

By Email

Our Ref: 23-795.01L

Neil Brown
Adept Consulting Engineers
4th Floor St James Square
Manchester
M2 6XX

6th February 2025

Dear Neil,

Re: Supplementary Hazardous Ground Gas Risk Assessment – Sovereign Business Park, Huyton, Liverpool

Following completion of the recent supplementary investigation works at the above location, we have pleasure in providing you with our ground investigation report. The following documents are attached with this report;

- Borehole Location Plan
- Ground Gas and Water Monitoring Certificates

1.0 Introduction:-

Further to comments received by Merseyside EAS on behalf of Knowsley Council regarding the previous ground gas monitoring carried out at Sovereign Business Park as part of the Ground Investigation Report carried out for this site (Ref. 23-795 February 2024), Arc Environmental Limited were commissioned by DAVOS Property Developments Ltd, to undertake a programme of supplementary hazardous ground gas risk monitoring to further assess the potential risk to the proposed development from hazardous ground gas migration.

These additional intrusive investigation works, undertaken by Arc Environmental Limited, comprised 4 no. window sampling boreholes (WSA - WSD) accompanied by the installation of combined ground gas and groundwater monitoring wells. As part of this supplementary report, the results of the previous ground gas monitoring have been included in the updated ground gas risk assessment.

The position of the borehole positions (both previous and supplementary) can be seen on the Borehole Location Plan attached and this plan should be used for orientating purposes only, as the positions shown are approximate and the plan is not to a standard scale. The information contained in this report is limited to the areas of the site as indicated on the borehole location plan attached, and to those areas accessible during the ground investigation.



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DH7 8PN

Re: Supplementary Hazardous Ground Gas Risk Assessment – Sovereign Business Park, Huyton, Liverpool (Cont'd)

2.0 Ground Conditions: -

From these supplementary boreholes carried out, made ground was recorded to depths of between c.0.70m to c.2.10m below current ground level (bcgl) comprising either site surfacing of grass over topsoil or asphalt overlying disturbed natural strata with anthropogenic debris (i.e. brick, concrete, etc).

Underlying the made ground the natural drift deposits comprised various bands of brown mottled grey sandy gravelly CLAY and brown clayey SAND, recorded to depths of between c.2.10m to c.5.00m bcgl. Natural bedrock deposits were noted to underly the natural drift deposits within WSB & WSD at depths of c.4.70m and c.2.60m respectively and were noted to comprise COAL and grey MUDSTONE, recorded to a depth of at least c.4.80m bcgl.

3.0 Insitu Testing: -

3.1 Insitu Ground Gas & Groundwater Monitoring: -

During these supplementary works, combined ground gas & water monitoring standpipes were installed within the WSA - WSD, to assess the site from potential on and off-site sources of hazardous ground gases. In addition, from the previous investigation works carried out ground gas & water monitoring standpipes were installed within WS01, WS02 & WS03.

A standard 50mm diameter HDPE standpipe, with gravel and geo-wrap surround, bentonite seal, gas valve cap and security cover, was installed within each borehole, and ground gas and water levels were allowed to reach equilibrium, prior to the first monitoring visit. A bentonite seal was installed to prevent excessive surface water ingress or venting of soil gas, with the resulting response zone covering the remaining depths of the installations. Monitoring has been undertaken using a GFM series infra-red gas analyser, with integral flow meter, and a Geotechnical Instruments dipmeter.

Based on the findings of the intrusive works (both previous and supplementary), and also in accordance with CIRIA Report C665, November 2007, BS8485:2015 + A1:2019 and BS8576:2013, it is felt that an adequate risk assessment can be undertaken based on the following limiting factors:

- The development has been considered as **low sensitivity** i.e. commercial development (Tables 5.5a & 5.5b – Typical/Idealised frequency and period of monitoring, after Wilson et al, 2005).
- The risk associated with the generation potential of a source is considered as **very low** (Based on the findings of intrusive works).
- Monitoring over a **minimum of one month** with **four recorded** readings (Tables 5.5a & 5.5b – Typical /idealised frequency and period of monitoring after Wilson et al, 2005).
- **Negligible** flow rates are recorded during the monitoring period (Table 8.5 – Modified Wilson & Card classification).
- A targeted and phased programme of gas monitoring has been completed, obtaining gas monitoring readings during varying atmospheric conditions, which covers the 'worst case' scenario for ground gas emissions to occur, particularly during rapid falls in atmospheric pressure (i.e. from c.1020mb and c.1010mb), and also during low atmospheric pressure events (i.e. c.1000mb and below).

Re: Supplementary Hazardous Ground Gas Risk Assessment – Sovereign Business Park, Huyton, Liverpool (Cont'd)

3.0 Insitu Testing (Cont'd): -

3.1 Insitu Ground Gas & Groundwater Monitoring (Cont'd): -

When considering the comments made by Merseyside EAS, the ground gas monitoring period was extended to further assess the potential risks from hazardous ground gases. A summary of the results for the visits undertaken both previously and during recent monitoring visits are presented in Table 1 below and on the following page, with a copy of the monitoring results attached.

Table 1

Note – Atmospheric pressure trend taken from www.weatheronline.co.uk for Huyton.

Position	Date	Atmospheric Pressure (mbar)	Water (m bgl)	CH ₄ (%v/v)	LEL (%v/v)	CO (%v/v)	CO ₂ (%v/v)	O ₂ (%v/v)	Flow Rate (l/hr)
Background		~	~	0	0	0	0	21.0	<0.1
WS01	01/11/23	977 (rising)	1.59	0.0	0.0	0.0	0.5	18.4	<0.1
WS02			1.25	0.0	0.0	0.0	0.4	19.3	<0.1
WS13			1.12	0.0	0.0	0.0	2.4	17.1	<0.1
WS01	15/11/23	1008 (falling)	1.67	0.0	0.0	0.0	0.6	19.4	<0.1
WS02			1.19	0.0	0.0	0.0	0.5	19.4	<0.1
WS13			1.20	0.0	0.0	0.0	0.5	20.0	<0.1
WS01	29/11/23	1000 (falling)	1.90	0.0	0.0	0.0	0.3	19.7	<0.1
WS02			1.90	0.0	0.0	0.0	0.3	19.8	<0.1
WS13			1.20	0.0	0.0	0.0	0.6	19.6	<0.1
WS01	12/12/23	1000 (falling)	1.70	0.0	0.0	0.0	0.2	20.2	<0.1
WS02			1.10	0.0	0.0	0.0	1.9	19.3	<0.1
WS13			1.10	0.0	0.0	0.0	0.6	20.2	<0.1
WS01	04/12/24	1019-1022 (Falling)	1.87	0.0	0.0	0.0	0.3	19.9	<0.1
WS02			1.36	0.0	0.0	0.0	1.2	19.1	<0.1
WS13			1.16	0.0	0.0	0.0	0.8	19.6	<0.1
WSA			1.45	0.0	0.0	0.0	0.0	19.9	<0.1
WSB			1.87	0.0	0.0	0.0	0.5	19.7	<0.1
WSC			2.45	0.0	0.0	0.0	0.6	19.2	<0.1
WSD			1.05	0.0	0.0	0.0	0.0	20.2	<0.1
WS01	18/12/24	1004-1005 (Rising)	1.81	0.0	0.0	0.0	0.4	19.7	<0.1
WS02			1.40	0.0	0.0	0.0	0.8	19.2	<0.1
WS13			1.15	0.0	0.0	0.0	0.2	19.8	<0.1
WSA			1.39	0.0	0.0	0.0	0.6	19.3	<0.1
WSB			1.62	0.0	0.0	0.0	0.4	19.5	<0.1
WSC			2.33	0.0	0.0	0.0	0.3	19.8	<0.1
WSD			1.16	0.0	0.0	0.0	0.1	20.0	<0.1
WS01	09/01/25	1030 (Rising)	1.92	0.0	0.0	0.0	0.2	20.2	<0.1
WS02			1.34	0.0	0.0	0.0	0.7	19.5	<0.1
WS13			1.14	0.0	0.0	0.0	0.3	20.1	<0.1
WSA			1.87	0.0	0.0	0.0	0.1	20.1	<0.1
WSB			1.85	0.0	0.0	0.0	0.5	19.8	<0.1
WSC			2.45	0.0	0.0	0.0	0.4	19.6	<0.1
WSD			1.10	0.0	0.0	0.0	0.0	20.3	<0.1

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Certificate No 368032021

Re: Supplementary Hazardous Ground Gas Risk Assessment – Sovereign Business Park, Huyton, Liverpool (Cont'd)

3.0 Insitu Testing (Cont'd): -

3.1 Insitu Ground Gas & Groundwater Monitoring (Cont'd): -

Table 1 (Cont'd)

Note – Atmospheric pressure trend taken from www.weatheronline.co.uk for Huyton.

Position	Date	Atmospheric Pressure (mbar)	Water (m bgl)	CH ₄ (%v/v)	LEL (%v/v)	CO (%v/v)	CO ₂ (%v/v)	O ₂ (%v/v)	Flow Rate (l/hr)
Background		~	~	0	0	0	0	21.0	<0.1
WS01	17/01/25	1002-1003 (Falling)	1.89	0.0	0.0	0.0	0.4	19.7	<0.1
WS02			1.28	0.0	0.0	0.0	0.9	19.0	<0.1
WS13			1.20	0.0	0.0	0.0	0.2	19.9	<0.1
WSA			1.92	0.0	0.0	0.0	0.2	20.0	<0.1
WSB			1.79	0.0	0.0	0.0	0.6	19.3	<0.1
WSC			2.23	0.0	0.0	0.0	0.3	19.8	<0.1
WSD			1.17	0.0	0.0	0.0	0.2	19.9	<0.1
WS01	28/01/25	991-992 (Falling)	1.91	0.0	0.0	0.0	0.3	20.1	<0.1
WS02			1.33	0.0	0.0	0.0	1.3	19.1	<0.1
WS13			1.24	0.0	0.0	0.0	0.4	19.8	<0.1
WSA			2.10	0.0	0.0	0.0	0.1	19.1	<0.1
WSB			1.94	0.0	0.0	0.0	0.5	20.1	<0.1
WSC			2.53	0.0	0.0	0.0	0.6	20.2	<0.1
WSD			1.00	0.0	0.0	0.0	0.7	19.9	<0.1
WS01	06/02/25	1028 (Steady)	1.97	0.0	0.0	0.0	0.2	21.0	<0.1
WS02			1.54	0.0	0.0	0.0	0.8	20.3	<0.1
WS13			1.31	0.0	0.0	0.0	0.3	19.8	<0.1
WSA			1.98	0.0	0.0	0.0	0.2	19.9	<0.1
WSB			1.92	0.0	0.0	0.0	0.5	19.6	<0.1
WSC			2.42	0.0	0.0	0.0	0.4	19.8	<0.1
WSD			1.22	0.0	0.0	0.0	0.0	20.9	<0.1

From the monitoring visits completed, no detectable concentrations of Methane (CH₄) have been recorded. Concentrations of Carbon Dioxide (CO₂) have been recorded up to a maximum of 2.4% v/v, with slightly reduced Oxygen (O₂) concentrations (minimum 17.1% v/v). Negligible flow rates (<0.1l/hr) have been recorded within all monitoring wells during the monitoring visits.

For the purposes of assessing the proposed development, the site is characterised based on the limiting borehole hazardous gas flow rate (Q_{hg}) for Methane and Carbon Dioxide, known as the Gas Screening Value (GSV), which in turn determines the level of any gas protection required, in accordance with Table 1 in BS8485 and Tables 8.5 & 8.7 in CIRIA C665. Therefore, to complete the risk assessment, the maximum GSV for the CH₄ and CO₂ levels recorded have been determined as follows:

- Methane (CH₄) – Due to the lack of Methane recorded, a GSV cannot be calculated.
- Carbon Dioxide (CO₂) - multiplying the maximum concentration recorded (taken as 2.4%) by the maximum flow rate (0.1l/hr.) which gives a GSV of 0.0024 l/hr. (calculated from 2.4% (0.024) x 0.1 l/hr. maximum flow rate) for CO₂.

Re: Supplementary Hazardous Ground Gas Risk Assessment – Sovereign Business Park, Huyton, Liverpool (Cont'd)

3.0 Insitu Testing (Cont'd): -

3.1 Insitu Ground Gas & Groundwater Monitoring (Cont'd): -

From the results obtained from both the previous and recent ground gas monitoring, the presence of hazardous ground gases does not exceed the GSV assessment value of 0.07 l/hr. (Characteristic Situation 1) for Carbon Dioxide, indicating that no gas protection measures are required for the proposed development.

5.0 General Comments: -

From the results of the groundwater monitoring carried out in the standpipes, standing water levels have been recorded between depths of c.1.00m and c.2.53m bgl. As a result, the standpipes were purged of water with the wells allowed to recharge prior to the gas monitoring being carried out.

We trust the contents of this report is to your satisfaction however, if you require any further information or clarification, please do not hesitate to contact us.

Yours sincerely,



.....
For and on behalf of Arc Environmental Ltd
Darren McGrath FGS MEnvSc Tech IOSH
Director

Borehole Location Plan



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The contractor shall check all dimensions on site before commencement of any works. No dimensions to be scaled off this drawing.
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LEGEND

 AREA OF INVESTIGATION WORKS

rev.	date	amendments	drawn	chckd

Client:

ADEPT CSCE

Project Title:

Holewood Wines & Spirits
The Sovereign Distillery, Wilson Road, Huyton
Merseyside, L36 6AD

Drawing Title:

Borehole Location Plan

Scale at A3:	Date:	Drawn by:	Approved by:
NTS @ A3		P.D	S.T

Job Ref:	Dwg no:	Rev:
23-795	—	—

WSB

WSA

WSC

WSD

WS01

WS02

WS03

Gas Monitoring Certificates

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Arc Environmental Ground Gas & Groundwater Monitoring Certificate



Site:	Sovereign
Ref:	23-795

Visit	Date	Time	Equipment	Weather	Initials	Comments	Borehole	Gas Flow (l/hr)	Atmospheric Pressure (mb)	Trend	Methane (% v/v)		Methane (% LEL)		Carbon Dioxide (% v/v)		Oxygen (% v/v)		Hydrocarbons (GFM 435 only)		Other Gases (PPM)			
										R/F/S	Initial	Steady	Initial	Steady	Initial	Steady	Initial	Steady	Hex %	PID Cf	PID (Isobutylene)	H ₂ S	CO	
1	01/11/2023	11.30am	GFM435	RAIN	PR		WS01	<0.1	977			0.0		0.0		0.5		18.4				0.0	0.0	1.59
							WS02	<0.1	977			0.0		0.0		0.4		19.3				0.0	0.0	1.25
							WS13	<0.1	977			0.0		0.0		2.4		17.1				0.0	0.0	1.12
2	15/11/23	1.00pm	GFM435	CLEAR	PR		WS01	<0.1	1008			0.0		0.0		0.6		19.4				0.0	0.0	1.67
							WS02	<0.1	1008			0.0		0.0		0.5		19.4				0.0	0.0	1.19
							WS13	<0.1	1008			0		0		0.5		20.0				0.0	0.0	1.20
3	29/11/23	9.00am	GFM435	CLEAR	PR		WS01	<0.1	1001			0.0		0.0		0.3		19.7				0.0	0.0	1.91
							WS02	<0.1	1000			0.0		0.0		0.3		19.8				0.0	0.0	1.85
							WS13	<0.1	1000			0.0		0.0		0.6		19.6				0.0	0.0	1.15
4	12/12/2023	10.00am	GFM435	RAIN	PR		WS01	<0.1	997			0.0		0.0		0.2		20.2				0.0	0.0	1.68
							WS02	<0.1	997			0.0		0.0		1.9		19.3				0.0	0.0	1.08
							WS13	<0.1	996			0.0		0.0		0.6		20.2				0.0	0.0	1.11
5																								
6																								

Notes:
Detection limits - Methane = 0.0%, Carbon Dioxide = 0.0%, LEL = 0.0%, Oxygen = 0.0%, Flow = 0.1l/hr
Monitoring order is from **Left to Right** across table
Monitoring should be for **Not Less** than 3 minutes. However, if high concentrations of gasses initially recorded, monitoring should be for up to 10 minutes
N/A = Not applicable = Off the scale

Cf = PID compensation Factor (1-10) - Must be used to multiply the PID reading to give an accurate measure of the total hydrocarbons in the borehole when methane is present
Hex = Hexane (Valid and in range up to 2.000%) - Recorded when abnormally high methane is present.
PID = Photo Ionisation Detector (Calibrated to Isobutylene)

Arc Environmental Ground Gas & Groundwater Monitoring Certificate

Site:	Sovereign
Ref:	23-795



Visit	Date	Time	Equipment	Weather	Initials	Comments	Borehole	Gas Flow (l/hr)	Atmospheric Pressure (mb)	Trend	Methane (% v/v)		Methane (% LEL)		Carbon Dioxide (% v/v)		Oxygen (% v/v)		Hydrocarbons (GFM 435 only)		Other Gases (PPM)			
											Initial	Steady	Initial	Steady	Initial	Steady	Initial	Steady	Hex %	PID Cf	PID (isobutylene)	H ₂ S	CO	
1	04/12/2024	11.30am	GFM435	OVERCAST	PR		WS01	<0.1	1022	Falling		0.0		0.0		0.3		19.9				0.0	0.0	1.87
							WS02	<0.1	1022	Falling		0.0		0.0		1.2		19.1				0.0	1.0	1.38
							WS13	<0.1	1019	Falling		0.0		0.0		0.8		19.6				0.0	0.0	1.16
							WSA	<0.1	1020	Falling		0.0		0.0		0.0		19.9				0.0	0.0	1.45
							WSB	<0.1	1021	Falling		0.0		0.0		0.5		19.7				0.0	0.0	1.87
							WSC	<0.1	1020	Falling		0.0		0.0		0.6		19.2				0.0	0.0	2.45
							WSD	<0.1	1020	Falling		0.0		0.0		0.0		20.2				0.0	0.0	1.05
2	18/12/2025	10.15am	GFM430	CLOUDY	PR		WS01	<0.1	1004	Rising		0.0		0.0		0.4		19.7				0.0	0.0	1.81
							WS02	<0.1	1005	Rising		0.0		0.0		0.8		19.2				0.0	0.0	1.40
							WS13	<0.1	1004	Rising		0.0		0.0		0.2		19.8				0.0	0.0	1.15
							WSA	<0.1	1004	Rising		0.0		0.0		0.6		19.3				0.0	0.0	1.39
							WSB	<0.1	1005	Rising		0.0		0.0		0.4		19.5				0.0	0.0	1.62
							WSC	<0.1	1004	Rising		0.0		0.0		0.3		19.8				0.0	0.0	2.23
							WSD	<0.1	1004	Rising		0.0		0.0		0.1		20.0				0.0	0.0	1.16
3	09/01/2025	10.30am	GFM430	CLOUDY	PR		WS01	<0.1	1030	Rising		0.0		0.0		0.2		20.2				0.0	0.0	1.92
							WS02	<0.1	1030	Rising		0.0		0.0		0.7		19.5				0.0	0.0	1.34
							WS13	<0.1	1030	Rising		0.0		0.0		0.3		20.1				0.0	0.0	1.14
							WSA	<0.1	1030	Rising		0.0		0.0		0.1		20.1				0.0	0.0	1.87
							WSB	<0.1	1030	Rising		0.0		0.0		0.5		19.8				0.0	0.0	1.85
							WSC	<0.1	1030	Rising		0.0		0.0		0.4		19.6				0.0	0.0	2.45
							WSD	<0.1	1030	Rising		0.0		0.0		0.0		20.3				0.0	0.0	1.10
4	17/01/2025	10.20am	GFM435	CLOUDY	PR		WS01	<0.1	1002	Falling		0.0		0.0		0.4		19.7				0.0	0.0	1.89
							WS02	<0.1	1002	Falling		0.0		0.0		0.9		19.0				0.0	0.0	1.28
							WS13	<0.1	1002	Falling		0.0		0.0		0.2		19.9				0.0	0.0	1.20
							WSA	<0.1	1002	Falling		0.0		0.0		0.2		20.0				0.0	0.0	1.92
							WSB	<0.1	1002	Falling		0.0		0.0		0.6		19.3				0.0	0.0	1.79
							WSC	<0.1	1003	Falling		0.0		0.0		0.3		19.8				0.0	0.0	2.23
							WSD	<0.1	1003	Falling		0.0		0.0		0.2		19.9				0.0	0.0	1.17
5	28/01/202	10.15am	GFM430	RAIN	PR		WS01	<0.1	992	Falling		0.0		0.0		0.3		20.1				0.0	0.0	1.91
							WS02	<0.1	992	Falling		0.0		0.0		1.3		19.1				0.0	0.0	1.33
							WS13	<0.1	991	Falling		0.0		0.0		0.4		19.8				0.0	0.0	1.24
							WSA	<0.1	992	Falling		0.0		0.0		0.1		19.1				0.0	0.0	2.10
							WSB	<0.1	992	Falling		0.0		0.0		0.5		20.1				0.0	0.0	1.94
							WSC	<0.1	992	Falling		0.0		0.0		0.6		20.2				0.0	0.0	2.53
							WSD	<0.1	992	Falling		0.0		0.0		0.7		19.9				0.0	0.0	1.00
6	06/02/2025	10.00am	GFM435	Clear	PR		WS01	<0.1	1028	Steady		0.0		0.0		0.2		21.0				0.0	0.0	1.97
							WS02	<0.1	1028	Steady		0.0		0.0		0.8		20.3				0.0	0.0	1.54
							WS13	<0.1	1028	Steady		0.0		0.0		0.3		19.8				0.0	0.0	1.31
							WSA	<0.1	1028	Steady		0.0		0.0		0.2		19.9				0.0	0.0	1.98
							WSB	<0.1	1028	Steady		0.0		0.0		0.5		19.6				0.0	0.0	1.92
							WSC	<0.1	1028	Steady		0.0		0.0		0.4		19.8				0.0	0.0	2.42
							WSD	<0.1	1028	Steady		0.0		0.0		0.0		20.9				0.0	0.0	1.22

Notes:
Detection limits - Methane = 0.0%, Carbon Dioxide = 0.0%, LEL = 0.0%, Oxygen = 0.0%, Flow = 0.1l/hr
Monitoring order is from **Left to Right** across table
Monitoring should be for **Not Less** than 3 minutes. However, if high concentrations of gases initially recorded, monitoring should be for up to 10 minutes
N/A = Not applicable
= Off the scale

Cf = PID compensation Factor (1-10) - Must be used to multiply the PID reading to give an accurate measure of the total hydrocarbons in the borehole when methane is present.
Hex = Hexane (Valid and in range up to 2.000%) - Recorded when abnormally high methane is present.
PID = Photo Ionisation Detector (Calibrated to Isobutylene)