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Mr K Gelder
South West Yorkshire Partnership
Finance Department
Block 9
Fieldhead Hospital
Ouchthorpe Lane
Wakefield WF1 3SP

BY E-MAIL

Our Ref: SWY/02/HMMjc

12th March 2018

Dear Mr Gelder

Mount Vernon Road, Worsborough, Barnsley

In accordance with our commission, and following issue of the ARP Geotechnical Ltd (ARP) Stage 2 Geo-Environmental Report, reference SWY/02r1 dated February 2018, we have now completed all six of the gas monitoring visits at the above site. A full set of gas monitoring results are appended and summarised below.

Background

During the site investigation which commenced in November 2017, 4 no. gas monitoring wells were installed, in WS2, WS5, WS8 and WS13, and subsequently monitored by ARP Geotechnical Ltd. The well in WS2 was installed to 2.0m depth, with the bottom 1.0m comprising slotted pipe with gravel surround, and the upper 1.0m comprising plain pipe. The wells in WS5 and WS13 were installed to 1.0m depth, with the bottom 0.5m comprising slotted pipe with gravel surround, and the upper 0.5m comprising plain pipe. The well in WS8 was installed to 1.4m depth, with the bottom 1.0m comprising slotted pipe with gravel surround, and the upper 0.4m comprising plain pipe. All were sealed with bentonite and a lockable flush cover.

Monitoring

The ground gas investigation was undertaken in accordance with BS 8576 : 2013 "Guidance on investigations for ground gas - Permanent gases and Volatile Organic Compounds (VOCs)". A ground gas risk assessment was carried out in accordance with BS 8485 : 2015 "Code of practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings".

The monitoring visits were carried out to record the levels of methane (CH_4), oxygen (O_2), carbon dioxide (CO_2), groundwater level, and borehole gas flow rate within the wells. The visits were made between Wednesday 13th December 2018 and Thursday 8th March 2018, during a variety of atmospheric pressures, including one visit of rising pressure and five visits of variable pressure.

Maximum readings of 0.0% v/v CH_4 and 2.5% v/v CO_2, were recorded, along with a maximum peak borehole gas flow rate of 0.0 l/hr.

Assessment

The British Standard, BS 8485 : 2015, utilises the concept of borehole hazardous gas flow rates (Q_{hg}), in litres/hour (l/hr), which are obtained by multiplying flow rate by concentrations in the air stream of the particular gas being considered for each borehole. The Q_{hg} is used to derive a gas screening value (GSV), which is defined as the "flow rate of a specific hazardous gas representative of a site or zone, derived from assessment of borehole concentration and flow rate measurements and taking account of all other influencing factors, in accordance with a conceptual site model".

The table below allows the selection of the 'Characteristic Gas Situation' (CS) based on GSVs, using a numbering system of 1 to 6, where 1 equates to a very low hazard potential and 6 equates to a very high hazard potential.

Characteristic Gas Situation (CS)	NHBC Traffic Light	Hazard Potential	Gas Screening Value - l/hr - (GSV)	Additional Factors
1	Green	Very Low	<0.07	Typically <1% CH_4 and <5% CO_2, otherwise consider an increased Characteristic Gas Regime
2	Amber 1	Low	>0.07 to <0.7	Typical Measured Flow Rate <70l/hr, otherwise consider an increase to CS 3
3	Amber 2	Moderate	>0.7 to <3.5	
4	Red	Moderate to high	>3.5 to <15	
5		High	>15 to <70	
6		Very High	>70	

Based on Table 2 of BS 8485:2015

Therefore, for the gas regime identified on the site, where 0.0% v/v CH_4 and 2.5% v/v CO_2 were detected, along with 0.0 l/hr borehole flow rate, a maximum worst-possible Qhg of 0.00 l/hr is the result, for carbon dioxide.

A Characteristic Situation (CS) of CS1 is therefore applicable, which is equivalent to Green under the NHBC traffic light system. Therefore, no gas protection measures are required for the proposed properties on the site.

We trust the above is sufficient for your requirements. However, should you have any queries, or wish to discuss the matter further, please do not hesitate to contact us at your convenience.

Yours sincerely
for ARP GEOTECHNICAL LTD

H M McPhail

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ARP GEOTECHNICAL BOREHOLE MONITORING RESULTS

JOB NO. SWY/02 **CLIENT:** South West Yorkshire Partnership

SITE: Mount Vernon Hospital

BAROMETRIC PRESSURES

Monitor Date	Weather on Day	Pressure on Day (mb)*	Pressure on day before (mb)*	Pressure 2 days before (mb)*	Pressure 3 days before (mb)*	Trend*
13/12/2017	Sunny, cold	990	1007	989	979	Variable
21/12/2017	Mild,rainy	1034	1033	1033	1033	Rising
07/02/2018	dry, cold	1022	1018	1029	1030	Variable
14/02/2018	Wet, cold	1000	998	1012	1001	Variable
22/02/2018	dry, cold	1027	1029	1023	1016	Variable
08/03/2018	Snowy,cold	992	994	998	989	Variable

Check dates. Monitoring should be carried out over 3 months

*Pressures at midday (EGNM) corrected to sea level.

https://www.timeanddate.com/weather/uk/leeds/historic

ARP GEOTECHNICAL BOREHOLE MONITORING RESULTS

JOB NO: SWY/02 **CLIENT:** South West Yorkshire Partnership

SITE: Mount Vernon Hospital

BH: WS13

Date	BH Steady Flow Rate (l/hr)*	Peak CH_4 %	Qhg CH_4 (l/hr)	Peak CO_2 %	Qhg CO_2 (l/hr)	Min. O_2 %	Depth to G Water (m)	Comment
13/12/2017	0.0	0.0	0.000	0.0	0.000	19.0		
21/12/2017	0.0	0.0	0.000	0.0	0.000	19.2		
07/02/2018	0.0	0.0	0.000	0.0	0.000	19.1		
14/02/2018	0.0	0.0	0.000	0.0	0.000	19.0		
22/02/2018	0.0	0.0	0.000	0.0	0.000	18.9		
08/03/2018	0.0	0.0	0.000	0.0	0.000	18.8		

* Where no flow is detected, detection limit of 0.1l/hr should be inserted

Qhg = Hazardous gas flow rate, in accordance with BS8485:2007

ARP GEOTECHNICAL BOREHOLE MONITORING RESULTS

JOB NO: SWY/02 **CLIENT:** South West Yorkshire Partnership

SITE: Mount Vernon Hospital

BH: WS2

Date	BH Steady Flow Rate (l/hr)*	Peak CH_4 %	Qhg CH_4 (l/hr)	Peak CO_2 %	Qhg CO_2 (l/hr)	Min. O_2 %	Depth to G Water (m)	Comment
13/12/2017	0.0	0.0	0.000	2.0	0.000	18.0		
21/12/2017	0.0	0.0	0.000	1.0	0.000	18.9		
07/02/2018	0.0	0.0	0.000	0.5	0.000	19.0		
14/02/2018	0.0	0.0	0.000	0.0	0.000	19.1		
22/02/2018	0.0	0.0	0.000	0.4	0.000	19.3		
08/03/2018	0.0	0.0	0.000	0.7	0.000	20.4		

* Where no flow is detected, detection limit of 0.1l/hr should be inserted

Qhg = Hazardous gas flow rate, in accordance with BS8485:2007

ARP GEOTECHNICAL BOREHOLE MONITORING RESULTS

JOB NO: SWY/02 **CLIENT:** South West Yorkshire Partnership

SITE: Mount Vernon Hospital

BH: WS5

Date	BH Steady Flow Rate (l/hr)*	Peak CH_4 %	Qhg CH_4 (l/hr)	Peak CO_2 %	Qhg CO_2 (l/hr)	Min. O_2 %	Depth to G Water (m)	Comment
13/12/2017	0.0	0.0	0.000	1.0	0.000	20.0		
21/12/2017	0.0	0.0	0.000	2.5	0.000	19.5		
07/02/2018	0.0	0.0	0.000	1.0	0.000	19.0		
14/02/2018	0.0	0.0	0.000	0.5	0.000	19.1		
22/02/2018	0.0	0.0	0.000	0.8	0.000	19.4		
08/03/2018	0.0	0.0	0.000	0.9	0.000	20.0		

* Where no flow is detected, detection limit of 0.1l/hr should be inserted

Qhg = Hazardous gas flow rate, in accordance with BS8485:2007

ARP GEOTECHNICAL BOREHOLE MONITORING RESULTS

JOB NO: SWY/02 **CLIENT:** South West Yorkshire Partnership

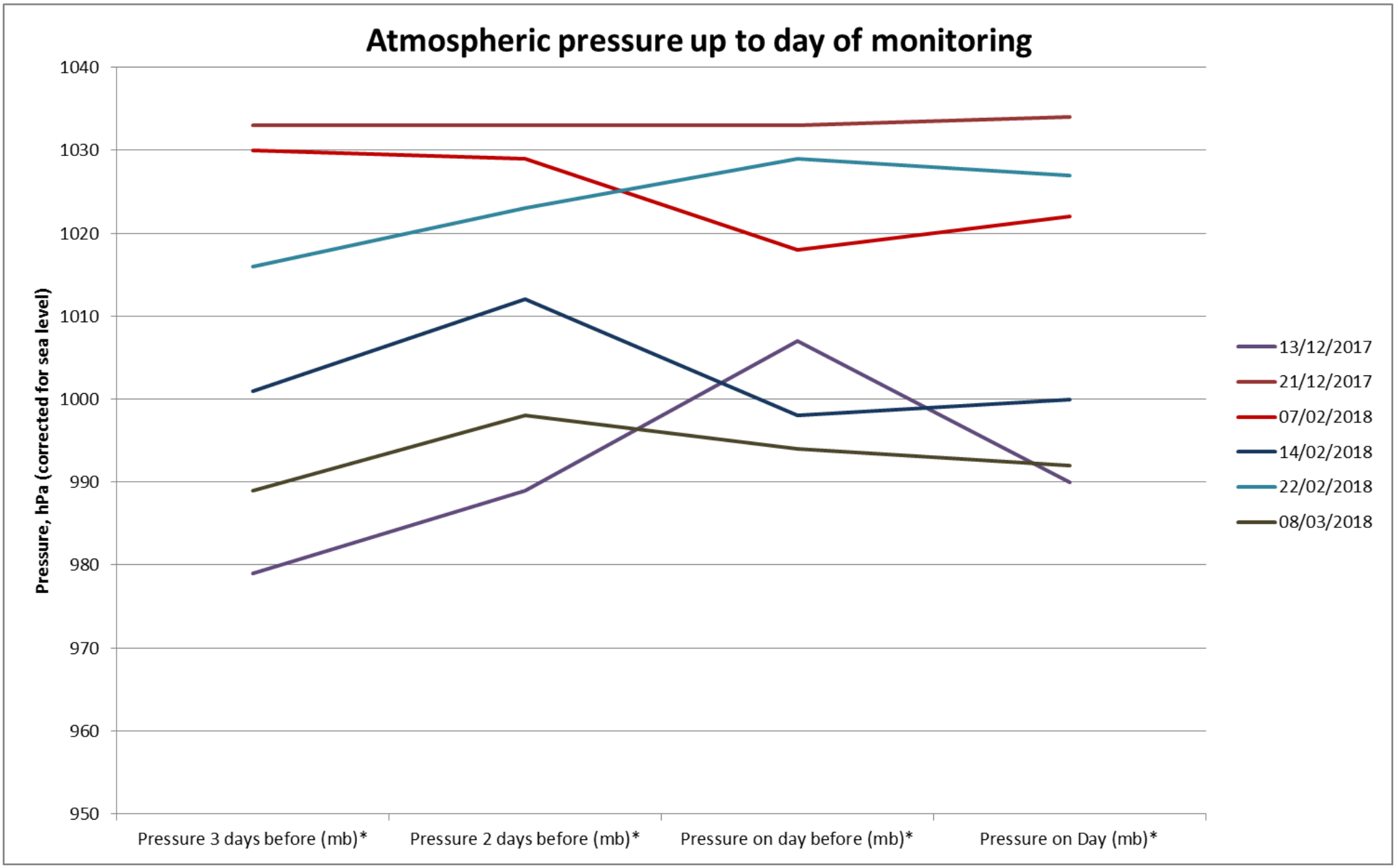
SITE: Mount Vernon Hospital

BH: WS8

Date	BH Steady Flow Rate (l/hr)*	Peak CH_4 %	Qhg CH_4 (l/hr)	Peak CO_2 %	Qhg CO_2 (l/hr)	Min. O_2 %	Depth to G Water (m)	Comment
13/12/2017	0.0	0.0	0.000	0.5	0.000	20.0		
21/12/2017	0.0	0.0	0.000	1.0	0.000	19.0		
07/02/2018	0.0	0.0	0.000	1.5	0.000	19.2		
14/02/2018	0.0	0.0	0.000	0.5	0.000	19.0		
22/02/2018	0.0	0.0	0.000	0.0	0.000	19.5		
08/03/2018	0.0	0.0	0.000	0.2	0.000	19.8		

* Where no flow is detected, detection limit of 0.1l/hr should be inserted

Qhg = Hazardous gas flow rate, in accordance with BS8485:2007


Atmospheric pressure up to day of monitoring
Pressure, hPa (corrected for sea level)
1040
1030
1020
1010
1000
990
980
970
960
950
Pressure 3 days before (mb)*
Pressure 2 days before (mb)*
Pressure on day before (mb)*
Pressure on Day (mb)*
13/12/2017
21/12/2017
07/02/2018
14/02/2018
22/02/2018
08/03/2018