

Ground Gas Risk Assessment

**LAND OFF CHURCH LANE, MOSTON, GREATER
MANCHESTER**

Project Ref: GUK-0524-02

For: Built Developments Limited

CLIENT:

Built Developments Limited

PROJECT:

Residential Development

SITE REFERENCE:

**Land off Church Lane
Moston
Greater Manchester**

REPORT REFERENCE:

GUK-0524-02/Rp-003



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1 INTRODUCTION

1.1 Appointment

Groundsmiths (UK) Ltd ('Groundsmiths') were appointed by Built Developments Limited to undertake periodic monitoring of biogenic ground gases at their residential development located off Church Lane, Moston, Greater Manchester (the 'Site').

Groundsmiths have prepared this report (the 'Report') for the sole use of the Client that commissioned it in accordance with the agreement under which our services are performed. No other warranty, expressed or implied, is made as to the professional advice included in this Report. Any unauthorised third parties using the information presented do so entirely at their own risk and are duly excluded from any warranty, duty of care or skill.

No part of this Report shall be reproduced or redistributed without the prior written consent of Groundsmiths. However, the Report may be issued by the Client or their Agent to the Local Planning Authority to support the discharge of any pre-commencement, pre-occupancy or other stage of development condition as may be imposed in relation to the Site's assessment under the Town and Country Planning Act 1990.

1.2 Report Context and Objectives

Groundsmiths' recent involvement with the Site comprised the completion of an LCRM: Stage 1 Risk Assessment ^[1] and the undertaking of an intrusive site investigation ^[2]. These works were completed to support the Client's planning application for the development, although from an environmental perspective part of that was to identify the level of risk associated with any potential fugitive biogenic ground gas regime.

This Report therefore follows on from the aforementioned documentation and aims to provide a summary of the ground gas data acquired in relation to the development as proposed, and to identify where any remedial measures are required in construction.

It should be noted that it is not the intention of this Report to reproduce the content of the preliminary risk assessment and/or site investigation, so reference to those documents should be made as required. With the remit of this study, however, a brief summary of the Site's Conceptual Site Model is given for completeness.

1.3 Limitations of Study

All previously issued reports, data, and ground related information prepared for the Site should be referred to as necessary. Interpretation and recommendations given in this Report should not be assumed valid for adjacent areas of land, or for alternate land use. Should the proposed Site usage change, the recommendations and conclusions presented in this Report may need to be re-assessed in accordance with current guidance.

The appraisal presented herein has been undertaken subject to the limitations detailed in Section 4, and/or any other limitations as may be stated in the report.

2 GROUND GAS RISK

2.1 Conceptual Site Model

As indicated above, an initial assessment of risk for the Site and a detailed phase of follow-on intrusive ground investigation has been completed. The general Conceptual Site Model, resulting from the findings of those studies, indicated that:

- Third party information did not record the presence of any made ground or artificial deposits within the boundary to the Site. The investigation confirmed, however, that the Site is underlain by a variable thickness of very poor quality made ground, with this being broadly 0.6-1.1m thick across the northern part of the Site, transitioning to be up to c.11.0m deep across an 'infilled' (former valley) area in a southerly manner. Material composition in the north typically comprised a dark brown clinker, loam, and clay/sand matrix with inclusions of much gravel, brick fragments, concrete fragments, and some localised tarmac, whilst the deeper infilled area of fill constituted stratified and thick interbedded layers of soft black sandy gravelly clay with layers and horizons of ash, clinker, some slag waste, bricks, concrete, timber sleepers, plastic, and many cobble setts. Some vegetative materials were also apparent within the made ground;
- Beneath the made ground in general were proven sandy to very sandy cohesive deposits (Diamicton) with gravel and cobbles of various natural lithologies. Within shallow-depth boreholes the upper horizon was noted to typically be firm becoming stiff, whilst the deeper soils were proven to be typically stiff becoming very stiff. From the base of the Diamicton across the infilled area a weathered zone comprising a thick unit of sand was recorded, before intact sandstone was proven locally from c.20.0m bgl. Schematic sections 0524-02-002 to 0524-02-004, as appended, indicate the general placement of the soil conditions encountered during the investigation;
- Groundwater strikes were limited, being recorded from a depth of 8.6m bgl at the position of borehole CP4;
- Risk associated with shallow coal mining (including mine gases) was not expected on the basis of available Coal Authority data;
- Third party data recorded the presence of former landfill activity within 250m of the Site. This included a c.1974-1977 Manchester City Council operated waste site (for inert, industrial, commercial, household, special, and liquid materials) at Moston Brook, Northampton Road, Harpurhey, at a distance of 103m to the south.

Following completion of the qualitative risk assessments, which followed guidance prescribed by Rudland et al ^[3], it was identified that an overall moderate risk from biogenic ground gases should be anticipated based on the Site's setting (with relatively nearby landfill activity), the underlying ground conditions (i.e. the gassing potential of the deep made ground) and the identified potential migration pathways (i.e. via any permeable soils with subsequent accumulation in buildings/void spaces). It was recommended that mitigation measures consistent with Characteristic Situation 2 of BS8485 ^[4] should be allowed for until confirmed through monitoring.

2.2 Monitoring Programme & Results

Toxic, asphyxiating, flammable, and potentially explosive ground gases can enter buildings and other structures on and below the ground. A potential risk to building development may

therefore exist where methane and/or carbon dioxide concentrations exceed a calculated Gas Screening Value¹ and there is measurable gas flow emission. Characteristic Situation 1 (very low hazard potential) is given a Gas Screening Value threshold of 0.07 L/hr, for either carbon dioxide or methane, and is the point at which no special precautions in construction are deemed necessary; methane concentrations for Characteristic Situation 1 need to be typically less than 1.00%v/v, whilst for carbon dioxide this is 5.00%v/v. Above these concentrations *consideration* should be given to providing the appropriate level of gas protective measures as specified in current guidance, such as Characteristic Situation 2.

In light of the Site's potential gas risk, monitoring comprising 6 No. return visits commenced on the 10th October 2024 and finished on the 9th January 2025; monitoring has therefore been completed across a total period of around 13 weeks. The objective of the monitoring was to establish general baseline gas concentrations for the Site and to identify if any protective measures in construction would be required. The piezometer wells (GW1 to GW4), as installed by the drilling contractor on the 1st October 2024, were utilised for the monitoring; the positions of these are indicated on appended Figure Ref. 0524-02-001.

Monitoring was undertaken using a Gas Data[®] GFM436-1 analyser which is equipped to monitor and analyse the gas content of landfill, biogas, and contaminated land sites. The parameters measured were CH₄, O₂, CO₂, H₂S, CO, atmospheric pressure, and gas flow. Specialist functionality of the instrument also includes measurement of Hexane and the Lower Explosive Limit (LEL) of methane, both of which are reported in the results tables given in Appendix A. Background conditions were monitored on each sampling event, the results of which are also provided for information.

In summary, the following data may be reported:

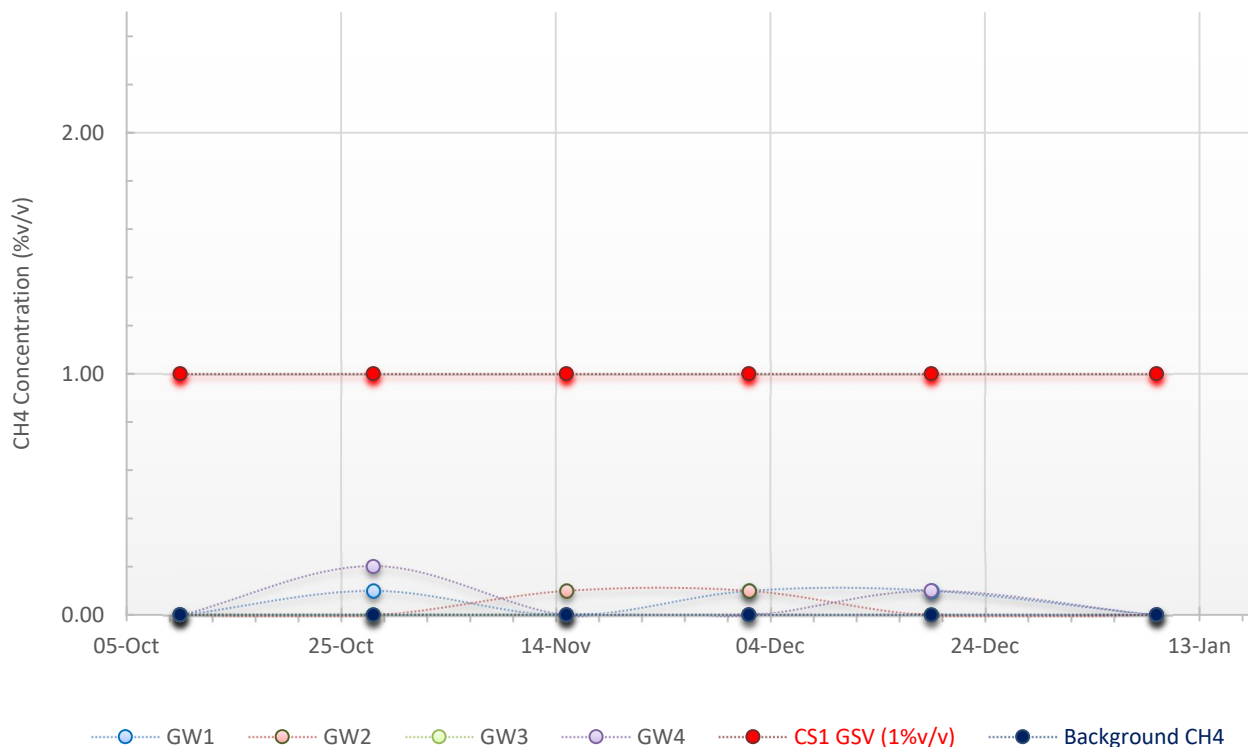
Methane (CH₄)

With respect to methane, measured concentrations across all six monitoring events were either at 0.00%v/v or very low (peaking at 0.20%v/v) in all four piezometers, but below the BS8485 Characteristic Situation 1 Gas Screening Value of 1.00%vv.

A summary of the methane monitoring data is presented in Graph 1, overleaf.

Background atmospheric methane concentrations were measured at 0.00%v/v across the complete monitoring period, which would be expected.

¹ Gas Screening Value – The flow rate of a gas representative of a site or zone within a site, derived from the assessment of gas concentration and flow rate measurements, but taking into account all other factors in accordance with the Conceptual Site Model. The Gas Screening Value is based on measured data, but ultimately derived using professional judgement.



Graph 1: Methane Concentrations (%v/v) with Time

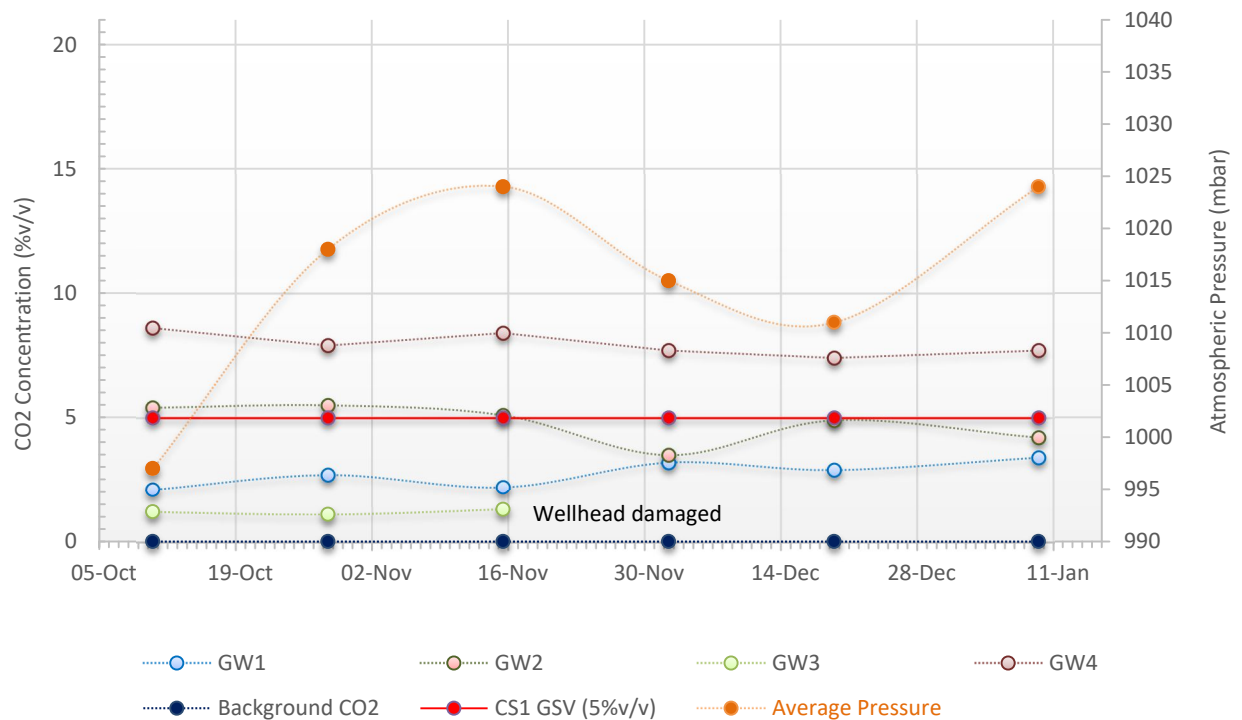
Carbon Dioxide (CO₂)

The measured concentrations of carbon dioxide within all four piezometers were found to be variable across the monitoring period, but for some values to be in excess of the BS8485 Characteristic Situation 1 Gas Screening Value of 5.00%v/v.

In GW1, carbon dioxide concentrations ranged between 2.10%v/v (10th October 2024) and 3.40%v/v (9th January 2025), with the average across the six monitoring events being 2.75%v/v. For GW2 the range was 3.50%v/v (2nd December 2024) to 5.50%v/v (28th October 2024) with an average of 4.77%v/v, whilst for GW3 the measured concentrations ranged between 1.10%v/v (28th October 2024) and 1.30%v/v (15th November 2024); piezometer GW3 became buried during other works in November 2024, so the average of the available dataset was 1.20%v/v.

In GW4, the concentrations of carbon dioxide were found to be consistently high, with values between 7.40%v/v (19th December 2024) and 8.60%v/v (10th October 2024) being recorded; the average is 7.95%v/v.

A graphical representation of the monitoring data is presented in Graph 2, overleaf. Background atmospheric carbon dioxide concentrations were measured to be 0.00%v/v across the monitoring period, which would be expected.



Graph 2: Carbon Dioxide Concentrations (%v/v) with Time & Pressure (mbar)

Hexane (Hex)

The GFM436 analyser incorporates an additional hexane calibration of the infra-red sensor which is used to indicate, quantify, and track hydrocarbon gases that would normally make an infra-red methane calibration read excessively high, or be over-range. The instrument is calibrated across a range between 0.00% and 2.00%v/v, so that common hydrocarbons (e.g. vapours associated with fuels and oils) from low level spillages or other sources can be detected and measured.

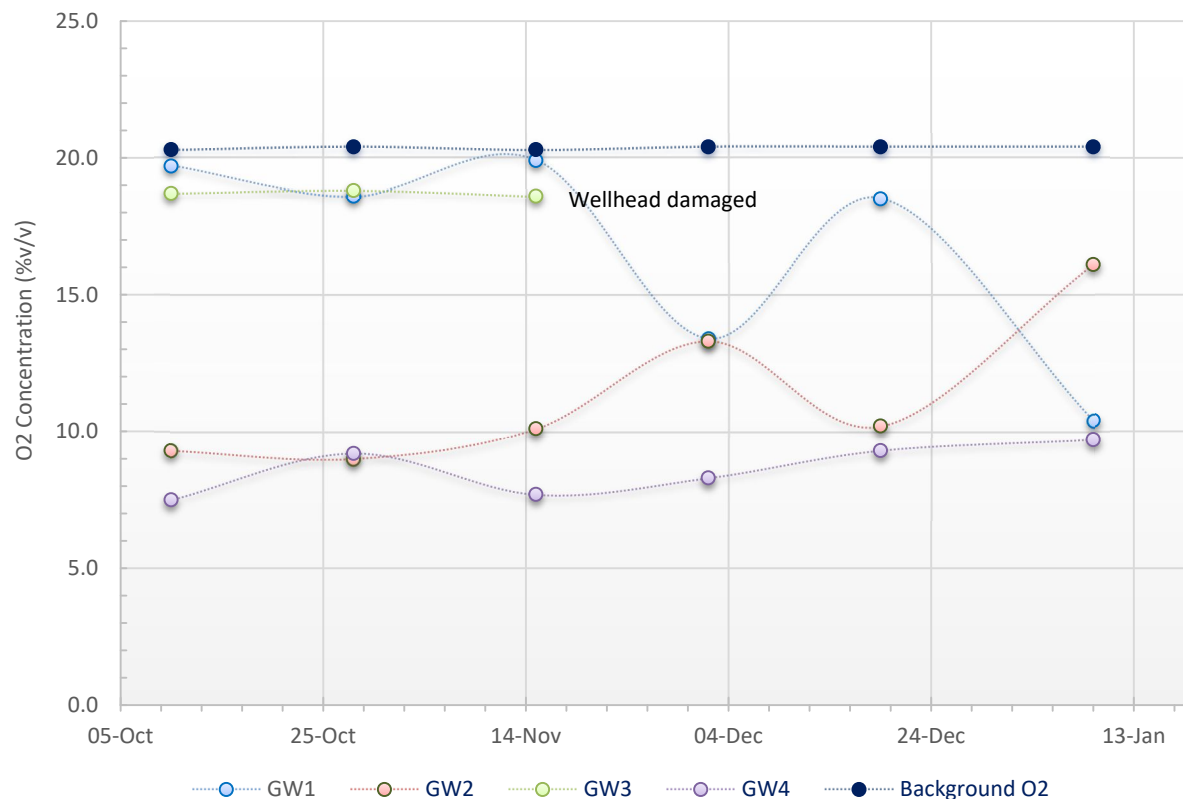
The result is expressed as a percentage hexane vapour equivalent. With respect to hexane, concentrations were observed to be consistently at 0.00%v/v across all monitoring events. On this basis, it is considered that significant risk associated with unknown hydrocarbon sources within the near surface or underlying soils would not be expected.

Oxygen (O₂)

Oxygen levels were observed to be slightly depleted in GW1 and GW3, somewhat depleted in GW2, and particularly low in GW4 across each of the monitoring events, with measured concentrations being below background atmospheric readings (20.30%v/v to 20.40%v/v). The data indicates that anaerobic conditions exist within the underlying soils, particularly those within the area of deep made ground, although it should be noted that current guidance, such as BS8485, does not provide recommendations for where depleted oxygen conditions are present (this does not affect development in any way). The data is provided, therefore, for information purposes only:

- GW1 – 10.40%v/v to 19.90%v/v
- GW2 – 9.00%v/v to 16.10%v/v
- GW3 – 18.60%v/v to 18.80%v/v (limited to three rounds of monitoring)
- GW4 – 7.50%v/v to 9.70%v.v

A summary of the oxygen monitoring data is presented in Graph 3, below.



Graph 3 – Oxygen Concentrations (%v/v) with Time & Pressure (mbar)

Hydrogen Sulphide (H₂S) and Carbon Monoxide (CO)

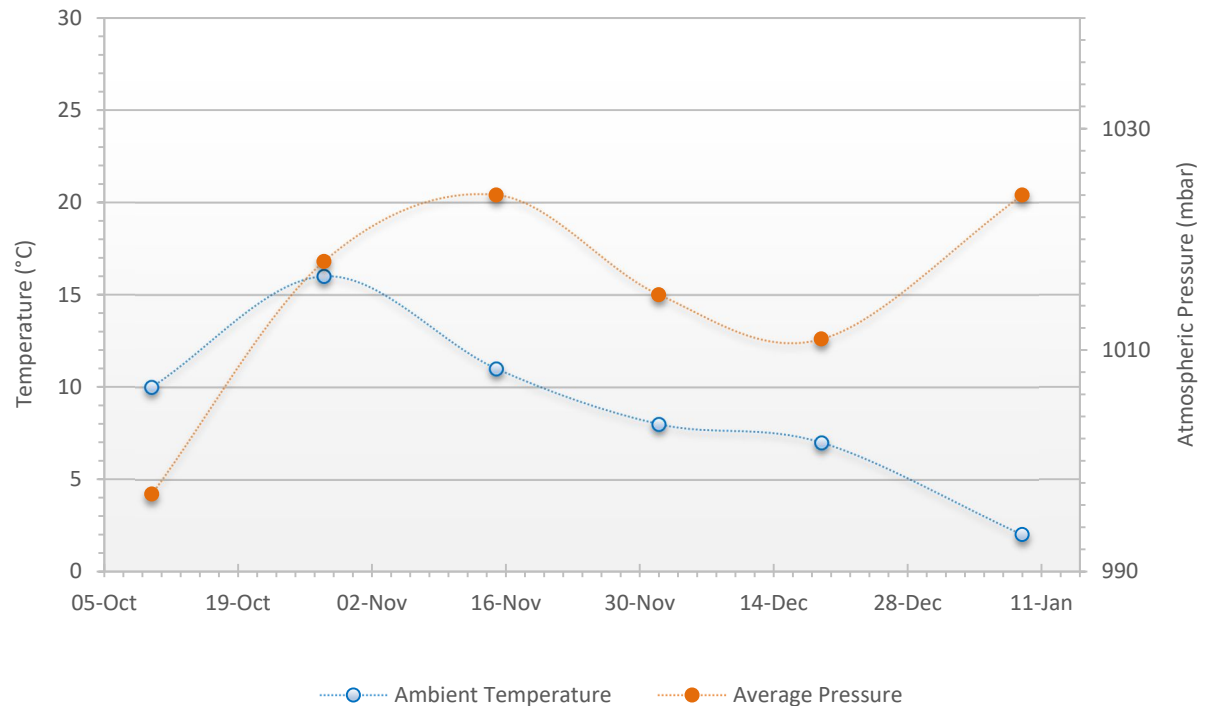
No hydrogen sulphide or carbon monoxide were measured during the monitoring period. Concentrations were observed to be consistently at 0.00%v/v in all four wells and are therefore considered to present no risk to Site end users, even though a low-oxygen environment appears to be present beneath the Site.

Atmospheric Pressure (mbar) & Temperature (°C)

Atmospheric pressures measured across the monitoring period were recorded from between 997mbar and 1024mbar. Steady state pressure was noted during all monitoring visits except for round 6 (9th January 2025) where pressure fell slightly from 1024-1023mbar.

Ambient air temperature across the monitoring period was measured between 2° and 16°C.

A summary of the pressure and temperature data is presented in Graph 4, below.



Graph 4 – Pressure (mbar) and Temperature Change (°C) with Time

Flow (L/hr)

Ground gas pressure (or gas flow) can be a significant driving force for vertical and/or horizontal ground gas migration through the sub-surface environment and in the calculation of the Site Characteristic Gas Screening Value. It may be reported that the gas flow rate for each of the four gas wells was consistently recorded as being 0.00 L/hr across the monitoring period.

Gas Screening Values & Site Characteristic Situation

The results of the qualitative analysis can be developed, together with gas monitoring results, to give a semi-quantitative estimate of risk for a development. The system proposed by Wilson and Card ^[5] was a development of the method described in CIRIA R149 ^[6] and is now widely used by consultants and regulators to assess the risks posed by development sites to sensitive end users. The method utilises gas concentrations and hazardous gas flow rates (volume per unit time) calculated from individual borehole measurements to define a characteristic gas situation for a site based on the limiting borehole gas volume flow for carbon dioxide and/or methane. The limiting borehole gas volume flow is referred to as the

Gas Screening Value, the calculation of which is carried out for both gases. The 'worst case' value is adopted. The Gas Screening Value is calculated as:

$$\text{Gas Screening Value (litres of gas per hour)} = \text{maximum borehole flow rate (L/hr)} \times \text{maximum gas concentration (\%v/v)}$$

In accordance with BS8485, the dwellings to be constructed will be categorised as Type A (high risk) since residential properties have smaller internal spaces that are generally less well-ventilated than larger commercial structures.

As part of the assessment, consideration has been given to the construction of the proposed structures, together with the control of any future structural changes to the buildings and their maintenance, since potential risks posed by ground gases may be strongly influenced by these factors. On this basis, the following Site Characteristic Gas Screening Values have been determined:

Ground Gas	Maximum Recorded Flow Rate Q_{hg} (L/hr)	Maximum Recorded Concentration (%v/v)	Gas Screening Value CO ₂ (L/hr)	Gas Screening Value CH ₄ (L/hr)
CO ₂	0.00	8.60	0.000	-
CH ₄	0.00	0.20	-	0.000

Since no detectable gas flow emission was recorded in any of the four piezometers, it was not possible to calculate a Site Characteristic Gas Screening Value for either carbon dioxide or methane. This effectively determines the Site as Characteristic Situation 1 as the Gas Screening Value would be <0.07 L/hr (very low risk), although it's important to acknowledge that risk assessment guidance states that the presence of *significantly* elevated concentrations (of either methane, carbon dioxide, or in combination) with zero flow rates (as is the case here) should not be dismissed.

Whilst no gas emission has been recorded, it is possible that the following conditions could lead to measurable flow rates at some point in the (as built) post-development case. As a result, higher gas concentrations may also be recorded:

1. Piling (which will be required for part of the Site given the underlying ground conditions), which could create preferential pathways beneath the buildings for increased gas migration to the surface;
2. Differing atmospheric conditions with seasonal fluctuation, and
3. The development itself, as lower pressures could potentially occur within the buildings once built because of the venturi effect.

On this basis, and because some concentrations of carbon dioxide have been recorded to in excess of 5.00%v/v, it is considered that precautions to Characteristic Situation 2 (Gas Screening Value = 0.07-<0.7 L/hr) will need to be provided.

2.3 Site Determination

As indicated above, the Site is underlain by a variable thickness of anthropogenic made ground, but being c.11.0m thick at its deepest (as recorded) part. Beneath this are glacial cohesive deposits, weathered bedrock deposits (sand), and sandstone. Marl was also recorded to be present by the British Geological Survey, although such material was not encountered during the ground investigation.

Although elevated carbon dioxide concentrations were measured in only two (GW2 and GW4) of the four piezometers, there is clear evidence that the made ground is not only capable of generating elevated concentrations of ground gas, it is considered that the made ground is also capable of sustaining elevated concentrations. Made ground across the northern part of the Site was more sand and clinker-based, which yielded sporadic but low concentrations all the same, whereas the organic clays and detritus of the made ground within the infilled area are more consistent with how alluvial clays/silts and riverine soils (e.g. Tidal Flat Deposits) can generate high gassing regimes^{2,3}; for this Site, therefore, the measured elevated carbon dioxide concentrations are considered to be directly attributable to organic degradable material that is cycled within the made ground materials that have been observed. Further to this, and on the basis of the environmental laboratory suite testing completed within the remit of the ground investigation, it may be concluded that all of the made ground samples tested recorded some level of hydrocarbon contamination, and some positive volatile organic contaminants too. Whilst significant undiscovered buried sources of organic contamination (e.g. fuels and/or oils) are considered unlikely to be encountered, the made ground exhibits an inherent trend for the presence of such contaminants⁴, and therefore presents a risk to Site end users without mitigation.

On the basis of the monitoring results, and in accordance with BS8485, it is reiterated that the Site should be determined as being Characteristic Situation 2. This determination is given as a precaution, not because there is a demonstrable issue from positive gas emission, but because of the presence of elevated carbon dioxide to in excess of the respective upper threshold concentrations and the possibility of there being measurable flow at some point in the future. Construction techniques, natural changes within the made ground, and/or other influencing factors could alter the gassing regime as measured at this time. The installation of appropriate mitigating ground gas measures to Characteristic Situation 2 will therefore be required in construction.

² Ground investigation works undertaken at 224 Wilderspool Causeway, Warrington, in 2022 by Earth Environmental & Geotechnical identified elevated concentrations of carbon dioxide to c.15.00%v/v within the underlying clay and silt soils. Protective measures to Characteristic Situation 2 of BS8485 were required in construction (see report Refs: A3642/23/RMS/V2, dated 31st March 2023, and A3642/20/LR, dated 1st July 2024).

³ Alluvial soils, which contain organic materials, are capable of generating quite high concentrations of methane and carbon dioxide. Methane in particular having been recorded on sites underlain by alluvium to be up to c.90.00%v/v (Card et al (2012)) ^[7].

⁴ There are no coal or underground workings present beneath the Site. The measured concentrations of carbon dioxide and methane cannot therefore be attributable to mining legacy.

2.4 Further Works

On the basis of the data presented herein, it is indicated that remedial works to the proposed residential dwellings will need to be undertaken to break the plausible source-pathway-receptor linkage identified between measured ground gas contamination and future Site end users.

Specific LCRM Stage 3 proposals and verification methodology for the remediation will need to be submitted to the Local Planning Authority in the form of a standalone Remedial Strategy, with this being compliant with Yorkshire and Lincolnshire Pollution Advisory Group ('YALPAG') ^[8] guidance.

3 REGULATORY APPROVAL

This Report has been compiled in accordance with good practice guidance for the assessment and management of land that may be affected by contamination (ground gas).

The conclusions presented are considered reasonable on the basis of available information and the assessment of the Site as carried out by Groundsmiths under instruction from the Client. However, it remains the responsibility of the Client to ensure that the Site poses no significant risk to any sensitive receptor(s) and that it remains aligned with the proposed end-use and assessment framework adopted in this Report and any previously submitted reports prepared for the development.

If at any time in the future, additional information comes to light that puts into doubt the accuracy of the professional opinion or third party information presented herein, then it may be necessary to revisit the assessment.

Works undertaken cannot be guaranteed to gain approval by the regulatory authorities and / or your warranty provider, so copies of this Report should be made available to the relevant organisations for comment and approval, prior to undertaking any irrecoverable works associated with the Site.

4 REPORTING LIMITS

Copyright © 2025 Groundsmiths (UK) Ltd. All rights reserved.

The findings and opinions provided in this Report are given in good faith and are subject to the limitations and constraints imposed by the methods and information sources described.

Whilst every effort has been made to carry out an assessment that enables a realistic characterisation of the environmental parameters to be identified, the possibility of significant variation in actual ground conditions beneath the Site cannot be discounted. The findings and opinions presented in this Report are relevant to the time this assessment was undertaken but should not necessarily be relied upon to represent conditions at a substantially later date. Further information, supplementary ground investigation, construction activities, change of Site use, or the passage of time may reveal conditions that were not indicated in the data presented and therefore could not have been considered in the preparation of this Report. Where such information might impact upon stated opinions, Groundsmiths reserve the right to modify the opinions expressed in this Report.

Where opinions expressed in this Report are based on current available guidelines and legislation, no liability can be accepted for the effects of any future changes to such guidelines and legislation. New information or improved practices and changes in legislation may require reinterpretation of the Report as a whole, or in part.

This Report does not constitute an archaeological, ecological, or arboriculturalist / invasive plant species survey. Any comment given in relation to these is for information only. Further assessments to assess these may be required as part of any planning condition and should therefore be undertaken by suitably qualified experts as required.

Groundsmiths reserve the right to edit and / or retract any conclusion or recommendation made in this Report should any further information, with respect to the Site, become available.

Groundsmiths disclaim any obligation to update the Report for events taking place after the time during which the assessment was carried out.

Groundsmiths do not provide or purport to provide legal advice. Should the client require such advice, then that of lawyers should be sought.

Groundsmiths accept no responsibility if any findings given in this Report are not implemented by the Client or their agents.

Groundsmiths accept no responsibility if any further works, as requested by the Local Planning Authority in the discharge of their duty of care, are not implemented by the Client or their agents.

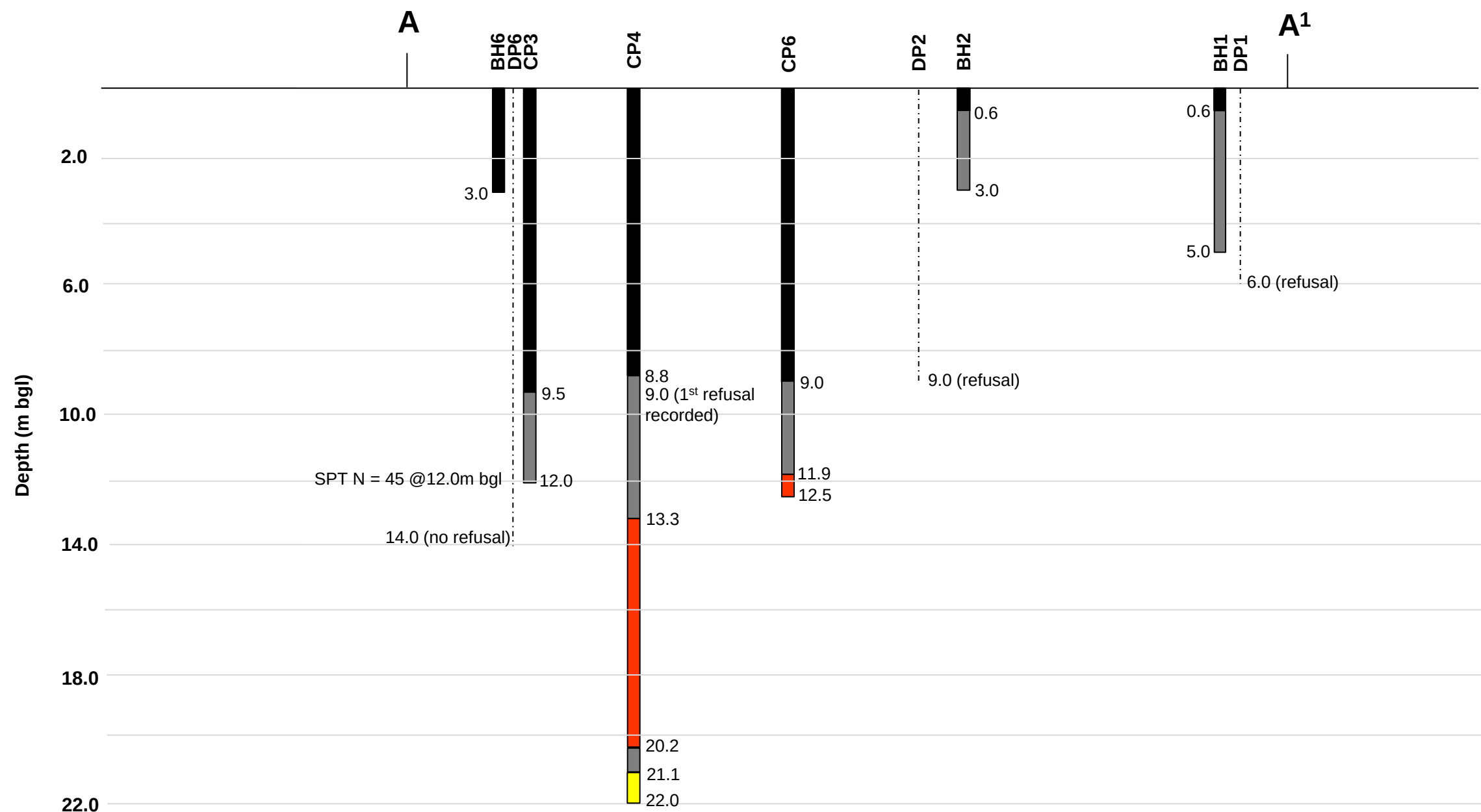
5 INFORMATION SOURCES

The following references have been cited in the production of this report:

- 1 Groundsmiths (UK) Ltd (2024). LCRM Stage 1 Risk Assessment. Land off Church Lane, Moston, Greater Manchester. Ref. GUK-0524-02/Rp-001, dated 28th May.
- 2 Groundsmiths (UK) Ltd (2025). LCRM: Intrusive Site Investigation. Land off Church Lane, Moston, Greater Manchester. Ref. GUK-0524-02/Rp-002, dated 6th January.
- 3 D. J. Rudland, R. M. Lancefield & P. N. Mayel (2001). CIRIA C552 - Contaminated Land Risk Assessment – A Guide to Good Practice.
- 4 BS8485 (2015+A1:2019) Code of Practice for the Design of Protective Measures for Methane and Carbon Dioxide Ground Gases for New Buildings.
- 5 Wilson, S.A. and Card, G.B. (1999) Reliability and Risk in Gas Protection Design. Ground Engineering, 32, 2, pp.32-36, February, EMAP, London.
- 6 CIRIA Report 149 (1995). Protecting Development from Methane.
- 7 Card, G., Wilson, S. and Mortimer, S. (2012). A Pragmatic Approach to Ground Gas Risk Assessment. CL:AIRE Research Bulletin RB17. CL:AIRE, London, UK. ISSN: 2047-6450 (online).
- 8 Yorkshire and Lincolnshire Pollution Advisory Group (2016). Verification Requirements for Gas Protection Systems. Technical Guidance for Developers, Landowners and Consultants. Version 1.1.

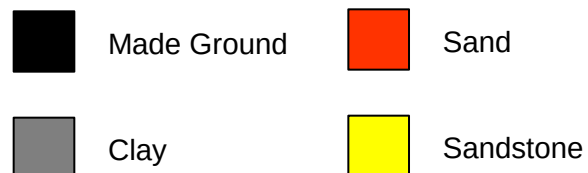
FIGURES & DRAWINGS





NOTE: Refer to individual borehole records for SPT data

NOTE: SPT refusal @ N = 50



Project: Church Lane, Moston

Client: Built Developments Limited

Drawing: Schematic Section A – A¹

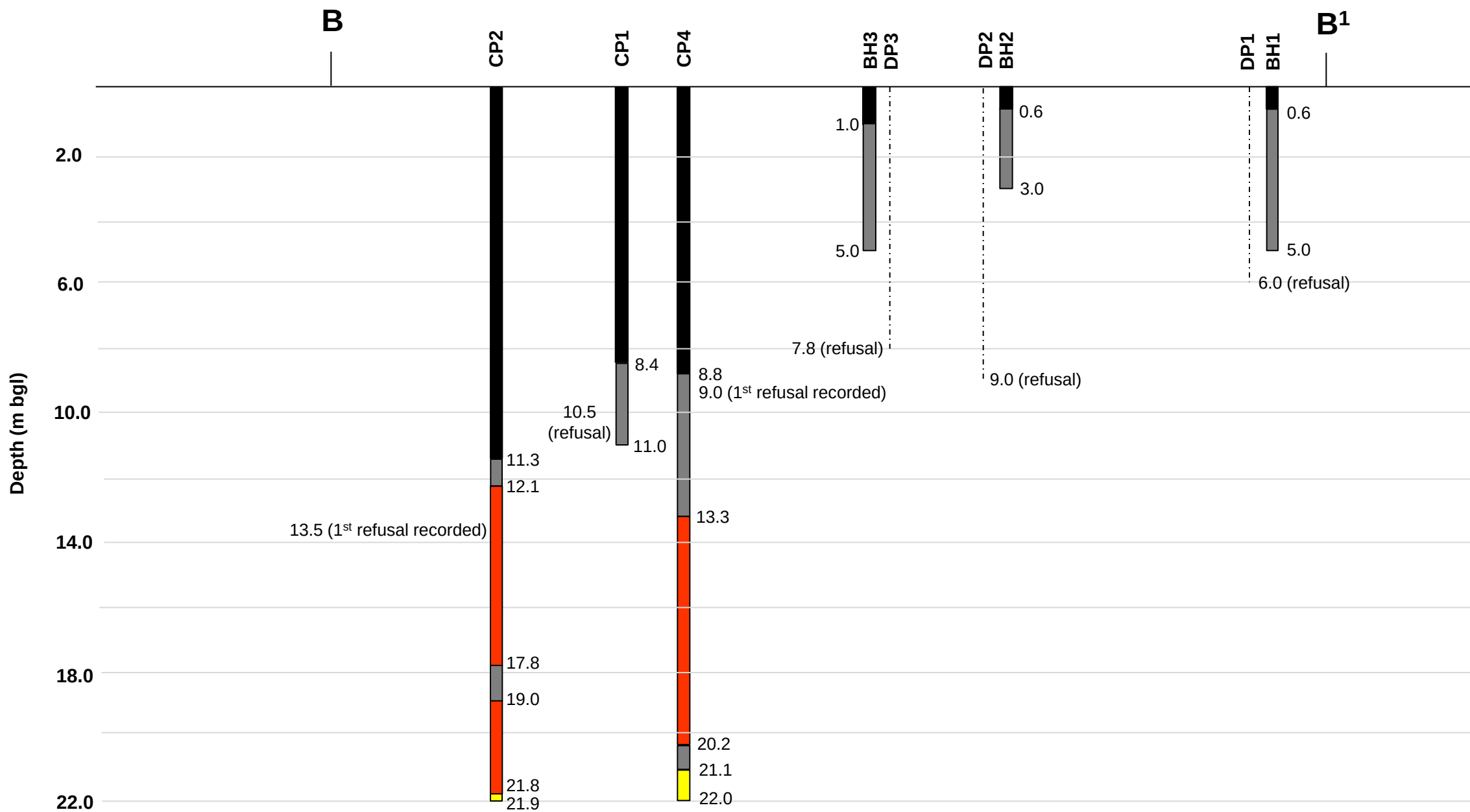
Drawn/Checked: AJS

Project No: 0524-02

Drawing No: 002

Date: Sept. 2024

GROUNDSMITHS
GEOTECHNICAL ENGINEERS



NOTE: Refer to individual borehole records for SPT data

NOTE: SPT refusal @ N = 50



Project: Church Lane, Moston

Client: Built Developments Limited

Drawing: Schematic Section B – B¹

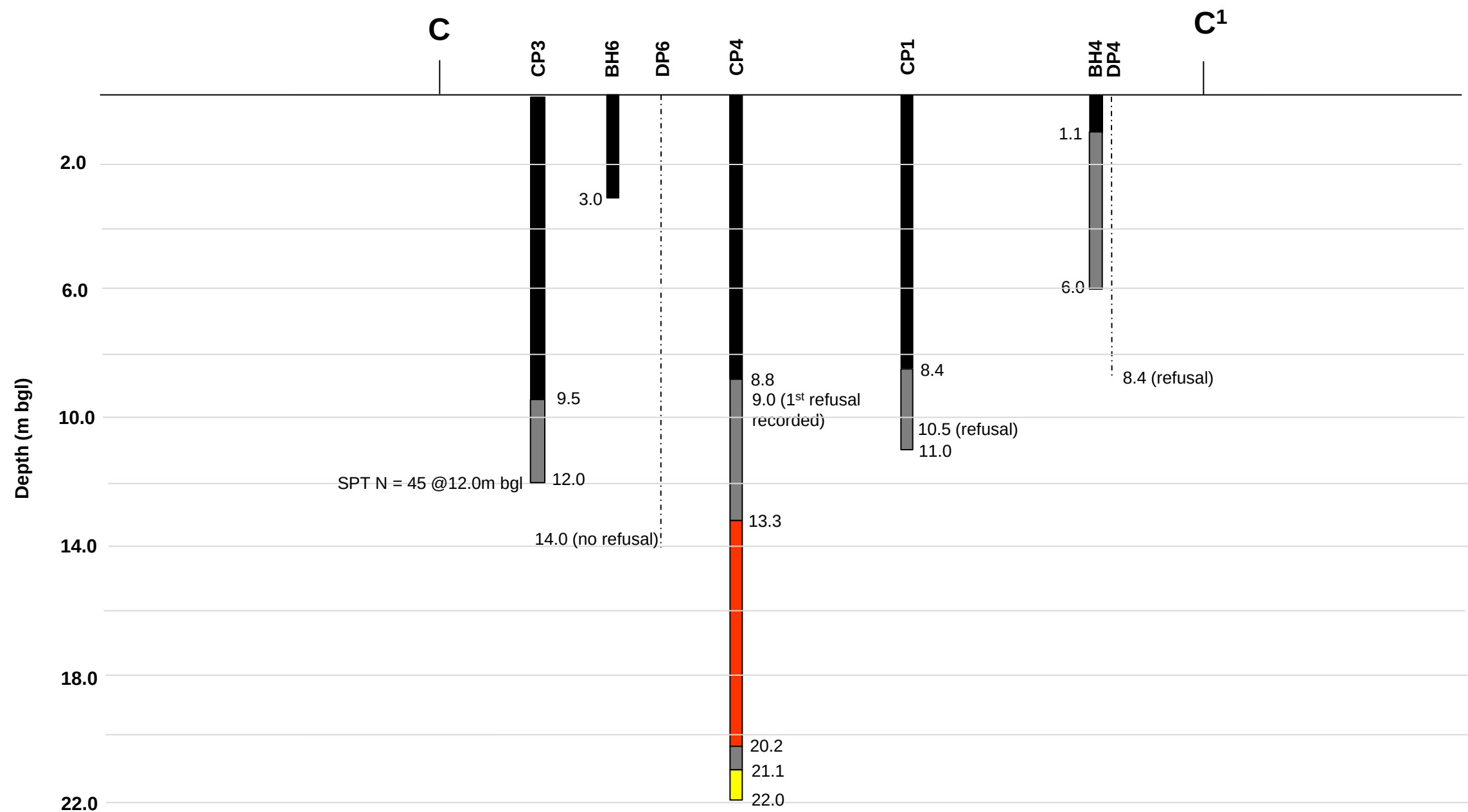
Drawn/Checked: AJS

Project No: 0524-02

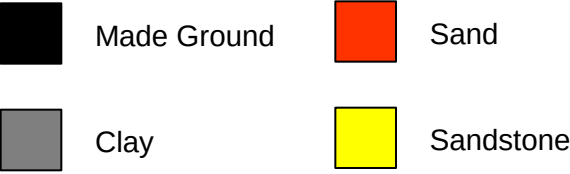
Drawing No: 003

Date: Sept. 2024

GROUNDSMITHS
GEOTECHNICAL ENGINEERS



NOTE: Refer to individual borehole records for SPT data
NOTE: SPT refusal @ N = 50



Project: Church Lane, Moston	Client: Built Developments Limited
Drawing: Schematic Section C – C ¹	Drawn/Checked: AJS
Project No: 0524-02	Drawing No: 004
Date: Sept. 2024	

GROUNDSMITHS
GEOTECHNICAL ENGINEERS

APPENDIX A

GROUND GAS MONITORING DATA

GROUND GAS MONITORING RECORD SHEET						GROUND SMITHS GEOTECHNICAL ENGINEERS						
Project: Residential Development		Project No: GUK-0524-02		Visit No: 1 of 6								
Location: Church Lane, Moston					Operative: AJS							
Client: Built Developments Limited					Date: 10/10/2024							
Monitoring Point	CH4 (%v/v)	LEL (%v/v)	CO2 (%v/v)	HEX (%v/v)	H2S (ppm)	O2 (%v/v)	CO (ppm)	Flow Rate _q (l/hr)	GSV CH ₄ (l/hr)*	GSV CO ₂ (l/hr)*	Response Zone	Comments
GW1	0.00	0.00	2.10	0.00	0.00	19.70	0.00	0.30	0.000	0.006	Natural Strata	-
GW2	0.00	0.00	5.40	0.00	0.00	9.30	0.00	0.00	0.000	0.000	Made Ground	-
GW3	0.00	0.00	1.20	0.00	0.00	18.70	0.00	0.00	0.000	0.000	Made Ground	-
GW4	0.00	0.00	8.60	0.00	0.00	7.50	0.00	0.00	0.000	0.000	Made Ground	-
Background	0.00	0.00	0.00	0.00	0.00	20.30	0.00	-				-

Meteorological Conditions

Ground Conditions
Wind
Cloud Cover
Rain
Barometric Pressure (mb)
Pressure Trend during Test
Temperature (C)

Dry
Calm
None
x
None
997
10

x
Moist
x
Light
x
Slight
Slight
Falling
x
Steady

Wet
Moderate
Cloudy
Moderate
x
Steady
Rising

Snow
Strong
Overcast
Heavy

Frozen
x
Unsurfaced
Hardstand

GSV = maximum flow rate (l/hr) x maximum gas concentration (%)

* Borehole hazardous gas flow rate (Qhg) as specified in BS8485:2015.

BRITISH STANDARD

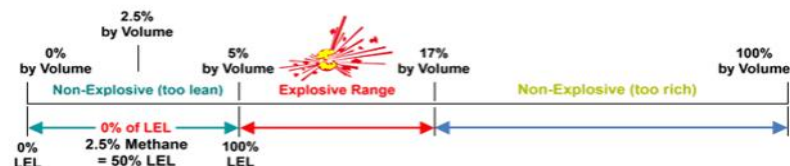
BS 8485:2015

Table 2 CS by site characteristic GSV

CS	Hazard potential	Site characteristic GSV ^{A)} L/h	Additional factors
CS1	Very low	<0.07	Typically <1% methane concentration and <5% carbon dioxide concentration (otherwise consider an increase to CS2)
CS2	Low	0.07 to <0.7	Typical measured flow rate <70 L/h (otherwise consider an increase to CS3)
CS3	Moderate	0.7 to <3.5	–
CS4	Moderate to high	3.5 to <15	–
CS5	High	15 to <70	–
CS6	Very high	>70	–

^{A)} The figures used in this column are empirical.

Methane - LEL: 5% by volume in Air / UEL: 17% by volume in Air



GROUND GAS MONITORING RECORD SHEET						GROUND SMITHS GEOTECHNICAL ENGINEERS						
Project: Residential Development		Project No: GUK-0524-02		Visit No: 2 of 6								
Location: Church Lane, Moston				Operative: LTS								
Client: Built Developments Limited				Date: 28/10/2024								
Monitoring Point	CH4 (%v/v)	LEL (%v/v)	CO2 (%v/v)	HEX (%v/v)	H2S (ppm)	O2 (%v/v)	CO (ppm)	Flow Rate _q (l/hr)	GSV CH ₄ (l/hr)*	GSV CO ₂ (l/hr)*	Response Zone	Comments
GW1	0.10	3.30	2.70	0.00	0.00	18.60	0.00	0.00	0.000	0.000	Natural Strata	-
GW2	0.00	0.00	5.50	0.00	0.00	9.00	0.00	0.00	0.000	0.000	Made Ground	-
GW3	0.00	0.00	1.10	0.00	0.00	18.80	0.00	0.00	0.000	0.000	Made Ground	-
GW4	0.20	4.10	7.90	0.00	0.00	9.20	0.00	0.00	0.000	0.000	Made Ground	-
Background	0.00	0.00	0.00	0.00	0.00	20.40	0.00	-				-

Meteorological Conditions

Ground Conditions
Wind
Cloud Cover
Rain
Barometric Pressure (mb)
Pressure Trend during Test
Temperature (C)

Dry
Calm
None
None
1018
16

☒

Moist

☒

Light

☒

Slight

☒

Slight

Wet
Moderate

☒

Cloudy
Moderate

Snow
Strong
Overcast
Heavy

Falling

☒

Steady
Rising

Frozen

☒

Unsurfaced
Hardstand

GSV = maximum flow rate (l/hr) x maximum gas concentration (%)

* Borehole hazardous gas flow rate (Qhg) as specified in BS8485:2015.

BRITISH STANDARD

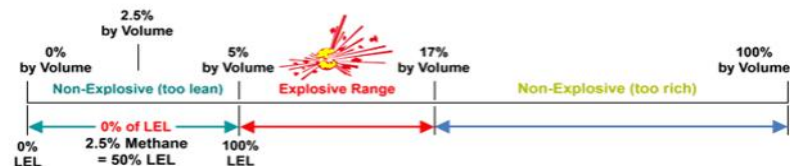
BS 8485:2015

Table 2 CS by site characteristic GSV

CS	Hazard potential	Site characteristic GSV ^{A)} L/h	Additional factors
CS1	Very low	<0.07	Typically <1% methane concentration and <5% carbon dioxide concentration (otherwise consider an increase to CS2)
CS2	Low	0.07 to <0.7	Typical measured flow rate <70 L/h (otherwise consider an increase to CS3)
CS3	Moderate	0.7 to <3.5	–
CS4	Moderate to high	3.5 to <15	–
CS5	High	15 to <70	–
CS6	Very high	>70	–

^{A)} The figures used in this column are empirical.

Methane - LEL: 5% by volume in Air / UEL: 17% by volume in Air



GROUND GAS MONITORING RECORD SHEET						GROUND SMITHS GEOTECHNICAL ENGINEERS						
Project: Residential Development		Project No: GUK-0524-02		Visit No: 3 of 6								
Location: Church Lane, Moston				Operative: LTS								
Client: Built Developments Limited				Date: 15/11/2024								
Monitoring Point	CH4 (%v/v)	LEL (%v/v)	CO2 (%v/v)	HEX (%v/v)	H2S (ppm)	O2 (%v/v)	CO (ppm)	Flow Rate _q (l/hr)	GSV CH ₄ (l/hr)*	GSV CO ₂ (l/hr)*	Response Zone	Comments
GW1	0.00	0.00	2.20	0.00	0.00	19.90	0.00	0.00	0.000	0.000	Natural Strata	-
GW2	0.10	2.80	5.10	0.00	0.00	10.10	0.00	0.00	0.000	0.000	Made Ground	-
GW3	0.00	0.00	1.30	0.00	0.00	18.60	0.00	0.00	0.000	0.000	Made Ground	-
GW4	0.00	0.00	8.40	0.00	0.00	7.70	0.00	0.00	0.000	0.000	Made Ground	-
Background	0.00	0.00	0.00	0.00	0.00	20.30	0.00	-				-

Meteorological Conditions

Ground Conditions
Wind
Cloud Cover
Rain
Barometric Pressure (mb)
Pressure Trend during Test
Temperature (C)

☒

 Dry

☐

 Moist

☐

 Wet

☐

 Snow

☐

 Frozen

☒

 Unsurfaced

☐

 Hardstand

☐

 Calm

☒

 Light

☐

 Moderate

☐

 Strong

☐

 None

☒

 Slight

☐

 Cloudy

☐

 Overcast

☒

 None

☐

 Slight

☐

 Moderate

☐

 Heavy

☐

 Falling

☒

 Steady

☐

 Rising

1024

11

GSV = maximum flow rate (l/hr) x maximum gas concentration (%)

* Borehole hazardous gas flow rate (Qhg) as specified in BS8485:2015.

BRITISH STANDARD

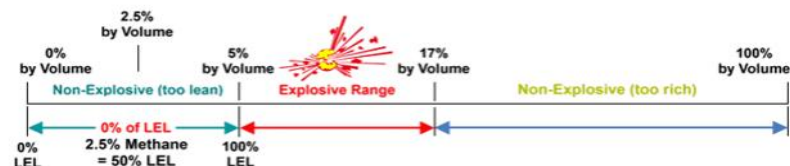
BS 8485:2015

Table 2 CS by site characteristic GSV

CS	Hazard potential	Site characteristic GSV ^{A)} L/h	Additional factors
CS1	Very low	<0.07	Typically <1% methane concentration and <5% carbon dioxide concentration (otherwise consider an increase to CS2)
CS2	Low	0.07 to <0.7	Typical measured flow rate <70 L/h (otherwise consider an increase to CS3)
CS3	Moderate	0.7 to <3.5	–
CS4	Moderate to high	3.5 to <15	–
CS5	High	15 to <70	–
CS6	Very high	>70	–

^{A)} The figures used in this column are empirical.

Methane - LEL: 5% by volume in Air / UEL: 17% by volume in Air



GROUND GAS MONITORING RECORD SHEET												
Project: Residential Development		Project No: GUK-0524-02		Visit No: 4 of 6								
Location: Church Lane, Moston				Operative: LTS								
Client: Built Developments Limited				Date: 02/12/2024								
Monitoring Point	CH4 (%v/v)	LEL (%v/v)	CO2 (%v/v)	HEX (%v/v)	H2S (ppm)	O2 (%v/v)	CO (ppm)	Flow Rate _q (l/hr)	GSV CH ₄ (l/hr)*	GSV CO ₂ (l/hr)*	Response Zone	Comments
GW1	0.10	2.10	3.20	0.00	0.00	13.40	0.00	0.00	0.000	0.000	Natural Strata	-
GW2	0.10	3.20	3.50	0.00	0.00	13.30	0.00	0.00	0.000	0.000	Made Ground	-
GW3	Damaged											
GW4	0.00	0.00	7.70	0.00	0.00	8.30	0.00	0.00	0.000	0.000	Made Ground	-
Background	0.00	0.00	0.00	0.00	0.00	20.40	0.00	-				-

Meteorological Conditions

Ground Conditions	☐ Dry	☐ Moist	☒ Wet	☐ Snow	☐ Frozen	☒ Unsurfaced	☐ Hardstand
Wind	☐ Calm	☒ Light	☐ Moderate	☐ Strong			
Cloud Cover	☐ None	☐ Slight	☐ Cloudy	☒ Overcast			
Rain	☐ None	☒ Slight	☐ Moderate	☐ Heavy			
Barometric Pressure (mb)	1015						
Pressure Trend during Test	☐ Falling	☒ Steady	☐ Rising				
Temperature (C)	8						

GSV = maximum flow rate (l/hr) x maximum gas concentration (%)

* Borehole hazardous gas flow rate (Qhg) as specified in BS8485:2015.

BRITISH STANDARD

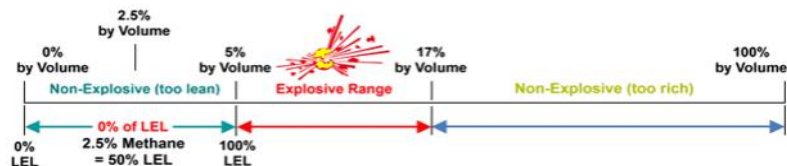
BS 8485:2015

Table 2 CS by site characteristic GSV

CS	Hazard potential	Site characteristic GSV ^{A)} L/h	Additional factors
CS1	Very low	<0.07	Typically <1% methane concentration and <5% carbon dioxide concentration (otherwise consider an increase to CS2)
CS2	Low	0.07 to <0.7	Typical measured flow rate <70 L/h (otherwise consider an increase to CS3)
CS3	Moderate	0.7 to <3.5	–
CS4	Moderate to high	3.5 to <15	–
CS5	High	15 to <70	–
CS6	Very high	>70	–

^{A)} The figures used in this column are empirical.

Methane - LEL: 5% by volume in Air / UEL: 17% by volume in Air



GROUND GAS MONITORING RECORD SHEET												
Project: Residential Development		Project No: GUK-0524-02		Visit No: 5 of 6								
Location: Church Lane, Moston				Operative: LTS								
Client: Built Developments Limited				Date: 19/12/2024								
Monitoring Point	CH4 (%v/v)	LEL (%v/v)	CO2 (%v/v)	HEX (%v/v)	H2S (ppm)	O2 (%v/v)	CO (ppm)	Flow Rate _q (l/hr)	GSV CH ₄ (l/hr)*	GSV CO ₂ (l/hr)*	Response Zone	Comments
GW1	0.10	2.10	2.90	0.00	0.00	18.50	0.00	0.00	0.000	0.000	Natural Strata	-
GW2	0.00	2.60	4.90	0.00	0.00	10.20	0.00	0.00	0.000	0.000	Made Ground	-
GW3	Damaged											
GW4	0.10	3.40	7.40	0.00	0.00	9.30	0.00	0.00	0.000	0.000	Made Ground	-
Background	0.00	0.00	0.00	0.00	0.00	20.40	0.00	-				-

Meteorological Conditions

Ground Conditions	☐ Dry	☒ Moist	☐ Wet	☐ Snow	☐ Frozen	☒ Unsurfaced	☐ Hardstand
Wind	☐ Calm	☒ Light	☐ Moderate	☐ Strong			
Cloud Cover	☐ None	☒ Slight	☐ Cloudy	☐ Overcast			
Rain	☒ None	☐ Slight	☐ Moderate	☐ Heavy			
Barometric Pressure (mb)	1011						
Pressure Trend during Test		☐ Falling	☒ Steady	☐ Rising			
Temperature (C)	7						

GSV = maximum flow rate (l/hr) x maximum gas concentration (%)

* Borehole hazardous gas flow rate (Qhg) as specified in BS8485:2015.

BRITISH STANDARD

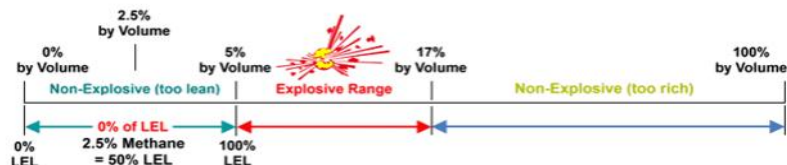
BS 8485:2015

Table 2 CS by site characteristic GSV

CS	Hazard potential	Site characteristic GSV ^{A)} L/h	Additional factors
CS1	Very low	<0.07	Typically <1% methane concentration and <5% carbon dioxide concentration (otherwise consider an increase to CS2)
CS2	Low	0.07 to <0.7	Typical measured flow rate <70 L/h (otherwise consider an increase to CS3)
CS3	Moderate	0.7 to <3.5	–
CS4	Moderate to high	3.5 to <15	–
CS5	High	15 to <70	–
CS6	Very high	>70	–

^{A)} The figures used in this column are empirical.

Methane - LEL: 5% by volume in Air / UEL: 17% by volume in Air



GROUND GAS MONITORING RECORD SHEET												
Project: Residential Development		Project No: GUK-0524-02		Visit No: 6 of 6								
Location: Church Lane, Moston				Operative: LTS								
Client: Built Developments Limited				Date: 09/01/2025								
Monitoring Point	CH4 (%v/v)	LEL (%v/v)	CO2 (%v/v)	HEX (%v/v)	H2S (ppm)	O2 (%v/v)	CO (ppm)	Flow Rate _q (l/hr)	GSV CH ₄ (l/hr)*	GSV CO ₂ (l/hr)*	Response Zone	Comments
GW1	0.00	0.00	3.40	0.00	0.00	10.40	0.00	0.00	0.000	0.000	Natural Strata	-
GW2	0.00	0.00	4.20	0.00	0.00	16.10	0.00	0.00	0.000	0.000	Made Ground	-
GW3	Damaged											
GW4	0.00	0.00	7.70	0.00	0.00	9.70	0.00	0.00	0.000	0.000	Made Ground	-
Background	0.00	0.00	0.00	0.00	0.00	20.40	0.00	-				-

Meteorological Conditions

Ground Conditions	☐ Dry	☐ Moist	☒ Wet	☐ Snow	☐ Frozen	☒ Unsurfaced	☐ Hardstand
Wind	☐ Calm	☒ Light	☐ Moderate	☐ Strong			
Cloud Cover	☐ None	☒ Slight	☐ Cloudy	☐ Overcast			
Rain	☒ None	☐ Slight	☐ Moderate	☐ Heavy			
Barometric Pressure (mb)	1024-1023						
Pressure Trend during Test	☐ Rising	☒ Falling	☐ Steady	☐ Rising			
Temperature (C)	2						

GSV = maximum flow rate (l/hr) x maximum gas concentration (%)

* Borehole hazardous gas flow rate (Qhg) as specified in BS8485:2015.

BRITISH STANDARD

BS 8485:2015

Table 2 CS by site characteristic GSV

CS	Hazard potential	Site characteristic GSV ^{A)} L/h	Additional factors
CS1	Very low	<0.07	Typically <1% methane concentration and <5% carbon dioxide concentration (otherwise consider an increase to CS2)
CS2	Low	0.07 to <0.7	Typical measured flow rate <70 L/h (otherwise consider an increase to CS3)
CS3	Moderate	0.7 to <3.5	–
CS4	Moderate to high	3.5 to <15	–
CS5	High	15 to <70	–
CS6	Very high	>70	–

^{A)} The figures used in this column are empirical.

Methane - LEL: 5% by volume in Air / UEL: 17% by volume in Air

