

This Report has been cleared for submission to the Director David Flynn, by Warren

Phelan, Programme Manager,



on 29 November 2023.

Signed: Philomena Kelly Date: 5 December 2023



## OFFICE OF ENVIRONMENTAL SUSTAINABILITY

### INSPECTOR'S REPORT ON AN APPLICATION FOR A CERTIFICATE OF AUTHORISATION FOR A CLOSED LANDFILL

<b>TO:</b>	David Flynn, Director	
<b>FROM:</b>	Ewa Babiarczyk, Inspector.	Circular Economy Programme
<b>DATE:</b>	5th November 2023	
<b>RE:</b>	Application by <b>Clare County Council</b> for a Certificate of Authorisation for a closed landfill at <b>Whitegate Landfill, Bargarriff, Whitegate, County Clare</b> . Certificate of Authorisation Register Number <b>H0035-01</b> .	

#### 1. Application details

Type of facility:	Closed landfill as defined in the Regulations <sup>1</sup> .
Original site ownership	Clare County Council.
Current site ownership	Clare County Council.
Operator of closed landfill	Clare County Council has operated this site since 1960s.
Proposed use post remedial works	The site is intended to be returned to wild habitat.
Risk category of closed landfill:	High risk (Class A) due to <ul style="list-style-type: none"><li>leachate migration through surface water pathway (SPR8).</li></ul> The principal risk identified is the risk of landfill leachate migration into the adjacent surface water drains and the stream downstream of the landfill.

<sup>1</sup> Waste Management (Certification of Historic Unlicensed Waste Disposal and Recovery Activity) Regulations 2008 (S.I. No. 524 of 2008).

Historic landfill register number:	S22-02502
Grid Reference	175000 E and 189900 N (ING)
Application received:	27 <sup>th</sup> August 2021
AA screening determination:	27 <sup>th</sup> January 2022
Publication date for Notice for Public Consultation on Appropriate Assessment:	19 <sup>th</sup> August 2022
No of Submissions or Observations on Appropriate Assessment:	There were no Submissions or Observations received.
Regulation 7(4) notice:	27 <sup>th</sup> January 2022, 31 <sup>st</sup> March 2022 and 9 <sup>th</sup> August 2022.
Additional information received:	Regulation 7(4) Reply received on 7 <sup>th</sup> March 2022, 4 <sup>th</sup> April 2022 and 9 <sup>th</sup> December 2022.
Name of Qualified Person:	Sean Moran, Credentials provided by The Institute of Geologists of Ireland.
EPA site inspection:	No inspection was required.

## 2. Information on the closed landfill

Location of facility	The closed landfill is located 800m to the north of Whitegate village, County Clare, off the R352 Road, 2.8km to the west of Lough Derg.  The location of the landfill site is shown in Figure 1.
Period of landfilling	1960s to 1998.
Surrounding area	The site is located in a rural area and is surrounded on all sides by forestry, as shown in Figure 2. A local road runs along the western site boundary. Across this road, to the west of the site, lies the Slieve Aughty Mountains SPA (Site code: 004168) and agricultural land lies beyond the forestry area, to the south-west of the site. An unnamed surface water land drain runs towards the east along the northern site boundary. This drain is referred to hereafter as the Northern drain. A drain also runs along the eastern boundary, hereafter referred to as the Eastern drain. The Eastern drain discharges into the Northern drain near the western corner of the site. The Bargarriff Bog (Site Code: WMI_CL335) of High conservation value <sup>1</sup> lies approximately

<sup>1</sup> Map of Irish Wetlands [www.wetlandsurveys.ie](http://www.wetlandsurveys.ie) (date accessed 13<sup>th</sup> September 2023)

	<p>200m east of the landfill. An undesignated wetland, which the applicant refers to as Crooked Lough, lies 250m south-west of the site. The Cregg Lough (Lake Id: 25_184) is located 730m south-west of the site and the Alewnaghta Lough (Lake Id: 25_189) is located approximately 1km north-east of the site, as also shown in Figure 2.</p> <p>The nearest domestic dwellings are located approximately 600m north and 600m south of the landfill.</p>
Area of the closed landfill	The waste body covers an area of 1.19ha and lies within the site area of 1.3ha.
Quantity of waste at the facility	Approximately 29,750 tonnes (59,500m <sup>3</sup> ).
Characterisation of waste deposited	<p>The waste comprises of predominantly municipal waste (approximately 90%) and commercial waste, industrial waste, construction &amp; demolition (C&amp;D) waste and agriculture waste. The waste encountered during site investigations includes mixed and domestic refuse, plastic including 'black plastic', black silage plastic and bale wrapping, bottles, cans, crisp package, rubble, car engine, oil drums or similar containers, animal medicine bottles, a fridge, furniture, 'a domestic wrapper', car battery, two newspapers (from 19<sup>th</sup> July 1993 and April 1994), furniture, plywood type sheeting, sawdust, vegetation and metal. The industrial waste included chipboard or chipboard products.</p> <p>Waste was deposited across the entire site apart from along the eastern site boundary and an area within the south-western boundary. The extent of the waste body is shown in Figure 3.</p>

### 3. Site investigations

Current condition and appearance of closed landfill:	<p>The landfill rises approximately 4m to 5m above the surrounding land and forms a ridge sloping west to east. The site is fenced off and densely covered with gorse.</p> <p>Exposed waste on the landfill surface and waste in the adjacent surface water drains was observed by the applicant. The Tier 3 assessment recommends the waste be pulled back from the drains and covered with a cap. Condition 3.1(a) reflects this recommendation and is further detailed in Section titled '<i>Proposed Remedial Actions</i>' below. Also, litter on the adjacent forestry land and waste, either from fly tipping or fallen waste from the main body, was observed in 'deep ponds at the base of the ridge on its southern side.' Condition 3.1(a) further requires that the local authority removes this waste and litter for disposal or recovery at an appropriate facility.</p> <p>Leachate was observed in the Northern drain in 2008, causing an orange discolouration of the water as shown in Figure 5. The Tier 2 assessment also states that leachate was also evident in the forestry drains at the eastern edge of the landfill in 2009.</p>
Site investigations	<p>The site investigations carried out as part of Tier 1, 2 and 3 assessments established the following facts:</p> <ul style="list-style-type: none"> <li>• The landfill is underlined by peat;</li> </ul>

	<ul style="list-style-type: none"> <li>• The waste was deposited above ground level;</li> <li>• The waste body is approximately 4m to 5m deep with the maximum depth of waste observed in trial holes at 4.8m bgl;</li> <li>• The waste body is partially covered with a 200mm to 700mm layer of soil;</li> <li>• Rainwater infiltrates through the existing cover material into the waste body and it is likely that rainfall infiltrates the waste to its base;</li> <li>• Landfill leachate is being generated and migrates into the drains running along the northern and eastern site boundary;</li> <li>• It is likely that shallow groundwater beneath the site discharges to the stream to the north-east of the site;</li> <li>• Landfill gas is being generated and is venting to atmosphere; and</li> <li>• It is likely that gas migrates to the adjacent surface water drains and to lower ground to the south and east of the site.</li> </ul>
<p>Monitoring and analysis of samples (water, gas, waste):</p>	<p>The following site investigations were carried out as part of Tier 1, 2 and 3 assessments:</p> <ul style="list-style-type: none"> <li>• Desk study, including, but not limited to, studying local authority archive records, Geological Survey Ireland (GSI) maps, Ordnance Survey Ireland (OSI) maps and aerial photographs and National Parks and Wildlife Service maps;</li> <li>• Ecological assessment of the site was carried out in 2009;</li> <li>• Four site walkovers were carried out (the first two walkovers were carried out in 2008, the third one was carried out in 2009 and the fourth on 4<sup>th</sup> March 2021);</li> <li>• Trial hole investigation (ten trial holes were excavated in 2009);</li> <li>• Leachate monitoring (one round was carried out at four trial holes in 2009);</li> <li>• Soil sampling (four samples were taken from four trial holes in 2009. It is noted however that no analysis of these samples was carried out);</li> <li>• Groundwater monitoring (one round at three monitoring locations was carried out in 2009 and two rounds at two monitoring locations were carried out in 2021);</li> <li>• Surface water monitoring (four rounds, first of which was carried out at two monitoring locations in 2008. The second round was carried at seven locations in 2009 and the third and fourth round were carried out at four monitoring locations in 2021); and</li> <li>• Gas monitoring (two rounds, first of which was carried out at six monitoring locations in 2008 and the second round was carried out at one monitoring location in 2009).</li> </ul>
<p>Hydrology</p>	<p>The closed landfill is located within the catchment of the Lower</p>

Shannon (Catchment Identification Number: 25C) and the Bow\_SC\_010 sub-catchment (Sub-catchment Id: 25C\_7).

The Northern drain eventually discharges into the Whitegate River (waterbody code: IE\_SH\_25D100200, segment code: 25\_710) 0.8km downstream of the site, and via the Whitegate River into the Alewnaghta Lough (waterbody code: IE\_SH\_25\_189) 2km downstream of the site, as shown in Figure 1. The Slieve Aughty Mountains Special Protection Area (SPA) (Site code: 004168) is located immediately to the west (and upstream) of the site.

A wetland area named 'The Crooked Lough' lies approximately 250m to the south-west of the site, as shown in Figure 7. The Tier 1 states that according to the Ordnance Survey maps, a drain connects Crooked Lough to the Eastern drain. However, the Tier 1 assessment further states that the land drainage underwent modification at some point and there are now a series of field drains to the immediate south of the site and the original drain from Crooked Lough could not be located by the applicant.

The Whitegate River and the Alewnaghta Lough form part of the Lough Derg (Shannon) SPA (site code: 004058). The Water Framework Directive (WFD) status assigned to the Whitegate River is classified as Good. It is noted that forestry is identified as a pressure associated with the Whitegate River. The WFD status assigned to the Alewnaghta Lough, to which the Whitegate River discharges, is classified as Bad. Invasive species and nutrient pollution associated with agriculture are identified in the catchment monitoring assessment reports<sup>1</sup> as a significant pressure contributing to the Bad ecological status of the Alewnaghta Lough.

Cregg Lough lies approximately 750m south-west and upgradient of the site. The applicant states within the Tier 2 assessment that there is no hydrological connection between the landfill and the Cregg Lough.

Surface water monitoring

There were four rounds of surface water monitoring as outlined in the table below.

*Table 1: Surface water monitoring rounds*

<b>Round &amp; monitoring date</b>	<b>Monitoring locations</b>
Round No. 1 26 <sup>th</sup> November 2008	Locations SW1 & SW2, as shown in Figure 6. <ul style="list-style-type: none"> <li>• SW1 – (d/s) on the northern drain at the site boundary.</li> <li>• SW2 – (u/s) flooded lands adjacent to the southern site boundary.</li> </ul>
Round No. 2	New Locations SW1 to SW7, as shown in Figures 7 and

<sup>1</sup> Source: Water Framework Directive (WFD) website available at [https://wfd.edenireland.ie/waterbody/ie\\_sh\\_25\\_189/characterisation?charIt=CI000001](https://wfd.edenireland.ie/waterbody/ie_sh_25_189/characterisation?charIt=CI000001) (Accessed 22<sup>nd</sup> August 2022)

	5 <sup>th</sup> November 2009	<p>8.</p> <ul style="list-style-type: none"> <li>• SW1 - c.50m downstream on the site on the Northern drain.</li> <li>• SW2 - c.75 m downstream on the site on the Northern drain.</li> <li>• SW3 - c.25 m downstream on the site on the Northern drain.</li> <li>• SW4 - downstream location c. halfway down the northern site boundary on the Northern drain.</li> <li>• SW5 - upstream location c.85m north-east of the site, on the unnamed drain which flows into the Northern Drain from the North.</li> <li>• SW6 - upstream location c. 140m south-west of the site, on the unnamed drain which flows into the Northern drain from the South.</li> <li>• SW7 - downstream location c.35m east of the site on the Eastern drain.</li> </ul>																				
	Round No. 3 24 <sup>th</sup> March 2021	<p>Existing 2009 Locations SW1 &amp; SW6 and New Locations: SW10 &amp; SW11, as shown in Figure 8.</p> <ul style="list-style-type: none"> <li>• SW1 - c.50m downstream on the site on the Northern drain.</li> <li>• SW6 - upstream location c. 140m south-west of the site, on the unnamed drain which flows into the Northern drain from the South.</li> <li>• SW10 - c.10m upstream of the site on the Northern drain. The drain is occasionally dry at this location.</li> <li>• SW11 - c.1.6km downstream of the site on the Whitegate River.</li> </ul>																				
	Round No. 4 24 <sup>th</sup> April 2021	Existing Locations SW1, SW6 and SW11, as used for Round No. 3, as shown in Figure 8.																				
<p>It is noted that the upstream location SW10 was not sampled on 24<sup>th</sup> April 2021. Accordingly, the table below shows the maximum parameter concentrations recorded at surface water monitoring locations SW1, SW6, SW10 and SW11 measured on 24<sup>th</sup> March 2021.</p> <p><i>Table 2: Surface water monitoring results, March 2021</i></p>																						
<table border="1"> <thead> <tr> <th rowspan="3">Parameter</th> <th rowspan="3">EQS <sup>1</sup>/ Parametric value <sup>2</sup></th> <th colspan="4">Monitoring locations</th> </tr> <tr> <th colspan="2">Upstream</th> <th colspan="2">Downstream</th> </tr> <tr> <th>SW6 Unnamed drain</th> <th>SW10 Northern drain</th> <th>SW1 Northern drain</th> <th>SW11 Whitegate river</th> </tr> </thead> <tbody> <tr> <td> </td> <td> </td> <td> </td> <td> </td> <td> </td> <td> </td> </tr> </tbody> </table>			Parameter	EQS <sup>1</sup> / Parametric value <sup>2</sup>	Monitoring locations				Upstream		Downstream		SW6 Unnamed drain	SW10 Northern drain	SW1 Northern drain	SW11 Whitegate river						
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<sup>1</sup> Environmental Quality Standard from the European Communities Environmental Objectives (Surface Water) Regulations 2009, as amended.

<sup>2</sup> Parametric Value from the European Union (Drinking Water) Regulations 2023.

Ammoniacal nitrogen	≤0.09 (95%ile) Total Ammonia (as mg N/l) <sup>1</sup>	0.06	0.04	<b>5.19</b>	<b>0.34</b>
Cyanide total [µg/l]	10 <sup>1</sup>	<10	<b>30</b>	<10	<10
Cadmium dissolved [µg/l]	0.08 <sup>1</sup>	<0.45	<0.45	<0.45	<0.45
Copper dissolved [µg/l]	5 <sup>1</sup>	<1	1.97	<1	<b>6.16</b>
Iron [µg/l]	200 <sup>2</sup>	<b>1,304</b>	<b>243.04</b>	<b>3,065</b>	179.33
Manganese dissolved [µg/l]	50 <sup>2</sup>	<b>167.41</b>	17.89	<b>529.20</b>	<b>120.68</b>
Lead dissolved [µg/l]	1.2 <sup>1</sup>	1.08	<b>2.03</b>	<1	<1
Mercury [µg/l]	0.07 <sup>1</sup>	<0.5	<0.5	<0.5	<0.5
Nickel dissolved [µg/l]	4 <sup>1</sup>	2.66	3.90	<b>4.03</b>	3.43
Escherichia Coli (E.coli) [CFU/100ml]	0 number/100ml <sup>2</sup>	<b>&lt;10</b>	<b>&lt;1</b>	<b>10</b>	<b>7</b>
Coliform Bacteria [CFU/100ml]	0 number/100ml <sup>2</sup>	<b>85</b>	<b>70</b>	<b>&gt;201</b>	<b>&gt;201</b>
<p>The above surface water monitoring results show exceedances of the EQSs at the downstream point SW1 for total ammonia and nickel, and exceedances of the parametric values for iron, manganese, Escherichia Coli and Coliform bacteria. These exceedances indicate that leachate may be migrating into the Northern drain downstream of the landfill. The monitoring results for location SW11 show exceedances of relevant standards for total ammonia, copper, manganese, Escherichia Coli and Coliform bacteria. However, location SW11 is located c.1.6km downstream of the landfill on the Whitegate River where significant dilution is available. The Tier 3 assessment states that it is possible that run off from other activities in the catchment such as forestry, intensive dairy farming and piggery activities located to the east and south-east of the landfill may also be impacting on surface water quality at SW11. The monitoring results at SW6 and SW10 further show exceedances of cyanide, iron, manganese, lead, Escherichia Coli and Coliform bacteria upstream of the landfill, indicating that there are other sources of contamination upstream of the landfill which affect downstream water quality. Furthermore, the monitoring result for upstream location SW6 shows</p>					

	<p>an exceedance of the EQS of 25 µg/l for Arsenic (30.29µg/l) on 24<sup>th</sup> April 2021. It is also noted that it cannot be determined whether the actual concentrations for cadmium and mercury, were within the relevant standards as the limit of detection for the monitoring methods utilised were above the EQS.</p> <p>Condition 3.9(d) requires quarterly monitoring of surface water in accordance with Schedule A.3, as detailed in Section titled '<i>Proposed Remedial Actions</i>' below. Additionally, Condition 3.9(g) requires that the limit of detection of the monitoring methods shall be below the relevant standard reference values and parametric values.</p>												
Hydrogeology	<p>The closed landfill lies within the Tynagh Groundwater Body (GWB Number: IE_SH_G_236). The status of this groundwater body is Good. The site is underlain by an aquifer classified as Poor Aquifer - Bedrock which is Generally Unproductive except for Local Zones (PI). The aquifer vulnerability beneath the site is classified on the GIS mapping system as Moderate. The Tier 3 assessment states however that the harvesting of peat has reduced the Moderate vulnerability rating and the trial hole excavations indicate that the vulnerability in trial holes T6 and T8 is Extreme. Groundwater beneath the site flows towards the north-east, as shown in Figure 9.</p> <p><i>Drinking water abstractions</i></p> <p>The Whitegate Public Water Supply (PWS Id. 0300PUB1030_1) is located in Whitegate Springs approximately 3km south-west of the site. It is a groundwater abstraction. Because groundwater beneath the site flows in a north-easterly direction, there will be no impact on this abstraction from the site.</p> <p>Three private wells were identified on the GSI mapping system<sup>1</sup> within 2.5km downgradient of the site:</p> <p><i>Table 3: Downgradient private wells</i></p> <table border="1" data-bbox="528 1339 1447 1731"> <thead> <tr> <th>Well Id.</th> <th>Location</th> <th>Use</th> </tr> </thead> <tbody> <tr> <td>1719SWW003</td> <td>c. 1km east of the site, in the townland of Kilkittaun, Co. Clare.</td> <td>Agricultural and Domestic</td> </tr> <tr> <td>1719SWW001</td> <td>c. 1.2km north-east of the site, in the townland of Tintrim, Co. Clare.</td> <td>Agricultural and Domestic</td> </tr> <tr> <td>1719SWW002</td> <td>c. 2.5 north-east of the site, in the townland of Kilcooney, Co. Clare.</td> <td>Agricultural and Domestic</td> </tr> </tbody> </table> <p>Due to the fact that groundwater beneath the site flows in a north-eastern direction, there may be a potential impact on the three boreholes. However, the appropriate capping will limit ingress of rainwater into the waste body thus limiting the generation of leachate which may impact groundwater.</p>	Well Id.	Location	Use	1719SWW003	c. 1km east of the site, in the townland of Kilkittaun, Co. Clare.	Agricultural and Domestic	1719SWW001	c. 1.2km north-east of the site, in the townland of Tintrim, Co. Clare.	Agricultural and Domestic	1719SWW002	c. 2.5 north-east of the site, in the townland of Kilcooney, Co. Clare.	Agricultural and Domestic
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<sup>1</sup> Geological Survey of Ireland mapping system [www.gsi.ie](http://www.gsi.ie) (date accessed 12<sup>th</sup> September 2023)



	<p>Condition 3.9(e) requires monitoring of groundwater in accordance with Schedule A.4, which requires groundwater monitoring upgradient and downgradient of the waste body on a quarterly basis and specifies the minimum parameters to be monitored. Furthermore, Condition 3.4 requires appropriate monitoring on a biannual basis to identify any impact on the quality of water abstracted at wells downgradient of the landfill and the assessment of the monitoring results against drinking water standards.</p>
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<p>Leachate and water quality:</p>	<p><u>Trial hole investigation</u></p> <p>Ten trial holes (Trial Hole (T) 1 to Trial Hole (T) 10) were excavated on 5<sup>th</sup> November 2009 to a depth of between 1.25m and 4.9m below the ground level, as shown in Figures 3 and 7. It is noted that nine trial holes were installed along the site boundary and not in the centre of the waste body. The applicant's correspondence dated 7<sup>th</sup> March 2022 states that the purpose of installing the trial holes closer to the margins was to confirm the lateral extent of the waste and that the waste is consistent in its composition across the site. The correspondence further states that based on the observations of the waste in the trial holes in the north and south of the site it was considered unnecessary to install trial holes in the centre of the waste mass.</p> <p>One trial hole, T6, was installed outside the site boundary. The profile for trial hole T6 states that rubble was encountered in this location, indicating that the waste body may be extending beyond the site boundary. The applicant's correspondence dated 7<sup>th</sup> December 2022 states however, that, based on review of the original trial hole logs, together with a recent inspection of the area in question by Council staff, it is evident that soils comprising of glacial tills, cobbles and boulders are present at the eastern boundary of the landfill body and that there is no evidence of rubble or other construction and demolition wastes present in or around the location of T6.</p> <p>The trial hole investigation confirmed the presence of a c.200 – 700mm capping layer comprising of topsoil. Waste was present in eight trial holes T1 to T5 and T8 to T10, with the maximum depth of waste encountered at 4.8m bgl. These locations are shown in Figure 3. It is noted that the log for Trial Hole 7, which is located in the waste body, didn't state the presence of any waste, only sand and small boulders were recorded. All trial hole locations were underlain by peat.</p> <p>Liquid was observed in the trial holes and the applicant's correspondence dated 7<sup>th</sup> March 2022 states that the liquid comprised of rainfall recharge through the waste mass and leachate as a result of rainfall moving through the waste and that it is not perched groundwater or the water table. Odour was observed at T2, T3, T4, T5 and T8. Bedrock was reached in trial holes T1 and T8. The Tier 2 assessment states that no subsoil was observed between the waste deposited and the bedrock in T8 and there was only minimal dispersed waste in T1.</p> <p><u>Soil sampling</u></p> <p>The Tier 2 assessment states that soil samples were collected from trial holes T1, T2, T3 and T4 on 5<sup>th</sup> November 2009 and that analysis of</p>
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these (samples) will depend on the leachate results obtained in the coming weeks.' It is noted that no soil analysis results were submitted.

Leachate monitoring

Leachate samples were collected from four trial holes T3, T4, T5 and T8 on 5<sup>th</sup> November 2009, as shown in Figures 3 and 7. The table below shows the maximum parameter concentrations recorded.

Table 4: Leachate monitoring results, November 2009

Parameter	Groundwater Threshold Value /Limit <sup>1,2,3</sup>	Trial hole Id.			
		T3	T4	T5	T8
Ammonia [mg/l]	0.065 <sup>1</sup> Ammonium as N	<b>34.8</b>	<b>98.36</b>	<b>193.35</b>	<b>81.27</b>
Orthophosphate [mg/l]	0.035 <sup>1</sup> [mg/l P] Molybdate Reactive Phosphorous	<b>&lt;0.08</b>	<b>&lt;0.08</b>	<b>&lt;0.08</b>	<b>&lt;0.08</b>
BOD [mg/l]	2.2 <sup>2</sup>	<b>15</b>	<b>80</b>	<b>186</b>	<b>36</b>
Electrical conductivity [µS/cm]	1,875 <sup>3</sup>	<b>2,400</b>	<b>2,600</b>	<b>4,000</b>	<b>2,200</b>
Chloride [mg/l]	187.5 <sup>1</sup>	75.3	<b>222.4</b>	<b>213</b>	43.96
Potassium [mg/l]	5 <sup>2</sup>	<b>109</b>	<b>119</b>	<b>272</b>	<b>44</b>
Calcium [mg/l]	200 <sup>2</sup>	<b>236</b>	195	<b>271</b>	<b>206</b>
Magnesium [mg/l]	50 <sup>2</sup>	<b>94.9</b>	<b>77.9</b>	<b>74.7</b>	49.6
Arsenic [µg/l]	7.5 <sup>1</sup>	4.46	6.31	<b>16.8</b>	6.46
Boron [µg/l]	750 <sup>1</sup>	<b>1,090</b>	<b>939</b>	<b>776</b>	618
Chromium [µg/l]	37.5 <sup>1</sup>	8.9	22.3	<b>38.5</b>	11.1
Manganese [µg/l]	50 <sup>2</sup>	<b>1,730</b>	<b>1,380</b>	<b>2,130</b>	<b>2,230</b>
Benzene [µg/l]	0.75 <sup>1</sup>	<b>&lt;1.30</b>	<b>&lt;1.30</b>	<b>1.82</b>	<b>&lt;1.30</b>

<sup>1</sup> Groundwater threshold value (GTV), as set out in the European Communities Environmental Objectives (Groundwater) Regulations, 2010, as amended.

<sup>2</sup> Environmental quality standard (EQS), as set out in the Environmental Quality Standard (EQS) as set out in European Communities Environmental Objectives (Surface Water) Regulations 2009, as amended.

<sup>3</sup> Interim guideline values (IGV), as set out in the EPA publication 'Towards setting guideline values for the protection of groundwater in Ireland – Interim Report', 2003.

Chlorobenzene [µg/l]	1.0 <sup>2</sup>	<b>&lt;3.50</b>	<b>&lt;3.50</b>	<b>24.7</b>	<b>&lt;3.50</b>
Naphthalene [µg/l]	Total PAHs 0.075 <sup>1</sup>	<b>1.17</b>	<b>&lt;1</b>	<b>1.12</b>	<b>&lt;1</b>

The leachate monitoring results show exceedances of groundwater threshold values of ammonium, molybdate reactive phosphorous, chloride, arsenic, boron, chromium, benzene and total PAHs. Furthermore, the monitoring results show exceedances of EQSs for BOD, potassium, calcium, magnesium, manganese and chlorobenzene and the IGV for conductivity. The Tier 3 Assessment states the leachate analysis results indicate weak and aged leachate in isolated pockets in the waste mass, and that it is likely that the leachate discharges to the Northern drain, particularly in the winter months. The Tier 3 further states that because the leachate is weak and rainfall amounts are high in the winter the impacts from leachate downstream of the landfill are relatively low.

The applicant was requested to carry out up to date leachate monitoring. The applicant's correspondence dated 7<sup>th</sup> March 2022 states: *'It is highly likely that the leachate quality will be different since it was established in 2009. Given the extent of rainfall recharge through the waste over the past 13 years it is highly likely that the leachate is now much weaker, and the associated risk posed by it is also much lower than when it was monitored in 2009. (The local authority) do not therefore consider that the expense of installing leachate wells now is justified and that any investment in managing the site risk should focus on remediation works such as capping to diverting the rainfall recharge that is generating any remaining leachate.'*

Condition 3.1(f) requires the installation of one or more leachate monitoring boreholes if required by the Agency, in the event leachate assessment is necessary in the future to validate remediation techniques or assess the cause of off-site impacts. Condition 3.9(b) requires leachate monitoring on a biannual basis if required by the Agency in accordance with Schedule A.1, as outlined in detail in Section titled *'Proposed Remedial Actions'* below.

*Groundwater quality*

Four wells were monitored in total, as outlined in Table 5 below and shown in Figure 3. It is noted that each of the monitored wells is located a significant distance from the landfill, i.e., the nearest well (Well A) is located c.950m north of the site. The Tier 3 assessment also states that other sources of potential contamination, which include a piggery and intensive dairy farm, are located downgradient of the landfill and upgradient of the monitored wells and that it is considered that the elevated parameters in the monitored wells were more likely to originate from these sources and not the landfill.

*Table 5: Groundwater monitoring rounds and locations*

<b>Round &amp; monitoring date</b>	<b>Monitoring locations</b>
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Round No. 1 December 2009	Wells A, Well B and Well C, as shown in Figure 9. <ul style="list-style-type: none"> <li>• <b>Well A</b> - c.950m north of the site (the applicant refers to this well as upgradient well).</li> <li>• <b>Well B</b> (also referred to as GW1) - c.980m north-east of the site, in Killkittuan townland (the applicant refers to this well as downgradient well).</li> <li>• <b>Well C</b> - c.1.2km east of the site (the applicant refers to this well as downgradient well).</li> </ul>
Round No. 2 24 <sup>th</sup> March 2021	The existing monitoring location: <ul style="list-style-type: none"> <li>• <b>Well B</b> (also referred to as GW1) and</li> </ul> New location: <ul style="list-style-type: none"> <li>• <b>Well A-1</b> (also referred to as GW10) - c. 1km north of the site (the applicant refers to this well as upgradient well)</li> </ul>
Round No. 3 24 <sup>th</sup> April 2021	The existing monitoring locations: <ul style="list-style-type: none"> <li>• <b>Well A-1</b> (also referred to as GW10) - the applicant referred to this well as upgradient well, and</li> <li>• <b>Well B</b> (also referred to as GW1).</li> </ul>

The table below shows the monitoring results from the monitoring on 24<sup>th</sup> April 2021 at monitoring borehole Well A-1 (GW10) and Well B (GW1) in 2021.

*Table 6: Groundwater monitoring results, March and April 2021*

Parameter	EQS/ Limit 1,2,3	Well A-1 (GW10) upgradient		Well B (GW1) downgradient	
		March 2021	April 2021	March 2021	April 2021
Ammonium [mg/l]	0.065 <sup>1</sup>	0.02	0.03	<b>3.18</b>	<b>2.69</b>
Chloride [mg/l]	24 <sup>1</sup>	20.4	22.3	22.6	<b>26.0</b>
Manganese [µg/l]	50 <sup>2</sup>	8.34	21.48	<b>781.01</b>	<b>784</b>
Potassium [mg/l]	5 <sup>3</sup>	<b>&lt;10</b>	<b>&lt;10</b>	<b>&lt;10</b>	<b>&lt;10</b>

<sup>1</sup> As set out in the European Communities Environmental Objectives (Groundwater) Regulations, 2010, as amended.

<sup>2</sup> As set out in the European Union (Drinking Water) Regulations 2023, S.I. No. 99 of 2023.

<sup>3</sup> Interim guideline values (IGV), as set out in the EPA publication 'Towards setting guideline values for the protection of groundwater in Ireland – Interim Report', 2003.

Total coliforms [CFU/100ml]	0 <sup>2</sup> Coliform bacteria [number/100 ml]	<1	<1	<1	<1
E. coli [CFU/100ml]	0 <sup>2</sup> [number/100 ml]	<1	<1	<1	<1

The monitoring results show exceedances at the downstream location Well B of the relevant EQSs for ammonium and chloride and the drinking water regulation value of manganese. The Tier 3 assessment states that the sources of these parameters are most likely associated with activities in the catchment such as the piggery and/or the dairy farm and not the landfill. The Tier 3 assessment further states that the presence of a compacted peat layer beneath the waste means that any leachate generated in the waste will discharge laterally preferentially along the surface water pathway rather than vertically to the groundwater.

The applicant was requested to install at least three groundwater monitoring boreholes outside the waste body and at a distance which is representative of any potential impact the landfill may have on groundwater, and to carry out groundwater monitoring at these boreholes. The applicant's correspondence dated 7<sup>th</sup> March 2023 states however that *'The wells that are currently monitored are the closest groundwater sensitive receptors to the site and are therefore considered the most suitable groundwater monitoring locations. As outlined in the Tier 3 report, given the nature of the subsoil (peat) and the underlying bedrock aquifer which is a poorly productive aquifer, groundwater pathways are short with discharge to adjacent streams and rivers. It is highly likely that the rainfall recharge predominantly discharges to the drains and streams around the landfill and does not percolate to any significant degree through the peat. For this reason, it is considered that installing groundwater wells at the site will not provide any significant additional information and the budget for the site should therefore focus on the remedial measures required to mitigate the risk posed which is to the surface water receptors.'*

In the event of any future changes to nearby groundwater receptors and to validate the conclusions outlined in the Tier 3 report regarding groundwater percolation along with the proposed capping to prevent leachate generation and the extreme aquifer vulnerability noted in trial holes T6 and T8, the draft CoA requires the installation of groundwater monitoring boreholes. Taking account of the applicants budgeting reasoning outlined above, the draft CoA requires that the monitoring boreholes are combined for gas monitoring also. The installation of the boreholes is required under Condition 3.1(g). Condition 3.9(e) requires groundwater monitoring for parameters on a quarterly basis in accordance with Schedule A.4. Also, based on the monitoring results above and as the waste contains municipal waste and industrial waste, it is considered that monitoring for organic compounds in the groundwater is appropriate. Accordingly, Condition 3.9(f) requires an annual screening of groundwater for trace organic substances.

Landfill gas:

Landfill gas can migrate from the waste body. The most likely pathway for the migration of landfill gas is through the underlying soils and the existing cover layer over the waste.

The Tier 3 assessment states that landfill gas migrates freely to atmosphere where the landfill cover is thin. The Tier 3 assessment further states that gas can migrate laterally to the surface water drain to the north of the site and to lower ground to the south and east of the site.

One round of subsurface gas monitoring was carried out with an impact searcher bar, at 0.5m to 1m depths, at six monitoring locations 1 to 6 on 26<sup>th</sup> November 2008, as shown in Figure 6. The associated gas monitoring form states that the ground was too wet for any further sampling. No methane (CH<sub>4</sub>) was detected during this sampling event. The highest concentration of (CO<sub>2</sub>) carbon dioxide was measured at 1.7% v/v at location No. 5.

Gas monitoring, using a gas probe, was also carried out at one on-site monitoring location G1 located near the northern site boundary on 5<sup>th</sup> November 2009, as shown in Figure 7. The results are shown in Table 7 below.

Table 7: Landfill gas monitoring results, November 2009

Monitoring Location Id	CH <sub>4</sub> (% v/v)	CO <sub>2</sub> (% v/v)	Trigger levels outside the waste body <sup>1</sup>	
			CH <sub>4</sub> (% v/v)	CO <sub>2</sub> (% v/v)
GW1	<b>12.2</b>	<b>4</b>	1	1.5

The monitoring results show exceedances of the trigger levels for methane and carbon dioxide at the edge of the waste body.

The applicant was requested to carry up-to-date gas monitoring. Correspondence dated 7<sup>th</sup> March 2022 states: *'The site is situated in a remote location with the closest gas sensitive receptor more than 600m to the north of the site. The Risk Assessment as detailed in the EPA Code of Practice, 'Environmental Risk Assessment for Unregulated Waste Disposal Sites', clearly demonstrates that landfill gas is not a risk. (SPR 10 and SPR 11, Tier 1 report). Any residual gas is currently freely venting to atmosphere therefore the gas risk is insignificant. As part of the proposed remedial measures gas ventilation wells will be installed to mitigate any gas risk once the site is capped. It is therefore considered that installing landfill gas monitoring wells at this time is unwarranted.'*

Condition 3.9(c) and Schedule A.2 require gas monitoring to detect the presence and concentration of landfill gas at the proposed gas vents within the waste body and outside the waste body at the combined gas and groundwater monitoring wells, as outlined in Section titled *'Proposed Remedial Actions'* below, on a quarterly basis. Condition 3.11 enables changes to monitoring requirements, with the agreement of the Agency following evaluation of test results and/or relevant proposals.

<sup>1</sup> As set out in the EPA Landfill Manuals - Landfill Monitoring, 2<sup>nd</sup> Edition, 2003.

<p>Conceptual site model:</p>	<p>Tier 1 Assessment determined that the overall risk score for the closed landfill was High (Class A). This classification was due to the risk of landfill leachate migration, through surface water, into the Slieve Aughty Mountains Special Protection Area (Site code: 004168) (SPR 9), which is located immediately to the west (and upstream) of the site.</p> <p>It is noted that the 2009 Addendum to the Tier 2 Investigation states in respect of SPR 9, that the high rating (70%) was due to the proximity of the landfill to the Slieve Aughty Mountains SPA but 'it is considered logical that when there is no discernible impact on the SPA from the landfill, the scoring would take account of this fact, and the classification of the landfill as being high risk should be adjusted downwards to low risk. For all practical purposes the SPR 9 link does not exist.' Also, in relation to the risk on private wells (SPR3), which scored 9% (low risk) in the Tier 1 assessment risk classification, the addendum states that, based on the analytical data for leachate from the landfill, and samples taken from the adjoining surface water drains, the landfill was unlikely to be the contributory factor to the elevated results in Wells B and C. Accordingly, the addendum recommended that <i>'The Tier 2 assessment, undertaken in accordance with the EPA prescribed methodology, and in consultation with the Agency, does not support an SPR 9 or SPR 3 linkage. It is recommended therefore that the landfill classification be reduced to Class C, or low risk. As the site is considered to be low risk no Tier 3 assessment is required, and the next phase is to move directly to remediation'</i>. No record of the said consultation with the Agency was provided.</p> <p>It is noted however that the Tier 3 assessment was carried out and, following the Tier 3 investigations, the risk classification remains High (Class A), due to the risk of leachate migration to the adjacent surface water drains (SPR 8). SPR 3 remains as low risk.</p> <p>The conceptual site model is shown in Figure 10.</p>

#### 4. SPR linkages and remedial actions

<p>SPR linkage scenarios (applicable ones only):</p>	<p><b>Leachate and gas migration scores:</b></p> <p><u>High scores:</u></p> <p>One pathway was identified as High Risk:</p> <ul style="list-style-type: none"> <li>• Migration of leachate, via surface water drainage/runoff, to surface water bodies (SPR 8).</li> </ul> <p><u>Moderate scores:</u></p> <p>There was no pathway identified as Moderate Risk:</p> <p><u>Low scores:</u></p> <p>Eight pathways were identified as Low Risk:</p> <ul style="list-style-type: none"> <li>• Migration of leachate, via groundwater flowing to water</li> </ul>
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	<p>drainage/runoff, to surface waterbodies (SPR 1);</p> <ul style="list-style-type: none"> <li>• Migration of leachate, via groundwater, to Surface Water Body Protected Areas (SWDTE) (SPR 2);</li> <li>• Migration of leachate to private wells (SPR 3);</li> <li>• Migration of leachate into Groundwater Protected Areas (GWDTE) (SPR4);</li> <li>• Migration of leachate to the underlying aquifer (SPR 5);</li> <li>• Migration of leachate, via groundwater migration, to surface water bodies (SPR 7);</li> <li>• Migration of leachate, via surface water drainage/runoff, to Surface Water Body Protected Areas (SPR 9); and</li> <li>• Human health exposure pathway of off-site lateral migration of landfill gas into nearby buildings (SPR 10).</li> </ul> <p><b>Summary:</b></p> <p>Upon the review of the SPR linkages and monitoring data;</p> <ul style="list-style-type: none"> <li>• remedial action is warranted to address the risk of leachate migrating from the site into surface water.</li> </ul>
<p>Proposed remedial actions:</p>	<p>The applicant proposed the following remedial measures:</p> <p>1. <u>Landfill cap</u></p> <p>(i) 500mm layer of clean soil and perimeter berm;</p> <p>The applicant states that due to the nature of the waste and the low amenity use a 500mm capping layer over the waste may suffice. The applicant intends to import clean soil and build up the capping layer to achieve the 500mm thick capping layer across the site. The Tier 3 assessment further states that to prevent leachate break out along the sides, the sides of the landfill will also have to be sealed with a clay barrier, as shown in Figure 11 and 12.</p> <p>The Tier 3 assessments further recommends that the cap should be graded to achieve a fall from a central ridge, running north to south, to the sides of the capped site with a fall of 1:40, which will allow rainfall to run-off the landfill into the surrounding surface water drains rather than percolate through the waste. The Agency requires a detailed design of the cap to be submitted prior to installation.</p> <p>It is considered however that an engineered cap of 1m thickness is more appropriate for the landfill. This is due to the nature of leachate being generated that is migrating into adjacent surface water drains, the type of waste encountered during site investigations (e.g., car engine, oil drums or similar containers, animal medicine bottles, a fridge, car battery) along with the results of the surface water monitoring which indicate that the waste within the landfill is not inert. In accordance with the EPA Landfill Manuals – Landfill Site Design, a 500mm thick cap as proposed is more suited to a landfill for inert waste.</p> <p>Accordingly, Condition 3.1(c) requires a landfill cap that comprises</p>



of a minimum 1m thick mineral layer with 1mm thick low permeability geomembrane, or equivalent, to achieve a hydraulic conductivity of less than or equal to  $1 \times 10^{-9} \text{m/s}$ . Condition 3.1(d) requires installation of a compacted clay perimeter berm around the waste body and that the clay berm shall be integrated with the landfill cap and achieve the same hydraulic conductivity. Additionally, Condition 3.1(c) requires reprofiled gradients to provide for run-off of rainwater in accordance with *EPA Landfill Manuals – Landfill Site Design* and Condition 3.12 requires that only greenfield soil and stone, including greenfield soil and stone that meets by-product criteria, or soil and stone of equivalent nature and character, in terms of chemical and physical composition, can be imported for use in remedial, corrective, or other engineering works at the site.

(ii) Surface drainage

The applicant recommends surface water drainage along the boundaries to divert rainfall away from the waste mass. The applicant's correspondence dated 7<sup>th</sup> March 2023 states that *'the compacted capping layer will cover the waste mass which will be pulled back from the surrounding surface water drains and stream along the boundaries. The capping layer will be contoured to allow surface water runoff from the central more elevated portion of the site to the perimeter with runoff into the surrounding surface water courses. It is not intended to have a single surface water discharge point.'*

However, owing to the cap required, see Condition 3.1(c), a water drainage layer is to be incorporated into the cap and only uncontaminated surface water drained from this layer is discharged into the adjacent surface water drains via specified discharge points at the landfill boundaries.

2. Gas ventilation

The applicant proposes installation of four gas vents in the waste body, one in each quadrant of the site to prevent lateral landfill gas migration, as shown in Figures 11 and 13.

Condition 3.1(c) requires a gas drainage layer within the cap and Condition 3.1(e) requires the installation of four gas vents in accordance with the *EPA Landfill Manuals – Landfill Site Design* and that spacing between the gas vent pipes shall be sufficient to achieve adequate gas venting.

Condition 3.9(c) and Schedule A.2 require gas monitoring at the gas vents within the waste body and in the dual-purpose landfill gas/groundwater monitoring boreholes required to be installed under Condition 3.1(g).

Additionally, Condition 3.8 requires a drawing showing the interpolated extent of the waste body, the area capped in accordance with Condition 3.1(c) and the gas vents installed in accordance with Condition 3.1(e).

3. Environmental monitoring

Tier 3 Assessment recommends that, to establish the effectiveness of

	<p>the remedial measures, annual monitoring of surface water is undertaken at the following locations, as shown in Figure 7 and 8:</p> <ul style="list-style-type: none"> <li>- SW-10 upstream of the landfill;</li> <li>- SW-4 and SW-2 on the northern drain</li> <li>- SW-11 on the Whitegate River.</li> </ul> <p>Additionally, the Tier 3 Assessment recommends the surface water be monitored for ammonia, sodium, chloride, potassium, manganese, electrical conductivity and the heavy metal suite consisting of cadmium, chromium, copper, lead, mercury, nickel and zinc.</p> <p>It is considered that surface water monitoring at the existing adjacent locations SW10, SW1 and SW4 and the further location SW11 is appropriate. However, it is also considered that surface water monitoring should include the following locations:</p> <ul style="list-style-type: none"> <li>- SW3 on the Northern drain where contamination with leachate was observed,</li> <li>- SW6 upstream of the landfill on the Eastern drain, and</li> <li>- SW7 downstream of the landfill on the Eastern drain</li> </ul> <p>It is considered that the initial surface water monitoring frequency should be on a quarterly basis. Accordingly, this is set out in Condition 3.9(d) and Schedule A.3.</p> <p>Having regard to the monitoring results submitted in support of the application for a certificate of authorisation and the age of the closed landfill, the above remedial measures are considered appropriate and recommended in Condition 3.1. Additional remediation measures, also listed in Condition 3.1, include:</p> <ul style="list-style-type: none"> <li>• Requirement to minimise the disturbance of deposited waste to the extent possible – Condition 3.1(b);</li> <li>• Gas vent specification and spacing requirements – Condition 3.1(c);</li> <li>• Requirement to reseed grass within the site – Condition 3.1(j).</li> </ul> <p>The proposed remedial measures are intended to break the SPR linkages by preventing:</p> <ul style="list-style-type: none"> <li>• migration of leachate into the adjacent land drain and, via this land drain, to other surface water bodies.</li> <li>• Migration of leachate into the underlying aquifer.</li> </ul> <p>The recommended certificate of authorisation allows for the importation and use of soil and stone to complete the works.</p>
Proposed aftercare monitoring and assessment:	<p>Monitoring as specified in Condition 3.9 and Schedule A of the recommended certificate of authorisation.</p> <p>Validation report to be submitted within 30 months.</p>
Adequacy of risk assessment:	<p>Regulation 7(7) of the Regulations states that the EPA must be satisfied with the risk assessment before proposing to grant a certificate of authorisation. The risk assessment is adequate as it has identified, assessed and adequately addressed the associated risks</p>

	inherent within the landfill site.
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## 5. Appropriate Assessment

Appendix 1 lists the European Sites assessed, their associated qualifying interests and conservation objectives along with the assessment of the effects of the activity on the European Sites.

A screening for Appropriate Assessment was undertaken to assess, in view of best scientific knowledge and the conservation objectives of the site, if the activity, individually or in combination with other plans or projects is likely to have a significant effect on any European Site. In this context, particular attention was paid to the European Sites at the Slieve Aughty Mountains SPA (site code: 004168), Lough Derg (Shannon) SPA (site code: 004058) and Lough Derg, North-east Shore SAC (site code: 002241).

The activity is not directly connected with or necessary to the management of any European Site and the Agency considered, for the reasons set out below, that it cannot be excluded, on the basis of objective information, that the activity, individually or in combination with other plans or projects, will have a significant effect on any European Site and accordingly determined that an Appropriate Assessment of the activity was required. A Natura Impact Statement was not requested as it was considered that there was sufficient information available to allow Appropriate Assessment to be carried out.

The reasons for the determination that an Appropriate Assessment was required are as follows:

- The landfill site is located adjacent to the Slieve Aughty Mountains SPA (site code: 004168).
- There is a hydrological connection between the closed landfill and the Lough Derg (Shannon) SPA (site code: 004058), via the land drain along the northern site boundary which discharges into the Whitegate River (waterbody code: IE\_SH\_25D100200, segment code: 25\_710). The Whitegate River forms part of the Lough Derg (Shannon) SPA.
- There is a hydrological connection between the closed landfill and the Lough Derg, North-east Shore SAC (site code: 002241), via the land drain along the northern site boundary which discharges into the Whitegate River (waterbody code: IE\_SH\_25D100200, segment code: 25\_710). The Whitegate River flows into the Alewnaghta Lough (segment code: 25\_189), and onwards into the Derrainy river (waterbody code: IE\_SH\_25D100200, segment code: 25\_450) which flows into Lough Derg (segment code: 25\_191a) where the Lough Derg, North-east Shore SAC is located.

An Inspector's Appropriate Assessment has been completed and has determined, based on best scientific knowledge in the field and in accordance with the European Communities (Birds and Natural Habitats) Regulations 2011 as amended, pursuant to Article 6(3) of the Habitats Directive, that the activity, individually or in combination with other plans or projects, will not adversely affect the integrity of any European Site, in particular the Slieve Aughty Mountains SPA (site code: 004168), Lough Derg (Shannon) SPA (site code: 004058) and Lough Derg, North-east Shore SAC (site code: 002241), having regard to their conservation objectives and will not affect the preservation of these sites at favourable conservation status if carried out in accordance with the recommended certificate of authorisation and the Conditions attached hereto for the following reasons:

- specifically, the remedial works will be undertaken to minimise the potential for water pollution to the Slieve Aughty Mountains SPA (site code: 004168), Lough Derg (Shannon) SPA (site code: 004058) and Lough Derg, North-east Shore SAC (site

code: 002241) and will ensure that there will be no significant impact on these European Sites; and

- the project alone, which consists of the remediation of the closed landfill, or in combination with other projects, will not adversely affect the integrity and conservation status of any of the qualifying interests of the Slieve Aughty Mountains SPA (site code: 004168), Lough Derg (Shannon) SPA (site code: 004058) and Lough Derg, North-east Shore SAC (site code: 002241).

In light of the foregoing reasons, no reasonable scientific doubt remains as to the absence of adverse effects on the integrity of those European Sites: Slieve Aughty Mountains SPA (site code: 004168), Lough Derg (Shannon) SPA (site code: 004058) and Lough Derg, North-east Shore SAC (site code: 002241).

## **6. Recommendation**

This report has been prepared by Ewa Babiarczyk and Seán Byrne.

I recommend granting the certificate of authorisation as proposed.

Signed



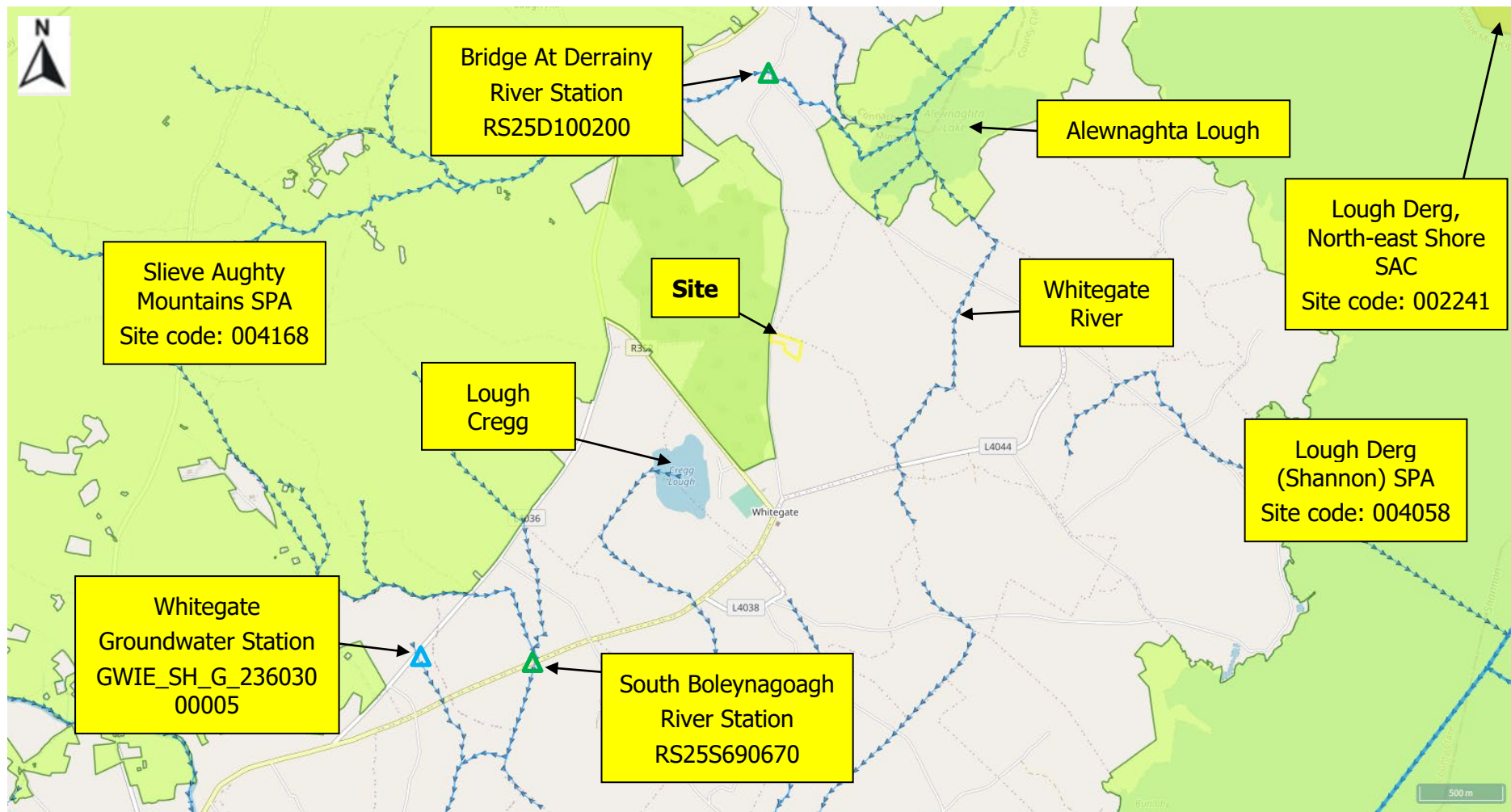
Ewa Babiarczyk

Date 29<sup>th</sup> November 2023

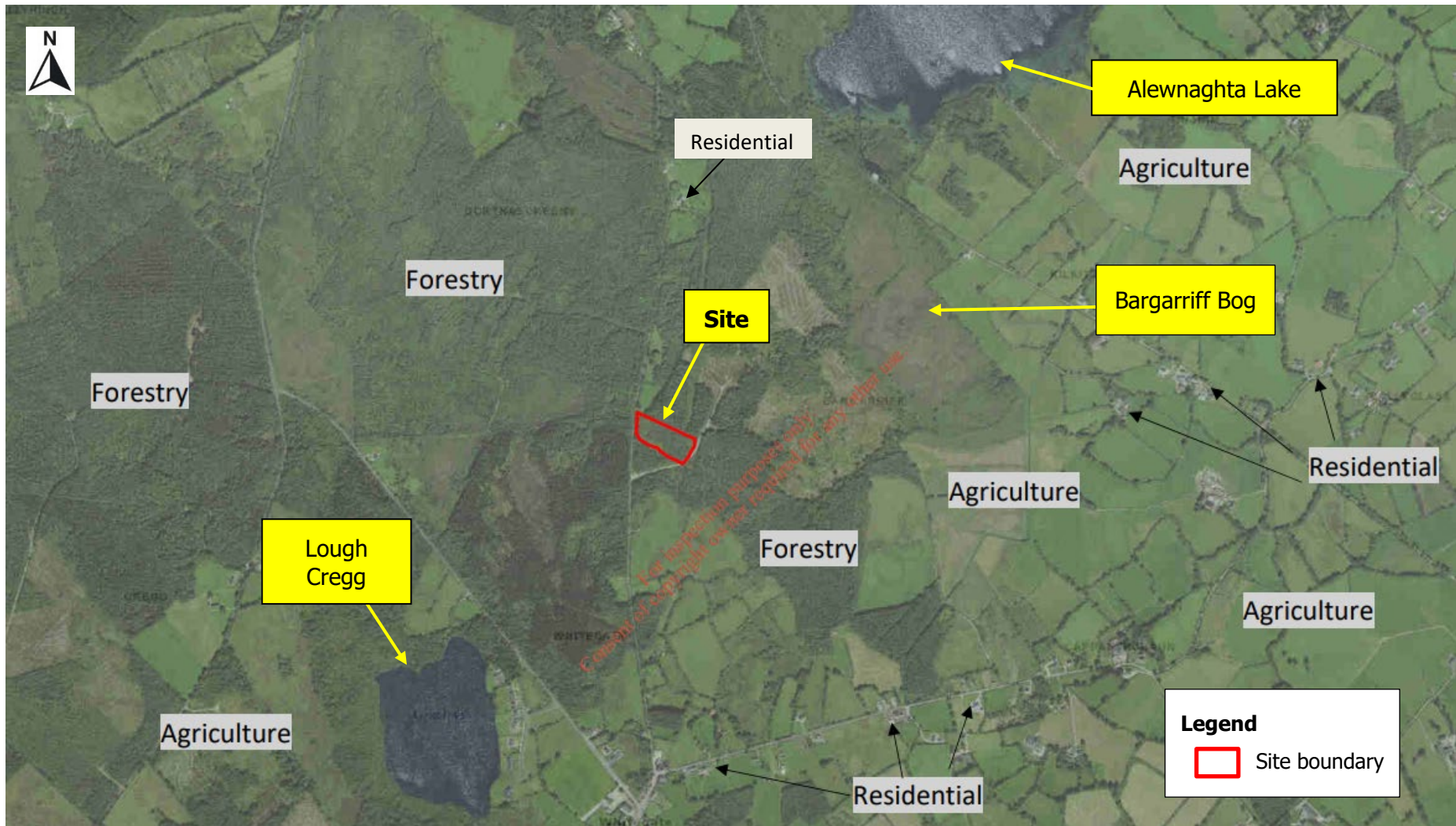
## **Procedural Note**

Any representations received by the Agency within 30 days of the draft certificate of authorisation being made available will be considered by the Agency.

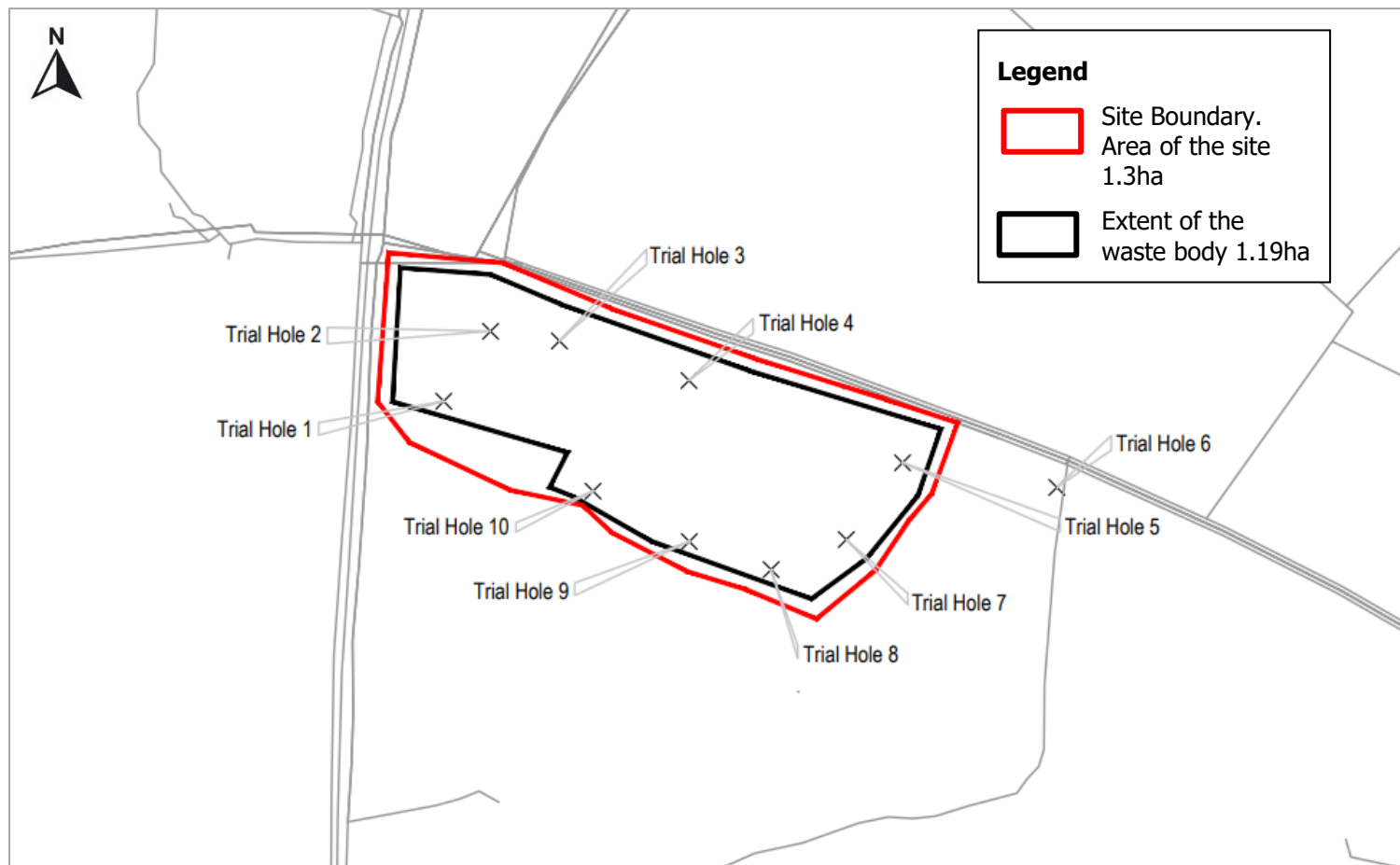
As soon as practicable after the expiry of the 30-day period the Agency will determine the certificate of authorisation, which may vary from the draft certificate, and shall issue an appropriately validated certificate of authorisation in accordance with the Waste Management (Certificate of Historic Unlicensed Waste Disposal and Recovery Activity) Regulations 2008.



**Figure 1: Location of Whitegate Historic Landfill**



**Figure 2: Site boundary & site surroundings**

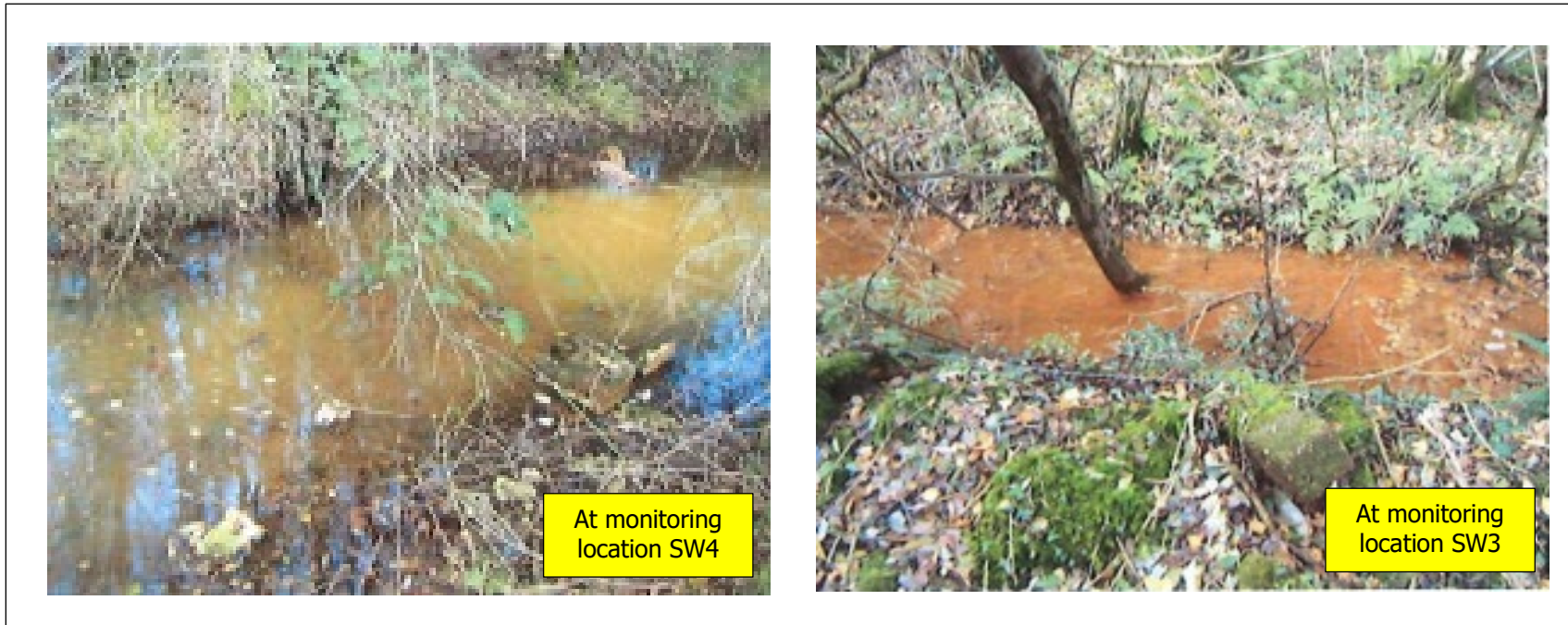


**Figure 3: Extent of the waste body and trial hole locations**

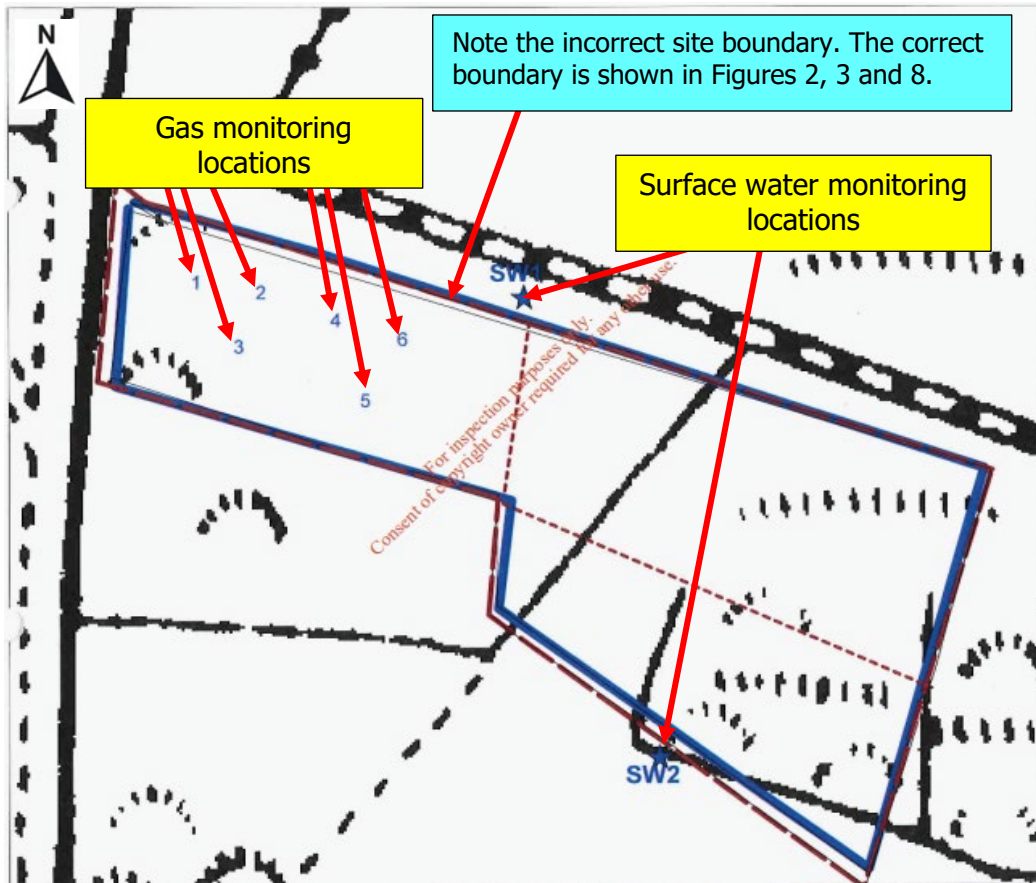


**Figure 4: Exposed waste and ponding**

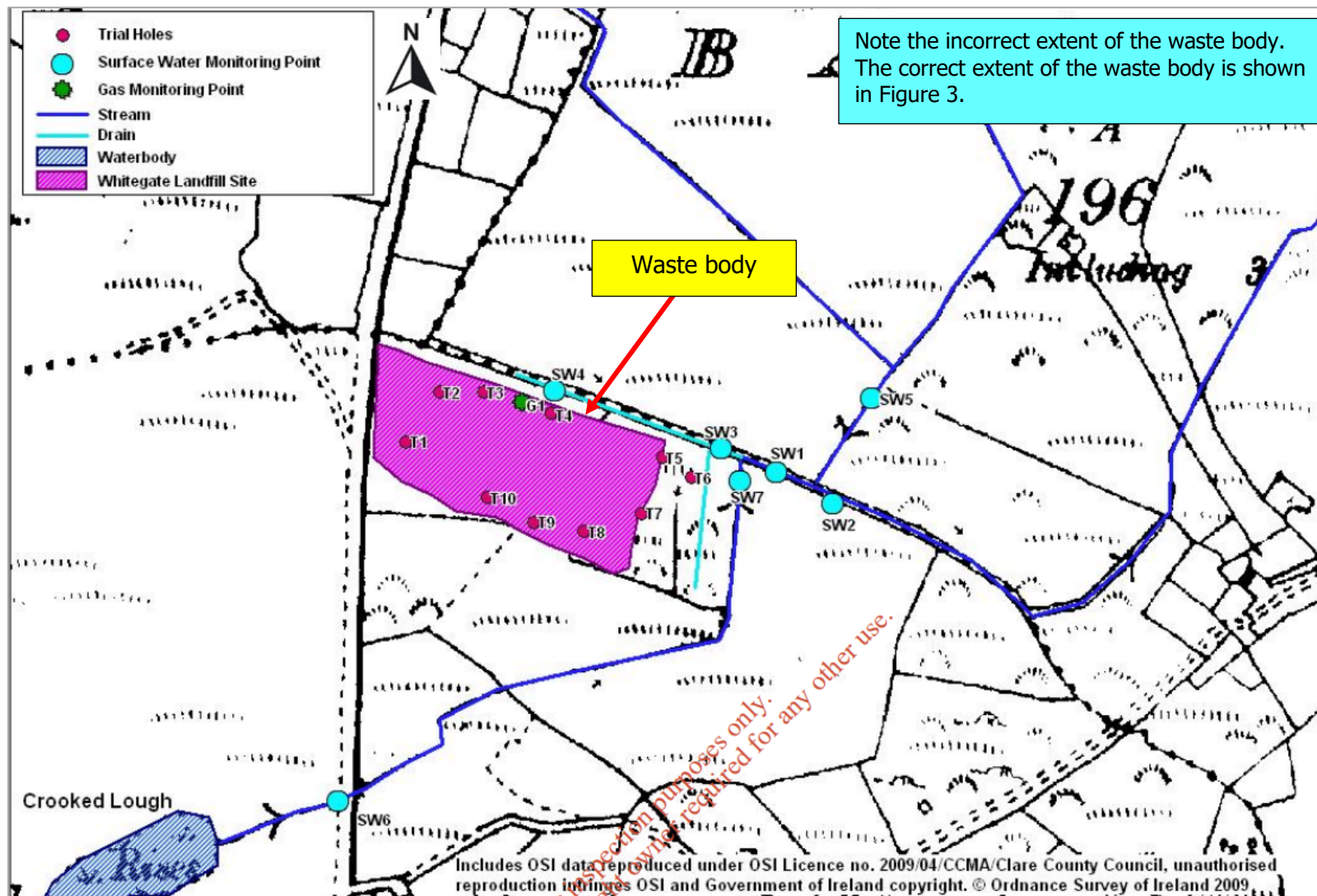




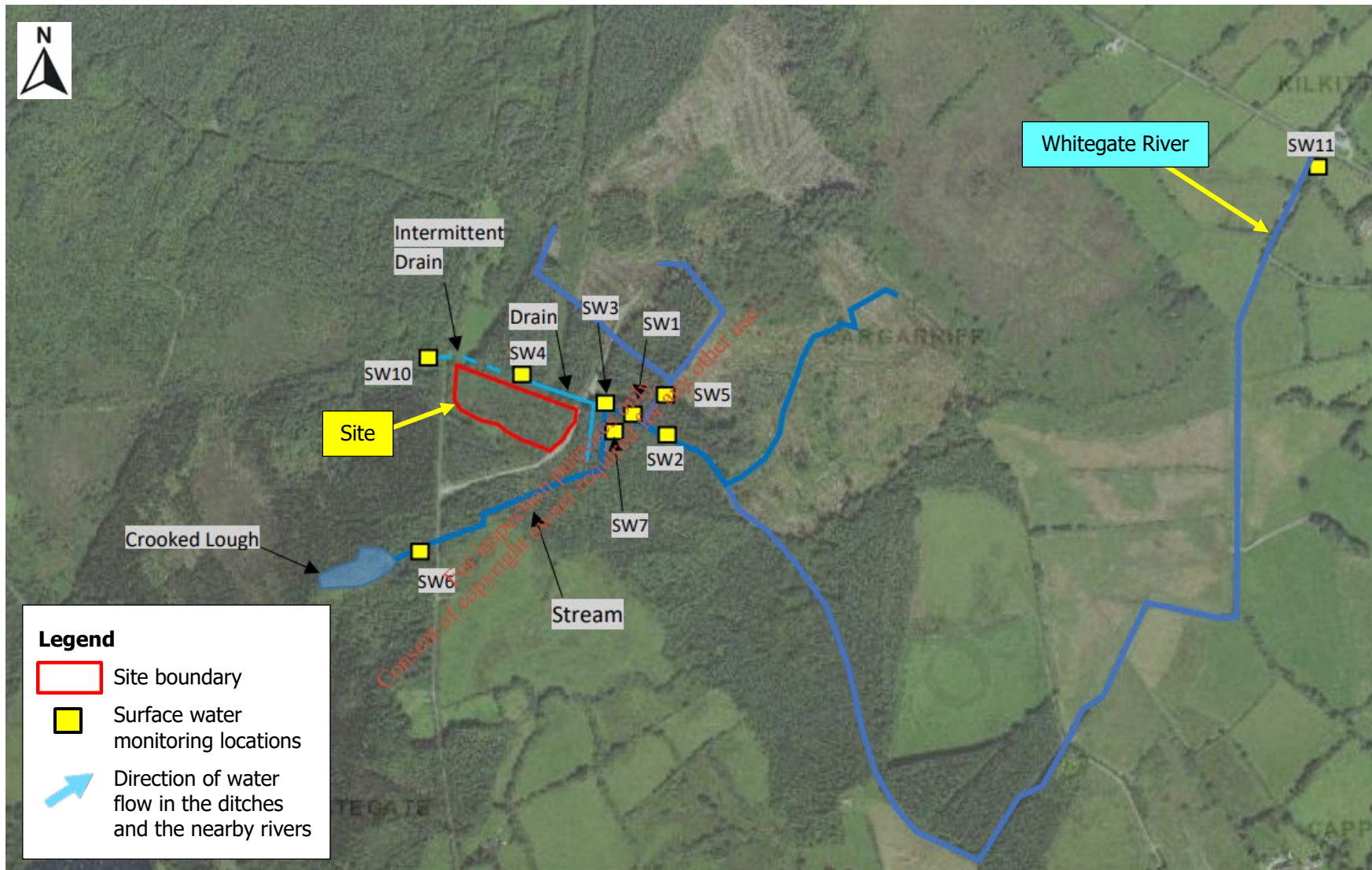
**Figure 5: Northern drain at monitoring location SW4 and c.100m downstream of SW4, at monitoring location SW3**



**Figure 6: Surface water monitoring and Gas monitoring locations 2008**



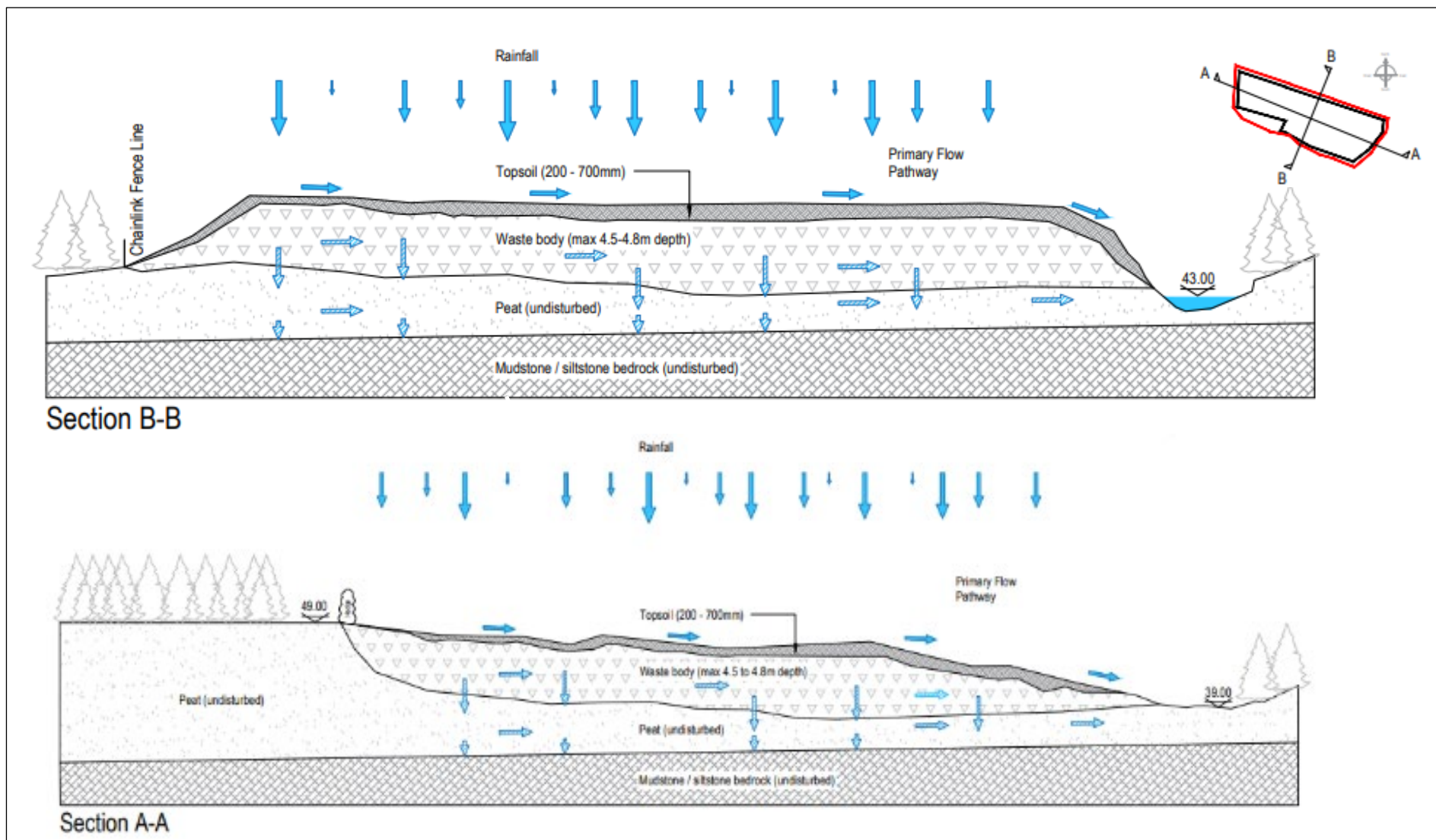
**Figure 7: Surface water monitoring (SW) locations 2009, gas monitoring (G1) location 2009 and Trial hole locations**



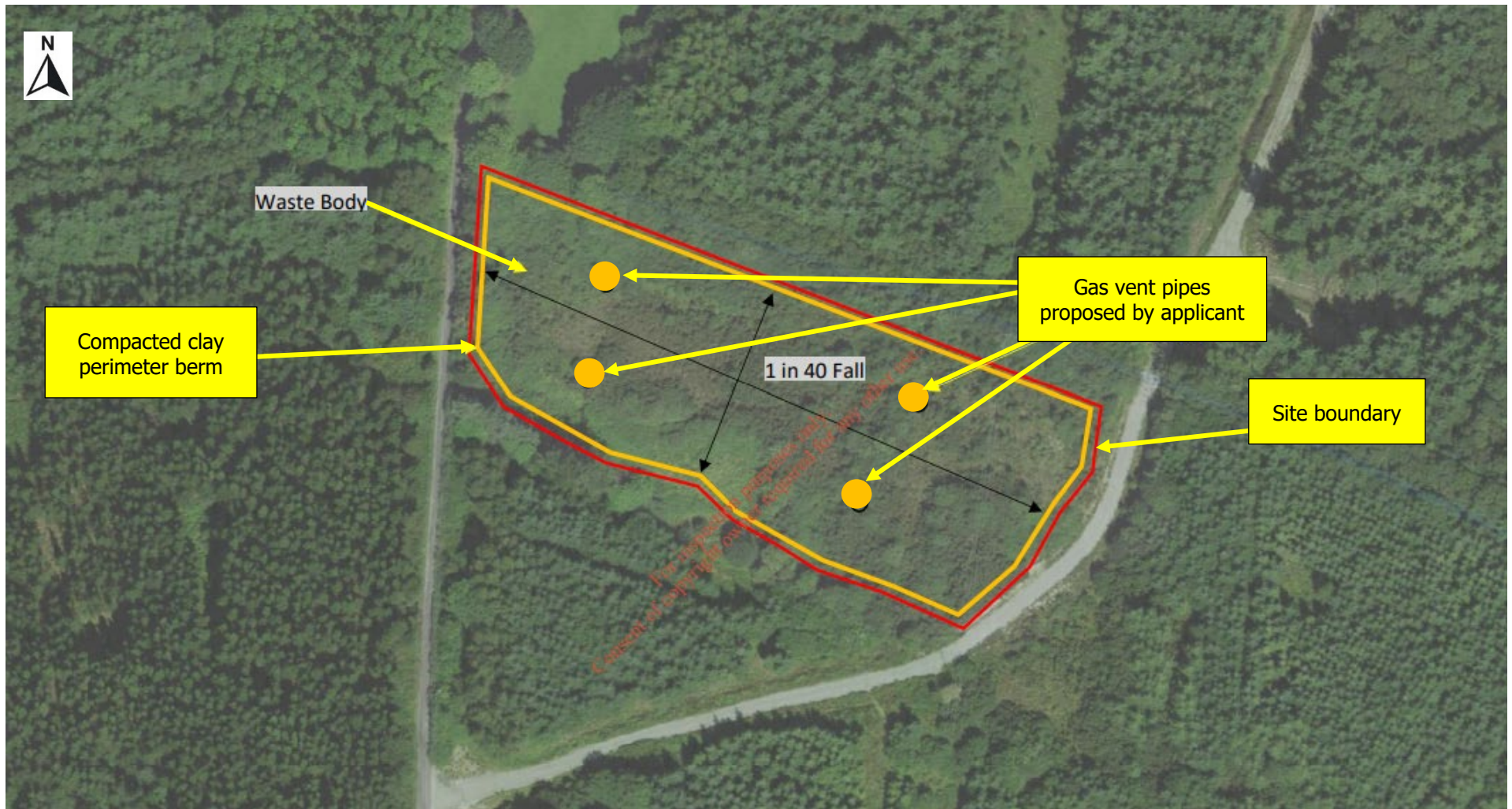
**Figure 8: Surface water monitoring (SW) locations 2009 and 2021**



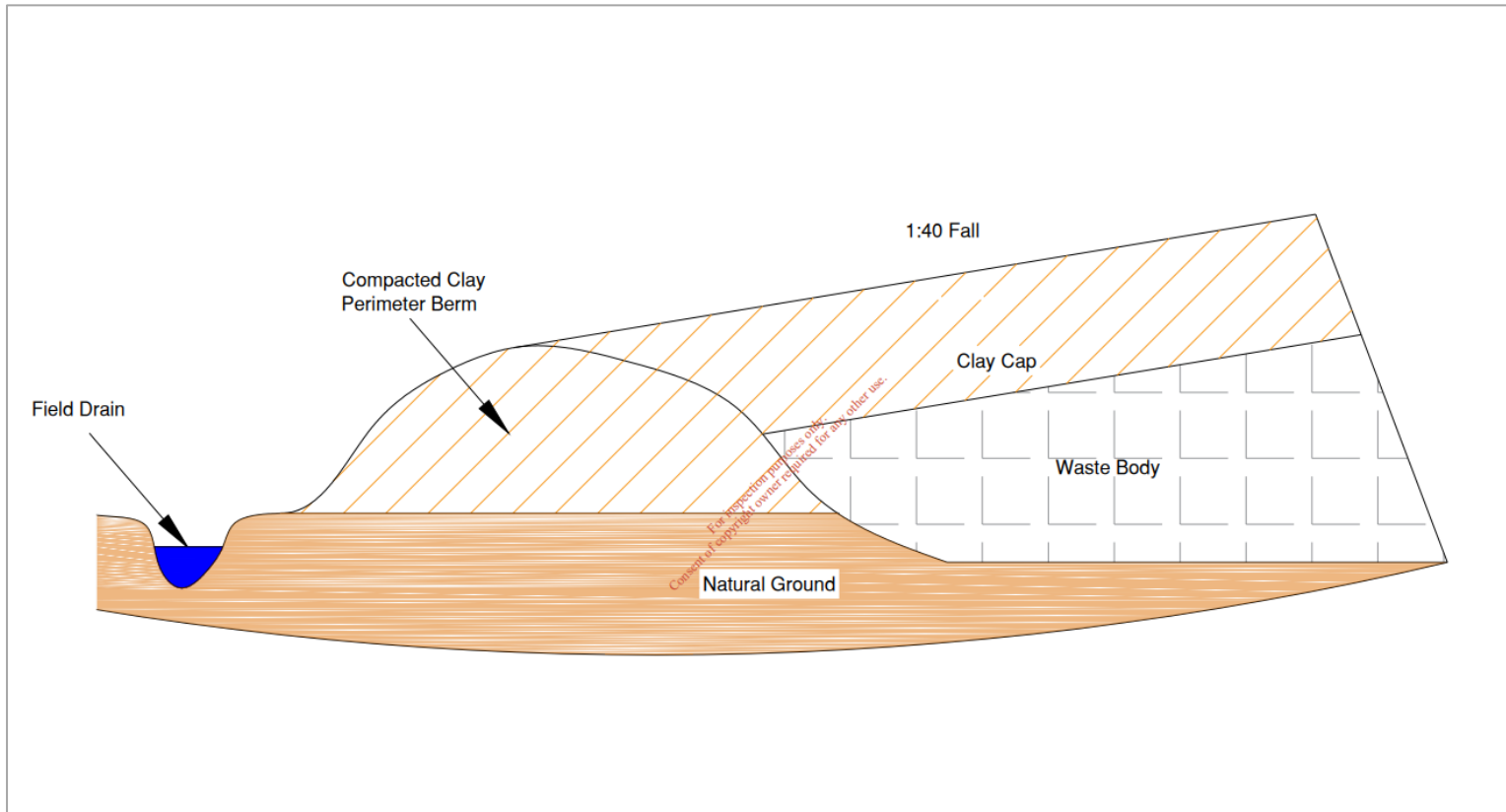
**Figure 9: Groundwater flow direction and Groundwater monitoring wells**



**Figure 10: Conceptual site model for Whitegate Historic Landfill**

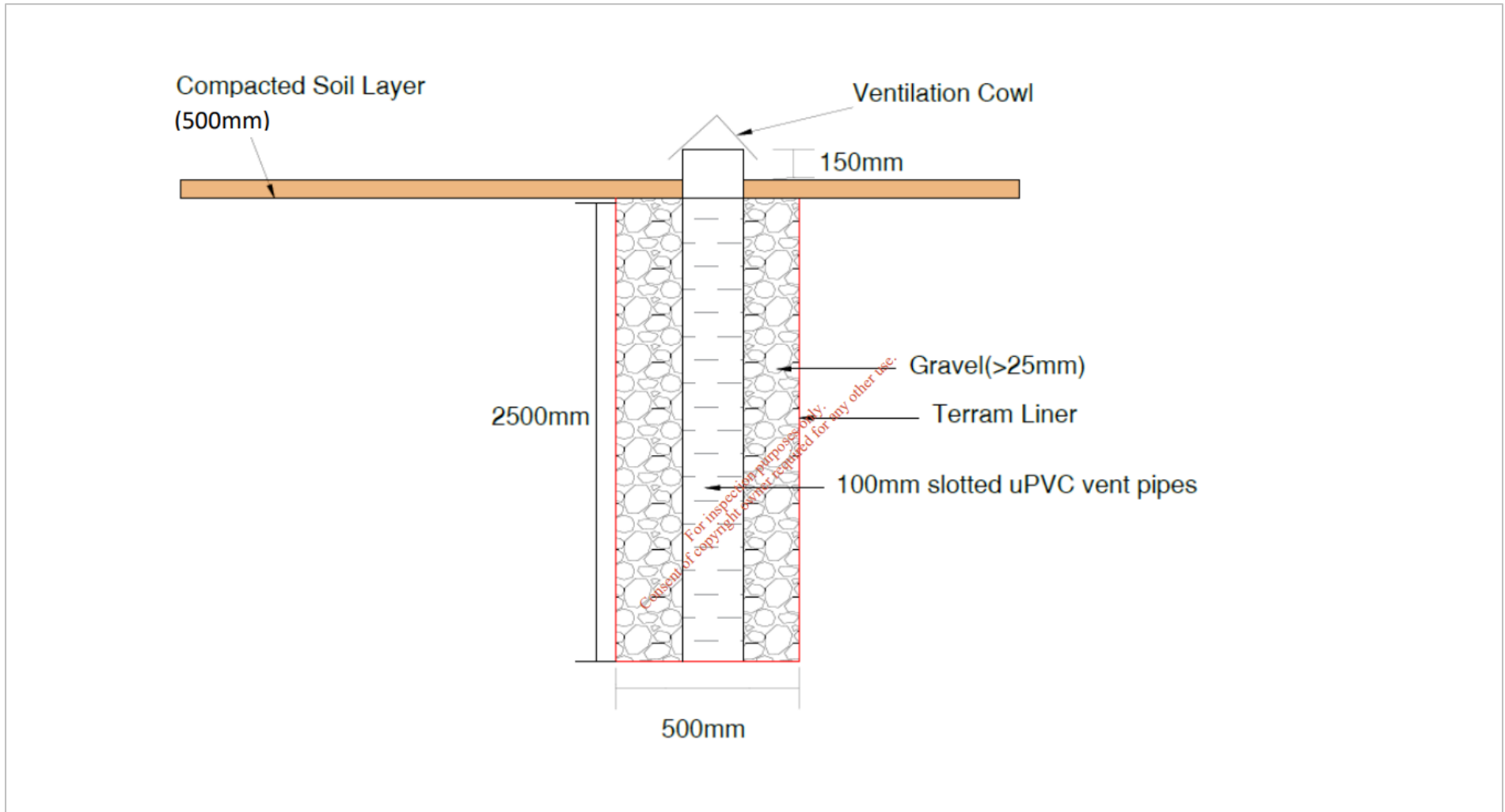


**Figure 11: Proposed gas vents and perimeter berm**



**Figure 12: Proposed clay berm**





**Figure 13: Cross-section through the proposed gas vent pipes**

**Appendix 1: Assessment of the effects of activity on European sites and proposed mitigation measures.**

European Site	Direction from the facility (km)	Qualifying Interests (* denotes priority habitat)	Conservation Objectives	Assessment
Slieve Aughty Mountains SPA (site code: 004168)	Immediately adjacent to the western site boundary.	<b>Species:</b> A082 Hen Harrier <i>Circus cyaneus</i> A098 Merlin <i>Falco columbarius</i>	NPWS (2022) Conservation objectives for Slieve Aughty Mountains SPA [004168].  Version 1. National Parks and Wildlife Service, Department of Housing, Local Government and Heritage [dated 20/12/2022].	<p>The SPA is located upstream of the closed landfill. Also, groundwater beneath the landfill flows towards north-east. Accordingly, there will be no impact from the site on the surface water or groundwater within this European Site.</p> <p>The main potential for impact on the Qualifying interests of this SPA would arise from changes in air quality, which could affect the species, and the disturbance to the habitat through activities that could affect population trends.</p> <p>There is a potential risk from migration of passive landfill gas into atmosphere.</p> <p>Condition 3.1 requires the installation of the passive gas vents. Condition 3.9 and Schedule A require gas monitoring at the proposed gas vents and, if required, between the landfill and the nearest buildings.</p> <p>Condition 3.13 requires that no emissions arising from activities carried on at the site, including, amongst others, gas, dust and noise, or litter, shall result in an impairment of, or an interference with amenities or the environment beyond the facility boundary or any other legitimate uses of the environment beyond the facility boundary.</p> <p><i>Conclusion:</i></p> <p>The controls in the recommended certificate of authorisation will ensure that the qualifying interests of this European site are protected.</p>
Lough Derg (Shannon) SPA (site code: 004168)	860m north-east from the site.	<b>Species:</b> A017 Cormorant <i>Phalacrocorax</i>	NPWS (2022) Conservation objectives for Lough Derg	The main potential for impact on the Qualifying interests of this SPA would arise from changes in water and air quality, which could affect the species and habitats directly or

European Site	Direction from the facility (km)	Qualifying Interests (* denotes priority habitat)	Conservation Objectives	Assessment
004058)		<i>carbo</i> A061 Tufted Duck <i>Aythya fuligula</i> A067 Goldeneye <i>Bucephala clangula</i> A193 Common Tern <i>Sterna hirundo</i>  <b>Habitats:</b> A999 Wetlands	(Shannon) SPA [004058].  First Order Site-specific Conservation Objectives Version 1.0. Department of Housing, Local Government and Heritage [dated 12/10/2022].	<p>indirectly, disturbance to the habitat through activities that could affect the waterbird population trends.</p> <p>There is a potential risk from migration of landfill leachate into surface waters and groundwater. There is also a potential risk from migration of passive landfill gas into atmosphere.</p> <p>The recommended certificate of authorisation specifies conditions to protect the surface waters and groundwater and in turn the qualifying interests of this European Site.</p> <p>The capping, as required under Condition 3.1, will limit ingress of rainwater into the waste body thus limiting the generation of leachate.</p> <p>Condition 3.9 requires monitoring of leachate, groundwater upgradient and downgradient of the landfill and surface water upstream and downstream of the landfill.</p> <p>Condition 3.9 and Schedule A require gas monitoring at the proposed gas vents and, if required, between the landfill and the nearest buildings.</p> <p>Furthermore, Condition 3.3 requires that the closed landfill and the remedial works shall not cause environmental pollution or deterioration in the status of the receiving surface water body or groundwater body.</p> <p>In addition, Condition 3.13 requires that no emissions arising from activities carried on at the site, including, amongst others, leachate and gas, or litter and mud, shall result in an impairment of, or an interference with amenities or the environment beyond the facility boundary or any other legitimate uses of the environment beyond the facility boundary.</p>

European Site	Direction from the facility (km)	Qualifying Interests (* denotes priority habitat)	Conservation Objectives	Assessment
				<p><i>Conclusion:</i></p> <p>The controls in the recommended certificate of authorisation will ensure that the activity will not negatively impact on water or air quality and that the qualifying interests of this European Site are protected.</p>
<p>Lough Derg, North-east Shore SAC (site code: 002241)</p>	<p>4.5km north-east from the site.</p>	<p><b>Habitats:</b></p> <p>5130 <i>Juniperus communis</i> formations on heaths or calcareous grasslands</p> <p>7210 Calcareous fens with with <i>Cladium mariscus</i> and species of the Caricion davallianae*</p> <p>7230 Alkaline fens</p> <p>8240 Limestone pavements*</p> <p>91E0 Alluvial forests with <i>Alnus glutinosa</i> and <i>Fraxinus excelsior</i> (Alno-Padion, Alnion incanae, Salicion albae)*</p> <p>91J0 <i>Taxus baccata</i> woods of the British Isles*</p>	<p>NPWS (2019) Conservation Objectives: Lough Derg, North-east Shore SAC [002241].</p> <p>Version 1. National Parks and Wildlife Service, Department of Culture, Heritage and the Gaeltacht [dated 24<sup>th</sup> April 2019].</p>	<p>The main potential for impact on the Qualifying interests of this SAC would arise from changes in water and air quality, which could affect the habitats, and disturbance to the habitats through activities that could affect the habitats.</p> <p>There is a potential risk from migration of landfill leachate into surface waters and groundwater. There is also a potential risk from migration of passive landfill gas into the atmosphere.</p> <p>The recommended certificate of authorisation specifies conditions to protect the surface waters and groundwater and in turn the qualifying interests of this European Site.</p> <p>The capping, as required under Condition 3.1, will limit ingress of rainwater into the waste body thus limiting the generation of leachate.</p> <p>Condition 3.9 requires monitoring of leachate, groundwater upgradient and downgradient of the landfill and surface water upstream and downstream of the landfill and at the outlet from the site water drainage system.</p> <p>Condition 3.9 and Schedule A require gas monitoring at the proposed gas vents and, if required, between the site and the nearest buildings.</p> <p>Furthermore, Condition 3.3 requires that the closed landfill and the remedial works shall not cause environmental pollution or deterioration in the status of the receiving</p>

European Site	Direction from the facility (km)	Qualifying Interests (* denotes priority habitat)	Conservation Objectives	Assessment
				<p>surface water body or groundwater body.</p> <p>In addition, Condition 3.13 requires that no emissions arising from activities carried on at the site, including, amongst others, leachate and gas, or litter and mud, shall result in an impairment of, or an interference with amenities or the environment beyond the facility boundary or any other legitimate uses of the environment beyond the facility boundary.</p> <p><i>Conclusion:</i></p> <p>The controls in the recommended certificate of authorisation will ensure that the activity will not negatively impact on water or air quality and that the qualifying interests of this European Site are protected.</p>