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# **Geo-environmental Ground Investigation Report**

**ON**

**PROPOSED RESIDENTIAL DEVELOPMENT**

**AT**

**CHAIRBARROWS FARM,  
WHITECHAPEL ROAD, CLECKHEATON**

**FOR**

**Mr M GRAVES**

**APRIL 2022**

**E21/7893/R001**

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Appendix B Trial Hole Logs  
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Soakaway Test Results

Appendix C Chemical Analysis of Samples  
Geotechnical Analysis of Samples

## 0.0 EXECUTIVE SUMMARY

SITE	<p>The site is located at Chairbarrows Farm to the north of Whitechapel Road, Cleckheaton. The site is irregular in shape, with the narrow southern boundary fronting onto Wakefield Road.</p> <p>The site is divided into three areas, a western field, an eastern field and a central hardpaved area containing farm buildings.</p> <p>The site falls from the west to the east at an average grade of 1 in 18.</p>
HISTORY	<p>The site has been shown as Chairbarrows Farm since 1892. Buildings were shown in the western field from 1931 to 1976. Chairbarrows Colliery was shown to the south west of the site from 1905, was inactive by 1933 and no longer shown from 1976.</p>
GEOLOGY	<p>No superficial deposits or artificial ground are recorded on the site.</p> <p>The site is underlain by the Pennine Lower Coal Measures consisting of sandstone.</p> <p>The nearest fault line is approximately 30m south west of the site.</p> <p>The trial pits and window samples proved a shallow depth of topsoils, made ground and clays overlying sandstone which was encountered at 0.3-1.5m below existing ground levels. In the lower east of the site, this was proved to be underlain by a layer of clay.</p>
MINING/QUARRYING	<p>The Online Coal Authority Interactive Map shows that the site is not in a development high risk area. No coal outcrops are shown within, or within close proximity of the site.</p> <p>Previous investigation works to the north proved a 0.3-0.4m thick coal seam 3.4m and 1.4m below existing ground levels respectively. The seams are known to dip southwards towards the site. The relatively thin seam of coal noted will have in excess of ten times seam thickness of competent rock cover beneath the site.</p>
HYDROLOGY	<p>There are no recorded surface water features in the immediate vicinity of the site.</p> <p>The site is not located within any Environment Agency defined flood zones or shown to be at risk of flooding from rivers or the sea.</p>
HYDROGEOLOGY	<p>The groundwater vulnerability map for the area indicates that the site overlies rocks designated as a Secondary (A) aquifer.</p> <p>No groundwater was recorded during the trial pit excavations or window sample investigation.</p>

A single borehole recorded water at a depth of 1.95m below ground levels on single occasion.

HAZARDOUS GAS	<p>No radon protection measures are required for site.</p> <p>Gas monitoring has been undertaken on four occasions to date and recorded no methane and a maximum carbon dioxide concentration of 2.3%.</p> <p>Due to the low levels of carbon dioxide levels and flow rates on site, we would recommend the gas regime on this site be currently classified as <b>Green</b> by the NHBC traffic light system, or <b>CS1</b> by BS 8485:2015 Table 2.</p>
CONTAMINATION	<p>An elevated level of Lead was proved in the fill material in the western field. No other elevated levels of heavy or phytotoxic metals or PAH compounds were recorded in the samples from site.</p> <p>No asbestos was recorded in the samples taken from site.</p>
REMEDICATION	<p>Contaminated fill material from western field to be removed from site.</p> <p>Further sampling to be undertaken on topsoil from eastern field to confirm its suitability to remain on site.</p>
FOUNDATIONS	<p>We would suggest that the proposed two storey residential properties should be constructed on reinforced strip/trench fill footings founded entirely onto sandstone strata due to the proximity of the existing trees on site, this will also avoid differential settlement. The foundation widths will vary dependent upon the line loadings calculated.</p>
DRAINAGE	<p>Infiltration methods have proved unsuitable for use on site. We would therefore recommend that Kirklees Council FRM and Yorkshire Water are contacted to agree a suitable discharge rate and location for the on-site drainage.</p>

## **1.0 INTRODUCTION**

- 1.1 As requested by Martin Walsh Architectural on behalf of Mr M Graves, this practice carried out ground and contamination investigation works for a proposed residential development at Charibarrows Farm, Whitechapel Road, Cleckheaton.
- 1.2 The purpose of the report was to:-
- 1.2.1 Identify the nature of the near surface strata, in order to enable recommendations to be made as to the most economic foundation solution for the proposed residential development.
  - 1.2.2 To identify any areas of contaminated ground.
  - 1.2.3 Propose a suitable outline remediation strategy, which will enable the site to be developed safely, to the satisfaction of the overseeing regulators and in compliance with the current environmental standards.
  - 1.2.4 Determine if infiltration methods would be a suitable form of surface water disposal.
- 1.3 Soil sampling was undertaken via trial pits to determine the near surface strata. Distributed samples were taken for testing to ascertain the nature of the soils and fills present.
- 1.4 The conclusions and recommendations made in this report are limited to the findings of the preliminary Geotechnical Survey. The report is made on condition that Haigh Huddleston Associates will not in any circumstances be liable for loss, arising directly or indirectly from ground conditions encountered between trial pits and window samples, which have not been revealed by the investigation.
- 1.5 Any opinion given on the possible configuration of strata between trial pit and window sample locations and below maximum depth of the investigation is for guidance only. Any remarks on groundwater conditions made are based solely on observations made at the time of investigation. Kindly note that levels may differ from those reported due to seasonal variations or other influences.
- 1.6 Furthermore, there is the possibility that any trial pits or window samples undertaken as part of the investigatory works may be within the influence of existing or proposed foundations or excavations. Haigh Huddleston Associates cannot be held responsible for any failure of any excavations, foundations or structures within the influence of the trial pits or window samples.

## **2.0 THE SITE**

- 2.1 The site is located at Chairbarrows Farm, to the north of Whitechapel Road, Cleckheaton and lies around OS Grid Reference 417520, 425970. A site location plan is attached in Appendix A at the rear of the report.
- 2.2 The site is irregular in shape, with the narrow southern boundary fronting onto Whitechapel Road. There are residential properties to the south of Whitechapel Road. Immediately north is an area that has been used as storage, and to the south east is a small wooded area. To the remaining boundaries to the west and north east is open field. The site area is approximately 0.38ha.
- 2.3 The site consists of a central developed area with two smaller fields to the west and east. The central area is hard paved with a mixture of dilapidated tarmac and concrete. In the southern third are the main two storey stone and rendered brick built extension. In the northern two thirds of the central area is a single storey brick built workshed and a single storey timber and blockwork workshed.
- 2.4 The western and northern boundaries of the site are open onto the adjacent fields. The remainder of the site boundaries are formed by a stone wall with fencing and a conifer hedge.
- 2.5 The site generally falls from a high point of 141.0m AOD on the western boundary to a low of 137m AOD in the north eastern corner at an average grade of 1 in 18. Ground levels continue to fall away to the east and north east of the site.

### **3.0 SITE HISTORY**

- 3.1 The Preliminary Geo-Environmental Risk Assessment by Delta Simons (Ref: 19-1572.08 dated June 2021) which covers part of the site as well as the land to the north, west and east has been consulted, and below is a brief description outlining the significant developments that may affect future construction on the site.
- 3.2 A cluster of buildings labelled as Chairbarrows Farm has been shown in the central area of the site from 1892. From 1931, buildings were shown in the field immediately west of the farm, and were no longer shown from 1976. The remainder of the site has remained as field.
- 3.3 Chairbarrows Colliery was shown immediately south west of the site in 1905, and shown as disused by 1933. It is no longer shown on the maps from 1976 onwards and residential and commercial properties have subsequently been built on the northern edge of the former colliery.
- 3.4 Aside from the historical colliery, there has been no significant developments in the vicinity considered likely to have an adverse affect on the site.

#### **4.0 SITE GEOLOGY & MINING**

- 4.1 The BGS Digital Geological map of Great Britain at 1:50,000 has been consulted and we would report as follows:-
- 4.2 No artificial or superficial deposits are shown directly overlying the site.
- 4.3 The site is underlain by the Pennine Lower Coal Measures consisting of Sandstone.
- 4.4 The nearest fault line is located approximately 30m south west of the site and heads north west to south east.
- 4.5 The Online Coal Authority Interactive Map shows that the site is not in a development high risk area. No coal outcrops are shown within, or withing close proximity of the site. Historical shallow workings are shown approximately 25m south west of the site.
- 4.6 Previous investigations undertaken by RGS Geotechnical Ltd detailed in their report Ref: J4342/18/E/GE involved rotary boreholes 80m north and 80m north east of the site respectively. These proved a 0.3-0.4m thick coal seam 3.4m and 1.4m below existing ground levels respectively. The seams are known to dip southwards towards the site. The relatively thin seam of coal noted will have in excess of ten times seam thickness of competent rock cover beneath the site.
- 4.7 There are no known mine entries recorded within, or within 20m of, the site.
- 4.8 There are no detailed deep BGS boreholes recorded in the immediate vicinity of the site.

## **5.0 ENVIRONMENTAL CONSIDERATIONS**

### **5.1 Radon**

The UK Radon online maps indicate the property is not in a Radon Affected Area, as less than 1% of properties are above the action level.

No Radon Protective Measures are necessary.

### **5.2 Landfill Sites**

There are no recorded historic landfills within 250m of the site.

### **5.3 Flood Risk**

The site is not located in a currently defined Environment Agency floodzone or at risk of flooding from rivers and the sea.

### **5.4 Groundwater**

The groundwater vulnerability map for the area indicates that the site overlies bedrock designated as a Secondary (A) aquifer. These are permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers.

The site is not within a currently defined (Groundwater) Source Protection Zone (SPZ).

There are no licensed groundwater or surface water abstractions within 250m of the site.

There are no recorded pollution incidents to controlled water within 250m of the site.

There are no recorded surface water features in the immediate vicinity of the site.

## 6.0 **PRELIMINARY CONCEPTUAL SITE MODEL**

- 6.1 The initial stage in assessing the risks posed from contaminated land during the redevelopment of a site is to prepare a conceptual model. A generalised conceptual model can be developed highlighting the main pollutant linkages through a contaminant ► pathway ► receptor model for a residential development. In order to prepare the conceptual model for a particular site the following parameters need to be reviewed as discussed below.
- 6.2 Contamination of existing land can be caused by a number of factors, including:-
- i) Possible historical/current industrial activities.
  - ii) Disposal of waste materials.
  - iii) Storage of materials.
  - iv) A number of natural processes can also lead to hazardous gases and elevated heavy metals.
- 6.3 Potential pathways can include ground and surface water, permeable strata, existing services providing a conduit and voided ground. Potential receptors can include human health, ecosystems, controlled waters and building structures. There are a number of ways that a receptor can be exposed to the contaminant these include, inhalation, direct contact, ingestion, dermal contact and uptake.
- 6.4 Sources of potential contamination, that could affect the proposed development, from either on or off site activities would include the following:-
- i) Possible ground gas migration from shallow mine workings in the vicinity of the site.
  - ii) Possible made ground used to raise site levels beneath buildings on site.
  - iii) Construction materials to the buildings on site.
- Based on the above activities the potential for some contamination to exist on site is considered to be low.
- 6.5 Considering the proposed residential end use, there will be two possible human receptor groups exposed to the existing onsite contamination:-
- a) Site operatives during development.
  - b) End users, future site residents (the critical receptor is a 6 year-old girl).

6.6 Human receptors may be exposed to site contamination by a number of possible pathways. These pathways are summarised in Table 1 below.

**Table 1- Potential Human Exposure Pathways**

<u>Human Exposure Pathway</u>	<u>Site Residents</u>	<u>Construction Workers</u>
<b>Soil Ingestion</b>	YES	YES
<b>Consumption of Home Grown Vegetables</b>	YES	NO
<b>Dermal Contact</b>	YES	YES
<b>Dust Inhalation</b>	YES	YES
<b>Gases/Vapours</b>	YES	NO

6.7 The construction workers will come into contact with any contaminated soil to a far greater extent than future residents. The exposure pathways are generally through dermal contact and indirect ingestion. However their exposure will be for a limited time and the provision and correct use of personnel protective equipment and adequate welfare facilities during construction should restrict their risks to acceptable levels.

6.8 Future site residents can be protected in the long term development of the site via a suitable remediation strategy that ensures any proposed contaminated materials remaining on-site are suitably isolated beneath an effective capping layer.

6.9 The risk of pollution to controlled waters by existing contamination is considered low. There have been no historical uses of the site, or in the immediate vicinity of the site, likely to cause contamination. There are no licensed ground water abstractions recorded within 250m of the development. There have been no recorded pollution incidents to controlled waters associated with the site.

6.10 No specific areas of ecological importance have been identified in the initial desk top study. Therefore the site is considered to be in a low risk environmental setting. The potential for phototoxic materials to exist at shallow depth should be considered, these could pose a potential risk to new planting and soft landscaping areas within the proposed development.

6.11 The proposed planning drawings indicate residential properties with private garden areas and hard paved site access and parking areas. The presence of elevated

sulphates and hydrocarbons could affect the long term integrity of buried concrete structures, including foundations and drainage pipes. Plastic water supply pipes can also be damaged by the presence of hydrocarbon contamination.

## **7.0 FIELDWORK**

- 7.1 Trial pit excavations were undertaken on the 15<sup>th</sup> February 2022 using a JCB 3CX with back actor and 600mm wide bucket. Nine trial pits were undertaken in total, three of which were used for soak-a-way testing. In addition to this, six window samples were undertaken on site, to allow for gas monitoring stations to be installed to determine if ground gas generation would adversely affect the site.
- 7.2 Materials encountered in the trial pits and boreholes were examined and categorised. Trial pit and borehole logs are contained within Appendix B of the report.
- 7.3 The soakaway tests were undertaken in accordance with the method specified in BRE Digest 365 Soakaway Design. An instantaneous supply of water was provided via an IBC. In general the trial pits were filled and the water levels were recorded against time as the water permeated into the natural strata. The water level was monitored over an extended time period to determine the infiltration rate for the sand strata.
- 7.4 The site investigation works were designed to achieve comprehensive site coverage within the proposed development area. Locations of window samples and trial pits were restricted by the presence of the existing buildings on site and crops within the western field.
- 7.5 Soil samples were removed from the natural and made ground deposits within the trial pits. The samples were removed by operatives wearing gloves and placed into airtight clean plastic containers and glass bottles for transportation to the laboratory.
- 7.6 A total of seven samples from the natural and made ground deposits were recovered from the trial holes for chemical analysis. The testing was carried out by a UKAS accredited laboratory to nationally or accredited in-house methods. The results of the contamination testing are contained within Appendix C of this report.
- 7.7 A suite of common potential contaminants consisting of heavy metals, phytotoxic metals, sulphates, sulphides and poly-aromatic hydrocarbons was analysed for, including a range of metals and inorganic substances and asbestos.

7.8 All samples were stored in airtight containers within cool boxes at approximately 4°C until delivery to the laboratory within 48 hours.

## **8.0 RESULTS OF THE INVESTIGATION**

### **8.1 GEOTECHNICAL INVESTIGATION**

- 8.1.1 A copy of the trial hole and window sample logs providing a complete record of strata encountered beneath the proposed development is presented in Appendix B.
- 8.1.2 The fieldwork generally proved a shallow depth of made ground and clays overlying a sandstone bedrock.
- 8.1.3 In TP07 and TP08 in the eastern field, there was short cut grass over 0.2-0.3m of topsoil. In TP01 in the western field, there was short cut grass over fill consisting of soils, brick fragments, glass and gravels.
- 8.1.4 At the surface of TP02, TP03, TP04, TP07 and TP08 in the central areas of the site, the surface consisted of a 0.1-0.2m thick concrete slab. In TP09 there were two concrete slabs with a layer of bricks, rubble, gravels and glass sandwiched between two concrete slabs.
- 8.1.5 Beneath the concrete slabs, and at the surface of TP05 and TP06 at the very north of the site, there was a 0.3-0.55m layer of made ground. The made ground consisted of a mix of bricks, ash, soft clay, sandstone gravels, topsoil, glass, hardcore and tarmac scalpings.
- 8.1.6 Below the made ground and topsoil in all but TP05 and TP08 was a layer of soft to firm light brown sandy clay with sandstone gravels. The thickness of the clay strata varied between 0.5m and 0.8m across site. At the base of this in TP06 and TP07 in the central northern area was a 0.3-0.4m thick layer of weak light brown mudstone excavated as gravels with clays pockets.
- 8.1.7 At the base of all but TP08, a weathered sandstone was encountered mostly at depths of 1.1-1.5m below existing ground levels. In TP05 in the north west and TP08 in the east of the site the weathered sandstone was encountered at 0.3m below existing ground levels. The sandstone was mainly excavated as angular gravels, with occasional cobbles, boulders and clay pockets encountered and became difficult to excavate at 1.1-2.3m below existing ground levels.

- 8.1.8 Beneath the sandstone in TP08, a soft light brown/orange sandy clay with numerous sandstone gravels was encountered at 2.1m below existing ground levels. This extended to the base of the trial pit at 2.4m below existing ground levels. TP08 was located at the lower north eastern edge of the site, and there is the potential for this clay strata to extend to the west beneath the remainder of the site, below the depth of the trial pits undertaken.
- 8.1.9 Generally, the window samples proved up to 1.0m of topsoil and gravelly clay overlying the sandstone bedrock which was encountered at 1.0m below existing ground levels in all but WS04 in the north of the site. In WS04, 1.0m of rubble and red brick overlaid 0.8m of gravelly clay with the sandstone bedrock encountered at 1.8m below existing ground levels.
- 8.1.10 Standard Penetration Test 'N' values taken at 1.0m depth increments within the window samples are summarised in Table 2 below:-

**Table 2 Summary of SPT (N Values)**

Depth (m)	1.00-1.45	2.00-2.45
WS01	12	REFUSAL
WS02	24	REFUSAL
WS03	16	REFUSAL
WS04	14	REFUSAL
WS05	16	REFUSAL
WS06	16	REFUSAL

- 8.1.11 The SPT tests generally proved stiff to very stiff gravelly clays with refusals recorded in the underlying sandstone bedrock. There is the potential for the numerous gravels within the clays to affect the SPT values for this strata.
- 8.1.12 As discussed previously in the report, three of the trial pits were used to carry out soakaway tests in order to obtain infiltration rates across the site.
- 8.1.13 The infiltration rate has been calculated in each case between the 75% and 25% full values as recommended in the BRE Digest 365. The soakaway results are included in Appendix B and are summarised Table 3 below:-

**Table 3 Summary of infiltration rates**

<b>SOAKAWAY NUMBER</b>	<b>INFILTRATION RATE</b> <b>m/s x10<sup>-6</sup></b>
TP02	11.5
TP04 – TEST 1	750
TP04 – TEST 2	718
TP08	231

8.1.14 All three trial pits recorded moderate to high infiltration rates of 11.5-750 x10<sup>-6</sup> m/s. In TP04, the trial pit was emptying within minutes of the IBC emptying, which accounts for the lack of head within the soakaway calculations. It was not possible to undertake repeat tests in the other two trial pits due to time constraints.

8.1.15 The result of the geotechnical analysis undertaken on the samples of clayey soil indicates the clay to be of low to medium (Plasticity Index 12-14%). If the modified results are calculated, taking into account the percentage of material retained on a 425micron sieve, the results correspond to a low shrinkage clay. The test certificates are contained in Appendix C.

## **8.2 GROUNDWATER**

8.2.1 No groundwater was encountered during the trial pit investigation.

8.2.2 No groundwater strikes were recorded during the window sample investigation. Groundwater was recorded at a depths of 1.95m below existing ground levels in a single monitoring station on one occasion to date.

8.2.3 It should be recognised that ground water levels may vary throughout the year. During periods of heavy rainfall the groundwater levels may be substantially higher than the results revealed in these investigations.

## **8.3 GAS MONITORING**

8.3.1 As discussed previously WS02, WS03, WS04 and WS05 were installed with gas standpipes and lockable covers. In addition to this, an existing intact monitoring station from previous site investigation works was proved on site. Gas testing is

currently being undertaken on site and to-date the wells have been monitored on four occasions following the installation of the standpipes.

8.3.2 A standard gas monitoring procedure has been followed in accordance with CIRIA guidance, including measurement of the following:-

- i) Methane, Oxygen and Carbon Dioxide concentrations.
- ii) Atmospheric Pressure.
- iii) Gas Flow Rate.
- iv) Standing water level.

8.3.3 The result of the monitoring undertaken to-date is summarised in Table 4 below. A complete set of results will be reported on completion of the intended testing programme.

**Table 4 - Summary of Recorded Gas Levels.**

Borehole No.	Date	Oxygen %	Carbon Dioxide %	Methane %	Flow Rate (l/hr)	Depth to Water (m)	Atmospheric Pressure (mb)
WS02	23.02.22	20.2	ND	ND	ND	DRY	993
	09.03.22	20.2	0.1	ND	ND	DRY	996
	22.03.22	18.4	ND	ND	ND	DRY	1014
		20.5	0.0	ND	ND	DRY	974
WS03	23.02.22	20.3	ND	ND	ND	DRY	994
	09.03.22	20.3	0.1	ND	ND	DRY	996
	22.03.22	20.2	0.1	ND	ND	DRY	1014
		20.5	0.1	ND	ND	DRY	975
WS04	23.02.22	19.8	0.3	ND	ND	DRY	993
	09.03.22	17.9	0.7	ND	ND	DRY	996
	22.03.22	17.5	1.2	ND	ND	DRY	1014
		18.0	1.5	ND	ND	DRY	973
WS05	23.02.22	19.2	0.9	ND	ND	DRY	992
	09.03.22	18.0	1.9	ND	ND	DRY	996
	22.03.22	17.6	2.3	ND	ND	1.95	1014
		19.5	1.6	ND	ND	DRY	972
ExBH	23.02.22	18.6	1.6	ND	ND	DRY	992
	09.03.22	18.2	1.6	ND	ND	DRY	996
	22.03.22	17.1	2.0	ND	ND	DRY	1014
		18.9	1.9	ND	ND	DRY	973

- 8.3.4 All four visits to date have been undertaken during falling air pressure. During the monitoring to date, a maximum carbon dioxide concentration of 2.3% has been recorded in WS05. No methane has been recorded on site. No flow rates have been detected on site.
- 8.3.5 Gas monitoring undertaken in the adjacent fields previously by RGS Geotechnical and Delta Simmons proved low levels of carbon dioxide indicating a site-wide classification of CS1 in accordance with BS8485:2015.
- 8.3.5 Due to the low levels of carbon dioxide levels and flow rates on site, we would recommend the gas regime on this site be currently classified as **Green** by the NHBC traffic light system, or **CS1** by BS 8485:2015 Table 2.
- 8.3.6 The gas monitoring is ongoing and a final report confirming any gas protection measures required will be prepared when the monitoring is completed.

## **9.0 CONTAMINATION**

### **9.1 HUMAN HEALTH RISK ASSESSMENT**

9.1.1 The appraisal of contaminated land within the UK is based on a risk assessment approach. The method involves the principle of defining a source ► pathway ► receptor, linkage to establish a human health risk. For any risk to exist to a potential receptor from an identified contaminant there must be an unbroken source ► pathway ► target relationship.

9.1.2 In the first instance site data for the contaminant levels are compared against guidance such as the CLEA values published by DEFRA. Should the site values exceed the guidance criteria, the contamination levels are recognised to have the potential to pose a risk to human health. Two scenarios are then available:-

- a) To break or remove one of the source ► pathway ► receptor linkages, by specifying an appropriate level of remedial work. Examples of remedial action may include the removal of the contaminated material or alternatively specifying a sufficient capping layer.
- b) The alternative approach is to provide a more detailed human health site specific risk assessment. This will involve examining factors such as soil properties, exposure assumptions, groundwater flows and contamination composition.

### **9.2 CONTAMINATION RESULTS**

9.2.1 As stated above, in order to put the analytical results into context, the data has in the first instance been assessed in relation to several sets of guidelines: -

9.2.2 The analytical results have been assessed via an initial screening assessment with regard to the current Contaminated Land Exposure Assessment model (CLEA UK) for human health, which has been produced for the Environment Agency and the Department of Environment, Food and Rural Affairs (DEFRA). The CLEA model provides Soil Guideline Values (SGVs) for a limited range of contaminants only, and these are based on risk to human health. As such they do not take into account potential risks to other receptors eg groundwater and third party land.

- 9.2.3 It is proposed to redevelop the site for residential properties with private garden areas. Soil results have therefore been assessed against Generic Assessment Criteria (GAC) based on guidelines from the Chartered Institute of Environmental Health (CIEH) and Land Quality Management Ltd (LQM) S4UL document. Where there is no GAC, guidance limits have been adopted from sources referenced in the table below.
- 9.2.4 In addition to the above, the calculation of SGVs based on an acceptably low level of risk is currently being undertaken. These Category 4 Screening Levels (C4SL) have been calculated for six substances to date by modifying the toxicological/exposure parameters within CLEA. C4SLs have been used as tier 1 trigger levels within this assessment, superseding the previous CIEH and LQM SGVs.
- 9.2.5 Assessment of risk is considered as a tiered approach. Assessment based on non intrusive means is considered Tier 1 assessment, comparison against SGVs and GACs is a Tier 2 assessment, and the generation of and comparison with Site Specific Assessment Criteria (SSAC) is a Tier 3 assessment and is conducted where deemed appropriate following the Tier 2 assessment.
- 9.2.6 The sulphate and acid concentrations have been compared against the BRE digest "Concrete in Aggressive Ground" parts 1-4. This will enable the concrete class to be specified in relation to possible contact with aggressive soils.
- 9.2.7 The results of the chemical analysis are presented on the laboratory analysis sheets with Appendix C. A summary of the significance of the results is presented in Table 5.

**Table 5****Comparison of contaminant against accepted guidance values for residential use with plant uptake**

<u>CONTAMINANT</u>	<u>SGV</u> <u>MG/KG</u>	<u>CONCENTRATION IN</u> <u>ALL SOILS.</u> <u>MG/KG</u>	<u>No. OF</u> <u>SAMPLES</u> <u>EXCEEDING</u> <u>GUIDANCE</u> <u>VALUES</u>	<u>PERCENTAGE</u> <u>OF SAMPLES</u> <u>EXCEEDING</u> <u>GUIDELINE</u> <u>VALUE</u>
<b>Arsenic</b>	37 (4)	1.4-23	0/7	
<b>Cadmium</b>	22 (4)	<0.1-0.8	0/7	
<b>Chromium (Total)</b>	130 (2)	2.7-25	0/7	
<b>Lead</b>	200 (4)	2.6-250	1/7	14.3%
<b>Mercury (Total)</b>	1.2 (1)	<0.05-0.34	0/7	
<b>Selenium</b>	250 (1)	0.5-1.5	0/7	
<b>Copper</b>	2400 (1)	4.1-58	0/7	
<b>Nickel</b>	180 (1)	1.0-21	0/7	
<b>Zinc</b>	3700 (1)	24-300	0/7	
<b>Sulphate</b>	0.24 (3)	0.03-0.18	0/7	
<b>Thiocyanate</b>	50	<0.6-2.4	0/7	
<b>Sulphide</b>	250	<10-100	0/7	
<b>Naphthalene</b>	2.3 (1)	<0.1	0/7	
<b>Benzo(a)pyrene</b>	5 (4)	<0.1-1.3	0/7	
<b>PAH (Total)</b>	40	<1.6-2.8	0/7	
<b>EPH (Total)</b>	250	210	0/1	
<b>Phenols</b>	760 (1)	<0.3	0/7	
<b>Asbestos</b>	No fibres	None	0/7	
<b>pH</b>	6-8	5.1-8.8	0/7	

(1) Copyright Land Quality Management Ltd reproduced with permission; Publication Number S4UL3499. All rights reserved.

(2) DEFRA CLR SGV's withdrawn used for initial comparison

(3) BS 8110 1985 Table 6.1

(4) Category 4 Screening Levels

9.2.8 A elevated level of Lead of 250 mg/kg was recorded in the sample of fill from TP01 in the western field.

9.2.9 There were no other elevated levels of heavy or phytotoxic metals recorded in the samples from site.

9.2.10 No elevated levels of PAH (Total) or individual PAH compounds were recorded in the samples taken from site.

9.2.11 No asbestos was recorded in the samples taken from site.

9.2.13 There were no elevated sulphate levels in the samples taken from site, however the pH values recorded were as low as 5.1. This corresponds to a design sulphate class DS-1, ACEC class AC-2z, when compared against the BRE Special Digest 1 "Concrete in aggressive ground".

### **9.3 QUALITATIVE RISK ASSESSMENT**

9.3.1 The Qualitative Risk Assessment is based upon the previously discussed source ► pathway ► receptor principle. In relation to the proposed site these may be described as follows:-

#### **9.3.2 SOURCE**

- i) Elevated level of Lead in a single sample.
- ii) No elevated levels of ground gas.

#### **9.3.3 PATHWAYS**

- i) Ingestion of contamination material.
- ii) Inhalation of contaminated particles.
- iii) Dermal contact with the known contamination.
- iv) Leaching to controlled waters.

#### **9.3.4 RECEPTORS**

- i) Residential site users.
- ii) Construction and maintenance workers.
- iii) Controlled waters.
- iv) The building structure.

9.3.5 Each of the receptors will now be appraised and attribute the likely risks involved.

##### **i) Residential site users.**

Based on the chemical results obtained it is considered that there is currently a **low** risk to end users from localised ground contamination on-site.

A single elevated level of Lead of 250 mg/kg was recorded in the sample of topsoil from TP01. This topsoil was also noted to contain bricks and glass and be unsuitable for re-use on site.

No other elevated levels of heavy or phytotoxic metals or PAH compounds were recorded in the samples from site.

No asbestos recorded in the samples taken from site.

It is recommended that the fill from TP01, and any similar in the western field, is treated as a contamination hotspot and removed from site. The remainder of the topsoil on site should be scraped and stockpiled behind protective fencing to prevent cross contamination during development. Further samples should be taken to confirm the material is suitable for re-use within domestic gardens.

During the monitoring to date, a maximum carbon dioxide concentration of 2.3% has been recorded in WS05. No methane has been recorded on site. No steady flow rates have been detected in the monitoring stations. Due to the low levels of carbon dioxide levels and flow rates on site, we would recommend the gas regime on this site be currently classified as **Green** by the NHBC traffic light system, or **CS1** by BS 8485:2015 Table 2. The gas monitoring is ongoing and a final report confirming any gas protection measures required will be prepared when the monitoring is completed.

#### **ii) Construction and Maintenance Workers.**

It is considered that there is a **low** risk to construction and maintenance workers from the redevelopment of the site.

Construction workers should always wear PPE including overalls, boots and gloves when handling the contaminated materials onsite. In addition eating, drinking and smoking should be restricted to designated areas where the above hygiene facilities are available.

#### **iii) Controlled Waters**

There are no groundwater abstractions located within 250m of the site. The nearest recorded surface water feature to the site is over 250m away. A single slightly elevated level of lead has been proved in the samples taken from site. It is therefore

considered unlikely that there is a risk to groundwater and controlled waters from existing contamination on site.

**iv) Building Structures.**

Service providers should be forwarded the final validated chemical levels in order for them to provide an accurate specification for the apparatus to be provided. New services should be surrounded and backfilled with clean material to afford some protection to the apparatus and allow any future maintenance work to be undertaken in clean material.

There were no elevated sulphate levels in the samples taken from site, however the pH values recorded were as low as 5.1. This corresponds to a design sulphate class DS-1, ACEC class AC-2z, when compared against the BRE Special Digest 1 "Concrete in aggressive ground".

## **10.0 CONCLUSIONS AND RECOMMENDATIONS**

### **10.1 GEOTECHNICAL ASSESSMENT**

- 10.1.1 The fieldwork generally proved a shallow depth of topsoil and made ground overlying clays with a sandstone bedrock. For initial design purposes we would envisage a safe bearing capacity of 100kN/m<sup>2</sup> where foundations are cited into the clay strata and 150kN/m<sup>2</sup> where foundations are extended onto the solid sandstone strata.
- 10.1.2 We would therefore suggest that the proposed two storey residential properties should be constructed on reinforced strip/trench fill footings founded entirely onto sandstone strata due to the proximity of the existing trees on site, this will also avoid differential settlement. The foundation widths will vary dependent upon the line loadings calculated.
- 10.1.3 All foundations should be placed below a line of 45° drawn up from the base of any services or other structures.
- 10.1.4 Where existing foundations or structures are encountered during construction, these should be totally removed from the excavations to enable the new foundations to be constructed without obstructions.
- 10.1.5 At present it is not anticipated that excessive ground water control measures will be required. Please note that ground water flows can vary throughout the year and a further assessment should be undertaken if construction work is proposed following a prolonged rainfall event.
- 10.1.6 There were no elevated sulphate levels in the samples taken from site, however the pH values recorded were as low as 5.1. This corresponds to a design sulphate class DS-1, ACEC class AC-2z, when compared against the BRE Special Digest 1 "Concrete in aggressive ground".
- 10.1.7 Wherever any foundations are located near existing or proposed new trees, their foundations must be sited below the root growth zone. Reference should be made to the NHBC standards Chapter 4.2 "Building Near Trees" which provides guidance on foundation criteria, depths and construction. All services should be similarly

protected. Plasticity testing of the clays on site has shown them to be of low volume change potential.

## **10.2 GROUND FLOOR SLAB – GAS MEASURES**

10.2.1 As discussed previously, gas monitoring stations were installed in four of the window sample locations on site due to the possibility of ground gas migration from shallow mine workings in the vicinity of the site. In addition to this, an intact monitoring station from previous site investigation works was used for monitoring.

10.2.2 A maximum carbon dioxide concentration of 2.3% was recorded in WS05. No methane has been recorded. No steady flow rates have been detected in the monitoring stations.

10.2.3 Gas monitoring undertaken in the adjacent fields previously by RGS Geotechnical and Delta Simmons proved low levels of carbon dioxide indicating a site-wide classification of CS1 in accordance with BS8485:2015.

10.2.4 The proposed development consists of low rise residential housing and therefore the gas regime has been characterised in accordance with the traffic light methodology as outlined in *CIRIA Report C665*. Due to the low carbon dioxide levels on site, we would recommend the gas regime on this site be currently classified as **Green** by the NHBC traffic light system, or **CS1** by BS 8485:2015 Table 2.

10.2.5 No Radon Protection measures are required for the site.

10.2.6 Due to the presence of trees immediately adjacent the site, a suspended beam & block floor will be required for the properties in accordance with NHBC Chapter 4.2, this will allow a ventilated void to be constructed beneath the floor construction.

10.2.7 A detailed analysis of the results and any gas protection measures required will be confirmed on completion of the on-site gas testing in a separate report.

### **10.3 CONTAMINATION ASSESSMENT**

- 10.3.1 An elevated level of Lead of 250 mg/kg was recorded in the sample of fill from TP01.
- 10.3.2 No other elevated levels of heavy or phytotoxic metals or PAH compounds were recorded in the samples from site.
- 10.3.3 No asbestos recorded in the samples taken from site.
- 10.3.4 It is recommended that the fill from TP01, and any similar material from the western field, is removed from site to a suitably licensed waste facility. Waste transfer tickets should be retained for inclusion in a validation report.
- 10.3.5 Should the existing topsoil in the eastern field prove unsuitable for use on site, or insufficient in volume, clean material will need to be imported to provide a minimum 300mm thick growing medium for the garden areas. All material should be tested and certified prior to bringing to site to confirm it is free from contaminants.
- 10.3.6 If the imported material is from a Greenfield site, a minimum of 3 samples or 1 per 250m<sup>3</sup> of imported material should be taken for testing, whichever is greater. If it is from a brownfield site, a minimum of 6 samples, or 1 per 100m<sup>3</sup> of imported material should be taken for testing, whichever is greater. Material provided by a commercial supplier should be certified to the same level of testing, with the certificate less than two months old.
- 10.3.7 All imported certified material should be placed immediately. If this is not possible, or the material is not certified and sampling is to be carried out prior to being laid, it should be securely stored on site prior to use to prevent possible contamination from any materials on site.
- 10.3.8 If any areas of made ground are removed off site, they should be taken to a licensed waste site and full documentation should be obtained. Any material to be taken off-site should be suitably quarantined prior to removal to prevent cross contamination. Any relevant chemical test results should be given to the landfill operator, so that they can determine if this material is suitable to be disposed of in their licensed landfill.

10.3.9 Should any further suspected areas of contamination be exposed during site strip/construction, an engineer should be contacted to determine if additional chemical testing should be undertaken. The on-site staff should maintain a photographic record and dates of any exposed contaminated material.

#### **10.4 SURFACE WATER DRAINAGE**

10.4.1 The trial pits undertaken on site have proved made ground and topsoils overlying clays with a sandstone bedrock.

10.4.2 The soakaways on site moderate to high infiltration results of  $11.5-750 \times 10^{-6}$  m/s, with variations noted despite the similarity of the underlying material. It is therefore apparent that the infiltration is reliant on fissures within the underlying sandstone bedrock.

10.4.3 In addition to this, in TP08 at the lower eastern edge of the site, a layer of clay was proved beneath the weathered sandstone. There is the potential for this material to extend westwards beneath the site, below the level of the trial pits and window samples undertaken. As ground levels fall away to the east and north east of the site, there is the possibility for the clay strata to outcrop, potentially leading to the re-emergence of ground water onto the neighbouring land.

10.4.4 Due to the reliance on fissures, which may not necessary be present within the required soakaway locations, and the possibility of water re-emergence to the north east and east, it is our recommendation that in this instance infiltration will not be a suitable long term method of surface water disposal.

10.4.5 We would therefore recommend that Kirklees Council FRM and Yorkshire Water are contacted to agree a suitable discharge rate and location for the on-site drainage.

## **11.0 SUGGESTED FURTHER WORK**

- 11.1 Gas monitoring to be completed and final assessment on gas protection measures to be made.
- 11.2 Removal of contaminated fill in western field to be validated.
- 11.3 Further samples to be taken of existing topsoil in eastern field to confirm suitability for re-use on site.

## 12.0 APPROVALS

12.1 Proposals for the remediation of contaminated land may require the approval of numerous bodies.

These include:

- a) Kirklees Council Environmental Health Department as required by the building and planning regulations.
- b) The NHBC or similar as they will provide the insurance costs to cover the property.
- c) The Environment Agency if there are risks of contamination to ground or surface water systems. They will also require notification if material is removed from site and taken to an appropriate tip.
- d) Relevant highways and drainage authorities and other service companies may also wish to know about the level of contaminants.

Prepared by



M. Dean. BSc(Hons) HND

Checked by



M. Huddleston. MEng

April 2022

This report is subject to the provisions of the Copyright Acts and is for the sole benefit of Mr M Graves in respect of the proposals described.

# **APPENDIX A**

**Site Location Plan**

**Dwg No. E21/7893/03 – Site Investigation Plan**

**Dwg No. E21/7893/32 - Typical Site Conceptual Model**



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Firth Building  
99-101 Leeds Road  
Dewsbury  
WF12 7BU

Client : Michael Graves  
Job Title: Whitechapel Road, Cleckheaton  
HD19 6HH  
Job Number : E21/7893

## LOCATION PLAN

OS Grid Reference : SE 175259  
Easting : 417538  
Northing : 425959

Topographical Survey carried out  
using GPS.





Rev A. Amended to suit Site Investigation Works.

16.02.22 JF

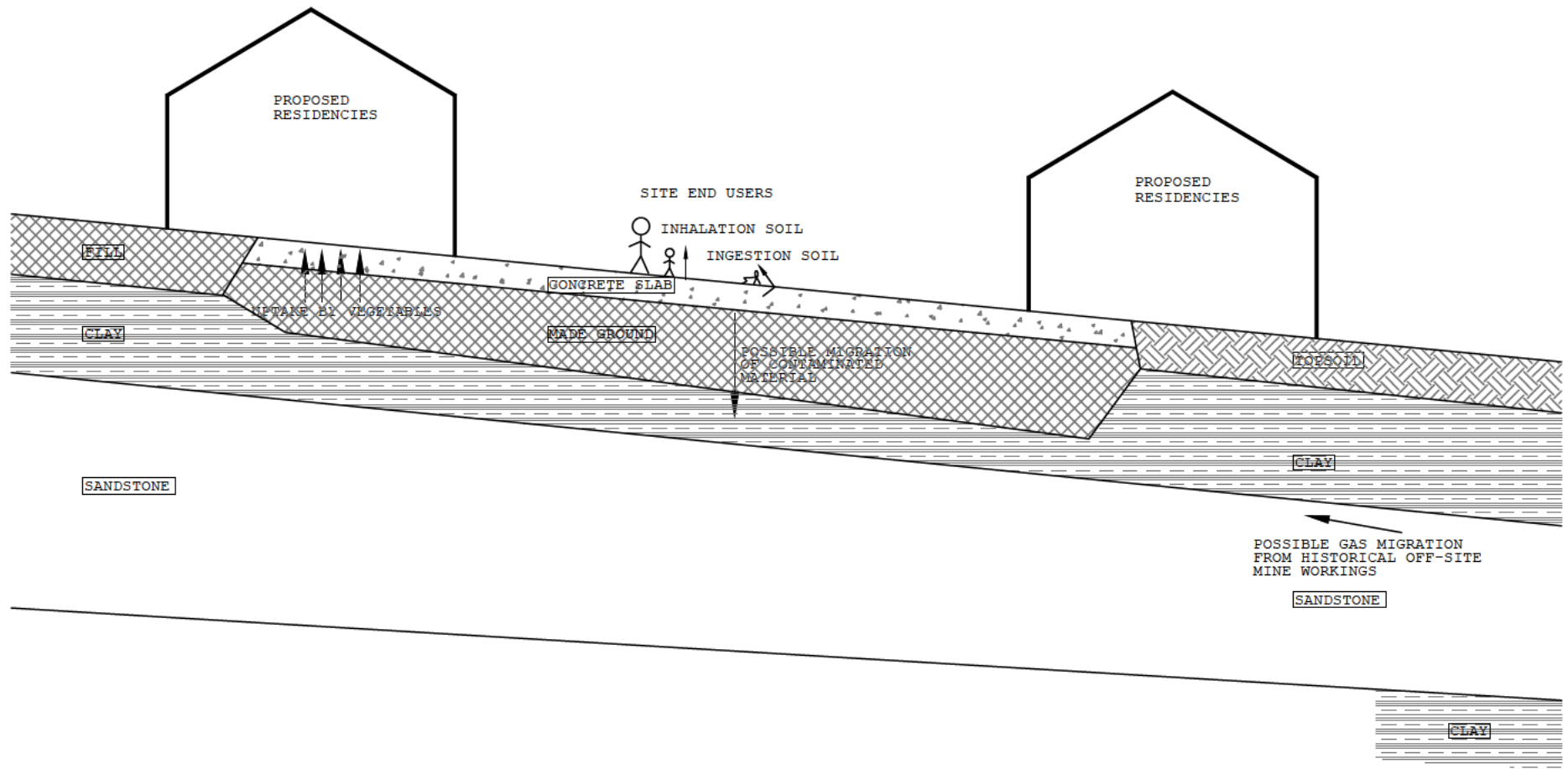


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e martin@haighhuddleston.co.uk

Client				
MICHAEL GRAVES				
Project				
294 - 298 WHITECHAPEL ROAD, CLECKHEATON				
Detail				
TRIAL PIT LOCATION PLAN				
Scale	Dwn	Chkd	Date	Dwg No.
1:500	JF	MH	JAN-22	E21/7893/003_01A



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e martin@haighhuddleston.co.uk

Client	MICHAEL GRAVES			
Project	294-298 WHITECHAPEL ROAD, CLECKHEATON			
Detail	Typical Site Conceptual Model			
Scale	Dwn	Chkd	Date	Dwg No.
NTS	MD		Apr'22	E21/7893/32

# **APPENDIX B**

**Trial Hole Logs**

**Window Sample Logs**

**Soakaway Test Results**



# TRIAL HOLE NO. 1

<b>Client :</b>	<b>MICHAEL GRAVES</b>	<b>Job No :</b>	<b>7893</b>
<b>Site :</b>	<b>WHITECHAPEL ROAD, CLECKHEATON</b>	<b>Date :</b>	<b>15 February 2022</b>

<b>0.0</b>		
	<b>0.4</b>	Short grass over dark brown topsoil containing brick fragments, glass and sandstone gravels.
	<b>0.5</b>	Soft light brown sandy clay with occasional sandstone gravels.
	<b>1.0</b>	
	<b>1.2</b>	
	<b>1.5</b>	Moderately weak light brown weathered sandstone becoming difficult to excavate with depth.
	<b>1.7</b>	Unable to excavate further.
	<b>2.0</b>	
	<b>2.5</b>	
	<b>3.0</b>	
	<b>3.5</b>	
	<b>4.0</b>	

**REMARKS:**

Ground water encountered during excavation      NO  
Sample taken      NO  
Sides of excavation remained stable      YES  
Level      .....

**NOTES:**

.....  
.....



# TRIAL HOLE NO. 2

<b>Client :</b>	<b>MICHAEL GRAVES</b>	<b>Job No :</b>	<b>7893</b>
<b>Site :</b>	<b>WHITECHAPEL ROAD, CLECKHEATON</b>	<b>Date :</b>	<b>15 February 2022</b>

<b>0.0</b>		
	<b>0.1</b>	Concrete slab.
		Made ground consisting of brick fragments, soft clay, gravels.
	<b>0.5</b>	Sample taken at 0.5m.
		Soft light brown sandy clay containing numerous sandstone gravels.
	<b>1.0</b>	
	<b>1.3</b>	
	<b>1.5</b>	Moderately strong light brown weathered sandstone excavated as angular gravels with occasional clay pockets.
	<b>2.0</b>	
	<b>2.3</b>	Unable to excavate further.
	<b>2.5</b>	
	<b>3.0</b>	
	<b>3.5</b>	
	<b>4.0</b>	

**REMARKS:**

Ground water encountered during excavation      NO  
Sample taken      YES at 0.5m  
Sides of excavation remained stable      YES  
Level      .....

**NOTES:**

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# TRIAL HOLE NO. 3

<b>Client :</b>	<b>MICHAEL GRAVES</b>	<b>Job No :</b>	<b>7893</b>
<b>Site :</b>	<b>WHITECHAPEL ROAD, CLECKHEATON</b>	<b>Date :</b>	<b>15 February 2022</b>

<b>0.0</b>		
	<b>0.15</b>	Concrete slab.
		Made ground consisting of bricks.
	<b>0.5</b>	Sample taken at 0.5m.
	<b>0.7</b>	Sample taken at 0.8m.
		Soft/firm light brown sandy clay with numerous sandstone gravels.
	<b>1.0</b>	
	<b>1.2</b>	
		Moderately strong weathered sandstone excavated as angular gravels.
	<b>1.5</b>	
	<b>2.0</b>	Unable to excavate further.
	<b>2.5</b>	
	<b>3.0</b>	
	<b>3.5</b>	
	<b>4.0</b>	

**REMARKS:**

Ground water encountered during excavation      NO  
Sample taken      YES at 0.5m & 0.8m.  
Sides of excavation remained stable      YES  
Level      .....

**NOTES:**

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.....



# TRIAL HOLE NO. 4

<b>Client :</b>	<b>MICHAEL GRAVES</b>	<b>Job No :</b>	<b>7893</b>
<b>Site :</b>	<b>WHITECHAPEL ROAD, CLECKHEATON</b>	<b>Date :</b>	<b>15 February 2022</b>

<b>0.0</b>		
	<b>0.15</b>	Concrete slab over thin layer of limestone aggregate.
		Made ground consisting of ash, brick, soft brown clay.
	<b>0.5</b>	
	<b>0.7</b>	
		Soft/firm light brown sandy clay with numerous sandstone gravels.
	<b>1.0</b>	
	<b>1.5</b>	
	<b>1.5</b>	
		Moderately strong sandstone excavated as angular gravels with occasional cobbles and clay pockets.
	<b>2.0</b>	
	<b>2.1</b>	
	<b>2.5</b>	
	<b>3.0</b>	
	<b>3.5</b>	
	<b>4.0</b>	

**REMARKS:**

Ground water encountered during excavation      NO  
Sample taken      NO  
Sides of excavation remained stable      YES  
Level      .....

**NOTES:**

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# TRIAL HOLE NO. 5

<b>Client :</b>	<b>MICHAEL GRAVES</b>	<b>Job No :</b>	<b>7893</b>
<b>Site :</b>	<b>WHITECHAPEL ROAD, CLECKHEATON</b>	<b>Date :</b>	<b>15 February 2022</b>

<b>0.0</b>		
	<b>0.3</b>	Made ground consisting of tarmac scalpings over hardcore. Sample taken at 0.2m.
<b>0.5</b>	<b>1.1</b>	Moderately strong light brown weathered sandstone excavated as angular gravels with clay pockets.
<b>1.0</b>		
<b>1.5</b>		
<b>2.0</b>		
<b>2.5</b>		
<b>3.0</b>		
<b>3.5</b>		
<b>4.0</b>		

**REMARKS:**

Ground water encountered during excavation      NO  
Sample taken      YES at 0.2m.  
Sides of excavation remained stable      YES  
Level      .....

**NOTES:**

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# TRIAL HOLE NO. 6

<b>Client :</b>	<b>MICHAEL GRAVES</b>	<b>Job No :</b>	<b>7893</b>
<b>Site :</b>	<b>WHITECHAPEL ROAD, CLECKHEATON</b>	<b>Date :</b>	<b>15 February 2022</b>

<b>0.0</b>		
		Made ground consisting of bricks, sandstone gravels, topsoil and glass. Sample taken at 0.3m.
<b>0.5</b>	<b>0.5</b>	
		Sample taken at 0.7m. Soft light brown sandy clay containing numerous sandstone gravels.
<b>1.0</b>		
	<b>1.2</b>	
		Moderately weak light brown mudstone excavated as angular gravels with clay pockets.
<b>1.5</b>	<b>1.5</b>	
		Moderately strong light brown sandstone excavated as angular gravels.
<b>2.0</b>		
	<b>2.3</b>	Unable to excavate further.
<b>2.5</b>		
<b>3.0</b>		
<b>3.5</b>		
<b>4.0</b>		

**REMARKS:**

Ground water encountered during excavation	NO
Sample taken	YES at 0.3m. & 0.7m.
Sides of excavation remained stable	YES
Level	.....

**NOTES:**

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# TRIAL HOLE NO. 7

<b>Client :</b>	<b>MICHAEL GRAVES</b>	<b>Job No :</b>	<b>7893</b>
<b>Site :</b>	<b>WHITECHAPEL ROAD, CLECKHEATON</b>	<b>Date :</b>	<b>15 February 2022</b>

<b>0.0</b>		
	<b>0.2</b>	Short grass over dark brown topsoil. Sample taken at 0.2m.
<b>0.5</b>		Soft light brown sandy clay.
	<b>0.7</b>	
<b>1.0</b>		Moderately weak light brown mudstone excavated as angular gravels with clay pockets.
	<b>1.1</b>	
<b>1.5</b>		Moderately strong light brown sandstone excavated as angular gravels with pockets of dense clayey sand.
	<b>1.6</b>	Unable to excavate further.
<b>2.0</b>		
<b>2.5</b>		
<b>3.0</b>		
<b>3.5</b>		
<b>4.0</b>		

**REMARKS:**

Ground water encountered during excavation      NO  
Sample taken      YES at 0.2m.  
Sides of excavation remained stable      YES  
Level      .....

**NOTES:**

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# TRIAL HOLE NO. 8

<b>Client :</b>	<b>MICHAEL GRAVES</b>	<b>Job No :</b>	<b>7893</b>
<b>Site :</b>	<b>WHITECHAPEL ROAD, CLECKHEATON</b>	<b>Date :</b>	<b>15 February 2022</b>

<b>0.0</b>		
	<b>0.3</b>	Short grass over dark brown topsoil. Sample taken at 0.2m.
<b>0.5</b>		Moderately strong light brown weathered sandstone excavated as angular gravels with numerous sandy clay pockets and occasional sandstone boulders.
<b>1.0</b>		
<b>1.5</b>		
<b>2.0</b>		
<b>2.1</b>		
	<b>2.4</b>	Soft light brown/orange sandy clay with numerous sandstone gravels.
<b>2.5</b>		
<b>3.0</b>		
<b>3.5</b>		
<b>4.0</b>		

**REMARKS:**

Ground water encountered during excavation      NO  
Sample taken      YES at 0.2m.  
Sides of excavation remained stable      YES  
Level      .....

**NOTES:**

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# TRIAL HOLE NO. 9

<b>Client :</b>	<b>MICHAEL GRAVES</b>	<b>Job No :</b>	<b>7893</b>
<b>Site :</b>	<b>WHITECHAPEL ROAD, CLECKHEATON</b>	<b>Date :</b>	<b>15 February 2022</b>

<b>0.0</b>		
	<b>0.3</b>	Concrete slab over made ground consisting of bricks, rubble, sandstone gravels and glass.
	<b>0.4</b>	Second concrete slab.
<b>0.5</b>		
	<b>0.7</b>	Made ground consisting of bricks, ash, soft clay.
<b>1.0</b>		
<b>1.5</b>	<b>1.5</b>	Soft/firm light brown sandy clay with numerous sandstone gravels.
<b>2.0</b>		
	<b>2.1</b>	Moderately strong light brown sandstone excavated as angular gravels.
<b>2.5</b>		
<b>3.0</b>		
<b>3.5</b>		
<b>4.0</b>		Unable to excavate further.

**REMARKS:**

Ground water encountered during excavation      NO  
Sample taken      NO  
Sides of excavation remained stable      YES  
Level      .....

**NOTES:**

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.....

Firth Buildings,  
99-101 Leeds Road,  
Dewsbury, WF12 7BU

Tel: 01924 464342  
Fax: 01924 450662



**Haigh Huddleston & Associates**

Civil Structural Engineering Consultants

**Equipment & Methods**

**Client: Michael Graves**

**Site: Whitechapel Road, Cleckheaton**

**BOREHOLE No. 01**

**Ground Level**

**Date: 15.02.2022**

**Co-ordinates:**

Description	Reduced Level	Legend	Depth (thick)	Sample/Tests				
				Depth	Sample		Test	
					Type	No.		
Gravelly clay.			1.0	1.0				4,4,3,3,3,3
Weathered sandstone			1.0	2.0				8,4,4, 24/30 REFUSED
				3.0				
				4.0				
				5.0				
				6.0				
				7.0				
				8.0				
				9.0				
				10.0				
				11.0				
				12.0				
				13.0				
				14.0				
				15.0				

Remarks  
Piezometer installation  
1m plain  
1m slotted

Logged by  
M. Willard

Scale

FIG

Firth Buildings,  
99-101 Leeds Road,  
Dewsbury, WF12 7BU

Tel: 01924 464342  
Fax: 01924 450662



**Haigh Huddleston & Associates**  
Civil Structural Engineering Consultants

<b>Equipment &amp; Methods</b>	<b>Client: Michael Graves</b>		
	<b>Site: Whitechapel Road, Cleckheaton</b>		

<b>BOREHOLE No. 02</b>	<b>Ground Level</b>	<b>Date: 15.02.2022</b>
<b>Co-ordinates:</b>		

Description	Reduced Level	Legend	Depth (thick)	Sample/Tests			
				Depth	Sample		
					Type	No.	
Gravelly clay.			1.0	1.0			6,5,6,6,6,6
Weathered sandstone			1.0	2.0			10,12,15,15,15 5/10 REFUSED
				3.0			
				4.0			
				5.0			
				6.0			
				7.0			
				8.0			
				9.0			
				10.0			
				11.0			
				12.0			
				13.0			
				14.0			
				15.0			

Remarks Piezometer installation 1m plain 1m slotted	Logged by
	Scale
	FIG

Firth Buildings,  
99-101 Leeds Road,  
Dewsbury, WF12 7BU

Tel: 01924 464342  
Fax: 01924 450662



**Haigh Huddleston & Associates**

Civil Structural Engineering Consultants

**Equipment & Methods**

**Client: Michael Graves**

**Site: Whitechapel Road, Cleckheaton**

**BOREHOLE No. 03**

**Ground Level**

**Date: 15.02.2022**

**Co-ordinates:**

Description	Reduced Level	Legend	Depth (thick)	Sample/Tests				
				Depth	Sample		Test	
					Type	No.		
Gravelly clay.			1.0	1.0				3,3,4,4,4,4
Weathered sandstone			1.0	2.0				25/30 refused 90 10/5 refused
				3.0				
				4.0				
				5.0				
				6.0				
				7.0				
				8.0				
				9.0				
				10.0				
				11.0				
				12.0				
				13.0				
				14.0				
				15.0				

Remarks  
Piezometer installation  
1m plain  
1m slotted

Logged by

Scale

FIG

Firth Buildings,  
99-101 Leeds Road,  
Dewsbury, WF12 7BU

Tel: 01924 464342  
Fax: 01924 450662



**Haigh Huddleston & Associates**

Civil Structural Engineering Consultants

**Equipment & Methods**

**Client: Michael Graves**

**Site: Whitechapel Road, Cleckheaton**

**BOREHOLE No. 04**

**Ground Level**

**Date: 15.02.2022**

**Co-ordinates:**

Description	Reduced Level	Legend	Depth (thick)	Sample/Tests			
				Depth	Sample		Test
					Type	No.	
Rubble & red brick			1.0	1.0			8,3,3,3,4,4
Gravelly clay			0.8	1.8			5,15,15,20
Weathered sandstone			0.2	2.0			15/30 refused
	3.0						
	4.0						
	5.0						
	6.0						
	7.0						
	8.0						
	9.0						
	10.0						
	11.0						
	12.0						
	13.0						
14.0							

Remarks  
Piezometer installation  
1m plain  
1m slotted

Logged by

Scale

FIG

Firth Buildings,  
99-101 Leeds Road,  
Dewsbury, WF12 7BU

Tel: 01924 464342  
Fax: 01924 450662



**Haigh Huddleston & Associates**  
Civil Structural Engineering Consultants

<b>Equipment &amp; Methods</b>	<b>Client: Michael Graves</b>						
	<b>Site: Whitechapel Road, Cleckheaton</b>						

<b>BOREHOLE No. 05</b>	<b>Ground Level</b>						<b>Date: 15.02.2022</b>
<b>Co-ordinates:</b>							

Description	Reduced Level	Legend	Depth (thick)	Sample/Tests				
				Depth	Sample		Test	
					Type	No.		
Topsoil			0.2	0.2				5,4,3,4,5,4
Gravelly clay			0.8	1.0				12,13,12,13,19
Weathered sandstone			1.0	2.0				15
				3.0				
				4.0				
				5.0				
				6.0				
				7.0				
				8.0				
				9.0				
				10.0				
				11.0				
				12.0				
				13.0				
				14.0				
				15.0				

Remarks Piezometer installation 1m plain 1m slotted	Logged by
	Scale
	FIG

Firth Buildings,  
99-101 Leeds Road,  
Dewsbury, WF12 7BU

Tel: 01924 464342  
Fax: 01924 450662



**Haigh Huddleston & Associates**

Civil Structural Engineering Consultants

**Equipment & Methods**

**Client: Michael Graves**

**Site: Whitechapel Road, Cleckheaton**

**BOREHOLE No. 06**

**Ground Level**

**Date: 15.02.2022**

**Co-ordinates:**

Description	Reduced Level	Legend	Depth (thick)	Sample/Tests				
				Depth	Sample		Test	
					Type	No.		
Topsoil			0.2	0.2				4,8,4,4,4,4  10, 15/20 refused 30/refused
Gravelly clay			0.8	1.0				
Weathered sandstone			1.0	2.0				
				3.0				
				4.0				
				5.0				
				6.0				
				7.0				
				8.0				
				9.0				
				10.0				
				11.0				
				12.0				
				13.0				
				14.0				
		15.0						

Remarks  
Piezometer installation  
1m plain  
1m slotted

Logged by

Scale

FIG

**Soil Permeability test**

TP02

**Site** Whitechappel Road, Cleckheaton

**Date**

Feb-22 (Test 1)

**Client** Michael Graves

**Job No.** E21/7893

Pit dimensions            m  
    **Length**                    1.8  
    **Width**                     0.7  
    **Depth**                     2.3

<b>Time</b>	<b>Time into Test Mlns</b>	<b>Dip Reading mm</b>	<b>Vol cu.m</b>	<b>Vol Change cu.m</b>	<b>Contact area Avge sq.m</b>	<b>Permeability lit/ sq.m/sec</b>
10.32	0	1850	0.56700		3.51000	
10.35	3	1880	0.52920	0.03780	3.36000	0.06114
10.36	4	1900	0.50400	0.02520	3.26000	0.12689
10.39	7	1930	0.46620	0.03780	3.11000	0.06593
10.46	14	1940	0.45360	0.01260	3.06000	0.00972
10.55	23	1960	0.42840	0.02520	2.96000	0.01550
11.07	35	1980	0.40320	0.02520	2.86000	0.01203
11.56	84	2020	0.35280	0.05040	2.66000	0.00621
13.10	158	2050	0.31500	0.03780	2.51000	0.00329
14.20	228	2060	0.30240	0.01260	2.46000	0.00121

BRE Value            0.01146372 lit/ sq.m/sec

Average Permeability Value: 0.033547261 lit/ sq.m/sec

**Soil Permeability test**

TP04

**Site** Whitechappel Road, Cleckheaton

**Date**

Feb-22 (Test 1)

**Client** Michael Graves

**Job No.** E21/7893

Pit dimensions            m  
    **Length**                    1.8  
    **Width**                     0.7  
    **Depth**                     2.1

<b>Time</b>	<b>Time into Test Mlns</b>	<b>Dip Reading mm</b>	<b>Vol cu.m</b>	<b>Vol Change cu.m</b>	<b>Contact area Avge sq.m</b>	<b>Permeability lit/ sq.m/sec</b>
10.59	0	1820	0.35280		2.66000	
11.02	3	1950	0.18900	0.16380	2.01000	0.38972
11.03	4	2080	0.02520	0.32760	1.36000	0.67910
11.06	7	2100	0.00000	0.35280	1.26000	0.42857

BRE Value            0.75000000 lit/ sq.m/sec

Average Permeability Value: 0.499132511 lit/ sq.m/sec

**Soil Permeability test**

TP04

**Site** Whitechappel Road, Cleckheaton

**Date**

Feb-22

(Test 2)

**Client** Michael Graves

**Job No.**

E21/7893

Pit dimensions            m  
    **Length**                    1.8  
    **Width**                     0.7  
    **Depth**                     2.1

<b>Time</b>	<b>Time into Test Mlns</b>	<b>Dip Reading mm</b>	<b>Vol cu.m</b>	<b>Vol Change cu.m</b>	<b>Contact area Avge sq.m</b>	<b>Permeability lit/ sq.m/sec</b>
13.15	0	1980	0.15120		1.86000	
13.16	1	2060	0.05040	0.10080	1.46000	1.01205
13.19	3.00	2100.00	0.00000	0.05040	1.26000	0.30882

BRE Value      0.71794872    lit/ sq.m/sec

Average Permeabilty Value: 0.660435861    lit/ sq.m/sec

**Soil Permeability test**

TP08

**Site** Whitechappel Road, Cleckheaton

**Date**

Feb-22 (Test 1)

**Client** Michael Graves

**Job No.** E21/7893

Pit dimensions            m  
    **Length**                    1.3  
    **Width**                     0.7  
    **Depth**                     2.4

<b>Time</b>	<b>Time into Test Mlns</b>	<b>Dip Reading mm</b>	<b>Vol cu.m</b>	<b>Vol Change cu.m</b>	<b>Contact area Avge sq.m</b>	<b>Permeability lit/ sq.m/sec</b>
13.30	0	2050	0.31850		2.31000	
13.32	2	2090	0.28210	0.03640	2.15000	0.13602
13.34	4	2130	0.24570	0.03640	1.99000	0.14654
13.45	15	2400	0.00000	0.24570	0.91000	0.25674

BRE Value            0.23122530 lit/ sq.m/sec

Average Permeability Value: 0.141280879 lit/ sq.m/sec

# **APPENDIX C**

**Chemical Analysis of Samples**

**Geotechnical Analysis of Samples**



# DETS

## Certificate of Analysis

*Certificate Number* 22-03441

*Issued:* 03-Mar-22

*Client* Haigh Huddleston & Associates Ltd  
Firth Buildings  
99-101 Leeds Road  
Dewsbury  
WF12 7BU

*Our Reference* 22-03441

*Client Reference* 7893

*Order No* (not supplied)

*Contract Title* White Chapel

*Description* 7 Soil samples.

*Date Received* 21-Feb-22

*Date Started* 21-Feb-22

*Date Completed* 03-Mar-22

*Test Procedures* Identified by prefix DETSn (details on request).

*Notes* Opinions and interpretations are outside the laboratory's scope of ISO 17025 accreditation. This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. This certificate shall not be reproduced except in full, without the prior written approval of the laboratory.

*Approved By*



Kirk Bridgewood  
General Manager



2139

## Summary of Chemical Analysis

### Matrix Descriptions

*Our Ref* 22-03441

*Client Ref* 7893

*Contract Title* White Chapel

Sample ID	Depth	Lab No	Completed	Matrix Description
TP01	0.2	1973850	03/03/2022	Dark brown gravelly, sandy CLAY including odd rootlets (Possible made ground - brick)
TP02	0.5	1973851	03/03/2022	Dark brown gravelly, sandy CLAY including odd rootlets
TP03	0.5	1973852	03/03/2022	Dark brown gravelly, sandy CLAY including odd rootlets (Possible made ground - slag)
TP03	0.8	1973853	03/03/2022	Brown gravelly, sandy CLAY
TP05	0.2	1973854	03/03/2022	Dark brown gravelly, sandy CLAY
TP06	0.3	1973855	03/03/2022	Dark brown gravelly, sandy CLAY
TP08	0.2	1973856	03/03/2022	Dark brown gravelly, sandy CLAY including odd rootlets

## Summary of Chemical Analysis

### Soil Samples

Our Ref 22-03441

Client Ref 7893

Contract Title White Chapel

Lab No	1973850	1973851	1973852	1973853	1973854	1973855	1973856
Sample ID	TP01	TP02	TP03	TP03	TP05	TP06	TP08
Depth	0.20	0.50	0.50	0.80	0.20	0.30	0.20
Other ID							
Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
Sampling Date	15/02/2022	15/02/2022	15/02/2022	15/02/2022	15/02/2022	15/02/2022	15/02/2022
Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s	n/s

Test	Method	LOD	Units							
<b>Metals</b>										
Arsenic	DETSC 2301#	0.2	mg/kg	20	21	23	4.1	1.4	16	13
Cadmium	DETSC 2301#	0.1	mg/kg	0.6	0.2	0.3	< 0.1	0.8	0.4	0.3
Chromium	DETSC 2301#	0.15	mg/kg	24	25	17	15	2.7	22	20
Copper	DETSC 2301#	0.2	mg/kg	50	31	58	12	4.1	38	30
Lead	DETSC 2301#	0.3	mg/kg	250	53	97	7.8	2.6	81	46
Mercury	DETSC 2325#	0.05	mg/kg	0.28	0.34	0.13	< 0.05	< 0.05	0.08	0.07
Nickel	DETSC 2301#	1	mg/kg	20	19	21	16	1.0	19	17
Selenium	DETSC 2301#	0.5	mg/kg	1.4	0.8	0.7	0.7	0.5	1.5	1.1
Zinc	DETSC 2301#	1	mg/kg	300	96	120	33	24	180	96
<b>Inorganics</b>										
pH	DETSC 2008#		pH	7.5	7.9	8.8	6.9	7.0	7.4	5.1
Thiocyanate	DETSC 2130#	0.6	mg/kg	2.4	< 0.6	< 0.6	< 0.6	1.5	1.2	1.4
Total Organic Carbon	DETSC 2084#	0.5	%	6.0	2.6	7.2	< 0.5	3.0	3.5	3.0
Sulphide	DETSC 2024*	10	mg/kg	450	41	190	120	65	53	45
Sulphate as SO <sub>4</sub> , Total	DETSC 2321#	0.01	%	0.18	0.06	0.14	0.03	0.09	0.07	0.08
<b>Petroleum Hydrocarbons</b>										
EPH (C10-C40)	DETSC 3311#	10	mg/kg			< 10		210		
<b>PAHs</b>										
Naphthalene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Acenaphthylene	DETSC 3301	0.1	mg/kg	0.2	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Acenaphthene	DETSC 3301	0.1	mg/kg	0.2	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Fluorene	DETSC 3301	0.1	mg/kg	0.3	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Phenanthrene	DETSC 3301	0.1	mg/kg	2.5	< 0.1	0.1	< 0.1	< 0.1	0.3	< 0.1
Anthracene	DETSC 3301	0.1	mg/kg	0.5	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Fluoranthene	DETSC 3301	0.1	mg/kg	3.1	< 0.1	0.3	< 0.1	0.2	0.7	< 0.1
Pyrene	DETSC 3301	0.1	mg/kg	2.9	< 0.1	0.2	< 0.1	0.1	0.6	< 0.1
Benzo(a)anthracene	DETSC 3301	0.1	mg/kg	1.3	< 0.1	0.2	< 0.1	< 0.1	0.2	< 0.1
Chrysene	DETSC 3301	0.1	mg/kg	1.4	< 0.1	0.2	< 0.1	0.1	0.2	< 0.1
Benzo(b)fluoranthene	DETSC 3301	0.1	mg/kg	1.0	< 0.1	0.1	< 0.1	< 0.1	0.2	< 0.1
Benzo(k)fluoranthene	DETSC 3301	0.1	mg/kg	0.6	< 0.1	< 0.1	< 0.1	< 0.1	0.1	< 0.1
Benzo(a)pyrene	DETSC 3301	0.1	mg/kg	1.3	< 0.1	0.1	< 0.1	< 0.1	0.4	< 0.1
Indeno(1,2,3-c,d)pyrene	DETSC 3301	0.1	mg/kg	0.9	< 0.1	0.6	< 0.1	< 0.1	< 0.1	< 0.1
Dibenzo(a,h)anthracene	DETSC 3301	0.1	mg/kg	0.2	< 0.1	0.1	< 0.1	< 0.1	< 0.1	< 0.1
Benzo(g,h,i)perylene	DETSC 3301	0.1	mg/kg	0.9	< 0.1	0.1	< 0.1	< 0.1	< 0.1	< 0.1
PAH Total	DETSC 3301	1.6	mg/kg	17	< 1.6	2.2	< 1.6	< 1.6	2.8	< 1.6
<b>Phenols</b>										
Phenol - Monohydric	DETSC 2130#	0.3	mg/kg	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3

## Summary of Asbestos Analysis

### Soil Samples

*Our Ref* 22-03441

*Client Ref* 7893

*Contract Title* White Chapel

Lab No	Sample ID	Material Type	Result	Comment*	Analyst
1973850	TP01 0.20	SOIL	NAD	none	Darryl Fletcher
1973851	TP02 0.50	SOIL	NAD	none	Darryl Fletcher
1973852	TP03 0.50	SOIL	NAD	none	Darryl Fletcher
1973853	TP03 0.80	SOIL	NAD	none	Darryl Fletcher
1973854	TP05 0.20	SOIL	NAD	none	Darryl Fletcher
1973855	TP06 0.30	SOIL	NAD	none	Darryl Fletcher
1973856	TP08 0.20	SOIL	NAD	none	Darryl Fletcher

Crocidolite = Blue Asbestos, Amosite = Brown Asbestos, Chrysotile = White Asbestos. Anthophyllite, Actinolite and Tremolite are other forms of Asbestos. Samples are analysed by DETSC 1101 using polarised light microscopy in accordance with HSG248 and documented in-house methods. NAD = No Asbestos Detected. Where a sample is NAD, the result is based on analysis of at least 2 sub-samples and should be taken to mean 'no asbestos detected in sample'. Key: \* - not included in laboratory scope of accreditation.

## Information in Support of the Analytical Results

Our Ref 22-03441  
 Client Ref 7893  
 Contract White Chapel

### Containers Received & Deviating Samples

Lab No	Sample ID	Date Sampled	Containers Received	Holding time exceeded for tests	Inappropriate container for tests
1973850	TP01 0.20 SOIL	15/02/22	GJ 250ml, PT 1L		
1973851	TP02 0.50 SOIL	15/02/22	GJ 250ml, PT 1L		
1973852	TP03 0.50 SOIL	15/02/22	GJ 250ml, PT 1L		
1973853	TP03 0.80 SOIL	15/02/22	GJ 250ml, PT 1L		
1973854	TP05 0.20 SOIL	15/02/22	GJ 250ml, PT 1L		
1973855	TP06 0.30 SOIL	15/02/22	GJ 250ml, PT 1L		
1973856	TP08 0.20 SOIL	15/02/22	GJ 250ml, PT 1L		

Key: G-Glass P-Plastic J-Jar T-Tub

DETS cannot be held responsible for the integrity of samples received whereby the laboratory did not undertake the sampling. In this instance samples received may be deviating. Deviating Sample criteria are based on British and International standards and laboratory trials in conjunction with the UKAS note 'Guidance on Deviating Samples'. All samples received are listed above. However, those samples that have additional comments in relation to hold time, inappropriate containers etc are deviating due to the reasons stated. This means that the analysis is accredited where applicable, but results may be compromised due to sample deviations. If no sampled date (soils) or date+time (waters) has been supplied then samples are deviating. However, if you are able to supply a sampled date (and time for waters) this will prevent samples being reported as deviating where specific hold times are not exceeded and where the container supplied is suitable.

### Soil Analysis Notes

Inorganic soil analysis was carried out on a dried sample, crushed to pass a 425µm sieve, in accordance with BS1377.

Organic soil analysis was carried out on an 'as received' sample. Organics results are corrected for moisture and expressed on a dry weight basis.

The Loss on Drying, used to express organics analysis on an air dried basis, is carried out at a temperature of 28°C +/-2°C.

### Disposal

From the issue date of this test certificate, samples will be held for the following times prior to disposal :-

Soils - 1 month, Liquids - 2 weeks, Asbestos (test portion) - 6 months

## Appendix A - Details of Analysis

Method	Parameter	Units	Limit of Detection	Sample Preparation	Sub-Contracted	UKAS	MCERTS
DETSC 2002	Organic matter	%	0.1	Air Dried	No	Yes	Yes
DETSC 2003	Loss on ignition	%	0.01	Air Dried	No	Yes	Yes
DETSC 2008	pH	pH Units	1	Air Dried	No	Yes	Yes
DETSC 2024	Sulphide	mg/kg	10	Air Dried	No	Yes	Yes
DETSC 2076	Sulphate Aqueous Extract as SO4	mg/l	10	Air Dried	No	Yes	Yes
DETSC 2084	Total Carbon	%	0.5	Air Dried	No	Yes	Yes
DETSC 2084	Total Organic Carbon	%	0.5	Air Dried	No	Yes	Yes
DETSC 2119	Ammoniacal Nitrogen as N	mg/kg	0.5	Air Dried	No	Yes	Yes
DETSC 2130	Cyanide free	mg/kg	0.1	Air Dried	No	Yes	Yes
DETSC 2130	Cyanide total	mg/kg	0.1	Air Dried	No	Yes	Yes
DETSC 2130	Phenol - Monohydric	mg/kg	0.3	Air Dried	No	Yes	Yes
DETSC 2130	Thiocyanate	mg/kg	0.6	Air Dried	No	Yes	Yes
DETSC 2321	Total Sulphate as SO4	%	0.01	Air Dried	No	Yes	Yes
DETSC 2325	Mercury	mg/kg	0.05	Air Dried	No	Yes	Yes
DETSC 3049	Sulphur (free)	mg/kg	0.75	Air Dried	No	Yes	Yes
DETSC2123	Boron (water soluble)	mg/kg	0.2	Air Dried	No	Yes	Yes
DETSC2301	Arsenic	mg/kg	0.2	Air Dried	No	Yes	Yes
DETSC2301	Barium	mg/kg	1.5	Air Dried	No	Yes	Yes
DETSC2301	Beryllium	mg/kg	0.2	Air Dried	No	Yes	Yes
DETSC2301	Cadmium Available	mg/kg	0.1	Air Dried	No	Yes	Yes
DETSC2301	Cadmium	mg/kg	0.1	Air Dried	No	Yes	Yes
DETSC2301	Cobalt	mg/kg	0.7	Air Dried	No	Yes	Yes
DETSC2301	Chromium	mg/kg	0.15	Air Dried	No	Yes	Yes
DETSC2301	Copper	mg/kg	0.2	Air Dried	No	Yes	Yes
DETSC2301	Manganese	mg/kg	20	Air Dried	No	Yes	Yes
DETSC2301	Molybdenum	mg/kg	0.4	Air Dried	No	Yes	Yes
DETSC2301	Nickel	mg/kg	1	Air Dried	No	Yes	Yes
DETSC2301	Lead	mg/kg	0.3	Air Dried	No	Yes	Yes
DETSC2301	Selenium	mg/kg	0.5	Air Dried	No	Yes	Yes
DETSC2301	Zinc	mg/kg	1	Air Dried	No	Yes	Yes
DETSC 3072	Ali/Aro C10-C35	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C10-C12	mg/kg	1.5	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C10-C12	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C10-C35	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C12-C16	mg/kg	1.2	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C12-C16	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C16-C21	mg/kg	1.5	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C16-C21	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C21-C35	mg/kg	3.4	As Received	No	Yes	Yes
DETSC 3072	Aliphatic C21-C35	mg/kg	3.4	As Received	No	Yes	Yes
DETSC 3072	Aromatic C10-C12	mg/kg	0.9	As Received	No	Yes	Yes
DETSC 3072	Aromatic C10-C12	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aromatic C10-C35	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aromatic C12-C16	mg/kg	0.5	As Received	No	Yes	Yes
DETSC 3072	Aromatic C12-C16	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aromatic C16-C21	mg/kg	0.6	As Received	No	Yes	Yes
DETSC 3072	Aromatic C16-C21	mg/kg	10	As Received	No	Yes	Yes
DETSC 3072	Aromatic C21-C35	mg/kg	1.4	As Received	No	Yes	Yes
DETSC 3072	Aromatic C21-C35	mg/kg	1.4	As Received	No	Yes	Yes
DETS 062	Benzene	mg/kg	0.01	As Received	No	Yes	Yes
DETS 062	Ethylbenzene	mg/kg	0.01	As Received	No	Yes	Yes
DETS 062	Toluene	mg/kg	0.01	As Received	No	Yes	Yes
DETS 062	Xylene	mg/kg	0.01	As Received	No	Yes	Yes
DETS 062	m+p Xylene	mg/kg	0.01	As Received	No	Yes	Yes
DETS 062	o Xylene	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3311	C10-C24 Diesel Range Organics (DRO)	mg/kg	10	As Received	No	Yes	Yes
DETSC 3311	C24-C40 Lube Oil Range Organics (LORO)	mg/kg	10	As Received	No	Yes	Yes
DETSC 3311	EPH (C10-C40)	mg/kg	10	As Received	No	Yes	Yes

## Appendix A - Details of Analysis

Method	Parameter	Units	Limit of Detection	Sample Preparation	Sub-Contracted	UKAS	MCERTS
DETSC 3303	Acenaphthene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Acenaphthylene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Benzo(a)pyrene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Benzo(a)anthracene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Benzo(b)fluoranthene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Benzo(k)fluoranthene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Benzo(g,h,i)perylene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Dibenzo(a,h)anthracene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Fluoranthene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Indeno(1,2,3-c,d)pyrene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Naphthalene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Phenanthrene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3303	Pyrene	mg/kg	0.03	As Received	No	Yes	Yes
DETSC 3401	PCB 28 + PCB 31	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3401	PCB 52	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3401	PCB 101	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3401	PCB 118	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3401	PCB 153	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3401	PCB 138	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3401	PCB 180	mg/kg	0.01	As Received	No	Yes	Yes
DETSC 3401	PCB Total	mg/kg	0.01	As Received	No	Yes	Yes

Method details are shown only for those determinands listed in Annex A of the MCERTS standard. Anything not included on this list falls outside the scope of MCERTS. No Recovery Factors are used in the determination of results. Results reported assume 100% recovery. Full method statements are available on request.

End of Report



# STRUCTURAL SOILS LTD

## TEST REPORT



Report No. 785155 R1

1774

Date 04-March-2022 Contract White Chapel Road

Client Haigh Huddleston Associates  
Address Firth Building  
99-101 Leeds Road  
Dewsbury  
WF12 7BU

For the Attention of Martin Huddleston

Samples submitted by client	18/02/2022	Client Reference	
Testing Started	28/02/2022	Client Order No.	
Testing Completed	04/03/2022	Instruction Type	Written

Tests marked 'Not UKAS Accredited' in this report are not included in the UKAS Accreditation Schedule for our Laboratory.

### UKAS Accredited Tests Undertaken

Moisture Content (oven drying method) BS1377:Part 2:1990,clause 3.2 (superseded)\*\*  
Liquid Limit (definitive method) BS1377:Part 2:1990,clause 4.3  
Plastic Limit BS1377:Part 2:1990,clause 5.3  
Plasticity Index Derivation BS1377:Part 2:1990,clause 5.4

\* This clause of BS1377 is no longer the most up to date method due to the publication of ISO17892

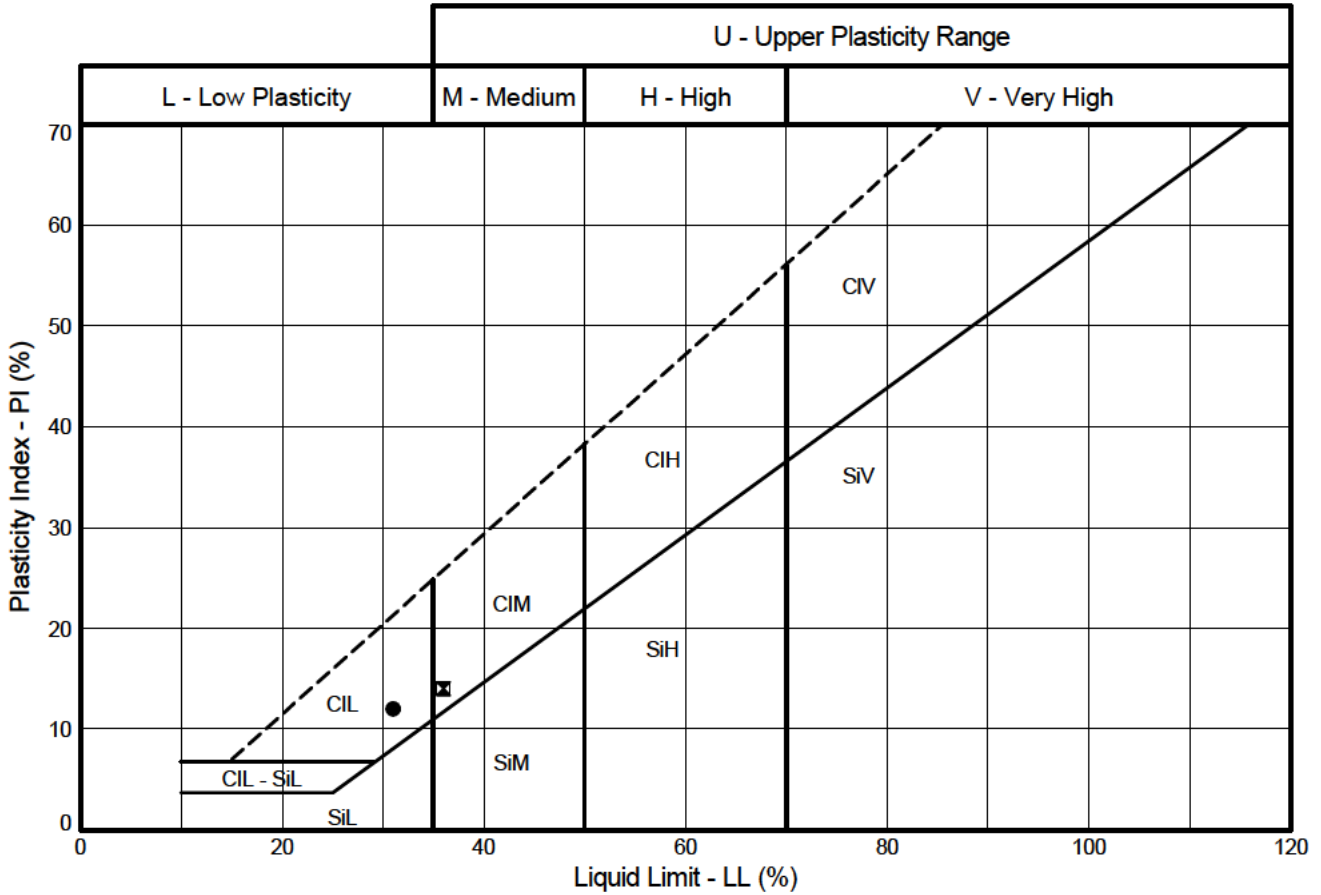
Please Note: Remaining samples will be retained for a period of one month from today and will then be disposed of.  
Test were undertaken on samples 'as received' unless otherwise stated.  
Opinions and interpretations expressed in this report are outside the scope of accreditation for this laboratory.

Structural Soils Ltd, The Potteries, Pottery Street, Castleford, WF10 1NJ Tel.01977 552255. E-mail mark.athorne@soils.co.uk



# PI vs LL CHART

According to BS EN 14688-2:2018  
Testing in accordance with BS EN ISO 17892-12:2018+A1:2021



Sample Identification			Test Method #	Preparation Method +	WC %	LL %	PL %	PI %	<425µm %	Lab location	Notes
Exploratory Position ID	Sample	Depth (m)									
●	TP01	D	0.50	5.3/5.5/6.5	5.2.7	17.3	31	19	12	85	C
☒	TP06	D	0.70	5.3/5.5/6.5	5.2.7	19.3	36	22	14	82	C


# Tested in accordance with the following clauses of BS EN ISO 17892-12:2018+A1:2021  
5.3 - Cone Penetrometer Method; 5.3.14 - One-Point Cone Penetrometer Method; 5.4 - Casagrande Method; 5.5 - Plastic Limit Method; 6.5 - Plasticity Index

Water Content (WC) tested in accordance with BS EN ISO 17892-1:2014

+ Tested in accordance with the following clauses of BS EN ISO 17892-12:2018+A1:2021  
5.2.1 - Natural State and 5.2.7 - Wet Sieved

Key: \* = Non-standard test, NP = Non plastic, I = Increasing WC, D = Decreasing WC.

Lab location: B = Bristol (BS3 4AG), C = Castleford (WF10 1NJ), H = Hemel Hempstead (HP3 9RT), T = Tonbridge (TN11 9HU)

 <p><b>STRUCTURAL SOILS</b> The Potteries Pottery Street Castleford W. Yorkshire WF10 1NJ</p>	Compiled By		Date
	LORNA WHITWORTH		04/03/22
	Contract <b>Whitechapel Road</b>		Contract Ref: <b>785155</b>

GINT\_LIBRARY\_V10\_01.GLB LibVersion: v8\_07 | Graph L - ALINE STANDARD - 17892 - A4P | 785155 - WHITECHAPEL ROAD.GPJ - v10\_01. Structural Soils Ltd, Branch Office - Castleford: The Potteries, Pottery Street, Castleford, West Yorkshire, WF10 1NJ. Tel: 01977-552255, Fax: 01977-552299, Web: www.soils.co.uk, Email: ask@soils.co.uk, | 04/03/22 - 11:23 | LW5 |



# TESTING VERIFICATION CERTIFICATE



1774

The test results included in this report are certified as:-

ISSUE STATUS: **FINAL**

In accordance with the Structural Soils Ltd Laboratory Quality Management System, results sheets and summaries of results issued by the laboratory are checked by an approved signatory. The integrity of the test data and results are ensured by control of the computer system employed by the laboratory as part of the Software Verification Program as detailed in the Laboratory Quality Manual.

This testing verification certificate covers all testing compiled on or before the following datetime: **04/03/2022 12:21:50**.

Testing reported after this date is not covered by this Verification Certificate.

Approved Signatory  
**Luke Fisher (Laboratory Manager)**

(Head Office)  
Bristol Laboratory  
Unit 1A, Princess Street  
Bedminster  
Bristol  
BS3 4AG

Castleford Laboratory  
The Potteries, Pottery Street  
Castleford  
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WF10 1NJ

Hemel Laboratory  
18 Frogmore Road  
Hemel Hempstead  
Hertfordshire  
HP3 9RT

Tonbridge Laboratory  
Anerley Court, Half Moon Lane  
Hildenborough  
Tonbridge  
TN11 9HU



**STRUCTURAL  
SOILS LTD**

Contract:

**Whitechapel Road**

Job No:

**785155**

