



Haigh Huddleston & Associates

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Our Ref: E20/7768/JF/001

13th May 2022

(Email Only)

FAO: Matthew Robinson

Martin Walsh Architectural
Firth Buildings
99-103 Leeds Road
Dewsbury
WF12 7BU

Dear Sir,

Re: Lindley Moor Road, Lindley

Further to the intrusive site investigation works detailed in the Haigh Huddleston & Associates Geo-Environmental Ground Investigation report (Ref: E20/7768/R002 Dated: April 2022), gas testing was undertaken at the above development to confirm if ground gas migration from potential shallow mine workings beneath the site would adversely affect the development. The proposed development consists of a number of commercial units with parking areas.

Kindly note that this letter only addresses issues with regards to ground gas migration affecting properties. It must be read in conjunction with the aforementioned report. For the preparation of this letter, the following best practice guidance has been taken into account:

- BS8485:2015+A1:2019 "Code of Practice for the Design of Protective Measures for Methane and Carbon Dioxide Ground Gases for New Buildings";
- BS8576:2013 "Guidance on Investigations for Ground Gas – Permanent Gases and Volatile Organic Compounds (VOCs)";
- CIRIA "Assessing Risks Posed by Hazardous Ground Gases to Buildings", report C665, 2007;
- CIRIA "The VOCs Handbook. Investigating, Assessing and Managing Risks from Inhalation of VOCs at Land Affected by Contamination", report C682, 2009;
- CL:AIRE "A Pragmatic Approach to Ground Gas Risk Assessment", report ref. RB17, November 2012;

Eleven boreholes were undertaken to depths of 13-30m beneath the site and evidence of coal was found in six of the boreholes. In addition to this, five boreholes were drilled and installed with gas monitoring standpipes consisting of 1m of plain

pipe at the surface and 2m of slotted pipe. The standpipes were constructed with lockable covers, backfilled with single size gravels and sealed with bentonite.

Six rounds of gas monitoring were undertaken between 23rd February 2022 and 5th May 2022 using a Gas Data GFM 436. The results are tabulated in the Appendix to the rear of this letter.

The gas monitoring was undertaken over a range in barometric pressure between 999mb and 1020mb. The readings taken on five of the six visits were recorded under falling pressure.

On site, no methane was detected. Carbon dioxide values were found between 0.8 and 4.8% with oxygen levels between 16.7 and 20.1%. Steady flow rates were detected in borehole R13 & R15 on 23rd February 2022. These steady flow rates took 45 seconds to equalise. Additional steady flow rates were detected in borehole R02 on 9th March 2022. These steady flow rates also took 45 seconds to equalise. Peak flow rates were also recorded at random intervals but all equalised immediately.

During the first site visit on 23rd February 2022, readings were taken from all five boreholes. However, upon arrival of visit 2 on 9^h March 2022, it was not possible to take a reading from R08 due to the high ground water within the borehole. The water was extracted from the borehole using a battery powered pump, however the borehole filled with water again within the following 5 minutes meaning we were unable to take a reading. This also occurred on 6th April, 20th April & 5th May 2022 meaning no readings could be taken from R08 on these visits. Although it wasn't possible to take readings from R08 on four of the six visits, there was little variance in concentrations for individual boreholes. We are therefore confident that the above represents a true reflection of the gas regime affecting any new development.

Due to the relatively low carbon dioxide levels recorded throughout the duration of the visits, the abnormally high steady flow rate of 15.6l/hr on 23rd February 2022 could be considered as an anomaly that can be disregarded due to no flow rates being detected throughout the remainder of the visits.

Discussions

In addition to this, we can confirm that the site is not within a Radon Affected Area, as less than 1% of properties are above the action level. Therefore, **NO Radon Protection Measures are required for this development.**

When consulting BS 8485:2015 Table 2 the site can be characterised as CS2 for Type D buildings (any small rooms within the proposed development such as W/C's are categorized as Type C). Furthermore, when consulting table 4, a score of 1.5 is suggested for Type D buildings and 2.5 for Type C buildings. Consulting tables 5 - 7 we would recommend the following to achieve a score of 2.5 (based off a worst case scenario) due to the potential for long term build-up of gases beneath the ground floor slab:

- | | |
|--|-------------------|
| - Cast in situ ground-bearing floor slab with only nominal mesh reinforcement & minimal service entries. | 0.5 Points |
| - Fully vented minimum 150mm deep void below suspended slab. To be increased to 250mm where the proximity of trees affect the foundation construction. | 0 Points |

- Continuous membrane across the cavity/party walls. 0 Points
- Cavity tray in the external walls. 0 Points
- Fully sealed service entries and ducts to manufactures specification. 0 Points

- A Suitable Gas Barrier meeting all of the following criteria: **2.0 Points**
 - Sufficiently impervious to gasses with a methane gas Transmission rate <40.0ml/day/m2/atm (average) for sheets and joints (tested in accordance with BS ISO 15105-1 manometric method).
 - Sufficiently durable to remain serviceable for the anticipated life of the building and duration of gas Emissions.
 - Sufficiently strong to withstand in-service stresses (eg. Settlement if placed below a flood slab).
 - Sufficiently strong to withstand the installation process And following trades until covered (eg. Penetrations From steel fibres in fibre reinforced concrete, Penetration from reinforcement ties, tearing due to Working above it, dropping tools etc.)
 - Capable, after installation, of providing a complete Barrier to the entry of the relevant gas.
 - Verified in accordance with CIRIA C735 [N1]

Total **2.5 Points**

We hope that the above is sufficient for your requirements. However, should you have any queries please do not hesitate to contact me direct.

Yours sincerely,

JAMES FARRAR
j.farrar@haighhuddleston.co.uk

Appendix

SITE:	Lindley Moor Road, Huddersfield	
CLIENT:	2SH Developments Ltd	
JOB NO:	7768	
SHEET NO:	1	

GAS MONITORING RESULTS

	GAS CONCENTRATIONS												FLOW DATA				Qhg per borehole		WELL AND WATER DATA				A Pressure (mB)	Comments	
Monitoring Point	Methane (%v/v)		%LEL		Carbon dioxide (%v/v)		Oxygen (%v/v)		H2S (ppm)	CO (ppm)	Hex (%)	PIDCf ()	Flow rate (l/hr)		Differential borehole Pressure (Pa)	Time for flow to equalise (secs)	Methane (l/hr)	CO2 (l/hr)	Water level (mbgl)	Depth of well (m)	Response Zone				
	Peak	Steady	Peak	Steady	Peak	Steady	Min	Steady					Steady	Peak											
AIR	ND	ND	ND	ND	ND	ND	20.6	20.6	ND	ND	ND	1.0	NR	NR	NR	NR	NR	NR	NR	NR	NR	979	Time: 14:00	Date: 23.02.22	
R02	ND	ND	ND	ND	0.8	0.8	20.0	20.0	ND	10.0	ND	1.0	ND	ND	ND	ND	NR	0.0008	0.10	3.00	NR	978			
R05	ND	ND	ND	ND	2.3	2.3	19.2	19.2	ND	ND	ND	1.0	ND	ND	ND	ND	NR	0.0023	1.30	3.00	1.0-1.30	978	Sunny, Windy, Cold		
R15	ND	ND	ND	ND	1.2	1.2	19.6	19.6	ND	ND	ND	1.0	ND	ND	ND	ND	NR	0.0012	2.10	3.00	1.0-2.10	979	Falling A.P		
R13	ND	ND	ND	ND	2.1	2.1	19.1	19.1	ND	ND	ND	1.0	4.0	52.7	29	45	NR	0.084	0.90	3.00	NR	979	R02 terminated after 1 min 45 seconds due to water ingress into machine		
R08	ND	ND	ND	ND	4.8	4.8	16.7	16.7	ND	ND	ND	1.0	15.6	54.5	169	45	NR	0.7488	0.70	3.00	NR	979			
AIR	ND	ND	ND	ND	ND	ND	20.6	20.6	ND	ND	0.010	1.0	NR	NR	NR	NR	NR	NR	NR	NR	NR	981	Time: 12:00	Date: 09.03.22	
R02	ND	ND	ND	ND	1.2	1.2	20.1	20.1	ND	10	ND	1.0	-4.5	-4.5	-36	45	NR	0.054	0.90	3.00	NR	980			
R05	ND	ND	ND	ND	2.4	2.4	17.3	17.3	ND	ND	ND	1.0	ND	ND	ND	ND	NR	0.0024	1.90	3.00	1.0-1.90	980	Cloudy, Windy, Dry		
R15	ND	ND	ND	ND	2.2	2.2	17.6	17.6	ND	ND	ND	1.0	ND	ND	ND	ND	NR	0.0022	2.30	3.00	1.0-2.30	980			
R13	ND	ND	ND	ND	2.3	2.3	18.4	18.4	ND	ND	ND	2.0	ND	0.4	ND	ND	NR	0.0023	1.60	3.00	1.0-1.60	981	Falling A.P		
R08	Unable to take reading due to water level within borehole																								
AIR	ND	ND	ND	ND	ND	ND	19.8	19.8	ND	ND	ND	1.0	NR	NR	NR	NR	NR	NR	NR	NR	NR	1000	Time: 8:45	Date: 22.03.22	
R02	ND	ND	ND	ND	1.3	1.3	20.0	20.0	ND	10.0	ND	1.0	ND	ND	ND	ND	NR	0.0013	1.90	3.00	1.0-1.90	1000			
R05	ND	ND	ND	ND	2.3	2.3	18.2	18.2	ND	ND	ND	1.0	ND	ND	ND	ND	NR	0.0023	2.20	3.00	1.0-2.20	999	Sunny, Warm, Dry		
R15	ND	ND	ND	ND	2.4	2.4	18.8	18.8	ND	ND	ND	1.0	ND	ND	ND	ND	NR	0.0024	3.00	3.00	1.0-3.00	999			
R13	ND	ND	ND	ND	2.2	2.2	17.9	17.9	ND	ND	ND	1.0	ND	ND	ND	ND	NR	0.0022	3.00	3.00	1.0-3.00	998	Falling A.P		
R08	ND	ND	ND	ND	4.8	4.6	17.1	17.1	ND	ND	ND	1.0	ND	ND	ND	ND	NR	0.0048	0.90	3.00	NR	998			
AIR	ND	ND	ND	ND	ND	ND	20.3	20.3	ND	ND	ND	1.0	NR	NR	NR	NR	NR	NR	NR	NR	NR	958	Time: 14:00	Date: 06.04.22	
R02	ND	ND	ND	ND	2.5	2.5	18.4	18.4	ND	ND	ND	1.0	ND	ND	ND	ND	NR	0.0025	1.90	3.00	1.0-1.90	958			
R05	ND	ND	ND	ND	2.6	2.6	18.3	18.3	ND	ND	ND	1.0	ND	ND	ND	ND	NR	0.0026	3.00	3.00	1.0-3.00	958	Cloudy, Windy, Wet		
R15	ND	ND	ND	ND	2.3	2.3	18.4	18.4	ND	ND	ND	1.0	ND	ND	ND	ND	NR	0.0023	2.70	3.00	1.0-2.70	959			
R13	ND	ND	ND	ND	1.8	1.8	19.4	19.4	ND	11.0	ND	1.0	ND	0.8	ND	ND	NR	0.0018	3.00	3.00	1.0-3.00	960	Falling A.P		
R08	Unable to take reading due to water level within borehole																								

ND - Not detected

NR - Not recorded

NB: where no flow (ND) recorded Qhg values are calculated using equipment limit of detection (0.1 l/hr). Where negative flows recorded, these are converted to positive values for calculation of Qhg.

SITE:	Lindley Moor Road, Huddersfield	
CLIENT:	2SH Developments Ltd	
JOB NO:	7768	
SHEET NO:	2	

GAS MONITORING RESULTS

	GAS CONCENTRATIONS												FLOW DATA				Qhg per borehole		WELL AND WATER DATA				A Pressure (mB)	Comments
Monitoring Point	Methane (%v/v)		%LEL		Carbon dioxide (%v/v)		Oxygen (%v/v)		H2S (ppm)	CO (ppm)	Hex (%)	PIDCf ()	Flow rate (l/hr)		Differential borehole Pressure (Pa)	Time for flow to equalise (secs)	Methane (l/hr)	CO2 (l/hr)	Water level (mbgl)	Depth of well (m)	Response Zone			
	Peak	Steady	Peak	Steady	Peak	Steady	Min	Steady					Steady	Peak										
AIR	ND	ND	ND	ND	ND	ND	20.5	20.5	ND	ND	ND	1.0	NR	NR	NR	NR	NR	NR	NR	NR	NR	988	Time: 11:00 Date: 20.04.22	
R02	ND	ND	ND	ND	2.2	2.2	18.5	18.5	ND	10.0	ND	1.0	ND	ND	ND	ND	NR	0.0022	2.10	3.00	1.0-2.10	988		
R05	ND	ND	ND	ND	2.4	2.4	17.6	17.6	ND	ND	ND	1.0	ND	ND	ND	ND	NR	0.0024	2.60	3.00	1.0-2.60	987	Sunny, Dry, Warm	
R15	ND	ND	ND	ND	1.7	1.7	18.7	18.7	ND	ND	ND	1.0	ND	ND	ND	ND	NR	0.0017	3.00	3.00	1.0-3.00	989		
R13	ND	ND	ND	ND	2.0	2.0	17.9	17.9	ND	ND	ND	1.0	ND	ND	ND	ND	NR	0.002	3.00	3.00	1.0-3.00	988		
R08	Unable to monitor due to water ingress in machine																							
AIR	ND	ND	ND	ND	ND	ND	20.7	20.7	ND	ND	0.003	1.0	NR	NR	NR	NR	NR	NR	NR	NR	NR	992	Time: 13:00 Date: 05.05.22	
R02	ND	ND	ND	ND	2.2	2.2	19.1	19.1	ND	ND	0.000	1.0	ND	ND	ND	ND	NR	0.0022	2.20	3.00	1.0-2.20	992		
R05	ND	ND	ND	ND	2.3	2.3	19.0	19.0	ND	ND	0.000	1.0	ND	ND	ND	ND	NR	0.0023	2.30	3.00	1.0-2.30	991	Cloudy, Dry, Warm	
R15	ND	ND	ND	ND	1.8	1.8	19.3	19.3	ND	ND	0.000	1.0	ND	0.8	ND	ND	NR	0.0018	3.00	3.00	1.0-3.00	992		
R13	ND	ND	ND	ND	2.1	2.1	19.1	19.1	ND	ND	0.000	1.0	ND	2.3	ND	ND	NR	0.0021	2.80	3.00	1.0-2.80	991	Falling A.P	
R08	Unable to monitor due to water ingress in machine																							

ND - Not detected

NR - Not recorded

NB: where no flow (ND) recorded Qhg values are calculated using equipment limit of detection (0.1 l/hr). Where negative flows recorded, these are converted to positive values for calculation of Qhg.