


Signed: 

Dated: 27th August 2020



**OFFICE OF ENVIRONMENTAL
SUSTAINABILITY**

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

TO: Gerard O'Leary, Director

FROM: Ewa Babiarczyk, Inspector, Environmental Licensing Programme

DATE: 27th August 2020

RE: Application by **Monaghan County Council** for a Certificate of Authorisation for a closed landfill at **Killycronaghan Landfill, Killycronaghan, Smithborough, County Monaghan.**

Certificate of Authorisation Register Number **H0366-01.**

1. Application details

Type of facility:	Closed landfill as defined in the Regulations ¹ .
Original site ownership	Monaghan County Council.
Current site ownership	Private ownership.
Operator of closed landfill	Monaghan County Council operated this since 1970.
Proposed use post remedial works	Monaghan County Council intends the site to be used as pasture for low intensity grazing.
Risk category of closed landfill:	High risk (class A) due to <ul style="list-style-type: none"> • migration of landfill leachate into groundwater and adjacent surface water bodies; and • migration of landfill gas into on-site and off-site agricultural buildings.
Section 22 register number:	S22-02296
Grid Reference	256923 E and 328618 N
Application received:	15 th January 2020

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

AA screening determination:	23 rd March 2020
Regulation 7(4) notice:	29 th May 2020
Additional information received:	Regulation 7(4) Reply received on 29 th May 2020. Unsolicited information received on 29 th June 2020, 3 rd July 2020, 9 th July 2020, 13 th July 2020 and 15 th July 2020.
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	<p>The closed landfill is located 6.6km north-east of Clones town, 2.4km south-west of Smithborough village and 1km south off the N54 road.</p> <p>The location of the landfill site is shown in Figure 1.</p> <p>It is noted that the applicant proposed that the extent of the site boundary is reduced from that indicated in Figure 2 to that indicated in Figure 7 (i.e. the extent of the area proposed to be capped). However, as stated in the Tier 3 Assessment, the proposed area to be capped requires further site investigations as it may be the case that some waste is deposited outside the area proposed to be capped. Accordingly, the original site boundary, as shown in Figure 2, will be the extent of the site to be authorised under the Certificate of Authorisation. Condition 3.5 requires a report on the further site investigations to be submitted for agreement by the Agency.</p>
Period of landfilling	1970 to circa 1984.
Surrounding area	<p>The closed landfill is surrounded by agricultural fields. To the south-east, east and north, the site is bounded by the Kilgormly river. The Magheramey river bounds the site to the north-west.</p> <p>There are poultry houses located adjacent to the north-east of the site as shown in Figure 2. There is no licence for this poultry unit. There are also three dwelling houses within 500m of the site boundary. The nearest dwelling house is located 230m of the north-eastern site boundary.</p>
Area of the closed landfill	The site covers an area of 9 ha.
Quantity of waste at the facility	Approximately 147,784 tonnes. 106,000 m ³
Characterisation of waste deposited	The waste comprises of municipal solid waste (MSW) located in the following areas as shown in Figure 3:

	<ul style="list-style-type: none"> • 2.2 ha area with made ground/waste (predominantly organic) over and/or gravel with leachate (Zone A); and • 0.08 ha area with a small amount of waste at the southern site boundary (Zone B). <p>The deposited waste includes a black bag type waste with plastic, clothes, glass bottles, coal bags, fertiliser bags, planks of wood, nets, metal wires and newspapers.</p>
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3. Site investigations

<p>Current condition and appearance of closed landfill:</p>	<p>The site lies at an elevation of between 50mOD and 55mOD and is mainly flat with a hill rising in the south-western part of the site. The site is used for pasture. There are two farm buildings on the site. They are located near the site entrance at the eastern site boundary, as shown on Figure 2.</p> <p>Condition 3.1(k) requires continuous gas monitoring and installation of gas vents and gas alarms in these buildings. Additionally, Condition 3.1(l) requires that the local authority ensures that recommendations in the guidance given in the Department of Environment 1994 publication "Protection of New Buildings and Occupants from Landfill Gas" and any subsequent revisions have been considered and applied to these two buildings.</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 closed landfill has been capped with soil but the cap allows rainfall to infiltrate into the waste body; • the landfill is unlined; • there is migration of landfill leachate into groundwater; • the landfill is contributing to a deterioration in groundwater quality; • the waste material is deposited in a single infill area tending west to east in the centre of the site and between approximately 150m in length and 130m in width; • the average thickness of the waste body is 5m and there is a layer of leachate contaminated sands and gravels below waste; • the groundwater table appears to be intersecting the waste body; • leachate seepage was observed near the centre of the site; • landfill gas is being generated; • there are two wells present on-site. The Council believes these to be old methane wells;

	<ul style="list-style-type: none"> • a canal, called Ulster Canal, used to flow through the area of the site. A bridge (called Lemmon's Bridge) which was built over the former canal is located in the north-eastern part of the site, as shown in Figure 2; and • there is a partial blockage on the Kilgormly river, a few meters away from the south-eastern site boundary, with the result that water in the river is stagnant. The applicant believes this blockage was caused by road works. The applicant stated verbally that although the blockage is not impacting the closed landfill, it is proposed to clear the blockage. Given the fact that the blockage is outside the site boundary and it is not impacting the closed landfill, the clearance of the blockage is not included as remedial works in the recommend certificate of authorisation.
<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"> • desktop study, including site walk-over which was carried out on 12th June 2018; • trial pit excavations (sixteen trial pits were excavated on 24th and 25th September 2018); • groundwater sampling (two rounds of sampling at three boreholes were carried out on 2nd and 9th October 2018); • groundwater level analysis (carried out on 9th October 2018); • waste sampling (two samples of the made ground/waste were collected on 24th September 2018); • geophysical survey (carried out on 30th and 31st October 2018); • geotechnical analysis, including variable head permeability testing (carried out on 11th October 2018); • surface water quality (sampling carried out at four locations on 1st and 9th October 2018); • landfill gas monitoring (carried out at three locations on 1st and 9th October 2018); • soil analysis (carried out on 16th October 2018); • topographical survey; and • modelling of the current and future impacts on groundwater quality and surface water quality, and current (carried out on 25th March 2019) and future volumes of landfill gas being generated by the deposited waste (carried out on 13th May 2019).
<p>Hydrology</p>	<p>The closed landfill is located within the Erne catchment (catchment Identification Number: 36) and the sub-catchment of River Finn [Monaghan] (waterbody code: IE_NW_36F010200).</p> <p>Immediately to the south-east, east and north, the site borders with the Kilgormly river (waterbody code: IE_NW_36F010200). The status</p>

	<p>of this river is Moderate. At the northern site boundary, the Kilgormly river discharges into the Magheramey river (waterbody code: IE_NW_36F010200). The status of the Magheramey river is also Moderate.</p> <p>Two rounds of surface water monitoring were carried out on the 1st and 9th October 2018 at an upstream location SW4 and further downstream monitoring locations SW3, SW2 and SW1, which is the furthest downstream monitoring location, as shown in Figure 4. Monitoring results show exceedances of Environmental Quality Standards (EQS) set out in European Communities Environmental Objectives (Surface Waters) Regulations 2009, as amended, for ammonia as N at the downstream location SW1. While the EQS for Total Ammonia as N is less than 0.140 mg/l (95thile flow) the recorded maximum concentration of ammoniacal nitrogen as N at SW1 was 0.258mg/l. Tier 2 Assessment states that the presence of Ammonia at such level may be an indication of slurry spreading run-off from the agricultural fields in the area, rather than direct impact from the landfill.</p> <p>The monitoring results also show that concentrations of all parameters monitored at the furthest downstream monitoring location SW1, with the exception of pH, are slightly higher than the concentrations of these parameters recorded at the furthest upstream monitoring location SW4. For example, while the concentration of BOD at SW4 is recorded by the applicant as less than 1mg/l, the concentration of BOD at SW1 is 2.12 mg/l. The increase in the parameter concentrations at the downstream location shows that the water quality is impacted by the closed landfill.</p> <p>Condition 3.9(d) requires monitoring of surface water at the locations upstream and downstream of the closed landfill on a quarterly basis. This condition also specifically requires monitoring for Total Ammonia as N and Molybdate Reactive Phosphorus (MRP) (mg P/l) as this parameter was omitted from the monitoring carried out by the applicant.</p>
Hydrogeology	<p>The closed landfill lies within the Clones Groundwater Body (GWB Number: IEGBNI_NW_G_063). The status of this groundwater body is good. The site is underlain by a productive fissured bedrock and the aquifer vulnerability beneath the site varies from Moderate, through High to Extreme. The site investigations at boreholes GW01, GW2 and GW03, as shown in Figure 5, established that groundwater beneath the site flows towards east to south-east.</p> <p>There are no groundwater dependent ecosystems in the area. The nearest public water supply is the Smithborough groundwater abstraction (abstraction ID 2400PUB1010_1) located 1km north-east of the closed landfill. Given the groundwater flow beneath the site towards east to south-east, there will be no impact on this groundwater protection area from the closed landfill.</p> <p>Other public groundwater water supplies are Monaghan public water supply (abstraction IDs: 2400PUB1024_6 and 2400PUB1024_7)</p>

	<p>located 12km north-east of the closed landfill and Clones public water supply (abstraction IDs: 2400PUB1002_1 and 2400PUB1002_2) located 12km to the south-east of the site. Given the groundwater flow beneath the site towards east to south-east, there will be no impact on groundwater abstracted at the Monaghan abstraction. There is potential, however, for the landfill leachate to impact the quality of water being abstracted from the Clones abstraction however, the appropriate capping of the landfill will limit ingress of rain water into the waste body thus limiting the generation of leachate.</p> <p>There are a number of private drinking wells in close proximity to the site. The closest well is located 200m south-east of the closed landfill. Out of the remaining wells, three wells are located north-west of the closed landfill; three wells are located north-east and one well is located south-east of the closed landfill. There is potential for the landfill leachate to impact the quality in wells located south-east of the closed landfill however, the appropriate capping of the landfill will limit ingress of rain water into the waste body thus limiting the generation of leachate and its ingress into groundwater.</p> <p>Condition 3.9(e) requires monitoring of groundwater quality upgradient and downgradient of the waste body. Additionally, Condition 3.4 requires carrying out appropriate monitoring on a biannual basis to identify any impact on the quality of water abstracted at wells downgradient of the landfill.</p>
<p>Leachate and water quality:</p>	<p>Trial pit investigations at sixteen locations, as shown in Figure 5, established that made ground comprising waste was encountered in nine trial pits (TP03; TP06, TP07, TP08; TP11, TP12, TP13; TP15 and TP16). The base of the waste material was not reached at the termination depth of 4.5m below ground level in trial pits TP06, TP08, TP11, TP13. The base of the waste was encountered between 3.0m – 4.8m in trial pits TP03, TP07, TP12 and TP15 where natural ground was found also. No waste and natural ground comprising of quaternary glacial till were confirmed in the perimeter trial pits TP01, TP02, TP04, TP05, TP09, TP10 and TP14.</p> <p>Monitoring of groundwater was carried out at three locations GW01, GW02 and GW03, as shown in Figure 5. The monitoring results carried out on 2nd and 9th October 2018 show elevated levels of Ammonical Nitrogen as N at all three monitoring boreholes. While Environmental Quality Standard (EQS) for Ammonium as N set out in the European Communities Environmental Objectives (Groundwater) Regulations 2010, as amended², is 0.175mg/l, the concentrations of Ammonical Nitrogen as N in GW01, GW02 and GW03 were recorded, respectively, at 0.324 mg/l, 1.14 mg/l and 33.2 mg/l. Tier 2 Assessment states that the elevated concentrations of Ammonia in both upgradient boreholes GW01 and GW02 are considered representative of background levels possibly due to agricultural land spreading and adds that the presence of peat beneath the site could</p>

² European Union Environmental Objectives (Groundwater) (Amendment) Regulations 2016 (S.I. No. 366 of 2016)

	<p>also be a potential source of elevated Ammonia in groundwater. However, Tier 2 Assessment also states that, given the Ammonia concentration in GW03 (downstream) recorded at 33.2mg/l is 100-times greater than the recorded concentrations at the upgradient borehole (GW01), the landfill is impacting groundwater quality.</p> <p>The groundwater monitoring recorded coliforms in all monitoring boreholes. The concentration of total coliforms was recorded at 2,420 cfu/100ml in GW01, 1,590 cfu/100ml in GW02 and 698 cfu/100ml in GW03. Tier 2 Assessment states that the combined presence of elevated ammonia and coliforms in all monitoring boreholes may be evidence of localised contamination due to agricultural land spreading or poorly functioning septic tanks.</p> <p>The monitoring results also show elevated concentrations of lead in all monitoring boreholes. While the EQS for lead is 0.0075 mg/l, as set out in the European Communities Environmental Objectives (Groundwater) Regulations 2010, as amended, the concentration of this parameter was recorded at 0.278mg/l in GW01, 0.179mg/l in GW02 and 0.136 in GW03. Tier 2 Assessment attributes the elevated concentrations to the localised hydrochemistry due to the presence of historical lead mining sites across County Monaghan and the bedrock formations underlying the site.</p> <p>The monitoring results also show elevated phosphorus and potassium concentrations recorded at GW3. While the threshold for phosphorus is 0.035 mg/l, as set out in the European Communities Environmental Objectives (Groundwater) Regulations 2010, the recorded concentration is 0.91 mg/l. Also, while the interim guideline value (IGV)³ for potassium is 5 mg/l, the recorded concentration of this parameter is 17.7 mg/l. Tier 2 Assessments states that the significant difference in phosphorous and potassium concentrations between the upgradient monitoring locations and GW03 suggests that the waste body is impacting the downstream groundwater quality.</p> <p>The monitoring results also show elevated concentrations of barium. While the IGV for barium is 0.1 mg/l, the recorded concentrations are: 0.133 mg/l in GW01, 0.780 mg/l in GW02 and 0.352 mg/l in GW3. Tier 2 Assessment considers the recorded concentrations to be evidence of the localised groundwater hydrochemistry.</p> <p>The monitoring results further show elevated iron concentrations recorded at GW01 and GW02. While the IGV for iron is 0.2 mg/l, the recorded concentration of this parameter is 0.547 mg/l in borehole GW01 and 3.47 mg/l in borehole GW02. The monitoring results also show elevated manganese concentrations at all monitoring locations. While the IGV for manganese is 0.05 mg/l, the recorded concentration of this parameter was 0.0516 mg/l in GW01, 0.406 mg/l in GW02 and 0.0771 mg/l in GW03. Tier 2 Assessment states that the elevated iron and manganese concentrations are typical of</p>
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³ As set out in the EPA publication 'Towards setting guideline values for the protection of groundwater in Ireland – Interim Report'.

	<p>the local bedrock hydrochemistry. However, Tier 2 Assessment also states that the iron concentration of 3.47 mg/l in GW02, which is over 17-times higher than the IGV for iron of 0.2 mg/l is a result of leachate migration from the waste body.</p> <p>The monitoring results also show elevated alkalinity (CaCO₃) in all monitoring boreholes. While threshold for alkalinity is 200 mg/l, the concentration recorded in GW1 was 291 mg/l, 421 mg/l in GW2 and 333 mg/l in GW03. Tier 2 Assessment states that groundwater quality within such a range is a factor of local bedrock hydrochemistry.</p> <p>Notwithstanding the above groundwater quality analysis, having regard to the direction of groundwater flow towards east to south-east, as shown in Figure 6, and the location of waste body, as shown in Figure 3, it is noted that the monitoring of water quality in the only downgradient groundwater monitoring borehole (GW03) does not provide a thorough representation of downgradient groundwater quality. Accordingly, Condition 3.9(e) requires monitoring on a quarterly basis of groundwater from the three existing boreholes and at least three additional groundwater monitoring boreholes, one of which shall be upgradient of the waste body and two of which shall be downgradient of the waste body. Additionally, Condition 3.9(b) requires quarterly monitoring for leachate.</p>
Landfill gas:	<p>There is a risk of landfill gas migration to on-site and off-site buildings. The most likely pathway for the migration of the landfill gas is through the underlying bedrock and existing landfill cap.</p> <p>Landfill gas monitoring was carried out at the same boreholes as the groundwater monitoring, boreholes GW01, GW02 and GW03, as shown on Figure 5. The monitoring was carried out on 1st and 9th October 2018. The monitored parameters were methane (CH₄), carbon dioxide (CO₂) and oxygen (O₂). No elevated methane or carbon dioxide concentrations were recorded.</p> <p>Condition 3.1(c) requires a landfill cap, to include a 1mm thick low permeability geomembrane, and Condition 3.1(f) requires a passive gas venting system to be installed. Additionally, Condition 3.9(c) requires monitoring to detect the presence and concentration of landfill gas on a quarterly basis.</p>
Conceptual site model:	<p>Tier 1 Assessment determined that the overall risk score for the closed landfill was High (Class A).</p> <p>Tier 2 Assessment confirmed this classification due to the risk of migration of landfill gas into the adjacent buildings and migration of landfill leachate into groundwater.</p> <p>The conceptual site model is shown in Figure 8.</p>

4. SPR linkages and remedial actions

<p>SPR linkage scenarios (applicable ones only):</p>	<p>Leachate and gas migration scores:</p> <p><u>Low scores:</u></p> <p>Three pathways were identified in Tier 2 Assessment as Low Risk:</p> <ul style="list-style-type: none"> • Migration of leachate into groundwater protected areas (SPR4); • Migration of leachate to public water supplies (SPR 6); and • Migration of leachate, via surface water drainage/runoff, to Surface Water Body Protected Areas (SPR 9). <p><u>Moderate scores:</u></p> <p>Three pathways were identified as Moderate Risk:</p> <ul style="list-style-type: none"> • Migration of leachate to private wells (SPR 3); • Migration of leachate to the underlying aquifer (SPR 5); and • Migration of leachate, via groundwater migration, to surface water bodies (SPR 7). <p><u>High scores:</u></p> <p>Five pathways were identified as High Risk:</p> <ul style="list-style-type: none"> • Leachate migration into groundwater, and, via groundwater, to surface waterbodies (SPR 1); • Migration of leachate, via groundwater, to Surface Water Body Protected Areas (SWDTE) (SPR 2); • Migration of leachate, via surface water drainage/runoff, to surface water bodies (SPR 8); • Human health exposure pathway of off-site lateral migration of landfill gas into nearby buildings (SPR 10); and • Vertical landfill gas migration (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 groundwater and surface water bodies. • remedial action is warranted to address the risk of off-site migration of landfill gas.
<p>Proposed remedial actions:</p>	<p>Two types of computer modelling were used for purposes of Tier 3 Assessment. LandSim modelling was used to examine the current and future impact on groundwater quality and associated impacts to surface water quality. LandGEM modelling was used to examine the current and future volume of gas being generated by the deposited waste. This information was used to inform appropriate remedial and mitigation measures to either eliminate or reduce those risks.</p>

The applicant considered the following remedial measures as the feasible options:

1 Landfill cap

Tier 3 Assessment recommends that the landfill cap will facilitate the future use of the remediated site as grazing land and it consists of the following elements:

- 200mm topsoil layer;
- 800mm subsoil layer;
- Sub-surface drainage geocomposite;
- 1mm LLDPE Barrier Layer; and
- Sub-surface landfill gas collection geocomposite.

The extent of the area to be capped, as shown in Figure 7, was determined on geophysical survey and site investigation findings. Zone B (see Figure 3) was detected as a possible zone containing waste by the geophysical survey. However, the site investigations showed made ground containing only a small percentage of waste (fragments of plastic) in this location (TP15) and concluded that this waste was related to localised tipping/land raising as opposed to historic landfilling. Condition 3.1(a) requires removal of the waste detected by trial pit TP15.

2 Leachate management system, surface water run-off system, and surface water and groundwater monitoring

Leachate management system

Tier 3 Assessment recommends that a vertical cut-off barrier using LLDPE liner is constructed along the edge of the landfill cap to limit leachate migration into adjacent surface waters.

Surface water run-off drainage system

Tier 3 Assessment also recommends that sub-surface drains are constructed to the natural fall of the ground level, falling first from the highest portion in the centre of the site towards the north-east boundary and into a combined sub-surface/French drain which will run along the edge of the cap. The system will discharge into Kilgormly river at three locations.

Surface water monitoring

Tier 3 Assessment recommends surface water monitoring on a quarterly basis at the existing monitoring locations SW1, SW2, SW3 and SW4.

Groundwater monitoring

Tier 3 Assessment recommends quarterly groundwater monitoring at the existing monitoring locations GW01, GW02 and GW03 and three additional boreholes, one of which (borehole GW04) is to be installed upgradient of the waste body and two of which (boreholes GW05 and GW06) are to be

installed downgradient of the waste body. Condition 3.9(e) requires monitoring of groundwater from the three existing boreholes and at least three additional groundwater monitoring boreholes, two of which shall be located downgradient of the waste body and one of which shall be located upgradient of the waste body. Condition 3.1(i) requires installation of at least three additional groundwater monitoring boreholes, of which one shall be upgradient of the waste body and two of which shall be downgradient of the waste body.

3 Landfill gas control and management

Tier 3 Assessment recommends installation of passive gas ventilation and a gas pumping trial to determine if vertical gas interception trenches are required to be installed. Additionally, the assessment recommends gas monitoring at additional locations.

Passive gas ventilation

It is recommended that the capping includes a landfill gas drainage layer which will be directly connected to a gas collection network and a series of vertical stand pipes venting to atmosphere at 2-3m above the final ground level. The vertical stand pipes will include carbon filtration packs to "scrub" any odour and low concentrations of methane from the landfill gas prior to venting. The stand pipes will also include wind driven rotating cowls to induce a negative pressure within the stand pipes, improving gas flow.

Gas pumping trial

The applicant proposes that the gas pumping trial will be used to determine the quantity and quality of landfill gas actively produced at the site.

Having regard to the gas monitoring results submitted as part of Tier 2 Assessment, which show very low levels of gas being generated at the facility, i.e. the highest concentration of methane was recorded at 0.2% v/v at monitoring locations GW02 and GW03, it is recommended that, prior to making a determination whether the gas pumping trial is required, the applicant monitors landfill gas on a quarterly basis and for a period of 12 months. Accordingly, Condition 3.1(m) requires the local authority, following such gas monitoring, to seek agreement of the Agency regarding whether to carry out a gas pumping trial.

Vertical gas interception trenches

The applicant stated that installation of such gas interception trenches will depend on the results of the landfill gas pumping trial. It is proposed that the gas interception trenches would be installed along the landfill cap edges. Condition 3.1(f)(v) requires that the base of the interception trenches is constructed at the depth of the maximum depth of the waste body. Condition 3.1(f)(vi) requires gas vent pipes with fans to

be installed within the trenches to prevent the increased back-pressure caused by the landfill cap from causing increase in the lateral movement of gas.

Gas monitoring

Tier 3 Assessment recommends gas monitoring on a quarterly basis at the existing monitoring locations GW01, GW02 and GW03. Additionally, considering that the closed landfill is a high risk site, monitoring of landfill gas from at least two downgradient locations, rather than one downgradient location, is regarded as appropriate. Accordingly, Condition 3.1(h) requires installation of at least three gas monitoring boreholes, of which one shall be upgradient of the waste body and two of which shall be downgradient of the waste body. Condition 3.9(c) requires quarterly monitoring to detect the presence and concentration of landfill gas in all monitoring boreholes.

Having regard to the monitoring results submitted in support of the application for certificate of authorisation, the age of the closed landfill, the location of the nearest private well (0.3km east of the site) and the fact that the nearby dwellings are serviced by public supply water mains, the following remedial measures are considered appropriate and recommended in Condition 3.1:

- (a) Remove waste detected by trial pit TP15 investigation;
- (b) Minimise the disturbance of deposited waste to the extent possible;
- (c) Install a low permeability landfill cap, minimum 1m, with 1mm thick low permeability geomembrane having a hydraulic conductivity of less than or equal to $1 \times 10^{-9} \text{m/s}$;
- (d) Install a vertical cut-off barrier;
- (e) Install surface water run-off drainage system;
- (f) Install passive gas venting system. The gas venting system shall meet the following requirements:
 - (i) A landfill gas drainage layer;
 - (ii) Vertical stand pipes with carbon filtration packs and wind driven rotating cowls;
 - (iii) The stand pipes shall not be perforated above the ground level;
 - (iv) Gravel filled gas interception trenches (if recommended by a gas pumping trial);
 - (v) The base of the interception trenches shall be constructed at the depth of the maximum depth of the waste body; and
 - (vi) Gas vent pipes with fans shall be installed within the interception trenches every 20m and at other locations, as appropriate, such that the increased back-pressure caused by the cap does not result in increased lateral movement of gas;

	<p>(vii) The interception trenches shall be connected to the gas boreholes.</p> <p>(g) Install three leachate monitoring boreholes within the waste body;</p> <p>(h) Install at least three gas monitoring boreholes outside the waste body, of which one shall be upgradient of the waste body and two of which shall be downgradient of the waste body;</p> <p>(i) Install at least three additional groundwater monitoring boreholes, of which one shall be upgradient of the waste body and two of which shall be downgradient of the waste body;</p> <p>(j) Reseed grass within the site;</p> <p>(k) Install continuous gas monitoring, gas vents and gas alarms in the on-site farm buildings;</p> <p>(l) Ensure that recommendations in the guidance given in the Department of Environment 1994 publication "Protection of New Buildings and Occupants from Landfill Gas" and any subsequent revisions have been considered and applied to all buildings constructed on the facility;</p> <p>(m) 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(c), seek agreement of the Agency regarding whether to carry out a gas pumping trial; and</p> <p>(n) Upon any agreement obtained in accordance with Condition 3.1(m), the local authority shall submit details of the proposed gas pumping trial for agreement by the Agency, and implement any recommendations arising therefrom.</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, subsequently, into surface water bodies; and • migration of landfill gas to the on-site and off-site agricultural buildings. <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>

<p>Adequacy of risk assessment:</p>	<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 for the following reasons:</p> <ul style="list-style-type: none"> • It has identified, assessed and adequately addressed the associated risks inherent with the landfill site. • An Appropriate Assessment was also completed to evaluate the potential risk to the European sites associated with the adjoining surface waters. It concluded that the remedial measures will not impact on the protected sites at Upper Lough Erne NI SPA (Site Code: UK9020071), Upper Lough Erne NI SAC (Site Code: UK0016614), Lough Oughter and Associated Loughs SAC (Site Code: 000007), Kilroosky Lough Cluster SAC (Site Code: 001786), Magheraveely Marl Loughs NI SAC. (Site Code: UK0016621), Slieve Beagh SPA (Site code: 004167), Slieve Beagh NI SAC (Site Code: UK0016622) and Slieve Beagh-Mullaghfad-Lisnaskea NI SPA (Site Code: UK9020302).
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5. Appropriate assessment

There are eight 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 Upper Lough Erne NI SPA (Site Code: UK9020071), Upper Lough Erne NI SAC (Site Code: UK0016614), Lough Oughter and Associated Loughs SAC (Site Code: 000007), Kilroosky Lough Cluster SAC (Site Code: 001786), Magheraveely Marl Loughs NI SAC. (Site Code: UK0016621), Slieve Beagh SPA (Site code: 004167), Slieve Beagh NI SAC (Site Code: UK0016622) and Slieve Beagh-Mullaghfad-Lisnaskea NI SPA (Site Code: UK9020302).

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 Upper Lough Erne NI SPA (Site Code: UK9020071), Upper Lough Erne NI SAC (Site Code: UK0016614) and Lough Oughter and Associated Loughs SAC (Site Code: 000007).

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 Upper Lough Erne NI SPA (Site Code: UK9020071), Upper Lough Erne NI SAC (Site Code: UK0016614), Lough Oughter and Associated Loughs SAC (Site Code: 000007), Kilroosky Lough Cluster SAC (Site Code: 001786), Magheraveely Marl Loughs NI SAC. (Site Code:

UK0016621), Slieve Beagh SPA (Site code: 004167), Slieve Beagh NI SAC (Site Code: UK0016622) and Slieve Beagh-Mullaghfad-Lisnaskea NI SPA (Site Code: UK9020302), 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 Upper Lough Erne NI SPA (Site Code: UK9020071), Upper Lough Erne NI SAC (Site Code: UK0016614) and Lough Oughter and Associated Loughs SAC (Site Code: 000007) 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 Upper Lough Erne NI SPA (Site Code: UK9020071), Upper Lough Erne NI SAC (Site Code: UK0016614) and Lough Oughter and Associated Loughs SAC (Site Code: 000007);
- there are no significant emissions to air from the landfill which could affect the bird species that the Upper Lough Erne NI SPA (Site Code: UK9020071), Slieve Beagh SPA (Site code: 004167) and Slieve Beagh-Mullaghfad-Lisnaskea NI SPA (Site Code: UK9020302) are designated for; and
- Kilroosky Lough Cluster SAC (Site Code: 001786), Magheraveely Marl Loughs NI SAC (Site Code: UK0016621), Slieve Beagh NI SAC (Site Code: UK0016622), Slieve Beagh SPA (Site code: 004167) and Slieve Beagh-Mullaghfad-Lisnaskea NI SPA (Site Code: UK9020302) do not receive water from the waterbodies located at the closed landfill.

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: Upper Lough Erne NI SPA (Site Code: UK9020071), Upper Lough Erne NI SAC (Site Code: UK0016614), Lough Oughter and Associated Loughs SAC (Site Code: 000007), Kilroosky Lough Cluster SAC (Site Code: 001786), Magheraveely Marl Loughs NI SAC. (Site Code: UK0016621), Slieve Beagh SPA (Site code: 004167), Slieve Beagh NI SAC (Site Code: UK0016622) and Slieve Beagh-Mullaghfad-Lisnaskea NI SPA (Site Code: UK9020302).

6. Recommendation

I recommend granting the certificate of authorisation as proposed.

Signed



Ewa Babiarczyk

Date 27th August 2020

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.

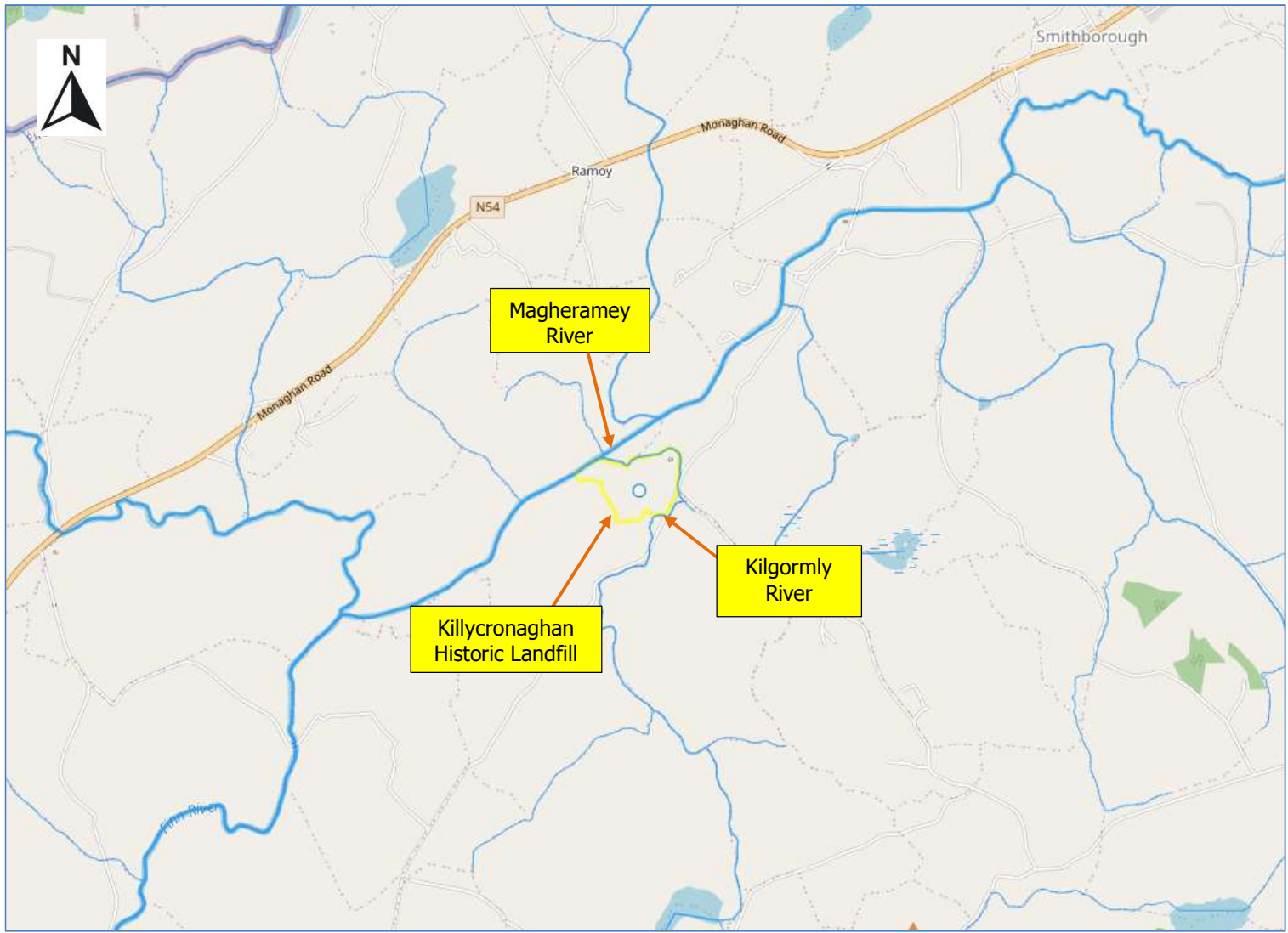


Figure 1: Location of Killycronaghan Historic Landfill

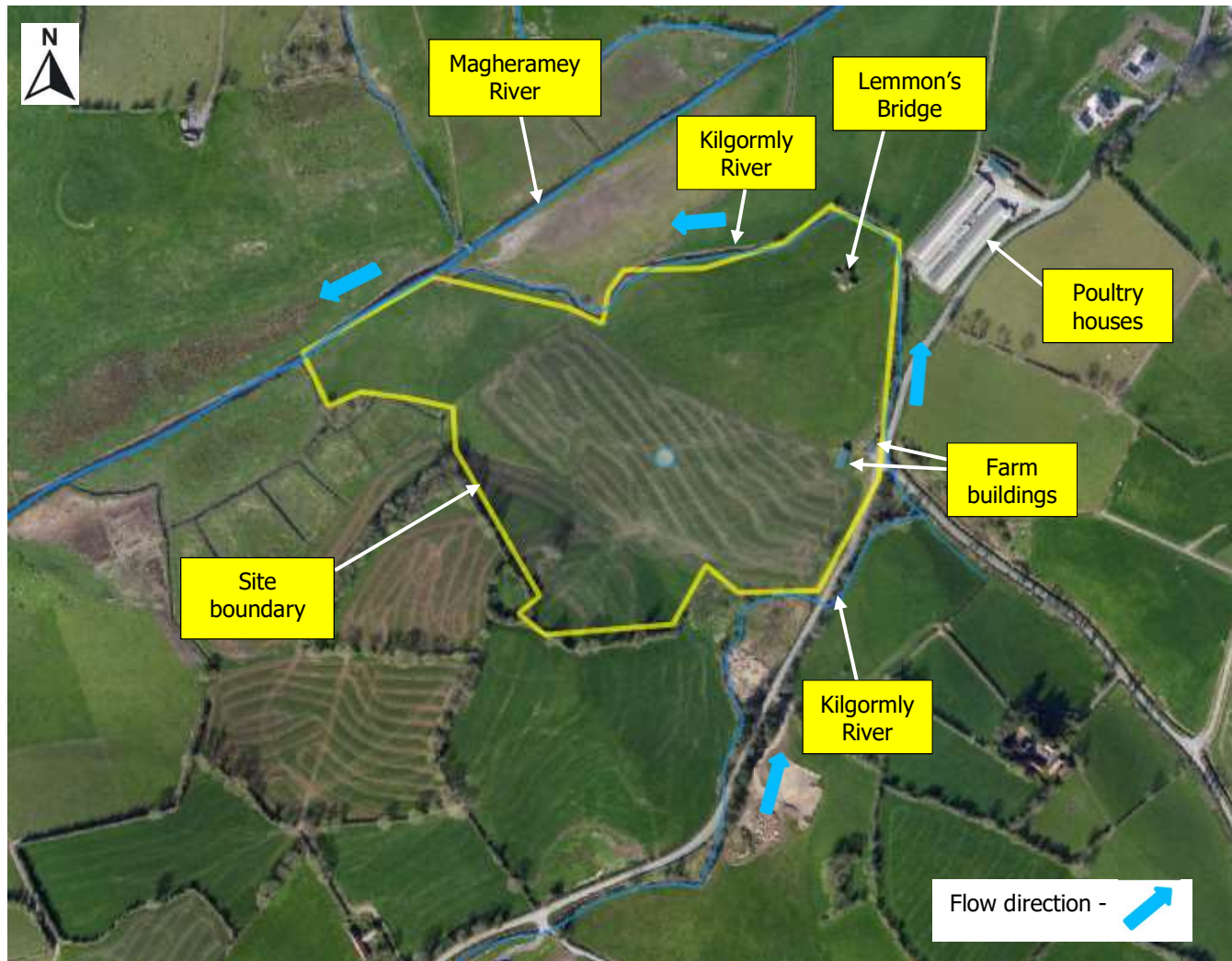


Figure 2: Site layout and site surroundings

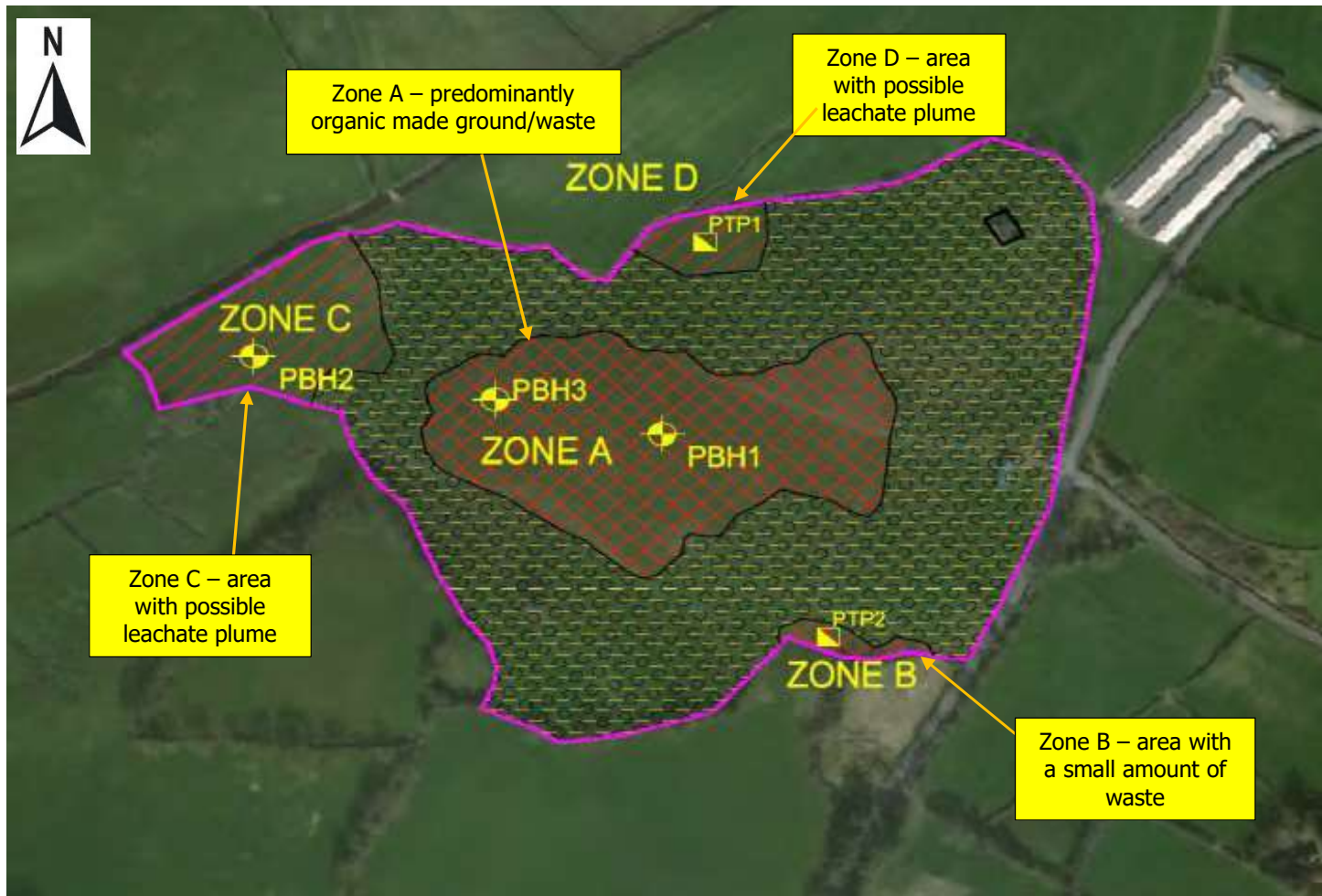


Figure 3: Extent of deposited waste



Figure 4: Surface water monitoring locations



Figure 5: Groundwater borehole (GW) and trial pit (TP) locations



Figure 6: Groundwater flow direction



Figure 7: Approximate Area to be capped

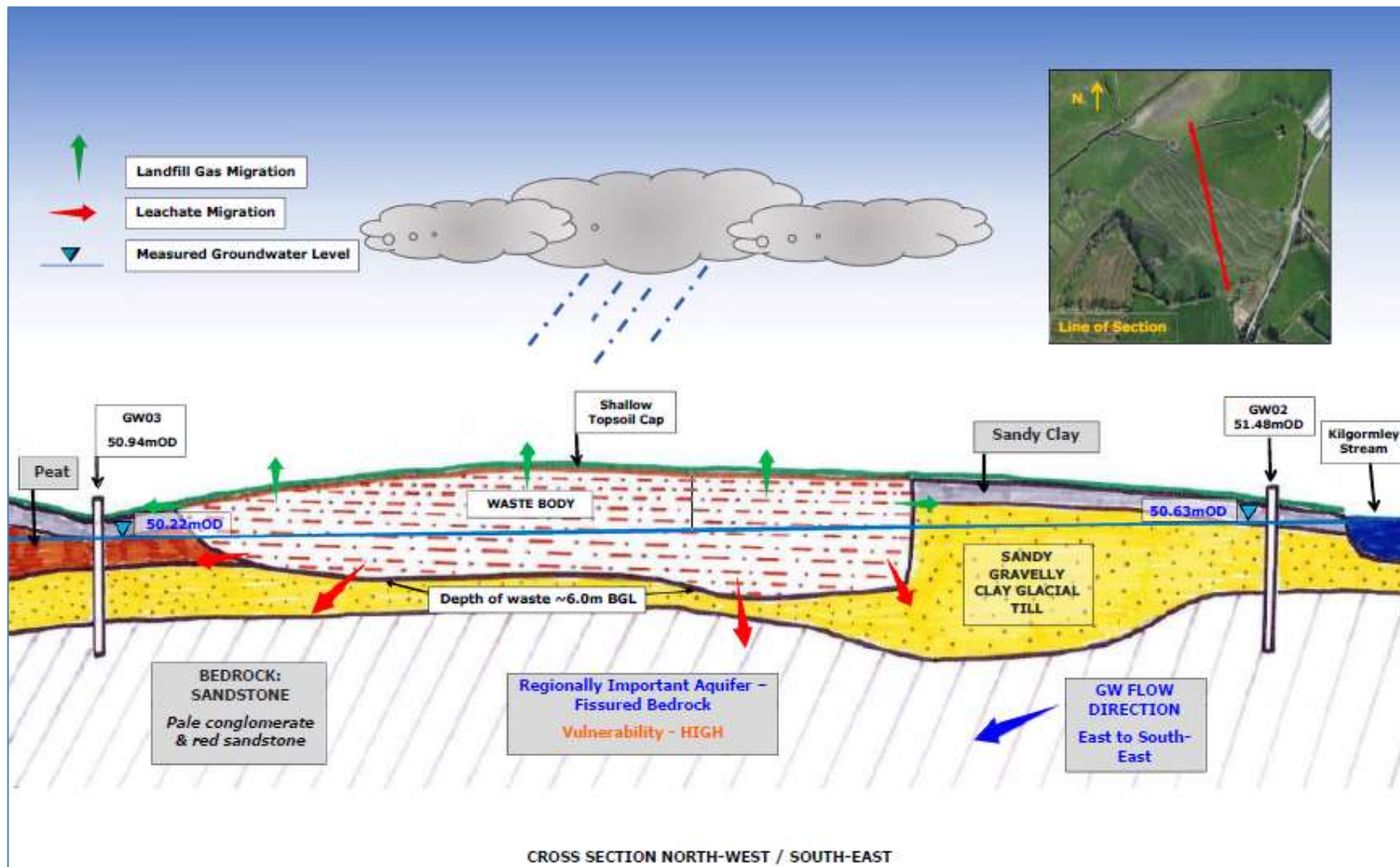


Figure 8: Conceptual site model for Killycronaghan Historic Landfill site

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
Upper Lough Erne NI SPA (Site Code: UK9020071)	16.2km south-west of the closed landfill	[A038] Whooper Swan <i>Cyngus cyngus</i>	https://natura2000.eea.europa.eu/Natura2000/SDF.aspx?site=UK9020071 [date accessed: on 02 nd July 2020].	<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 from on-site and off-site boreholes.</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 passive gas venting system.</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>
Upper Lough Erne NI SAC (Site Code: UK0016614)	16.2km south-west of the closed landfill	[3150] Natural eutrophic lakes with Magnopotamion or Hydrocharition -type vegetation [6410] Molinia meadows on calcareous,	https://natura2000.eea.europa.eu/Natura2000/SDF.aspx?site=UK0016614 [date accessed: 2 nd July 2020].	<p><u>Emissions to Water</u></p> <p>There will be no emissions from the landfill site to surface water.</p>

		<p>peaty or clayey-silt-laden soils (Molinion caeruleae)</p> <p>[7230] Alkaline fens</p> <p>[91A0] Old sessile oak woods with Ilex and Blechnum in the British Isles</p> <p>[91D0] Bog woodland</p> <p>[91E0] Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae)</p> <p>[1355] Otter <i>Lutra lutra</i></p> <p>[1106] Black salmon <i>Salmo salar</i></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 from on-site and off-site boreholes.</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 passive gas venting system.</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 Oughter and Associated Loughs SAC (Site Code: 000007)	18km south-west of the closed landfill	<p>[3150] Natural eutrophic lakes with Magnopotamion or Hydrocharition - type vegetation</p> <p>[91D0] Bog woodland*</p> <p>[1355] Otter <i>Lutra lutra</i></p>	NPWS (2020) Conservation objectives for Lough Oughter and Associated Loughs SAC [000007]. Generic Version 7.0. Department of Culture, Heritage and the Gaeltacht [dated 7 th April 2020].	<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 from on-site and off-site boreholes.</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 passive gas venting system.</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>
Kilroosky Lough Cluster SAC (Site Code: 001786)	7.2km west of the closed landfill	<p>[3140] Hard oligo-mesotrophic waters with benthic vegetation of <i>Chara</i> spp.</p> <p>[7210] Calcareous fens with <i>Cladium mariscus</i> and species of the Caricion davallianae*</p> <p>[7230] Alkaline fens</p> <p>[1092] White-clawed Crayfish <i>Austropotamobius pallipes</i></p>	NPWS (2020) Conservation objectives for Kilroosky Lough Cluster SAC [001786]. Generic Version 7.0. Department of Culture, Heritage and the Gaeltacht [dated 7 th April 2020].	This SAC does not receive the water from the waterbodies located at the closed landfill.
Magheraveely Marl Loughs NI SAC (Site Code: UK0016621)	4.5km north-west of the closed landfill	<p>[3140] Hard oligo-mesotrophic waters with benthic vegetation of <i>Chara</i> spp.</p> <p>[7210] Calcareous fens with <i>Cladium mariscus</i> and species of the Caricion davallianae*</p> <p>[7230] Alkaline fens</p> <p>[1092] Atlantic stream Crayfish <i>Austropotamobius pallipes</i></p>	https://natura2000.eea.europa.eu/Natura2000/SDF.aspx?site=UK0016621 [date accessed: 2 nd July 2020].	This NI SAC does not receive the water from the waterbodies located at the closed landfill.
Slieve Beagh SPA (Site code: 004167)	10km north of the closed landfill	A082 Hen Harrier <i>Circus cyaneus</i>	NPWS (2020) Conservation objectives for Slieve Beagh SPA [004167]. Generic Version 7.0. Department of Culture, Heritage and the Gaeltacht [dated 7 th April 2020].	<p>This SPA does not receive the water from the waterbodies located at the closed landfill.</p> <p>Also, there will be no emissions to air from the closed landfill.</p> <p>Recommended certificate of authorisation requires installation of a landfill cap and passive gas venting system.</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>
Slieve Beagh NI SAC (Site Code: UK0016622)	14.5km north of the closed landfill	<p>[3160] Natural dystrophic lakes and ponds</p> <p>[4030] European dry heaths</p> <p>[7130] Blanket bogs</p>	<p>https://natura2000.eea.europa.eu/Natura2000/SDF.aspx?site=UK0016622 [date accessed: 2nd July 2020].</p>	<p>This NI SAC does not receive the water from the waterbodies located at the closed landfill.</p>
Slieve Beagh-Mullaghfad-Lisnaskea NI SPA (Site Code: UK9020302)	12km north of the closed landfill	A082 Hen Harrier <i>Circus cyaneus</i>	<p>https://natura2000.eea.europa.eu/Natura2000/SDF.aspx?site=UK9020302 [date accessed: 2nd July 2020].</p>	<p>This SPA does not receive the water from the waterbodies located at the closed landfill.</p> <p>Also, there will be no emissions to air from the closed landfill.</p> <p>Recommended certificate of authorisation requires installation of a landfill cap and passive gas venting system.</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>