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Ireland

Closed Landfill Recommended Certificate of Authorisation

Certificate of Authorisation Number:	H0035-01
Certification of Authorisation Holder:	Clare County Council
Name of Facility:	Whitegate Historic Landfill
Location of Facility:	Bargarriff, Whitegate, County Clare.

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Glossary of Terms

All terms in this Certificate of Authorisation should be interpreted in accordance with the definitions in the Waste Management (Certification of Historic Unlicensed Waste Disposal and Recovery Activity) Regulations 2008 (S.I. No. 524 of 2008) unless otherwise defined in the Certificate of Authorisation.

Agency	Environmental Protection Agency.
Agreement	Agreement in writing.
Annually	At approximately twelve-monthly intervals.
Application	The application by the local authority for this Certificate of Authorisation including the risk assessment, any amendments to the risk assessment, additional information received from the local authority and other documents provided by the local authority.
By-product	As defined in the European Communities (Waste Directive) Regulations 2011 as amended, and determined and/or registered as required.
Certificate of Authorisation	Includes this document and the application.
Closed Landfill	As defined in the Waste Management (Certification of Historic Unlicensed Waste Disposal and Recovery Activity) Regulations 2008.
Code of Practice	As defined in the Waste Management (Certification of Historic Unlicensed Waste Disposal and Recovery Activity) Regulations 2008.
Biannually	All or part of a period of six consecutive months.
Documentation	Any report, record, results, data, drawing, proposal, interpretation or other document in written or electronic form which is required by this Certificate of Authorisation.
Drawing	Any reference to a drawing or drawing number means a drawing or drawing number contained in the application, unless otherwise specified in this Certificate of Authorisation.
Environmental Pollution	As defined in the Waste Management Act 1996 as amended.
Greenfield soil and stone	Soil and stone from land that has not been previously developed and is not contaminated soil and stone.
Heavy Metals	This term is to be interpreted as set out in “Parameters of Water Quality, Interpretation and Standards” published by the Agency in 2001. ISBN 1-84095-015-3.

Incident	<p>The following shall constitute an incident for the purposes of this Certificate of Authorisation:</p> <ul style="list-style-type: none">(i) an emergency;(ii) any emission which does not comply with the requirements of this Certificate of Authorisation;(iii) malfunction or breakdown of key environmental abatement, control or monitoring equipment;(iv) any trigger level specified in this Certificate of Authorisation which is attained or exceeded; excluding landfill as within the waste body; and(v) any indication that environmental pollution has, or may have, taken place.
Inert Waste	<p>Waste that does not undergo any significant physical, chemical or biological transformations. Inert waste will not dissolve, burn or otherwise physically or chemically react, biodegrade or adversely affect other matter with which it comes into contact in a way likely to give rise to environmental pollution or harm human health. The total leachability and pollutant content of the waste and the ecotoxicity of the leachate must be insignificant, and in particular not endanger the quality of surface water and/or groundwater.</p>
Maintain	<p>Keep in a fit state, including such regular inspection, servicing, calibration and repair as may be necessary to perform its function adequately.</p>
Necessary Measures	<p>As defined in the Waste Management (Certification of Historic Unlicensed Waste Disposal and Recovery Activity) Regulations 2008.</p>
Relevant Heavy Metals	<p>Heavy metals for analysis shall include, as a minimum, those metals identified as relevant, having regard to the risk assessment and surface water and groundwater monitoring results as required by this Certificate of Authorisation.</p>
Risk Assessment	<p>As defined in the Waste Management (Certification of Historic Unlicensed Waste Disposal and Recovery Activity) Regulations 2008.</p>
Sample	<p>Unless the context of this document indicates to the contrary, the term sample or samples shall include measurements taken by electronic instruments.</p>
Status	<p>As defined in the Water Framework Directive, in relation to surface water and groundwater.</p>
The Local Authority	<p>Clare County Council, Áras Contae an Chláir, New Road, Ennis, County Clare, V95 DXP2.</p>
Trigger Level	<p>A parameter value, the achievement or exceedance of which requires certain actions to be taken by the local authority.</p>

Reasons for the Decision

In proposing to grant this Certificate of Authorisation, the Agency determines that the risk assessment submitted by the local authority as part of the application for a Certificate of Authorisation is adequate. To ensure appropriate protection for human health and the environment and to ensure conformity with the provisions of Council Directive 2008/98/EC and Council Directive 2006/118/EC, the conditions set out in Part II of this Certificate of Authorisation are specified as further necessary measures in addition to those identified by the risk assessment.

The Agency also considers that the activity will not adversely affect the integrity of any European Site and has decided to impose conditions for the purposes of ensuring it does not do so. It has determined that the activity, if managed, operated and controlled in accordance with the Certificate of Authorisation, will not have any adverse effect on the integrity of any of those sites.

The Agency accordingly proposes to grant a certificate of authorisation to **Clare County Council** to carry out the activity, at **Whitegate Historic Landfill** subject to the Conditions set out in *Part II, Conditions*.

In reaching this decision the Agency has considered the documentation relating to the certificate of authorisation application, Register Number: **H0035-01** and the supporting documentation received from the applicant; the Inspector's Report dated **29th November 2023**; and has carried out an Appropriate Assessment of the likely significant effects of the necessary measures, including remediation measures, on European Sites. The Agency has performed its functions in a manner consistent with Section 15 of the Climate Action and Low Carbon Development Act 2015 as amended.

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 **Slieve Aughty Mountains SPA (Site code: 004168)**, **Lough Derg (Shannon) SPA (Site code: 004058)** and **Lough Derg, North-east Shore SAC (Site code: 002241)**.

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

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

- **The landfill site is located adjacent to the Slieve Aughty Mountains SPA (Site code: 004168).**

- **There is a hydrological connection between the closed landfill and the Lough Derg (Shannon) SPA (Site code: 004058), via the land drain along the northern site boundary which discharges into the Whitegate River (waterbody code: IE_SH_25D100200, segment code: 25_710). The Whitegate River forms part of the Lough Derg (Shannon) SPA.**
- **There is a hydrological connection between the closed landfill and the Lough Derg, North-east Shore SAC (Site code: 002241), via the land drain along the northern site boundary which discharges into the Whitegate River (waterbody code: IE_SH_25D100200, segment code: 25_710). The Whitegate River flows into the Alewnaghta Lough (segment code: 25_189), and onwards into the Derrainy river (waterbody code: IE_SH_25D100200, segment code: 25_450) which flows into Lough Derg (segment code: 25_191a) where the Lough Derg, North-east Shore SAC is located.**

The Agency has completed the Appropriate Assessment of potential impacts on these sites and has made certain, 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 **Slieve Aughty Mountains SPA (Site code: 004168), Lough Derg (Shannon) SPA (Site code: 004058) and Lough Derg, North-east Shore SAC (Site code: 002241)**, having regard to their conservation objectives and will not affect the preservation of these sites at favourable conservation status if carried out in accordance with this Certificate of Authorisation and the conditions attached hereto for the following reasons:

- **specifically, the remedial works will be undertaken to minimise the potential for water pollution to the Slieve Aughty Mountains SPA (Site code: 004168), Lough Derg (Shannon) SPA (Site code: 004058) and Lough Derg, North-east Shore SAC (Site code: 002241) and will ensure that there will be no significant impact on these European Sites; and**
- **the project alone, which consists of the remediation of the closed landfill, or in-combination with other projects, will not adversely affect the integrity and conservation status of any of the qualifying interests of the Slieve Aughty Mountains SPA (Site code: 004168), Lough Derg (Shannon) SPA (Site code: 004058) and Lough Derg, North-east Shore SAC (Site code: 002241).**

The Agency is satisfied that no reasonable scientific doubt remains as to the absence of adverse effects on the integrity of **these European Sites: Slieve Aughty Mountains SPA (Site code: 004168), Lough Derg (Shannon) SPA (Site code: 004058) and Lough Derg, North-east Shore SAC (Site code: 002241).**

Part I Authorisation of a Closed Landfill

The Environmental Protection Agency (the Agency) proposes to grant, under Regulation 7(5) of the Waste Management (Certification of Historic Unlicensed Waste Disposal and Recovery Activity) Regulations 2008 (the Regulations), this Certificate of Authorisation to **Clare County Council, Áras Contae an Chláir, New Road, Ennis, County Clare, V95 DXP2**, in respect of the closed landfill at **Bargarriff, Whitegate, County Clare**, subject to Conditions set out in Part II and Schedule set out in Part III of this Certificate of Authorisation.

Part II Conditions

Condition 1. Scope

- 1.1 For the purposes of this Certificate of Authorisation, the closed landfill authorised by this Certificate of Authorisation is the area of land outlined in **red** on **Drawing No. 001** titled **‘Extent of Landfill Body, Whitegate Historical Landfill, Dec 2022 Rev 1’** (Drawing date created: 2022-12-05) submitted with the application. Any reference in this Certificate of Authorisation to “closed landfill” shall mean the area thus outlined in **red**. Activities associated with the closed landfill shall be carried on only within the area outlined.
- 1.2 No waste shall be accepted at the closed landfill.
- 1.3 No waste shall be burned at the closed landfill.
- 1.4 The facility shall be controlled, operated and maintained, and emissions shall take place as authorised by this Certificate of Authorisation. No material change that will result in an increase in the actual or potential nature or quantity of any emission shall be carried out or commenced without the agreement of the Agency.
- 1.5 Nothing in this Certificate of Authorisation shall prohibit authorised beneficial uses of the site of the closed landfill provided that such uses do not interfere with the integrity of the remediation measures adopted.
- 1.6 The Risk Assessment for the site shall be re-evaluated and provided to the Agency in the event of future developments or changes in land use at the site, if required by the Agency.

Reason: *To clarify the scope of this Certificate of Authorisation.*

Condition 2. Notifications, Records and Reports

- 2.1 The local authority shall notify the Agency, in a format as may be specified by the Agency, 2 months in advance of the intended date of commencement of the remediation works.
- 2.2 The local authority shall notify the Agency as soon as practicable after the occurrence of any incident. The incident notification shall be provided in a format as may be specified in relevant guidance issued by the Agency.
- 2.3 The local authority shall keep the following documents available for inspection by the Agency at all reasonable times and to members of the public by request:
- (a) Records of all sampling, analyses, measurements, examinations, calibrations and maintenance;
 - (b) Records of incidents;
 - (c) Records of all complaints of an environmental nature;
 - (d) The validation report prepared on completion of the remediation; and
 - (e) Other documentation required by this Certificate of Authorisation or as may be otherwise directed by the Agency.
- 2.4 The local authority shall assign the necessary resources, including financial, to complete the remediation measures specified in this Certificate of Authorisation and risk assessment and to respond to any incident.
- 2.5 The local authority shall annually pay to the Agency €1,083, or such sum as the Agency from time to time determines in accordance with charges policy, for the performance of its functions under the Waste Management (Certification of Historic Unlicensed Waste Disposal and Recovery Activity) Regulations 2008 in relation to the closed landfill regulated by this Certificate of Authorisation.

Reason: *To provide for the collection and reporting of adequate information on the activity. To provide for adequate resources for monitoring and measures to protect the environment.*

Condition 3. Management and Monitoring

3.1 The local authority shall implement, unless otherwise agreed by the Agency, the following measures within 24 months of the date of grant of this Certificate of Authorisation, or as otherwise agreed by the Agency:

(a) **Remove, for disposal or recovery at an appropriate facility, waste and litter from the adjacent land, subject to landowner's consent. Waste from the adjacent surface water drains shall be pulled back and covered by the cap and perimeter berm, as required under Condition 3.1(c) and Condition 3.1(d).**

(b) Minimise the disturbance of deposited waste to the extent possible;

(c) Install a low permeability landfill cap over the entire waste body, minimum 1m with 1mm thick low permeability geomembrane, or equivalent, to achieve a hydraulic conductivity of less than or equal to $1 \times 10^{-9} \text{m/s}$;

The landfill cap shall incorporate the following elements **and be designed and installed** in accordance with the EPA Landfill Manuals. **Detailed design of the cap shall be submitted to the Agency for approval** prior to installation:

(i) Gas drainage layer.

(ii) Water drainage layer. **Only** uncontaminated surface water drained from the water drainage layer shall discharge to **the adjacent surface water drains**.

(iii) **Reprofiled gradients to provide for rainwater run-off from the surface of the landfill.**

(d) **Install a compacted clay perimeter berm around the waste body. The clay berm shall be integrated with the landfill cap and achieve the same hydraulic conductivity.**

(e) Install, operate **and maintain** a gas management system **at the facility**.

The design of the gas management system (layout, depth, sealing etc.) shall be in accordance with the EPA Landfill Manuals – Landfill Site Design.

The gas management system shall include the following elements:

(i) **Vertical gas vent pipes within the waste body**, as appropriate.

- **Four proposed gas vents shall be installed, as per Figure 5.1 titled 'Remediation Measures' of the Tier 3 assessment submitted on 7th March 2022;**

- The gas vent pipes shall not be perforated above ground level; and

- The spacing between the gas vent pipes shall be sufficient to achieve adequate gas venting.

(f) **Install one or more leachate monitoring boreholes within the waste body, if required by the Agency.**

- (g) Install at least three **combined** groundwater **and** gas monitoring boreholes, of which one shall be upgradient of the waste body and two of which shall be downgradient of the waste body, **within a distance that is reflective of the potential impacts of the landfill.**
 - (h) Reseed grass within the site.
- 3.2 Site Notice Board
- (a) The local authority shall, within one month of the date of grant of this Certificate of Authorisation and for the duration of the remediation works, provide a Site Notice Board on the closed landfill site so that it is legible to persons outside the main entrance to the closed landfill site. The minimum dimensions of the board shall be 1200 mm by 750 mm.
 - (b) The board shall clearly show:
 - (i) The name of the Certificate of Authorisation holder;
 - (ii) The name of the closed landfill site;
 - (iii) The Certificate of Authorisation reference number;
 - (iv) The contact telephone **number** in relation to the closed landfill site; and
 - (v) Where information relating to the closed landfill site can be obtained.
- 3.3 The local authority shall manage the closed landfill and the remedial works to ensure that discharges and emissions from the closed landfill do not cause environmental pollution or deterioration in the status of the receiving surface water body or groundwater body.
- 3.4 The local authority shall carry out appropriate monitoring on a biannual basis to identify any impact on the quality of water abstracted at wells downgradient of the landfill. Monitoring results shall be assessed against drinking water standards.
- 3.5 The local authority shall compile a validation report in accordance with the requirements of the Code of Practice. Unless otherwise agreed, the validation report shall be submitted to the Agency within **36 months** of the date of grant of this Certificate of Authorisation. **Additional measures shall be implemented, as approved by the Agency, in the event remediation has not been successful.**
- 3.6 The local authority shall assess the results of all monitoring carried out to confirm whether the closed landfill continues to achieve the objectives set for it in the risk assessment or this Certificate of Authorisation. **Where objectives are not achieved, additional remediation measures shall be implemented, as approved by the Agency.**
- 3.7 The local authority shall submit to the Agency, by the 31st March of each year, an annual update covering the previous calendar year. This update, which shall be to the satisfaction of the Agency, shall include as a minimum the information specified in Condition 3.9 and *Schedule A: Monitoring*, of this Certificate of Authorisation.

- 3.8 The local authority shall, within **30** months of the date of grant of this Certificate of Authorisation, submit a drawing showing the following elements interpolated:
- (a) **Site boundary;**
 - (b) Extent of the waste body and the area capped, as required under Condition 3.1(c);
 - (c) The locations of the gas management system infrastructure, **as required under Condition 3.1(e);**
 - (d) All monitoring points for landfill gas, groundwater, surface water and, **if required by the Agency, leachate;**
 - (e) **Adjacent surface water drains. The drains should be shown in blue and include arrows showing water flow direction; and**
 - (f) **Surface water discharge points into the adjacent surface water drains as per Condition 3.1(c)(ii).**
- 3.9 The local authority shall conduct, record and assess:
- (a) A visual inspection of the landfill, on an annual basis, to ensure that the condition of the site has not deteriorated;
 - (b) Monitoring (sample, analyse, and characterise) of leachate in accordance with *Schedule A.1 Leachate Monitoring*, of this Certificate of Authorisation.
 - (c) Monitoring of landfill gas as required in *Schedule A.2 Landfill Gas Monitoring*, of this Certificate of Authorisation.
 - (i) Landfill gas monitoring results shall be assessed and reported against the following:
 - The trigger levels, for landfill gas measured at the monitoring wells, as set out in the EPA Landfill Manuals – Landfill Monitoring:
 - Methane, greater than or equal to 1.0% v/v; and
 - Carbon dioxide, greater than or equal to 1.5% v/v.
 - (d) Monitoring (sample, analyse and characterise) of surface water as required in *Schedule A.3 Surface Water Monitoring*, of this Certificate of Authorisation.
 - (e) Monitoring (sample, analyse and characterise) of groundwater as required in *Schedule A.4 Groundwater Monitoring*, of this Certificate of Authorisation.
 - (f) Screening of groundwater for trace organic substances, on an annual basis, in accordance with the EPA Landfill Manuals – Monitoring and any subsequent amendments.
 - (g) The **limit of detection** of the monitoring methods utilised for monitoring under Condition 3.9(b) to (f) and *Schedule A: Monitoring*, of this Certificate of Authorisation shall **be below** the relevant trigger levels, as set out in Condition 3.9(c)(i), standard reference values and parametric

values. The analysis shall be carried out in a **laboratory** appropriately accredited **for the required analyses**.

- (h) The assessment and reporting of monitoring results for leachate, surface water and groundwater against standard reference values and parametric values for relevant pollutants, including environmental quality standards in the European Communities Environmental Objectives (Surface Waters) Regulations 2009, as amended, European Communities Environmental Objectives (Groundwater) Regulations 2010, as amended, EPA Interim Guideline Values (IGV) and European Union (Drinking Water) Regulations **2023**.
- 3.10 Unless otherwise agreed by the Agency, the local authority shall carry out a monthly review of the gas management system and **record** details of any problems **and the corrective/preventative actions taken**.
- 3.11 The location, frequency, timeframes, methods and scope of monitoring, visual inspections, sampling and **analytical methods**, and reporting requirements as set out in this Certificate of Authorisation, may be amended with the **approval** of the Agency following evaluation of test results and/or relevant proposals.
- 3.12 Soil and stone
- 3.12.1 Soil and stone imported for use in remedial, corrective or other engineering works at the closed landfill shall be greenfield soil and stone, **including greenfield soil and stone that meets by-product criteria**, or soil and stone of equivalent nature and character, in terms of chemical and physical **composition**.
- 3.12.2 Documented acceptance, storage/stockpiling and utilisation procedures shall be operational in advance of receipt of such materials. Records shall be maintained showing the site of origin of the soil and stone and its nature.
- 3.13 No emissions, including **landfill gas, leachate, odour, dust and noise, or litter, mud, vermin and birds**, shall result in an impairment of, or an interference with amenities or the environment beyond the facility boundary or any other legitimate uses of the environment beyond the facility boundary.
- 3.14 The local authority shall ensure, at all times after the grant of this Certificate of Authorisation, that all infrastructure and all equipment required under this Certificate of Authorisation has been and is:
- (i) installed;
 - (ii) commissioned;
 - (iii) present on site;
 - (iv) functioning at all times (except during maintenance and calibration); and
 - (v) calibrated and maintained in full working order.

In the event of the malfunction of any abatement equipment, the local authority shall notify the Agency as soon as practicable, and alternative abatement and monitoring facilities shall be put in place. The use of alternative equipment, other than in emergency situations, shall be as approved by the Agency.

3.15 Wells and boreholes

3.15.1 Groundwater monitoring wells **and boreholes** shall be constructed having regard to the guidance given in the EPA landfill manuals - Landfill Monitoring and any subsequent amendments.

3.15.2 All wellheads shall be adequately protected to prevent contamination or physical damage.

3.15.3 All wells and boreholes shall be adequately sealed to prevent surface contamination and, as may be appropriate, decommissioned according to the UK Environment Agency guidelines “Decommissioning Redundant Boreholes and Wells”, unless otherwise **approved** by the Agency.

3.16 The local authority shall clearly label and provide safe and permanent access to all on-site sampling and monitoring points and to off-site points as required by the risk assessment or this Certificate of Authorisation. The requirement with regard to off-site points is subject to the prior agreement of the landowners concerned.

3.17 Incidents

In the event of an incident the local authority shall immediately:

- (a) If necessary, contact the emergency services;
- (b) Carry out an investigation to identify the nature, source and cause of the incident and any emission arising therefrom;
- (c) Isolate the source of any such emission;
- (d) Evaluate the environmental pollution, if any, caused by the incident;
- (e) Identify and execute measures to minimise the emissions/malfunction and the effects thereof;
- (f) Restore compliance in the shortest possible time and carry out any preventative actions to prevent recurrence of the incident;
- (g) Identify the date, time and place of the incident; and
- (h) Notify the Agency (in accordance with Condition 2.2) and all other relevant authorities including, where relevant, the Water Services Authority and Inland Fisheries Ireland.

3.18 Communications Programme

3.18.1 The Certificate of Authorisation holder shall establish, maintain and implement a Communications Programme to ensure that members of the public can obtain information from the local authority concerning the closed landfill.

3.18.2 The Communications Programme shall inform members of the public what they can and should do to protect their property and health.

3.18.3 The local authority shall, as part of the Communications Programme, publish landfill gas, landfill leachate, groundwater and surface water monitoring data biannually in a manner accessible by the public.

Reason: *To make provision for the proper closure of the activity ensuring protection of the environment.*

Part III: Schedules

Schedule A: Monitoring

A.1 Leachate Monitoring

Monitoring locations: Leachate monitoring borehole(s) within the waste body, if required under Condition 3.1(f).

Parameter	Monitoring frequency
Biochemical Oxygen Demand (BOD) (mg O ₂ /l)	Biannually
Ammonium (µg/l N)	
Molybdate Reactive Phosphorus as P (µg/l)	
Chloride (mg/l)	
Barium (µg/l)	
Magnesium (mg/l)	
Manganese (µg/l)	
Phosphorus (µg/l)	
Potassium (mg/l)	
Iron (µg/l)	
Calcium (mg/l)	
Boron (µg/l)	
Chromium (µg/l)	
Arsenic (µg/l)	
Relevant Heavy Metals (µg/l)	
Benzene (µg/l)	
Chlorobenzene (µg/l)	
Total Polycyclic Aromatic Hydrocarbons (µg/l)	
Other parameters as may be required by the Agency.	As required by the Agency

A.2 Landfill Gas Monitoring

Monitoring locations: The proposed gas vents within the waste body, as required under Condition 3.1(e); and

The monitoring boreholes outside the waste body required under Condition 3.1(g).

Parameter	Monitoring frequency ^{Note 1}
Gas flow (m³/hr)	Quarterly
Methane (CH ₄ %v/v)	
Carbon dioxide (CO ₂ %v/v)	
Carbon Monoxide (CO %v/v)	
Oxygen (O ₂ %v/v)	
Hydrogen sulphide (H ₂ S %v/v)	

Note 1: Landfill gas monitoring shall be carried out in accordance with the EPA Landfill Manuals – Landfill Monitoring and the EPA Air Guidance (AG) Notes, including any subsequent amendments.



A.3 Surface Water Monitoring

Monitoring locations: Upstream locations: SW6 and SW10 and Downstream locations: SW1, SW3, SW4, SW7 and SW11 as per Figure 3.3 ‘Surface Water Sampling Points’ of the Tier 3 assessment received on 9th March 2022.

Parameter	Monitoring frequency
Biochemical Oxygen Demand (BOD) (mg O ₂ /l)	Quarterly
Total Ammonia (mg N/l)	
Molybdate Reactive Phosphorus as P (mg/l)	
Sodium (mg/l)	
Chloride (mg/l)	
Potassium (mg/l)	
Electrical conductivity (µS/cm)	
Copper (µg/l)	
Iron (µg/l)	
Arsenic (µg/l)	
Manganese (µg/l)	
Mercury (µg/l)	
Nickel (µg/l)	
Relevant Heavy Metals (µg/l)	As required by the Agency
Other parameters as may be required by the Agency.	

A.4 Groundwater Monitoring

Monitoring locations: Groundwater monitoring boreholes, as required to be installed under Condition 3.1(g).

Parameter	Monitoring frequency
Biochemical Oxygen Demand (BOD) (mg O ₂ /l)	Quarterly
Ammonium (µg/l N)	
Molybdate Reactive Phosphorus as P (µg/l)	
Chloride (mg/l)	
Barium (µg/l)	
Magnesium (mg/l)	
Manganese (µg/l)	
Potassium (mg/l)	
Calcium (mg/l)	
Iron (mg/l)	
Boron (µg/l)	
Chromium (µg/l)	
Arsenic (µg/l)	
Relevant Heavy Metals (µg/l)	
Benzene (µg/l)	
Chlorobenzene (µg/l)	
Total Polycyclic Aromatic Hydrocarbons (µg/l)	
Escherichia Coli (number/100ml)	
Coliform bacteria (number/100ml)	
Other parameters as may be required by the Agency.	As required by the Agency

Signed on behalf of the said Agency

On the xx day of xxxxx, 20XX

xxxxxxxxxxxxx, **Authorised Person**