



Ground Gas Addendum Report
Smithfield Market, Lawton Street

Reference:12-757-R5-1
Date: July 2022



GROUND GAS ADDENDUM REPORT

New Smithfield Market
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Prepared for:

Russells WBHO

Report Ref: 12-757-R5

Date Issued: July 2022

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1. INTRODUCTION

1.1. BACKGROUND

E3P have previously completed multiple rounds of ground investigation including a previous ground gas assessment with limited data. The previous reports completed for the site are listed below and should be read as a precursor to this report:

- ✳ **E3P** – *Supplementary Site Investigation Report*. Ref: Report No. 12-757-L5 dated 3rd March 2022
- ✳ **E3P** – *Supplementary Ground Investigation Report (Area 1)*. Ref: Report No. 12-757-L4 dated 15th December 2020
- ✳ **E3P** – *Phase II Geo-Environmental Site Assessment*. Ref: Report No. 12-757-r2 dated July 2020.
- ✳ **E3P** - *Geoenvironmental Desk Study* Ref: 12-757r3 Dated July 2020
- ✳ **E3P** - *Phase II Geoenvironmental Site Assessment*: 12-757r2, dated November 2018
- ✳ **E3P** - *Phase 1 Geoenvironmental Desk Study* Ref: 12-757, dated August 2018

This report covers the ground gas addendum based on rounds of ground gas monitoring undertaken based on wells installed in the following reports:

- ✳ **E3P** – *Supplementary Site Investigation Report*. Ref: Report No. 12-757-L5 dated 3rd March 2022 – Monitoring wells WS302, WS303, WS305, WS306.
- ✳ **E3P** – *Supplementary Ground Investigation Report (Area 1)*. Ref: Report No. 12-757-L4 dated 15th December 2020 – WS201, WS204, WS205, WS206, WS209, WS210
- ✳ **E3P** - *Phase II Geoenvironmental Site Assessment*: 12-75.7r2, dated November 2018 – Monitoring wells WS102, WS103, WS104, WS105, WS106.

The previous ground gas addendum (Ref: 12-757-L1 March 2019) is also considered within this assessment.

During the investigations completed E3P installed ground gas monitoring wells, which were to be monitored over six months after installation. The data collected from the gas monitoring wells are summarised in this report and this comprises the completed ground gas assessment.

1.2. PROPOSED DEVELOPMENT

Russell WBHO intends to construct a commercial development comprising two industrial steel frame units with ancillary office space with associated access, parking, service yard and landscaping including the replacement of the access roadway to the existing adjacent unit.

Drawing 12-757-002 (Appendix III) identifies the Proposed Development Layout. A snapshot of the proposed development layout is indicated in Figure 1.1 overleaf.



FIGURE 1.1 SNAPSHOT OF PROPOSED DEVELOPMENT



1.3. OBJECTIVES

The objectives of the ground gas addendum report are to provide a detailed assessment of ground gas risk based on all available data from the E3P ground investigation works.

1.4. LIMITATIONS

The limitations of this report are presented in Appendix I.

1.5. CONFIDENTIALITY

E3P has prepared this report solely for the use of the client and those parties with whom a warranty agreement has been executed, or with whom an assignment has been agreed. Should any third party wish to use or rely upon the contents of the report, written approval must be sought from E3P; a charge may be levied against such approval.



2. INVESTIGATION RATIONALE

The Initial Conceptual Site Model has identified that the underlying made ground may represent a potential source of ground gas generation. Ground conditions are discussed in more detail in Section 3. Based on the identification of these sources, E3P has determined that the site represents a moderate ground gas source generation potential.

Within the context of the proposed commercial end use and ground gas generation potential, the gas assessment requires that six visits are required over three months, with at least two sets of readings at low or falling atmospheric pressure as set out within CIRIA 665 Tables 5.5a and 5.5b.

A summary of the ground conditions within each location is summarised within Table 2.1.

TABLE 2.1 GROUND GAS MONITORING LOCATION RATIONALE

LOCATION	GROUND GAS SOURCE	DEPTH OF MONITORING WELL (m)
WS102	Dark brown slightly gravelly silty CLAY. Gravel is fine to medium sub-angular to rounded of sandstone and mudstone	1.00-5.00
WS103	Dark brown slightly gravelly silty CLAY. Gravel is fine to medium sub-angular to rounded of sandstone and mudstone.	0.50-2.00
WS104	MADE GROUND: Firm to stiff purple brown slightly gravelly clay. Gravel is fine to coarse sub-angular to rounded of mudstone and coal.	1.00-4.00
WS105	Very stiff high strength purple brown mottled grey slightly gravelly CLAY. Gravel is fine to coarse sub-angular to subrounded of mudstone and rare coal.	1.00-4.00
WS106	MADE GROUND: Soft to firm brown black slightly gravelly clay with cobbles. Gravel is fine to medium angular to sub-angular of mudstone, limestone, brick and ash. Cobbles are sub-angular of brick.	0.50-1.00
WS201	MADE GROUND: Firm brown gravelly clay (reworked). Gravel is medium to coarse angular to subrounded of sandstone and brick. (Rare black staining and slight hydrocarbon odour.)	0.50-1.00
WS204	Stiff brown slightly gravelly CLAY. Gravel is fine to medium subangular to subrounded of mudstone.	1.00-5.00
WS205	Stiff brown slightly gravelly CLAY. Gravel is fine to medium subangular to subrounded of mudstone.	1.00-2.00
WS206	Stiff brown slightly gravelly CLAY. Gravel is fine to medium subangular to subrounded of mudstone.	1.00-4.00
WS209	MADE GROUND: Dark brown slightly sandy gravel (sub-base). Gravel is fine to medium angular to sub-angular of sandstone and rare concrete and brick.	0.50-1.00



LOCATION	GROUND GAS SOURCE	DEPTH OF MONITORING WELL (m)
WS210	Stiff brown slightly gravelly CLAY. Gravel is fine to medium subangular to subrounded of mudstone.	1.00-2.00
WS302	Very stiff high strength brown mottled grey slightly gravelly CLAY. Gravel is fine to coarse subangular to subrounded of coal and sandstone	1.00 - 5.00
WS303	Very stiff high strength brown mottled grey slightly gravelly CLAY. Gravel is fine	0.50 - 5.00
WS304	MADE GROUND: Dark brown Gravel. Gravel is fine to coarse subangular to subrounded of asphalt coal and sandstone with fragments of timber and metal	0.50 - 1.50
WS305	Stiff medium strength brown slightly gravelly CLAY. Gravel is fine to coarse subangular to subrounded of sandstone. Becoming very stiff high strength at 3.00 m bgl.	1.00 - 5.00

2.1. MONITORING METHODOLOGY

Concentrations of methane (CH₄), carbon dioxide (CO₂) and oxygen (O₂) were measured using an infra-red gas analyser (GFM435) calibrated to a reference standard (before and after each survey) and gas flow rates were measured using an integrated flow meter.

Gas measurements were recorded for a minimum of 60 seconds at each location, at which point the maximum concentration of CH₄ and CO₂, together with the lowest concentration of O₂ were recorded.

The results of the ground gas monitoring are presented in Table 2.2, 2.3 and 2.4.



TABLE 2.2 SUMMARY OF GROUND GAS MONITORING RESULTS – INVESTIGATION 2022

WELL	DATE	CH ₄ INITIAL (%V/V)	CH ₄ STEADY (%V/V)	CH ₄ GSV (L/HR)	CO ₂ INITIAL (%V/V)	CO ₂ STEADY (%V/V)	CO ₂ GSV (L/HR)	O ₂ (%V/V)	ATMOS (MB)	ATMOS. DYNAMIC	FLOW (L/HR)	RESPONSE ZONE (M BGL)	DEPTH BASE (M BGL)	TO	DEPTH WATER (M BGL)	TO
WS302	03/02/2022	0.1	0.1	0.0001	0.1	0.1	0.0001	16.8	1001	Falling	0.1	1.00 - 5.00	5.00		4.95	
	22/02/2022	0.1	0.1	0.0001	0.1	0.1	0.0001	20	1007	Falling	0.1		5.00		4.95	
	01/03/2022	0.1	0.1	0.0001	0.1	0.1	0.0001	19.7	1022	Rising	0.1		5.00		4.88	
	07/03/2022	0.1	0.1	0.0001	0.1	0.1	0.0001	19.6	1019	Falling	0.1		5.00		4.88	
WS303	03/02/2022	N/A											5.00		N/A	
	22/02/2022	0.1	0.1	0.0001	0.1	0.1	0.0001	19.9	1007	Falling0	0.1	1.00 - 5.00	5.00		4.00	
	01/03/2022	0.1	0.1	0.0001	0.1	0.1	0.0001	19.7	1023	Rising	0.1		5.00		4.00	
	07/03/2022	0.1	0.1	0.0001	0.1	0.1	0.0001	19.5	1020	Falling	0.1		5.00		4.00	
WS305	03/02/2022	0.1	0.1	0.0000	0.1	0.1	0.0001	14.6	1000	Falling	0.1	1.00 - 5.00	5.00		4.00	
	22/02/2022	0.1	0.1	0.0001	0.1	0.1	0.0001	19.8	1008	Falling	0.1		5.00		3.95	
	01/03/2022	0.1	0.1	0.0001	0.1	0.1	0.0001	19.5	1022	Rising	0.1		5.00		4.00	
	07/03/2022	0.1	0.1	0.0000	0.1	0.1	0.0001	19.4	1021	Falling	0.1		5.00		3.94	
WS304	03/02/2022	0.1	0.1	0.0001	0.1	0.1	0.0001	19.3	1000	Falling	0.1	0.50 - 1.50	1.50		1.3	
	22/02/2022	0.1	0.1	0.0001	0.1	0.1	0.0001	19.9	1007	Falling	0.1		1.50		1.31	
	01/03/2022	0.1	0.1	0.0001	0.1	0.1	0.0001	19.3	1023	Rising	0.1		1.50		1.30	
	07/03/2022	0.1	0.1	0.0001	0.1	0.1	0.0001	19.4	1020	Falling	0.1		1.50		1.30	



TABLE 2.3 SUMMARY OF GROUND GAS MONITORING RESULTS – INVESTIGATION 2020

WELL	DATE	CH ₄ INITIAL (%V/V)	CH ₄ STEADY (%V/V)	CH ₄ GSV (l/hr)	CO ₂ INITIAL (%V/V)	CO ₂ STEADY (%V/V)	CO ₂ GSV (l/hr)	O ₂ (%V/V)	ATMOS (mb)	ATMOS. DYNAMIC	FLOW (l/hr)	RESPONSE ZONE (m bgl)	DEPTH TO BASE (m bgl)	DEPTH TO WATER (m bgl)	
WS201	27/5/20	0.10	0.10	0.0001	6.90	6.90	0.0069	12.90	1009	Steady	0.10	0.5-1.0	1.10	0.99	
	2/6/20	0.10	0.10	0.0001	6.50	6.50	0.0065	13.30	1012	Falling	0.10		1.10	0.96	
	30/6/20	0.10	0.10	0.0016	7.90	7.90	0.1264	8.80	997	Steady	1.60		1.10	0.86	
	20/7/2020	0.10	0.10	0.00098	7.20	7.20	0.07056	9.50	999	Steady	0.98		1.10	0.90	
	13/8/20	0.10	0.10	0.00052	3.70	3.70	0.01924	16.60	1007	Rising	0.52		1.10	0.94	
	28/8/2020	0.10	0.10	0.00079	4.10	4.10	0.03239	14.20	999	Rising	0.79		1.10	0.95	
WS204	27/5/20	Damaged and repaired.													
	27/5/20	0.10	0.10	0.0001	0.10	0.10	0.0001	20.70	1009	Steady	0.10	1.0-5.0	3.05	2.05	
	2/6/20	0.10	0.10	0.0001	0.10	0.10	0.0001	20.80	1012	Falling	0.10		3.05	2.03	
	30/6/20	Flooded											N/A		
	20/7/2020	0.10	0.10	0.00013	0.10	0.10	0.00013	20.40	999	Steady	0.13		3.05	0.10	
	13/8/20	0.10	0.10	-0.0030	0.10	0.10	-0.0030	20.90	1007	Rising	-3.04		3.04	GL	
	28/8/2020	0.10	0.10	0.0001	0.10	0.10	0.0001	ND	ND	Rising	ND		ND		
	WS205	27/5/20	0.10	0.10	0.0001	0.50	0.50	0.0005	20.10	1009	Steady		0.10	1.0-2.0	1.98
2/6/20		0.10	0.10	0.0001	0.40	0.40	0.0004	20.40	1012	Falling	0.10		1.98		1.47
30/6/20		Not Accessible											N/A		
20/7/2020		0.10	0.10	0.00013	0.60	0.60	0.00078	19.90	999	Steady	0.13	1.97	1.52		
13/8/20		0.10	0.10	-0.0017	0.50	0.50	-0.0087	20.40	1007	Rising	-1.74	1.98	1.60		



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	28/8/2020	0.10	0.10	ND					999	Rising	ND		ND	
WS206	27/5/20	Well Damaged and repaired												
	27/5/20	0.10	0.10	0.0001	0.20	0.20	0.0002	20.70	1009	Steady	0.10	1.0-4.0	3.20	1.35
	2/6/20	0.10	0.10	0.0001	0.30	0.30	0.0003	20.80	1012	Falling	0.10		3.21	1.33
	30/6/20	0.10	0.10	0.00026	0.70	0.70	0.00182	19.60	997	Steady	0.26		3.25	1.68
	20/7/2020	0.10	0.10	0.00052	0.60	0.60	0.00312	19.80	999	Steady	0.52		3.24	1.54
	13/8/20	0.10	0.10	0.00013	0.50	0.50	0.00065	19.90	1007	Rising	0.13		3.24	1.60
	28/8/2020	0.10	0.10	0.00026	0.40	0.40	0.00104	20	999	Rising	0.26		3.24	1.62
WS209	27/5/20	0.10	0.10	0.00013	3.50	3.50	0.00455	13.50	1009	Steady	0.13	0.5-1.0	1.05	0.76
	2/6/20	0.10	0.10	0.0001	3.20	3.20	0.0032	13.90	1012	Falling	0.1		1.05	0.75
	30/6/20	0.10	0.10	0.00026	4.20	4.20	0.01092	15.30	997	Steady	0.26		1.07	0.66
	20/7/2020	0.10	0.10	0.00013	3.90	3.90	0.00507	14.60	999	Steady	0.13		1.06	0.70
	13/8/20	0.10	0.10	0.00052	3.40	3.40	0.01768	15.80	1007	Rising	0.52		1.05	0.75
	28/8/2020	0.10	0.10	0.00026	3.10	3.10	0.00806	16.20	999	Rising	0.26		1.05	0.80
WS210	27/5/20	0.10	0.10	0.0001	0.10	0.10	0.0001	19.4	1009	Steady	0.1	1.0-2.0	1.93	1.48
	2/6/20	0.10	0.10	0.0001	0.10	0.10	0.0001	19.6	1012	Falling	0.1		1.94	1.44
	30/6/20	0.10	0.10	0.00052	0.10	0.10	0.00052	19.2	997	Steady	0.52		1.90	1.45
	20/7/2020	0.10	0.10	0.00026	0.10	0.10	0.00026	19.4	999	Steady	0.26		1.90	1.49



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	13/8/20	0.10	0.10	0.00013	0.10	0.10	0.00013	19.5	1007	Rising	0.13		1.90	1.50
	28/8/2020	0.10	0.10	0.00052	0.10	0.10	0.00052	19.7	999	Rising	0.52		1.90	1.54

*ND means No Data



TABLE 2.4 SUMMARY OF GROUND GAS MONITORING RESULTS – INVESTIGATION 2018

WELL	DATE	CH4 INITIAL (%V/V)	CH4 STEADY (%V/V)	CH4 GSV (l/hr)	CO2 INITIAL (%V/V)	CO2 STEADY (%V/V)	CO2 GSV (l/hr)	O2 (%V/V)	ATMOS (mb)	ATMOS. DYNAMIC	FLOW (l/hr)	RESPONSE ZONE (m bgl)	DEPTH TO BASE (m bgl)	DEPTH TO WATER (m bgl)
WS102	10/10/18	0.1	0.1	0.00052	2.4	2.4	0.01248	17	1007	Falling	0.52	1.00-4.50	4.22	0.64
	17/10/18	0.1	0.1	0.00026	1.9	1.9	0.00494	18.4	1009	Rising	0.26		4.21	0.7
	01/11/18	0.1	0.1	0.00026	1.1	1.1	0.00286	18.8	999	Rising	0.26		4.22	0.71
	6/11/2018	0.1	0.1	0.00026	0.7	0.7	0.00182	19.3	988	Falling	0.26		4.22	0.68
WS103	10/10/18	0.1	0.1	0.00378	1.9	1.9	0.07182	13.2	1007	Falling	3.78	1.00-2.00	1.9	0.42
	17/10/18	0.1	0.1	0.0024	1.4	1.4	0.0336	14.5	1009	Rising	2.4		1.9	0.53
	01/11/18	0.1	0.1	0.00141	1.7	1.7	0.02397	13.9	999	Rising	1.41		1.89	0.45
	6/11/2018	0.1	0.1	0.00052	2.0	2.0	0.0104	14.5	988	Falling	0.52		1.87	0.42
WS104	10/10/18	0.1	0.1	0.00324	4.5	4.5	0.1458	11.6	1007	Falling	3.24	1.00-4.00	4.1	1.4
	17/10/18	0.1	0.1	0.0019	4.1	4.1	0.0779	12.4	1009	Rising	1.9		4.1	1.51
	01/11/18	0.1	0.1	0.00196	5.9	5.9	0.11564	9.4	999	Rising	1.96		4.1	1.69
	6/11/2018	0.1	0.1	0.00154	9.6	9.6	0.14784	2.7	988	Falling	1.54		4.1	1.75
WS105	10/10/18	0.1	0.1	0.0001	0.1	0.1	0.0001	17.2	1007	Falling	0.1	1.00-4.00	3.84	2.44
	17/10/18	0.1	0.1	0.00013	0.2	0.2	0.00026	17.1	1009	Rising	0.13		3.84	2.52
	01/11/18	0.1	0.1	0.00087	0.3	0.3	0.00261	17.8	999	Rising	0.87		3.84	1.99
	6/11/2018	0.1	0.1	0.00144	0.4	0.4	0.00576	18.3	988	Falling	1.44		3.84	1.97
WS106	10/10/18	0.1	0.1	0.0001	1	1	0.001	13.5	1007	Falling	0.1	1.00-1.50	1.67	Dry
	17/10/18	0.1	0.1	0.00026	0.7	0.7	0.00182	14.3	1009	Rising	0.26		1.68	Dry
	01/11/18	0.1	0.1	0.00052	0.8	0.8	0.00416	18.1	999	Rising	0.52		1.67	Dry



WELL	DATE	CH4 INITIAL (%V/V)	CH4 STEADY (%V/V)	CH4 GSV (l/hr)	CO2 INITIAL (%V/V)	CO2 STEADY (%V/V)	CO2 GSV (l/hr)	O2 (%V/V)	ATMOS (mb)	ATMOS. DYNAMIC	FLOW (l/hr)	RESPONSE ZONE (m bgl)	DEPTH TO BASE (m bgl)	DEPTH TO WATER (m bgl)
	6/11/2018	0.1	0.1	0.00013	0.6	0.6	0.00078	19.3	988	Falling	0.13		1.65	Dry



3. GROUND GAS RISK ASSESSMENT

3.1. GROUND GAS RISK ASSESSMENT METHODOLOGY

The potential impact on the development from ground gases has been assessed with reference to standards and guidelines published in CIRIA Report 665 – *Assessing risks posed by hazardous ground gases to buildings* (2007). However, it is recommended that the full ground gas assessment and recommended protection measures are agreed with the local authority prior to their adoption on site. Furthermore, all protection measures adopted should be validated by a suitably qualified engineer.

CIRIA C665 and NHBC Report No 10627-R01 provide assessments for carbon dioxide and methane based upon gas screening values (GSVs) utilising flow rates and concentrations. The site-based GSVs for steady state methane and carbon dioxide are based upon the following equation:

$$GSV = \frac{\text{concentration (by vol)}}{100} \times \text{flowrate (1 / hr)}$$

The GSVs within CIRIA C665 are based upon all buildings other than standard residential houses. The NHBC GSVs are based upon standard residential houses with precast concrete floors (block and beam). The CIRIA 665 report author (Steve Wilson) since provided further clarification regarding which guidance should be adopted for residential houses that have suspended cast in-situ concrete floor slab: for the avoidance of doubt, it was confirmed that the GSVs within the CIRIA 665 guidance should be adopted.

The GSVs within CIRA C665 are based upon all buildings other than standard residential houses.

The thresholds for GSVs based upon CIRIA guidance are provided within Table 3.1.

TABLE 3.1 THRESHOLDS FOR GAS SCREENING VALUES (GSV) IN ACCORDANCE WITH CIRIA C665 COMMERCIAL END USE.

CLASSIFICATION	GSV (METHANE AND CARBON DIOXIDE)
CS1	< 0.07
CS2	< 0.70
CS3	< 3.5
CS4	< 15
CS5	< 70
CS6	> 70



3.1.1. SOURCES OF GROUND GAS

The Phase I report and subsequent ground investigation has identified the following potential sources of ground gas:

-  Made ground deposits.

3.1.2. GROUND CONDITIONS

The site is predominantly hard standing and as such there is no vegetation other than what is encroaching through the sites southern fence line with Lawton Street.

There is one historical landfill site located 141 m northeast which accepted inert waste and liquid sludge.

According to the Coal Authority Interactive Map Viewer the site is not within a Development High Risk Area, and no mine entries are identified in the vicinity, therefore, no further action considered necessary.

Historical and current commercial land uses on site, including a locomotive yard, as well as Made Ground, represent potential localised sources of mobile hydrocarbon contamination. Hardstanding across the site and underlying superficial Clay deposits reduce the potential for infiltration and migration of mobile contaminants, if present. However, considering the underlying Principal aquifer, a moderate to high risk to controlled waters is identified. Made Ground associated with historical development may be a source of carbon dioxide and methane

3.1.3. GROUNDWATER

WS204 flooded at one point during the assessment so these readings can not be taken into consideration regarding groundwater level fluctuations. WS102, WS103 and WS204 was flooded throughout the assessment.

Within the remaining wells, groundwater levels were observed to fluctuate over the monitoring period, with levels generally decreasing over the monitoring period, probably linked to the more favourable drainage and less rainfall in the summer months. The greatest groundwater change occurred within WS206 where levels decreased by 0.27 m over the monitoring period.

3.1.4. GAS FLOW

During the monitoring a positive flow was noted in all wells. The measure of positive flow is considered to be the result of groundwater fluctuations and flooding of the well causing compression – as opposed to gas generation – as the highest flows are recorded during periods of high groundwater levels.

Negative flows may be indicative of back pressure from wind being greater than the active flow from the wells. Negative flows were recorded in WS204 and WS205.

3.1.5. GAS CONCENTRATIONS

Methane has been recorded within all monitoring wells at maximum concentrations of 0.1% v/v. No elevated concentrations were recorded during monitoring and this should not be grounds for concern.

Carbon dioxide concentrations were recorded within all the monitoring wells at concentrations ranging from 0.10% v/v to 9.60% v/v (WS104). The maximum carbon dioxide levels were also associated with low oxygen concentrations.



3.1.6. GAS ASSESSMENT

In accordance with the methodology outlined with the CIRIA publication C665, E3P have utilised the results of the ground gas monitoring surveys to calculate a tentative gas screening value (GSV).

The GSVs for the monitoring positions are summarised in Table 3.2.

TABLE 3.2 GAS RISK PROFILE AND LOCATION

LOCATION	MAX CO ₂ (% v/v)	GSV (l/hr)	MAX CH ₄ (% v/v)	GSV (l/hr)	CLASSIFICATION
WS102	2.4	0.01248	0.1	0.00052	CS1
WS103	1.9	0.07182	0.1	0.00378	CS2
WS104	9.6	0.14784	0.1	0.00324	CS2
WS105	0.4	0.00576	0.1	0.00144	CS1
WS106	0.8	0.00416	0.1	0.00052	CS1
WS201	7.90	0.0016	0.10	0.0016	CS2
WS204	0.10	0.00013	0.10	0.00013	CS1
WS205	0.60	0.00078	0.10	0.00013	CS1
WS206	0.70	0.00312	0.10	0.00052	CS1
WS209	4.20	0.01768	0.10	0.00052	CS1
WS210	0.10	0.00052	0.10	0.00052	CS1
WS302	0.10	0.0001	0.10	0.0001	CS1
WS303	0.10	0.0001	0.10	0.0001	CS1
WS305	0.10	0.0001	0.10	0.0001	CS1
WS306	0.10	0.0001	0.10	0.0001	CS1

The GSV has been compared to the criteria outlined with CIRIA C665 to determine the level of risk to the proposed development and to ensure the appropriate remedial options are incorporated into any future building design in this area.

Ground gas monitoring suggests that the site can be classified as CS1, and that gas protection measures will not be required.

This is due to the fact the elevated ground gas concentrations identified are not below the proposed structures, furthermore as part of the proposed development the site will undergo a Made Ground turnover which will result in any anthropogenic material being removed.

In summary, the site currently has a low gas generation potential. Importantly there is no evidence of significant advective flow or the presence material that could cause surface emissions of gas out of the ground in large volumes.

END OF REPORT



APPENDIX I

LIMITATIONS

1. This report and its findings should be considered in relation to the terms of reference and objectives agreed between E3P and the client as indicated in Section 1.3.
2. For the work, reliance has been placed on publicly available data obtained from the sources identified. The information is not necessarily exhaustive and further information relevant to the site may be available from other sources. When using the information it has been assumed it is correct. No attempt has been made to verify the information.
3. This report has been produced in accordance with current UK policy and legislative requirements for land and groundwater contamination which are enforced by the local authority and the Environment Agency. Liabilities associated with land contamination are complex and requires advice from legal professionals.
4. During the site walkover, reasonable effort has been made to obtain an overview of the site conditions. However, during the site walkover, no attempt has been made to enter areas of the site that are unsafe or present a risk to health and safety, are locked, barricaded, overgrown, or the location of the area has not been made known or accessible.
5. Access considerations, the presence of services and the activities being carried out on the site limited the locations where sampling locations could be installed and the techniques that could be used.
6. Site sensitivity assessments have been made based on available information at the time of writing and are ultimately for the decision of the regulatory authorities.
7. Where mention has been made to the identification of Japanese Knotweed and other invasive plant species and asbestos or asbestos-containing materials, this is for indicative purposes only and do not constitute or replace full and proper surveys.
8. The executive summary, conclusions and recommendations sections of the report provide an overview and guidance only and should not be specifically relied upon without considering the context of the report in full.
9. E3P cannot be held responsible for any use of the report or its contents for any purpose other than that for which it was prepared. The copyright in this report and other plans and documents prepared by E3P is owned by them and no such plans or documents may be reproduced, published or adapted without written consent. Complete copies of this may, however, be made and distributed by the client as is expected in dealing with matters related to its commission. Should the client pass copies of the report to other parties for information, the whole report should be copied, but no professional liability or warranties shall be extended to other parties by E3P in this connection without their explicit written agreement there to by E3P.
10. New information, revised practices or changes in legislation may necessitate the re-interpretation of the report, in whole or in part.



APPENDIX II

GLOSSARY

TERMS

ACM	Asbestos-containing material	MMP	Materials management plan
ADS	Acoustic design statement	ND	Not detected
AST	Above-ground storage tank	NDP	Nuclear density probe
BGS	British Geological Survey	NMP	Noise management plan
BSI	British Standards Institute	NPSE	Noise policy statement for England
BTEX	Benzene, toluene, ethylbenzene, xylenes	NR	Not recorded
CA	Coal Authority	PAH	Polycyclic aromatic hydrocarbon
CBR	California bearing ratio	PCB	Polychlorinated biphenyl
CIEH	Chartered Institute of Environmental Health	PI	Plasticity index
CIRIA	Construction Industry Research Association	PID	Photo ionisation detector
CLEA	Contaminated land exposure assessment	POS	Public open space
CML	Council of Mortgage Lenders	PPE	Personnel protective equipment
CoC	Contaminants of concern	ProPG	Professional practice guidance
CSM	Conceptual site model	QA	Quality assurance
DNAPL	Dense non-aqueous phase liquid (chlorinated solvents, PCB)	SGV	Soil guideline value
DWS	Drinking water standard	SPH	Separate-phase hydrocarbon
EA	Environment Agency	SPT	Standard penetration test
EQS	Environmental quality standard	SVOC	Semi-volatile organic compound
FFL	Finished floor level	TPH	Total and speciated petroleum hydrocarbon
GAC	General assessment criteria	TPH CWG	Total Petroleum Hydrocarbon (Criteria Working Group)
GL	Ground level	UKWIR	United Kingdom Water Infrastructure Risk
GSV	Gas screening value	UST	Underground storage tank
HCV	Health criteria value	VCC	Vibro-concrete column
ICSM	Initial conceptual site model	VOC	Volatile organic compound
LEL	Lower explosive limit	VRSC	Vibro-replacement stone columns
LMRL	Lower method reporting limit	VSC	Vibro-stone columns
LNAPL	Light non-aqueous phase liquid (petrol, diesel, kerosene)	WHO	World Health Organisation



Smithfield Market

Ground gas addendum

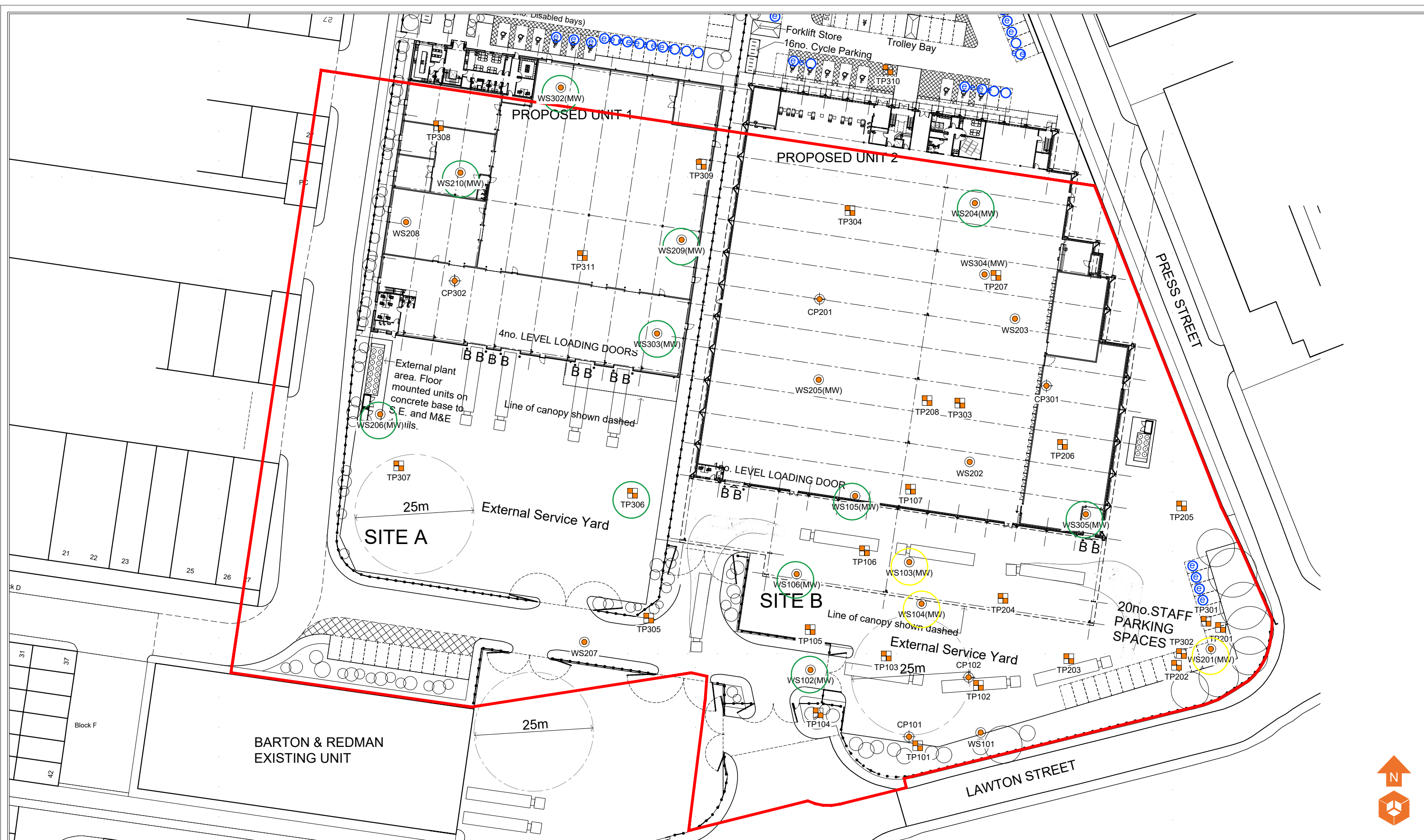
July 2022

MCV	Moisture condition value	WRAP	Waste and Resources Action Programme
MIBK	Methyl isobutyl ketone	WTE	Water table elevation
m	Metres	ppm	Parts per million
km	Kilometres	mg/m³	Milligram per metre cubed
% v/v	Percent volume in air	m bgl bgl	Metres below ground level
mb	Millibars (atmospheric pressure)	m bcl	Metre below cover level
l/hr	Litres per hour	mAOD	Metres above ordnance datum (sea level)
µg/l	Micrograms per litre (parts per billion)	kN/m²	Kilonewtons per metre squared
ppb	Parts per billion	µm	Micrometre
mg/kg	Milligrams per kilogram (parts per million)	SSRT	Site Specific Remediation Target
PSD	Particle Size Distribution	DD	Dry Density
CL:AIRE	Contaminated Land: Applications in Real Environments	Mc	Moisture Content
ρ	Bulk Density	GPR	Ground Penetrating Radar
NDP	Nuclear Density Probe	FFL	Finished Floor Level
LEL	Lower Explosive Limit	UKWIR	UK Water Industry Research
CIRIA	Construction Industry Research and Information Association	LOD	Limit of Detection



APPENDIX III

DRAWINGS



Location Symbols		Ground Gas	
	Approximate Window Sample Probehole Location		Characteristic Situation 1
	Approximate Window Sample Probehole Location with Install		Characteristic Situation 2
	Approximate Trial Pit Location		
	Approximate Cable Percussive Borehole Location		

Notes:				
P1	REVB	03.08.2022	HM	SE
P1	REVA	29.07.2022	LM	SE
Phase	Issue	Date	Drawn	Checked

Client:	
Russells Construction	
Job Title:	
Barton & Redman, Manchester	

Job No:	
12-757	
Drawing No:	
023	
Date:	
03.08.2022	
Scale:	
NTS @ A3	
Drawing Title:	
Ground Gas Assessment Plan	

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