Station Road, Hebburn

Remediation Strategy

For

Aldi Stores Ltd

Report Ref	Issue	Prepared by	Date	Reviewed by	Date
13675/RS	1	N Watson	14.10.15	A Hampson	14.10.15

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Station Road, Hebburn
Remediation Strategy

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CONTENTS

FIGURES

APPENDICES

1 INTRODUCTION

1.1 3e Consulting Engineers Ltd (3e) were commissioned by Aldi Stores Ltd to produce a Remediation Strategy for an area of land located adjacent to Station Road, Hebburn. The proposed development includes an Aldi store with associated car parking and soft landscaping, details of which are provided in **Appendix A**.

1.2 The site, centred on National Grid Reference 30810 564480, is located off Glen Street in the town of Hebburn approximately 5.8km east of Newcastle City Centre. A site location plan is included as **Figure 1**.

1.3 The site occupies an area of 0.49Ha and is currently occupied by grassed open space with occasional mature trees, encompassed by timber knee rail fencing. The grassed areas are separated by public pavements, whilst a roadway crosses the central site area. The north easterly portion of the site is currently occupied by raised flower beds.

1.4 Previous Phase I and Phase II Geo-Environmental Assessment Reports, followed by a Gas Addendum Report, were completed for this site by 3e. The following reports should be read in conjunction with this Remediation Strategy:

- 3e Consulting Engineers Ltd, 'Station Road, Hebburn, Phase I Geo-Environmental Assessment' (August 2013). Report Ref: 13675.

- 3e Consulting Engineers Ltd, 'Station Road, Hebburn, Phase II Geo-Environmental Assessment' (August 2015). Report Ref: 13675/SI.

- 3e Consulting Engineers Ltd, 'Station Road, Hebburn, Gas Addendum Report' (September 2015). Report Ref: LTR/13675/1CL/2/CB.

1.5 A copy of this Ground Gas Addendum Report is included in **Appendix B**.

2 SUMMARY OF GROUND INVESTIGATION

Site History

2.1 From 1859 the site is recorded as undeveloped grassland. By 1896, a small school is recorded across the north-western site area, with the remainder of the site occupied by several rows of terraced housing. By 1970, the terraced residential houses have been demolished and replaced by new residential properties. The site remained unchanged until 2013 when all buildings previously occupying the site were demolished.

Ground Investigation

2.2 The investigatory work comprised the completion of five mini percussive boreholes (WS01 to WS05), with associated combined gas and groundwater monitoring wells (installed within WS01, WS02 and WS03), and three rotary open-hole boreholes (RBH01 to RBH03), the locations of which are shown on **Figure 2** (Exploratory Hole Location Plan).

Soil Profile

2.3 Made ground was encountered within the all of the exploratory holes to depths of between 0.25m and 1.50m below ground level (bgl). These materials generally comprised grass and tarmac gravel surfacing, overlying sandy gravel, brick rubble and disturbed clay, with anthropogenic debris (i.e. brick, concrete, coal and occasional slag). However, occasional ash fragments were also noted contained within the made ground at the location of WS02 at depths of between 0.65m and 1.20m bgl.

2.4 The underlying drift deposits generally comprised firm to stiff slightly sandy gravelly clay, and were identified within WS01 to WS05 up to in excess of 5.45m depth. At the rotary hole locations, slightly sandy gravelly clay deposits were also identified to depths of between 8.30m to 9.40m bgl.

2.5 Sandstone bedrock deposits encountered from depths of between 8.30m and 9.40m, overlying grey mudstone with occasional thin sandstone and dark grey mudstone inter-beds, to a maximum recorded depth of 35.00m bgl. A thin coal and mudstone band was also encountered at depths of between 17.50m and 20.20m.

Contamination Assessment

2.6 During the previous works, generally low levels of contamination were identified for the majority of the made ground samples screened from across the site. However, a slightly increased level of PAH contamination (Dibenz(ah)anthracene) was identified at the location of WS02 only, which is considered to be associated with the presence of ash contained within the made ground at this location.

2.7 As no ash was identified within the made ground across the remainder of the site, the elevated levels of PAH contamination within WS02 are considered to be representative of an isolated 'hotspot' (i.e. separate averaging area), and as such are not pervasive across the site. From the proposed layout, as these materials are to be wholly encapsulated below proposed hard-standing, which effectively breaks any available pathways, no further risk is anticipated to human health in this regard.

2.8 However, as agreed with the Local Authority (LA) a 'watching brief' will be undertaken during the site enabling works to confirm the absence of potential 'unidentified' contamination and/or additional 'ashy' materials below areas of the site not investigated as part of the previous intrusive works (i.e. between exploratory hole locations), most notably within areas of future soft landscaping.

2.9 The levels of contaminants in the samples screened are not considered to be at levels which would present a risk to any off site sources or controlled waters.

Ground Gas Assessment

2.10 From the results of the ground gas monitoring undertaken for this site, elevated levels of Carbon Dioxide were recorded up to 6.1% v/v indicating the presence of a low gas regime below the proposed development area. Therefore, the installation of a gas membrane to CIRIA CS2 classification will be required in the proposed new building to negate any risk to the proposed end users.

Remediation Overview

2.11 When considering the above, to ensure long term protection in the future (i.e. for human health), the following remedial measures are recommended for this site:

- A 'watching brief' is to be undertaken during the site enabling works and removal of existing site surfacing, to confirm the absence of any potential 'unidentified' contamination and/or additional 'ashy' materials within the shallow soils below the site, most notably within areas of future soft landscaping.
- Installation of a gas membrane to CS2 classification within the proposed building to negate any risk to human health (i.e. future end users).

3 REMEDIATION STRATEGY

Remediation and Validation Requirements

3.1 The following remediation method statement details a process of working that will ensure the site is left in a condition to ensure no further risk is presented to human health. In summary, the following remedial measures will be required as discussed in more detail below:

Pre-Construction Works

- A 'watching brief' to confirm the absence of potential 'unidentified' contamination and/or additional 'ashy' materials within the shallow soils below the site, most notably within areas of future soft landscaping.
- If areas of gross contamination or soils which differ from those encountered in the site investigation are encountered these should be suitably assessed (including laboratory analysis, if required) to determine whether further remedial works are required.

Provision of Ground Gas Protective Measures (Barrier)

3.2 Based upon the findings of the gas monitoring, slightly elevated levels of Carbon Dioxide were identified resulting in this site falling within a low risk Characteristic Situation 2 (CS2) in accordance with CIRIA C665.

3.3 To ensure adequate protection to future site users, gas protective measures for the future building (Aldi store) will be installed in order to obtain a minimum 2.5 points of points of protection, in accordance with BS8485:2015 for a Type C Building (commercial).

3.4 At this stage, the following mitigation is proposed, which is based upon the incorporation of a ground bearing floor slab within the design of the proposed building:

- A cast in-situ ground bearing floor slab – 0.5 points.
- A suitable gas resistant membrane (with verification) – 2 points.

3.5 In addition to the above, as a minimum the following protection measures should be implemented for this site:

- A minimum 2000g reinforced gas membrane, suitably lapped and taped.
- All joints and service penetrations sealed.
- Minimum penetration of floor/ground slab by services.
- Adequate ventilation of confined spaces.

3.6 The implementation of the gas resistant membrane should be verified by either a suitably qualified third party installer or an experienced verification consultant, followed by the production of a verification/validation report, to ensure that all works are completed in accordance with CIRIA C735:2014 'Good practice on the testing and verification of protection systems for buildings against hazardous ground gases'.

General Requirements

3.7 Any materials brought on to site to be utilised within areas of soft landscaping including topsoil, subsoil and granular type materials will require validation testing to confirm the suitability of these materials for use on this site, using the assessment criteria for imported soils provided in **Table 1**.

3.8 Any materials brought on to site should be suitably screened and tested for human health assessment prior to delivery with these results sent to validators a minimum of 1 week before delivery to site. To confirm the suitability of these materials, validation testing of these materials may also be required following importation and/or emplacement onto site.

3.9 The sampling frequency for these materials will be dependent upon the final volumes, nature and origin of the imported materials. Once the source of imported materials has been determined, the sampling regime will need to be agreed with the LA. For this development it is proposed to adopt the sampling frequency shown in **Table 2**.

3.10 Upon completion of the above works a validation/verification report will be prepared by each relevant party to ensure all works are completed in accordance with the Remediation Strategy.

Table 1 – Imported Soil Acceptance Criteria

DETERMINAND	RESIDENTIAL END USE CRITERIA (mg/kg) IN SOIL (1)
Metals:	
Arsenic	37
Cadmium	11
Chromium	910
Lead	450(2)
Mercury	40
Selenium	250
Copper	2400
Nickel	180
Zinc	3700
PAH compounds:	
Acenaphthene	1100
Acenaphthylene	920
Anthracene	11000
Benzo(a)anthracene	13
Benzo(a)pyrene	3.0
Benzo(b)fluoranthene	3.7
Benzo(g,h,i)perylene	350
Benzo(k)fluoranthene	100
Chrysene	27
Dibenz(a,h)anthracene	0.30
Fluoranthene	890
Fluorene	860
Indeno(1,2,3-cd)pyrene	41
Naphthalene	13
Phenanthrene	440
Pyrene	2000
TPH	
Aliphatic EC 5-6	160
Aliphatic EC >6-8	530
Aliphatic EC >8-10	150
Aliphatic EC >10-12	760
Aliphatic EC >12-16	4300
Aliphatic EC >16-35	110000
Aliphatic EC >35-44	110000
Aromatic EC >5-7	300
Aromatic EC >7-8	660
Aromatic EC >8-10	190
Aromatic EC >10-12	380
Aromatic EC >12-16	660
Aromatic EC >16-21	930
Aromatic EC >21-35	1700
Aromatic EC >35-44`	1700
Inorganics:	
Water soluble sulphate	0.5g/l(3)
Acidity (pH)	not less than 5
Asbestos	Presence

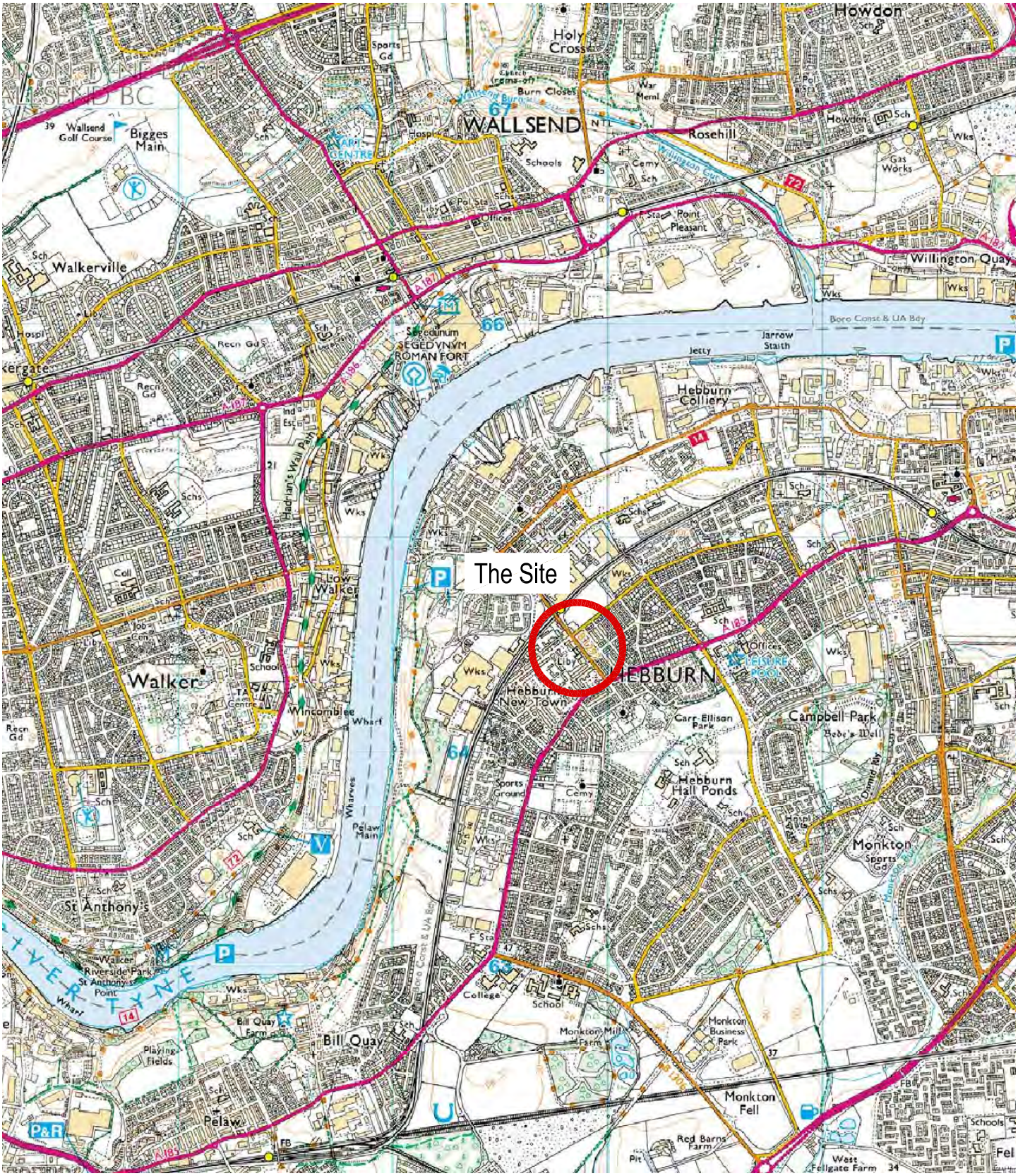
Notes:

(1) LQM/CIEH S4UL 2015 guidance value for residential with home grown produce unless otherwise stated
(2) CLEA 1.04
(3) Upper level for Class 1 concrete (BRE Special Digest:2005)
Assessment criteria based on 6% soil organic matter

Table 2 – Imported Soil Testing Frequency

Type of material	Frequency of testing	Testing schedule
Crushed hardcore, stone, brick used as capping	Minimum 3 or 1 per 500m^3	• Standard metals/metalloids • Speciated PAHs • Asbestos • Leachate analysis
Greenfield Soils	Minimum 3 or 1 per 250m^3	• Standard metals/metalloids • Speciated PAHs • Asbestos
Brownfield Soils	Minimum 6 or 1 per 100m^3 (whichever is greater)	• Standard metals/metalloids • Speciated PAHs • Asbestos • Banded TPH

Figures



Date	Revision	Checked	Rev.

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Project	Station Road, Hebburn Aldi Stores Ltd		
Title	Site Location Plan		
Scale 1:25,000 at A4	Drawn CB	Checked AC	Date Aug '15
Job No. 13675	Drawing No. Figure 1		Rev 0

Key:

- WS — Mini Percussive Borehole Location
- RBH — Rotary Borehole Location
- Site Boundary
- Proposed Building (approx)

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Project: Station Road, Hebburn Aldi Stores Ltd			
Title: Exploratory Hole Location Plan			
Scale: 1:500 at A3	Drawn: NW	Checked: AC	Date: Aug '15
Job No.: 13675	Drawing No.: Figure 2		Rev: 0

Appendix B

Ground Gas Addendum Report

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Our ref: LTR/13675/1CL/2/CB

30 September 2015

Mr Simon Plumb
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Dear Mr Plumb

Station Road, Hebburn - Gas Monitoring Results

Please find attached a copy of the gas monitoring results for the site adjacent to Station Road in Hebburn, Newcastle Upon Tyne.

It is recommended that this letter is read in conjunction with the Phase II Geo-Environmental Assessment for the site which was produced by 3e Consulting Engineers in August 2015, ref: 13675/SI.

Boreholes WS01, WS02 and WS03 were monitored for ground gas on 6 occasions between 15th July 2015 and 29th September 2015. During the monitoring, the barometric pressure varied between 998 and 1033mb with both rising and falling pressure trends.

During the monitoring period, Methane was detected at a maximum concentration of 6.1% and Carbon dioxide was recorded at a maximum concentration of 5.7%. Depleted levels of Oxygen were recorded at concentrations as low as 0.3%v/v recorded. A maximum negative flow of -9.4l/hr was detected during the monitoring. Groundwater was recorded at levels ranging between 1.15m and 4.83m below ground level (bgl).

In accordance with guidelines in CIRIA C665 a maximum gas screening value (GSV) of 0.60l/hr can be calculated for Methane whereas a maximum GSV of 0.56 is calculated for Carbon Dioxide. In view of this, it is considered that the site falls within Characteristic Situation 2. Gas protection measures will be required in accordance with guidelines provided in BS8485.

If you have any queries, please do not hesitate to contact me.

Yours faithfully

C Brewster

Christopher Brewster
Geo-environmental Engineer

Gas monitoring record

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Job no: 13675
Site: Station Road, Hebburn
Date: 15-Jul-15
Weather: Sunny spells
Pressure Trend: Rising

BH No	Methane (%v/v)	Carbon dioxide (%v/v)	Oxygen (%v/v)	Barometric Pressure (mb)	Flow (l/hr)	Water level (m bgl)	Remarks
WS01	0.2	2.4	16.7	1014	<0.1	2.83	
WS02	0.0	0.0	11.0	1014	<0.1	4.83	
WS03	0.0	1.6	17.5	1014	<0.1	4.12	

Date: 28-Jul-15
Weather: Raining
Pressure Trend: Falling

BH No	Methane (%v/v)	Carbon dioxide (%v/v)	Oxygen (%v/v)	Barometric Pressure (mb)	Flow (l/hr)	Water level (m bgl)	Remarks
WS01	0.0	3.9	13.1	998	-9.8	1.31	
WS02	0.0	0.0	13.9	998	-0.1	4.23	
WS03	0.0	2.3	17.9	998	<0.1	3.70	

Date: 12-Aug-15
Weather: Sunny
Pressure Trend: Falling

BH No	Methane (%v/v)	Carbon dioxide (%v/v)	Oxygen (%v/v)	Barometric Pressure (mb)	Flow (l/hr)	Water level (m bgl)	Remarks
WS01	3.4	5.6	0.3	1020	<0.1	1.21	
WS02	0.0	0.0	9.2	1020	<0.1	3.60	
WS03	0.0	2.7	15.4	1020	<0.1	3.18	

Date: 28-Aug-15
Weather: Sunny/Cloudy
Pressure Trend: Rising

BH No	Methane (%v/v)	Carbon dioxide (%v/v)	Oxygen (%v/v)	Barometric Pressure (mb)	Flow (l/hr)	Water level (m bgl)	Remarks
WS01	4.8	5.7	2.3	1006	<0.1	1.19	Lel - 95
WS02	0.1	0.0	8.2	1006	<0.1	1.34	
WS03	0.0	3.2	9.3	1006	<0.1	2.73	

Date: 09-Sep-15
Weather: Overcast and dry
Pressure Trend: Falling

BH No	Methane (%v/v)	Carbon dioxide (%v/v)	Oxygen (%v/v)	Barometric Pressure (mb)	Flow (l/hr)	Water level (m bgl)	Remarks
WS01	6.1	4.9	5.5	1022	Peak:1.4 SS: <0.1	1.18	
WS02	0.0	0.0	9.4	1022	<0.1	1.42	
WS03	0.1	3.7	5.6	1022	<0.1	2.46	

SS: Steady state

Date: 29-Sep-15
Weather: Sunny/Dry
Pressure Trend: Steady

BH No	Methane (%v/v)	Carbon dioxide (%v/v)	Oxygen (%v/v)	Barometric Pressure (mb)	Flow (l/hr)	Water level (m bgl)	Remarks
WS01	1.9	2.2	15.4	1033	<0.1	1.15	LEL: 38
WS02	0.1	0.0	10.4	1033	-0.1	1.65	
WS03	0.0	3.8	10.4	1033	<0.1	2.20	