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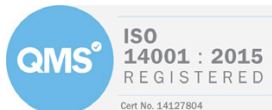


GAS MONITORING REPORT

job number	date
site address	
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Please consider the environment before printing this report.



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Rogers Geotechnical Services Ltd
Offices 1 & 2 Barncliffe Business Park, Near Bank, Shelley, Huddersfield, HD8 8LU
☎ 01484 604354 Company No. 5130864

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Our Ref C3637/23/E/GM
5th June 2024

31 Gawthorpe Lane,
Kirkheaton,
Huddersfield,
West Yorkshire,
HD5 0NY



For the attention of Steve Douthwaite,

Dear Sir,

Ref: Land off Wood Lane, Colnebridge.

Further to our report on a geo-environmental investigation (C3637/23/E/5969) which was presented in April 2024, we have now completed the gas monitoring and present our findings.

Monitoring

Gas monitoring standpipes were installed to between 2.0m and 4.0m depth in boreholes WS01, WS02 and WS03, the locations of which are provided on the site plan presented as Appendix 1 of the geo-environmental report. Visits were made to the site between the 1st February and 15th April 2024. The results of this work can be seen in the Appendix and are tabulated below.

Table 1: Gas monitoring								
Location	Date	CH ₄ (%)	CO ₂ (%)	O ₂ (%)	Flow	Barometric Pressure (mb)	Water Level (m)	Standpipe Depth (m)
WS01	01.02.2024	0.1-0.1	0.3-0.3	21.6-21.6	0.1	1026 ↔	1.20	3.19
	09.02.2024	0.1-0.1	0.4-0.4	21.0-21.0	0.1	969 ↔	1.33	
	15.02.2024	0.1-0.1	0.4-0.4	20.6-20.6	0.1	991 ↔	1.22	
	22.02.2024	0.0-0.1	0.6-0.6	20.7-20.7	0.1	974 ↔	1.35	
	11.03.2024	0.1-0.1	1.0-1.0	21.3-21.3	0.1	1003 ↑	1.16	
	15.04.2024	0.0-0.0	0.5-0.5	20.0-20.0	0.1	992 ↔	1.18	
WS02	01.02.2024*	0.1-0.1	1.6-1.6	20.5-20.5	0.1	1027 *	0.35	3.00
	09.02.2024	0.1-0.2	0.4-1.3	21.0-21.0	0.1	970 ↔	0.22	
	15.02.2024	0.0-0.1	0.1-3.0	21.2-19.8	0.2	999 ↔	0.28	
	22.02.2024	0.1-0.2	1.3-1.3	21.4-21.4	0.1	975 ↔	0.21	
	11.03.2024	0.0-0.0	4.6-4.7	20.7-20.7	0.2	1003 ↑	0.30	
	15.04.2024	0.0-0.0	0.1-0.1	19.8-19.8	0.1	990 ↔	0.16	
WS03	01.02.2024	0.0-0.1	1.0-1.0	20.8-20.8	0.4	1027 ↔	0.29	2.00
	09.02.2024	0.1-0.1	0.3-1.6	21.0-20.5	0.2	970 ↔	0.24	
	15.02.2024	0.1-0.1	0.6-0.6	21.2-21.2	0.1	999 ↔	0.32	
	22.02.2024	0.0-0.0	2.6-2.8	19.3-19.3	0.1	974 ↔	0.27	
	11.03.2024	0.0-0.0	1.3-2.4	18.6-18.4	0.2	1004 ↑	0.35	
	15.04.2024	0.0-0.0	1.1-1.1	16.9-16.9	0.1	990 ↔	0.39	

↑ rising pressure

↓ falling pressure

→ steady pressure



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The monitoring visits prior to the 15th April 2024 were undertaken using a Geotechnical Instruments (UK) Ltd. GA5000 (serial No G503524) which was last calibrated on the 12th September 2023. The final visit carried out on the 15th April 2024 was carried out with a Ashtend GFM436-1 monitor last calibrated on the 5th March 2024 (and has the serial No. 14082). The calibration certificates for both monitors used can be found within the Appendix.

Gas Concentrations

With respect to ground gas, the results of the monitoring visits indicated a maximum concentration of 0.2% methane, with concentrations of carbon dioxide ranging between 0.1% and 4.7%, in association with oxygen levels of between 16.9% and 21.6%. It should be appreciated that on non-contaminated sites there is generally about 20% by volume of oxygen, associated with low levels of carbon dioxide. In addition, a maximum flow rate of 0.4 litres per hour was recorded and will be employed in the following calculations.

The principal driving force for initiating the movement of gas in the ground is a change in barometric pressure. The most onerous gas condition on a site is usually observed on days of low or falling barometric pressure, preferably below 1000mb. It has been noted that measurements undertaken solely during high pressure conditions may be of lesser value. At this site the readings undertaken to date were at atmospheric pressures of between 1005mb and 1018mb.

Risk Assessment

In order to establish the gas screening value (GSV) for carbon dioxide or methane, the maximum gas concentration (expressed as a decimal) is multiplied by the borehole flow rate (l/hr). In this case 0.2% (0.002) methane was recorded along with 4.7% (0.047) carbon dioxide, in association with a maximum flow rate of 0.4 l/hr. This results in a GSV of 0.0008 l/hr for methane and a GSV of 0.0188 l/hr for carbon dioxide.

In accordance with Table 2 of BS8485: 2015, *Code of practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings*, the site may be characterised as *Characteristic Situation Level 1*. It is therefore considered that there is a very low risk of harm to end users and site operatives and no special precautionary measures are required in accordance to Table 8.6, *Typical scope of gas protection measures*, of CIRIA report C665.

With regard to the number of monitoring visits required reference is made to Tables 5.5a and 5.5b of CIRIA report C665 (2007)¹. Accepting that the proposed development is of high sensitivity and that the generation potential is very low, these tables suggest that 6 readings could be undertaken over a period of 3 months. However, C665 notes that *not all sites will require gas monitoring for the period and frequency indicated in Tables 5.5a and 5.5b*.

In this case, a total of 6 monitoring visits were undertaken over a three-month time period and for the purpose of this assessment, it is considered that the site can be fully classified as Characteristic Situation Level 1.

¹ Adapted from tables 5.5a and 5.5b of CIRIA C665, 2007, *Assessing risks posed by hazardous ground gas to buildings*, p60.



References

- British Standards Institution (2013), BS 8576 Guidance on Investigations for Ground Gas – Permanent Gases and Volatile Organic Compounds.
- British Standards Institution (2015 +A1:2019) BS8485: *Code of practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings*, B.S.I., London.
- CIRIA Report C665, *Assessing risks posed by ground gasses to building*.

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We trust that this information is of interest and should you have any other requirements do not hesitate to contact us.

For Rogers Geotechnical Services Ltd,

Yours Faithfully,

Steven Hale BSc FGS
Geo-environmental Technician

Rob Palmer MSc FGS ACIEH
Senior Geo-environmental Engineer

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Client:

Site:

Input by : M. Tuck

Checked by : H Letch

Date : 15.04.2024

Date : 16.04.2024

Gas Monitor: Geotech GA5000

Serial No. G503524

Calibration Date: 12.09.2023

Dip Meter: 003

(If second monitor is used)

Gas Monitor: Ashtend GFM436-1

Serial No. 14082

Calibration Date: 05.03.2024

Dip Meter 3

[illegible][illegible]

CERTIFICATION OF CALIBRATION



Date Of Calibration: 12-Sep-2023

Certificate Number: G503524_2/33564

Issued by: QED Environmental Systems Ltd.

Customer: QED Environmental Systems Ltd (Lease)
Barncliffe Mills Near Bank Shelley
HUDDERSFIELD HD8 8LU UNITED KINGDOM

Description: Gas Analyser

Model: GA5000

Serial Number: G503524

UKAS Accredited results:

Results after adjustment :

Methane (CH ₄)		
Certified Gas (%)	Instrument Reading (%)	Uncertainty (%)
5.0	5.0	0.072
15.0	15.0	0.13
60.0	59.7	0.42

Carbon Dioxide (CO ₂)		
Certified Gas (%)	Instrument Reading (%)	Uncertainty (%)
5.0	5.0	0.074
15.0	15.0	0.13
40.0	40.0	0.29

Oxygen (O ₂)		
Certified Gas (%)	Instrument Reading (%)	Uncertainty (%)
20.2	20.3	0.25

The inwards assessment was carried out 01-Aug-2023.

The maximum adjustment is larger than the specification limit.

Inwards assessment data is available if requested.

All concentrations are molar.

CH₄, CO₂ readings recorded at : 33.5 °C ± 2.5 °C

O₂ readings recorded at : 23.9 °C ± 2.5 °C

Barometric Pressure : 1003 mbar ± 4 mbar

Method of Test : The analyser is calibrated in a temperature controlled chamber using a series of reference gases, in compliance with procedure LP004.

Instrument has passed calibration as the measurement result is within the specification limit. The specification limit takes into account the measurement uncertainty.

The results relate only to the item calibrated

This certificate is issued in accordance with the laboratory accreditation requirements of the United Kingdom Accreditation Service. It provides traceability of measurement to the SI system of units and/or to units of measurement realised at the National Physical Laboratory or other recognised national metrology institutes. This certificate may not be reproduced other than in full, except with the prior written approval of the issuing laboratory.

Calibration Instance:118 IGC Instance:117

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www.qedenv.com +44 (0) 333 800 0088 sales@qedenv.co.uk

QED Environmental Systems Ltd. Cyan Park - Unit 3, Jimmy Hill Way, Coventry, CV2 4QP, UNITED KINGDOM

Registered in England and Wales 1898734

CERTIFICATION OF CALIBRATION



Date Of Calibration: 12-Sep-2023

Certificate Number: G503524_2/33564

Issued by: QED Environmental Systems Ltd.

The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor of $k=2$, providing a level of confidence of approximately 95%. The uncertainty evaluation has been carried out in accordance with UKAS requirements.

Calibrations marked 'Non-UKAS Accredited results' on this certificate have been included for completeness.

Non-UKAS accredited results after adjustment:

Barometer (mbar)	
Reference	Instrument Reading
1003	1003

Additional Gas Cells		
Gas	Certified Gas (ppm)	Instrument Reading (ppm)
CO	500	500
H ₂ S	273.5	274

Internal Flow	
Applied (l/hr)	Instrument Reading (l/hr)
5.0	4.9
10.0	9.9

Date of Issue : 15-Sep-2023

Approved by Signatory

Keeley Knight

Laboratory Inspection

End of Certificate

This certificate is issued in accordance with the laboratory accreditation requirements of the United Kingdom Accreditation Service. It provides traceability of measurement to the SI system of units and/or to units of measurement realised at the National Physical Laboratory or other recognised national metrology institutes. This certificate may not be reproduced other than in full, except with the prior written approval of the issuing laboratory.

Calibration Instance:118 IGC Instance:117

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QED Environmental Systems Ltd. Cyan Park - Unit 3, Jimmy Hill Way, Coventry, CV2 4QP, UNITED KINGDOM

Registered in England and Wales 1898734

TEST DATE AND CONDITIONS	
Date	05/03/24
Atmospheric pressure	1000mb
Ambient Temp	21.2°C
EnviroNics Serial No.	2633

GAS DATA LTD	 GAS DATA LISTEN · ANALYSE · INFORM
Unit D,	
Earlplace Business Park,	
Coventry,	
CV4 9XL, UK	
+44 (0) 24 7630 3311	

GFM436-1 FINAL INSPECTION & CALIBRATION CHECK CERTIFICATE

FLOW CHECKS					
Calibration Flow		Instrument Flow Channels Read			
Applied Flow (l/hour)	Applied Pressure (Pa)	Flow [Flow] (l/hour)	tol. (l/hour)	Differential Pressure [Dp] (Pa)	tol. (Pa)
-30.0	-436	-29.6	+/-3.0	-434	+/-50
-3.0	-18	-2.8	+/-1.0	-20	+/-6
0.0	0	0.0	0.0	0	0.0
+3.0	15	3.0	+/-0.5	17	+/-3
+30.0	379	29.9	+/-3.0	387	+/-50
+60.0	1203	59.4	+/-6.0	1198	+/-130
+90.0	2395	90.4	+/-9.0	2452	+/-250

TEMPERATURE CHECK		
Calibration Temperature	Instrument Temperature Channel Read	
Applied Equivalent Temperature (°C)	Temperature [Temp] (°C)	tol. (°C)
-10.0	-10.0	+/- 2.0
0.0	0.0	+/- 1.0
30.0	30.0	+/- 1.0
60.0	60.0	+/- 1.0
100.0	100.0	+/- 1.0

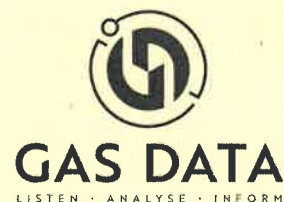
Notes:

The instrument identified by the serial number stated above has been tested by Gas Data personnel for calibration accuracy on the date and under the ambient conditions stated. Gas Data Ltd internal BS EN ISO9001:2015, BS EN ISO 14001:2015 and BS EN ISO 45001:2018 compliant workshop procedures were followed to apply known calibration test gases, gas flow rates, pressures and temperatures of the values stated. The results displayed on the instrument at each stage are recorded above.

Gas Data Ltd is certified to: BS EN ISO 9001:2015
 BS EN ISO 14001:2015
 BS EN ISO 45001:2018

TEST DATE AND CONDITIONS	
Date	05/03/24
Atmospheric pressure	1000mb
Ambient Temp	21.2°C
EnviroNics Serial No.	2633

GAS DATA LTD
Unit D,
Earlplace Business Park,
Coventry,
CV4 9XL, UK
+44 (0) 24 7630 3311



GFM436-1 FINAL INSPECTION & CALIBRATION CHECK CERTIFICATE

INSTRUMENT DETAILS	
Serial No	Customer
14082	Ashtead Technology Ltd

INSTRUMENT CHECKS			
Keyboard	✓	Pump Flow	500cc/min
Display Contrast	✓	Pump Flow @ -200mB	350cc/min
Clock Set / Running	✓	S/W Version	G436-00.0029/0010
Labels Fitted	✓	Recalibration Date	05/03/25

GAS CHECKS							
Calibration Gas		Instrument Gas Channels Read					
Gas Type	Applied Conc.	CH4 (%)	tol. (% vol.)	CO2 (%)	tol. (% vol.)	O2 (%)	tol. (% vol.)
N2	100%	0.0	0.0	0.0	0.0	0.0	+/-0.1
CH4	5%	5.1	+/-0.3	0.0	0.0	0.0	+/-0.1
	60%	60.2	+/-3.0	0.0	0.0	0.0	+/-0.1
CO2	5%	0.0	0.0	5.1	+/-0.3	0.0	+/-0.1
	40%	0.0	0.0	40.1	+/-3.0	0.0	+/-0.1
O2	20.9%	0.0	0.0	0.1	+0.1	21.0	+/-0.5

OPTIONAL GAS CHECKS							
Calibration Gas		Instrument Gas Channels Read					
Gas Type	Applied Conc.	Label	H2S	CO		Hexane	tol. (% vol.)
		Range	5000ppm	2000ppm		2.00%	
N2	100%		0	0		0.000	0.0
H2S	1500ppm		1490	0			+/- 5.0
CO	1000ppm		130	992			+/- 5.0
Hexane	2.00%					1.940	+/- 10.0

PRESSURE CHECKS							
Calibration Pressure		Instrument Pressure Channels Read					
Pressure @	Applied Pressure	Atmospheric [Ap] (mB)	tol. (mB)				
All Ports	Current Atmospheric	999	+/-2.0				
Ap Port (Internal)	+800mB(a)	799	+/-5.0				
	+1200mB(a)	1197	+/-5.0				