



OFFICE OF ENVIRONMENTAL SUSTAINABILITY

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

TO:	Mr Tom Ryan, Director	
FROM:	Ewa Babiarczyk, Inspector,	Environmental Licensing Programme
DATE:	10 th June 2021	
RE:	Application by Mayo County Council for a Certificate of Authorisation for a closed landfill at Kilbeg, Claremorris, County Mayo . Certificate of Authorisation Register Number H0319-01 .	

1. Application details

Type of facility:	Closed landfill as defined in the Regulations ¹ .
Original site ownership	Mayo County Council.
Current site ownership	Mayo County Council.
Operator of closed landfill	Mayo County Council has operated this site since 1982.
Proposed use post remedial works	Mayo County Council intends to use the site as a solar farm.
Risk category of closed landfill:	Moderate risk (class B) due to <ul style="list-style-type: none"> • migration of landfill leachate into the underlying aquifer (SPR 5).
Section 22 register number:	S22-02588
Grid Reference	135086 E and 274669 N
Application received:	1 st October 2020
AA screening determination:	1 st April 2021
Regulation 7(4) notice:	27 th November 2020

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

Additional information received:	Regulation 7(4) Reply was received on 23 rd February 2021. Correction to an item in the Regulation 7(4) Reply was received on 6 th April 2021.
Name of Qualified Person:	James O'Neill, Credentials provided by Engineers 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 south-east of Claremorris town centre, County Mayo, immediately adjacent to the N17 road and a railway. The location of the landfill site is shown in Figure 1.
Period of landfilling	1982 to 1996.
Surrounding area	The site is bounded by a railway to the north and by the Knock-Claremorris Bypass (N17) to the west. Land drains flow along western and northern site boundary, as shown in Figure 2 and boggy agricultural ground adjoins the site from the south and east. The Section 22 Register indicates that a separate site is located 40m west/ north-west of the site, as shown in Figure 1 (site name: Tommy Brennan PER 259; Section 22 Register: S22-02703). However, it is evident that this is not a closed landfill and instead relates to a construction and demolition waste recovery site that was the subject of a waste permit application. There is a housing estate 280m west/ south-west of the site and an electric substation 150m north of the site. The Kilbeg-Malone River flows 230m east of the site and the Lisduff_30 River flows 380m south-east of the site.
Area of the closed landfill	The site covers an area of approximately 6 ha. The waste body extends beyond the site boundary into privately owned land, as shown in Figure 2. The applicant proposes to cap the waste body, including the waste beyond the site boundary, as outlined in Section: <i>Proposed Remedial Actions</i> of this Inspector's Report. It is noted that the site boundaries shown in Figure 1 and Figure 6 of this report are different to the site boundary shown in Figure 2 and Figure 5. The applicant revised the site boundary, as shown in Figures 2 and 5, in the correspondence received on 23 rd February 2021.
Quantity of waste at the facility	Approximately 279,623 tonnes (199,731 m ³)
Characterisation of waste deposited	The waste comprises municipal waste and construction & demolition (C&D) waste. The encountered waste includes peat mixed with domestic waste, plastic, paper and concrete insulation. The extent of the waste body is 3.8 ha, as shown in Figure 2.

3. Site investigations

<p>Current condition and appearance of closed landfill:</p>	<p>The site topography falls from south to north and west to east. The Corine Land Cover 2018 classification for the site is mostly inland wetlands (peat bogs). Leachate seepage was observed during the site walkover survey on 16th January 2020, as shown in Figure 3. Condition 3.1(d) requires a cap to be put in place over the full extent of the waste body, which will reduce leachate generation. Also, waste on the surface of the landfill was observed, as shown in Figure 4. Condition 3.1(b) requires that the local authority removes this waste for disposal or recovery at an appropriate facility.</p> <p>The Tier 3 Assessment also states that invasive plant species, Japanese Knotweed, is present on site. Condition 3.18 requires an Invasive Species Prevention and Eradication Plan.</p>
<p>Site investigations</p>	<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"> • The waste body is covered with a layer of 0.3m-0.9m thick soil; • The base of the waste body was not reached and exceeded the depth of 6.5m at four out of seven trial pits; • Natural black peat till was detected to depths of 5.9m and 4m below ground level (bgl) in monitoring boreholes BH01 and BH02; • No bedrock was encountered during the trial pit excavation or installation of boreholes BH01 and BH02; • Landfill leachate is being generated; and • Landfill gas is being generated.
<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"> • Desk study (the study involved, but was not limited to, studying GIS mapping system, Geological Survey of Ireland maps, National Parks and Wildlife Service maps, Mayo County Council Site Plans and the Corine land cover classification); • Walkover survey was carried out on 16th January 2020; • Trial pit investigation (seven trial pits were excavated on 25th November 2010); • Slit trenches investigation (six slit trenches were excavated on 26th November 2010); • Waste sampling (six samples were collected from the trial pits TP01 to TP06. Analysis was carried out on 25th and 26th November 2010); • Leachate monitoring (at one location BH01 was carried out on 2nd December 2010 and 27th November 2020); • Groundwater monitoring (at one monitoring location BH2 was carried out on 2nd December 2010 and 27th November 2020);

	<ul style="list-style-type: none"> • Landfill gas monitoring (at fifteen locations was carried out on 25th and 26th November 2010 and at one location on 27th November 2020); • LandGEM gas modelling (carried out in 2019). • Surface water monitoring (at two monitoring locations was carried out in 2009 and on 27th November 2020).
Hydrology	<p>The closed landfill is located within the sub-catchment of the Robe_SC_010 River (sub-catchment Identification Number (Id): 30_9) and the catchment of the Corrib River (Catchment Id: 30).</p> <p>There is a land drain which flows north along the western site boundary and discharges into a drain which flows east immediately along the northern site boundary, as shown in Figure 2. The drain flowing east discharges into the Kilbeg-Malone River (waterbody code: IE_WE_30R010200) 230m east of the site. The Water Framework Directive (WFD) status assigned to the Kilbeg-Malone River upstream and downstream of the closed landfill is Good.</p> <p>The Kilbeg-Malone River flows into a south-easterly direction and discharges into the Lisduff_30 River (waterbody code: IE_WE_30R010200) approximately 440m south-east of the site. The Water Framework Directive (WFD) status assigned to the Lisduff_30 River upstream and downstream of the discharge location for the Kilbeg-Malone River is Good. The Lisduff_30 River discharges into the Robe River (waterbody code: IE_WE_30R010200) 2.2km south-east of the site. The WFD status of the Robe River upstream and downstream of the discharge location for the Lisduff_30 River is also Good.</p> <p>Two rounds of surface water monitoring were carried out on the Kilbeg-Malone River at unnamed locations upstream and downstream of the closed landfill in 2009 and at locations SW1 and SW5 on 27th November 2021, as shown in Figure 5. SW1 is identified as being upstream of the landfill on the adjacent drain. It is noted however, that this location is not situated fully upstream of the landfill and therefore the water quality from this location may not adequately reflect upstream water quality. However, it provides a comparison to the downstream monitoring point SW5 which is located 235m to the north-east of the landfill. Additionally, due to the fact that groundwater beneath the site flows towards the south/ south-east, towards the Kilbeg-Malone River, it is considered that the location of SW5 may not adequately reflect the actual impact from the deposited waste on the river.</p> <p>The applicant proposes to monitor surface water at six locations SW1, SW2, SW3, SW4, SW5 and SW6, as shown in Figure 5. It is noted however, that location SW6 may also not reflect the actual impact from the waste body on downstream surface water. Therefore, an additional monitoring location, to be identified as SW7, on the Lisduff River south-east of the closed landfill is required under Condition 3.9(e).</p> <p>Notwithstanding the above, the table below shows the parameter concentrations recorded at SW1 and SW5 during the monitoring on 27th November 2020.</p>

Parameter	EQS ¹	SW1 Upgradient location	SW5
BOD [mg/l]	2.2	<3	<3
Copper [µg/l]	5	<1.2	1
Dissolved Oxygen [%]	80% - 120%	102.3	101.8
Cyanide [mg/l]	0.01	<0.009	<0.009
Ammonia as N [mg/l]	0.090	15	0.268
Arsenic [µg/l]	25	<0.6	<0.6
Zinc [µg/l]	100	19	7
Chromium [µg/l]	3.4	1	0.6
Nickel [µg/l]	4	2	2
Lead [µg/l]	1.2	<0.6	1
Fluoride by ISE [mg/l]	0.5	<0.1	<0.1
Molybdate Reactive Phosphorus (MRP) [mg P/l]	0.045	0.198	0.025
Mercury [µg/l]	0.07	0.02	<0.01

The monitoring results show that concentrations of Ammonia exceeded the environmental quality standard (EQS) set out in the *European Communities Environmental Objectives (Surface Water) Regulations 2009, as amended*, at both monitoring locations. Also, it is noted, that it cannot be determined whether the actual concentrations for BOD were within the relevant standard as the limit of detection for the monitoring method was above the EQS. The monitoring results further show an exceedance of Molybdate Reactive Phosphorus upstream of the closed landfill. This indicates that surface water quality may also be impacted by factors other than the closed landfill.

Condition 3.9(e) requires quarterly monitoring of surface water at locations proposed by the applicant and the additional location SW7, as outlined above. Condition 3.9(e) also specifies the minimum parameters to be monitored. Additionally, Condition 3.9(g) requires that the sensitivity of the monitoring methods utilised shall have an appropriate limit of detection to allow for comparison of pollutant concentrations against the relevant trigger levels and/or standard reference values.

¹ Environmental Quality Standard (EQS); 95% high status, annual average EQS (AA-EQS) or maximum allowable concentration (EQS-MAC) as set out in European Communities Environmental Objectives (Surface Water) Regulations 2009, as amended.

Hydrogeology	<p>The closed landfill lies within the Cong-Robe groundwater body (GWB Number: IE_WE_G_0019). The status of this groundwater body is good. The site is underlain by a bedrock aquifer which is classified as a Regionally Important Aquifer - Karstified (conduit; Rkc). There are three types of aquifer vulnerability beneath the site: High, Moderate and Low. The waste body is predominantly underlined by the High vulnerability aquifer. Groundwater beneath the site flows towards the south/ south-east.</p> <p>The nearest Group Scheme borehole (GSI Name: 1127SEW004) is located 550m west/ south-west of the site. Due to the fact that groundwater beneath the site flows in the south/ south-east direction, there will be no impact on the water quality in this borehole.</p> <p>There are no Groundwater Drinking Water Protection Areas within the site. The closest Group Water Schemes (GWSs) are Loughanemon Barnacarroll GWS and Kilcolman Facefield GWS located, respectively, 3.1km north/ north-east and 4.6km north of the site. Due to the fact that groundwater beneath the site flows in south/ south-east direction, there will be no impact on these GWSs.</p> <p>Irishtown GWS is located 5.8km south-east of the site. Due to the fact that groundwater beneath the site flows towards the south/ south-east, there may be a potential impact to this GWS. However, the appropriate capping will limit ingress of rainwater into the waste body thus limiting the generation of leachate. Condition 3.9(f) requires quarterly monitoring of groundwater quality upgradient and downgradient of the waste body and specifies the minimum parameters to be monitored. Additionally, Condition 3.9(b) requires quarterly monitoring of leachate.</p>
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Leachate and water quality:	<p><u>Trial pit investigation</u></p> <p>Seven trial pits TP01 to TP07 were excavated on 25th November 2010, as shown in Figure 6. The maximum depth of the trial pits was 6.5m bgl. Waste material was encountered between 0.0m – 6.5m in all trial pits from TP01 to TP07 however, the base of the waste body was reached at only three trial pits: TP03, TP05 and TP07. Leachate at the depth from 3.7m to 6m bgl and strong pungent odour were encountered in each trial pit.</p> <p><u>Slit Trenches</u></p> <p>Six slit trenches ST01, ST02, ST03, ST04, ST05, ST06 and ST07 were excavated on 26th November 2010 to determine the lateral extent of the waste body, as shown in Figure 6. The edge of the waste body was encountered in ST01, ST02, ST05 and ST06.</p> <p><u>Waste sampling</u></p> <p>Six waste samples were collected from trial pits TP01 to TP06 and analysed against the waste limit values, as set out in the Waste Acceptance Criteria (WAC) set out in <i>Council Decision of 19 December 2002 establishing criteria and procedures for the acceptance of waste at landfills pursuant to Article 16 of and Annex II to Directive 1999/31/EC</i>. The analysis shows that a number of parameter concentrations exceeded either the inert, non-hazardous or hazardous waste criteria, as shown in</p>
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table below. The orange highlight denotes the type of waste criteria exceeded for a particular parameter.

Parameter	Landfill Waste Acceptance Criteria Limits ¹			Trial pits where WAC are exceeded
	Inert	Non-haz	Haz	
Molybdenum [mg/kg]	0.5	10	30	0.65 (TP06)
Antimony [mg/kg]	0.06	0.7	5	0.08 (TP06)
Chloride [mg/kg]	800	15,000	25,000	3,600 (TP06)
Sulphate [mg/kg]	1,000	20,000	50,000	Readings ranged from 1,700 to 5,100 (TP01 to TP06)
Total Dissolved Solids [mg/kg]	4,000	60,000	100,000	Readings ranged from 4,200 to 16,000 (TP01 to TP06)
Mineral Oil (C10 to C40) [mg/kg]	500	-	-	Readings ranged from 540 to 1,000 (TP01, TP02 and TP05)
Dissolved Organic Carbon [mg/kg]	500	800	1,000	580 (TP02) & 1,100 (TP06)
Total Organic Carbon [%]	3	5	6	Readings ranged from 10 to 19 (TP01 to TP06)
Loss on Ignition [%]	-	-	10	Readings ranged from 13 to 37 (TP01 to TP06)

The sampling results show that the inert waste criteria is exceeded at all sampled trial pits for sulphate and total dissolved solids, at TP01, TP02 and TP05 for mineral oil, at TP06 for molybdenum, antimony and chloride and at TP02 for dissolved organic carbon. The sampling results further show that the hazardous waste criteria is exceeded at all sampled trial pits for total organic carbon and loss on ignition and at TP06 for dissolved organic carbon. The applicant states in correspondence received on 23rd February 2021 that municipal waste is generally high in organic matter content which is the likely cause for the exceedance of the hazardous WAC for these three parameters.

Leachate and groundwater quality

The Tier 3 Assessment states that leachate monitoring was carried out at one location within the waste body at borehole BH01 on 2nd December

¹ Waste Acceptance Criteria (WAC) as set out in *Council Decision of 19 December 2002 establishing criteria and procedures for the acceptance of waste at landfills pursuant to Article 16 of and Annex II to Directive 1999/31/EC*

2010 and 27th November 2020, as shown in Figure 5, and that groundwater monitoring was carried out at combined monitoring borehole BH02 on the same dates. It is noted however that BH02 is located within the waste body, close to the southern edge, as shown in Figure 5. Tier 3 Assessment states that waste appears to be tapering to 0.80m at BH02 and that groundwater level was present at 0.785m below the surface. The Tier 3 Assessment further states that it can be assumed that groundwater intersects the waste body further upgradient.

The 2010 monitoring at BH01 included Biochemical Oxygen Demand and Chemical Oxygen Demand, while the 2010 monitoring at BH02 included Biochemical Oxygen Demand, Chemical Oxygen Demand, Faecal Coliforms and Total Coliforms. The 2020 monitoring at BH01 and BH02 was carried out for a wider range of parameters. Due to the fact that groundwater beneath the site flows towards the south/ south-east, BH02 is considered to be an upgradient location within the waste body and BH01 is considered to be a downgradient location within the waste body.

The table below shows the monitoring results from the monitoring carried out 27th November 2020. The monitoring results from these two locations provide information on the difference between the quality of groundwater at the edge of the waste body (BH02) and the leachate strength within the waste body (BH01).

Parameter	EQS/ Limit ^{1,2,3}	BH02 upgradient, at the edge of the waste body	BH01 downgradient within the waste body
Conductivity at 20°C [μ S/cm]	1,875 ¹	903	3,040
Copper [μ g/l]	1,500 ¹	3	91
Sodium [mg/l]	150 ¹	15	107
Chloride [mg/l]	187.5 ¹	28.9	135
Iron [μ g/l]	200 ²	2,897	73,142
Potassium [mg/l]	5 ²	11	130
Magnesium [mg/l]	50 ²	12	66
Ammonia as N [mg/l]	0.175 ¹	3.2	161
BOD [mg/l]	2.2 ³	-	23
Arsenic [μ g/l]	7.5 ¹	<0.6	13

¹ European Communities Environmental Objectives (Groundwater) Regulations, 2010, as amended.

² As set out in the EPA publication 'Towards setting guideline values for the protection of groundwater in Ireland – Interim Report', 2003.

³ Environmental Quality Standard (EQS); 95% high status, as set out in European Communities Environmental Objectives (Surface Water) Regulations 2009, as amended.

	Manganese [$\mu\text{g/l}$]	50 ²	385	645
	Zinc [$\mu\text{g/l}$]	75 ¹	121	517
	Chromium [$\mu\text{g/l}$]	37.5 ¹	<0.6	35
	Boron [$\mu\text{g/l}$]	750 ¹	34	537
	Cadmium [$\mu\text{g/l}$]	3.75	<0.6	1
	Calcium [mg/l]	200 ²	177	278
	Nickel [$\mu\text{g/l}$]	15 ¹	2	36
	Lead [$\mu\text{g/l}$]	7.5 ¹	3	75
	Molybdate Reactive Phosphorus [mg/l]	0.035 ¹	2.09	2.01
	Mercury [$\mu\text{g/l}$]	0.75 ¹	0.01	<0.20
	<p>The monitoring results show exceedances of the EQSs and limits at both locations. The results also show that most of the parameter concentrations measured at the location BH01 significantly exceed the concentrations measured at the edge of the waste body. Furthermore, the exceedances of the parameters at the upgradient location (BH02) may indicate an impact from factors other than the landfill.</p> <p>It is noted that no monitoring for organic compounds was carried out at BH01 and BH02. Due to the fact that the waste contains municipal /domestic waste, it is considered that monitoring for organic compounds in the leachate is appropriate. Accordingly, Condition 3.9(c) requires an annual screening of leachate for trace organic substances.</p> <p>The applicant proposes two additional leachate monitoring locations LW01 and LW02 within the waste body, as shown in Figure 5. Condition 3.9(b) reflects this recommendation and, additionally, requires leachate monitoring, on a quarterly basis, at the existing monitoring location within the waste body BH01. Condition 3.9(b) also specifies the minimum parameters to be monitored.</p> <p>The applicant proposes that groundwater monitoring is carried out at the existing borehole BH02 and at an additional combined monitoring borehole BH04, upgradient of the waste body, and two additional combined boreholes BH03 and BH05 downgradient of the waste body. It is noted however that the location of borehole BH03 may not be fully representative of the downgradient groundwater condition therefore, Condition 3.1(g) requires installation of one additional groundwater monitoring borehole (to be identified as BH06) downgradient of the waste body. Condition 3.9(f) requires monitoring of groundwater at the above locations on a quarterly basis and specifies the minimum parameters to be monitored.</p>			
Landfill gas:	<p>There is a risk of vertical and lateral landfill gas migration. The most likely pathway for the migration of the landfill gas is through the underlying soils and the existing landfill cover material. Furthermore, the Tier 3 Assessment states that the development of the solar farm will give rise</p>			

to a human presence on the site and the infrastructure associated with development such as panels framework, pipework, cabling etc. will provide potential conduits for landfill gas.

Landfill gas monitoring was carried out at seven trial pits TP01 to TP07, two boreholes BH01 and BH02 and six slit trenches ST01 to ST03 and ST05 to ST07 in November 2010, as shown in Figure 6. Additionally, one location, BH01, was monitored on 27th November 2020. The monitored parameters were methane (CH₄), carbon dioxide (CO₂) and oxygen (O₂).

It is noted that no gas monitoring was carried out at location BH02. The applicant stated in the correspondence received on 23rd February 2021 that there was damage to the monitoring location BH02 and therefore, no gas monitoring was carried out at this location in November 2020. The applicant proposes to repair the damage and continue monitoring at this location. Accordingly, the repair to the monitoring borehole BH02 is required under Condition 3.1(c). Additionally, Condition 3.15.2 requires that all wellheads shall be adequately protected to prevent contamination or physical damage.

The table below shows levels of methane and carbon dioxide measured during the two monitoring events in 2010 and on 27th November 2020.

Monitoring location	2010 Monitoring		2020 Monitoring	
	Methane (v/v %)	Carbon dioxide (% v/v)	Methane (v/v %)	Carbon dioxide (% v/v)
BH01	78.1	32.2	53.7	22
BH02	0.4	1.6		
TP01	0.1	0.2		
TP02	0.1	0.1		
TP03	0.1	0.2		
TP04	0.1	0.2		
TP05	0.1	0.2		
TP06	0.1	0.2		
TP07	0.1	0.1		
ST01	0.1	0.1		
ST02	0.1	0.2		
ST03	0.1	0.1		
ST05	0.1	0.1		
ST06	0.1	0.2		
ST07	0.1	0.1		

The monitoring results show that landfill gas is being generated within the waste body and methane and carbon dioxide levels measured at BH01 are high. However, it is noted that 2020 levels for these parameters are lower than the 2010 levels. The decrease in methane and carbon dioxide levels indicates that the waste body is undergoing stabilisation.

	<p>The monitoring results also show that landfill gas is being generated at locations close to or at the edge of the waste body (BH02, ST01, ST02, ST05 and ST06), indicating that gas may be migrating outside the waste body. It is noted however that, with the exception of the level of carbon dioxide at BH02 (recorded at 1.6 % v/v in 2010), the gas readings at these locations did not exceed the trigger levels for monitoring emissions of methane (1% v/v or greater) and carbon dioxide (1.5% v/v or greater) outside the waste body of, as set out in the Agency Landfill Manuals - Landfill Monitoring, 2nd Edition, 2003.</p> <p><u>Landfill Gas Assessment – LandGEM</u></p> <p>LandGEM modelling was carried out in 2019 to estimate the quantity of landfill gas generated by the landfill during its operation and the post-closure phase. It is noted however that the waste amount that was inputted in the model was 168,000 tonnes. The applicant recalculated the amount of deposited waste and stated in correspondence of 23rd February 2021 that the amount of deposited waste is 279,623 tonnes. Therefore, it is considered that findings of the modelling are underestimated and not accurate.</p> <p>Notwithstanding the above, the modelling shows that landfill gas will continue to be generated at the closed landfill for a number of years.</p> <p>The applicant proposes monitoring of landfill gas at the existing boreholes BH01 and BH02 and three additional monitoring boreholes BH03, BH04 and BH05 outside the waste body, as shown in Figure 5. Accordingly, Condition 3.1(f) requires installation of the additional gas monitoring locations BH03, BH04 and BH05 and Condition 3.9(d) requires quarterly monitoring to detect the presence and concentration of landfill gas at the existing and proposed boreholes.</p> <p>Furthermore, the measured landfill gas levels, as described above, indicate that there may be pockets of landfill gas within the waste body. Therefore, it is considered that gas vents within the waste body are required. Condition 3.1(e) requires the installation of gas vents and requires that spacing between the gas vent pipes shall be in accordance with the EPA Landfill Manuals – Landfill Site Design.</p>
Conceptual site model:	<p>Tier 1 and 2 Assessment determined that the overall risk score for the closed landfill was Moderate (Class B) due to leachate migration into the underlying aquifer and, via groundwater, to human receptors and surface waters.</p> <p>Tier 2 and Tier 3 Assessments confirmed this classification due to leachate migration into the underlying aquifer.</p> <p>The conceptual site model is shown in Figure 7.</p>

4. SPR linkages and remedial actions

SPR linkage scenarios (applicable ones only):	<p>Leachate and gas migration scores:</p> <p><u>High scores:</u></p> <p>There are no pathways identified as High Risk.</p>
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	<p><u>Moderate scores:</u></p> <p>One pathway was identified as Moderate Risk:</p> <ul style="list-style-type: none"> • Migration of leachate to the underlying aquifer (SPR 5). <p><u>Low scores:</u></p> <p>Seven pathways were identified as Low Risk:</p> <ul style="list-style-type: none"> • Migration of leachate, via groundwater flowing to water drainage/runoff, into surface waterbodies (SPR 1); • Migration of leachate to private wells (SPR 3); • Migration of leachate to public water supplies (SPR 6); • Migration of leachate, via groundwater migration, to surface water bodies (SPR 7); • Migration of leachate, via surface water drainage/runoff, to surface water bodies (SPR 8); • Lateral landfill gas migration to human receptors (SPR 10); and • Vertical landfill gas migration to human receptors (SPR 11). <p>Summary:</p> <p>Upon the review of the monitoring data;</p> <ul style="list-style-type: none"> • remedial action is warranted to address the risk of leachate migrating from the site into the aquifer and, via groundwater, to surface waters. • remedial action is warranted to address the risk of migration of landfill gas to on-site and off-site locations.
<p>Proposed remedial actions:</p>	<p>Tier 3 Assessment recommends the following remedial measures as the feasible options:</p> <p>1. Landfill cap</p> <p>The Tier 3 Assessment recommends that the landfill capping covers the entire waste body, as shown in Figure 2, and comprises of the following elements, or equivalent:</p> <ul style="list-style-type: none"> (i) 200mm topsoil layer; (ii) 800mm subsoil layer; (iii) 0.5m thick drainage layer of a hydraulic conductivity of a minimum 1×10^{-4} m/s, or equivalent such as a geocomposite; (iv) 1mm LLDPE barrier layer, or equivalent; and (v) landfill gas collection geocomposite. <p>The Tier 3 Assessment also states that the cap will be required to support any on-site solar farm infrastructure, providing a suitable base for the solar panel array.</p> <p>It is noted that the purpose of the landfill cap as specified in the Certificate of Authorisation is to limit the ingress of rainwater and generation of landfill leachate, the integrity of which should not be</p>

impacted by the solar farm infrastructure. Condition 3.4 requires that the integrity of the landfill cap shall be maintained at all times and shall not be compromised by the installation of any future developments.

2. Landfill gas management system

The Tier 3 Assessment recommends a gas pumping trial to determine the quantity and quality of landfill gas generated at the landfill and states that remediation measures for landfill gas will be adopted subject to the findings of this trial. Condition 3.1(i) requires that the applicant seeks the Agency's agreement whether to carry out a gas pumping trial within twelve months, following gas monitoring as required under Condition 3.9(d). Condition 3.1(j) requires implementation of any recommendations arising from the gas pumping trial subject to the agreement by the Agency.

Notwithstanding the above, Condition 3.1(e) requires installation of gas vent pipes in the waste body. Condition 3.1(e)(iii) requires that spacing between the gas vent pipes shall be in accordance with the EPA Landfill Manuals – Landfill Site Design.

Condition 3.8 requires a drawing showing the interpolated extent of the waste body, the area capped in accordance with Condition 3.1(d), the gas vents installed in accordance with Condition 3.1(e) and any other gas management infrastructure, as may be required following the gas pumping trial.

3. Environmental monitoring

Surface water monitoring

The Tier 3 Assessment recommends surface water monitoring at six locations SW1, SW2, SW3, SW4, SW5 and SW6, as shown in Figure 5. Additionally, as outlined in Section: *Hydrology* above, one additional monitoring location is required on the Lisduff River (monitoring location south-east of the closed landfill (SW7)).

Condition 3.9(e) requires quarterly monitoring of surface water at the above locations and specifies the minimum parameters to be monitored.

Leachate monitoring

The Tier 3 Assessment recommends monitoring of leachate at the locations LW01 and LW02 within the waste body, as shown in Figure 5. Condition 3.9(b) reflects this recommendation and, in addition, requires leachate monitoring at the existing monitoring location within the waste body BH01.

Groundwater monitoring

The Tier 3 Assessment recommends that groundwater is monitored at the existing borehole BH02, upgradient of the waste body at the proposed monitoring borehole BH04 and downgradient of the waste body at the proposed monitoring boreholes BH03 and BH05, as shown in Figure 5. It is noted however that borehole BH03 may not be fully representative of the downgradient groundwater conditions. Accordingly,

Condition 3.1(g) requires installation of one additional groundwater monitoring borehole (BH06) downgradient of the waste body. Condition 3.9(f) requires monitoring of groundwater at the above locations on a quarterly basis and specifies the minimum parameters to be monitored.

Landfill gas monitoring

The Tier 3 Assessment recommends monitoring of landfill gas at the existing boreholes BH01 and BH02 within the waste body and the three proposed monitoring boreholes BH03, BH04 and BH05 outside the waste body, as shown in Figure 5. Accordingly, Condition 3.1(f) requires installation of the additional gas monitoring locations BH03, BH04 and BH05. Condition 3.9(d) requires a quarterly monitoring to detect the presence and concentration of landfill gas at BH01, BH02 and the three proposed boreholes.

Having regard to the monitoring results submitted in support of the application for certificate of authorisation, the age of the closed landfill and the fact that the nearby dwellings are serviced by a public water supply, the following remedial measures are considered appropriate and recommended in Condition 3.1:

- (a) Minimise the disturbance of deposited waste to the extent possible;
- (b) Remove, for disposal or recovery at an appropriate facility, the waste from the surface of the landfill within three months of the date of grant of this Certificate of Authorisation;
- (c) Carry out repairs to the monitoring borehole BH02;
- (d) Install a low permeability landfill cap over the entire waste body, minimum 1m, with 1mm thick low permeability geomembrane having a hydraulic conductivity of less than or equal to $1 \times 10^{-9} \text{m/s}$;
- (e) Install a gas management system in the waste body, within six months of the date of grant of this Certificate of Authorisation.

The gas management system shall include the following elements:

- (i) Gas vent pipes with fans or cowls, as appropriate;
- (ii) The gas vent pipes shall not be perforated above the ground level; and
- (iii) Spacing between the gas vent pipes shall be in accordance with EPA Landfill Manuals – Landfill Site Design.

On agreement by the Agency, the gas vent pipes and associated infrastructure may be removed or altered in accordance with any recommendations arising from the trial in accordance with Condition 3.1(i).

- (f) Install three additional combined landfill gas/groundwater monitoring boreholes outside the waste body (boreholes BH03, BH04 and BH05);
- (g) Install one additional groundwater monitoring borehole (borehole BH06) downgradient of the waste body;
- (h) Install two additional leachate monitoring boreholes within the waste body (monitoring boreholes LW01 and LW02);

	<p>(i) The local authority shall, within twelve months of the date of grant of this Certificate of Authorisation, following gas monitoring, as required under Condition 3.9(d), seek agreement of the Agency regarding whether to carry out a gas pumping trial for the purpose of determining the quantity and quality of landfill gas;</p> <p>(j) The local authority shall implement any recommendations arising from the gas pumping trial, subject to the agreement by the Agency; and</p> <p>(k) Reseed grass within the site.</p> <p>The proposed remedial actions are intended to break the SPR linkages by preventing:</p> <ul style="list-style-type: none"> • migration of leachate into the aquifer and surface water bodies; and • migration of landfill gas to the on-site and off-site locations. <p>The proposed capping will also prevent any waste materials from appearing on the surface of the landfill site.</p> <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 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 inherent with the landfill site.</p>

5. Appropriate assessment

There are thirteen European Sites within the vicinity of the facility. These are listed in the Appendix 1.

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 Lough Carra/Mask Complex SAC (site code: 001774), Lough Mask SPA (site code: 004062), Lough Carra SPA (site code: 004051), Carrowkeel Turlough SAC (site code: 000475), River Moy SAC (site code: 002298), Lough Corrib SAC (site code: 000297), Lough Corrib SPA (site code: 0004042), Kilglassan/Caheravoostia Turlough Complex SAC (site code: 000504), Balla Turlough SAC (site code: 000463), Greaghans Turlough SAC (site code: 000503), Towerhill House SAC (site code: 002179), Ardkill Turlough SAC (site code: 000461) and Ballinafad SAC (site code: 002081).

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.

The reason for this determination is as follows:

- There is a hydrological connection between the closed landfill and Carra/Mask Complex SAC (site code: 001774) and Lough Mask SPA (site code: 004062) and, despite the fact that these European Sites are located approximately 45km downstream of the site, it cannot be excluded, based on the submitted monitoring results for surface water and groundwater, that the closed landfill will have no effect on these European Sites.
- There is no hydrological connection between the closed landfill and the rest of the European Sites.

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 Lough Carra/Mask Complex SAC (site code: 001774), Lough Mask SPA (site code: 004062), Lough Carra SPA (site code: 004051), Carrowkeel Turlough SAC (site code: 000475), River Moy SAC (site code: 002298), Lough Corrib SAC (site code: 000297), Lough Corrib SPA (site code: 0004042), Kilglassan/Caheavoostia Turlough Complex SAC (site code: 000504), Balla Turlough SAC (site code: 000463), Greaghans Turlough SAC (site code: 000503), Towerhill House SAC (site code: 002179), Ardkill Turlough SAC (site code: 000461) and Ballinafad SAC (site code: 002081), 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 application, risk assessment and 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 in the Lough Carra/Mask Complex SAC (site code: 001774) and Lough Mask SPA (site code: 004062) and will ensure that there will be no significant impact on these European Sites;
- 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 Lough Carra/Mask Complex SAC (site code: 001774) and Lough Mask SPA (site code: 004062); and
- there is no hydrological connection between the closed landfill and Lough Carra SPA (site code: 004051), Carrowkeel Turlough SAC (site code: 000475), River Moy SAC (site code: 002298), Lough Corrib SAC (site code: 000297), Lough Corrib SPA (site code: 0004042), Kilglassan/Caheavoostia Turlough Complex SAC (site code: 000504), Balla Turlough SAC (site code: 000463), Greaghans Turlough SAC (site code: 000503), Towerhill House SAC (site code: 002179), Ardkill Turlough SAC (site code: 000461) and Ballinafad SAC (site code: 002081).

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: Lough Carra/Mask Complex SAC (site code: 001774), Lough Mask SPA (site code: 004062), Lough Carra SPA (site code: 004051), Carrowkeel Turlough SAC (site code: 000475), River Moy SAC (site code: 002298), Lough Corrib SAC (site code: 000297), Lough Corrib SPA (site code: 0004042), Kilglassan/Caheavoostia Turlough Complex SAC (site code: 000504), Balla Turlough SAC (site code: 000463), Greaghans Turlough SAC (site code: 000503), Towerhill House SAC (site code: 002179), Ardkill Turlough SAC (site code: 000461) and Ballinafad SAC (site code: 002081).

6. Recommendation

I recommend granting the certificate of authorisation as proposed.

Signed



Ewa Babiarczyk

Date 10th June 2021

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.

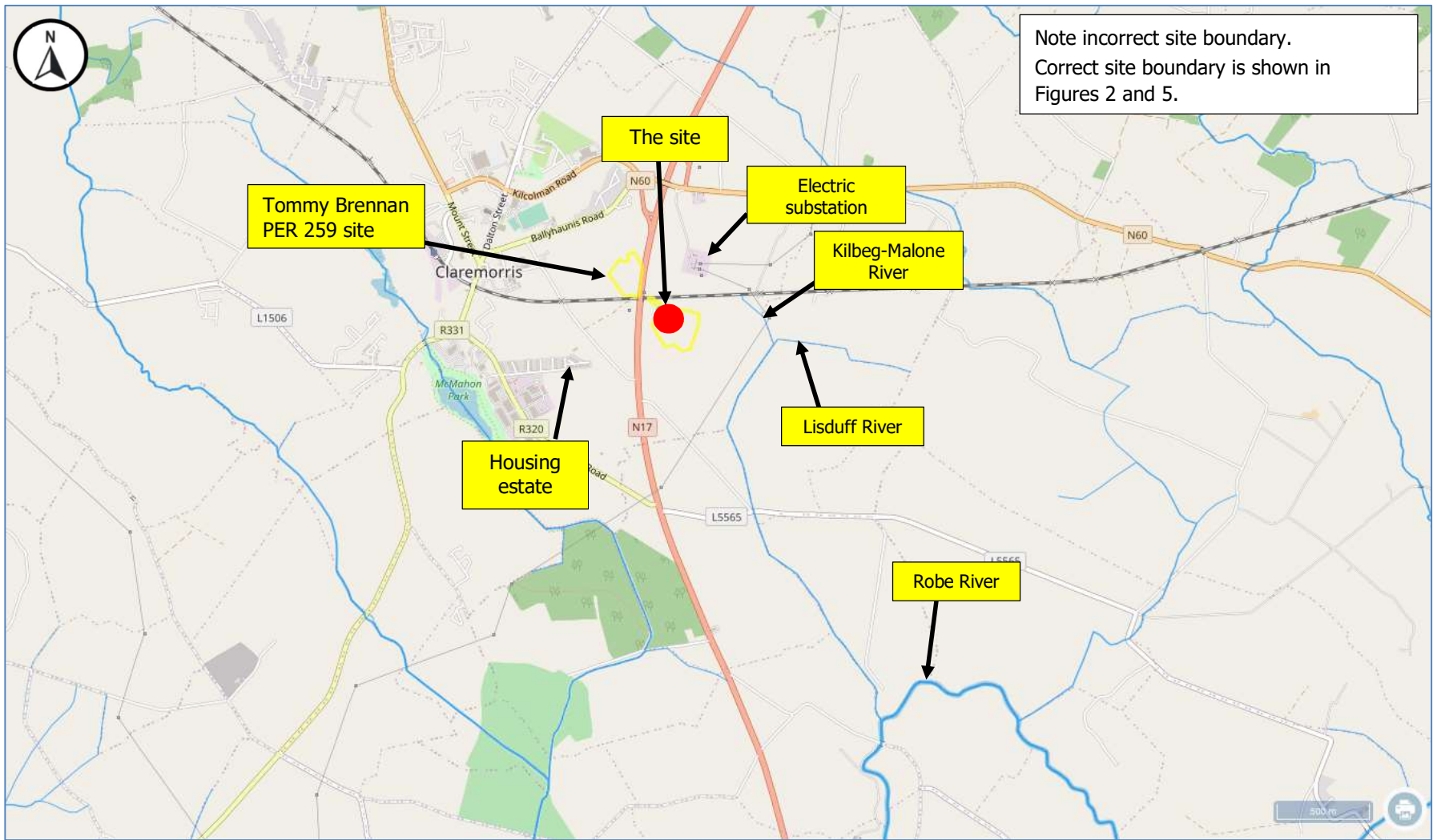


Figure 1: Location of Claremorris Historic Landfill and site surroundings

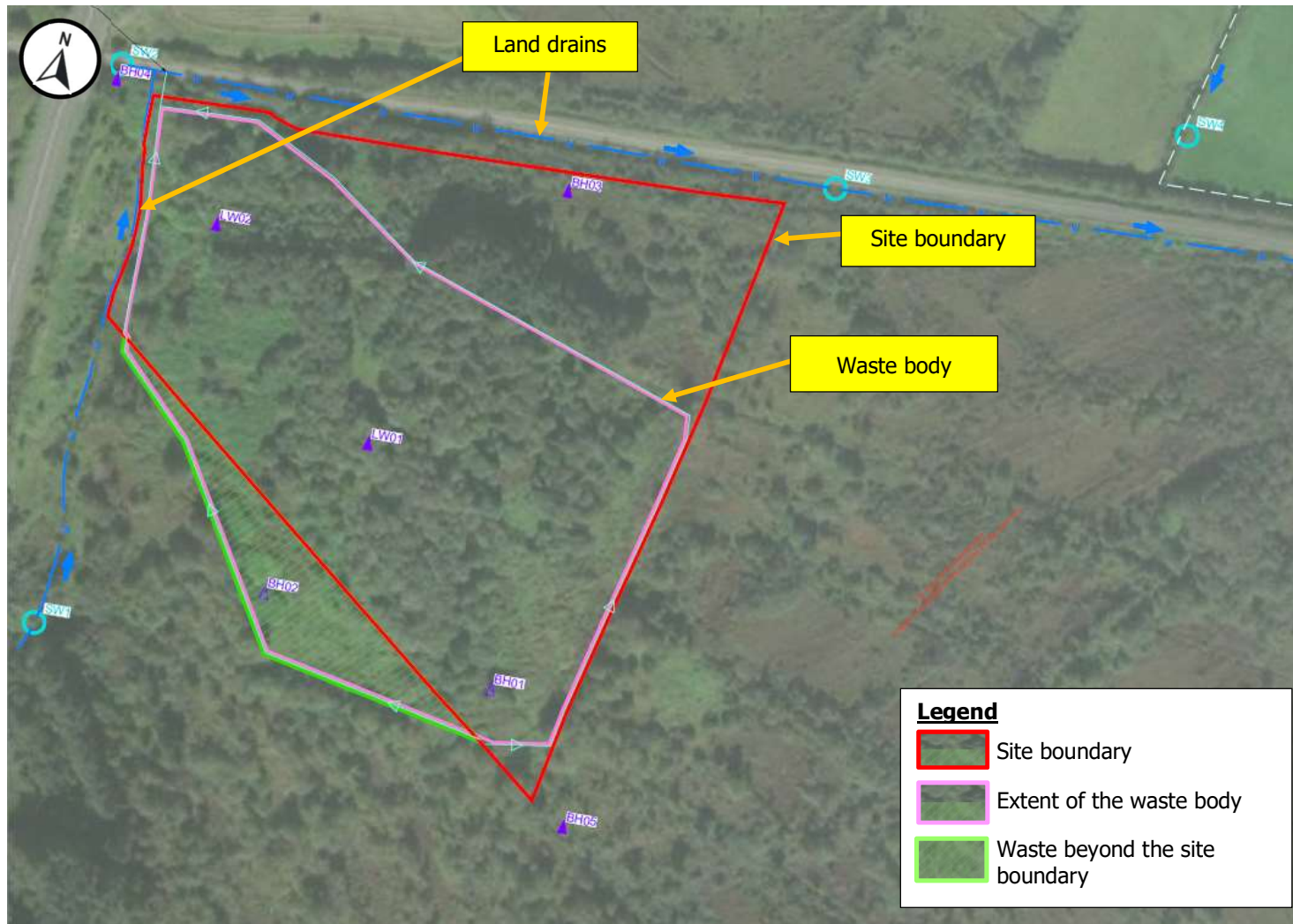


Figure 2: Site layout and the extent of deposited waste



Figure 3: Leachate seepage



Figure 4: Waste on surface of the landfill

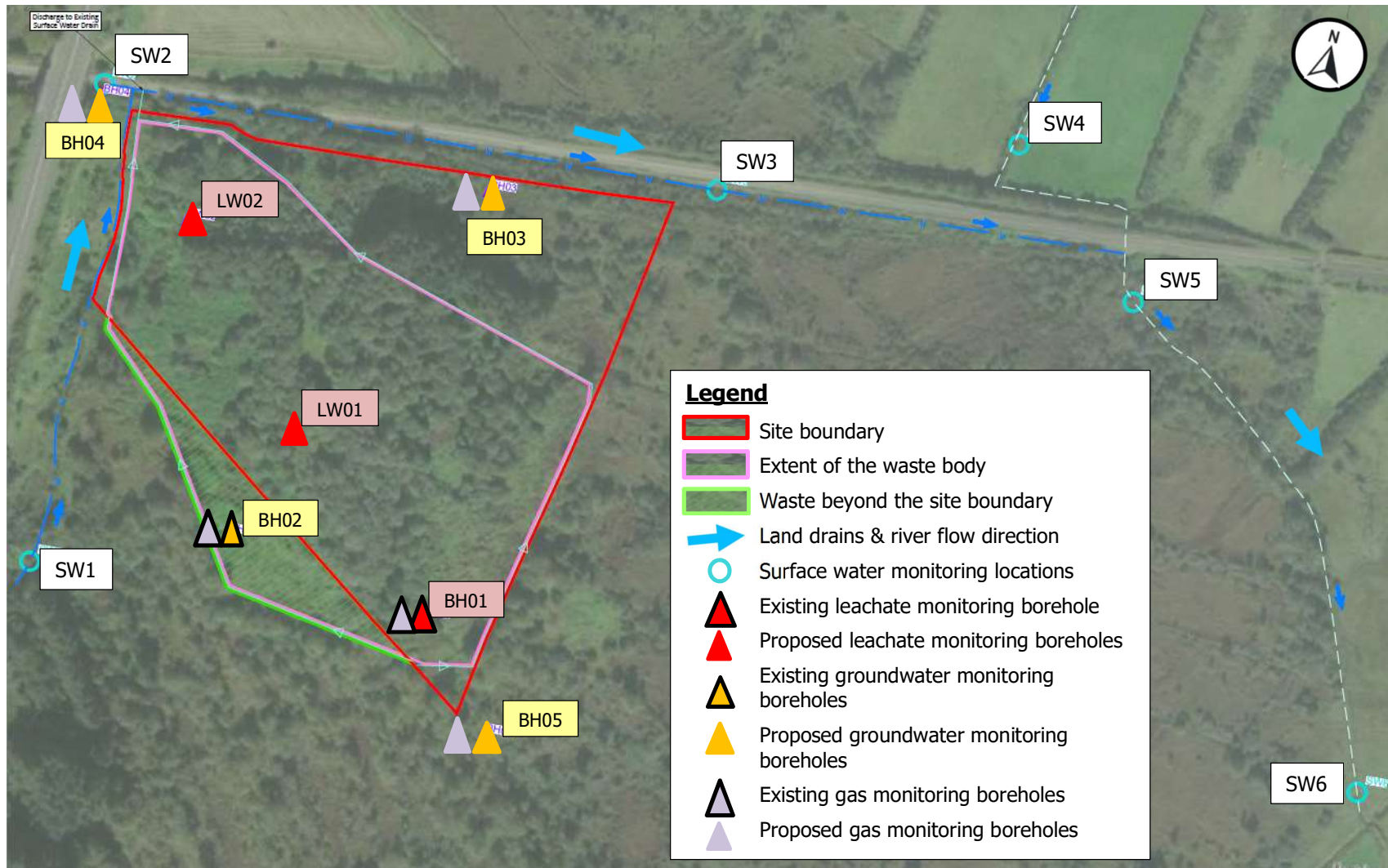


Figure 5: Surface water, leachate, groundwater and gas monitoring boreholes



Figure 6: Trial pit (TP), slit trench (ST) and combined monitoring boreholes (BH)

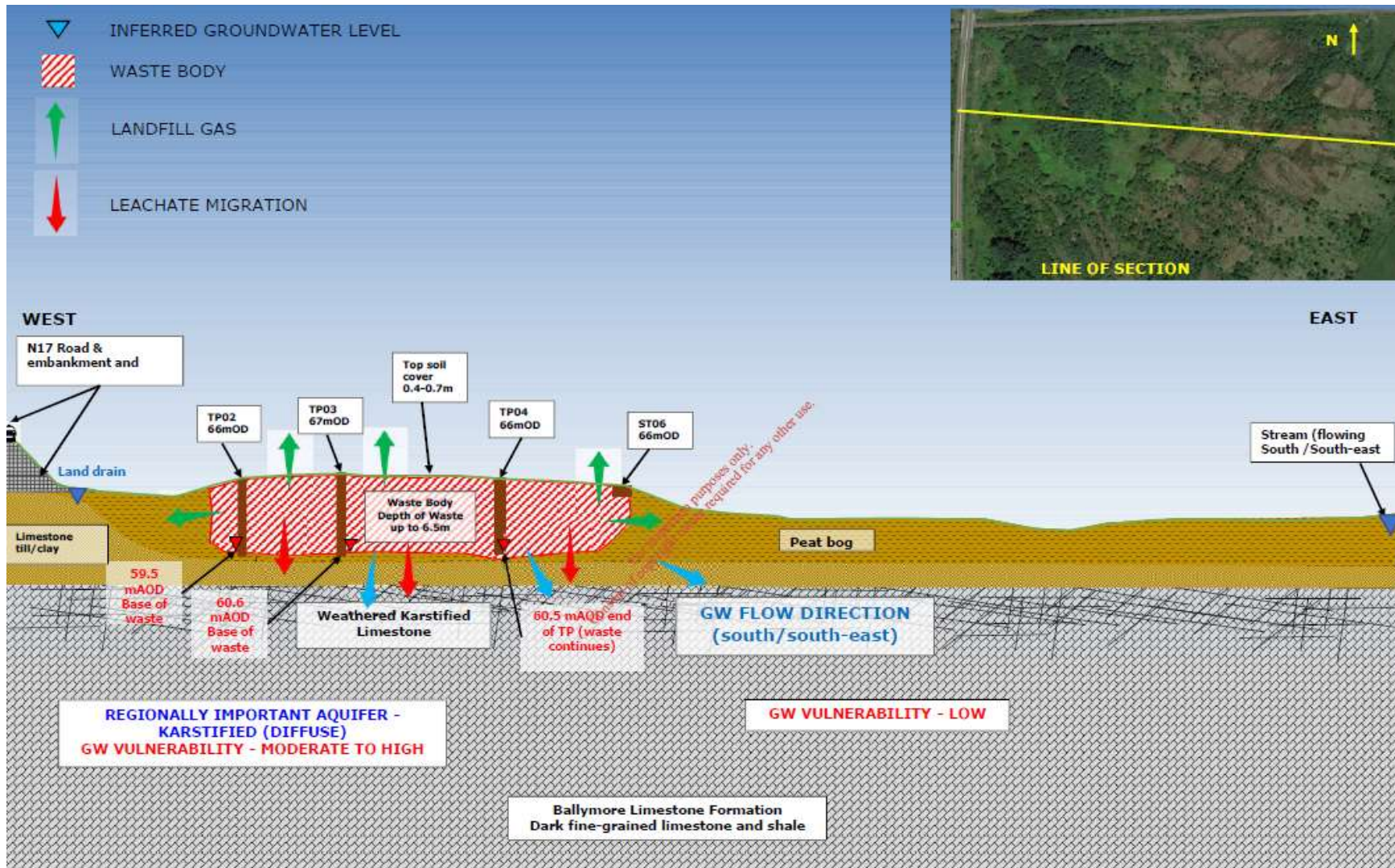


Figure 7: Conceptual site model for Claremorris Historic Landfill

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

European Site	Distance from the facility (km)	Qualifying Interests (* denotes priority habitat)	Conservation Objectives	Assessment
Lough Carra/Mask Complex SAC (site code: 001774)	15.4 km west of the closed landfill	<p>3110 Oligotrophic waters containing very few minerals of sandy plains (<i>Littorelletalia uniflorae</i>)</p> <p>3130 Oligotrophic to mesotrophic standing waters with vegetation of the <i>Littorelletea uniflorae</i> and/or <i>Isoeto-Nanojuncetea</i></p> <p>3140 Hard oligo-mesotrophic waters with benthic vegetation of <i>Chara</i> spp.</p> <p>4030 European dry heaths</p> <p>6210 Semi-natural dry grasslands and scrubland facies on calcareous substrates (<i>Festuco Brometalia</i>) (* important orchid sites)*</p> <p>7210 Calcareous fens with <i>Cladium mariscus</i> and species of the <i>Caricion davallianae</i>*</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> (<i>Alno-Padion</i>, <i>Alnion incanae</i>, <i>Salicion albae</i>)*</p>	<p>NPWS (2021) Conservation objectives for Lough Carra/Mask Complex SAC [001774]. Generic Version 8.0.</p> <p>Department of Housing, Local Government and Heritage [dated 23rd March 2021].</p>	<p><u><i>Emissions to Water</i></u></p> <p>There will be no emissions from the landfill site to surface water.</p> <p><u>Conclusion:</u></p> <p>Condition 3.1 of the certificate of authorisation outlines the remedial actions required at the site.</p> <p>Condition 3.9 requires monitoring, sampling, analysis and characterisation of leachate. It also requires sampling, analysis and characterisation of groundwater upgradient and downgradient of the waste body and surface water upstream and downstream of the landfill.</p> <p>The controls in the recommended certificate of authorisation ensure the qualifying interests of this European site are protected.</p> <p><u><i>Emissions to Air</i></u></p> <p>Recommended certificate of authorisation requires installation of a landfill cap and gas venting system.</p> <p>Condition 3.1(i) requires carrying out, subject to the agreement by the Agency, of a gas pumping trial and Condition 3.1(j) requires implementation of any</p>

				<p>recommendations which may arise from this trial.</p> <p><u>Conclusion:</u></p> <p>The controls in the recommended certificate of authorisation ensure the qualifying interests of this European site are protected.</p>
Lough Mask SPA (site code: 004062)	21 km west/ west-south of the closed landfill	<p>A061 Tufted Duck <i>Aythya fuligula</i></p> <p>A179 Black-headed Gull <i>Chroicocephalus ridibundus</i></p> <p>A182 Common Gull <i>Larus canus</i></p> <p>A183 Lesser Black-backed Gull <i>Larus fuscus</i></p> <p>A193 Common Tern <i>Sterna hirundo</i></p> <p>A395 Greenland White-fronted Goose <i>Anser albifrons flavirostris</i></p>	<p>NPWS (2021) Conservation objectives for Lough Mask SPA [004062]. Generic Version 8.0.</p> <p>Department of Housing, Local Government and Heritage [dated 23rd March 2021].</p>	<p><u>Emissions to Water</u></p> <p>There will be no emissions from the landfill site to surface water.</p> <p><u>Conclusion:</u></p> <p>Condition 3.1 of the certificate of authorisation outlines the remedial actions required at the site.</p> <p>Condition 3.9 requires monitoring, sampling, analysis and characterisation of leachate. It also requires sampling, analysis and characterisation of groundwater upgradient and downgradient of the waste body and surface water upstream and downstream of the landfill.</p> <p>The controls in the recommended certificate of authorisation ensure the qualifying interests of this European site are protected.</p> <p><u>Emissions to Air</u></p> <p>Recommended certificate of authorisation requires installation of a landfill cap and gas venting system.</p> <p>Condition 3.1(i) requires carrying out, subject to the agreement by the Agency,</p>

				<p>of a gas pumping trial and Condition 3.1(j) requires implementation of any recommendations which may arise from this trial.</p> <p><u>Conclusion:</u></p> <p>The controls in the recommended certificate of authorisation ensure the qualifying interests of this European site are protected.</p>
Lough Carra SPA (site code: 004051)	15.2 km west/ west-south of the closed landfill	A182 Common Gull <i>Larus canus</i>	<p>NPWS (2021) Conservation objectives for Lough Carra SPA [004051]. Generic Version 8.0.</p> <p>Department of Housing, Local Government and Heritage [dated 23rd March 2021].</p>	There is no hydrological connection between the closed landfill and the European Site.
Carrowkeel Turlough SAC (site code: 000475)	7 km south-west of the closed landfill	3180 Turloughs *	<p>NPWS (2021) Conservation Objectives: Carrowkeel Turlough SAC 000475. Version 1.</p> <p>National Parks and Wildlife Service, Department of Housing, Local Government and Heritage [dated 11th January 2021]</p>	There is no hydrological connection between the closed landfill and the European Site.
River Moy SAC (site code: 002298)	9.1 km west/ west-north and 7.4 km north-east of the closed landfill	<p>1092 White-clawed Crayfish <i>Austropotamobius pallipes</i></p> <p>1095 Sea Lamprey <i>Petromyzon marinus</i></p> <p>1096 Brook Lamprey <i>Lampetra planeri</i></p>	<p>NPWS (2016) Conservation Objectives: River Moy SAC 002298. Version 1.</p> <p>National Parks and Wildlife Service, Department of Arts, Heritage, Regional, Rural and</p>	There is no hydrological connection between the closed landfill and the European Site.

		<p>1106 Salmon <i>Salmo salar</i></p> <p>1355 Otter <i>Lutra lutra</i></p> <p>7110 Active raised bogs*</p> <p>7120 Degraded raised bogs still capable of natural regeneration</p> <p>7150 Depressions on peat substrates of the Rhynchosporion</p> <p>7230 Alkaline fens</p> <p>91A0 Old sessile oak woods with <i>Ilex</i> and <i>Blechnum</i> in the British Isles</p> <p>91E0 Alluvial forests with <i>Alnus glutinosa</i> and <i>Fraxinus excelsior</i> (Alno-Padion, Alnion incanae, Salicion albae)*</p>	Gaeltacht Affairs [dated 3 rd August 2016].	
Lough Corrib SAC (site code: 000297)	27 km south-west of the closed landfill	<p>1029 Freshwater Pearl Mussel <i>Margaritifera margaritifera</i></p> <p>1092 White-clawed Crayfish <i>Austropotamobius pallipes</i></p> <p>1095 Sea Lamprey <i>Petromyzon marinus</i></p> <p>1096 Brook Lamprey <i>Lampetra planeri</i></p> <p>1106 Salmon <i>Salmo salar</i></p> <p>1303 Lesser Horseshoe Bat <i>Rhinolophus hipposideros</i></p> <p>1355 Otter <i>Lutra lutra</i></p> <p>1393 Slender Green Feather-moss <i>Drepanocladus vernicosus</i></p> <p>1833 Slender Naiad <i>Najas flexilis</i></p> <p>3110 Oligotrophic waters containing very few minerals of sandy plains (Littorelletalia uniflorae)</p>	<p>NPWS (2017) Conservation Objectives: Lough Corrib SAC 000297. Version 1.</p> <p>National Parks and Wildlife Service, Department of Arts, Heritage, Regional, Rural and Gaeltacht Affairs [dated 28th April 2017].</p>	There is no hydrological connection between the closed landfill and the European Site.

		<p>3130 Oligotrophic to mesotrophic standing waters with vegetation of the Littorelletea uniflorae and/or Isoeto-Nanojuncetea</p> <p>3140 Hard oligo-mesotrophic waters with benthic vegetation of Chara spp.</p> <p>3260 Water courses of plain to montane levels with the Ranunculion fluitantis and Callitriche-Batrachion vegetation</p> <p>6210 Semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco-Brometalia) (* important orchid sites)</p> <p>6410 <i>Molinia</i> meadows on calcareous, peaty or clayey-silt-laden soils (Molinion caeruleae)</p> <p>7110 Active raised bogs*</p> <p>7120 Degraded raised bogs still capable of natural regeneration</p> <p>7150 Depressions on peat substrates of the Rhynchosporion</p> <p>7210 Calcareous fens with <i>Caldium mariscus</i> and species of the Caricion davallianae*</p> <p>7220 Petrifying springs with tufa formation (Cratoneurion)*</p> <p>7230 Alkaline fens</p> <p>8240 Limestone pavements*</p> <p>91A0 Old sessile oak woods with <i>Ilex</i> and <i>Blechnum</i> in the British Isles</p> <p>91D0 Bog woodland*</p>		
Lough Corrib SPA (site code: 004042)	27 km south-west of the closed landfill	<p>A051 Gadwall <i>Anas strepera</i></p> <p>A056 Shoveler <i>Anas clypeata</i></p>	NPWS (2021) Conservation objectives for Lough Corrib SPA [004042]. Generic Version 8.0.	There is no hydrological connection between the closed landfill and the European Site.

		<p>A059 Pochard <i>Aythya farina</i></p> <p>A061 Tufted Duck <i>Aythya fuligula</i></p> <p>A065 Common Scoter <i>Melanitta nigra</i></p> <p>A082 Hen Harrier <i>Circus cyaneus</i></p> <p>A125 Coot <i>Fulica atra</i></p> <p>A140 Golden Plover <i>Pluvialis apricaria</i></p> <p>A179 Black-headed Gull <i>Chroicocephalus ridibundus</i></p> <p>A182 Common Gull <i>Larus canus</i></p> <p>A193 Common Tern <i>Sterna hirundo</i></p> <p>A194 Arctic Tern <i>Sterna paradisaea</i></p> <p>A395 Greenland White-fronted Goose <i>Anser albifrons flavirostris</i></p>	<p>Department of Housing, Local Government and Heritage [dated 23rd March 2021].</p>	
<p>Kilglassan/Caheravoostia Turlough Complex SAC (site code: 000504)</p>	<p>11.8 km south-west of the closed landfill</p>	<p>3180 Turloughs *</p>	<p>NPWS (2021) Conservation Objectives: Kilglassan/Caheravoostia Turlough Complex SAC 000504. Version 1. National Parks and Wildlife Service, Department of Housing, Local Government and Heritage [dated 15th January 2021].</p>	<p>There is no hydrological connection between the closed landfill and the European Site.</p>
<p>Balla Turlough SAC (site code: 000463)</p>	<p>12.5 km north-west of the closed landfill</p>	<p>3180 Turloughs *</p>	<p>NPWS (2021) Conservation Objectives: Balla Turlough SAC 000463. Version 1. National Parks and Wildlife Service, Department of Housing, Local Government and Heritage [dated 11th January 2021].</p>	<p>There is no hydrological connection between the closed landfill and the European Site.</p>

Greaghans Turlough SAC (site code: 000503)	13.1 km south/south-west of the closed landfill	3180 Turloughs *	NPWS (2021) Conservation Objectives: Greaghans Turlough SAC 000503. Version 1. National Parks and Wildlife Service, Department of Housing, Local Government and Heritage [dated 11 th January 2021].	There is no hydrological connection between the closed landfill and the European Site.
Towerhill House SAC (site code: 002179)	14 km west of the closed landfill	1303 Lesser Horseshoe Bat <i>Rhinolophus hipposideros</i>	NPWS (2018) Conservation Objectives: Towerhill House SAC 002179. Version 1. National Parks and Wildlife Service, Department of Culture, Heritage and the Gaeltacht [dated 18 th September 2018].	There is no hydrological connection between the closed landfill and the European Site.
Ardkill Turlough SAC (site code: 000461)	14 km south/south-west of the closed landfill	3180 Turloughs *	NPWS (2020) Conservation Objectives: Ardkill Turlough SAC 000461. Version 1. National Parks and Wildlife Service, Department of Housing, Local Government and Heritage [dated 16 th December 2020].	There is no hydrological connection between the closed landfill and the European Site.
Ballinafad SAC (site code: 002081).	15 km north-west of the closed landfill	1303 Lesser Horseshoe Bat <i>Rhinolophus hipposideros</i>	NPWS (2018) Conservation Objectives: Ballinafad SAC 002081. Version 1. National Parks and Wildlife Service, Department of Culture, Heritage and the Gaeltacht [dated 27 th August 2018].	There is no hydrological connection between the closed landfill and the European Site.