



INTERPRETATIVE REPORT

on

A GROUND INVESTIGATION

for

CHESTER ROAD, KELSALL



On Behalf Of

**Castlemead Group
Abenbury House
17 Wilkinson Business Park
Clywedog Road South
Wrexham
LL13 9AE**

REPORT NO: G19021-IR

June 2019

**REPORT ON A GROUND INVESTIGATION FOR A PROPOSED RESIDENTIAL DEVELOPMENT
AT CHESTER ROAD, KELSALL.**

Revision History

Revision	Date	Purpose / Status	Document Reference
v.1	June 2019	final	G19021-IR

Prepared By	Reviewed By
	
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INTERPRETATIVE REPORT ON A GROUND INVESTIGATION FOR A PROPOSED NEW RESIDENTIAL DEVELOPMENT AT CHESTER ROAD, KELSALL.

Factual Information

1. Introduction

- 1.1 This report has been prepared on instructions given by Castlemead Group Ltd, Abenbury House, 17 Wilkinson Business Park, Clywedog Road South, Wrexham, LL13 9AE, in correspondence dated 5th February 2019.
- 1.2 It is understood that the current proposals for the site include the construction of twenty one single story detached and semi-detached residential properties and eight two story apartments (within four blocks) with associated garden and vehicle parking areas and carriageway infrastructure. A two story doctor's surgery is also proposed within the eastern extent of the site.
- 1.3 The purpose of this report was to obtain preliminary data regarding the ground and groundwater conditions at the site, so that suitable methods of design and construction may be adopted for the proposed construction. As part of these works a preliminary soil contamination assessment has been carried out.
- 1.4 The site is located on land off Chester Road, approximately 500m west of Kelsall village centre (approximate National Grid Reference 352025, 368007) as shown on the appended site location plan (Nicholls Colton Group drawing no. G19021-IR/01).
- 1.5 This investigation has been undertaken on the specific instructions of Castlemead Group Ltd and no reliance should be made by third parties as to its adequacy or completeness in relation to future extension requirements of the area under consideration. Similarly, Nicholls Colton Group will accept no liability in relation to the use of data contained in this report by third parties.

2. Site Description and Walkover Survey

- 2.1 A site walkover was undertaken by a Geotechnical Engineer at the outset of the site works and the salient observations are noted below:
- 2.2 The site area is approximately rectangular in shape and generally comprises open fields.
- 2.3 A mature broadleaf tree is located within the south east area of the site.
- 2.4 Anecdotal information suggests a number of underground tanks, possibly septic, are present adjacent to the site's western boundary. This is supported by the observation of 3 manhole covers at ground level and cordoned off by barbed wire fencing. The manholes are located in one group of two and a single manhole by itself.
- 2.5 A badger conservation area is located immediately adjacent to the site's northern boundary. No ground investigation works were undertaken within this area.
- 2.6 There were no obvious signs or potential sources of contamination noted during the walkover.
- 2.7 The site is topographically flat.

2.8 The site is bound on all sides by trees beyond which lie Chester Road to the north, open fields and a residential property to the east, a landscaped residential estate to the south and Flat Lane to the west beyond which are commercial properties.

2.9 Access to the site is via an access road off Flat Lane, Kelsall.

3. Desk Study

3.1 A desk study was collated, prepared and submitted by Tier Environmental Ltd on behalf of Liberty Properties. A summary of the desk study report is provided in the following sections:

A Phase 1 Preliminary Risk Assessment Report Land Off Chester Road, Kelsall (dated: 11th November 2015).

3.2 Site History

3.2.1 The site is presently and historically comprised of agricultural fields. Relevant surrounding historical land uses of note within 250m of the site area include a potentially infilled sand pit (70m north west), potentially in-filled ponds (15m north, 20m and 35m east) potentially infilled quarry and marl pit (180m northeast), a smithy (200m northwest), an unspecified works and a saw mill (70m west). Given the distance from the site area and the nature of the underlying geology the report considered that the smithy, unspecified works or saw mill does not represent a risk to the site.

3.2.2 With the exception of a stand of woodland trees (potentially an orchard) noted circa 1969, there have been no significant changes to the site area since the mid 1870's.

3.3 Environmental Review

3.3.1 The desk study report indicates the bedrock geology underlying the site is designated as a Secondary B Aquifer – Undifferentiated (Tarporey Siltstone Formation). The superficial geology is designated as an Unproductive Aquifer (Glacial Till).

3.3.2 There are no licensed abstractions within 500m of the site.

3.3.3 The site is not located within a Source Protection Zone.

3.3.4 The site and its surrounding area are not indicated to be at risk of flooding.

3.3.5 There are no significant surface water features located within 250m of the site; the nearest surface water feature is a pond located 10m east of the site.

3.3.6 A BGS recorded landfill is located 70m west of the site. There are several areas of infilled land within 250 of the site (see section 3.2.1).

3.3.7 There are no local potentially contaminative activities, such as discharge consents, pollution incidents, fuel stations, etc. or pertinent contemporary Trade Directory Entries indicated in the immediate vicinity of the site that are considered likely to have a potential significant adverse affect on the development.

3.3.8 An electricity sub station is located with 205m of the site, however it is not considered to represent a risk to the site due to the low mobility of Poly-Chlorinated Biphenyls (PCB's) and the distance from the site area

3.3.9 The site is indicated to be located within a Nitrate Vulnerable Zone.

3.4 Geological Review

3.4.1 The geological information included within the desk study report indicates the site to be underlain by the solid geology of the Tarporley Siltstone Formation of the Jurassic period. Superficial deposits are indicated to comprise Glacial Till of the Quaternary period.

3.4.2 The site is not located in a Radon affected area, as less than 1% of properties are above the action level

3.4.3 The site is not located within a Coal Mining Area

4. Site Work and In Situ Testing

4.1 Four window sample boreholes (WS1 to WS4) were put down at the site to a maximum depth of 2.45m bgl (below ground level). The borehole log is included in this report as Appendix A.

4.2 Standard Penetration Tests (SPT's) were carried out using the cone (C) attachment within the borehole. The tests were carried out in accordance with BS EN ISO 22476-3:2005. The results are included on the appended borehole log (Appendix A). The calibration / efficiency certificate for the rig is also attached.

4.3 Five machine excavated trial pits were put down at the site for bulk inspection of the soils; three of the trial pits were constructed as soakaways in accordance with BRE digest 365:2016 to determine soil infiltration rates. The trial pits and soakaway test results are included in this report as Appendices B and C respectively.

4.4 Five Dynamic Cone Penetration (DCP) tests were undertaken at the site to obtain equivalent CBR (California Bearing Ratio) values. The DCP test results are included as Appendix D of this report.

4.5 The positions of the exploratory holes were determined and set out on site by Nicholls Colton Group taking into account the available access and services. The positions of the boreholes are shown on the appended exploratory hole location plan (Nicholls Colton drawing no. G19021-IR/02).

4.6 Bulk and fragmentary disturbed samples were recovered from all materials revealed within the exploratory holes. Geo-environmental samples were obtained specifically for contamination testing.

4.7 The samples were taken to Nicholls Colton Group's laboratory for further examination and testing.

4.8 The fieldwork was carried out during the period 25th to 27th November 2019.

4.9 The investigation was generally carried out in accordance with BS 5930:2015 "Codes of Practice for Site Investigations", logged in accordance with BS EN ISO 14688-1:2004 and BS EN ISO 14688-2:2004 and the work overseen by an experienced Geo-Environmental Engineer.

5. Laboratory Testing

- 5.1 The laboratory testing schedules were prepared by Nicholls Colton Group.
- 5.2 Included in this report is information taken from the results of tests undertaken in Nicholls Colton Group's laboratory at 7-11 Harding Street, Leicester. This is UKAS accredited testing laboratory No. 0320. The results of the laboratory tests in this report do not include all data required by the documented test procedure. However, all such data has been recorded and will be stored for six years from the date of test. This data will be issued on the client's instructions.

The following accredited test procedures were carried out:

- Natural Moisture Content
- Plastic Limit
- Liquid Limit
- Plasticity Index
- Particle Size Distribution (sieving)

Opinions and interpretations expressed herein are outside the scope of UKAS accreditation.

- 5.3 The geotechnical laboratory tests were carried out during the period 3rd April to 16th April 2019.
- 5.4 The geotechnical laboratory testing has been carried out in accordance with BS 1377: 1990 using calibrated equipment specified within the British Standard.
- 5.5 The geotechnical laboratory test results are included in this report as Appendix E.
- 5.6 In addition to the geotechnical laboratory testing, laboratory testing of the soils was undertaken by Nicholls Colton's laboratory, in accordance with MCERTS accreditation standards. The samples were analysed for the following determinants:-

(all values 'total' unless otherwise stated)

- | | |
|------------|-----------------------------|
| • Arsenic | • Zinc |
| • Cadmium | • Phenols |
| • Chromium | • pH value |
| • Copper | • Polyaromatic Hydrocarbons |
| • Lead | • TPH (speciated) |
| • Mercury | • Asbestos (presence of) |
| • Nickel | |

- 5.7 Four soil samples were also tested for a sulphate content suite (in accordance with BRE Special Digest 1) as listed below. Concentrations of the following determinands were measured in selected soil samples obtained from the site:

- Sulphate (total and water soluble)
- Sulphur (total)
- pH

- 5.8 The chemical testing was carried out during the period 3rd April to 12th April 2019.

5.9 The chemical test results are included in this report as Appendix F.

6. General Geology and Revealed Strata

6.1 Geological sources (including the Geological Survey of Great Britain (England and Wales)) indicate the site to lie in an area where the underlying superficial deposits are anticipated to comprise Till, (Diamicton) of Quaternary Age. Underlying the superficial deposits the bedrock geology is anticipated to comprise the Tarporley Siltstone Formation of Triassic Age.

6.2 The exploratory holes revealed a general downward strata succession of:

TOPSOIL	-	Grass over topsoil
SUPERFICIAL DEPOSITS –	-	Reddish brown silty gravelly SAND.
TILL (DIAMICTON)	-	Reddish brown sandy gravelly SILT.
	-	Reddish brown slightly gravelly CLAY.
SOLID GEOLOGY –	-	Reddish brown or grey SILTSTONE.
TARPORLEY SILTSTONE FORMATION		

7. Groundwater

7.1 Groundwater seepages were not encountered within any of the exploratory holes put down across the site.

7.2 No long term monitoring of groundwater levels has been undertaken as part of this investigation. It should be noted that groundwater levels may differ at times due to seasonal variations or other effects.

8. Gas

8.1 Three combined gas/groundwater monitoring standpipes were installed in selected boreholes (WS1, WS3 and WS4A) across the site area to allow a period of ground gas monitoring to be undertaken.

8.2 A total of four monitoring visits have been scheduled.

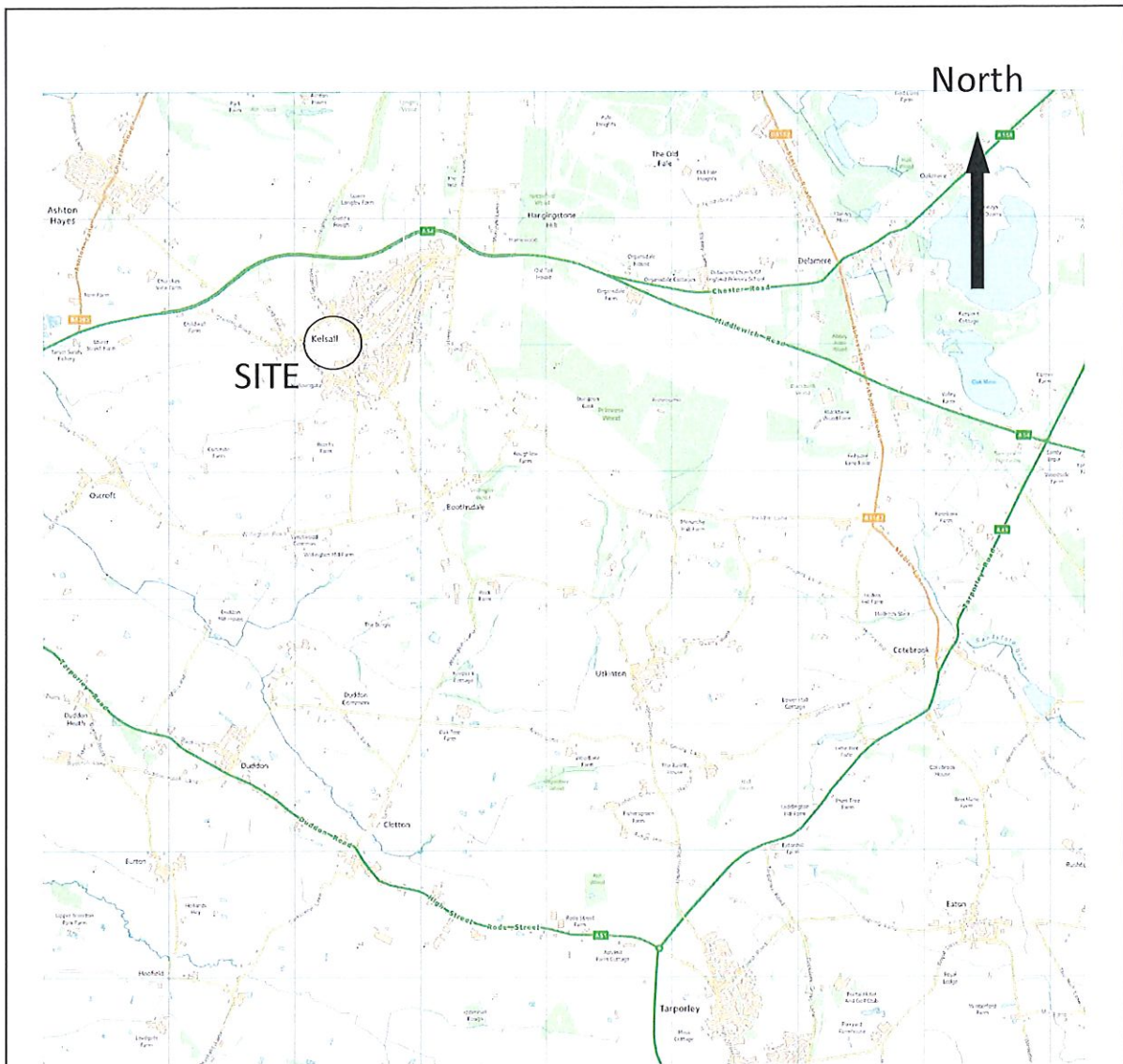
8.3 Maximum carbon dioxide and methane concentrations have been recorded up to 2.1% vol. and 0.1% vol. respectively. A positive flow rate of 0.2l/hr has been recorded on a single visit.

8.4 A gas assessment is included as section 18.

DRAWINGS

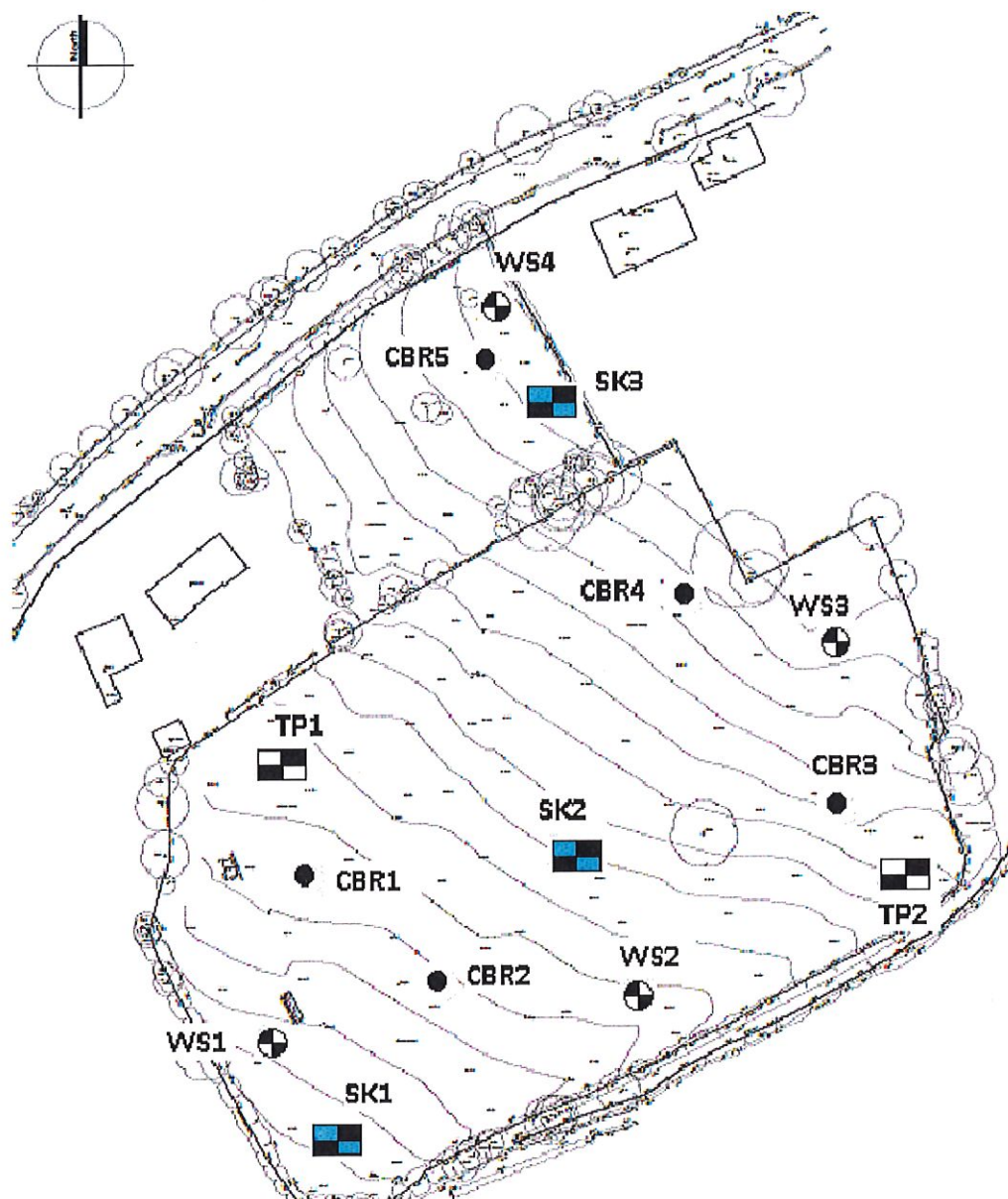
G19021-IR/01 Site Location Plan

G19021-IR/02 Exploratory Hole Location Plan



Based upon the (year) Ordnance Survey 1:50000 Scale Landranger (number) Map with the permission of the Controller of Her Majesty's Stationery Office, © Crown copyright Nicholls Colton Group Ltd., 7-11 Harding Street, Leicester. Conventional Licence No. AL 100014431.

		Client: Castlemead Group
Project: Chester Road, Kelsall		
Drawing No: G19021-IR/01	Title: Site Location Plan	Date: June 2019



Client:
Castlemead Group

Project:
Chester Road, Kelsall

Drawing No:
G19021-IR/02

Title:
Exploratory Hole Location Plan

Date:
June 2019

APPENDIX F

Laboratory Test Results - Contamination



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Nicholls Colton Group
7-11 Harding Street
Leicester
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Analytical Test Report: G19021/001

Your Project Reference:	Chester Road	Samples Received on:	03/04/2019
Your Order Number:	G19021	Testing Instruction Received:	03/04/2019
Report Issue Number:	1	Sample Tested:	03/04 to 12/04/2019
Samples Analysed:	8 soil samples	Report issued:	12/04/2019

Signed

Peter Swanston
Environmental Laboratories Manager
Nicholls Colton Group

Notes:

General

Please refer to Methodologies tab for details pertaining to the analytical methods undertaken.

Samples will be retained for 14 days after issue of this report with the exception of the asbestos test portion which is held for 6 months unless otherwise requested.

Moisture Content was determined in accordance with NC method statement MS - CL - Sample Prep, oven dried at <30°C.

Moisture Content is reported as a percentage of the dry mass of soil, this calculation is in accordance with BS1377, Part 2, 1990, Clause 3.2

Stone Content was determined in accordance with NC method statement MS - CL - Sample Prep and refers to the percentage of stones retained on a 10mm BS test sieve.

With the exception of Sulphate and Sulphur which are crushed over the 2mm test sieve, concentrations are reported as a percentage mass of the dry soil passing the 10mm BS test sieve. As received samples have been corrected for moisture content but not stone content.

Samples were supplied by customer, results are representative of the material provided

Asbestos

Opinions and interpretations expressed herein are outside the scope of UKAS accreditation

Deviating Samples

Samples were received in suitable containers Yes

A date and time of sampling was provided Yes

Sample holding times were exceeded prior to analysis of determinants Yes

Where samples do not meet one or more of the above criteria they will be classed as deviating, this means data may not be representative of the sample at the time of sampling and it is possible that results provided may be compromised.

Accreditation Key

UKAS = UKAS Accreditation, MCERTS = MCERTS Accreditation, u = Unaccredited

MCERTS Accreditation only covers the SAND, CLAY and LOAM matrices

Date of Issue 24.01.2017

Owned by Emily Bissett - Customer Services Supervisor

Authorised by James Gane - Commercial Manager

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G19021/001

Project Reference - Chester Road

Analytical Test Results - NCG Soil Suite

NC Reference			31877	31879	31882	31883
Client Sample Reference			SK2	WS1	WS3	WS4
Client Sample Location			E1	D1	B1	B2
Depth - Top (m)			0.40	0.00	0.10	0.50
Depth - Bottom (m)			0.40	0.25	0.40	1.00
Date of Sampling			27/03/2019	27/03/2019	27/03/2019	27/03/2019
Time of Sampling			Not provided	Not provided	Not provided	Not provided
Sample Matrix			Clay	Sand	Sand	Sand
Determinant	Units	Accreditation				
Arsenic	(mg/kg)	MCERTS	< 10	< 10	< 10	< 10
Cadmium	(mg/kg)	MCERTS	0.5	0.9	0.5	0.3
Chromium (Total)	(mg/kg)	UKAS	12	13	13	5.8
Copper	(mg/kg)	MCERTS	17	34	16	20
Lead	(mg/kg)	MCERTS	51	120	39	15
Mercury	(mg/kg)	UKAS	< 2.5	< 2.5	< 2.5	< 2.5
Nickel	(mg/kg)	MCERTS	14	15	15	11
Zinc	(mg/kg)	MCERTS	74	130	59	39
Phenols (Total)	(mg/kg)	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0
pH	pH Units	MCERTS	6.8	5.7	5.6	5.9
Acenaphthene	(mg/kg)	MCERTS	< 0.02	< 0.02	< 0.02	< 0.02
Acenaphthylene	(mg/kg)	UKAS	< 0.02	< 0.02	< 0.02	< 0.02
Anthracene	(mg/kg)	UKAS	< 0.02	0.02	< 0.02	< 0.02
Benzo (a) anthracene	(mg/kg)	MCERTS	0.05	0.12	< 0.02	< 0.02
Benzo (a) pyrene	(mg/kg)	MCERTS	0.05	0.13	< 0.02	< 0.02
Benzo (b) fluoranthene	(mg/kg)	MCERTS	0.06	0.17	< 0.02	0.03
Benzo (g, h, i) perylene	(mg/kg)	MCERTS	0.04	0.10	< 0.02	< 0.02
Benzo (k) fluoranthene	(mg/kg)	MCERTS	< 0.02	0.07	< 0.02	< 0.02
Chrysene	(mg/kg)	MCERTS	0.06	0.13	< 0.02	< 0.02
Dibenzo (a,h) anthracene	(mg/kg)	MCERTS	< 0.02	< 0.02	< 0.02	< 0.02
Fluoranthene	(mg/kg)	MCERTS	0.08	0.22	< 0.02	0.03
Fluorene	(mg/kg)	MCERTS	< 0.02	< 0.02	< 0.02	< 0.02
Indeno (1, 2, 3,-cd) pyrene	(mg/kg)	MCERTS	0.04	0.09	< 0.02	< 0.02
Naphthalene	(mg/kg)	MCERTS	< 0.02	< 0.02	< 0.02	< 0.02
Phenanthrene	(mg/kg)	MCERTS	0.03	0.07	< 0.02	< 0.02
Pyrene	(mg/kg)	MCERTS	0.08	0.20	< 0.02	0.03
Total PAH (Sum of USEPA 16)	(mg/kg)	UKAS	0.65	1.4	< 0.32	0.37
Gasoline Range Organics (>C ₈ to C ₁₀)	(mg/kg)	UKAS	-	< 5.0	< 5.0	< 5.0
Diesel Range Organics (>C ₁₀ to C ₂₁)	(mg/kg)	MCERTS	-	15	< 10.0	< 10.0
Mineral Range Organics (>C ₂₁ to C ₄₀)	(mg/kg)	MCERTS	-	50	17	12
Total TPH (>C ₈ to C ₄₀)	(mg/kg)	MCERTS	-	68	31	23
Asbestos	-	UKAS	-	No asbestos detected	No asbestos detected	No asbestos detected

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Project Reference - Chester Road

Analytical Test Results - BRE Suite

NC Reference			31878	31880	31881	31884
Client Sample Reference			SK3	WS1	WS2	WS4
Client Sample Location			B2	D2	B2	B3
Depth - Top (m)			1.00	2.00	0.25	1.00
Depth - Bottom (m)			1.50	2.45	1.00	1.20
Date of Sampling			27/03/2019	27/03/2019	27/03/2019	27/03/2019
Time of Sampling			Not provided	Not provided	Not provided	Not provided
Sample Matrix			Clay	Clay	Sand	Sand
Determinant	Units	Accreditation				
Water soluble sulphate	(mg/l)	u	< 10	< 10	< 10	< 10
Acid Soluble Sulphate	(%)	u	< 0.01	< 0.01	< 0.01	< 0.01
Total Sulphur	(%)	u	< 0.01	< 0.01	< 0.01	< 0.01
pH Value	pH Units	MCERTS	6.7	6.1	5.9	6.2

G19021/001

Project Reference - Chester Road

Sample Descriptions

NC Reference	Client Sample Reference	Sample Location	Description	Moisture Content (%)	Stone Content (%)	Passing 2mm test sieve (%)
31877	SK2	E1	Reddish brown slightly sandy silty clay with occasional rootlets	17	2.6	-
31878	SK3	B2	Reddish brown slightly sandy silty clay with occasional rootlets	-	-	100
31879	WS1	D1	Reddish brown silty sand with rare rootlets	16	2.7	-
31880	WS1	D2	Reddish brown slightly gravelly slightly sandy silty clay	-	-	89
31881	WS2	B2	Reddish brown silty sand	-	-	47
31882	WS3	B1	Reddish brown clayey silty sand with rare rootlets	18	1.1	-
31883	WS4	B2	Reddish brown silty sand	10	54	-
31884	WS4	B3	Reddish brown silty sand	-	-	61



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G19021/001

Project Reference - Chester Road

Analysis Methodologies

Matrix	Determinant	Sample condition for analysis	Test Method used
Soil	Metals	Air Dried	In house method statement - MS - CL - ICP metals
Soil	PAH	As Received	In house method statement - MS - CL - PAH (As received)
Soil	Phenols	As Received	In house method statement - MS - CL - Phenols by Skalar
Soil	pH	As Received	In house method statement - MS - CL - pH in soils (using a 1:3 soil to water extraction)
Soil	Sulphate (w/s)	Oven Dried	In house method statement - MS - CL - Anions by Aquakem
Soil	Acid Sulphate	Oven Dried	In house method statement - MS - CL - Acid Soluble Sulphate
Soil	Total Sulphur	Oven Dried	In house method statement - MS - CL - Total Sulphur by ICP
Soil	Total TPH	As Received	In house method statement - MS - CL - TPH (GC-FID)- Sample was not subject to a 'scrubbing' cleanup step prior to analysis
Soil	Asbestos	-	Fibre identification is in accordance with in house documented methods which are based on the procedure documented in the HSE Document HSG 248 "Asbestos: The analysts guide for sampling, analysis and clearance procedures"