are not accredited.  * Analysis subcontracted to a Jones Environmental approved laboratory.  AD Samples are dried at 35°C ±5°C  CO Suspected carry over  LOD/LOR Limit of Detection (Limit of Reporting) in line with ISO 17025 and MCERTS	В	Indicates analyte found in associated method blank.
NAD No Asbestos Detected.  ND None Detected (usually refers to VOC and/SVOC TICs).  NDP No Determination Possible  SS Calibrated against a single substance  SV Surrogate recovery outside performance criteria. This may be due to a matrix effect.  W Results expressed on as received basis.  + AQC failure, accreditation has been removed from this result, if appropriate, see 'Note' on previous page.  ++ Result outside calibration range, results should be considered as indicative only and are not accredited.  * Analysis subcontracted to a Jones Environmental approved laboratory.  AD Samples are dried at 35°C ±5°C  CO Suspected carry over  LOD/LOR Limit of Detection (Limit of Reporting) in line with ISO 17025 and MCERTS	DR	Dilution required.
NAD No Asbestos Detected.  ND None Detected (usually refers to VOC and/SVOC TICs).  NDP No Determination Possible  SS Calibrated against a single substance  SV Surrogate recovery outside performance criteria. This may be due to a matrix effect.  W Results expressed on as received basis.  + AQC failure, accreditation has been removed from this result, if appropriate, see 'Note' on previous page.  ++ Result outside calibration range, results should be considered as indicative only and are not accredited.  * Analysis subcontracted to a Jones Environmental approved laboratory.  AD Samples are dried at 35°C ±5°C  CO Suspected carry over  LOD/LOR Limit of Detection (Limit of Reporting) in line with ISO 17025 and MCERTS  ME Matrix Effect	M	MCERTS accredited.
ND None Detected (usually refers to VOC and/SVOC TICs).  NDP No Determination Possible  SS Calibrated against a single substance  SV Surrogate recovery outside performance criteria. This may be due to a matrix effect.  W Results expressed on as received basis.  + AQC failure, accreditation has been removed from this result, if appropriate, see 'Note' on previous page.  ++ Result outside calibration range, results should be considered as indicative only and are not accredited.  * Analysis subcontracted to a Jones Environmental approved laboratory.  AD Samples are dried at 35°C ±5°C  CO Suspected carry over  LOD/LOR Limit of Detection (Limit of Reporting) in line with ISO 17025 and MCERTS  ME Matrix Effect	NA	Not applicable
NDP No Determination Possible  SS Calibrated against a single substance  SV Surrogate recovery outside performance criteria. This may be due to a matrix effect.  W Results expressed on as received basis.  + AQC failure, accreditation has been removed from this result, if appropriate, see 'Note' on previous page.  ++ Result outside calibration range, results should be considered as indicative only and are not accredited.  * Analysis subcontracted to a Jones Environmental approved laboratory.  AD Samples are dried at 35°C ±5°C  CO Suspected carry over  LOD/LOR Limit of Detection (Limit of Reporting) in line with ISO 17025 and MCERTS	NAD	No Asbestos Detected.
SS Calibrated against a single substance  SV Surrogate recovery outside performance criteria. This may be due to a matrix effect.  W Results expressed on as received basis.  + AQC failure, accreditation has been removed from this result, if appropriate, see 'Note' on previous page.  ++ Result outside calibration range, results should be considered as indicative only and are not accredited.  * Analysis subcontracted to a Jones Environmental approved laboratory.  AD Samples are dried at 35°C ±5°C  CO Suspected carry over  LOD/LOR Limit of Detection (Limit of Reporting) in line with ISO 17025 and MCERTS  ME Matrix Effect	ND	None Detected (usually refers to VOC and/SVOC TICs).
SV Surrogate recovery outside performance criteria. This may be due to a matrix effect.  W Results expressed on as received basis.  + AQC failure, accreditation has been removed from this result, if appropriate, see 'Note' on previous page.  ++ Result outside calibration range, results should be considered as indicative only and are not accredited.  * Analysis subcontracted to a Jones Environmental approved laboratory.  AD Samples are dried at 35°C ±5°C  CO Suspected carry over  LOD/LOR Limit of Detection (Limit of Reporting) in line with ISO 17025 and MCERTS  ME Matrix Effect	NDP	No Determination Possible
W Results expressed on as received basis.  + AQC failure, accreditation has been removed from this result, if appropriate, see 'Note' on previous page.  ++ Result outside calibration range, results should be considered as indicative only and are not accredited.  * Analysis subcontracted to a Jones Environmental approved laboratory.  AD Samples are dried at 35°C ±5°C  CO Suspected carry over  LOD/LOR Limit of Detection (Limit of Reporting) in line with ISO 17025 and MCERTS  ME Matrix Effect	SS	Calibrated against a single substance
+ AQC failure, accreditation has been removed from this result, if appropriate, see 'Note' on previous page.  ++ Result outside calibration range, results should be considered as indicative only and are not accredited.  * Analysis subcontracted to a Jones Environmental approved laboratory.  AD Samples are dried at 35°C ±5°C  CO Suspected carry over  LOD/LOR Limit of Detection (Limit of Reporting) in line with ISO 17025 and MCERTS  ME Matrix Effect	SV	Surrogate recovery outside performance criteria. This may be due to a matrix effect.
++ Result outside calibration range, results should be considered as indicative only and are not accredited.  * Analysis subcontracted to a Jones Environmental approved laboratory.  AD Samples are dried at 35°C ±5°C  CO Suspected carry over  LOD/LOR Limit of Detection (Limit of Reporting) in line with ISO 17025 and MCERTS  ME Matrix Effect	W	Results expressed on as received basis.
* Analysis subcontracted to a Jones Environmental approved laboratory.  AD Samples are dried at 35°C ±5°C  CO Suspected carry over  LOD/LOR Limit of Detection (Limit of Reporting) in line with ISO 17025 and MCERTS  ME Matrix Effect	+	AQC failure, accreditation has been removed from this result, if appropriate, see 'Note' on previous page.
Analysis subcontracted to a sories Environmental approved laboratory.  AD Samples are dried at 35°C ±5°C  CO Suspected carry over  LOD/LOR Limit of Detection (Limit of Reporting) in line with ISO 17025 and MCERTS  ME Matrix Effect	++	Result outside calibration range, results should be considered as indicative only and are not accredited.
CO Suspected carry over  LOD/LOR Limit of Detection (Limit of Reporting) in line with ISO 17025 and MCERTS  ME Matrix Effect	*	Analysis subcontracted to a Jones Environmental approved laboratory.
LOD/LOR Limit of Detection (Limit of Reporting) in line with ISO 17025 and MCERTS  ME Matrix Effect	AD	Samples are dried at 35°C ±5°C
ME Matrix Effect	СО	Suspected carry over
ME Matrix Effect  NFD No Fibres Detected  BS AQC Sample  LB Blank Sample  N Client Sample  TB Trip Blank Sample  OC Outside Calibration Range  AA x2 Dilution  AB x5 Dilution  AC x10 Dilution	LOD/LOR	Limit of Detection (Limit of Reporting) in line with ISO 17025 and MCERTS
NFD No Fibres Detected  BS AQC Sample  LB Blank Sample  N Client Sample  Trip Blank Sample  OC Outside Calibration Range  AA x2 Dilution  AB x5 Dilution  AC x10 Dilution	ME	Matrix Effect
BS AQC Sample  LB Blank Sample  N Client Sample  Trip Blank Sample  OC Outside Calibration Range  AA x2 Dilution  AB x5 Dilution  AC x10 Dilution	NFD	No Fibres Detected
LB Blank Sample  N Client Sample  TB Trip Blank Sample  OC Outside Calibration Range  AA x2 Dilution  AB x5 Dilution  AC x10 Dilution	BS	AQC Sample
N Client Sample TB Trip Blank Sample OC Outside Calibration Range AA x2 Dilution AB x5 Dilution AC x10 Dilution  AC x10 Dilution	LB	Blank Sample Old The Control of the
TB Trip Blank Sample OC Outside Calibration Range  AA x2 Dilution AB x5 Dilution AC x10 Dilution  AC x10 Dilution	N	Client Sample Client Sample
OC Outside Calibration Range  AA x2 Dilution  AB x5 Dilution  AC x10 Dilution  AC x10 Dilution	ТВ	Trip Blank Sample
AA x2 Dilution treatment AB x5 Dilution treatment AC x10 Dilution	OC	Outside Calibration Range
AB x5 Dilution YOUTH AC x10 Dilution	AA	x2 Dilution
AC x10 Dilution	AB	x5 Dilution For Hills
<u> </u>	AC	x10 Dilution

Exova Jones Environmental

Method Code Appendix

**JE Job No:** 17/19137

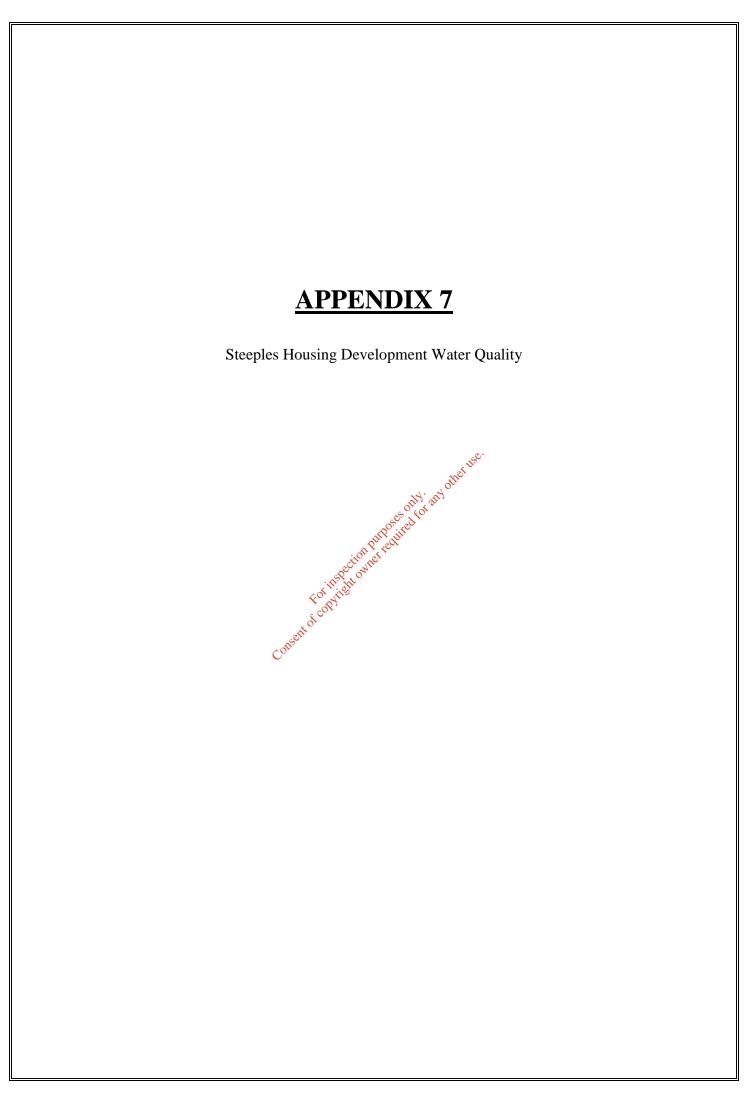
Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/S ANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM4	Modified USEPA 8270 method for the solvent extraction and determination of 16 PAHs by GC-MS.	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.				
TM4	Modified USEPA 8270 method for the solvent extraction and determination of 16 PAHs by GC-MS.	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.	Yes			
TM15	Modified USEPA 8260. Quantitative Determination of Volatile Organic Compounds (VOCs) by Headspace GC-MS.	PM10	Modified US EPA method 5021. Preparation of solid and liquid samples for GC headspace analysis.				
TM15	Modified USEPA 8260. Quantitative Determination of Volatile Organic Compounds (VOCs) by Headspace GC-MS.	PM10	headspace analysis.  Modified US FPA method 5021. Preparation of solid and liquid samples for GC headspace analysis.	Yes			
TM16	Modified USEPA 8270. Quantitative determination of Semi-Volatile Organic compounds (SVOCs) by GC-MS.	. ^>	headspace and visis.  headspace and visis.  City of the common of solid and liquid samples for GC headspace and visis.  Water samples are extracted with solvent using a magnetic stirrer to create a vortex.				
TM16	Modified USEPA 8270. Quantitative determination of Semi-Volatile Organic compounds (SVOCs) by GC-MS.	PM301 COT	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.	Yes			
TM20	Modified BS 1377-3: 1990/USEPA 160.3 Gravimetric determination of Total Dissolved Solids/Total Solids	PM0	No preparation is required.	Yes			
TM26	Determination of phenols by Reversed Phased High Performance Liquid Chromatography and Electro-Chemical Detection.	PM0	No preparation is required.				
TM26	Determination of phenols by Reversed Phased High Performance Liquid Chromatography and Electro-Chemical Detection.	PM0	No preparation is required.	Yes			
TM30	Determination of Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry). Modified US EPA Method 200.7, 6010B and BS EN ISO 11885 2009	PM14	Analysis of waters and leachates for metals by ICP OES/ICP MS. Samples are filtered for dissolved metals and acidified if required.				

Exova Jones Environmental

Method Code Appendix

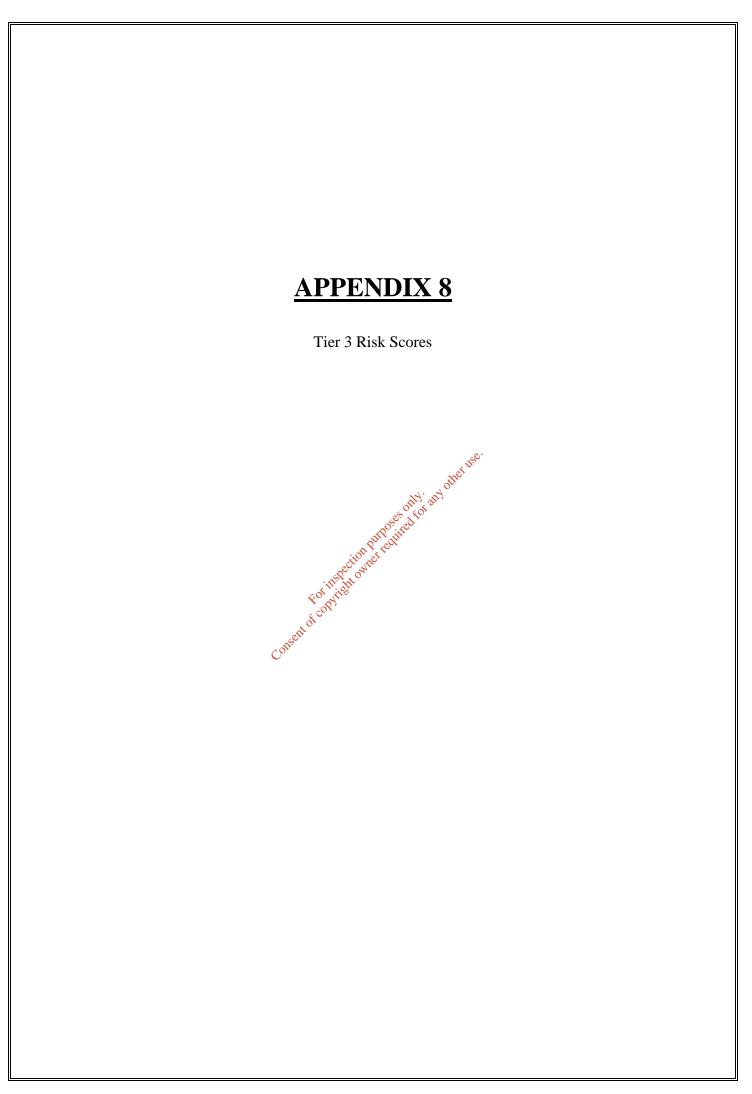
**JE Job No:** 17/19137

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/S ANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM30	Determination of Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry). Modified US EPA Method 200.7, 6010B and BS EN ISO 11885 2009	PM14	Analysis of waters and leachates for metals by ICP OES/ICP MS. Samples are filtered for dissolved metals and acidified if required.	Yes			
TM38	Soluble Ion analysis using the Thermo Aquakem Photometric Automatic Analyser. Modified US EPA methods 325.2, 375.4, 365.2, 353.1, 354.1	PM0	No preparation is required.	Yes			
TM42	Modified US EPA method 8270. Pesticides and herbicdes by GC-MS	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.				
TM57	Modified US EPA Method 410.4. Chemical Oxygen Demand is determined by hot digestion with Potassium Dichromate and measured spectrophotometerically.	PM0	No preparation is dequired.	Yes			
TM58	Modified USEPA methods 405.1 and BS 5667-3. Measurement of Biochemical Oxygen Demand. When cBOD (Carbonaceous BOD) is requested a nitrification inhibitor is added which prevents the oxidation of reduced forms of nitrogen, such as ammonia, nitrite and organic nitrogen which exert a nitrogenous demand.	PM0	No preparation is required.  No preparation is required.	Yes			
TM60	Modified USEPA 9060. Determination of TOC by calculation from Total Carbon and Inorganic Carbon using a TOC analyser, the carbon in the sample is converted to CO2 and then passed through a non-dispersive infrared gas analyser (NDIR).	PMOOF COR	No preparation is required.	Yes			
TM89	Modified USEPA method OIA-1667. Determination of cyanide by Flow Injection Analyser. Where WAD cyanides are required a Ligand displacement step is carried out before analysis.	PM0	No preparation is required.	Yes			
TM149	Determination of Pesticides by Large Volume Injection on GC Triple Quad MS, based upon USEPA method 8270	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.				



																		Forameter Alkalin	ty Ammon	ium NH Chloride	Caliform 8	acter Colour (True)	Conductivity (	@ Copper	€ Coš ire	on to	angelier index Lead	Manganeo	Nitrate NG3	Nitrite NO2	Odour pH	Temp	perature Tota	al Hardness Turbidity	Zinc	Appearance (0)Ch	Clastridium Per Fr	ee Chlorine Taste	Total Chlori	ine Colour (Ti	rue  Temperature
																		M.Sc.	- 0.	250	0		2500	2	Varies	200	Var	NS 50	50	Varies		2.0					0				
																		Min.														6.5						0.1 -	0.1		
																		Test Method																							
Andhiwed	Category	Entity	Entity Reference	Station	Station Reference	Station Easting	Station North	in Laboratory	River Basin Dist	Vater Manage 16	Nater Body S	Sample Tempta Sam	sie ReferentSample Da	<ul> <li>Sample Time</li> </ul>	<ul> <li>Sample Meth</li> </ul>	to Sampled By Reason	Comments	Analyst Conclus or	gn Pg	(gm /r	MPN/100	mis Hazen	µS/cm	// // // // // // // // // // // // //	MPN/100mk	PB <sup>(1</sup>	Descriptive µg	Pau P	mg/li	mg/l	Odour Units p	Hunits De	egrees C	mg/I NTU	µg/l	Descriptive	cfu/100mls	mg/1 Taxte Un	Figm stic	Pt-Ci	
																			< 0.0		0	< 2	461		0	40			< 2		0	7.49		0.25							
Yes	DW - Small Private Supplies	Gowran - The Steeples Housing Development	15009914821	No. 54 The Steeples Gowran Co. Kilkenny	DWMON1500P8H8210001	263219.4	153581.7	Kilkenny Co Co	South Eastern R	lanrawttain SS	E_Rarrowtdaii C	Check Monitor 0733	9734 7-Nov-200	12:00	Grab	ANO ANO Complia	ince   W8151-07/		BU		OK	BLD	OK.		OK	OK			BLD	BLD	OK	OK.		OK.							
																		1				< 2	460	< 0.02	0	< 40	< 1		< 2	< 0.02				181 < 0.1			0				
Yes	DW - Small Private Supplies	Gowran - The Steeples Housing Development	1500PRH821	Gowran - No.16 The Steeples - Dowling	DWMON1500PRH8210004	263206.2	153580.8	Kilkenny Co Co	South Eastern R	lanrowthain Si	E_Barrowtdaii C	Check Monitor 0837	OW00660 23-Apr-200	8 09:00	Grab	HSE Cark Complia	ince -		K BU	b OK	OK	BLD	OK.	910	OK	BLD	OK BI	OK OK	BLD	BLD	OΚ	OK	OK	OK BLD	OK		OK				
																					0				0												0				
Yes	DW - Small Private Supplies	Gowran - The Steeples Housing Development	1500PRH821	No.21 The Steeples Gowran Dan Glynn	DWMON1500PRH8210002	263169.9	153572.4	Kilkenny Co Co	South Eastern R	lanrowthain Si	E_Barrowtdaii C	Check Monitor 0837	OW511F0(30-July-20)	g 10:00	Grab	Anthea Southe Complia	ince -	-			OK				OK												OK				
																			0.00	16.			490						< 2	0.026			19.5	< 0.1							
Yes	DW - Small Private Supplies	Gowran - The Steeples Housing Development	1500PRH821	No.21 The Steeples Gowran Dan Glynn	DWMON1500PRH8210002	263169.9	153572.4	Kilkenny Co Co	South Eastern R	lanrowthain Si	E_Barrowtdaii C	Check Monitor 0837	OW511G0 30-July-20I	8 15:00	Grab	Public Analysts: Complic	ince -	-	04	r.		OK	OK.						BLD	QΚ	OΚ	OK.	OK	BLD	BLD						
																					0				0																
Yes	DW - Small Private Supplies	Gowran - The Steeples Housing Development	1500PRH821	No.21 The Steeples Gowran Dan Glynn	DWMON1500PRH8210002	263169.9	153572.4	Kilkenny Co Co	South Eastern R	lanrowthain Si	E_Barrowtdaii C	Check Monitor 0937	OW0002E(28-1an-200	9 11:34	Grab	HSE Lab Water Complia	ince -		25 < 0.0		OK		622	0.02	OK	< 60	1.12 <		2.3	< 0.02			15.5	257 0.17	30	Clear				< 2	
																		2	12 <0.0				512 Or	< 0.02	0	< 40	OV SI		< 2	< 0.02	ov.		17.6 OV	226 < 0.1	30			40.1	< 0.1	<2	
Yes	DW - Small Private Supplies	Gowran - The Steeples Housing Development	1500PRH821	No.21 The Steeples Gowran Dan Glynn	DWMON1500PRH8210002	263169.9	153572.4	Kilkenny Co Co 1	South Eastern R	lanrowthain Si	E_Barrowthaii C	Check Monitor 0933	OW0002E 25-Aug-20	9 09:00	Grab	HSE Lab Water Complia	ince -		K BU	b ox	OK.		OK.	8.0	OK	BLD	OK BL	OK.	arp	BLD	OK	OK.	OK	OK BLD	OK	Clear		BLD	aco	910	
																			25 0.0					6.00			120	30		0.02		254	45	269 0.11				444			
Yes	DW - Small Private Supplies	Gowran - The Steeples Housing Development	1500PRH821	No.21 The Steeples Gowran Dan Glynn	DWMON1500P9H9210002	263169.9	153572.4	Kilkenny Co Co	South Eastern R	larrowthain Si	E_Barrowtdaii C	Check Monitor 1037	OW0002E 13-Jan-201	0  09:00	Grab	HSE Lab Water Surveill	ince -		25 0.0	15 12	0		497	0.02	0	40	1.29 5	30	2	0.02	Acceptable	7.54	15	268 0.11	20	Gear.		0.01	0.01	2	
																			24 0.0					6.60						0.02		7.39	19.7	200 01				444			
Yes	DW - Small Private Supplies	Gowran - The Steeples Housing Development	1500PRH821	No.21 The Steeples Gowran Dan Glynn	DWMON1500P9H9210002	263169.9	153572.4	Kilkenny Co Co	South Eastern R	larrowthain Si	E_Barrowtdaii C	Check Monitor 1037	OW00026 11-Aug-20	0  09:00	Grab	HSE Cark Surveit	ince -		74 0.0	16	0		565	0.02	0	40	1.26 5	20	2.8	0.02	Acceptable	7.39	19.7	308 0.1	20	Gear.		0.01	0.01	2	
	NW - Creal Drivate Constan	Gowran - The Steeples Housing Development		No.21 The Steegles Gowran Dan Givon	DWWWDW150000W0210002	363169.9	153577.4						OW/0002019-Eup-2011			HSE Cork Surveits			29 0.0	16 16			500	6.60		40	115 0	20		0.02		7.39	17.0	272 0.16		Clear		441	0.01		
	DW - Small Private Supplies	Gowran - The Steegles Housing Development Gowran - The Steegles Housing Development	15009908821	No.21 The Streeples Gowran Dan Given	DWMON1500P4069210002	263169.9	1545/2.4								Grab	HIS COX SURVEIL	ince -		29 0.0.	16 16				0.02		40	1.15		2	0.02	Acceptable		19.6	2/2 0.16	30	Clear		0.01	8.00	1 1	
	DW - Small Private Supplies DW - Small Private Supplies	Gowran - The Steeples Housing Development Gowran - The Steeples Housing Development	15009908821	No.21 The Sceepes Gowran Dan Givon No.21 The Sceepes Gowran Dan Givon	DWMCN15009998210002	363169.9	153572.4						DW00026 15-Aug-30 DW00026 16-Aug-30		G/30	HSE Cork Surveit	ance -		0.0	12			578			< 60			< 5	< 0.02			16.0	0.12		Clear					
	DW - Small Private Supplies	Gowran - The Steegles Housing Development Gowran - The Steegles Housing Development	15009908821	No.21 The Streeples Gowran Dan Given	DWMON1500P4069210002		153572.4						DW000026 1-0:1-2012		Grab	HIS COX SURVEIL			0.0				580			40				0.02			16.9	0.2		Clear.				1 1	
	DW - Small Private Supplies DW - Small Private Supplies	Gowran - The Steeples Housing Development Gowran - The Steeples Housing Development	15009908821	No.21 The Sceepes Gowran Dan Givon No.21 The Sceepes Gowran Dan Givon	DWMON150099H8210002								DW00026128-Apr-201		Crab	HSE Cork Surveit			0.0		0		558		0	40				0.02			16.9	0.19		Gear.				1 5	
	DW - Small Private Supplies DW - Small Private Supplies	Gowran - The Steeples Housing Development Gowran - The Steeples Housing Development	15009916821	No.21 The Sceepes Gowran Clan Gyon No.18 The Sceepes Gowran Co.Kilkenny	DWMCN15009998210002	emakii.ii	****/2.4	ner.	South Eastern 9	arrawaniin in			DW00026128-Apr-201		Cost	HSE COX Surveill		F I	0.0				560			40	1 3		1 2	0.02			30.7	0.19		Gear.				1 5	
	DW - Small Private Supplies	Gowran - The Steeples Housing Development	470000014024	No.21 The Steegles Gowran Dan Givon	DWWDN15009949210003	363169.9	153572.4	HAR .					OW0003E 10-My-20		Crah	HE COR SUPPRI	and .	i l	0.0				523			-				0.02			16.4	0.17		Gear.				1 1	
	NW - Small Private Supplies	Gowran - The Stregies Housing Development	15009914921	No.21 The Steeples Gowran Dan Givon	014840N15009948210002		153572.4	NCC.					OW000301 20-144-20		Grah	MSE Cork Sunwill	1000		9.00				528		0	40				0.02			30.5	0.1		Clear				- 2	
	NW - Small Private Supplies	Gowran - The Stregies Housing Development		No.21 The Steeples Gowran Dan Givon	014840N15009948210002		153572.4	ecc.					OW00026123-Mar-20		Grah	HSE Cark Surveit		L.	< 0.0				525		0	- 40			1 25	< 0.02			19.3	0.14		Gear.				1 6	
Yes	NW - Small Brigate Supplier	Gowran - The Stregies Housing Development		No.21 The Steegles Gowran Dan Givon	01AMON150009M8210002	363169.9	153572.4	use					OW/0003C 12-0-7-205		Grah	MSE Cork Sunwith	1000		< 0.0				585		0	< 40				< 0.02		2.41	16.0	2.08		ack solids in suspensio	rion.				
	NW - Small Private Supplies	Gowran - The Stregies Housing Development		No.21 The Steeples Gowran Dan Givon	DWMON1500PRH8210002		153572.4	Kilkwany Co. Co.					OW00026 18-Apr-201		Grah	HSE Cark Surveit	1000	L.	(0)				569		0	C 40	1		61	< 0.02			16.8	2.00		ack conds or cooperior. lack carticles in solutio				1 22	
Yes	DW - Small Private Supplies	Gowran - The Steegles Housing Development	15009914821	No.21 The Steeples Gowran Dan Givon	DWMON1500P8H8210002	263169.9	153572.4	HSE					OW/00028 17-Oct-201		Grab	HSE Cork Surveill	once -		< 0.1	09			587		0	40			< 5	0.051			21.1	0.2	_	Gear.				< 2	
Yes	DW - Small Private Supplies	Gowran - The Stregies Housing Development	15000914921	No.21 The Steegles Gowran Dan Givon	01AMON150009M8210002	363169.9	153572.4	ucc					OW00026 13-Mar-20		Grah	HSE Cark Surveit	1000	L.		10			535			< 40			- 25	< 0.02		7.6		0.3		Gear.				1 63	10
			15009914921	No.21 The Steeples Gowran Dan Givon	014840N15009948210002		153572.4						OW/00035 11-0-1-30		Grah	MSE Cork Sunwill		L.	0.0	9			573		0	c 40			25	< 0.02		7.6	14.0	0.3		Clear				1 22	17.0
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Consent of convinger to what required for any other use.



Landfill SiteName: Cloyne Landfill Ref. No. : 08/S Tier 1 Study

# **Risk Screening/ Prioritisation**

Tabl	e 1a LEACHATE: SOU	RC/HAZARD SCORING MA	ATRIX
	1	Waste FOOTPRINT (ha)	
WASTE TYPE	≤ 1ha	> 1 ≤ 5 ha	> 5ha
C&D	0.5	1	1.5
Municipal	5	7	10
Industrial	5	7	10
Pre 1977 sites	1	2	3

1a = 5

Table	1b LANDFILL GAS: SO	URC/HAZARD SCORING	MATRIX
	\	Waste FOOTPRINT (ha)	
WASTE TYPE	≤ 1ha	> 1 ≤ 5 ha	> 5ha
C&D	0.5	0.75	1
Municipal	5	7	10
Industrial	3	5	7
Pre 1977 sites	0.5	0.75	1

1b = 5

Table 2a : LEACHATE MIGRATION: PATHWAY	'S
GROUNDWATER VULNERABILITY (Vertical Pathway)	Points, of 158
Extreme Vulnerability	3,00
High Vulnerability	Only of
Moderate Vulnerability	ses die 1
Low Vulnerability	11 <sup>11</sup> 0.5
High - Low Vulnerability (use where vulnerability not on GIS)	2
Sepect own	2a =
on it idit	

Table 2b : LEACHATE MIGRATIONS PATHWAYS	
ૃંદિ	
GROUNDWATER FLOW REGIME (Horizontal Bathway)	Points
Karstified Groundwater Bodies (Rk)	5
Productive Fissured Bedrock Groundwater Bodies (Rf & Lm)	3
Gravel Groundwater Bodies (Rg and Lg)	2
Poorly Productive Bedrock Groundwater Bodies (LI, PI, Pu)	1

2b =	5

Table 2c : LEACHATE MIGRATION: PATHWAYS		
SURFACE WATER DRAINAGE (Surface water pathway)	Points	
Is there a direct connection between drainage ditches associated with the waste body and adjacent surface water body? Yes	2	
If no direct connection	0	

2c -	0
20 -	U

Tier 1 Study

Landfill SiteName: Cloyne Landfill Ref. No. : 08/S

# **Risk Screening/ Prioritisation**

Table 2d : LANDFILL GAS: PATHWAY	
LANDFILL GAS LATERAL MIGRATION POTENTIAL	Points
Sand and Gravel, Made ground, urban, karst	3
Bedrock	2
All other Tills (including limestone, sandstone etc - moderate permabi	1.5
All Namurian or Irish Sea Tills (low permability)	1
Clay, Alluvium, Peat	1
	2d =

Table 2e : LANDFILL GAS: PATHWAY (assuming receptor located above source)	
LANDFILL GAS LATERAL MIGRATION POTENTIAL	Points
Sand and Gravel, Made ground, urban, karst	5
Bedrock	3
All other Tills (including limestone, standstone etc - moderate permab	2
All Namurian or Irish Sea Tills (low permability)	1
Clay, Alluvium, Peat	1
	2e =

Table 3a: LEACHAGE MIGRATION: RECEPTORS	
HUMAN PRESENCE (presence of a house indicaates potential private wells)	Points, et 158
On or within 50m of the waste body	3,01
Greater than 50m but less than 250m	Only With
Greater than 250m but less than 1km from waste body	e <sup>5</sup> 0 1
Greater than 1km of the waste body	Mill 0
Greater than 1km of the waste body  Consent of Copyright Owner, the Co	3a =

3a = 3

Table 3b : LEACHAGE MIGRATION: RECEPTORS PROTECTED AREAS (SWDTE or GWDTE)	Points
Within 50m of waste body	3
Greater than 50m but less than 250m of the waste body	2
Greater than 250m but less than 1km from waste body	1
Greater than 1km of the waste body	0
Undesignated sites within 50m of waste body	1
Undesignated sites greater than 50m but less than 250m	0.5
Undesignated sites greater than 250m of the waste body	0
	3b =

Table 3c : LEACHAGE MIGRATION: RECEPTORS	
AQUIFER CATEGORY (resource potential)	Points
Regionally Important Aquifers (Rk, Rf, Rg)	5
Locally Important Aquifers (LI, Lm, Lg)	3
Poor Aquifers (PI, Pu)	1

3c =	5

Landfill SiteName: Cloyne Landfill Ref. No. : 08/S Tier 1 Study

# **Risk Screening/ Prioritisation**

Table 3d : LEACHAGE MIGRATION: RECEPTORS	
PUBLIC WATER SUPPLIES (Other than private wells)	Points
Within 100m of site boundary	7
Greater than 100m but less than 300m or with in Inner SPA for GW	
supplies	5
Greater than 300m but less than 1km or within Outer SPA (SO) for	
GW supplies	3
Greater than 1km (karst aquifer)	3
Greater than 1km (no karst aquifer)	0
	3d =

Table 3e: LEACHAGE MIGRATION: RECEPTORS	
CUREACE WATER PORIES	Dointe
SURFACE WATER BODIES	Points
Within 50m of site boundary	3
Greater than 50m but less than 250m	2
Greater than 250m but less than 1km	1
Greater than 1km	0

3e =	1
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	at V		
Table 3f : LEACHAGE MIGRATION: RECEPTORS			
HUMAN PRESENCE	es of Points		
On site or within 50m of site boundary	itie 5		
Greater than 50m but less than 150m	3		
Greater than 150m but less than 250m	1		
Greater than 250m	0.5		

3f = 5 Landfill SiteName: Cloyne Tier 1 Study

Landfill Ref. No. : 08/S

# **Risk Screening/ Prioritisation**

Note: The table below represents the Tier 1 risk rating for this site. SPR 1 to 9 represent the leachate risk scores. SPR 10 & 11 represent Landfill Gas risks. The migration pathways are colour coded as follows:

Groundwater &			
Surface Water	Groundwater only	Surface water only	Lateral & Vertical

Calculator	SPR Values	Maximum Score	Linkages	Normalised Score
SPR 1 =	40	300	Leachate => surface water	13%
SPR 2 =	0	300	Leachate => SWDTE	0%
SPR 3 =	120	240	Leachate => human presence	50%
SPR 4 =	0	240	Leachate => GWDTE	0%
SPR 5 =	200	400	Leachate => Aquifer	50%
SPR 6 =	200	560	Leachate => Surface Water	36%
SPR 7 =	40	240	Leachate => SWDTE	17%
SPR 8 =	0	60	Leachate => Surface Water	0%
SPR 9 =	0	60	Leachate => SWDTE	0%
SPR 10 =	75	150	Landfill Gas => Human Presence	50%
SPR 11 =	0	250	Landfill Gas => Human Presence	0%

<u></u>
Range of Risk Scores
Greater than or equal to 70% for any individual SPR lingage
Between 40-70% for any individual SPR linkage
Less than or equal to 40% for any individual SPR linkage
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TIER 3 RATING MODERATE RISK (Class B)

