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Our Ref: GRM/P10680/GAL.1

Date: 12th December 2024

Alan Johnston Partnership Ltd.
1 Dale Street
Liverpool
L2 2ET

For the Attention of John Marshall

Dear John,

Re: Gas Addendum Letter for Bigdale Drive, Kirkby, Liverpool

The gas monitoring programme at the above site is now complete. The assessment below supersedes the information in the Site Appraisal Report (GRM/P10680/PIISAR.1) and should be submitted to the regulatory bodies for approval.

The Phase I desk study identified possible made ground as a potential source of ground gas.

The site is not in an area where radon protective measures are required.

The Phase II ground investigation confirmed the presence of made ground as a potential source of ground gas. The made ground encountered generally comprised black granular material with gravel of tarmacadam, granite and brick. The made ground was encountered in all exploratory holes to depths of between 0.85m and 1.4m begl, with a general thickness of 1.0m.

As the proposed land use is classed as high sensitivity (residential with gardens); five 35mm diameter gas/water monitoring standpipes were installed across the site (WS01-WS05). The installations in WS01 and WS02 targeted the made ground and the natural strata, whilst those in WS03-WS05 targeted the natural strata due to the limited thickness of made ground present.

On the basis of the confirmed sources of ground gas and the proposed end use gas monitoring has been carried out fortnightly over an approximate three month period from 19th September 2024 to 5th December 2024, to assess the risk posed to the end user from potentially harmful ground gases. The scheduled visit on 15th November 2024 was not completed due to illness and replaced with a visit on the 5th December 2024.

The post fieldwork monitoring has been designed to identify and assess the groundwater and gas regimes below the site. The results are enclosed for reference and are summarised below:



Land Appraisal | Environmental | Geotechnical | Design | Mining | Inspections

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Borehole	Response Zone (m begl) / Strata	Contamination	No. of Monitoring Visits	Methane (%v/v)	Carbon Dioxide (%v/v)	Oxygen (%v/v)	Flow (l/hr)	Groundwater Depth (m)
WS01	0.5 – 2.0 MG	None	6	0.0	0.6-4.2	18.3-19.7	0.0-0.1	0.8-1.2
WS02	0.5 – 2.0 MG	None	6	0.0	0.2-1.0	19.6-20.4	0.0	0.6-1.2
WS03	1.0 – 4.0 NS	None	6	0.0	0.3-1.5	17.7-20.0	0.0-0.1	0.8-1.4
WS04	1.0 – 4.0 NS	None	6	0.0	1.6-4.3	5.2-17.8	0.0	1.0-2.5
WS05	1.0 – 4.0 NS	None	6	0.0	0.0-2.1	16.6-19.8	0.01	1.1-2.6
Notes: NS= Natural Strata, MG= Made Ground.					Atmospheric Pressure: 1000mb-1024mb			

The response zone in WS03 was flooded on one occasion (1st October 2024), however, the water was bailed and the borehole left to recharge prior to readings being obtained. Accordingly, the single occurrence of flooding is not considered to have materially affected the assessment.

Two of the monitoring visits were conducted during periods of falling pressure (19th September and 5th December); accordingly, the data obtained is considered to be representative of the ground gas conditions.

A maximum PID reading of 3.9 ppm was recorded, which is considered not to be significant.

A single depleted oxygen concentration of 5.2%v/v was recorded in WS04 on 5th December 2024. No other depleted oxygen concentrations were recorded during the monitoring program; accordingly, the occurrence is not considered to be typical. If working within confined spaces is required it is recommended that a site specific risk assessment is undertaken to better inform the risk to workers.

Ground Gas Risk Assessment

The primary guidance document to determine if gas protection measures are required is BS8485:2015+A1:2019. This uses hazardous gas flow rates (Q_{hg}), which are gas concentrations multiplied by borehole flow rates, to derive a Gas Screening Value (GSV) for the site. The gas regime is then determined based on the GSV and other factors including gas concentrations, flow rates, atmospheric conditions, water levels and the likely sources of the observed gas concentrations.

Made ground

Methane concentrations above 0.0%v/v were not detected during the monitoring period. Therefore, in the following assessment the monitors lower limit of detection for methane (0.1% v/v) has been used.

Using the default methane concentration of 0.1%v/v and the maximum recorded flow rate of 0.1l/hr a Q_{hg} of 0.0001l/hr has been calculated for methane. Using the maximum recorded steady state carbon dioxide concentration of 4.2%v/v and the maximum recorded flow rate of 0.1l/hr a Q_{hg} of 0.0042l/hr has been calculated for carbon dioxide. On this basis the GSV for the site is determined as 0.0042l/hr.

As the GSV is less than 0.07l/hr and the maximum recorded concentrations of methane and carbon dioxide are less than 1%v/v and 5%v/v respectively, the site has been assessed as 'Characteristic Situation 1' (very low hazard potential) as outlined in Table 2 of BS8485:2015, for which gas protection measures are not required.

Natural

Methane concentrations above 0.0%v/v were not detected during the monitoring period. Therefore, in the following assessment the monitors lower limit of detection for methane (0.1% v/v) has been used.

Using the default methane concentration of 0.1%v/v and the maximum recorded flow rate of 0.1l/hr a Qhg of 0.0001l/hr has been calculated for methane. Using the maximum recorded steady state carbon dioxide concentration of 4.3%v/v and the default flow rate of 0.1l/hr a Qhg of 0.0043l/hr has been calculated for carbon dioxide. On this basis the GSV for the site is determined as 0.0043l/hr.

As the GSV is less than 0.07l/hr and the maximum recorded concentrations of methane and carbon dioxide are less than 1%v/v and 5%v/v respectively, the site has been assessed as 'Characteristic Situation 1' (very low hazard potential) as outlined in Table 2 of BS8485:2015, for which gas protection measures are not required.

Groundwater

The monitoring program has confirmed the general presence of groundwater at depths of between 0.6m and 2.5m begl beneath the site. An allowance for sump-pumping is recommended, which is considered sufficient to control the anticipated water ingress into shallow, short-term excavations. Upgraded water controls may be required for deeper, or medium to longer-term excavations.

We trust this is suitable for your current requirements, should you require any further information or would like any clarification of the points raised please do not hesitate to contact us.

Yours sincerely,
for GRM Development Solutions Ltd

Paul Wardle BSc MA FGS
Acting Principal Geologist

Enc:
P10680 Gas Monitoring Location Plan
P10680 Gas Monitoring Results

Legend

- Site Boundary
- Exploratory Holes
- Window Sample Borehole



NOTES:

CLIENT:	ALAN JOHNSTON PARTNERSHIP on behalf of LIVV HOUSING GROUP
PROJECT:	Bigdale Drive, Kirby
TITLE:	Gas Monitoring Plan

PROJECT No:	P10680	DATE:	September 2024	DESIGN/DRAWN:	RJH
DRAWING NUMBER:	003	ISSUE:	A	© GRM Development Solutions Ltd © Crown Copyright. AL 100014100	



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In-Situ Gas Monitoring Results

Project Name	Bigdale Drive, Kirkby
Project Number	10680
Client	Alan Johnston Partnership Ltd
Date	19/09/2024
Weather	Sunny
Atmospheric Pressure (mb)	1021
Pressure Trend	Falling
Equipment	Gas Data GFM436
Operator	Liam Press

Ground Gas													
Well ID	Response Zone			Methane		CO2		Oxygen		Gas Flow		PID Reading	
	mbegl			%v/v		%v/v		%v/v		l/h		ppm	
ID	Top	Base	Strata	Peak	Steady	Peak	Steady	Low	Steady	Peak	Steady	Peak	Steady
WS01	0.5	2.0	MG	0.0	0.0	1.2	1.2	19.4	19.4	0.0	0.0	Not Recorded	
WS02	0.5	2.0	MG	0.0	0.0	0.2	0.2	20.4	20.4	0.0	0.0	Not Recorded	
WS03	1.0	4.0	NS	0.0	0.0	0.6	0.6	20.0	20.0	0.1	0.1	Not Recorded	
WS04	1.0	4.0	NS	0.0	0.0	2.2	2.2	16.5	16.5	0.0	0.0	Not Recorded	
WS05	1.0	4.0	NS	0.0	0.0	1.9	1.9	18.3	18.3	0.0	0.0	Not Recorded	

Groundwater	
Depth to Groundwater	Total Well Depth
mbegl	mbegl
1.1	2.2
0.9	2.1
1.2	3.8
2.5	3.9
2.6	3.9

Notes				Ground Material Key	
L.E.L.	Lower Explosive Limit (100% L.E.L.= 5% Flammable Gas)			MG	Made Ground
N.D.	Not Detected	a	Methane ==> 1% v/v	NS	Natural Strata
N.R.	Not Recorded	b	Carbon Dioxide ==>5% v/v		
PID	Photo-Ionising Detector	MG	Made Ground		
%	By volume	NS	Natural Strata		

Comments

WS01 fast recharge 5 secs= 1cm
 WS02 fast recharge 1 sec=1cm
 WS03 recharge 35 secs=1cm
 WS04,05 slow recharge



In-Situ Gas Monitoring Results

Project Name	Bigdale Drive, Kirkby
Project Number	10680
Client	Alan Johnston Partnership Ltd
Date	01/10/2024
Weather	Cloudy
Atmospheric Pressure (mb)	1021
Pressure Trend	Rising
Equipment	Gas Data GFM436
Operator	James Wardle

Ground Gas													
Well ID	Response Zone			Methane		CO2		Oxygen		Gas Flow		PID Reading	
	mbegl			%v/v		%v/v		%v/v		l/h		ppm	
ID	Top	Base	Strata	Peak	Steady	Peak	Steady	Low	Steady	Peak	Steady	Peak	Steady
WS01	0.5	2.0	MG	0.0	0.0	0.6	0.6	19.6	19.6	0.0	0.0	Not Recorded	
WS02	0.5	2.0	MG	0.0	0.0	1.0	1.0	19.9	19.9	0.0	0.0	Not Recorded	
WS03	1.0	4.0	NS	0.0	0.0	0.3	0.3	19.9	19.9	0.0	0.0	Not Recorded	
WS04	1.0	4.0	NS	0.0	0.0	2.3	2.3	14.5	14.5	0.0	0.0	Not Recorded	
WS05	1.0	4.0	NS	0.0	0.0	1.8	1.8	18.2	18.2	0.0	0.0	Not Recorded	

Groundwater	
Depth to Groundwater	Total Well Depth
mbegl	mbegl
0.8	2.2
0.6	2.1
0.8	3.8
1.0	3.9
1.1	3.9

Notes

L.E.L.	Lower Explosive Limit (100% L.E.L. = 5% Flammable Gas)		
N.D.	Not Detected	a	Methane => 1% v/v
N.R.	Not Recorded	b	Carbon Dioxide => 5% v/v
PID	Photo-Ionising Detector	MG	Made Ground
%	By volume	NS	Natural Strata

Ground Material Key

MG	Made Ground
NS	Natural Strata

Key

	Response Zone Flooded
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In-Situ Gas Monitoring Results

Project Name Bigdale Drive, Kirkby
Project Number 10680
Client Alan Johnston Partnership Ltd
Date 29/10/2024
Weather Mostly Cloudy
Atmospheric Pressure (mb) 1024
Pressure Trend Rising
Equipment Gas Data GFM436
Operator Steffan Williams

Ground Gas													
Well ID	Response Zone			Methane		CO2		Oxygen		Gas Flow		PID Reading	
	mbegl			%v/v		%v/v		%v/v		l/h		ppm	
ID	Top	Base	Strata	Peak	Steady	Peak	Steady	Low	Steady	Peak	Steady	Peak	Steady
WS01	0.5	2.0	MG	0.0	0.0	0.9	0.9	19.7	19.7	0.0	0.0	3.0	0.0
WS02	0.5	2.0	MG	0.0	0.0	0.8	0.8	20.1	20.1	0.0	0.0	3.6	0.0
WS03	1.0	4.0	NS	0.0	0.0	0.7	0.7	19.5	19.5	0.0	0.0	3.9	0.0
WS04	1.0	4.0	NS	0.0	0.0	2.3	2.3	16.2	16.2	0.0	0.0	1.9	0.0
WS05	1.0	4.0	NS	Not Recorded		Not Recorded		Not Recorded		Not Recorded		Not Recorded	

Groundwater	
Depth to Groundwater	Total Well Depth
mbegl	mbegl
1.0	2.3
1.0	2.1
1.2	3.9
1.7	3.8
1.9	3.9

Notes

L.E.L. Lower Explosive Limit (100% L.E.L. = 5% Flammable Gas)
N.D. Not Detected
N.R. Not Recorded
PID Photo-Ionising Detector
% By volume

Ground Material Key

MG Made Ground
NS Natural Strata

Comments

NO PID



In-Situ Gas Monitoring Results

Project Name Bigdale Drive, Kirkby
Project Number 10680
Client Alan Johnston Partnership Ltd
Date 15/11/2024
Weather Drizzle
Atmospheric Pressure (mb) 1024
Pressure Trend Worst
Equipment Gas Data GFM436
Operator Liam Press

Ground Gas													
Well ID	Response Zone			Methane		CO2		Oxygen		Gas Flow		PID Reading	
	mbegl			%v/v		%v/v		%v/v		l/h		ppm	
ID	Top	Base	Strata	Peak	Steady	Peak	Steady	Low	Steady	Peak	Steady	Peak	Steady
WS01	0.5	2.0	MG	0.0	0.0	4.2	4.2	18.5	18.5	0.1	0.1	Not Recorded	
WS02	0.5	2.0	MG	0.0	0.0	0.3	0.3	19.6	19.6	0.0	0.0	Not Recorded	
WS03	1.0	4.0	NS	0.0	0.0	1.5	1.5	18.2	18.2	0.0	0.0	Not Recorded	
WS04	1.0	4.0	NS	0.0	0.0	1.6	1.6	15.1	15.1	0.0	0.0	Not Recorded	
WS05	1.0	4.0	NS	0.0	0.0	0.0	0.0	19.8	19.8	0.0	0.0	Not Recorded	

Groundwater	
Depth to Groundwater	Total Well Depth
mbegl	mbegl
1.2	2.1
1.2	2.1
1.4	3.8
2.5	3.9
2.2	3.9

Notes

L.E.L. Lower Explosive Limit (100% L.E.L. = 5% Flammable Gas)
N.D. Not Detected
N.R. Not Recorded
PID Photo-Ionising Detector
% By volume

a Methane $\Rightarrow$ 1% v/v
b Carbon Dioxide $\Rightarrow$ 5% v/v
MG Made Ground
NS Natural Strata

Ground Material Key

MG Made Ground
NS Natural Strata



In-Situ Gas Monitoring Results

Project Name	Bigdale Drive, Kirkby
Project Number	10680
Client	Alan Johnston Partnership Ltd
Date	28/11/2024
Weather	Cloudy
Atmospheric Pressure (mb)	1024
Pressure Trend	Steady
Equipment	Gas Data GFM436
Operator	James Wardle

Ground Gas													
Well ID	Response Zone			Methane		CO2		Oxygen		Gas Flow		PID Reading	
	mbegl			%v/v		%v/v		%v/v		l/h		ppm	
ID	Top	Base	Strata	Peak	Steady	Peak	Steady	Low	Steady	Peak	Steady	Peak	Steady
WS01	0.5	2.0	MG	0.0	0.0	0.6	0.6	18.3	18.3	0.0	0.0	Not Recorded	
WS02	0.5	2.0	MG	0.0	0.0	0.2	0.2	19.6	19.6	0.0	0.0	Not Recorded	
WS03	1.0	4.0	NS	0.0	0.0	1.2	1.2	17.7	17.7	0.0	0.0	Not Recorded	
WS04	1.0	4.0	NS	0.0	0.0	3.0	3.0	17.8	17.8	0.0	0.0	Not Recorded	
WS05	1.0	4.0	NS	0.0	0.0	1.7	1.7	18.6	18.6	0.0	0.0	Not Recorded	

Groundwater	
Depth to Groundwater	Total Well Depth
mbegl	mbegl
0.9	2.2
0.8	2.1
1.2	3.9
1.5	4.0
1.5	4.0

Notes

L.E.L.	Lower Explosive Limit (100% L.E.L. = 5% Flammable Gas)
N.D.	Not Detected
N.R.	Not Recorded
PID	Photo-Ionising Detector
%	By volume

Ground Material Key

MG	Made Ground
NS	Natural Strata



In-Situ Gas Monitoring Results

Project Name Bigdale Drive, Kirkby
Project Number 10680
Client Alan Johnston Partnership Ltd
Date 05/12/2024
Weather Cloudy
Atmospheric Pressure (mb) 1000
Pressure Trend Falling
Equipment Gas Data GFM430
Operator Alfie Woolley

Ground Gas													
Well ID	Response Zone			Methane		CO2		Oxygen		Gas Flow		PID Reading	
	mbegl			%v/v		%v/v		%v/v		l/h		ppm	
ID	Top	Base	Strata	Peak	Steady	Peak	Steady	Low	Steady	Peak	Steady	Peak	Steady
WS01	0.5	2.0	MG	0.0	0.0	0.7	0.7	18.7	18.7	0.0	0.0	Not Recorded	
WS02	0.5	2.0	MG	0.0	0.0	0.6	0.6	19.6	19.6	0.0	0.0	Not Recorded	
WS03	1.0	4.0	NS	0.0	0.0	1.1	1.1	19.0	19.0	0.0	0.0	Not Recorded	
WS04	1.0	4.0	NS	0.0	0.0	4.3	4.3	5.2	5.2	0.0	0.0	Not Recorded	
WS05	1.0	4.0	NS	0.0	0.0	2.1	2.1	16.6	16.6	0.0	0.0	Not Recorded	

Groundwater	
Depth to Groundwater	Total Well Depth
mbegl	mbegl
2.0	2.2
0.8	2.0
1.0	3.9
1.5	3.9
1.4	4.9

Notes

L.E.L. Lower Explosive Limit (100% L.E.L. = 5% Flammable Gas)
N.D. Not Detected
N.R. Not Recorded
PID Photo-Ionising Detector
% By volume

a Methane $\Rightarrow$ 1% v/v
b Carbon Dioxide $\Rightarrow$ 5% v/v
MG Made Ground
NS Natural Strata

Ground Material Key

MG Made Ground
NS Natural Strata

Key

Threshold gas concentration exceeded



In-Situ Gas Monitoring Results

Project Name Bigdale Drive, Kirkby
Project Number 10680
Client Alan Johnston Partnership Ltd

Pressure Range 1000mb-1024mb
Reading Below 1000 mb: 0

Summary of Results for period: 19/09/2024 to 05/12/2024

				Methane		CO2		Oxygen		Gas Flow		PID Reading	
				%v/v		%v/v		%v/v		l/h		ppm	
ID	Top	Base	Strata	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
WS01	0.5	2.0	MG	0.0	0.0	0.6	4.2	18.3	19.7	0.0	0.1	3.0	0.0
WS02	0.5	2.0	MG	0.0	0.0	0.2	1.0	19.6	20.4	0.0	0.0	3.6	0.0
WS03	1.0	4.0	NS	0.0	0.0	0.3	1.5	17.7	20.0	0.0	0.1	3.9	0.0
WS04	1.0	4.0	NS	0.0	0.0	1.6	4.3	5.2	17.8	0.0	0.0	1.9	0.0
WS05	1.0	4.0	NS	0.0	0.0	0.0	2.1	16.6	19.8	0.0	0.0		

Depth to Groundwater	
mbegl	
Min	Max
0.8	2.0
0.6	1.2
0.8	1.4
1.0	2.5
1.1	2.6

BS8485:2015 Suggested Worse Case Site Classification:

Notes

L.E.L. Lower Explosive Limit (100% L.E.L.= 5% Flammable Gas)
N.D. Not Detected
N.R. Not Recorded
PID Photo-Ionising Detector
% By volume

Highlighted cell for following conditions

a Methane => 1% v/v
b Carbon Dioxide =>5% v/v
MG Made Ground
NS Natural Strata

Site Summary:

	GSV (l/h)	Max Values
Methane		
CO2	0.0043	4.3
Maximum Flow (l/h)	0.10	

Key

Threshold gas concentration exceeded