

Completion Report

For a site at

Windermere Close, Openshaw

Undertaken for

Eco-Res Ltd

Report Title:	Windermere Close, Openshaw Validation Completion Report
Report Reference:	8755G-WML-XX-ZZ-RP-G-0004
Client:	Eco-Res Ltd
Issue Date:	26th May 2021
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Revision Status / History

Rev	Date	Issue	Prepared	Checked	Authorised
-	26/05/2021	Original Issue	TPB	SCS	SCS

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1.0 INTRODUCTION

Appointment

- 1.1 WML Consulting (WML) has been commissioned by John Southworth Builders on behalf of Eco-Res Ltd to prepare a Completion Report in relation to development of land located on Windermere Close, Openshaw.

Proposed Development

- 1.2 It is proposed to construct six bungalows with private gardens and external hardstanding for parking.
- 1.3 A copy of the proposed development plan by GWPA is presented in Appendix 01.

Background

- 1.4 WML were initially commissioned by 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 Geoenvironmental Assessment Report, Reference 8775G-WML-00-XX-RP-G-0001, dated June 2019.
 - Phase 2 Geo-environmental Investigation and Assessment, Reference 8775G-WML-00-XX-RP-G-0002, dated January 2020.
- 1.5 Subsequently WML produced the following report in consideration of the need for remedial measures to be outlined and agreed as a pre-development requirement.
- Remediation Strategy, 8775G-A-WML-00-XX-RP-G-0003, dated March 2020.
- 1.6 The reports have been presented to Manchester City Council Planning Division in support of Planning Application No. 125384/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 The site is indicated by the BGS to be underlain by Devensian Glacial Till comprising mainly clay but possibly with interbedded sand and gravel horizons. The till is underlain by the Carboniferous Pennine Upper Coal Measures Formation (PUCM). These generally comprise interbedded mudstone, siltstone, sandstone and coal seams.
- 2.3 Based on the information provided by the Coal Authority and BGS, the probability of shallow unrecorded abandoned mine workings occurring beneath the site is considered low.
- 2.4 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.
- 2.5 The superficial deposits underlying the site are classified as a 'Secondary (Undifferentiated) Aquifer'. The underlying bedrock is classified as a 'Secondary (A) Aquifer'. The site is not within an Environment Agency Source Protection Zone (SPZ) and there are no groundwater abstraction licences within 250m of the site.
- 2.6 Clayton Brook is located approximately 210m east at its closest point and is therefore unlikely to be impacted by the site.
- 2.7 There are no active or historic landfill sites recorded within 250m of the site.
- 2.8 There are 12no potentially contaminative industrial sites within 250m of the subject site. The nearest of these relates to a telephone exchange 65m east.
- 2.9 The site was undeveloped until sometime prior to 1891 when residential terraced housing was constructed along Kendall Street. By the late 1970's the structures had been cleared and the site was redeveloped for continued residential housing, fronting Windermere Close to the south-east. The site was subsequently cleared between 2014 and 2016.

Ground Conditions

- 2.10 Ground conditions encountered during the intrusive investigation comprised made ground to depths of between 0.65m and 1.00mbgl, this being underlain by glacial till to a maximum proven depth of 5.00mbgl.
- 2.11 No significant visual and/or olfactory evidence of significant ground contamination was identified during the investigation.
- 2.12 Perched groundwater seepages were encountered within the granular made ground during the formation of WS1, WS2, WS2A and WS5 at depths of between 0.50 and 0.90mbgl. During the monitoring visits, groundwater was recorded at depths of between 0.50m and 1.40mbgl.
- 2.13 Chemical analysis indicated several exceedances of CoC's 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 to localised concentrations of arsenic, lead and PAH compounds, namely benzo[b]fluoranthene, benzo[a]pyrene and dibenz[a,h]anthracene within samples of shallow made ground all obtained from <0.40mbgl. No asbestos fibres were detected in any of the samples analysed.
- 2.14 Risks to controlled waters from the site were considered low with no specific environmental remediation considered necessary.

Ground Gas Monitoring

- 2.15 The preliminary risk to the development from ground gas was assessed as very low. However, it was considered prudent to undertake ground gas monitoring, primarily for methane and carbon dioxide, with associated flow rates, on 4no occasions between 20th January and 2nd March 2020.
- 2.16 The results indicate concentrations of peak and steady state methane not exceeding 0.1% by volume in air (v/v) with peak and steady state carbon dioxide concentrations ranging from 0.4 to 0.9% by volume in air (v/v).
- 2.17 No detectable ground gas flows have been recorded during the monitoring visits.
- 2.18 The results for each individual standpipe have been assessed with reference to guidance provided in BS8485:2015. Based on the measured flow rates and hazardous gas concentrations, individual "hazardous gas flow rates" (Q_{hg}) have been derived for each monitoring point, from which an individual "Characteristic Situation" (CS) has been determined, in accordance with Table 2 of BS8485:2015.
- 2.19 The results give a maximum individual Q_{hg} value of 0.0007l/hr with the worst case maximum combined value being 0.0009l/hr. These both indicate the site to classify as Characteristic Situation (CS) 1 – Very Low Gas Risk', with no specific gas protection measures required.

3.0 SUMMARY OF REMEDIATION OBJECTIVES

3.1 The following objectives were outlined in the Remediation Strategy.

Capping Requirements for Private Gardens

3.2 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.

3.3 Therefore, new private gardens and landscaped 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.

3.4 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

3.5 The following additional information was also to be provided.

- 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.

3.6 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 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 John Southworth upon request but were not provided prior to the issue of this report.

Imported Topsoil / Subsoil

- 4.5 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 a Brownfield source located in Congleton. Chemical analysis carried out on 6no samples (3no topsoil TS1-TS3 and 3no subsoil CFSS1 – CFSS3) from source indicated the soil was suitable for reuse with the results presented in Appendix 03. Delivery tickets for the soil were not provided prior to the issue of this report.
- 4.6 After import of the capping soils, WML attended site on 13th May 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.
- 4.7 During the inspection three samples of the imported topsoil (VP01 – 0.10, VP02 – 0.20 and VP03 – 0.10) and four samples of the imported subsoil (VP01 – 0.40, VP02 – 0.30, VP02 – 0.50 and VP04 – 0.40) were obtained. The samples, were submitted for chemical analyses and the test results are presented in Appendix 04.
- 4.8 Comparison of these results with the Assessment Criteria for 'residential with home-grown produce' as provided within Appendix 05, indicates that the relevant criteria were not exceeded.
- 4.9 Therefore, the soil was considered suitable, in terms of contamination levels, for the intended use.

Capping Thickness

- 4.10 The capping thicknesses were verified by the formation of hand excavated validation pits on 13th May 2021 by WML.
- 4.11 Selected photographs of the validation pits are provided in Appendix 02 and indicate between 400mm and 450mm of subsoil and between 150mm and 200mm of topsoil in garden areas.
- 4.12 A drawing showing the locations of the validation pits is presented in Appendix 01.
- 4.13 The imported topsoil generally comprised a dark brown sandy, organic clay. The imported subsoil generally comprised a brown grey, gravelly sand.
- 4.14 The gardens form an area of approximately 558m² with an average thickness of topsoil and subsoil at 183mm and 417mm respectively. This indicates the volume of emplaced imported soils to be around 335m³ confirming sampling and testing to have been undertaken at a ratio of 1 sample per

34m³ of topsoil and 1 sample per 58m³ of subsoil reducing to 1 per 17m³ and 1 per 33m³ respectively, with the inclusion of source testing.

Water Supply Pipes

- 4.15 United Utilities Water were consulted by the contractor 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

- 5.1 Clean imported topsoil and subsoil were found to be generally emplaced to depths of at least 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

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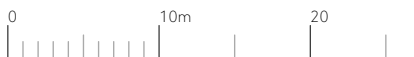
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Written dimensions should be taken.

Do not scale off drawing.

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Any discrepancies to be reported to the Architect.



Scale - 1:500 @A3

Existing Development	
2b3p Single Storey Dwelling (61m2) GIA	6
Total Dwellings	6

- Wall to Street Frontage
- Green Space
- Existing Trees - To be retained where possible, subject to tree survey
- Proposed Trees
- Site Development Boundary
- Site Ownership Boundary
- Existing Levels
- Proposed Levels
- Bike Store
- Washing Line

Services Per N D Oliver & Co Survey Drawing 8734 / 002A

- Telecoms
- Electric
- Noted as 'Unknown' - Presumed to be Gas

Rev	Date	Comment	Dr	Ch



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GWP Job Reference (299)1914

Job Title

Client



Proposed Site Plan

Name	1914-GWP-01-01-DR-A-(PA)-0003		
Scale	1:500@A3	Revision	NI
Drawn/Checked	TBA/TBA	First Issue	TBA
Drawing Status	S - WIP		

BIMcloud: BIMServer-HP - BIMcloud Basic for ARCHICAD 22/Mayton - (299)1914
GWP-01-DR-A-Manchester-Che-P00

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Validation Pit

Rev	Date	Comment	Dr	Ch



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Proposed Site Plan

Name	1914-GWP-01-01-DR-A-(PA)-0003		
Scale	1:500@A3	Revision	NI
Drawn/Checked	TBA/TBA	First Issue	TBA
Drawing Status	S - WIP		

BIMcloud: BIMServer-HP - BIMcloud Basic for ARCHICAD 22/Mayton - (299)1914
GWP-01-DR-A-Manchester-One-P00

WMLCONSULTING

Project: Windermere Close
Drg Title: Validation Location Plan
Job No: 8755G
Drg No: SK02
Date: 14/05/2021

By: TPB
Rev: -
Scale: NTS

APPENDIX 02

Photographs



Photograph 1
200mm of topsoil and 400mm of subsoil emplaced in VP01.



Photograph 2
Garden area showing VP01 location.



Photograph 3
200mm of topsoil and 400mm of subsoil emplaced in VP01.



Photograph 4
Garden area showing VP02 location.



Photograph 5
150mm of topsoil and 450mm of subsoil emplaced in VP03.



Photograph 6
Garden area showing VP03 location.

APPENDIX 03

Chemical Analyses from Source

Ross Farnell
Wardell Armstrong
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ST1 5BD

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Croxley Green
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Watford,
Herts,
WD18 8YS

t: 01923 225404
f: 01923 237404
e: reception@i2analytical.com

e: rfarnell@wardell-armstrong.com

Analytical Report Number : 20-48974

Project / Site name:	MSCONG	Samples received on:	23/12/2020
Your job number:	ST17200	Samples instructed on/ Analysis started on:	23/12/2020
Your order number:	ST27030	Analysis completed by:	31/12/2020
Report Issue Number:	1	Report issued on:	31/12/2020
Samples Analysed:	6 soil samples		


Signed:

Rachel Bradley
Deputy Quality Manager
For & on behalf of i2 Analytical Ltd.

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils	- 4 weeks from reporting
leachates	- 2 weeks from reporting
waters	- 2 weeks from reporting
asbestos	- 6 months from reporting

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Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement.
Application of uncertainty of measurement would provide a range within which the true result lies.
An estimate of measurement uncertainty can be provided on request.

Analytical Report Number: 20-48974

Lab Sample Number				1727302	1727303	1727304	1727305	1727306
Sample Reference				CFSS1	CFSS2	CFSS3	TS1	TS2
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Date Sampled				21/12/2020	21/12/2020	21/12/2020	21/12/2020	21/12/2020
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status					
Stone Content	%	0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Moisture Content	%	0.01	NONE	7.3	7.9	10	16	12
Total mass of sample received	kg	0.001	NONE	1.5	1.5	1.5	1.5	1.5

Asbestos in Soil	Type	N/A	ISO 17025	Not-detected	Not-detected	Not-detected	Not-detected	Not-detected
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General Inorganics

pH - Automated	pH Units	N/A	MCERTS	7.8	7	6.3	6	6.4
Total Cyanide	mg/kg	1	MCERTS	< 1	< 1	< 1	< 1	< 1
Organic Matter	%	0.1	MCERTS	< 0.1	< 0.1	0.6	7.4	4.4

Total Phenols

Total Phenols (monohydric)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
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Speciated PAHs

Naphthalene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Acenaphthylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Acenaphthene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Fluorene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Phenanthrene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	0.18	< 0.05
Anthracene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Fluoranthene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	0.54	< 0.05
Pyrene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	0.66	< 0.05
Benzo(a)anthracene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Chrysene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Benzo(a)pyrene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05

Total PAH

Speciated Total EPA-16 PAHs	mg/kg	0.8	MCERTS	< 0.80	< 0.80	< 0.80	1.38	< 0.80
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Heavy Metals / Metalloids

Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	3.6	2.8	5.4	4.3	4.3
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Chromium (hexavalent)	mg/kg	1.2	MCERTS	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	13	8.9	12	7.5	9.1
Copper (aqua regia extractable)	mg/kg	1	MCERTS	13	7.2	8.1	14	13
Lead (aqua regia extractable)	mg/kg	1	MCERTS	3.8	2.8	8.5	69	47
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	0.3	< 0.3	< 0.3	< 0.3	0.4
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	11	8.6	11	6.1	6.9
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	15	17	19	27	26

Analytical Report Number: 20-48974

Lab Sample Number				1727302	1727303	1727304	1727305	1727306
Sample Reference				CFSS1	CFSS2	CFSS3	TS1	TS2
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Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status					

Monoaromatics & Oxygenates

Benzene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Toluene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Ethylbenzene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
p & m-xylene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
o-xylene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0

Petroleum Hydrocarbons

TPH-CWG - Aliphatic >EC5 - EC6	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
TPH-CWG - Aliphatic >EC6 - EC8	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
TPH-CWG - Aliphatic >EC8 - EC10	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
TPH-CWG - Aliphatic >EC10 - EC12	mg/kg	1	MCERTS	< 1.0	< 1.0	3.2	< 1.0	< 1.0
TPH-CWG - Aliphatic >EC12 - EC16	mg/kg	2	MCERTS	< 2.0	< 2.0	7.6	< 2.0	< 2.0
TPH-CWG - Aliphatic >EC16 - EC21	mg/kg	8	MCERTS	< 8.0	< 8.0	9.7	< 8.0	< 8.0
TPH-CWG - Aliphatic >EC21 - EC35	mg/kg	8	MCERTS	< 8.0	< 8.0	19	< 8.0	< 8.0
TPH-CWG - Aliphatic (EC5 - EC35)	mg/kg	10	MCERTS	< 10	< 10	39	< 10	< 10

TPH-CWG - Aromatic >EC5 - EC7	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
TPH-CWG - Aromatic >EC7 - EC8	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
TPH-CWG - Aromatic >EC8 - EC10	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
TPH-CWG - Aromatic >EC10 - EC12	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aromatic >EC12 - EC16	mg/kg	2	MCERTS	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
TPH-CWG - Aromatic >EC16 - EC21	mg/kg	10	MCERTS	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aromatic >EC21 - EC35	mg/kg	10	MCERTS	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aromatic (EC5 - EC35)	mg/kg	10	MCERTS	< 10	< 10	< 10	< 10	< 10

U/S = Unsuitable Sample I/S = Insufficient Sample

Analytical Report Number: 20-48974

Lab Sample Number				1727307
Sample Reference				TS3
Sample Number				None Supplied
Depth (m)				None Supplied
Date Sampled				21/12/2020
Time Taken				None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status	
Stone Content	%	0.1	NONE	< 0.1
Moisture Content	%	0.01	NONE	14
Total mass of sample received	kg	0.001	NONE	1.5

Asbestos in Soil	Type	N/A	ISO 17025	Not-detected
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General Inorganics

pH - Automated	pH Units	N/A	MCERTS	6.7
Total Cyanide	mg/kg	1	MCERTS	< 1
Organic Matter	%	0.1	MCERTS	4.1

Total Phenols

Total Phenols (monohydric)	mg/kg	1	MCERTS	< 1.0
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Speciated PAHs

Naphthalene	mg/kg	0.05	MCERTS	< 0.05
Acenaphthylene	mg/kg	0.05	MCERTS	< 0.05
Acenaphthene	mg/kg	0.05	MCERTS	< 0.05
Fluorene	mg/kg	0.05	MCERTS	< 0.05
Phenanthrene	mg/kg	0.05	MCERTS	0.14
Anthracene	mg/kg	0.05	MCERTS	< 0.05
Fluoranthene	mg/kg	0.05	MCERTS	0.26
Pyrene	mg/kg	0.05	MCERTS	0.26
Benzo(a)anthracene	mg/kg	0.05	MCERTS	< 0.05
Chrysene	mg/kg	0.05	MCERTS	< 0.05
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	< 0.05
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	< 0.05
Benzo(a)pyrene	mg/kg	0.05	MCERTS	< 0.05
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	< 0.05
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	< 0.05
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	< 0.05

Total PAH

Speciated Total EPA-16 PAHs	mg/kg	0.8	MCERTS	< 0.80
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Heavy Metals / Metalloids

Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	4.8
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	< 0.2
Chromium (hexavalent)	mg/kg	1.2	MCERTS	< 1.2
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	8.8
Copper (aqua regia extractable)	mg/kg	1	MCERTS	14
Lead (aqua regia extractable)	mg/kg	1	MCERTS	29
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	7.6
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	28

Analytical Report Number: 20-48974

Lab Sample Number				1727307
Sample Reference				TS3
Sample Number				None Supplied
Depth (m)				None Supplied
Date Sampled				21/12/2020
Time Taken				None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status	
Monoaromatics & Oxygenates				
Benzene	µg/kg	1	MCERTS	< 1.0
Toluene	µg/kg	1	MCERTS	< 1.0
Ethylbenzene	µg/kg	1	MCERTS	< 1.0
p & m-xylene	µg/kg	1	MCERTS	< 1.0
o-xylene	µg/kg	1	MCERTS	< 1.0
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	MCERTS	< 1.0

Petroleum Hydrocarbons

TPH-CWG - Aliphatic >EC5 - EC6	mg/kg	0.001	MCERTS	< 0.001
TPH-CWG - Aliphatic >EC6 - EC8	mg/kg	0.001	MCERTS	< 0.001
TPH-CWG - Aliphatic >EC8 - EC10	mg/kg	0.001	MCERTS	< 0.001
TPH-CWG - Aliphatic >EC10 - EC12	mg/kg	1	MCERTS	7.4
TPH-CWG - Aliphatic >EC12 - EC16	mg/kg	2	MCERTS	16
TPH-CWG - Aliphatic >EC16 - EC21	mg/kg	8	MCERTS	< 8.0
TPH-CWG - Aliphatic >EC21 - EC35	mg/kg	8	MCERTS	18
TPH-CWG - Aliphatic (EC5 - EC35)	mg/kg	10	MCERTS	49

TPH-CWG - Aromatic >EC5 - EC7	mg/kg	0.001	MCERTS	< 0.001
TPH-CWG - Aromatic >EC7 - EC8	mg/kg	0.001	MCERTS	< 0.001
TPH-CWG - Aromatic >EC8 - EC10	mg/kg	0.001	MCERTS	< 0.001
TPH-CWG - Aromatic >EC10 - EC12	mg/kg	1	MCERTS	< 1.0
TPH-CWG - Aromatic >EC12 - EC16	mg/kg	2	MCERTS	< 2.0
TPH-CWG - Aromatic >EC16 - EC21	mg/kg	10	MCERTS	< 10
TPH-CWG - Aromatic >EC21 - EC35	mg/kg	10	MCERTS	< 10
TPH-CWG - Aromatic (EC5 - EC35)	mg/kg	10	MCERTS	< 10

U/S = Unsuitable Sample I/S = Insufficient Sample

Analytical Report Number : 20-48974

* These descriptions are only intended to act as a cross check if sample identities are questioned. The major constituent of the sample is intended to act with respect to MCERTS validation. The laboratory is accredited for sand, clay and loam (MCERTS) soil types. Data for unaccredited types of solid should be interpreted with care.

Stone content of a sample is calculated as the % weight of the stones not passing a 10 mm sieve. Results are not corrected for stone content.

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
1727302	CFSS1	None Supplied	None Supplied	Brown clay and sand with gravel.
1727303	CFSS2	None Supplied	None Supplied	Brown clay and sand with gravel.
1727304	CFSS3	None Supplied	None Supplied	Brown clay and sand with gravel.
1727305	TS1	None Supplied	None Supplied	Brown loam and clay with gravel and vegetation.
1727306	TS2	None Supplied	None Supplied	Brown loam and clay with gravel and vegetation.
1727307	TS3	None Supplied	None Supplied	Brown clay and loam with gravel and vegetation.

Analytical Report Number : 20-48974

Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Metals in soil by ICP-OES	Determination of metals in soil by aqua-regia digestion followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L038-PL	D	MCERTS
Asbestos identification in soil	Asbestos Identification with the use of polarised light microscopy in conjunction with disperion staining techniques.	In house method based on HSG 248	A001-PL	D	ISO 17025
Hexavalent chromium in soil (Lower Level)	Determination of hexavalent chromium in soil by extraction in water then by acidification, addition of 1,5 diphenylcarbazide followed by colorimetry.	In-house method	L080-PL	W	MCERTS
Moisture Content	Moisture content, determined gravimetrically. (30 oC)	In house method.	L019-UK/PL	W	NONE
Monohydric phenols in soil	Determination of phenols in soil by extraction with sodium hydroxide followed by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (skalar)	L080-PL	W	MCERTS
Organic matter (Automated) in soil	Determination of organic matter in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate.	In house method.	L009-PL	D	MCERTS
Speciated EPA-16 PAHs in soil	Determination of PAH compounds in soil by extraction in dichloromethane and hexane followed by GC-MS with the use of surrogate and internal standards.	In-house method based on USEPA 8270	L064-PL	D	MCERTS
pH in soil (automated)	Determination of pH in soil by addition of water followed by automated electrometric measurement.	In house method.	L099-PL	D	MCERTS
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight.	In-house method based on British Standard Methods and MCERTS requirements.	L019-UK/PL	D	NONE
Total cyanide in soil	Determination of total cyanide by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	MCERTS
BTEX and MTBE in soil (Monoaromatics)	Determination of BTEX in soil by headspace GC-MS.	In-house method based on USEPA8260	L073B-PL	W	MCERTS
TPHCWG (Soil)	Determination of hexane extractable hydrocarbons in soil by GC-MS/GC-FID.	In-house method with silica gel split/clean up.	L088/76-PL	W	MCERTS

For method numbers ending in 'UK' analysis have been carried out in our laboratory in the United Kingdom.

For method numbers ending in 'PL' analysis have been carried out in our laboratory in Poland.

Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.

APPENDIX 04

Chemical Analyses from Site



Final Report

Report No.: 21-16296-1

Initial Date of Issue: 21-May-2021

Client WML Consulting Ltd

Client Address: No. 8 Oak Green
Stanley Green Business Park
Earl Rd
Cheadle
SK8 6QL

Contact(s): Tom Booth

Project 8755G Windermere Close

Quotation No.:

Order No.: 8755G

No. of Samples: 7

Turnaround (Wkdays): 5

Date Approved: 21-May-2021

Approved By:


Details: Glynn Harvey, Technical Manager

Date Received: 17-May-2021

Date Instructed: 17-May-2021

Results Due: 21-May-2021

Results - Soil

Project: 8755G Windermere Close

Client: WML Consulting Ltd	Chemtest Job No.:		21-16296	21-16296	21-16296	21-16296	21-16296	21-16296	21-16296	21-16296
Quotation No.:	Chemtest Sample ID.:		1201579	1201580	1201581	1201582	1201583	1201584	1201585	1201585
Order No.: 8755G	Client Sample Ref.:		TS	SS	TS	SS	SS	TS	SS	SS
	Sample Location:		VP01	VP01	VP02	VP02	VP02	VP03	VP03	VP03
	Sample Type:		SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
	Top Depth (m):		0.10	0.40	0.20	0.30	0.50	0.10	0.40	0.40
	Date Sampled:		13-May-2021	13-May-2021	13-May-2021	13-May-2021	13-May-2021	13-May-2021	13-May-2021	13-May-2021
	Asbestos Lab:		COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY
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	24	8.8	17	12	10	15
pH	U	2010		4.0	8.1	8.2	8.5	8.4	8.2	8.4
Boron (Hot Water Soluble)	U	2120	mg/kg	0.40	< 0.40	< 0.40	< 0.40	< 0.40	< 0.40	< 0.40
Sulphate (2:1 Water Soluble) as SO4	U	2120	g/l	0.010	0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
Total Sulphur	U	2175	%	0.010	0.015	0.020	< 0.010	< 0.010	< 0.010	0.058
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	930	110	770	140	< 100	1800
Arsenic	U	2450	mg/kg	1.0	8.0	2.4	14	4.5	1.7	5.6
Cadmium	U	2450	mg/kg	0.10	0.21	0.48	0.36	0.33	0.26	0.25
Copper	U	2450	mg/kg	0.50	20	12	25	14	10	16
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	25	28	18	21	19	22
Lead	U	2450	mg/kg	0.50	53	15	74	24	14	44
Selenium	U	2450	mg/kg	0.20	< 0.20	< 0.20	0.29	< 0.20	< 0.20	0.22
Vanadium	U	2450	mg/kg	5.0	29	20	21	17	14	22
Zinc	U	2450	mg/kg	0.50	61	82	100	59	53	58
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	0.59	0.52	2.6	0.76	< 0.40	2.9
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	< 0.10	< 0.10	< 0.10
Anthracene	U	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Fluoranthene	U	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	2.2
Pyrene	U	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	2.0
Benzo[a]anthracene	U	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Chrysene	U	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Benzo[b]fluoranthene	U	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Benzo[k]fluoranthene	U	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Benzo[a]pyrene	U	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Indeno(1,2,3-c,d)Pyrene	U	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Dibenz(a,h)Anthracene	U	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Benzo[g,h,i]perylene	U	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Total Of 16 PAH's	U	2700	mg/kg	2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	4.2
Total Phenols	U	2920	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	0.20

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-diphenylcarbazine.
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; Dibenzo[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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* 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.