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Our Ref: P8985 EHOLet01
Date: 21st July 2021

Ms Natalie Heaney
Environmental Health
Kirklees Council

Dear Ms Heaney,

RE: Land South of The Lodge and North of Church Lane, Linthwaite (2021/91571)

We have been provided with a copy of the Kirklees Council Environmental Health consultation comments for GRM reports submitted in respect of planning permission 2021/91571.

Contamination

With regard to the area beneath the stable block and storage container; it is considered that a very low to low risk remains from contamination associated with the potential storage of farm machinery and the potential presence of hydrocarbon contamination associated with this. Therefore, it is recommended that GRM should be present when these are removed from site to make a visual and olfactory assessment of the soils in these locations, utilising a photoionisation detector (PID) to undertake onsite analysis of the soils for potential hydrocarbon vapours. If the soil appears to be impacted (e.g. staining, odours, or > 1.0m made ground), samples will be collected, so a more detailed quantitative risk assessment can be undertaken. It is also recommended that the results of this exercise are documented and issued to the Local Authority for approval.

Ground Gas

Ground gas monitoring has been undertaken on six occasions and is detailed in the GRM Gas Addendum Letter which has been appended to this letter for your reference.

It should also be noted that enquiries were made with Kirklees Council (24th June 2019) about the adjacent landfill at the time of the original investigation. GRM were notified that the landfill was filled with inert waste from building contractors between 1983 to 1994, before the licence was cancelled in 1997. GRM was also informed that a spike test was undertaken in 1994, which recorded no methane above the monitor's level of detection, and maximum carbon dioxide concentrations of 0.5%v/v.

Period and Frequency of Monitoring
Whilst the landfill was recorded to be inert; in line with BS 8576:2013, consideration has been given to the gas generation potential being higher than very low, due to the potential presence of unregulated tipping in the form of putrescible material which could potentially generate ground gas.

However, following six visits, including three during falling pressure, no elevated concentrations of methane (>1%) or carbon dioxide (>5.0%) were recorded, and no flow was recorded above the gas monitor's limit of detection (0.1l/hr) on any of the visits. Therefore, based on the inert record, the Kirklees Council spike test and the GRM monitoring, in line with the guidance, it is considered that the landfill was limited to inert waste and therefore has a very low gas generation potential.

In line with the decision matrix presented in CIRIA C665: A high sensitivity development (residential) combined with a very low gas generation potential (inert landfill); it was considered appropriate to undertake 6 visits over a period of 3 months.

Whilst the recommended guidance is to complete the monitoring over 3 months, an initial pre-purchase assessment was undertaken followed by a full Phase I and II site appraisal. This resulted in two visits being undertaken in 2019 followed by a further four in 2020 to complete the six visits required. This also allowed the monitoring to be undertaken over a greater period of time, between June 2019 to May 2020, and carried out across five different months. It should also be noted that this period of time covers a wider seasonality than the recommended guidance of 3 months.

CIRIA C665 recommends at least two sets of readings should be at low and falling atmospheric pressure (but not restricted to periods below <1000 mb). The GRM site data records three visits during falling pressure, including two at low and falling pressure (1002mb and 987mb on the 23.03.2020 and 24.04.2020 respectively). In addition to this, falling pressure at 1023mb was also recorded on the 15.04.2020 and steady low pressure was also recorded on the 05.05.2020.

Monitoring Frequency Undertaken

Exploratory locations WS02, WS03 and WS06 located on the southern, eastern and north western boundaries all recorded six visits in unsaturated response zones. The locations of these monitoring points give a good spread across the site, including WS06 which was situated at the closest point to the landfill recorded to the north west. WS06 was targeting the potential presence of migrating gas from the recorded landfill, which was not recorded.

At WS05 two visits were missed as the location could not be located by the GRM technician, and one visit recorded a submerged response zone due to shallow groundwater. However, as WS05 targeted the natural strata in a location which had no source of ground gas, the results (no methane, carbon dioxide of 0%v/v to 3.5%v/v, and no flow) show similar data to the other locations where response zones were situated in natural strata. Therefore, it is considered that no essential information was missed, and the data obtained is an accurate representation for that location.

WS01 targeted the deeper weathered Rossendale Formation and potentially deeper migrating gases. But due to the presence of impermeable clay, mudstone and associated shallow perched water, the response zone was recorded to be saturated. This also suggests that conditions are not conductive for ground gas migration. Therefore, in the absence of a source near WS01, it is considered that the submerged response zone has not reduced the confidence in the GRM data.

Summary

Given the evidence supplied above, we believe the risk from ground gas has been appropriately assessed and the site can be classified as Characteristic Situation 1 for which gas protection measures are not required.

With regards to contamination, further assessment of the localised potential sources of on-site contamination (area beneath the stable block and storage container) can be undertaken when these

items have been removed from site. The findings of this assessment will be supplied to Kirklees Council for approval and so the contaminated land conditions can be fully discharged.

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

George Salloway BSc (Hons), MSc, MIEnvSc
Senior Geo-environmental Scientist

Siobhan Jackson BSc (Hons), MIEnvSc, CEnv
Principal Geo-environmental Scientist

Enclosed:

- P8985 Land Off Church Lane, Linthwaite, GRM Gas Addendum Letter, ref: GRM/P8985/GAL, dated May 2020.

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Our Ref: P8985\GAL
Date: 15th May 2020

Casey Group Ltd
Rydings Road
Rochdale
OL12 9PS

Attention of Mark Schofield

Dear Mark,

Re: Gas Addendum Letter for Land Off Church Lane, Linthwaite

The gas monitoring programme at the above site is now complete. The assessment below supersedes the information in the Site Appraisal Report (Land Off Church Lane, Linthwaite, Phase II Site Appraisal Ref: P8985/F.1 dated May 2020 Ref) and should be submitted to the regulatory bodies for approval.

The Phase I desk study identified the following potential sources of ground gas:

- Infilled quarries surrounding the site.
- An adjacent historic landfill to the north west.

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

The ground investigation identified the following potential sources of ground gas:

Made Ground comprising dark brown, slightly sandy, gravelly clay with gravels of roadstone, brick, mudstone and sandstone was encountered in TP07 to a depth of 0.3m begl. However, due to its limited depth it is not considered a viable source of ground gas.

As the proposed end use has been classified as high sensitivity (residential with gardens), five 35mm diameter gas/water monitoring standpipes have been installed across the site in the window sample boreholes (WS01 WS02 W03 WS05 and WS06). In the absence of any identified ground gas sources, the standpipes were were targeted at the natural strata (very Low generation potential). It should be noted that WS06 was situated at the closest point to the historic offsite landfill (moderate generation potential) located to the north west of the site to assess any potential gas migrating onto the site.

On the basis of the confirmed sources of ground gas, proposed end use and to confirm potential liabilities, gas monitoring has been carried out fortnightly; with two visits undertaken to obtain an initial review of the gas assessment onsite on the 28th June 2019 and the 2nd July 2019. A further four visits were then undertaken fortnightly between the 23rd March 2020 and 5th May 2020 to

complete the gas monitoring programme and allow the risk posed to the end user from potentially harmful ground gases to be assessed.

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:

Borehole	Response Zone (m begl)	Strata	No. of Monitoring Visits	Methane (%v/v)	Carbon Dioxide (%v/v)	Oxygen (%v/v)	Flow (l/hr)	Depth to Groundwater (m)
WS01	1.7 – 4.0	NS	6	0 – 0.1	0 – 1.4	19.8 – 21.2	0	0.75 – 1.32
WS02	1.1 – 4.0	NS	6	0	0 – 2.9	17.7 – 21.0	0	3.28 - >4.0
WS03	1.0 – 3.0	NS	6	0 – 0.2	0 – 0.7	19.2 – 21.0	0	2.64 - >3.0
WS05	1.3 – 2.0	NS	4	0	0 – 0.5	19.8 – 21.0	0	1.18 – 1.68
WS06	1.0 – 1.4	NS	6	0	0.5 – 4.3	15.6 – 21.0	0	Not detected; >1.4
Notes: NS= Natural Strata, N.R. = Not Recorded.							Atmospheric Pressure: 987mb-1023mb	

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 (Qhg), 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 limiting factors including gas concentrations and flow rates.

Flow rates above the monitor's lower limits of detection were not detected during monitoring period. Therefore, in the following assessment the monitor's lower limit of detection for flow rate (0.1l/hr) has been used.

Using the maximum recorded methane concentration of 0.2%v/v and the default flow rate of 0.1l/hr, a Qhg of 0.0002l/hr has been calculated for methane. Using the maximum recorded 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 shallow groundwater beneath the site in window sample boreholes WS01 and WS05. Shallow groundwater was not encountered within window sample boreholes WS02, WS03 and WS06.

It is considered that the water encountered in WS01 is not representative of the local water table, but perched on impermeable clays, mudstones and siltstones (Rossendale Formation). Within WS05, the water was encountered between 1.18m and 1.68m begl; based on the water levels observed across the site, it is assumed that this water is perched (or infiltrating very slowly) on silts and fine sands (Huddersfield White Rock).

It is considered unlikely that dewatering will be required for shallow short-term excavations. The observed groundwater conditions suggest that only simple dewatering techniques (e.g. sump pumping) will be needed to control water ingress following any periods of significant rainfall. Care

should be taken to ensure that dewatering does not lead to settlement of soils below existing structures or services on or off-site.

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

George Salloway BSc (Hons), MSc MIEnvSc
Senior Geo-environmental Scientist

Richard Upton BSc (Hons), MSc, CEnv, MIEnvSc
Director

Enclosed:
P8985 Gas Monitoring Location Plan
P8985 Gas Monitoring Results

DO NOT SCALE

NOTES:

WS01 — WS Borehole (with gas and water monitoring standpipe)

N.B. All positions approximate only

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CLIENT:
First Choice Homes

PROJECT:
Land Off Church Road, Linthwaite

TITLE:
Gas Monitoring Plan

SCALE@SIZE :	ISSUE:
NTS	Final
DESIGN/DRAWN by :	DATE:
GS	June 2019
PROJECT No:	DRAWING No:
P8985	

In-Situ Gas Monitoring Results

Project Name	Church Lane, Linthwaite, Huddersfield
Project Number	8985
Client	The Alan Johnston Partnership
Date	28/06/2019
Weather	Sunny
Atmospheric Pressure (mb)	1020
Presure Trend	Rising
Equipment	Gas Data GFM430
Operator	James Wardle

Ground Gas												Groundwater	
Well ID	Response Zone			Methane		CO2		Oxygen		Gas Flow		Depth to Groundwater	Total Well Depth
	mbegl			%v/v		%v/v		%v/v		l/h		mbegl	mbegl
ID	Top	Base	Strata	Peak	Steady	Peak	Steady	Low	Steady	Peak	Steady		
WS01	1.70	4.00	NS	0.10	0.10	0.00	0.00	20.20	20.20	0.00	0.00	1.32	4.35
WS02	1.10	4.00	NS	0.00	0.00	0.20	0.20	20.00	20.00	0.00	0.00	Not Detected	4.18
WS03	1.00	3.00	NS	0.20	0.20	0.40	0.40	19.50	19.50	0.00	0.00	Not Detected	2.72
WS05	1.30	2.00	NS										
WS06	1.00	1.40	NS	0.00	0.00	3.90	3.90	15.70	15.70	0.00	0.00	Not Detected	1.36

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

NS	Natural Strata

Key

	Response Zone Flooded

Printed 14/05/2020

In-Situ Gas Monitoring Results

Project Name	Church Lane, Linthwaite, Huddersfield
Project Number	8985
Client	The Alan Johnston Partnership
Date	02/07/2019
Weather	Sunny
Atmospheric Pressure (mb)	1020
Presure Trend	Rising
Equipment	Gas Data GFM430
Operator	James Wardle

Ground Gas												Groundwater	
Well ID	Response Zone			Methane		CO2		Oxygen		Gas Flow		Depth to Groundwater	Total Well Depth
	mbegl			%v/v		%v/v		%v/v		l/h		mbegl	mbegl
ID	Top	Base	Strata	Peak	Steady	Peak	Steady	Low	Steady	Peak	Steady		
WS01	1.70	4.00	NS	0.00	0.00	1.40	1.40	19.80	19.80	0.00	0.00	1.30	4.35
WS02	1.10	4.00	NS	0.00	0.00	0.20	0.20	19.80	19.80	0.00	0.00	Not Detected	4.15
WS03	1.00	3.00	NS	0.00	0.00	0.60	0.60	19.20	19.20	0.00	0.00	Not Detected	2.70
WS05	1.30	2.00	NS										
WS06	1.00	1.40	NS	0.00	0.00	4.30	4.30	15.60	15.60	0.00	0.00	Not Detected	1.36

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

NS	Natural Strata

Key

	Response Zone Flooded

Printed 14/05/2020

In-Situ Gas Monitoring Results

Project Name	Church Lane, Linthwaite, Huddersfield
Project Number	8985
Client	The Alan Johnston Partnership
Date	23/03/2020
Weather	Mostly Sunny
Atmospheric Pressure (mb)	1002
Presure Trend	Falling
Equipment	Gas Data LMSXi
Operator	Bryan Burgh

Ground Gas												Groundwater	
Well ID	Response Zone			Methane		CO2		Oxygen		Gas Flow		Depth to Groundwater	Total Well Depth
	mbegl			%v/v		%v/v		%v/v		l/h		mbegl	mbegl
ID	Top	Base	Strata	Peak	Steady	Peak	Steady	Low	Steady	Peak	Steady		
WS01	1.70	4.00	NS	0.00	0.00	0.70	0.70	21.20	21.20	0.00	0.00	0.75	4.43
WS02	1.10	4.00	NS	0.00	0.00	0.90	0.90	20.90	20.90	0.00	0.00	3.28	4.20
WS03	1.00	3.00	NS	0.00	0.00	0.70	0.70	20.70	20.70	0.00	0.00	2.64	2.76
WS05	1.30	2.00	NS	0.00	0.00	0.20	0.20	20.80	20.80	0.00	0.00	1.18	1.84
WS06	1.00	1.40	NS	0.00	0.00	0.50	0.50	20.80	20.80	0.00	0.00	Not Detected	1.42

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

NS	Natural Strata

Key

	Response Zone Flooded

Printed 14/05/2020

In-Situ Gas Monitoring Results

Project Name	Church Lane, Linthwaite, Huddersfield
Project Number	8985
Client	The Alan Johnston Partnership
Date	15/04/2020
Weather	Sunny
Atmospheric Pressure (mb)	1023
Presure Trend	Falling
Equipment	Gas Data GFM430
Operator	Liam Press

Ground Gas											
Well ID	Response Zone			Methane		CO2		Oxygen		Gas Flow	
	mbegl			%v/v		%v/v		%v/v		l/h	
ID	Top	Base	Strata	Peak	Steady	Peak	Steady	Low	Steady	Peak	Steady
WS01	1.70	4.00	NS	0.00	0.00	0.60	0.60	21.00	21.00	0.00	0.00
WS02	1.10	4.00	NS	0.00	0.00	0.20	0.20	21.00	21.00	0.00	0.00
WS03	1.00	3.00	NS	0.00	0.00	0.10	0.10	20.90	20.90	0.00	0.00
WS05	1.30	2.00	NS	0.00	0.00	3.50	3.50	19.80	19.80	0.00	0.00
WS06	1.00	1.40	NS	0.00	0.00	0.80	0.80	20.60	20.60	0.00	0.00

Groundwater	
Depth to Groundwater	Total Well Depth
mbegl	mbegl
1.13	4.38
Not Detected	4.23
Not Detected	2.77
1.53	1.83
Not Detected	1.41

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

NS	Natural Strata

Key

	Response Zone Flooded

Printed 14/05/2020

In-Situ Gas Monitoring Results

Project Name	Church Lane, Linthwaite, Huddersfield
Project Number	8985
Client	The Alan Johnston Partnership
Date	24/04/2020
Weather	Sunny
Atmospheric Pressure (mb)	987
Presure Trend	Falling
Equipment	Gas Data LMSXi
Operator	Liam Press

Ground Gas											
Well ID	Response Zone			Methane		CO2		Oxygen		Gas Flow	
	mbegl			%v/v		%v/v		%v/v		l/h	
ID	Top	Base	Strata	Peak	Steady	Peak	Steady	Low	Steady	Peak	Steady
WS01	1.70	4.00	NS	0.00	0.00	0.60	0.60	20.50	20.50	0.00	0.00
WS02	1.10	4.00	NS	0.00	0.00	2.90	2.90	17.70	17.70	0.00	0.00
WS03	1.00	3.00	NS	0.00	0.00	0.00	0.00	20.80	20.80	0.00	0.00
WS05	1.30	2.00	NS	0.00	0.00	0.00	0.00	21.00	21.00	0.00	0.00
WS06	1.00	1.40	NS	0.00	0.00	2.00	2.00	19.70	19.70	0.00	0.00

Groundwater	
Depth to Groundwater	Total Well Depth
mbegl	mbegl
1.24	4.46
Not Detected	4.26
Not Detected	2.79
1.57	1.85
Not Detected	1.42

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

NS	Natural Strata

Key

	Response Zone Flooded

Printed 14/05/2020

In-Situ Gas Monitoring Results

Project Name	Church Lane, Linthwaite, Huddersfield
Project Number	8985
Client	The Alan Johnston Partnership
Date	05/05/2020
Weather	Cloudy
Atmospheric Pressure (mb)	992
Presure Trend	Steady
Equipment	Gas Data LMSXi
Operator	Liam Press

Ground Gas											
Well ID	Response Zone			Methane		CO2		Oxygen		Gas Flow	
	mbegl			%v/v		%v/v		%v/v		l/h	
ID	Top	Base	Strata	Peak	Steady	Peak	Steady	Low	Steady	Peak	Steady
WS01	1.70	4.00	NS	0.00	0.00	0.90	0.90	20.80	20.80	0.00	0.00
WS02	1.10	4.00	NS	0.00	0.00	0.00	0.00	21.00	21.00	0.00	0.00
WS03	1.00	3.00	NS	0.00	0.00	0.00	0.00	21.00	21.00	0.00	0.00
WS05	1.30	2.00	NS	0.00	0.00	1.80	1.80	20.50	20.50	0.00	0.00
WS06	1.00	1.40	NS	0.00	0.00	0.50	0.50	21.00	21.00	0.00	0.00

Groundwater	
Depth to Groundwater	Total Well Depth
mbegl	mbegl
1.19	4.44
Not Detected	4.22
Not Detected	2.75
1.68	1.82
Not Detected	1.41

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

NS	Natural Strata

Key

	Response Zone Flooded

Printed 14/05/2020