Land to the South of Gardner Road
Southwick
West Sussex

Ground Gas Risk Assessment

Report Beneficiary:
Adur & Worthing Councils
Worthing Town Hall
Chapel Road
Worthing
West Sussex
BN11 1HA

Project Reference: P15600

Report Reference: R15256

Document Control			
Issue No.	**Status**	**Issue Date**	**Notes**
1	Final	29th April 2022	

Report Section	Prepared By	Approved By
Ground Gas Risk Assessment	Stuart Card BA (Hons)	Alex Minchell-Bewick BSc MSc DIC AIEMA MIEnvSc CEnv

Head Office
Unit 3
The Old Grain Store
Ditchling Common Business Park
Ditchling
East Sussex
BN6 8SG
Tel: 01273 483119
www.ashdownsi.co.uk

Limitations

This report was prepared specifically for the Client's project and may not be appropriate to alternative schemes. The copyright for the report and licence for its use shall remain vested in Ashdown Site Investigation Limited (the Company) who disclaim all responsibility or liability (whether at common law or under the express or implied terms of the Contract between the Company and the Client) for any loss or damage of whatever nature in the event that this report is relied on by a third party, or is issued in circumstances or for projects for which it was not originally commissioned.

TABLE OF CONTENTS

1. INTRODUCTION 1

2. SITE LOCATION 1

3. ADDITIONAL MONITORING 2

4. SUPPLEMENTARY GAS RISK ASSESSMENT 2

4.1 Summary of Monitoring Results 2
4.2 Assessment of Monitoring Results 2
4.3 Assessment of Risk from Ground Gases 3
4.4 Assessment of Gas Protection Measures Required 4
4.5 Conclusions 5

5. LOCAL AUTHORITY APPROVAL 6

FIGURES AND APPENDICES

FIGURES

Figure 1 Site Plan

APPENDIX A

Proposed Development Layout

APPENDIX B

Local Authority Comments

APPENDIX C

Gas Concentration and Groundwater Monitoring Results

1. INTRODUCTION

It is proposed to develop the domestic garages site located to the south of Gardner Road, Southwick, West Sussex. The development proposals are understood to comprise the demolition of the existing garage buildings and the construction of a pair of semi detached houses, with areas of private garden and associated car parking spaces. A copy of the proposed development layout is included as Appendix A.

Ashdown Site Investigation Ltd has previously undertaken a ground investigation at the site and provided a risk assessment report[1]. The report confirmed the presence of made ground containing elevated concentrations of lead and PAH compounds and remedial measures were recommended in proposed soft landscaped areas.

The preliminary risk assessment identified a potential risk associated with ground gas generation, associated with historical ground workings, artificial ground and landfill shown in the vicinity of the site.

To quantify the level of risk, ground gas monitoring standpipes were installed within three boreholes and were monitored on three occasions. During the monitoring period, no significant concentrations of ground gases or gas flow rates were recorded. The calculated gas screening values (GSV) calculated for the site placed the site within Characteristic Situation 1, meaning that no gas protection measures are required as part of the development.

However, the report noted that the monitoring was undertaken during periods of relatively high pressure and recommended that a further three rounds of monitoring were undertaken over a six-week period to confirm the gas regime at the site.

The report was submitted alongside a planning application for the site[2] and was reviewed by an Environmental Health Technician for Adur and Worthing Councils. The council agreed with the recommendations of the previous report in respect of ground gas monitoring and requested a condition to be imposed on the planning application in this regard. A copy of the comments are included as Appendix B.

Whilst not discussed further in this report, it is noted that the council provided comments in relation to proposed remedial works at the site and did not consider the complete removal of made ground soils to be an appropriate form of remedial action at the site, rather that a cover system should be employed within soft landscaped areas.

Ashdown Site Investigation Ltd was commissioned to undertake the additional ground gas monitoring recommended, and to provide an updated ground gas risk assessment in relation to the discharge of Condition 10.

This report must be read in conjunction with the previous report for the site.

2. SITE LOCATION

The site comprises an approximately rectangular shaped plot of land located to the south of Gardner Road, Southwick, West Sussex and is centred on the approximate Ordnance Survey

[1] Combined Geotechnical, Ground Contamination Risk Assessment and Remediation Strategy Report, Project Ref: P15000, Report Ref: R14670, Issue 1, 19th March 2021.
[2] Adur District Council, Application No. AWDM/1247/21

national grid reference TQ 2533 0526. A site plan, with the borehole positions marked, is presented as Figure 1.

3. ADDITIONAL MONITORING

Including the previous phase of monitoring, a total of eight return visits to monitor gas levels at the site have now been undertaken between 22nd February 2021 and 14th March 2022, a period of approximately 13 months.

During the current phase of monitoring one of the standpipes, WS01, was initially inaccessible due to utility works that were being undertaken, and then later appears to have been destroyed.

4. SUPPLEMENTARY GAS RISK ASSESSMENT

4.1 Summary of Monitoring Results

No detectable gas flow rates have been recorded in any of the standpipes during any of the monitoring visits.

No detectable methane concentrations were recorded during any of the monitoring visits. Peak concentrations of carbon dioxide of up to 2.6% by volume were recorded. However, it is noted that on seven of the eight monitoring visits, the carbon dioxide concentrations recorded in the standpipes were less than 1%.

Atmospheric pressures varied between 1001 and 1030 during the monitoring period. Monitoring was carried out during periods of both rising and falling atmospheric pressure.

4.2 Assessment of Monitoring Results

As with the previous report, assessment of the results of the monitoring has been carried out in general accordance with the current guidance[3].

The guidance provides a methodology for assessing the risk from ground gases by the calculation of site-specific gas screening values (GSV) for each key asphyxiating or explosive gas (carbon dioxide and methane). These are calculated by multiplying the concentration (percentage/volume) of a gas by a gas flow rate (l/hr).

The screening has been carried out by calculating the GSV using the highest consistent flow rate recorded multiplied by the highest gas concentration recorded. This is considered to represent a highly conservative assessment of the risk posed by ground gases.

Where no detectable gas concentrations or flow rates are recorded, the GSV are calculated assuming values equal to the limit of detection of the instrument are present.

[3] CIRIA document C665, Assessing risks posed by hazardous ground gases to buildings, 2007.

The following table summarises the calculated GSV:

Table 1. Calculated GSV for Carbon Dioxide and Methane

Gas	GSV
Carbon Dioxide	0.026 x 0.1 = 0.0026
Methane	0.001 x 0.1 = 0.0001

4.3 Assessment of Risk from Ground Gases

4.3.1 Situation Types

CIRIA C665 identifies two types of development "Situation A" and "Situation B". Situation B is low rise housing, with a ventilated underfloor void of a minimum of 150mm. Situation A is for all other housing types that are not Situation B.

4.3.1.1 Situation B - Low Rise Housing

For standard low-rise housing, the NHBC have developed a characterisation system which assigns calculated GSV and typical maximum gas concentrations to four different "traffic light" scenarios.

Elements of Table 8.7 of CIRIA C665, which set out the typical maximum gas concentrations and GSV for the "Traffic Light Classification", are reproduced below.

Table 2. Reproduction of elements of Table 8.7 of C665

Traffic Light Classification	Methane		Carbon Dioxide	
	Typical Maximum Concentration (%)	Gas Screening Value (l/hr)	Typical Maximum Concentration (%)	Gas Screening Value (l/hr)
Green				
	1	0.16	5	0.78
Amber 1				
	5	0.63	10	1.56
Amber 2				
	20	1.56	30	3.10
Red				

4.3.1.2 Situation A – Developments Other than Situation B

For housing types other than Situation B, assessment is undertaken by calculating GSV for both methane and carbon dioxide. The appropriate characteristic situation for the site can then be determined by comparing the highest GSV (for either gas) with the threshold value detailed within Table 8.5 of CIRIA C665, which is partially reproduced below.

Table 3. Reproduction of elements of Table 8.5 of C665

Characteristic Situation (CIRIA R149)	Risk Classification	GSV (CH_4 or CO_2) Threshold (l/hr)	Additional Factors	Typical Source of Generation
1	Very low risk	<0.07	Typical methane of 1% and/or carbon dioxide of 5%. Otherwise consider increase to characteristic situation 2.	Natural soils with low organic content. "Typical" made ground
2	Low risk	<0.7	Borehole air flow not to exceed 70l/hr. Otherwise consider increase to characteristic situation 3.	Natural soils with high peat/organic content. "Typical" made ground
3	Moderate risk	<3.5		Old landfill, inert waste, mineworking flooded.

4.3.2 Assessment of Calculated GSV

For the calculated GSV, the development would either be characterised as "Green" in relation to developments in Situation B or "Characteristic Situation 1" for those developments in Situation A.

4.4 Assessment of Gas Protection Measures Required

4.4.1 Situation B – Low Rise Housing

For Situation B Developments, Box 8.4 of C665 specifies the levels of gas protection required for low rise housing based upon the allocated NHBC Traffic Light. This is partially reproduced below.

Table 4. Reproduction of elements of Box 8.4 of C665

Traffic light classification	Protection Measures Required
Green	Negligible gas regime identified and gas protection measures are not considered necessary.

4.4.2 Situation A – Developments Other Than Situation B

For Situation A Developments, Both CIRIA C665 and BS8485[4] set out advice on the design of gas protection measures.

Table 8.6 of CIRIA C665 provides the typical scope of gas protective measures, and is partially reproduced below.

[4] BS 8485:2015+A1:2019 Code of practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings

Table 5. Reproduction of elements of Table 8.6 of C665

Characteristic Situation	Residential Buildings (not those which belong to Situation B)		Office/commercial/industrial development	
(From Table 8.5)	Number of levels of protection	Typical scope of protective measures	Number of levels of protection	Typical scope of protective measures
1	None	No special precautions	None	No special precautions

Under BS8485, it is also necessary to consider the building type in which buildings in the development fall into. Table 3 of BS8485 defines the building types with a "Type A building" being those buildings in private ownership, which likely applies to this development site (and is the most conservative).

Table 4 of BS8485 identifies the score required for different characteristic situations for different "building types".

Table 6. Reproduction of elements of Table 4 of BS8485

Characteristic Situation	Minimum Gas Protection Score (points)			
	High Risk		Medium Risk	Low Risk
	Type A	Type B	Type C	Type D
1	0	0	0	0

4.5 Conclusions

Whilst the original report recommended that a further three monitoring visits should be undertaken over six weeks, the current phase comprised five additional monitoring visits over a period of four weeks.

Although the additional monitoring was carried out over a slightly shorter period than originally recommended, given the additional visits that were carried out and that the data has been found to be extremely consistent between both the first and second phases of monitoring, as well as within each phase, the data obtained is considered to be suitably robust on which to base the assessment provided herein.

The GSV calculated for the site indicate that the development should be considered as "Green" or "Characteristic Situation 1". Neither CIRIA C665 nor BS8485 recommend any specific gas protection measures for the respective classifications.

There is not considered to be an unacceptable risk to end users of the development from the concentrations of ground gases present beneath the site.

Remedial works in soft landscaped areas, as discussed within the previous report for the site, with the amendments required by the Local Authority are still required at the site.

No further gas monitoring is considered to be necessary.

5. LOCAL AUTHORITY APPROVAL

It is recommended that this report is submitted to the Local Planning Authority in support of an application to discharge Condition 10.

The recommendations made and conclusions drawn should be considered as provisional until such time as the Local Authority has approved the reports and the relevant conditions have been discharged.

Ashdown Site Investigation Ltd.

.

FIGURES

Figure 1 Site Plan



N

ASHDOWN SITE INVESTIGATION
L • I • M • I • T • E • D

Unit 3
The Old Grain Store
Ditchling Common Business Park
Ditchling
East Sussex
BN6 8SG
01273 483119
contact@ashdownsi.co.uk

Site:

Land to South of Gardner Road
Southwick
West Sussex

Report Ref:

P15600

Figure No.

1

Drawing Title

Site Plan

Scale

NTS

APPENDIX A

Proposed Development Layout

This drawing is copyright © of Yelo Architects Limited



01 Site Plan
Scale:1:200

1:200 @ A1
Scale in Metres
0 1 2 3 4 5 10 15 20

N

External Works Key

- Tarmac (Permeable)
- Turfed grass
- Shrub planting
- 450 x 450mm Marshalls Charnwood textured concrete paving (Permeable)
- P — Parking space (Permeable Tarmac)
- R — Refuse bin
- S — 1.2 x 1.8m timber close boarded shed for cycle storage
- W — 150l Water butt
- RD — Rotary drier
- Close boarded timber fence on retaining wall
- Close boarded timber fence
- TP — Telegraph Pole
- MH — Manhole
- ECP — Ducting for future Electric vehicle charging point

LANDSCAPE NOTE:
All hard surfaces are to be permeable in compliance with drainage report.

ISSUED FOR
PLANNING

Rev	Date	Description
-	-	-
-	-	-
-	-	-
-	-	-
-	-	-
A	31/08/21	Low knee rail added
-	30/06/21	Issued for Planning

Yelo Architects Ltd
Mocatta House, Spaces
Trafalgar Place,
Brighton
BN1 4DU
T 01273 608 444
E hello@yeloarchitects.com
W yeloarchitects.com
Twitter yeloarchitects

PROJECT	YO415-AWDC Infill
DRAWING TITLE	Gardner Road Proposed Site Plan
DRAWING NO	YO415-055
SCALE	1:200 @A1
DATE	31/08/21
REV	A

APPENDIX B

Local Authority Comments

From: Hannah Powell <hannah.powell@adur-worthing.gov.uk> on behalf of Hannah Powell
Sent: 07 September 2021 09:42
To: Peter Barnett
Subject: AWDM/1247/21

Flag Status: Flagged

Peter
Apologies for the delay in responding to the above.

With reference to the above application I have the following comments. A Combined Geotechnical, Ground Contamination Risk Assessment And Remediation Strategy Report (Ref: R14670 Dated 19th March 2021) has been submitted in support of this application.

This Report has identified the presence of elevated levels of PAH and lead contamination within the made ground at the site and proposes remedial measures with respect to soft landscaping at the site.

Only a single sample of natural ground appears to have been analysed as part of this investigation, I do not believe this gives sufficient coverage of this strata. Without additional sampling of this strata I would be reluctant to agree to the first remedial option of the removal of all made ground soils from soft landscaped areas without the addition of a visual marker and cover system (depth of clean cover dependent upon the use). The second two remedial options are acceptable for the different uses.

Due to relatively high atmospheric pressure during the first round of gas monitoring the report recommends a further three rounds of monitoring is undertaken over a six week period to confirm that the gas regime is consistent. Should the results of this monitoring indicate significantly different gas concentrations and/or encounter any significant flow rates, then a revised risk assessment should be undertaken to assess the level of risk posed and whether the categorisation of the site should be revised.

Please note, we would expect post placement sampling of imported soil to confirm compliance with screening values.

I would recommend the following conditions:

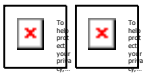
1. Prior to commencement of the development hereby approved (or such other date or stage in development as may be agreed in writing with the Local Planning Authority), the additional gas monitoring and remedial works shall be carried out in full accordance with the recommendations of the Combined Geotechnical, Ground Contamination Risk Assessment And Remediation Strategy Report (Ref: R14670 Dated 19th March 2021) and all works which form part of the approved scheme shall be completed before the permitted dwelling is occupied.

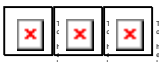
A Verification Report demonstrating completion of the works set out in the approved remediation strategy and the effectiveness of the remediation shall be submitted to and approved in writing by the Local Planning Authority. The report shall include results of sampling and monitoring carried out in accordance with the approved verification plan to demonstrate that the site remediation criteria have been met. It shall also include any plan (a 'long-term monitoring and maintenance plan') for longer-term monitoring of pollutant linkages, maintenance and arrangements for contingency action, as identified in the verification plan, and for the reporting of this to the Local Planning Authority.

2. Construction work shall not commence until a scheme for the protection of the existing neighbouring premises from dust has been submitted to and approved by the local planning authority. The scheme as approved shall be operated at all times during the demolition and construction phases of the development.

Regards
--

Hannah Powell
Environmental Health Technician, Adur & Worthing Councils
Phone: 01273 263357
Email: hannah.powell@adur-worthing.gov.uk
Website: http://www.adur-worthing.gov.uk/
Worthing Town Hall, Chapel Road, Worthing, West Sussex, BN11 1HA





APPENDIX C

Gas Concentration and Groundwater Monitoring Results

Gas Concentrations and Groundwater Monitoring Results

Site Name:	Land to the South of Gardner Road, Southwick, West Sussex
Project Ref:	P15600

Position	Date	Time	Dynamic Pressure (pa)	Atmospheric Pressure (mbar)	Atmospheric Trend	Standing Water Depth (m bgl)	Flow Rate (l/hr)				Methane (%)				Carbon Dioxide (%)				Oxygen (%)				CO (ppm)	H_2S (ppm)
							Seconds				Seconds				Seconds				Seconds					
							15	30	45	60	15	30	45	60	15	30	45	60	15	30	45	60		
WS01	22/02/2021	14:45	0	1014	Rising	DRY	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	20.5	20.7	20.6	20.6	0	0
WS02	22/02/2021	14:55	0	1014	Rising	DRY	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	20.5	20.8	20.7	20.7	0	0
WS03	22/02/2021	15:05	0	1014	Rising	DRY	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	20.5	21.0	20.8	20.6	0	0
WS01	05/03/2021	13:49	0	1030	Rising	DRY	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.6	0.6	0.6	0.6	20.2	19.8	19.7	19.6	0	0
WS02	05/03/2021	13:40	0	1030	Rising	DRY	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.4	0.4	0.4	19.2	19.1	19.1	19.1	0	0
WS03	05/03/2021	13:45	0	1030	Rising	DRY	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.2	0.2	0.2	19.0	20.2	20.2	20.2	0	0
WS01	09/03/2021	14:52	0	1018	Falling	DRY	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.7	0.8	0.8	0.8	20.0	19.3	19.2	19.1	0	0
WS02	09/03/2021	14:42	0	1019	Falling	DRY	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.5	0.5	0.5	19.7	18.9	18.6	18.6	0	0
WS03	09/03/2021	14:46	0	1019	Falling	DRY	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.3	0.3	0.3	19.0	19.7	19.9	20.0	0	0
WS02	15/02/2022	13:20	0	1003	Falling	2.40	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.8	0.8	0.8	0.8	19.2	18.8	18.6	18.6	0	0
WS03	15/02/2022	13:15	0	1003	Falling	DRY	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	20.4	20.4	20.4	20.4	0	0
WS02	22/02/2022	11:18	0	1012	Falling	2.52	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.7	0.7	0.7	0.7	19.1	19.0	19.0	19.0	0	0
WS03	22/02/2022	11:27	0	1012	Falling	DRY	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.6	0.6	0.6	0.6	20.0	20.4	20.4	20.4	0	0
WS02	03/03/2022	13:29	0	1018	Falling	2.50	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.6	1.7	0.7	0.7	18.9	18.8	18.7	18.7	0	0
WS03	03/03/2022	13:35	0	1017	Falling	DRY	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.7	0.7	0.7	0.6	19.6	19.5	19.6	19.6	0	0
WS02	11/03/2022	12:05	0	1002	Falling	2.80	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.7	0.7	0.7	0.7	19.5	19.2	19.1	19.1	0	0
WS03	11/03/2022	12:10	0	1001	Falling	DRY	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.8	0.8	0.7	0.7	19.6	19.6	19.6	19.5	0	0
WS02	14/03/2022	09:40	0	1023	Rising	2.78	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.6	0.7	0.7	0.7	20.0	19.3	19.2	19.1	0	0
WS03	14/03/2022	09:45	0	1023	Rising	DRY	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.5	0.5	0.5	20.2	20.1	20.0	19.9	0	0