

Our Ref: M680/01

Mark Robinson
Fraser Morgan Ltd
3rd Floor
207 Regent Street
London
W1B 3HH

Date: 18th June 2019

Dear Mark,

GAS RISK ASSESSMENT – COMMON END LANE, LEPTON

Please find enclosed the data from our recently completed gas monitoring for the above site. Our comments on the data are presented below.

It is proposed to develop the above site with a two-storey residential property. This letter presents recommendations for gas protection measures for the proposed development based on the data collected by Dunelm Geotechnical & Environmental (Dunelm).

Dunelm undertook a geoenvironmental appraisal of land at Common End Lane, Lepton and recommended ground gas monitoring was undertaken due to the potential of shallow mine workings and infilled ground present within 250m of the site, as detailed in the report:

- *Geoenvironmental Appraisal for land at Common End Lane, Lepton. Report No. M680/00, dated 17/04/2019.*

Reference should be made to the above report for details of the ground conditions encountered.

Gas risk assessment has been carried out in accordance with the following publications:

- CIRIA Report C665 - *Assessing risks posed by hazardous ground gases to buildings*, 2007.
- BS8485:2015+A1:2019 - *Code of Practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings*.
- NHBC *Guidance on evaluation of development proposals on sites where methane and carbon dioxide are present*, 2007.

In order to assess the potential risks associated with gas at this site, a number of factors have been considered. These are discussed below.

Potential Gas Sources

Potential sources of methane and carbon dioxide gas identified are summarised in the table below. The table also gives an indication of the likely gas generation potential and the risk of gas generation increasing in the future.

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Source	Details	Generation potential of source	Risk of gas generation increasing in future
Infilled ground within 250m	- A pond 50m south of the site was backfilled prior to 2014. - Another pond 120m north-east of the site was backfilled prior to 1985. - The geological plan indicates an area of infilled land approximately 39m east of the site. This appears to represent an infilled sandstone quarry that formerly existed at that location. Worked ground and made ground are also noted 120m west and 129m south-west of the site.	Very low	Low
Shallow Mineworkings	Intact coal encountered at 11.47m in RBH1 and at 21.30-21.40m in RBH1 to RBH3 considered to represent the Black Bed coal seam. Sufficient rock cover if the seams have been worked.	Very Low	Low

Gas Pathways

Ground conditions encountered during the investigation works undertaken by Dunelm comprised a sandy topsoil between 0.30m and 0.85m thick, underlain by stiff clays onto the underlying rockhead. Consequently, gas migration to surface should be limited to the presence of the relatively impermeable drift deposits.

Gas Monitoring

Gas monitoring wells were installed in three boreholes drilled (RBH1 – RBH3). Details of the monitoring wells are shown in the geoenvironmental appraisal report noted above.

The most recent guidance on gas risk assessment (CIRIA C665) includes recommendations for periods and frequencies for monitoring visits. These recommendations take into account the nature of the proposed development and the likely generation potential of the source and are shown in the table below.

		Generation potential of source				
		Very low	Low	Moderate	High	Very high
		e.g. inert made ground	e.g. alluvium or dock silt	e.g. landfill site pre-1960s	e.g. shallow mine workings	e.g. domestic landfill site post-1960s
Sensitivity of development	High (residential with gardens)	6/3	9/6	12/6	24/12	24/24
	Moderate (flats)	6/2	6/3	9/6	12/12	24/24
	Low (commercial)	4/1	6/2	6/3	12/6	12/12
6/3 indicates six readings over 3 months. At least 2 readings should be during periods of low and falling atmospheric pressure						

The proposed development comprises a two-storey residential property, considered a high sensitivity of development, which would be classified as a Type A development in accordance with BS8485:2015+A1:2019. It is considered that the generation potential of the gas source (taking into account the likelihood of future increases in gas generation) would be best classified as very low.

A total of seven visits were undertaken at the site, with gas monitoring carried out on five occasions over a total period of three months between 19th March 2019 and 7th June 2019. During two visits (18th April and 17th June 2019), the monitoring installations were covered by materials and were unable to be located to monitor. Three monitoring visits was carried out when atmospheric pressure was below 1000mbar, and one visit during a period of falling atmospheric pressure.

A summary of the monitoring results is shown in the table below.

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OHS 623618



FS586808



EMS 586809



FINALIST



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Monitoring point	Range of gas concentrations recorded (% v/v)		Flow rates recorded (litre/hour)
	Methane	Carbon Dioxide	
RBH1	ND	0.10 – 0.80	ND – 0.10
RBH2	ND	2.90 – 6.80	ND
RBH3	ND	0.30 – 3.50	ND - 0.10

ND: None detected

Site Gas Regime

Where flow rates are shown as 'none detected', a default value of 0.1 litres/hour has been used in the assessment, representing the limit of detection of the measuring equipment.

The monitoring results show that methane was not detected in any of the three boreholes drilled. The maximum steady state carbon dioxide concentration encountered was 6.80% in borehole RBH2 on the second visit, with carbon dioxide only exceeding 5% on this single occasion when atmosphere pressure was at its lowest. Depleted oxygen was noted in RBH2 and RBH3 during the first and second visits, with a minimum concentration of 7.90%v/v and 12.3%v/v.

Gas screening values for carbon dioxide have been calculated based on the maximum *steady state* readings obtained from the boreholes and the maximum *steady state* flow rates.

The gas screening values are shown in the table below together with the maximum gas concentration.

Maximum gas screening value - carbon dioxide (litre/hour)	Max. steady concentration (carbon dioxide)
0.0068	Max. 6.805v/v

ND: None detected

Using the above gas screening values and given the limited monitoring period, the site would be classified as CS2. However, consideration should be given to a CS1 gas regime, given that concentrations of carbon dioxide slightly exceeded 5% on one occasion in RBH3 and no methane was detected in all three boreholes.

For a building Type A as defined in BS8485:2015, gas remedial measures reaching 3.5 points would be required. For example, this could be achieved by a passive sub-floor dispersal layer and a gas resistant membrane. Reference should be made to BS8485:2015 for full details.

The above recommendations should be approved in writing by the relevant authorities prior to construction works taking place.

We trust that the enclosed are sufficient for your present needs, however, please do not hesitate to get in touch should you require further information.

Yours sincerely,



Becki Burndred
On behalf of Dunelm Geotechnical and Environmental Ltd.

Enc. – Gas Monitoring Sheets visits 1-7

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DATE & TIME					REGIONAL TREND			INSTRUMENT DETAILS		NOTES			
DAY	MONTH	YEAR	TIME (Start)	TIME (Finish)	Rising			NAME	GA5000				
19	03	2019	10:20	01:00:00				SERIAL NUMBER	G500110				
AMBIENT READINGS								LAST CALIBRATION				VISIT NO	
O2 (% v/v)	20.9	CO2 (% v/v)	0	CH4 (% v/v)	0	PID reading (ppm)	NR	NAME				1	OF
ATMOSPHERIC PRESSURE (mbar)				START	1011	FINISH	1011	SERIAL NUMBER		WEATHER CONDITIONS		GROUND CONDITIONS	
AIR TEMPERATURE °C				START	10	FINISH	11	LAST CALIBRATION		Overcast, mild, dry		Waterlogged	

[illegible]



DATE & TIME					REGIONAL TREND			INSTRUMENT DETAILS		NOTES		
DAY	MONTH	YEAR	TIME (Start)	TIME (Finish)	Rising			NAME	GA2000			
05	04	2019	09:15	09:45:00				SERIAL NUMBER	GA12649			
AMBIENT READINGS									LAST CALIBRATION		VISIT NO	
O2 (% v/v)	20.8	CO2 (% v/v)	0	CH4 (% v/v)	0	PID reading (ppm)	NR	NAME		2	OF	7
ATMOSPHERIC PRESSURE (mbar)				START	989	FINISH	989	SERIAL NUMBER		WEATHER CONDITIONS		GROUND CONDITIONS
AIR TEMPERATURE °C				START	7	FINISH	7	LAST CALIBRATION		Sunny spells, cool, dry		Damp

[illegible]



DATE & TIME					REGIONAL TREND			INSTRUMENT DETAILS		NOTES		
DAY	MONTH	YEAR	TIME (Start)	TIME (Finish)	Rising			NAME	GA2000			
18	04	2019	07:45	08:00:00				SERIAL NUMBER	GA12649			
AMBIENT READINGS									LAST CALIBRATION		VISIT NO	
O2 (% v/v)	20.8	CO2 (% v/v)	0	CH4 (% v/v)	0	PID reading (ppm)	NR	NAME		3	OF	7
ATMOSPHERIC PRESSURE (mbar)				START	NR	FINISH	NR	SERIAL NUMBER		WEATHER CONDITIONS		GROUND CONDITIONS
AIR TEMPERATURE °C				START	NR	FINISH	NR	LAST CALIBRATION				

[illegible]



DATE & TIME					REGIONAL TREND			INSTRUMENT DETAILS		NOTES			
DAY	MONTH	YEAR	TIME (Start)	TIME (Finish)	Falling			NAME	GA2000				
30	04	2019	07:50	08:30:00				SERIAL NUMBER	GA12649				
AMBIENT READINGS								LAST CALIBRATION		VISIT NO			
O2 % v/v	20.7	CO2 % v/v	0	CH4 % v/v	0	PID reading (ppm)	NR	NAME		4	OF	7	
ATMOSPHERIC PRESSURE (mbar)				START	1012	FINISH	1012	SERIAL NUMBER		WEATHER CONDITIONS		GROUND CONDITIONS	
AIR TEMPERATURE °C				START	7	FINISH	8	LAST CALIBRATION		Cloudy, dry, mild		Dry	

[illegible]



DATE & TIME					REGIONAL TREND			INSTRUMENT DETAILS		NOTES		
DAY	MONTH	YEAR	TIME (Start)	TIME (Finish)	Rising			NAME	GA2000			
20	05	2019	07:30	08:15:00				SERIAL NUMBER	GA12649			
AMBIENT READINGS									VISIT NO			
O2 (% v/v)	20.6	CO2 (% v/v)	0	CH4 (% v/v)	0	PID reading (ppm)		NR	NAME	07/01/2019		
ATMOSPHERIC PRESSURE (mbar)				START	999	FINISH	999	SERIAL NUMBER		5		
AIR TEMPERATURE °C				START	11	FINISH	13	LAST CALIBRATION		7		
									WEATHER CONDITIONS		GROUND CONDITIONS	
									Sunny, dry, mild		Dry	

[illegible]



DATE & TIME					REGIONAL TREND			INSTRUMENT DETAILS		NOTES		
DAY	MONTH	YEAR	TIME (Start)	TIME (Finish)	Rising			NAME	GA2000			
07	06	2019	08:00	08:30:00				SERIAL NUMBER	G505418			
AMBIENT READINGS								LAST CALIBRATION	15/04/2019	VISIT NO		
O2 (% v/v)	20.6	CO2 (% v/v)	0	CH4 (% v/v)	0	PID reading (ppm)	NR	NAME		6	OF	7
ATMOSPHERIC PRESSURE (mbar)				START	996	FINISH	995	SERIAL NUMBER		WEATHER CONDITIONS		GROUND CONDITIONS
AIR TEMPERATURE °C				START	13	FINISH	14	LAST CALIBRATION		Sunny, dry, mild		Moist

[illegible]



DATE & TIME					REGIONAL TREND			INSTRUMENT DETAILS		NOTES			
DAY	MONTH	YEAR	TIME (Start)	TIME (Finish)	Rising			NAME	Gas Data FGM 436-1				
17	06	2019	09:30	09:45:00				SERIAL NUMBER	13121				
AMBIENT READINGS								LAST CALIBRATION	13/09/2018				
O2 (% v/v)	20.1		CO2 (% v/v)	0	CH4 (% v/v)	0	PID reading (ppm)	NR	NAME	7 OF 7			
ATMOSPHERIC PRESSURE (mbar)				START	NR	FINISH	NR	SERIAL NUMBER					
AIR TEMPERATURE °C				START	NR	FINISH	NR	LAST CALIBRATION					
									WEATHER CONDITIONS			GROUND CONDITIONS	
									Overcast			Wet	

[illegible]