Bleak Hill III

784-B031732

Gas Screening Report

Environmental Permit Application

CEMEX UK Materials Limited

December 2022

Document prepared on behalf of Tetra Tech Environment Planning Transport Limited.
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TABLE OF CONTENTS

LIST OF TABLES

DRAWINGS

CEM/B031732/PER/01 - Environmental Permit Boundary
CEM/B031732/REC/01 – Receptor Plan
CEM/B031732/BH/01 – Borehole Plan
P6/206/7/A - Final Restoration

APPENDICES

Appendix A – Gas Monitoring Data

1.0 INTRODUCTION

1.1 REPORT CONTEXT

1.1.1 This document has been prepared by Tetra Tech on behalf of the Operator, CEMEX Materials UK Limited (CEMEX) to support an environmental permit application for the Bleak Hill III (the site) at Nea Road, Ringwood, Hampshire, BH24 3PL.

1.1.2 CEMEX are seeking to apply for a bespoke waste recovery permit for the permanent deposit of inert waste to land at Bleak Hill III to facilitate the restoration scheme (Drawing Number P6/206/7/A) as approved under planning permission 19/11326 granted by Hampshire County Council.

1.1.3 The objective of the Gas Screening Report is to assess the potential risk to sensitive receptors associated with gas.

1.1.4 The potential source of gas, potential pathways through the geosphere and atmosphere by which LFG can migrate and the potential receptors are identified.

1.1.5 The proposed waste types, which would be accepted at the site, are inert in nature. Consequently, a quantitative gas risk assessment (for example using the Environment Agency's (EA) approved GasSim software)) is not considered appropriate and has not been used. However, this qualitative gas risk assessment uses a number of sources of guidance, which include: -

- Environment Agency (2007), 'Potential Gas Production From Landfilling Of Inorganic Wastes', Report reference SC030144/SR, March 2007;
- Environment Agency (2007), 'Investigation And Quantification Of Gas Produced From Landfilling Of Inorganic Wastes' Report reference P1-516/2b, August 2007; and
- Environment Agency, Landfill Technical Guidance 03 (LFTGN03) 'Guidance on the Management of Landfill Gas', September 2004.

2.0 SITE DESCRIPTION

2.1 The site forms part of the wider Hamer Warren quarry site and is located approximately 1.5km southeast of Alderholt in Hampshire and is centred at approximate National Grid Reference (NGR) SU 13026 11339. The application site is detailed on Drawing Number CEM/B031732/PER/01.

2.2 Access to the site is achieved via an unnamed access road off Harbridge Drove which is located to the south of the site. The immediate surroundings of the site comprises woodland to the west, south east and north east and undeveloped/agricultural land to the north, south and east. The site is also located approximately 1.3km west of the Avon Valley which is designated as a Site of Special Scientific Interest (SSSI), Special Protection Area (SPA) and Ramsar.

2.3 The site is located to the north of the Hamer Warren Quarry site which includes an active landfill site (known as Bleak Hill I and II) which is operated by CEMEX. The landfill is regulated under a separate environmental permit (reference EPR/FP3498SZ and EAWML 21000).

2.4 Further details regarding the environmental setting of the site are provided in the Environmental Setting and Site Design (ESSD) report that has been prepared to support this application. A copy of the ESSD is provided as Appendix D of the Environmental Permit Application.

3.0 CONCEPTUAL GAS MODEL

3.1 The source, pathway, receptor approach has been used to derive a conceptual model showing the proposed engineering arrangements and to assess the potential risks of gas from the infilling at the site.

3.2 SOURCE

Off-site Sources of Gas

3.2.1 As noted in Section 2.3, the site is adjacent to an active landfill site (known as Bleak Hill I and II) which is operated by CEMEX. The landfill is regulated under a separate environmental permit (reference EPR/FP3498SZ and EAWML 21000).

3.2.2 The landfill is only permitted to accept inert waste which is defined in Article 2 of the Landfill Directive 1999/31/EC as follows: -

'Inert waste' means 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 to human health. The total leachability and pollutant content and the ecotoxicity of its leachate are insignificant and do not endanger the quality of any surface water and/or groundwater.

3.2.3 CEMEX have strict waste acceptance procedures in place to ensure that the landfill only accepts inert waste. This minimises the risk of acceptance of non-conforming wastes, such as biodegradable wastes, which would have the potential to cause the generation of gas.

3.2.4 In addition, the landfill benefits from appropriate engineering that meets the requirements of the Landfill Directive (1999/31/EC). Further, CEMEX are required to monitor gas at the landfill site in accordance with the requirements of the environmental permit and have an appropriate Action Plan in the event that gas concentrations exceed relevant action levels.

3.2.5 In light of the above, it is considered unlikely that significant quantities of landfill gas will be generated from the adjacent landfill site.

On Site Sources of Gas

3.2.6 The main potential source for this gas risk assessment is the waste that would be deposited at the site. The void will be infilled progressively and it is calculated that in order to complete the proposed works, a volume of 381,579m^3 of waste will be required in total.

3.2.7 The site would only accept inert waste which is defined in Article 2 of the Landfill Directive 1999/31/EC (definition provided in Section 3.2.2).

3.2.8 Table 1 lists those wastes that may be accepted at the site which do not require Waste Acceptance Criteria (WAC) testing under Council Decision (2003/33/EC), provided that they are inert and from a single source only (mixed loads from more than one site cannot be accepted without testing).

Table 1: Proposed Waste Types that Do Not Require WAC Testing

EWC Code	Description	Restriction
01	**WASTE RESULTING FROM EXPLORATION, MINING, QUARRYING AND PHYSICAL AND CHEMICAL TREATMENT OF MINERALS**	
01 01	**Wastes from mineral excavation**	

01 01 02	Waste glass-based fibrous materials	Restricted to waste overburden and interburden only
01 04	**Wastes from physical and chemical processing of non-metafillerous minerals**	
01 04 08	Waste gravel and crushed rocks other than those mentioned in 04 04 06	
01 04 09	Waste sand and clay	
10	**WASTES FROM THERMAL PROCESSES**	
10 12	**Wastes from manufacture of ceramic goods, bricks, tiles and construction products**	
10 12 08	Waste ceramics, brick, tiles and construction products (after thermal processing)	
17	**CONSTRUCTION AND DEMOLITION WASTES (INCLUDING EXCAVATED SOIL FROM CONTAMINATED SITES)**	
17 01	**Concrete, bricks, tiles and ceramics**	
17 01 01	Concrete	Selected C&D waste only
17 01 02	Bricks	Selected C&D waste only
17 01 03	Tiles and ceramics	Selected C&D waste only
17 01 07	Mixtures of concrete, bricks, tiles and ceramics other than those mentioned in 17 01 06	Selected C&D waste only. Metal from reinforced concrete must have been removed.
17 05	**Soil (including excavated soil from contaminated sites), stones and dredging spoil**	
17 05 04	Soil and stones other than those mentioned in 17 05 03	Excluding topsoil, peat; excluding soil and stones from contaminated sites
19	**WASTES FROM WASTE MANAGEMENT FACILITIES, OFF-SITE WASTE WATER TREATMENT PLANTS AND THE PREPARATION OF WATER INTENDED FOR HUMAN CONSUMPTION AND WATER FOR INDUSTRIAL USE**	
19 12	**Wastes from the mechanical treatment of waste (for example sorting, crushing, compacting, pelletising) not otherwise specified**	
19 12 09	Minerals only	Wastes from the treatment of waste aggregates that are otherwise naturally occurring minerals. Does not include fines from treatment of any non-hazardous waste or gypsum from recovered plasterboard.
20	**MUNICIPAL WASTES (HOUSEHOLD WASTE AND SIMILAR COMMERCIAL, INDUSTRIAL AND INSITUTIONAL WASTES) INCLUDING SEPARATELY COLLECTED FRACTIONS**	
20 02	**Garden and park wastes (including cemetery waste)**	
20 02 02	Soil and stones	Only from garden and parks waste; excluding topsoil, peat.

3.2.9 In addition to the wastes that are listed in Table 1, CEMEX propose to accept the waste codes listed in Table 2 below and will be subject to WAC testing as detailed in the Operating Techniques document (Appendix C of the Environmental Permit Application).

Table 2: Proposed Waste Types that Will Require WAC Testing

EWC Code	Description	Restriction

10	**WASTES FROM THERMAL PROCESSES**	
10 13	**Wastes from manufacture of cement, lime and plaster and articles and products made from them**	
10 13 14	Waste concrete and concrete sludge	
19	**WASTES FROM WASTE MANAGEMENT FACILITIES, OFF-SITE WASTEWATER TREATMENT PLANTS AND THE PREPARATION OF WATER INTENDED FOR HUMAN CONSUMPTION AND WATER FOR INDUSTRIAL USE**	
19 12	**Wastes from the mechanical treatment of waste (for example sorting, crushing, compacting, pelletising) not otherwise specified**	
19 12 12	Other wastes (including mixtures of materials) from mechanical treatment of wastes other than those mentioned in 19 12 11	Restricted to crushed bricks, tiles, concrete and ceramics only. Metal from reinforced concrete must be removed. Does not include fines from treatment of any non-hazardous waste or gypsum from recovered plasterboard.

3.2.10 Waste types for the construction of the Attenuation Layer will be restricted to the following waste codes in Table 3 below. The attenuation layer will be constructed with a minimum thickness of 1m with a hydraulic permeability of 1 x 10^{-7}m/s.

Table 3: Permitted Waste Types in the Attenuation Layer Only

EWC Code	Description	Restriction
17	**CONSTRUCTION AND DEMOLITION WASTES (INCLUDING EXCAVATED SOIL FROM CONTAMINATED SITES)**	
17 05	**Soil (including excavated soil from contaminated sites), stones and dredging spoil**	
17 05 04	Soil and stones other than those mentioned in 17 05 03*	
20	**MUNICIPAL WASTES (HOUSEHOLD WASTE AND SIMILAR COMMERCIAL, INDUSTRIAL AND INSITUTIONAL WASTES) INCLUDING SEPARATELY COLLECTED FRACTIONS**	
20 02	**Garden and park wastes (including cemetery waste)**	
20 02 02	Soil and stones	

** This specifically excludes excavated soil from contaminated sites.*

3.2.11 Gas is produced by the biological degradation of organic components. Microbial processes degrade organic matter in the absence of oxygen and produce methane and carbon dioxide. In terms of gas generation at the site, no organic matter will be present, and it is therefore considered that the inert waste materials deposited at the site will not give rise to significant quantities of gas. The potential for the generation of gas is therefore considered to be negligible.

3.2.12 The site will have strict waste acceptance procedures in place to ensure that only inert wastes are accepted at the site. This will minimise the risk of acceptance of non-conforming wastes, such as biodegradable wastes, which would have the potential to cause the generation of gas.

3.2.13 Considering the above, it is determined unlikely that there will be any source of significant gas generation at the proposed site.

3.3 PATHWAYS

3.3.1 A number of potential pathways exist which would provide a link between the sensitive receptors and gas generated within the site. The EA's guidance document LFTGN03 entitled 'Guidance on the Management of Landfill Gas' (September 2004) identifies the following generic potential pathways:-

- Direct release to atmosphere;
- Sub-surface migration, through the ground or along service ducts or pipelines;
- Indirect release to atmosphere e.g. from sub-surface gas migration; and
- Direct release of combustion products to atmosphere e.g. from flares/engines.

3.3.2 The primary pathway for gas generated within the site would be vertically to atmosphere through unrestored areas of waste. Pathways that are considered to be less preferential would be vertically through the restored areas of the site or laterally through the engineered side slope liner.

3.3.3 The EA's Report 'Investigation and Quantification of Gas Produced from Landfilling of Inorganic Wastes' (August 2007) considers the potential for gas to migrate from an inorganic or low carbon site. The report acknowledges that inorganic waste does not generate substantial quantities of gas, and that there will generally be an insufficient pressure differential to drive the gas through low permeability waste. Thus, as there will be only inert wastes accepted and deposited, it is considered that there will be an insufficient driving pressure for the gas to create a viable pathway.

3.3.4 Furthermore, the waste will be deposited within a site, which has an engineered clay side slope liner (attenuation layer) with a hydraulic permeability of less than 1 x $10m^{-7}$m/s. On completion of filling to final levels, the site will be capped with 1m of restoration soils comprising not less than 0.3m of topsoil.

3.3.5 In addition to the limitations for gas migration because of the negligible quantities of organic/biodegradable waste, which will be deposited, the proposed engineering design will further limit the potential for any viable pathways.

3.4 RECEPTORS

3.4.1 The details of all receptors within 1km of the site are summarised in Table 4 below and are shown on Drawing Number CEM/B031732/REC/01.

Table 4: Receptors Within 1km of The Site

ID	Receptor	Direction from Operational Area	Minimum Distance from the Permit Application Boundary (approx. m)
Domestic Dwellings			
1	Properties on Harbridge Drove	NE	55
2	Properties on Bleak Hill	E	80
3	Properties on Kent Lane	SE	784
4	Properties of Alderholt	NW	777
Commercial and Industrial Premises			
5	Bleak Hill Plants	NE	Adjacent
6	Snowdrop Cottage	SE	970
7	Warren Park Farm	W	501

8	Snowdrop Cottage (Indoor accommodation)	SE	970
9	Foxhill Farm, Alderholt	NW	530
10	Huzzey J (Self-catering accommodation)	W	740
11	Take a Tuk – New Forest	N	900
Schools / Hospitals / Shops/Amenities			
12	Alderholt Recreation Ground	NW	615
13	Alderholt Sports & Social Club	NW	765
Highways or Minor Roads			
14	Harbridge Drove	E	Adjacent
15	Lomer Lane	E	Adjacent
16	Harbridge Green	E	Adjacent
17	Kent Lane	E	842
18	Hillbury Road	N	410
19	Ringwood Road	N	238
20	Northern End Lane	NE	502
Ancient Woodland			
21	Ancient Woodland – Ancient and Semi-Natural Woodland	SW	656
22	Ancient Woodland – Ancient and Semi-Natural Woodland	SE	841
Protected Habitats			
23	Deciduous Woodland	W	366
24	Deciduous Woodland in Kent Hill	SE	179
25	BAP Priority Habitat –Woodpasture and Parkland	W	On boundary
26	BAP Priority Habitat – Woodpasture and Parkland	SE	676
27	Deciduous Woodland in Bleak Hill	E	184
28	Deciduous Woodland	N	22
29	Deciduous Woodland	NW	57
30	Deciduous Woodland	S	927
31	Deciduous Woodland	S	289
32	Deciduous Woodland	SE	772
33	Deciduous Woodland surrounding Warren Park Farm	NW	462
34	Deciduous Woodland	NE	837
35	Deciduous Woodland	W	464
36	Deciduous Woodland (Primrose Cottage)	NE	770
37	Deciduous Woodland	W	835
Nature and Heritage Conservation Sites – Local Wildlife Sites (LWS)			
38	Ringwood Forest & Home Wood	W	On boundary
39	Lomer Copse	E	155
40	Lomer Meadow	E	155
Listed Buildings and Scheduled Monuments			

41	Primrose Cottage, Harbridge Drove, Ellingham, Harbridge and Ibsley, New Forest, Hampshire (Grade II Listed)	SE	367
42	Fernhill Cottage, 35, Bleak Hill, Ellingham, Harbridge and Ibsley, New Forest, Hampshire (Grade II Listed)	E	599
Sensitive Land Uses			
43	Bleak Hill Farm	E	Adjacent
44	Hill View Farm	E	254
45	Oak Tree Farm	N	333
46	Warren Park Farm	W	845
Surface Water e.g. rivers and streams			
47	Lake	S	644
48	Lake	W	468
49	Lake	W	693
50	Hammer Brook	SW	661
51	Turmer Brook	SE	1km
Groundwater (sensitivity)			
According to the Multi-Agency Geographic Information for the Countryside's (MAGIC) website, the site is located on a Medium-High scale on the Groundwater Vulnerability Map. In terms of aquifers, the MAGIC website does not include the site in any aquifer designations.			

3.5 CURRENT MONITORING

3.5.1 Three boreholes (WOB1,WOB2 and WOB3) have been installed in the area and their location are shown on Drawing Number CEM/B031732/BH/01. Gas has been monitored from these points on a monthly basis since their installation in July 2018.

3.5.2 A copy of the gas monitoring data for boreholes WOB1, WOB2 and WOB3 is provided in Appendix A of this report.

3.5.3 The monitoring data in Appendix A indicates that the background concentrations of methane are negligible in all of the boreholes. The highest level being 0.4% v/v in WOB1 in February 2019. The levels of carbon dioxide range between 0.0% v/v to 4.2% v/v (recorded at borehole WOB1 in November 2019), with an overall average of 1.2% v/v.

3.5.4 Concentrations of oxygen recorded during the monitoring period were at or close to normal atmospheric levels.

3.6 ENVIROMENTAL ASSESSMENT LEVELS (EALS)

3.6.1 For the sub-surface migration of gas, Technical Guidance Note LFTGN03 'Guidance on the Management of Landfill Gas' considers that an appropriate environmental benchmark for methane and carbon dioxide is 1% and 1.5% by volume above background respectively. A suitable site specific Environmental Assessment Levels (EALs) for methane at the site is considered to be 1.0% by volume for all gas monitoring boreholes.

3.6.2 In terms of compliance levels for carbon dioxide, industry guidance document 'Perimeter soil gas emissions criteria and associated management' (January 2011) states:-

'Carbon dioxide is a poor choice of gas to regulate emissions from landfills because there are alternative sources in the sub-surface. Because emission based regulation of a gas generated naturally in the environment at concentrations 0 -20% is not logical, carbon dioxide should not be used for regulating the sub-surface strata outside a landfill unless there is a site specific high risk receptor nearby, such as an underground confined space....'

'An alternative to regulating on compliance limits is to regulate on the reaction to exceeding a carbon dioxide action level'.

3.6.3 This is also addressed in the EA's Position Statement 'Industry code of practice on perimeter soil gas' (August 2011) which states:-

'We will require operators to set action levels as part of their gas management plan and to monitor perimeter boreholes and assess carbon dioxide concentrations against the action level to prompt investigatory action and inform regular reviews of the conceptual model'

3.6.4 The above document considers that for background Carbon Dioxide concentrations between 0 to 20% by volume, it is appropriate in this circumstance to set limits in accordance with the ICoP and therefore Carbon Dioxide action levels have been proposed based on monitoring data obtained to date. The site specific EALs for methane and carbon dioxide are shown in Table 5 below.

3.6.5 The industry guidance document 'Perimeter soil gas emissions criteria and associated management' (January 2011) states for:-

- For every well the action level will be 1% carbon dioxide above the highest carbon dioxide concentration if the highest carbon dioxide concentration is less than 5%;
- For every well the action level will be 2% carbon dioxide above the highest carbon dioxide concentration if the highest carbon dioxide concentration is between 5 - 10%; and
- For every well the action level will be 3% carbon dioxide above the highest carbon dioxide concentration if the highest carbon dioxide concentration is between 10 - 20%.

3.6.6 This means that for each borehole an action level should be calculated separately as follows:-

Table 5: Site Specific EALs for Methane and Carbon Dioxide

Monitoring Location	Parameter	Proposed Compliance Level (v/v%)	Monitoring Frequency	Proposed Action Level (v/v%)
WOB1, WOB2 and WOB3	Methane	1.0	Monthly	0.5
WOB1	Carbon Dioxide	None	Monthly	5.2
WOB2				3.6
WOB3				5.1

4.0 GAS RISK ASSESSMENT

4.1 Landfill Technical Guidance Note LFTGN03 provides guidance on the level of risk assessment that is considered appropriate for different types of sites and states that Tier 1 Hazard Identification and Risk Screening should be sufficient to deal with most of the risks from inert sites. However, this is also dependent on the level of risk and uncertainty specific to the site.

4.2 The site is predicted to generate negligible quantities of gas due to the inert nature of the waste. Furthermore, the operator's detailed waste acceptance procedures and Environmental Management Plan will ensure that only inert waste is deposited at the site, thus removing any uncertainty with respect to the potential for the deposition of non-inert wastes. Taking these factors into consideration, it is concluded that the overall level of risk associated with the site is low. A qualitative risk assessment is therefore considered appropriate in order to determine the level of risk from gas at the site.

4.2 ACCIDENTS AND OTHER CONSEQUENCES

4.2.1 The EA's guidance (LFTGN03) requires a number of accident and failure scenarios to be assessed in order to quantify the impact of given events. The reliability of gas control measures and site engineering should be assessed in the risk assessment and the main hazards that could lead to accidental emissions should be identified. LFTGN03 provides examples of general categories of accidents that may potentially affect gas control:-

- Loss of containment e.g. leakage, liner failure, spillage;
- Loss of collection and/or treatment capability e.g. failure of pipework, control system, etc;
- Explosions and fires e.g. deep seated fire; and
- Failure of leachate extraction system and the effect on gas extraction.
- These scenarios have been assessed as part of the gas risk screening process.

4.2.2 These scenarios have been assessed as part of the gas risk screening process.

4.3 QUALITATIVE GAS RISK ASSESSMENT

4.3.1 The potential hazards that exist from gas are:

- Toxicity (acute and chronic);
- Ecotoxicity;
- Fire and explosion;
- Asphyxiation; and
- Odour.

4.3.2 The trace components of gas pose an odour and toxicity risk whilst the bulk gases pose a risk of explosion and asphyxiation, although carbon dioxide is also toxic and should be considered in the assessment of toxicity. Explosion and asphyxiation risk is generally related to sub-surface migration and accumulations in enclosed spaces, such as residential or commercial properties, or underground services. EA document LFTGN03 states that whilst this is more difficult to quantify, for the risk screening stage, the impact assessment should be based on:-

- The presence of potential pathways and site specific receptors; and
- A qualitative assessment of the severity of the consequences.

4.3.3 The qualitative assessment for each receptor is provided in Table 6.

Table 6: Qualitative Risk Assessment

Receptor	Hazard	Sensitivity of Receptor	Likelihood of Exposure
Occupiers of domestic dwellings and farmhouses listed in Table 4.	Odour, toxicity, asphyxiation	High	Very Unlikely
Workforce and customers in commercial and industrial properties listed in Table 4.	Odour, toxicity, asphyxiation	High	Very Unlikely
Recreational areas listed in Table 4.	Odour, toxicity, asphyxiation	High	Very Unlikely
Priority Habitats, Local Wildlife Sites, Designated Sites and agricultural land listed in Table 4.	Eco-toxicity	Low	Very Unlikely

4.3.4 Table 7 details the qualitative risk assessment which has been undertaken for the accident and failure scenarios using the risk assessment process and scoring system set out within EA document LFTGN03. Table 8 provides a justification of the 'likelihood' scores for each of the accident or failure scenarios set out in Table 7.

Table 7: Qualitative Risk Assessment for Accident and Failure Scenarios

Accident/Failure Scenario	Likelihood	Severity of Consequence	Score	Magnitude of Risk
Loss of containment (e.g. leakage, spillage)	Extremely unlikely (1)	Minor (1)	1	Insignificant
Explosions and fires	Very unlikely (2)	Significant (3)	6	Insignificant
Biodegradable Waste Input	Unlikely (3)	Significant (3)	9	Acceptable

Table 8: Justification for Assigned 'Likelihood' Scores

Accident/Failure Scenario	Justification for 'likelihood' score
Loss of containment (e.g. leakage, liner failure, spillage)	The site will be engineered to a high standard and the containment system will be subject to Construction Quality Assurance (CQA) supervision and testing. It is therefore extremely unlikely that the containment system will fail or leak.
Explosions and fires	The proposed waste types are inert in nature and therefore will not be combustible or explosive. Waste acceptance procedures will ensure that potentially flammable or explosive materials are not accepted at the site.
Biodegradable Waste Input	The proposed waste types are inert in nature. However, all wastes entering the site will be subject to detailed waste acceptance procedures. Wastes will only be accepted onto the site if they comply with the list of wastes included in the permit. Basic characterisation will ensure that the waste is suitable for acceptance at the regulated facility however if there is uncertainty regarding the acceptance of wastes at the site, testing may be required. No wastes will be accepted onto the site if there is uncertainty as to its source, conformance with the conditions in the permit and/or its suitability for the intended use. Consequently, it is considered unlikely that biodegradable waste will be accepted at the site.

4.3.5 The results of the qualitative risk assessment show that the most significant accident /failure scenario is the acceptance of biodegradable waste into the site which would arise from a failure in the operator's waste acceptance procedures.

4.3.6 As set out in the Operating Techniques (Appendix C of the Environmental Permit Application), there will be strict waste acceptance procedures in place to minimise the risk of non-compliant wastes being accepted. All site staff will be made aware of the procedures and the requirements of the company Environmental Management System. Furthermore, the Operating Techniques details the measures to be taken in the event that unauthorised waste is identified within a load.

4.3.7 As such, is it considered unlikely that biodegradable waste will be deposited within the site.

5.0 GAS MANAGEMENT AND MONITORING

5.1 GAS MANAGEMENT

5.1.1 Negligible quantities of gas are predicted to be generated from the site and no active gas management is therefore proposed within the site. The negligible quantities of gas generated would vent passively to atmosphere from the body of waste.

5.2 GAS MONITORING

5.2.1 In accordance with the EA's 'Waste recovery plans and deposit for recovery permits' guidance, if an operator intends to deposit waste more than 2m below the surrounding the ground surface, they must monitor the waste for methane, carbon dioxide and oxygen. The atmospheric pressure must also be recorded when taking gas readings.

5.2.2 Gas monitoring boreholes have been installed around the site, as shown on Drawing Number CEM/B031732/BH/01. The boreholes are currently monitored on a monthly basis for concentrations of methane, carbon dioxide and oxygen.

5.2.3 The proposed monitoring programme is detailed in Table 9.

Table 9: Monitoring Programme

Borehole Reference	Parameter	Monitoring Frequency
WOB1, WOB2, WOB3	Methane, carbon dioxide, oxygen, atmospheric pressure, differential pressure, temperature.	Monthly for 12 months (i.e., 12 data sets) then quarterly.

5.2.4 In addition to the above, the aforementioned guidance notes that if an operator intends to deposit waste more than 2 metres below the surrounding ground surface, they must monitor the waste for methane, carbon dioxide and oxygen. As such, in-waste monitoring boreholes will be installed in areas where waste deposits exceed 2m below the surrounding ground surface. The location of in-waste boreholes will be confirmed through the completion of site surveys which will confirm areas that comprise waste deposits that exceed 2m. The requirement for in-waste monitoring boreholes will be discussed with the Environment Agency.

5.3 COMPLIANCE LEVELS

5.3.1 Compliance Levels have been set for each borehole, based on guidance set out in EA Technical Guidance Note 03 (LFTGN03). These Compliance Levels are detailed within Table 5 of this Gas Screening Report. Compliance and action levels for the new boreholes will be finalised following 12 months of sampling.

5.3.2 This Gas Risk Screening Report has demonstrated that the potential for the generation of gas is low. However, an appropriate Action Plan is required in the unlikely event that Action Levels set for each borehole are exceeded. Action Levels will be set at a level which enables the site management to take timely and appropriate action, so that Compliance Levels are not exceeded. Further actions are however documented, in the event that both Action Levels and Compliance Levels are exceeded. The following sections set out the proposed Action Plan for the site.

5.4 ACTION PLAN

5.4.1 In the event that both Action Levels and Compliance Limits are exceeded. The following sections set out the proposed Action Plan for the site.

Investigation Procedure

5.4.2 The procedures for the assessment of gas monitoring results in relation to trigger limits are as follows:

1. For methane and carbon dioxide concentrations below the Action Level - allow as normal variability.
2. If methane or carbon dioxide concentrations exceed the Action Level then check previous two readings from the gas database and:

    i) If the previous readings do not exceed the Action Level then no further action is required other than to note that a breach has occurred.

    ii) If the previous two readings do exceed the Action Level, then increase monitoring frequency to fortnightly in affected and adjacent boreholes; and assess the possible cause of the increase in concentrations by problem solving described in Section 5.4.4.

3. If methane concentrations exceed the Compliance Level then check the previous reading from the gas database and:

    i) If the previous reading in the affected borehole was below the Action Level then take no further action except to note that the compliance level has been breached.

    ii) If the previous reading was above Action Level, then increase monitoring frequency to fortnightly in affected boreholes until concentrations reduce below Compliance Level %.

    iii) Assess the possible cause of the increase in concentrations by problem solving described in Section 5.4.4 and review previous monitoring results to see if there is any indication of a trend.

    iv) Monitor borehole pressure to determine likelihood of significant gas flow rates.

5.4.3 The procedures for the assessment of gas flow monitoring results in relation to compliance limits are as follows:

1. If significant flow rates are absent then continue monitoring fortnightly until gas concentrations reduce below Compliance Level.
2. If significant flow rates are absent but methane concentrations do not reduce below the Compliance Level within three months and the source of the gas has been identified as the permitted site, then consider the initiation of appropriate gas control measures in association with the EA.
3. If significant flow rates are present and readings persist above the Compliance Level % for more than 6 weeks with no signs of decreasing levels then carry out a gas survey of street services (for methane and carbon dioxide). Dependent on the results of the street survey, consider carrying out a gas survey of potentially affected properties after discussion with the EA.
4. The Company will make immediate arrangements to install gas control measures after consultation with the EA.

Problem Solving

5.4.4 In the preceding section, the first course of action proposed following any breach of compliance limits is to "assess the possible cause of the increase in gas concentrations". The routine to be followed to perform this instruction is set out below:

1. Check whether the barometric pressure was rising, falling or steady on the day and in the day(s) preceding the date of monitoring.
2. Check the results against those of other site monitoring boreholes to determine if the result is part of a general deterioration in the gas levels in the area, or a localised occurrence.
3. Check oxygen and carbon dioxide concentrations to determine if these correlate to a deterioration in methane concentrations.
4. Ensure that monitoring equipment is functioning effectively, check with an alternative gas machine, and consider taking a confirmatory sample for gas-chromatographic analysis if in any doubt.
5. Attempt to identify the most likely source of methane, in relationship to the history of the site, and previous monitoring results.
6. Investigate the surrounding area for signs of gas or leachate escape.

5.4.5 If a problem is identified, it will be rectified as soon as possible. The Site Manager or his nominee will be informed immediately, and he will co-ordinate any action required.

5.4.6 Record all actions in the Site Diary.

Gas Control procedure

5.4.7 Gas control measures may include one or more of the following: -

- Cut-off barrier;
- Passive vent trench;
- Passive venting or Pumped wells.

5.4.8 The selection of the appropriate control measures will be discussed with the Agency prior to installation and will take into account the nature and depth of the waste deposited. As this site contains only inert waste, it is highly unlikely that gas control procedures will be required, however if they were a passive vent trench or passive venting boreholes would probably be the most effective remedy.

5.4.9 Increased gas monitoring in the affected boreholes will continue throughout and after installation of the control measures and until values drop below the Action Level. Monthly monitoring will then resume unless the Action Level is exceeded again.

6.0 CONCLUSION

6.1 The proposed waste types will be inert in nature and will not give rise to significant quantities of gas. The negligible quantities of gas generated are unlikely to be under significant pressure which will minimise the likelihood of gas migration. Furthermore, the site will be engineered with a low permeability clay side slope and basal liner, which will further reduce the risk of lateral gas migration. The risk to nearby sensitive receptors associated with the generation and migration of gas is therefore considered to be low.

6.2 Background gas monitoring has been undertaken in the proposed permit area since July 2018 and a copy of the monitoring data is provided as Appendix A. The results of the monitoring show that negligible concentrations of methane and low to slightly elevated background concentrations of carbon dioxide in one location are recorded within the perimeter monitoring boreholes. These results have been used to set both Action Levels and Compliance Levels for the site.

6.3 Detailed waste acceptance criteria will be used to ensure that only inert wastes are accepted at the site. This will prevent unauthorised wastes being accepted. The absence of biodegradable material within the site shall ensure that significant quantities of gas are not produced within the site from waste and the risk to receptors remains low. Furthermore, this shall ensure that odour nuisance, vegetation stress and global atmospheric damage are also avoided.

6.4 This Gas Screening Report has determined that the site will not give rise to significant quantities of gas due to the inert nature of the proposed waste types. The site will be engineered in accordance with the requirements of the Landfill Directive 1999/31/EC, although this is not a requirement for waste recovery sites. It is considered that, with respect to gas, the site will be compliant with the requirements of the EA.

DRAWINGS

CEM/B031732/PER/01 - Environmental Permit Boundary

CEM/B031732/REC/01 – Receptor Plan

CEM/B031732/BH/01 – Borehole Plan

P6/206/7/A - Final Restoration

APPENDICES

APPENDIX A – GAS MONITORING DATA