Great Billing Quarry

Environmental Permit Application

Landfill Gas Screening Report

Mick George Limited

October 2022

Prepared on Behalf of Tetra Tech Environment Planning Transport Limited.

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1.0 INTRODUCTION

1.1 REPORT CONTEXT

1.1.1 Mick George Limited (Mick George) has commissioned Tetra Tech to undertake a Landfill Gas Screening Report for the proposed landfill site at Great Billing Gravel Quarry (the site).

1.1.2 The objective of the Landfill Gas Screening Report is to support the application of a bespoke waste disposal permit and to assess the potential risk to sensitive receptors associated with landfill gas.

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

1.1.4 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 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 SITE SETTING

2.1.1 The application site is situated to the east of the Great Billing Water Recycling Centre (WRC) and is located approximately 3km east of Northampton on the south side of the dual carriageway A45. To the north west of the application site but separated from the site by the dual carriageway A45, is the settlement of Great Billing which is part of the larger Northampton urban area (nearest homes in Great Billing are approximately 400m). Also, to the north beyond the A45, is the village of Ecton (nearest homes at approximately 800m) and North east is the village of Earls Barton, over 1km from the site. The River Nene and ponds lie to the south, approximately 400m from site. Further south, beyond the River Nene, lies the village of Cogenhoe, whose closest properties are approximately 800m.

2.1.2 Immediately to the west of the extraction site is the Great Billing Water Recycling Centre (WRC), which is owned by Anglian Water and serves the Northampton area, and an area designated as a waste management site that is partially developed for this use.

2.1.3 The northern boundary of the application site in the central parts reaches almost to the A45 just south of Ecton Lane where is crosses the A45. In other parts of the site the northern boundary is separated from the A45 by open land including an area of mature trees and agricultural land. The southern boundary adjoins a restored former mineral workings, comprising water bodies, beyond which is the River Nene. The western boundary of the extraction area is partly formed by an overland drain. Barton Brook forms the eastern boundary of the site and flows south to join the Nene

2.1.4 The site is centred at approximate National Grid Reference (NGR) SP 83190 62010. The site location and the environmental permit boundary is shown on Drawing Number MGL/B029956/PER/01.

2.2 GEOLOGY

2.2.1 Using the British Geological Survey (BGS) Geology of Britain Viewer, the recorded superficial deposits which underlay the site consist of clay and silt. These superficial deposits formed up to two million years ago in the Quaternary Period in a local environment previously dominated by rivers.

2.2.2 With regard to the bedrock geology underlying the site consists of the Lias Group deposit that comprises the Whitby Mudstone Formation. This mudstone is a sedimentary bedrock formed approximately 174 to 183 million years ago in the Jurassic Period in a local environment previously dominated by shallow seas.

2.3 HYDROLOGY

2.3.1 According to the Flood Map for Planning Service (FMPS) shows that the application site lies within the low probability flood area (Flood Zone 1), medium probability flood area (Flood Zone 2) and high probability flood area (Flood Zone 3). The application site is also shown as being potentially liable to flooding from several local reservoirs / water bodies.

2.3.2 Water bodies within the vicinity of the site include the River Nene which lies to the south of the application site and flows east roughly parallel to the southern boundary of the site. Billing Brook is located approximately 1.5km west of the site. The Ecton Brook flows south through the Ecton Brook Linear park along the western edge of Great Billing, towards the Great Billing Water Recycling Centre (WRC).

2.3.3 The Barton Brook flows south from Sywell Wood some 7.5 km to the north of the site. Its route takes it beneath the A45 from where it flows along the eastern boundary of the site and into the Nene. The Brook is joined at Sywell Reservoir (approximately 2.7 km north of the site) by a tributary originating in the north-east of Sywell village.

2.4 HYDROGEOLOGY

2.4.1 With reference to the Multi Agency Geographic Information for the Countryside's (MAGIC) website under the Groundwater Vulnerability Map, the site is not situated within a Groundwater Source Protection Zone.

2.4.2 In terms of aquifers, the MAGIC website shows that the site overlies a Secondary A Superficial Drift Aquifer. The Environment Agency defines this type of aquifer as *'permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers'*

2.4.3 In terms of the bedrock geology, the MAGIC website indicates that there are no recorded aquifers.

2.5 ECOLOGY

2.5.1 A 'Nature and Heritage Conservation Screen' (Reference EPR/KB3609CR/A001) was requested from the Environment Agency. The screen determines the presence of any site of nature and heritage conservation, or protected species or habitats that may be impacted by the proposal. A copy of the results is appended in the Environmental Risk Assessment (Appendix D of the Environmental Permit Application).

3.0 CONCEPTUAL LANDFILL GAS MODEL

3.0.1 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 landfill gas from the infilling at the site

3.1 SOURCE

3.1.1 The main potential source for this gas risk assessment is the is the permanent deposit of waste to land at the site. However, the waste types that will be accepted will be inert which will therefore not give rise to significant levels of landfill gas.

3.1.2 Inert waste 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, in particular, do not endanger the quality of any surface water and/or groundwater.

3.1.3 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: Waste Types that do not require Testing

EWC Code	Description
17	**CONSTRUCTION AND DEMOLITION WASTES (INCLUDING EXCAVATED SOILS FROM CONTAMINATED SITES)**
17 01	**Concrete, Bricks, Tiles And Ceramics**
17 01 01	Concrete
17 01 02	Bricks
17 01 03	Tiles And Ceramics
17 01 07	Mixtures Of Concrete, Bricks, Tiles And Ceramics Other Than Those Mentioned In 17 01 06
17 05	**Soil (Including Excavated Soil From Contaminated Sites) Soil 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 INSTITUTIONAL WASTES INLCUDING SEPARATELY COLLECTED FRACTIONS**
20 02	**Garden And Park Wastes**
20 02 02	Soil And Stones

**Selected construction and demolition waste with low contents of other types of materials (like metals, plastic, soil, organics, wood, rubber etc). The origin of the waste must be known.*

- No C&D waste from construction, polluted with inorganic or organic dangerous substances e.g. because of production processes in the construction, soil pollution, storage and usage of pesticides or other dangerous substances etc., unless it is made clear that the demolished construction was not significantly polluted.

- No C&D waste from constructions treated, covered or painted with materials, containing dangerous substances in significant amounts.

- The origin of the wastes must be known and they will have low contents (<5% by mass per load of other types of materials (like metals, plastics, soil, organics, wood, rubber, etc).

3.1.4 In addition to the wastes that are listed in Table 1, Mick George propose to accept the waste codes listed in Table 2 and will be subject to WAC testing against the WAC limits for inert waste (as defined under Council Decision 2003/33/EC).

Table 2: Waste Types that will Require WAC Testing

EWC Code	Description
01	**WASTES RESULTING FROM EXPLORATION, MINING, QUARRYING AND PHYSICAL AND CHEMICAL TREATMENT OF MINERALS**
01 04	**Wastes From Physical And Chemical Processing Of Non-Metalliferous Minerals**
01 04 08	Waste Gravel And Crushed Rocks Other Than Those Mentioned In 01 04 07
01 04 09	Waste Sand And Clays
19	**WASTES FROM WASTE MANAGEMENT FACILITIES, OFF-SITE WASTE WATER TREATMENT PLANTS AND PREPARATION OF WATER INTENDED FOR HUMAN CONSUMPTION / INDUSTRIAL WASTE**
19 12	**Wastes From The Mechanical Treatment Of Wastes**
19 12 09	Minerals (For Example Sand, Stones)
19 12 12	Other Wastes (Including Mixtures Of Materials) From Mechanical Treatment Of Wastes Other Than Those Mentioned In 19 12 11
19 13	**Wastes from soil and groundwater remediation**
19 13 02	Solids wastes from soil remediation other those mentioned in 19 13 01

3.1.5 Landfill 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 landfill 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 landfill gas. The potential for the generation of landfill gas is therefore considered to be negligible.

3.1.6 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 landfill gas.

3.1.7 Taking into account the above, it is considered unlikely that there will be any source of significant landfill gas generation at the site.

3.2 PATHWAYS

3.2.1 A number of potential pathways exist which would provide a link between the sensitive receptors and landfill gas generated within the landfill site. The Environment Agency'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 landfill gas migration; and
- Direct release of combustion products to atmosphere e.g. from flares/engines.

3.2.2 It is considered that the primary pathway for landfill 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 boundary engineering.

3.2.3 The Environment Agency's Report 'Investigation and Quantification of Gas Produced from Landfilling of Inorganic Wastes' (August 2007) considers the potential for landfill gas to migrate from an inorganic or low carbon landfill site. The report acknowledges that inorganic waste does not generate substantial quantities of landfill gas, and that there will generally be an insufficient pressure differential to drive the landfill 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 RECEPTORS

3.3.1 LFTGN 03 'Guidance on the Management of Landfill Gas' details the process of prioritising receptors which is a qualitative process based on consideration of the estimated impact, the sensitivity of the receptor and the likelihood of exposure.

3.3.2 The details of all receptors within 1km of the waste operation boundary are summarised in Table 2 below.

Table 3: Location of Potential Receptors within 1km in relation to waste operations

ID	Receptor	Direction from Operational Area	Minimum Distance from the Permit Application Boundary (approx. m)
Domestic Dwellings			
1	Cogenhoe Caravan Park	S	400
2	Residential properties in Cogenhoe	S	635
3	Residential properties on Whiston Road	S	980
4	Residential properties in Ecton	NW	870
5	Residential properties in Great Billing	NW	610
Commercial and Industrial Premises			
6	Anglian Water Waste Water Treatment Works	W	275
7	Ecton Household Waste Recycling Centre	W	795
8	Industrial properties on The Causeway	SW	985
9	Earls Barton Quarry	E	60
Schools / Hospitals / Shops/Amenities			
10	Ecton Brook Primary School	NW	700
11	St Andrew's CEVA Primary School	NW	990
Highways or Minor Roads			
12	A45	N	290
Priority Habitats			
13	Priority Habitat - Deciduous Woodland (Commander Spinney)	N	Adjacent
14	Priority Habitat - Deciduous Woodland (Wind Spinney)	E	Within permit boundary
15	Priority Habitat - Deciduous Woodland	NE	Within permit boundary
16	Priority Habitat - Deciduous Woodland (Crow Spinney)	N	485
17	Priority Habitat - Deciduous Woodland (Blackthorn Spinney)	N	735
18	Priority Habitat - Deciduous Woodland (Ryehill Spinney and Robersacks Spinney)	N	690
19	Priority Habitat - Deciduous Woodland	NW	555
20	Priority Habitat - Deciduous Woodland	W	815
21	Priority Habitat - Deciduous Woodland (Jigsaw Lake)	W	35
22	Priority Habitat - Deciduous Woodland	SW	100
23	Priority Habitat - Deciduous Woodland	SW	177
24	Priority Habitat - Deciduous Woodland	SW	580
25	Priority Habitat - Deciduous Woodland	SW	540
26	Priority Habitat - Deciduous Woodland	S	Adjacent
27	Priority Habitat - Deciduous Woodland	SE	420
28	Priority Habitat - Deciduous Woodland	N	55
29	Priority Habitat – Coastal and Floodplain Grazing Marsh	S	345
Sensitive land uses e.g. farmland, allotments, commercial fish farms			
30	Agricultural Land	375	S

31	Agricultural Land	260	N
Surface Water e.g. rivers and streams			
32	Lake	S	Adjacent
33	Jigsaw Lake	SW	135
34	Lake	SW	180
35	River Nene	S	330
36	Long Ley Pond	N	300
Designated ecological habitats/sites of geological importance e.g. Ramsar, SAC, SPA, SSSI, LNR, NNR, LWS			
37	Ecton Backwater LWS	S	Adjacent
38	Ecton Gravel Pits LWS	S	Adjacent
Designated Areas for Protected Species (as identified from Nature and Heritage Conservation Screen EPR/KB3609CR/A001)			
39	River Nene	S	330
40	Water bodies south of Site	S	Adjacent
Groundwater (sensitivity)			
According to the Multi-Agency Geographic Information for the Countryside's (MAGIC) website, the site is not located within a Groundwater Source Protection Zone. In terms of aquifers, the MAGIC website shows that the application site overlies a Secondary A aquifer.			

3.4 CURRENT MONITORING

3.4.1 Landfill gas monitoring is currently undertaken at boreholes BH01-BH18, BHA, BHB, BHC, BHE, BHE, BHF, BHM, BHN and BH9/01. The location of these boreholes is shown on Drawing Number GtB.Q_mpp_1121.

3.4.2 A copy of gas monitoring data is provided in Appendix A of this report.

3.4.3 The monitoring data in Appendix A indicates that the background concentrations of methane are negligible in all of the boreholes. The highest level being 0.1% v/v which has been recorded across all of the boreholes.

3.4.4 The levels of carbon dioxide range between 0.1% v/v to 4.2% v/v (recorded at borehole BHA in November 2021), with an overall average of 1.6% v/v.

3.4.5 Concentrations of oxygen recorded during the monitoring period were generally lower when Carbon Dioxide was present.

3.5 ENVIRONMENTAL ASSESSMENT LEVELS (EALS)

3.5.1 For the sub-surface migration of landfill 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.

3.5.2 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'.

3.5.3 This is also addressed in the Environment Agency'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'.

3.5.4 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 3 below.

3.5.5 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%.

3.5.6 This means that for each borehole an action level should be calculated separately as detailed in Table 4. With reference to the gas monitoring data in Appendix A, there have been no readings recorded at Borehole BH15. As such, it is not possible to calculate an action level for this borehole.

Table 4: Site Specific EALs for Methane and Carbon Dioxide

Monitoring Location	Parameter	Proposed Compliance Level (v/v%)	Monitoring Frequency	Proposed Action Level (v/v%)
BH1, BH2, BH3, BH4, BH5, BH6, BH7, BH8, BH9, BH10, BH11, BH12, BH13, BH14, BH15, BH16, BH17, BH18, BHA, BHB, BHC, BHE, BHF, BHM, BHN, BH 9/01	Methane	1.0	Quarterly	0.5
BH1	Carbon Dioxide	None		4.1
BH2				4.9
BH3				3.3
BH4				2.7
BH5				5
BH6				3.2
BH7				5
BH8				3.8
BH9				3.4
BH10				3.1
BH11				1.6
BH12				1.9
BH13				1.7
BH14				2.2
BH16				2.4
BH17				2.7
BH18				2.5
BHA				5.2
BHB				3.2
BHC				2.5
BHE				2.5
BHF				2.6
BHM				3.5
BHN				2.7
BH 9/01				4.4

4.0 LANDFILL GAS ASSESSMENT

4.0.1 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.

4.0.2 The infilling at the site is predicted to generate negligible quantities of landfill gas due to the inert nature of the waste accepted and deposited at the site. 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.

4.0.3 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 landfill gas at the site.

4.1 ACCIDENTS AND THEIR CONSEQUENCES

4.1.1 The Environment Agency'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 landfill 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 landfill 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 landfill fire; and
- Failure of leachate extraction system and the effect on landfill gas extraction.

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

4.2 QUALITATIVE LANDFILL GAS RISK ASSESSMENT

4.2.1 The potential hazards that exist from landfill gas are:

- Toxicity (acute and chronic);
- Ecotoxicity;

- Fire and explosion;
- Asphyxiation; and
- Odour.

4.2.2 The trace components of landfill 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. Environment Agency 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.

4.2.3 The qualitative assessment for each receptor is provided in Table 5.

Table 5: Qualitative Risk Assessment

Receptor	Hazard	Sensitivity of Receptor	Likelihood of Exposure
Occupiers of domestic dwellings in Table 2.	Odour, toxicity, asphyxiation	High	Very Unlikely
Workforce and customers in commercial and industrial properties listed in Table 2.	Odour, toxicity, asphyxiation	High	Very Unlikely
Schools listed in Table 2.	Odour, toxicity, asphyxiation	High	Very Unlikely
Priority Habitats, Local Wildlife Sites, protected species and habitats and agricultural land listed in Table 2.	Eco-toxicity	Low	Very Unlikely

4.2.4 Table 5 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 Environment Agency document LFTGN03. Table 7 provides a justification of the 'likelihood' scores for each of the accident or failure scenarios set out in Table 6.

Table 6: 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 7: 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 landfill 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.

4.2.5 The results of the qualitative risk assessment show that the most significant accident /failure scenario is the acceptance of biodegradable waste into the landfill site which would arise from a failure in the operator's waste acceptance procedures. The waste acceptance procedures are set out within the Operating Techniques document (Appendix B of the Environmental Permit Application).

4.2.6 These procedures are in line with EA requirements and all staff will be aware of the procedures and the requirements of the site's Environmental Management System. Furthermore, there is a documented procedure within the Operating Techniques document which details the measures to be taken in the event that unauthorised waste is identified within a load. It is therefore unlikely that biodegradable waste will be deposited within the landfill site.

5.0 GAS MANAGEMENT PLAN

5.1 CONTROL MEASURES

5.1.1 Negligible quantities of landfill gas are predicted to be generated from the proposed extension at Greetham Quarry. The negligible quantities of landfill gas generated would vent passively to atmosphere from the body of waste.

5.2 LANDFILL GAS MONITORING PLAN

5.2.1 The landfill gas monitoring would be carried out in accordance with the procedures set out in the Environment Agency's Guidance document LFTGN03 'Guidance on the Management of Landfill Gas'. The proposed monitoring programme is detailed in Table 8.

Table 8: Monitoring Programme

Monitoring Location	Parameter	Monitoring Frequency
BH1, BH2, BH3, BH4, BH5, BH6, BH7, BH8, BH9, BH10, BH11, BH12, BH13, BH14, BH15, BH16, BH17, BH18, BHA, BHB, BHC, BHE, BHF, BHM, BHN, BH 9/01	Methane, carbon dioxide, oxygen, meteorological data, atmospheric pressure, differential pressure, temperature.	Quarterly

5.3 COMPLIANCE LEVELS

5.3.1 Compliance Levels have been set for each current borehole, based on guidance set out in Environment Agency Technical Guidance Note 03 (LFTGN03). These Compliance Levels are detailed within Table 3 above and are based on concentrations of 1% above the background levels for methane.

5.3.2 This Landfill Gas Risk Screening Report has demonstrated that the potential for high concentrations of landfill 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 have been 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 infilling of the site.

5.4 ACTION PLAN

Methane

5.4.1 Action Levels for methane have been set as 0.5% above background, which give Mick George the opportunity to take timely and appropriate action in order to avoid the Compliance Levels being exceeded. In the event of methane or flammable gas being recorded within the perimeter monitoring boreholes at concentrations exceeding 0.5% by volume, the following action will be taken:-

- The Site Manager will be informed; and
- The Site Manager will assess the risk and may increase the frequency of landfill gas monitoring to determine whether there is an increasing trend in gas concentrations. The Manager may inform the Environment Agency if the trend is considered to be rising.

5.4.2 In the event of methane or flammable gas being detected within the perimeter boreholes at concentrations exceeding 1.0% methane by volume, the following action will be taken:-

5.4.3 The Site Manager will be informed;

- The Landfill Manager will assess the risk and may increase the frequency of landfill gas monitoring to determine whether there is an increasing trend in gas concentrations. The Manager may inform the Environment Agency if the trend is considered to be rising;
- The Landfill Manager will make an assessment of whether any receptors are potentially at risk from elevated methane concentrations and if this is considered likely, the need for receptor monitoring will be determined;
- Daily monitoring of the perimeter boreholes will be undertaken until concentrations of methane recorded in the boreholes fall below 1% by volume (20% LEL) and the Landfill Site Manager determines that the normal frequency of monitoring can be resumed; and
- In the unlikely event that methane (flammable gas) concentrations continue to remain elevated, the Landfill Site Manager will determine if remedial action is required. Any action taken will be agreed with the Environment Agency and recorded in the Site Diary.

Carbon Dioxide

5.4.4 Action Levels for Carbon Dioxide have been set for the current boreholes in Table 4, which currently equate to the highest background concentration (% v/v) recorded during the preoperational phase plus a variable amount above background.

5.4.5 In the event of Carbon Dioxide being recorded within the perimeter monitoring boreholes at concentrations exceeding the Action Levels specified in Table 3, the following action will be taken:-

- The Site Manager will be informed; and
- The Site Manager will assess the risk and may increase the frequency of landfill gas monitoring to determine whether there is an increasing trend in gas concentrations. The Manager may inform the Environment Agency if the trend is considered to be rising.

5.5 IN WASTE BOREHOLES

5.5.1 In accordance with LFTGN03 in-waste landfill gas monitoring infrastructure will be installed within each completed phase of filling.

5.5.2 In-waste landfill gas monitoring will be carried out in accordance with the procedures set out in LFTGN03. The proposed monitoring programme is detailed in Table 9 below and the proposed locations of the in-waste boreholes are provided on Drawing Number MGL/B029956/BH/01.

Table 9: In Waste Borehole Monitoring Programme

Parameter	Monitoring Frequency
Methane, carbon dioxide, oxygen, meteorological data, atmospheric pressure, differential pressure, temperature.	Quarterly

6.0 CONCLUSION

6.0.1 The proposed waste types will be inert in nature and will not give rise to significant quantities of landfill gas. The negligible quantities of landfill 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 landfill gas is therefore considered to be low.

6.0.2 Background landfill gas monitoring has been undertaken during the pre-operational phase of the site. 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.

6.0.3 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 landfill site shall ensure that significant quantities of landfill 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.

6.0.4 This Landfill Gas Screening Report has determined that the site will not give rise to significant quantities of landfill 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. It is considered that, with respect to landfill gas, the site will be compliant with the requirements of the Landfill Directive.

DRAWINGS

MGL/B029956/PER/01 - Environmental Permit Boundary

GtB.Q_mpp_1121 – Monitoring Point Plan

MGL/B029956/BH/01 – In-Waste Borehole Plan

APPENDICES

APPENDIX A – GAS MONITORING DATA