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- 1 JUL 2011

Job No... 210-298.....

FAO..... DH.....

GRM Development Solutions Limited
Laurus House
First Avenue
Centrum 100
Burton upon Trent
Staffordshire
DE14 2WH

Telephone: (01283) 551249
Facsimile: (01283) 211968
Email: info@grm-uk.com
Web Site: www.grm-uk.com

Our Ref: P5467-gas completion

Your Ref:

Date: 29th June 2011

The Alan Johnston Partnership
1 Dale Street
Liverpool
L2 2ET

For the attention of Mr. D. Hughes.

Dear Dave,

Re: Calder Vale Business Park.

Following completion of the gas monitoring programme at the above site, please find enclosed the full results and GRM's assessment of the gas regime at the site.

Gas monitoring has been carried out to assess the risk posed to the end user from harmful ground gases. The primary guidance document to determine if protection measures are required is CIRIA Report C665 'Assessing risks posed by hazardous ground gases to buildings' (2006). This uses Gas Screening Values (GSVs), which are gas concentrations multiplied by borehole flow rate, along with additional limiting factors (such as maximum methane concentrations) to classify the gas regime of a site.

The guidance document includes two methods of characterising a site. The main method 'Situation A' is based on work by Wilson and Card and is used for all types of development except low rise housing that meets the assumptions of 'Situation B'. The 'Situation B' method proposed by Boyle and Witherington for the NHBC assumes all properties have pre-cast suspended floors (beam and block) with ventilated under floor voids.

For this site, as the development does not include low rise housing, the risk from ground gases has been assessed using both 'Situation A'.

As the proposed land use is classed as low sensitivity (commercial / industrial), six gas/groundwater monitoring standpipes have been installed in the window sampling boreholes (WS2, WS4, WS10, WS12, WS13 and WS15) and two in the cable percussive boreholes (BH9 and BH10) with response zones targeted at the made ground and the natural strata.

As the gas hazard is considered low (limited made ground) the monitoring programme has comprised four visits over two months.

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

Borehole	Response Zone (m begl) / Strata	Contamination	No. of Monitoring Visits	Methane (%v/v)	Carbon Dioxide (%v/v)	Oxygen (%v/v)	Flow (l/hr)	Atmospheric Pressure Range
WS2	1-3 / Nat	None	4	0.0	0.2-1.4	18-20.9	0.0	996-1006
WS4	1-4.0 / Nat	None	4	0-1	0.8-5.5	3.4-19.7	0.0	996-1006
WS10	1-3 / Nat	None	4	0-2	0.4-4.4	14.8-19.9	0.0	996-1006
WS12	1-4 / Nat	None	4	0.0	0.4-2.6	17-20.1	0.0	996-1006
WS13	1-5 / MG / Nat	None	4	0-6.1	0-3.2	15.6-19.7	0.0	996-1006
WS15	1-4 / MG / Nat	None	4	0.0	0.5-3.6	14.4-18.9	0.0	996-1006
BH9	9-12.2 / Nat	None	4	0.0	0.0-0.1	19.2-20.5	0.0	996-1006
BH10	9.2-12.3	None	4	0.0	0.1-0.6	18.1-20.8	0.0	996-1006

No flow has been recorded during the monitoring program. In order to produce a positive result a default flow rate of 0.1l/hr has been used in the following assessment. Using the default borehole flow rate of 0.1l/hr and the maximum methane concentration of 6.1%v/v, a GSV of 0.0061 has been calculated for methane. Using the same flow rate and the maximum carbon dioxide concentration of 5.5%v/v, a GSV of 0.0055l/hr has been calculated for carbon dioxide.

These levels would normally fall in to 'Characteristic Situation 1' as the GSV is <0.07l/hr; however, as the level of methane is >1% and carbon dioxide is >5% the site has been assessed as 'Characteristic Situation 2' as outlined in table 8.5 of CIRIA C659.

These results are consistent with the interim results as reported in GRM/P5467/F.1 Site Appraisal report. Therefore, it is considered that **gas protection measures are required** for the proposed development. These should comprise a reinforced cast in situ floor slab, 2000 gauge damp proof membrane, underfloor venting (pipes) and sealed joints/service entries.

We trust that the above is suitable for your current requirements. However, if you have any queries then please do not hesitate to contact me.

Yours sincerely,



Paul Wardle
Geologist

Enc: Gas monitoring results

MONITORING OF SOIL GASES & GROUNDWATER



PROJECT NO. P5467

SITE. CALDER VALE, BURNLEY

CLIENT. The Alan Johnston Partnership

DATE. 27-Apr-11

CONDITIONS. TEMP SUNNY
ATMOSPHERIC PRESSURE: 1006

OPERATOR. STEPHEN MORRIS

EQUIPMENT. LMSxi Gas Data Recorder

GRM Development Solutions Limited
Laurus House
First Avenue
Centrum 100
Burton-upon-Trent
DE14 2WH

Telephone: (01283) 551249
Facsimile: (01283) 211968
Email: info@grm-uk.com

RESULTS

Borehole/ Well Ref. No.	Methane (CH ₄) %	Carbon Dioxide (CO ₂) %	Oxygen (O ₂) %	Flow	L.E.L	Depth to Groundwater (m)	Depth to Base of Well (m)
WS2	0.00	0.00	20.60	0.00	0.00	0.39	3
WS4	0.20	3.60	12.10	0.00	0.00	1.37	3.57
WS10	0.00	4.40	14.80	0.00	0.00	2	2.7
WS12	0.00	0.50	19.60	0.00	0.00	1.67	4.16
WS13	0.00	0.10	19.00	0.00	0.00	1.27	3.14
WS15	0.00	0.50	18.60	0.00	0.00	2.96	3.08
BH9	0.00	0.00	19.80	0.00	0.00	2.95	11.5
BH10	0.00	0.20	19.80	0.00	0.00	3.1	11.82

Notes

L.E.L. Lower Explosive Limit (100% L.E.L.'= 5% Flammable Gas
N.D. Not Detected
N.R. Not Recorded
% By Volume

Signed (Operator)

Authorised

MONITORING OF SOIL GASES & GROUNDWATER



PROJECT NO. P5467

SITE. CALDER VALE, BURNLEY

CLIENT. The Alan Johnston Partnership

DATE. 10-May-11

CONDITIONS. TEMP SHOWERS
ATMOSPHERIC PRESSURE: 1000

OPERATOR. STEPHEN MORRIS

EQUIPMENT.

GRM Development Solutions Limited
Laurus House
First Avenue
Centrum 100
Burton-upon-Trent
DE14 2WH

Telephone: (01283) 551249

Facsimile: (01283) 211968

Email: info@grm-uk.com

RESULTS

Borehole/ Well Ref. No.	Methane (CH ₄) %	Carbon Dioxide (CO ₂) %	Oxygen (O ₂) %	Flow	L.E.L.	Depth to Groundwater (m)	Depth to Base of Well (m)
WS2	0.0	0.0	19.0	0.0	0.0	0.37	3
WS4	1.0	5.5	3.4	0.0	22.5	1.63	3.57
WS10	0.0	0.7	17.0	0.0	0.0	1.85	2.7
WS12	0.0	2.6	17.1	0.0	0.0	1.62	4.16
WS13	6.1	0.0	15.6	0.0	>/>/>	1.55	3.14
WS15	0.0	0.6	17.3	0.0	0.0	3.02	3.08
BH9	0.0	0.0	19.7	0.0	0.0	2.9	11.5
BH10	0.0	0.4	18.7	0.0	0.0	3.1	11.82

Notes

L.E.L. Lower Explosive Limit (100% L.E.L.'= 5% Flammable Gas)
N.D. Not Detected
N.R. Not Recorded
% By Volume

Signed (Operator).....

Authorised.....

MONITORING OF SOIL GASES & GROUNDWATER



PROJECT NO. P5467

SITE. CALDER VALE, BURNLEY

CLIENT. The Alan Johnston Partnership

DATE. 24-May-11

CONDITIONS. TEMP 1006
ATMOSPHERIC PRESSURE:

OPERATOR. P.Wardle

EQUIPMENT. LMSxi Gas Data Recorder

GRM Development Solutions Limited
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Centrum 100
Burton-upon-Trent
DE14 2WH

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RESULTS

Borehole/ Well Ref. No.	Methane (CH ₄) %	Carbon Dioxide (CO ₂) %	Oxygen (O ₂) %	Flow	L.E.L	Depth to Groundwater (m)	Depth to Base of Well (m)
WS2	0.0	0.0	20.9	0.0	0.0	0.49	3
WS4	0.0	0.9	5.2	0.0	0.0	1.2	3.6
WS10	2.0	0.8	19.5	0.0	0.0	5	3
WS12	0.0	1.3	17.0	0.0	0.0	1.22	4
WS13	0.1	0.0	18.0	0.0	0.3	0.85	3.2
WS15	0.0	0.7	14.4	0.0	0.0	2.78	3.46
BH9	0.0	0.1	20.5	0.0	0.0	3.47	11.6
BH10	0.0	0.1	20.8	0.0	0.0	3.08	11.8

Notes

L.E.L. Lower Explosive Limit (100% L.E.L.'= 5% Flammable Gas)
N.D. Not Detected
N.R. Not Recorded
% By Volume

Signed (Operator).....

Authorised.....

MONITORING OF SOIL GASES & GROUNDWATER



PROJECT NO. P5467

SITE. CALDER VALE, BURNLEY

CLIENT. The Alan Johnston Partnership

DATE. 13-Jun-11

CONDITIONS. TEMP RAIN
ATMOSPHERIC PRESSURE: 996

OPERATOR. STEPHEN MORRIS

EQUIPMENT. LMSxi Gas Data Recorder

GRM Development Solutions Limited
Laurus House
First Avenue
Centrum 100
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DE14 2WH

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RESULTS

Borehole/ Well Ref. No.	Methane (CH ₄) %	Carbon Dioxide (CO ₂) %	Oxygen (O ₂) %	Flow	L.E.L.	Depth to Groundwater (m)	Depth to Base of Well (m)
WS2	0.0	0.2	18.0	0.0	0.0	0.33	
WS4	0.0	3.7	5.2	0.0	0.0	1.4	
WS10	0.0	0.4	19.9	0.0	0.0	1.75	
WS12	0.0	0.4	20.1	0.0	0.0	1.5	
WS13	1.3	0.0	19.7	0.0	27.2	1.17	
WS15	0.0	1.5	15.4	0.0	0.0	1.9	
BH9	0.0	0.1	19.2	0.0	0.0	2.9	
BH10	0.0	0.6	18.1	0.0	0.0	3.2	

Notes

L.E.L. Lower Explosive Limit (100% L.E.L.'= 5% Flammable Gas)
N.D. Not Detected
N.R. Not Recorded
% By Volume

Signed (Operator).....

Authorised.....