

Completion Report

For a site at

Site 1 Broadoak Road, Wythenshawe

Undertaken for

PJ Services (Bolton) Ltd

Report Title:	Site 1 Broadoak Road, Wythenshawe Validation Completion Report
Report Reference:	8398G-WML-XX-ZZ-RP-G-0006
Client:	PJ Services (Bolton) Ltd
Issue Date:	22/03/2021
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Checked By:	S C Seddon <i>S. Seddon</i>
Authorised By:	S C Seddon <i>S. Seddon</i>

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Revision Status / History

Rev	Date	Issue	Prepared	Checked	Authorised
-	22/03/2021	Final	TPB	SCS	SCS

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1.0 INTRODUCTION

Appointment

- 1.1 WML Consulting (WML) has been commissioned by PJ Services (Bolton) Ltd to prepare a Completion Report in relation to development of land located at the junction of Broadoak Road and Panfield Road, Wythenshawe.

Proposed Development

- 1.2 The development comprises construction of 4no semi-detached single-storey residential units with hardstanding for parking together with private gardens and landscaped area.
- 1.3 The proposed development plan is presented in Appendix 01.

Background

- 1.4 WML were initially commissioned by Wythenshawe Community Housing Group to undertake a Phase 1 Desk Study and Phase 2 Investigation and Assessment. These culminated in the following reports.
- Phase 1 Desk Study and Preliminary Geo-environmental Assessment, Reference 8398G/01, dated September 2018.
 - Phase 2 Geo-environmental Investigation and Assessment, Reference 8398G/03, dated October 2018.
 - Updated Ground Gas Risk Assessment, Reference 8398G/TPB, dated 10th January 2019.
- 1.5 Subsequently WML were commissioned by PJ Services (Bolton) Ltd to produce the following report in consideration of the need for remedial measures to be outlined and agreed as a pre-development requirement.
- Remediation Strategy, Reference 8398G/05, dated February 2020.
- 1.6 The reports have been presented to Manchester City Council Planning Division in support of Planning Application No. 122466/FO/2019.

Verification

- 1.7 This report presents the compilation of the remediation / validation information obtained during the redevelopment programme associated with the capping of garden areas as identified within the Remediation Strategy.

2.0 SUMMARY OF ENVIRONMENTAL CONDITIONS

- 2.1 The following paragraphs summarise the most relevant findings of the Phase 1 and Phase 2 reports.
- 2.2 British Geological Survey (BGS) plans indicate the site to be underlain by Devensian Glacial Till which mainly comprises clay with occasional sand and silt. The superficial deposits are indicated to be underlain by strata of the Triassic Bollin Mudstone Member which generally comprise mudstone with horizons of halite.
- 2.3 The property is not in a radon affected area as defined by the BGS/Public Health England as less than 1% of properties are above the action level of exposure.
- 2.4 The glacial till is classified as a 'Secondary Aquifer – Undifferentiated' (formerly unproductive). The bedrock underlying the site is classified as a 'Secondary (B) Aquifer'. The nearest surface water feature is Baguley Brook, 417m west of the site boundary.
- 2.5 There are no active, non-operational or historic landfills recorded within 1km of the site.
- 2.6 There are 2no potentially contaminative industrial sites within 250m of the subject site, both electricity sub-stations around 70m north-east.
- 2.7 The earliest maps dated 1876 indicate the site to mainly comprise a field pond in a rural setting. The pond was delineated to the northern and eastern sections by a tree-lined field boundary. Further trees were located along the western site boundary. By 1938 the pond within the site and those in the surrounding areas had been infilled. Although the site has since remained undeveloped public open space, by this time, the immediately surrounding area had been extensively developed for residential housing.

Ground Conditions

- 2.8 Ground conditions encountered during the intrusive investigation generally comprise made ground to depths of between 0.60m and 2.50mbgl. This is underlain by pond deposits in the western section of the site to a maximum depth of 3.45mbgl and more locally by cohesive glacial till. Both the pond deposits and glacial till were in turn underlain by the weathered Bollin Mudstone to a maximum proven depth of 4.45mbgl.
- 2.9 No significant visual and/or olfactory evidence of significant ground contamination was identified during the investigation.
- 2.10 Groundwater seepages were encountered during the formation of WS8 and WS10, within pond deposits at depths of 2.80m and 3.00mbgl respectively. During the subsequent monitoring visits standing groundwater was recorded within standpipes at depths of between 1.00m and 2.77mbgl.
- 2.11 Chemical analysis indicated several exceedances of CoCs within the Made Ground, when compared to the current LQM/CIEH (Suitable 4 Use Levels (S4ULs) reference values for residential with plant uptake. These relate in the main to PAH compounds, for which the 'PAH - Double Ratio Plots' for different congeners suggested these represent urban background combustion/pyrolytic signatures.
- 2.12 This was considered to confirm to a degree the site observations, in that no visual or olfactory evidence of hydrocarbon contamination was identified with the investigation logs indicating the presence of ash, coal, wood and clinker in the made ground in the majority of locations. The elevated concentrations of PAH encountered were therefore attributed to these materials being entrained within the soil matrix.
- 2.13 No asbestos fibres were detected in any of the samples analysed.

Ground Gas Monitoring

- 2.14 Ground gas monitoring, primarily for methane and carbon dioxide, with associated flow rates, was undertaken on 6no occasions, between 23rd October 2018 and 9th January 2019.
- 2.15 The results indicate concentrations of methane ranging from below detection limits of 0.1% to 3.1% by volume in air (v/v) with carbon dioxide concentrations ranging from 0.2% to 9.3% v/v. A maximum detectable ground gas flow of 0.50 l/hr has been recorded during the monitoring visits.
- 2.16 The results provide a maximum Qhg value of <0.0093l/hr and indicate that the site classifies as Characteristic Situation (CS) 1 – Very Low Gas Risk'. However, as methane concentrations exceed 1% and carbon dioxide concentrations exceed 5% it was considered that the classification would need to be increased to Characteristic Situation (CS) 2 – 'Low Gas Risk' in accordance with BS8485:2015.

3.0 SUMMARY OF REMEDIATION OBJECTIVES

3.1 The following objectives were outlined in the Remediation Strategy.

Gas Protection Measures

3.2 The following site specific gas protection measures were initially to be incorporated into all new structures to satisfy Characteristic Gas Situation 2 as outlined in BS8485:2015.

- Passive sub-floor dispersal (minimum 150mm clear void) with cross ventilation to internal sleeper walls of very good performance which meets all criteria out in Paragraph B.6 of BS 8485:2015.
- Sub-slab ventilation, swan neck pipes connected to external airbrick, at maximum 1,500mm centres to at least opposing sides of the structure.
- Lapped and taped gas resistant membrane, in the floor slab construction which meets all the criteria as set out in Table 7 of BS 8485:2015 and installed to reasonable levels of workmanship in line with current good practice.
- Membrane to be sealed around all penetrations and to damp proof course and taken over cavity walls.

3.3 Typical details of the gas protection system are provided on the AEW drawing in Appendix 01.

Capping Requirements for Private Gardens

3.4 As the level of contamination in the Made Ground renders it unsuitable for direct use beneath proposed garden/landscaped areas, development will need to include the provision of a clean cover over the Made Ground to break the direct contact pollution linkage as set out below.

3.5 Therefore, new private garden areas will need to be capped with a nominal 600mm clean cover over the existing Made Ground to break the direct contact pollution linkage. The make-up of the 600mm cover would be expected to consist of:

- 150mm of clean imported Topsoil;
- 450mm of clean imported sub-soil.

3.6 The surrounding landscaped areas, outside the current development zone, are to be retained unmodified with the exception of the localised planting of new trees.

3.7 The following were to be provided.

- Results of subsequent chemical analysis of imported Topsoil/sub-soil to confirm compliance with the Site Specific Assessment Criteria.
- Records of the volumes and suitability of all imported fill, Topsoil and sub-soil delivered to site in the form of delivery slips and certificates.
- Photographic evidence of suitable sub-soil/Topsoil cover in gardens where underlain by Made Ground.

General

- Details of any unexpected ground contamination and the measures undertaken to deal with this, to include records of excavation, the results of chemical analysis resulting from the removal of contaminated soil and / or groundwater.
- Sample waste management records confirming compliance with Duty of Care regulations.
- Confirmation of potable water supply pipe materials.

- 3.8 On completion of the Remediation Works, a Validation Report including the information as summarised above was to be submitted to the Local Planning Authority for approval.

4.0 VALIDATION

Unforeseen Ground Contamination

- 4.1 No evidence of contamination, unusual ground conditions, organic materials such as peat, and/or asbestos have been reported to WML during the construction phase of the works.
- 4.2 Furthermore, no evidence of such was reported by WML during periodic visits to site to inspect the building construction works.

General Groundworks

- 4.3 Due to the low levels of contamination within the existing topsoil and made ground, together with the limited site area, all site-derived soils were removed from site to an appropriate landfill.
- 4.4 The waste transfer documents can be provided by PJEC services upon request but were not provided prior to the issue of this report.

Gas Protection

- 4.5 Details of the intended gas protection measures were presented on the AEW Drawings in Appendix 01. The protection measures were considered sufficient to provide protection against 'Characteristic Gas Situation (CGS) 2 – Low Gas Risk' with a score of 3.5 points in accordance with BS8485:2015.
- 4.6 Subsequently between August and September 2020 gas protection measures were installed by ground workers under the supervision of PJ Services.

Sub-floor Ventilation

- 4.7 Although WML were not party to the sub slab inspections, photographs of the sub-slab voids and swan neck vents were provided by as verification evidence see photographs in Appendix 02.
- 4.8 The photographs clearly indicate the construction to include a suspended beam and block floor which PJ Services have confirmed to have a minimum 150mm sub-floor void, the internal sub-slab blockwork also include at least 2no but generally 3no cross ventilation points to allow for a very good performance for airflow.
- 4.9 The sub-slab void is vented to all sides by periscopic vents connected to external wall mounted air vents. The plots are split into two blocks as outlined on the AEW drawings, in Appendix 01, with at least two opposing sides of each block includes unobscured air bricks as required in BS8485.

Gas Barrier

- 4.10 Photographic evidence in Appendix 02, confirms, that the product used within Plots 1 to 4, was the Radbar flexible hydrocarbon membrane laid to the top of the beam and block floor.
- 4.11 WML did not inspect the installation of the proprietary DPC from Radbar across the cavity wall. However, PJ Services have provided typical photographs of the installation from the subject site.
- 4.12 The photographs are presented in Appendix 02 and show the Radbar was cut to form a DPC strip which was placed over the cavity wall. An overlap of around 450mm is indicated for subsequent lapping and taping to the Radbar barrier.
- 4.13 Photographs in Appendix 02 indicate sealing details to the barrier, confirming that the membrane continues over the cavity wall construction, thus providing full coverage to all ground floor areas.

- 4.14 All service entry ducts were fitted with 'top-hat' details and double taped to ensure a suitable seal which includes a secure jubilee clip arrangement and surface taping.
- 4.15 Photographs are presented in Appendix 02 with details of the gas membranes in Appendix 03.

Conclusion

- 4.16 WML consider that the gas protection measures employed are adequate to address low risk ground gas conditions with photographic evidence confirming that they have been installed to a reasonable standard of workmanship and are therefore validated as appropriate for the intended use.

Imported Topsoil / Subsoil

- 4.17 No suitable site-won topsoil or subsoil was available for re-use at the site for the capping of proposed garden areas. Therefore, all topsoil and subsoil required for use as capping soil was imported to site from an unnamed Brownfield source. Delivery tickets for the soil were not provided prior to the issue of this report.
- 4.18 After import of the capping soils, WML attended site on 4th March 2021 in order to obtain samples from the emplaced soil in order to submit them for chemical analyses and to check the thickness of the capping strata.
- 4.19 During the inspection three samples of the imported topsoil (VP01 – 0.10, VP02 – 0.05 and VP04 – 0.10) and three samples of the imported subsoil (VP01 – 0.40, VP02 – 0.50 and VP03 – 0.30) were obtained. The samples, were submitted for chemical analyses and the test results are presented in Appendix 04.
- 4.20 Comparison of these results with the Assessment Criteria for 'residential with home-grown produce' as provided within Appendix 06, indicates that the relevant criteria were not exceeded with the following very localised exception within a sample of subsoil:-

Contaminant	Number of Samples Exceeding SL	SL (mg/kg)	Recorded Concentrations (mg/kg)	Samples
Dibenz[a,h]anthracene	1	0.24	0.47	VP03 – 0.30m

- 4.21 The exceedance of dibenz[a,h]anthracene is very slight and localised to a single sample of subsoil. In addition, no visual or olfactory evidence of hydrocarbon contamination was identified on site. Therefore, the soil was considered suitable, in terms of contamination levels, for the intended use.

Capping Thickness

- 4.22 The capping thicknesses were verified by the formation of hand excavated validation pits on 4th March 2021 by WML.
- 4.23 Selected photographs of the validation pits are provided in Appendix 02 and indicate 450mm of subsoil and 150mm of topsoil in garden areas. A drawing showing the locations of the validation pits is presented in Appendix 01.
- 4.24 The imported topsoil generally comprised a dark brown clayey, organic sand. The imported subsoil generally comprised a brown, slightly silty, gravelly sand.
- 4.25 The gardens form an area of approximately 456m² with an average thickness of topsoil and subsoil at 150mm and 450mm respectively. This indicates the volume of emplaced imported soils to be around 274m³ confirming sampling and testing to have been undertaken at a ratio of 1 sample per 23m³ of topsoil and 1 sample per 68m³ of subsoil.

Water Supply Pipes

- 4.26 United Utilities Water were consulted with regards the selection of suitable water supply pipe materials for the development. In light of the ground conditions encountered, the requirement for specific materials and measures to protect the water supply from ground contamination was not required.

5.0 CONCLUSIONS

Capping Requirements for Garden / Landscaped Areas

- 5.1 Clean imported topsoil and subsoil were found to be emplaced to depths of 600mm. The Topsoil and sub-soil have been confirmed by chemical analysis to generally conform to appropriate site specific assessment criteria.
- 5.2 Therefore, as far as can be established the pre-occupation works required in relation to the relevant Planning Conditions have been undertaken to a reasonable standard of workmanship and appropriately validated.

APPENDIX 01

Drawings



House Type Schedule				
Key Image	Type	Description	Area (GIA)	Count
	Type D- 2B3P Bungalow	Affordable Housing	61.4m ²	4

- NOTES
- All dimensions and levels are to be checked on site.
 - Any discrepancies are to be reported to the architect before any work commences
 - This drawing shall not be scaled to ascertain any dimensions. Work to figured dimensions only.
 - This drawing shall not be reproduced without express written permission from AEW.
 - Title overlay drawings and ownership boundaries are produced using all reasonable endeavors. AEW cannot be responsible for the accuracy or scale discrepancy of base plans supplied to them.
 - All works are to be undertaken in accordance with Building Regulations and the latest British Standards.
 - All proprietary materials and products are to be used strictly in accordance with the manufacturers recommendations.

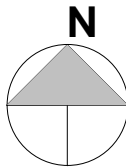
This drawing contains the following model files: -
S10403-AEW-XX-XX-M3-A-0001 [P0.1] [S0]

CDM 2015

Client notified of duties:
Principal Designer:

Unless noted below, all known hazards have been highlighted on the drawing:

Layout subject to comments of LPA, statutory infrastructure layouts, topographical line and level survey, title deeds etc.



P1	05.09.18	DS	DJ
Initial Issues			
REV	Date	Drawn by: -	Checked by: -
Status	Purpose of Issue		
S2	For Information		
drawing stage	Feasibility		
client			

WCHG

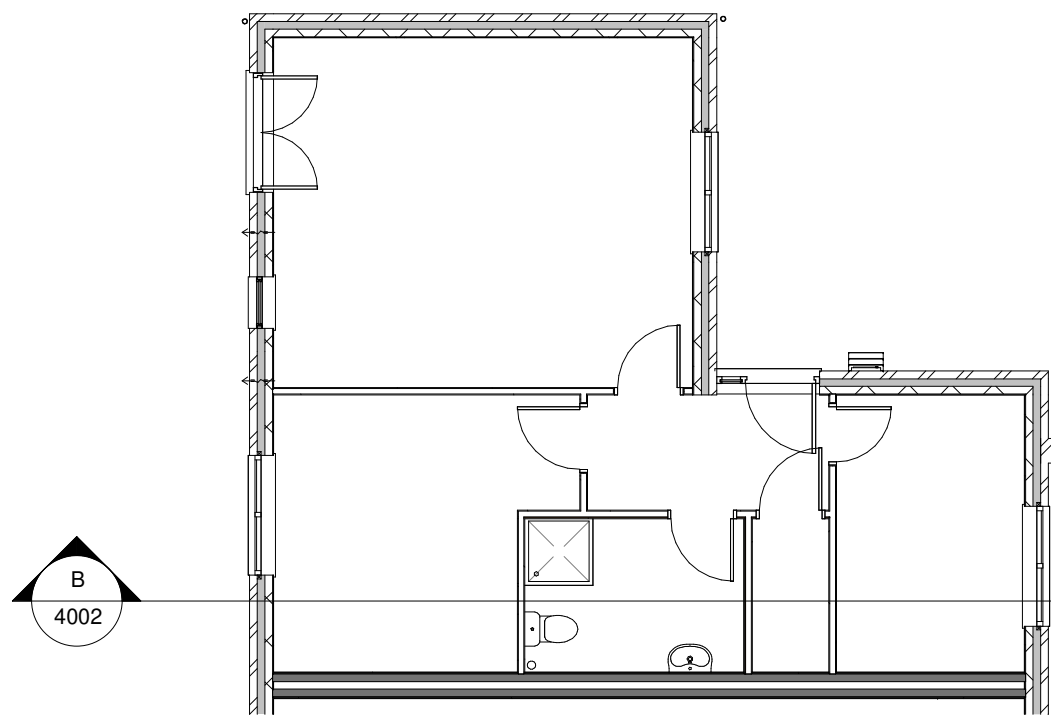
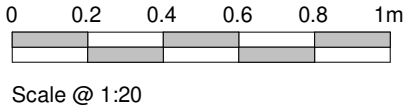
project

Broadoak Road - Site 1

drawing title

Site Layout - Proposed

date 05.09.2018 drawn DS
scale @ A2 1 : 200 checked DJ



Key Plan
Scale @ 1 : 100

NOTES

- All dimensions and levels are to be checked on site.
- Any discrepancies are to be reported to the architect before any work commences
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- This drawing shall not be reproduced without express written permission from AEW.
- Title overlay drawings and ownership boundaries are produced using all reasonable endeavors. AEW cannot be responsible for the accuracy or scale discrepancy of base plans supplied to them.
- All works are to be undertaken in accordance with Building Regulations and the latest British Standards.
- All proprietary materials and products are to be used strictly in accordance with the manufacturers recommendations.

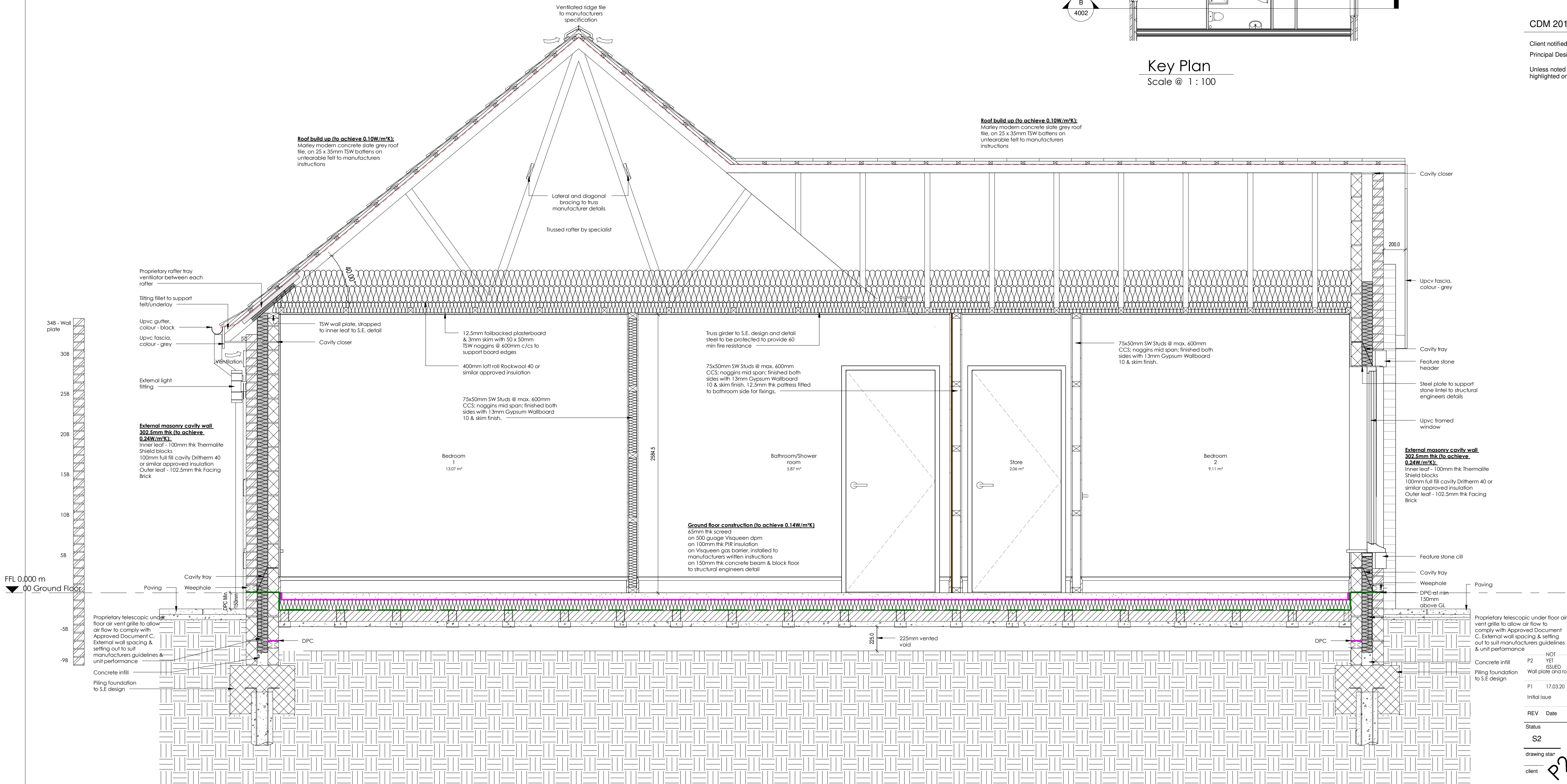
This drawing contains the following model files: -

BXXXX-AEW-XX-XX-M3-A-0001 [P0.1] [S0]

CDM 2015

Client notified of duties: **2018**
Principal Designer: **John McCall**

Unless noted below, all known hazards have been highlighted on the drawing:



Section A-A
Scale @ 1 : 20

NOT YET ISSUED					
REV	Date	Dr	Checked by		
P1	17.03.20	JM			
Initial issue					
Status	Purpor				
S2	P				
drawing size					
client					

WCHG

project

Broakoak Road

drawing title

Type D - Proposed Section B-B

date 26.02.20 drawn JM
scale @ A1 As indicated checked DS

Raw

P2

S10404-AEW-XX-XX-ZZ-DR-A-4002

Drwg No

aew architects
0161 214 4370
www.aewarchitects.com

project

Broakoak Road

drawing title

Type D - Proposed Section B-B

date 26.02.20 drawn JM
scale @ A1 As indicated checked DS

aew



House Type Schedule				
Key Image	Type	Description	Area (GIA)	Count
	Type D- 2B3P Bungalow	Affordable Housing	61.9m²	4

NOTES

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- All works are to be undertaken in accordance with Building Regulations and the latest British Standards.
- All proprietary materials and products are to be used strictly in accordance with the manufacturers recommendations.

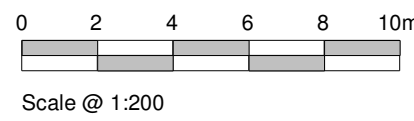
This drawing contains the following model files: -
S10403-AEW-XX-XX-M3-A-0001 [P0.1] [S0]

CDM 2015

Client notified of duties:
Principal Designer:
Unless noted below, all known hazards have been highlighted on the drawing:

Key

- Retained Amenity Space
- Lawn
- Paving
- Tarmac
- 2100mm High Fence (1800mm Privacy Panel) with 300mm Treils
- 900mm High Metal railings
- 900mm Low brick wall with piers and metal railings
- 2100mm High timber fence
- New trees



Validation Pit

WMLCONSULTING

Project: Broadoak Road – Site 1
Drg Title: Validation Pit Locations
Job No: 8398G By: TPB
Drg No: SK01 Rev: -
Date: 11/03/21 Scale: NTS

P2	26.03.19	DS	DJ
Adjusted following planners feedback			
P1	21.12.18	DS	DJ
Planning Submission			
REV	Date	Drawn by:-	Checked by:-
Status	Purpose of issue		
S2	Planning		
drawing stage	Planning		
client			

WCHG

project

Broadoak Road - Site 1

drawing title

Site Layout - Proposed

date 21.12.18 drawn DS
scale @ A1 1 : 200 checked CK

APPENDIX 02

Photographs



Photograph 1
Swan neck vent being installed into Plot 1 & 2.



Photograph 2
Typical edge detail to top of beam and block floor in Plot 1.



Photograph 3
Vents and edge details to Plots 3 and 4 with vent of Plot 2 to right.



Photograph 4
Beam and Block floor with edge details to Plots 3 and 4



Photograph 5
Proprietary top hats prior to installation.



Photograph 6
Lapped and taped Radbar hydrocarbon membrane within Plot 1, with insulation to the surface.



Photograph 7
Close up of surface taping to edge joints.



Photograph 8
Plot 3 indicating width of membrane to minimise internal lapping.



Photograph 9
150mm to topsoil and 450mm of subsoil emplaced in VP01.



Photograph 10
Garden area showing VP01 location.



Photograph 11
150mm to topsoil and 450mm of subsoil emplaced in VP02.



Photograph 12
Garden area showing VP02 location.



Photograph 13
150mm to topsoil and 450mm of subsoil emplaced in VP03.



Photograph 14
Garden area showing VP03 location.



Photograph 15
150mm to topsoil and 450mm of subsoil emplaced in VP04.



Photograph 16
Garden area showing VP04 location.

APPENDIX 03

Gas Membrane Specification



FLEXIBLE HYDROCARBON MEMBRANE

Radbar Flexible Hydrocarbon Membrane is manufactured from a blend of virgin polymers engineered to provide protection against the ingress of hydrocarbons and VOC's.

Radbar Flexible Hydrocarbon Membrane complies with BS 8485: 2015

Length	EN 1848-2	M	20
Width	EN 1848-2	M	1.3
Thickness	EN 1848-2	mm	1.0
Tensile Strength	EN EN 12311	N/mm ²	>22
Elongation	EN EN 12311	%	>398
Joint Strength	EN 12317-2	N	520
Watertightness 2kPa	EN 1928	-	Pass
Resistance to impact	EN 12691	mm	660
Resistance to static loading	EN 12730	Kg	20
Resistance to nail tear	EN 12310-1	N	>700
Durability (heat ageing)	EN 1926	-	Pass
Durability (chemical resistance)	EN 1847	-	Pass
Resistance to low temperature	EN 495-5	-	Pass @ -40
Water vapour permeability	EN 1932	g/m ² /day	0.08
Radon permeability		m ² /S	9.5 x 10 ⁻¹²
Methane permeability	ISO 15105-1	ml/m ² /day/atm	28
Diesel permeability	ISO 6179	g/m ² h	0.004
Petrol permeability	ISO 6179	g/m ² h	5.172
Xylene permeability	ISO 6179	g/m ² h	4.845
Toluene permeability	ISO 6179	g/m ² h	6.695
Chemical Resistance - Acidic	EN 14414-A	-	Pass
Chemical Resistance - Basic	EN 14414-B	-	Pass
Chemical Resistance - Solvents	EN 14414-C	-	Pass
Chemical Resistance – synthetic leachates	EN 14414-D	-	Pass
Resistance to leaching – Hot water	EN 14415-A	-	Pass



Resistance to leaching – Aqueous Alkaline	EN 14415-B	-	Pass
Resistance to leaching – Organic Alcohol	EN 14415-C	-	Pass

Accessories available from the Radbar range:

Jointing tape, double-sided and overlap tape
Top Hats, for sealing pipe penetrations
Pre-formed corners
Detailing Strip, self-adhesive for corners and penetrations
Protection Boards, for protecting the membrane post installation



sales@capitalvalleyplastics.com



01495 772255

Declaration of Performance

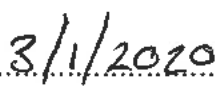
1. **Unique identification code of the product-type:**
Radbar Flexible Hydrocarbon Membrane (1.00mm)
2. **Product type:**
Type A in accordance with EN 13967:2012 + A1:2017
3. **Intended use or uses of the construction product, in accordance with the applicable harmonised technical specification, as foreseen by the manufacturer:**
Flexible sheets for waterproofing – Definitions and characteristics (EN 13967:2012 + A1:2017)
4. **Name and contact address of the manufacturer:**
Capital Valley Plastics
Cwmavon Works
Cwmavon Near Pontypool
Gwent
NP4 8UW
5. **Name of the authorized representative whose mandate covers the tasks specified in Article 12, Paragraph 2:**
Mathew Spiller
6. **System of assessment and verification of constancy of performance of the construction product:**
2+
7. **Notified body:**
British Board of Agreement (BBA)
NB 0836

8. **Declared Performance**

ESSENTIAL CHARACTERISTICS	1.0 MM	HARMONISED STANDARD
Water tightness 2kPa	Pass	EN 13967:2012+A1:2017
Reaction to fire	F	
Resistance to static loading	Pass	
Resistance to impact	245mm	
Durability against ageing - heat	Pass	
Durability against chemicals - alkali	Pass	

9. The performance of the product identified in points 1 and 2 is in conformity with the declared performance in point 8. This declaration of performance (DOP) is issued under the sole responsibility of the manufacturer identified in point 4.
Signed for and on behalf of the manufacturer by


.....
Mathew Spiller, Technical Manager
Capital Valley Plastics Ltd
Pontypool


.....
Date

APPENDIX 04

Chemical Analyses



2183

Final Report

Report No.:	21-07190-1		
Initial Date of Issue:	12-Mar-2021		
Client	WML Consulting Ltd		
Client Address:	No. 8 Oak Green Stanley Green Business Park Earl Rd Cheadle SK8 6QL		
Contact(s):	Sam Seddon		
Project	Broad oak Site 1		
Quotation No.:		Date Received:	08-Mar-2021
Order No.:	8398G	Date Instructed:	08-Mar-2021
No. of Samples:	6		
Turnaround (Wkdays):	5	Results Due:	12-Mar-2021
Date Approved:	12-Mar-2021		
Approved By:			
Details:	Glynn Harvey, Technical Manager		

Results - Soil

Project: Broadoak Site 1

Client: WML Consulting Ltd	Chemtest Job No.:				21-07190	21-07190	21-07190	21-07190	21-07190	21-07190
Quotation No.:	Chemtest Sample ID.:				1155468	1155469	1155470	1155471	1155472	1155473
Order No.: 8398G	Client Sample Ref.:				E	E	E	E	E	E
	Sample Location:				VP01	VP01	VP02	VP02	VP03	VP04
	Sample Type:				SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
	Top Depth (m):				0.10	0.40	0.05	0.50	0.30	0.10
	Date Sampled:				04-Mar-2021	04-Mar-2021	04-Mar-2021	04-Mar-2021	04-Mar-2021	04-Mar-2021
	Asbestos Lab:				DURHAM	DURHAM	DURHAM	DURHAM	DURHAM	DURHAM
Determinand	Accred.	SOP	Units	LOD						
ACM Type	U	2192		N/A	-	-	-	-	-	-
Asbestos Identification	U	2192		N/A	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected
ACM Detection Stage	U	2192		N/A	-	-	-	-	-	-
Moisture	N	2030	%	0.020	19	13	20	14	14	21
pH	U	2010		4.0	7.0	9.5	7.6	9.6	10.0	7.7
Boron (Hot Water Soluble)	U	2120	mg/kg	0.40	0.72	0.56	0.54	0.55	0.74	< 0.40
Sulphate (2:1 Water Soluble) as SO4	U	2120	g/l	0.010	< 0.010	0.31	< 0.010	0.32	0.38	0.027
Total Sulphur	U	2175	%	0.010	0.053	0.073	0.053	0.068	0.073	0.041
Cyanide (Total)	U	2300	mg/kg	0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Sulphate (Total)	U	2430	mg/kg	100	1000	1700	950	1400	1800	950
Arsenic	U	2450	mg/kg	1.0	4.2	8.7	4.0	8.0	9.1	4.5
Cadmium	U	2450	mg/kg	0.10	0.15	0.27	0.12	0.17	0.21	0.13
Copper	U	2450	mg/kg	0.50	12	17	9.7	16	16	11
Mercury	U	2450	mg/kg	0.10	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Nickel	U	2450	mg/kg	0.50	7.2	15	6.2	14	15	7.2
Lead	U	2450	mg/kg	0.50	28	43	23	45	43	25
Selenium	U	2450	mg/kg	0.20	0.28	< 0.20	0.25	< 0.20	< 0.20	0.23
Vanadium	U	2450	mg/kg	5.0	14	21	12	19	20	14
Zinc	U	2450	mg/kg	0.50	30	47	26	45	45	27
Chromium (Hexavalent)	N	2490	mg/kg	0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Organic Matter	U	2625	%	0.40	4.1	1.2	4.3	0.62	1.0	4.7
Naphthalene	U	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Acenaphthylene	U	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Acenaphthene	U	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Fluorene	U	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Phenanthrene	U	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	1.5	1.6	< 0.10
Anthracene	U	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	0.38	0.52	< 0.10
Fluoranthene	U	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	1.8	2.4	< 0.10
Pyrene	U	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	1.9	2.6	< 0.10
Benzo[a]anthracene	U	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	1.3	1.2	< 0.10
Chrysene	U	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	1.1	1.5	< 0.10
Benzo[b]fluoranthene	U	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	1.2	1.5	< 0.10
Benzo[k]fluoranthene	U	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	0.27	0.52	< 0.10
Benzo[a]pyrene	U	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	0.79	1.0	< 0.10
Indeno(1,2,3-c,d)Pyrene	U	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	0.77	< 0.10
Dibenz(a,h)Anthracene	U	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	0.47	< 0.10
Benzo[g,h,i]perylene	U	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	0.11	< 0.10

Results - Soil

Project: Broadoak Site 1

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	Sample Type:				SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
	Top Depth (m):				0.10	0.40	0.05	0.50	0.30	0.10
	Date Sampled:				04-Mar-2021	04-Mar-2021	04-Mar-2021	04-Mar-2021	04-Mar-2021	04-Mar-2021
	Asbestos Lab:				DURHAM	DURHAM	DURHAM	DURHAM	DURHAM	DURHAM
Determinand	Accred.	SOP	Units	LOD						
Total Of 16 PAH's	U	2700	mg/kg	2.0	< 2.0	< 2.0	< 2.0	10	14	< 2.0
Total Phenols	U	2920	mg/kg	0.30	< 0.30	< 0.30	0.49	< 0.30	< 0.30	< 0.30

Test Methods

SOP	Title	Parameters included	Method summary
2010	pH Value of Soils	pH	pH Meter
2030	Moisture and Stone Content of Soils(Requirement of MCERTS)	Moisture content	Determination of moisture content of soil as a percentage of its as received mass obtained at <37°C.
2040	Soil Description(Requirement of MCERTS)	Soil description	As received soil is described based upon BS5930
2120	Water Soluble Boron, Sulphate, Magnesium & Chromium	Boron; Sulphate; Magnesium; Chromium	Aqueous extraction / ICP-OES
2175	Total Sulphur in Soils	Total Sulphur	Determined by high temperature combustion under oxygen, using an Eltra elemental analyser.
2192	Asbestos	Asbestos	Polarised light microscopy / Gravimetry
2300	Cyanides & Thiocyanate in Soils	Free (or easy liberatable) Cyanide; total Cyanide; complex Cyanide; Thiocyanate	Alkaline extraction followed by colorimetric determination using Automated Flow Injection Analyser.
2430	Total Sulphate in soils	Total Sulphate	Acid digestion followed by determination of sulphate in extract by ICP-OES.
2450	Acid Soluble Metals in Soils	Metals, including: Arsenic; Barium; Beryllium; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Vanadium; Zinc	Acid digestion followed by determination of metals in extract by ICP-MS.
2490	Hexavalent Chromium in Soils	Chromium [VI]	Soil extracts are prepared by extracting dried and ground soil samples into boiling water. Chromium [VI] is determined by 'Aquakem 600' Discrete Analyser using 1,5-diphenylcarbazide.
2625	Total Organic Carbon in Soils	Total organic Carbon (TOC)	Determined by high temperature combustion under oxygen, using an Eltra elemental analyser.
2700	Speciated Polynuclear Aromatic Hydrocarbons (PAH) in Soil by GC-FID	Acenaphthene; Acenaphthylene; Anthracene; Benzo[a]Anthracene; Benzo[a]Pyrene; Benzo[b]Fluoranthene; Benzo[ghi]Perylene; Benzo[k]Fluoranthene; Chrysene; Dibenz[ah]Anthracene; Fluoranthene; Fluorene; Indeno[123cd]Pyrene; Naphthalene; Phenanthrene; Pyrene	Dichloromethane extraction / GC-FID (GC-FID detection is non-selective and can be subject to interference from co-eluting compounds)
2920	Phenols in Soils by HPLC	Phenolic compounds including Resorcinol, Phenol, Methylphenols, Dimethylphenols, 1-Naphthol and TrimethylphenolsNote: chlorophenols are excluded.	60:40 methanol/water mixture extraction, followed by HPLC determination using electrochemical detection.

Report Information

Key

U	UKAS accredited
M	MCERTS and UKAS accredited
N	Unaccredited
S	This analysis has been subcontracted to a UKAS accredited laboratory that is accredited for this analysis
SN	This analysis has been subcontracted to a UKAS accredited laboratory that is not accredited for this analysis
T	This analysis has been subcontracted to an unaccredited laboratory
I/S	Insufficient Sample
U/S	Unsuitable Sample
N/E	not evaluated
<	"less than"
>	"greater than"
SOP	Standard operating procedure
LOD	Limit of detection

Comments or interpretations are beyond the scope of UKAS accreditation

The results relate only to the items tested

Uncertainty of measurement for the determinands tested are available upon request

None of the results in this report have been recovery corrected

All results are expressed on a dry weight basis

The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVOCs, PCBs, Phenols

For all other tests the samples were dried at < 37°C prior to analysis

All Asbestos testing is performed at the indicated laboratory

Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

Sample Deviation Codes

- A - Date of sampling not supplied
- B - Sample age exceeds stability time (sampling to extraction)
- C - Sample not received in appropriate containers
- D - Broken Container
- E - Insufficient Sample (Applies to LOI in Trommel Fines Only)

Sample Retention and Disposal

All soil samples will be retained for a period of 45 days from the date of receipt

All water samples will be retained for 14 days from the date of receipt

Charges may apply to extended sample storage

If you require extended retention of samples, please email your requirements to:

customerservices@chemtest.com

APPENDIX 05

Soil Assessment Criteria

Site Specific Assessment Criteria for Residential (with homegrown produce) assuming a 1% SOM for Hydrocarbons

Contaminant	Assessment Criteria for Residential (mg/kg)
Metals	
Arsenic	37
Boron	290
Cadmium	26
Chromium III	910
Chromium VI	6
Copper	2,400
Lead*	200
Mercury	1.2
Nickel	130
Selenium	250
Vanadium	410
Zinc	3,700
Non – Metals	
Phenol	120
Polyaromatic Hydrocarbons (PAH)	
Benz[a]anthracene	7.2
Benzo[a]pyrene	2.2
Benzo[b]fluoranthene	2.6
Benzo[ghi]perylene	320
Benzo[k]fluoranthene	77
Chrysene	15
Dibenz[ah]anthracene	0.24
Fluoranthene	280
Indeno[123-cd]pyrene	27
Naphthalene	2.3
Pyrene	620

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* Where not included in the S4UL's criteria for a limited number of contaminants, namely lead, have been derived by DEFRA in their document entitled SP1010: Development of Category 4 Screening Levels for Assessment of Land Affected by Contamination, April 2014.

Contaminant	Criteria for Residential End Use (mg/kg)
Volatile Organic Compounds (VOCs)	
Benzene	0.087
Ethylbenzene	47
Toluene	130
Xylene	56
1,2-Dichloroethane	0.0071
1,1,1-Trichloroethane	8.8
Tetrachloroethane	1.6
Tetrachloroethene (PCE)	0.18
Tetrachloromethane	0.026
Trichloroethene (TCE)	0.016
Trichloromethane	0.91
Vinyl Chloride	0.00064
Semi-Volatile Organic Compounds (SVOCs)	
1,2-Dichlorobenzene	23
1,4-Dichlorobenzene	61 ^f
1,2,4-Trichlorobenzene	2.6
Hexachlorobenzene	1.8 (0.2) ^{vap}
Total Petroleum Hydrocarbons (TPH)	
Aliphatic C5-6	42
Aliphatic C6-8	100
Aliphatic C8-10	27
Aliphatic C10-12	130(48) ^{vap}
Aliphatic C12-16	1,100(24) ^{sol}
Aliphatic C16-35	65,000(8.48) ^{f, sol}
Aliphatic C35 - 44	65,000(8.84) ^{f, sol}
Aromatic C5 – 7 (benzene)	70
Aromatic C7 – 8 (toluene)	130
Aromatic C8-10	34
Aromatic C10-12	74
Aromatic C12-16	140
Aromatic C16-21	260 ^f
Aromatic C21-35	1,100 ^f
Aromatic C35 - 44	1,100 ^f

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