PADDOCK GEO ENGINEERING

Feltham Properties
Feltham Construction Limited
Feltham House
42 London Road
Newbury, RG14 1LA

Our Ref: P23-062gas Update L01
Your Ref:
Date: 24th August 2023

Land adjacent to Broadwell Spring, Market Lavington, SN10 4EA – Final Ground Gas Monitoring and Updated Risk Assessment

To Whom it May Concern,

Further to your instructions a ground gas risk assessment was carried out as part of a Ground Investigation and Phase 2 Intrusive Contamination Assessment for the above site in April 2023 reference P23-062gi.

For the above assessment ground gas monitoring was carried out on 3no visit during April 2023. To complete the required 6no. monitoring visits and further monitoring at times of low atmospheric pressure (<1000mb), a further 3 no. monitoring visits were carried out between May and June 2023 and the data used to update the ground gas risk assessment which is detailed below.

The ground investigation report should be read in conjunction with this Final Ground Gas Monitoring and Updated Risk Assessment.

Initial Ground Gas Risk Assessment

A Conceptual Gas Model was produced for the site for the initial ground gas risk assessment within the Ground Investigation report P23-062gi dated April 2023, which indicates a low ground gas risk to the proposed residential end site users, reference to which should be make when reading this final Ground Gas Monitoring and Updated Risk Assessment.

Preliminary ground gas monitoring comprising 3no. visits was carried out on the site during April 2023 to assess the risk posed from potential ground gas migration from landscaped land adjacent to the south of the site, landfills in the site area (closest 477m south) and an adjacent garage and petrol filling station to the east of the site from c. 1982 to before 2023.

The initial gas monitoring results gave a worst-case gas screening value of 0.0001l/hr for CH_4 and 0.0023l/hr CO_2. The calculated gas screening values are below the relevant threshold for both methane and carbon dioxide, which allows a Characteristic Situation 1 (CS1) / NHBC Green classification for the site.

Milton Keynes: The Log Cabin, Manor Farm, Whaddon Road, Newton Longville, Milton Keynes, MK17 0AU
Swindon/Oxford: 21 Tyrell Close, Stanford in the Vale, Oxon, SN7 8EY
T: 44 (0) 1908 764032
M: 44 (0) 7377 422528
E: matt@paddockgeoengineering.co.uk
W: www.paddockgeoengineering.co.uk

Company Number: 8613165
VAT Number: GB 166 8087 72

A minimum of 6 visits over a period of 3 months is recommended for a residential development, with at least 2no. at atmospheric pressures below 1000mb as per the CIRIA C665 guidance.

For the initial monitoring 3no. visits have been undertaken in April 2023 with none of the visits at atmospheric pressures of below 1000mb.

Given the risks identified on site and the results of the monitoring to date, it was considered that further monitoring with atmospheric pressure below 1000mb is unlikely to significantly alter the current conclusions. However, the minimum number of gas monitoring visits should be carried out.

Further to the above ground gas risk assessment the site is indicated within the reviewed associated Preliminary Contamination Risk Assessment to be in a lower probability radon area, with less than 1% of homes estimated to be at or above the action level. Therefore, no radon protection measures are necessary in the construction of any new swellings, buildings or extensions on site.

Updated Ground Gas Risk Assessment

Additional Ground Gas Monitoring

Following on from the initial 3no. ground gas monitoring visits on the site during April 2023 a further 3no. visit were made between May and June 2023 to complete the programmed 6no. visits.

The final ground gas monitoring visits were carried out by PGE using a Geotech GA5000 Gas Analyser (for detection of methane, carbon dioxide and oxygen) and a MiniRAE Lite (PGM 7300) Photo Ionisation Detector (PID) (for detection of volatile organic compounds - VOCs).

The results of the additional and initial monitoring are summarised in the table below, with the highest gas level within each well highlighted. The monitoring data is also enclosed.

Ground Gas Monitoring Summary

Borehole	Date	GW Level (mbgl)	Atmos. Press. (Mb)	Maximum Methane (% v/v)	Maximum Carbon Dioxide (% v/v)	Lowest Oxygen (% v/v)	Max sustained Flow (l/hr)	VOC
WS1	05/04/23 – 27/06/23	1.68-1.46	1009-1026	0.0	2.3	17.4	0.3	0.0
WS3		0.81-0.27		0.0	0.5	20.4		0.0
WS5		0.95-0.30		0.0	0.9	15.0		0.0

The ground gas monitoring on the site indicated very low concentrations of methane at a maximum level of 0.0% v/v. Therefore, for calculations a minimal value of 0.1% v/v will be employed.

Carbon dioxide concentrations were also recorded at low concentrations with a maximum level of 2.3% v/v in WS1 on 20th April 2023 monitoring visit.

Low sustained gas flows were recorded during the monitoring with a maximum value of 0.3l/hr.

A PID was also employed as a basic screening tool to identify potential hydrocarbon / vapour within the boreholes. No measurable concentrations of VOCs were noted during the monitoring visits.

It should be noted that elevated groundwater levels were recorded in the boreholes during the monitoring visits.

Updated Ground Gas Risk Assessment

The results of all the monitoring were assessed in accordance with CIRIA C665 2007 and BS8485:2015.

The proposed development comprises a single residential dwelling and thus based upon BS8485:2015, Table 3, the proposed development would likely be classified as;

> **Type A building –** Private ownership with no building management control on alteration to the internal structure, the use of rooms, the ventilation of rooms or the structural fabric of the building. Some small rooms present. Probably conventional building construction (rather than civil engineering). Examples include private housing and some retail premises.

As outlined in Note 3 for Table 3 – Building Type within BS8485:2015 highlights that the NHBC "Traffic Light" system is for use on residential developments and typically applies to Type A buildings.

The NHBC guidance assumes these Type A categorised buildings utilised beam and block floor construction with clear void ventilation.

Where this is the case, the development may be categorised, per Figure 8.1 CIRIA C665 2007, as falling under CIRIA Situation B;

> **Situation B -** Low rise building with minimum ventilated under floor void (minimum 150m)

Where the development fulfils these criteria the gas risk for the site may be assessed utilising either the NHBC "Traffic Light System" as outline in NHBC report No 10627-R01(04) / CIRIA C665 or the Characteristic Situation based upon the modified Wilson and Card classification, again as outlined within CIRIA C665.

Otherwise the development should be classified as

> **Situation A –** Any development other than Situation B e.g. factories, shops, commercial, warehouses, school, cinema, sports centres, stadiums, high rise housing with basements etc

For the proposed development, the site may be classified as Situation B as the proposed development is indicated to comprise residential dwellings of traditional construction. As such the site may potentially be assessed under either the NHBC "Traffic Light System" or the Characteristic Situation classification.

The results of all the monitoring were assessed in accordance with CIRIA C665 2007 / BS8485:2015.

A maximum methane concentration of 0.1% v/v and carbon dioxide concentration of 2.3% v/v were identified during the monitoring with a maximum sustained gas flow rate of 0.3l/hr detected.

The gas monitoring results gave a maximum Gas Screening value of 0.0003l/hr for methane and 0.0069l/hr carbon dioxide.

Based upon the calculated GSVs recorded the site falls into Characteristic Situation 1 (SC1) as per Table 2 within BS 8485:2015 or classifies as Green based upon NHBC traffic light system outlined in NHBC report No 10627-R01(04).

Ground Gas Risk Assessment Conclusions

A Conceptual Gas Model has been produced for the site which indicates a Low to Medium ground gas risk to the proposed residential end site users.

Ground gas monitoring comprising 6no. visits has been carried out on the site between April and June 2023 to assess the risk posed from potential ground gas migration from the landscaped land adjacent to the south of the site, landfills in the site area (closest 477m south) and an adjacent garage and petrol filling station to the east of the site from c. 1982 to before 2023.

The gas monitoring results so far have given a worst-case gas screening value of 0.0003l/hr for CH_4 and 0.0069l/hr CO_2. The calculated gas screening values are below the relevant threshold for both methane and carbon dioxide, which allows a Characteristic Situation 1 (CS1) / NHBC Green classification for the site.

A minimum of 6 visits over a period of 3 months is recommended for a residential development, with at least 2no. at atmospheric pressures below 1000mb as per the CIRIA C665 guidance. These criteria have been partially met with the monitoring, there was very limited low atmospheric pressure conditions during the monitoring period, so no monitoring has been carried out at times of atmospheric pressure below 1000mb, however, monitoring has been carried out at time of falling atmospheric pressure. Given the reading obtained it is considered that further monitoring at times of low atmospheric pressure are unlikely to give rise to an increased site gas classification.

Further to the above ground gas risk assessment the site is indicated within the reviewed associated Preliminary Contamination Risk Assessment to be in a lower probability radon area, with less than 1% of homes estimated to be at or above the action level. Therefore, no radon protection measures are necessary in the construction of any new dwellings, buildings or extensions on site.

Gas Protection Measures

For sites classifying as CS1 / Green, no special gas protection measures are required.

Written by:	Reviewed and Authorised by:
p.p	
Christian Avalos BSc (Hons) MSc FGS	**Matthew Paddock BSc (Hons) MSc FGS**
Senior Geo-Environmental Engineer	Director

Encs:
Borehole Location Plan
Monitoring Data

Certification

This report is produced for the sole use of the Client, and no responsibility of any kind, whether for negligence or otherwise, can be accepted for any Third Party who may rely upon it.

The conclusions and recommendations given in this report are based on our understanding of the future plans for the site and based on a scope of works agreed by the Client and afforded by the agreed budget. No responsibility is accepted for conditions not encountered, which are between exploratory points or outside of the agreed scope of work or if construction is commenced before regulatory approval of designs.

If the future plans for the site are changed, such as the site is developed for a more or less sensitive use, then a different interpretation might be appropriate.

The report has been prepared generally following the guidelines and principles established in the British Standards, BS5930:1999+A2:2010, BS 10175:2011, entitled 'Investigation of Potentially Contaminated Sites – Code of Practice' and the DEFRA/EA Contaminated Land Reports CLR7 and CLR8.

It necessarily relies on the co-operation of other organisations and the free availability of information and total access. No responsibility can, therefore, be accepted for conditions arising from information that was not available to the investigating team as a result of information being withheld or access being denied.

This report may suggest an opinion on a suspected configuration of strata or conditions between exploratory points and below the maximum depth of investigation. However, this is for guidance only and no liability can be accepted for its accuracy. Comments on the groundwater conditions are based on observations made at the time of the investigation unless otherwise stated. It should be noted, however, that groundwater levels might vary due to seasonal or other effects.

It should be noted that this report is based solely on the samples collected in the borehole locations investigated. During the works and following general site clearance, should the sub-soil conditions in other areas of the site appear to be inconsistent with those found in the areas sampled then this geotechnical appraisal and site contamination assessment may need to be reviewed.

This report is prepared and written in the context of the proposals stated in the introduction to this report and it should not be used in a differing context. Furthermore, new information, improved practices and changes in legislation may require an alteration to the report in whole or in part after its submission. Therefore, with any changes in circumstances, or after one year from the date of the report, the report should be referred back to Paddock Geo Engineering Limited for re-assessment (and, if necessary, for an estimate for the cost of such).

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PADDOCK GEO ENGINEERING

Exploratory Position Site Plan

Land adjacent to Broadwell Spring, Market Lavington, SN10 4EA

Feltham Properties

April 2023



NORTH

Percussion Liner Sampler Locations

Trial pit Locations

InfiltrationTesting Locations

Dynamic Probe Locations

Not to scale.
All positions are approximate.

GROUND GAS MONITORING SHEET

PADDOCK GEO ENGINEERING

SITE:	Land adjacent to Broadwell Spring, Market Lavington, SN10 4EA
JOB No.:	P23-062
DATE:	05/04/2023

BOREHOLE	WS1				Initial/ 30 secs	2 mins	Stable / 3 mins
TIME:	13:30	Flow l/h:	0.1	CH4 %	0.00	0.00	0.00
TEMP deg C:	11	DP Pa:		LEL			
Weather:	Raining	GW m:	1.60	CO2 %	1.10	0.90	0.70
Atm Pressure mb:	1009	Base of Borehole		O2 %	18.60	18.10	18.60
Operator:	BJ	Pipe Above GL	0.40	H2S ppm			
				VOCs %	0.00		
Comments							

BOREHOLE	WS5						
TIME:	13:36	Flow l/h:	0	CH4 %	0.00	0.00	0.00
TEMP deg C:	11	DP Pa:		LEL			
Weather:	Raining	GW m:	0.90	CO2 %	0.50	0.40	0.40
Atm Pressure mb:	1009	Base of Borehole		O2 %	21.10	21.20	21.20
Operator:	BJ	Pipe Above GL	0.50	H2S ppm			
				VOCs %	0.00		
Comments							

BOREHOLE	WS3						
TIME:	13:43	Flow l/h:	0	CH4 %	0.00	0.00	-
TEMP deg C:	11	DP Pa:		LEL			
Weather:	Raining	GW m:	0.70	CO2 %	0.60	0.60	-
Atm Pressure mb:	1009	Base of Borehole		O2 %	20.70	20.30	-
Operator:	BJ	Pipe Above GL	0.50	H2S ppm			
				VOCs %	0.00		-
Comments	Monitoring pulled in water during testing						

BOREHOLE							
TIME:		Flow l/h:		CH4 %			
TEMP deg C:		DP Pa:		LEL			
Weather:		GW m:		CO2 %			
Atm Pressure mb:		Base of Borehole		O2 %			
Operator:		Pipe Above GL		H2S ppm			
				VOCs %			
Comments							

Additional Notes

GROUND GAS MONITORING SHEET

PADDOCK GEO ENGINEERING

SITE:	Land adjacent to Broadwell Spring, Market Lavington, SN10 4EA
JOB No.:	P23-062
DATE:	12/04/2023

BOREHOLE	WS1				Initial/ 30 secs	2 mins	Stable / 3 mins
TIME:	11:02	Flow l/h:	0.1	CH4 %	0.00	0.00	0.00
TEMP deg C:	13	DP Pa:		LEL			
Weather:	Raining	GW m:	1.52	CO2 %	2.00	2.10	2.10
Atm Pressure mb:	1026	Base of Borehole		O2 %	18.50	18.40	18.50
Operator:	MIP	Pipe Above GL	0.40	H2S ppm			
				VOCs %	0.00		
Comments							

BOREHOLE	WS5						
TIME:	11:10	Flow l/h:	0	CH4 %	0.00	0.00	0.00
TEMP deg C:	13	DP Pa:		LEL			
Weather:	Raining	GW m:	0.65	CO2 %	1.00	0.90	0.90
Atm Pressure mb:	1026	Base of Borehole		O2 %	21.10	21.10	21.00
Operator:	MIP	Pipe Above GL	0.50	H2S ppm			
				VOCs %	0.00		
Comments							

BOREHOLE	WS3						
TIME:	11:20	Flow l/h:	0	CH4 %	-		
TEMP deg C:	13	DP Pa:		LEL			
Weather:	Raining	GW m:	0.42	CO2 %	-		
Atm Pressure mb:	1026	Base of Borehole		O2 %	-		
Operator:	MIP	Pipe Above GL	0.50	H2S ppm			
				VOCs %	0.00		
Comments	Monitoring pulled in water during testing						

BOREHOLE							
TIME:		Flow l/h:		CH4 %			
TEMP deg C:		DP Pa:		LEL			
Weather:		GW m:		CO2 %			
Atm Pressure mb:		Base of Borehole		O2 %			
Operator:		Pipe Above GL		H2S ppm			
				VOCs %			
Comments							

Additional Notes

GROUND GAS MONITORING SHEET

PADDOCK GEO ENGINEERING

SITE:	Land adjacent to Broadwell Spring, Market Lavington, SN10 4EA
JOB No.:	P23-062
DATE:	20/04/2023

BOREHOLE	WS1				Initial/ 30 secs	2 mins	Stable / 3 mins
TIME:	15:35	Flow l/h:	0.1	CH4 %	0.00	0.00	0.00
TEMP deg C:	14	DP Pa:		LEL			
Weather:	Sunny	GW m:	1.46	CO2 %	2.30	2.30	2.00
Atm Pressure mb:	1009	Base of Borehole		O2 %	18.60	15.80	15.80
Operator:	IT	Pipe Above GL	0.40	H2S ppm			
				VOCs %	0.00		
Comments							

BOREHOLE	WS5						
TIME:	15:45	Flow l/h:	0	CH4 %	-		
TEMP deg C:	14	DP Pa:		LEL			
Weather:	Sunny	GW m:	0.30	CO2 %	-		
Atm Pressure mb:	1009	Base of Borehole		O2 %	-		
Operator:	IT	Pipe Above GL	0.50	H2S ppm			
				VOCs %	0.00		
Comments	Monitoring pulled in water during testing						

BOREHOLE	WS3						
TIME:	15:50	Flow l/h:	0	CH4 %	-		
TEMP deg C:	14	DP Pa:		LEL			
Weather:	Sunny	GW m:	0.27	CO2 %	-		
Atm Pressure mb:	1009	Base of Borehole		O2 %	-		
Operator:	IT	Pipe Above GL	0.50	H2S ppm			
				VOCs %	0.00		
Comments	Monitoring pulled in water during testing						

BOREHOLE							
TIME:		Flow l/h:		CH4 %			
TEMP deg C:		DP Pa:		LEL			
Weather:		GW m:		CO2 %			
Atm Pressure mb:		Base of Borehole		O2 %			
Operator:		Pipe Above GL		H2S ppm			
				VOCs %			
Comments							

Additional Notes

GROUND GAS MONITORING SHEET

PADDOCK GEO ENGINEERING

SITE:	Land adjacent to Broadwell Spring, Market Lavington, SN10 4EA
JOB No.:	P23-062
DATE:	17/05/2023

BOREHOLE	WS1				Initial/ 30 secs	2 mins	Stable / 3 mins
TIME:	12:15	Flow l/h:	0.1	CH4 %	0.00	0.00	0.00
TEMP deg C:	16	DP Pa:		LEL			
Weather:	Dry	GW m:	1.44	CO2 %	0.40	0.50	0.50
Atm Pressure mb:	1020	Base of Borehole		O2 %	20.90	20.70	20.40
Operator:	EA	Pipe Above GL	0.40	H2S ppm			
				VOCs %	0.00		
Comments							

BOREHOLE	WS5						
TIME:	12:35	Flow l/h:	0.3	CH4 %	0.00	0.00	0.00
TEMP deg C:	14	DP Pa:		LEL			
Weather:	Sunny	GW m:	0.56	CO2 %	0.30	0.20	0.20
Atm Pressure mb:	1009	Base of Borehole		O2 %	20.60	20.80	20.70
Operator:	IT	Pipe Above GL	0.50	H2S ppm			
				VOCs %	0.00		
Comments							

BOREHOLE	WS3						
TIME:	12:22	Flow l/h:	0.2	CH4 %	0.00	0.00	0.00
TEMP deg C:	14	DP Pa:		LEL			
Weather:	Sunny	GW m:	0.36	CO2 %	0.50	0.20	0.20
Atm Pressure mb:	1009	Base of Borehole		O2 %	20.80	20.60	20.80
Operator:	IT	Pipe Above GL	0.50	H2S ppm			
				VOCs %	0.00		
Comments							

BOREHOLE							
TIME:		Flow l/h:		CH4 %			
TEMP deg C:		DP Pa:		LEL			
Weather:		GW m:		CO2 %			
Atm Pressure mb:		Base of Borehole		O2 %			
Operator:		Pipe Above GL		H2S ppm			
				VOCs %			
Comments							

Additional Notes

GROUND GAS MONITORING SHEET

PADDOCK GEO ENGINEERING

SITE:	Land adjacent to Broadwell Spring, Market Lavington, SN10 4EA
JOB No.:	P23-062
DATE:	02/06/2023

BOREHOLE	WS1				Initial/ 30 secs	2 mins	Stable / 3 mins
TIME:	12:50	Flow l/h:	0.2	CH4 %	0.00	0.00	0.00
TEMP deg C:	16	DP Pa:		LEL			
Weather:	Dry	GW m:	1.55	CO2 %	0.30	0.30	0.30
Atm Pressure mb:	1016	Base of Borehole		O2 %	18.50	16.50	21.30
Operator:	EA	Pipe Above GL	0.40	H2S ppm			
				VOCs %	0.00		
Comments							

BOREHOLE	WS5						
TIME:	13:30	Flow l/h:	0.1	CH4 %	0.00	0.00	0.00
TEMP deg C:	14	DP Pa:		LEL			
Weather:	Sunny	GW m:	0.57	CO2 %	0.30	0.20	0.20
Atm Pressure mb:	1009	Base of Borehole		O2 %	20.60	20.80	20.70
Operator:	IT	Pipe Above GL	0.50	H2S ppm			
				VOCs %	0.00		
Comments							

BOREHOLE	WS3						
TIME:	13:30	Flow l/h:	0.2	CH4 %	0.00	0.00	0.00
TEMP deg C:	14	DP Pa:		LEL			
Weather:	Sunny	GW m:	0.61	CO2 %	0.40	0.20	0.20
Atm Pressure mb:	1009	Base of Borehole		O2 %	20.90	21.10	21.00
Operator:	IT	Pipe Above GL	0.50	H2S ppm			
				VOCs %	0.00		
Comments							

BOREHOLE							
TIME:		Flow l/h:		CH4 %			
TEMP deg C:		DP Pa:		LEL			
Weather:		GW m:		CO2 %			
Atm Pressure mb:		Base of Borehole		O2 %			
Operator:		Pipe Above GL		H2S ppm			
				VOCs %			
Comments							

Additional Notes

GROUND GAS MONITORING SHEET

PADDOCK GEO ENGINEERING

SITE:	Land adjacent to Broadwell Spring, Market Lavington, SN10 4EA
JOB No.:	P23-062
DATE:	27/06/2023

BOREHOLE	WS1				Initial/ 30 secs	2 mins	Stable / 3 mins
TIME:	12:25	Flow l/h:	0.2	CH4 %	0.00	0.00	0.00
TEMP deg C:	19	DP Pa:		LEL			
Weather:	Clear	GW m:	1.68	CO2 %	1.10	1.00	1.40
Atm Pressure mb:	1013	Base of Borehole		O2 %	17.40	17.50	18.30
Operator:	GS	Pipe Above GL	0.40	H2S ppm			
				VOCs %	0.00		
Comments							

BOREHOLE	WS5						
TIME:	12:39	Flow l/h:	0.2	CH4 %	0.00	0.00	0.00
TEMP deg C:	19	DP Pa:		LEL			
Weather:	Clear	GW m:	0.81	CO2 %	0.40	0.30	0.30
Atm Pressure mb:	1013	Base of Borehole		O2 %	20.40	20.50	20.40
Operator:	GS	Pipe Above GL	0.50	H2S ppm			
				VOCs %	0.00		
Comments							

BOREHOLE	WS3						
TIME:	12:51	Flow l/h:	0.1	CH4 %	0.00	0.00	0.00
TEMP deg C:	19	DP Pa:		LEL			
Weather:	Clear	GW m:	0.95	CO2 %	0.90	0.90	0.90
Atm Pressure mb:	1013	Base of Borehole		O2 %	15.40	15.00	15.00
Operator:	GS	Pipe Above GL	0.50	H2S ppm			
				VOCs %	0.00		
Comments							

BOREHOLE							
TIME:		Flow l/h:		CH4 %			
TEMP deg C:		DP Pa:		LEL			
Weather:		GW m:		CO2 %			
Atm Pressure mb:		Base of Borehole		O2 %			
Operator:		Pipe Above GL		H2S ppm			
				VOCs %			
Comments							

Additional Notes