Haigh Huddleston & Associates
Civil & Structural Engineering Consultants
Firth Buildings, 99 - 101 Leeds Road, Dewsbury, WF12 7BU
t 01924 464342 f 01924 450662 e martin@haighhuddleston.co.uk

# Geo-environmental
# Ground Investigation Report

**ON**

**PROPOSED RESIDENTIAL DEVELOPMENT**

**AT**

## West Lane, Gomersal

**FOR**

**RHODES HOMES**

**NOVEMBER 2022**

**E21/7885/R001**

Haigh Huddleston Associates is the trading name of Haigh Huddleston Associates Limited
Registered Office: Firth Buildings, 99-101 Leeds Road, Dewsbury, WF12 7BU
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## 0.0 EXECUTIVE SUMMARY

| | |
|---|---|
| SITE | The site is a small rectangular patch of land located at the junction of West Lane and Latham Lane in Gomersal<br>The site consists of a field that was overgrown at the time of the site investigation work. Tree growth is noted to the northern, western and southern boundaries. Immediately east of the site has recently been developed for residential use. The site consists of an overgrown field with mature tree growth to the northern, western and southern boundaries. The site falls at an average grade of 1 in 22 from west to east. |
| HISTORY | The earliest OS Plan from 1854 shows the site to be an open field with a number of trees to the northern boundary. No development has occurred over the site from then until the present day. 10m west of the site was shown as West Lane colliery from 1894 to 1908 when it was no longer shown, just an old shaft was indicated. This shaft was no longer indicated by 1938 and by 1984 a residential development had been constructed over the colliery site. |
| GEOLOGY | No superficial strata is shown overlying the site. The site is shown to be underlain by the Lepton Edge Rock Formation consisting of Sandstone. There does not appear to be any fault lines in the vicinity of the site. The site investigation works proved a relatively thin layer of topsoil overlying a sandy clay, and a 0.2-1.1m thick band of mudstone to the western area of site. A thin layer of topsoil overlying a 1.25-1.90m thick layer of weathered sandstone was encountered to the eastern area of site. |
| MINING/QUARRYING | The Consultant Coal Mining Report states that there are no probable shallow mine workings beneath the site. |
| HYDROLOGY | The nearest recorded open surface water feature is Church Beck located approximately 350m south of the site.<br>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. |
| HYDROGEOLOGY | The groundwater vulnerability map for the area indicates that the site overlies rocks designated as a minor aquifer.<br>No groundwater was recorded during the trial pit excavations. |
| HAZARDOUS GAS | The property is in an area where no radon protective measures are required. |

| | |
|---|---|
| CONTAMINATION | No elevated levels of heavy or phytotoxic metals or PAH compounds were recorded in the samples from site.<br>No asbestos was recorded in the samples taken from site. |
| REMEDIATION | Topsoil to be scraped and stockpiled behind protective fencing on site prior to construction work commencing. |
| FOUNDATIONS | We would suggest that the proposed two storey residential properties should be constructed on reinforced strip/trench fill footings founded entirely onto weathered sandstone/mudstone strata. The foundation widths will vary dependent upon the line loadings calculated and bearing strata.<br>A review of the foundation proposals should be undertaken following design of finalised plot levels |
| DRAINAGE | Infiltration methods have proved suitable for use on site. Permeable paving would also be a suitable construction method to improve the surface water drainage strategy. |

## 1.0 INTRODUCTION

1.1 As requested by Rhodes Homes, Haigh Huddleston & Associates carried out ground and contamination investigation works for a proposed development on land west of West Lane, Gomersal.

1.1.1 Initial investigation works were previously undertaken on site to determine if infiltration methods would be a suitable form of surface water disposal. Haigh Huddleston & Associates undertook infiltration testing on 24th September 2021 and the results are discussed in the letter E21/7885/MD/001 dated 22nd October 2021. No infiltration testing was carried out in the upper western and southern parts of the site due to cohesive superficial deposits, however good infiltration rates were recorded in the lower eastern half of the site.

1.3 The purpose of the report was to:-

1.3.1 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.

1.3.2 To identify any areas of contaminated ground.

1.3.3 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.

1.3.4 Determine if infiltration methods would be a suitable form of surface water disposal.

1.4 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.

1.5 The conclusions and recommendations made in this report are based on the findings of the initial and additional investigations carried out on site. 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, which have not been revealed by the investigation.

1.6 Any opinion given on the possible configuration of strata between trial pit 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.

1.7 Furthermore, there is the possibility that any trial pits 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.

## 2.0 THE SITE

2.1 The site is located on land to the south of West Lane, Gomersal and lies around OS Grid Reference 420599, 426459. A site location plan is attached in Appendix A at the rear of the report.

2.2 The site is rectangular in shape, with the northern boundary fronting onto West Lane. Latham Lane butts up to the western boundary. There are residential properties to the east and south of the site. To the north of West Lane is a wooded area surrounding a single residential address (Gomersal Hall). The site area is approximately 0.32ha.

2.3 The site is a single grassed field, with mature tree growth being noted adjacent the northern, southern, and western boundaries. A bunch of saplings were noted to the southern-central area of the site.

2.4 The site is bounded on all sides by wooden fencing, with access to the site via West Lane on the western boundary. The northern boundary fence fronting West Lane is sat within a cluster of large mature trees, with most of the western boundary fence being subject to the same. Half of the southern boundary fence is buried within a thick evergreen hedge, with the occasional large mature trees along the boundary.

2.5 The site falls from a high point of 151.52m AOD in the south western corner of the site to a low point of 146.53m AOD in the north eastern corner at an average grade of 1 in 23.

2.6 Although the site currently has access points on the western boundary from Latham Lane, it is understood that the proposed residential development is to be accessed via 2 separate areas of West Lane to the north.

## 3.0 SITE HISTORY

3.1 The earliest OS Plan from 1854 shows the site to be an open field with a number of trees to the northern boundary. No development has occurred over the site from then until the present day.

3.2 10m west of the site was shown as West Lane colliery from 1894 to 1908 when it was no longer shown, just an old shaft was indicated. This shaft was no longer indicated by 1938 and by 1984 a residential development had been constructed over the colliery site.

3.3 The land immediately east of the site was shown as developed in 1854, and has recently been redeveloped for residential use.

3.4 From 1938 to the present day there is primarily residential development in the vicinity of the site except from an industrial estate approximately 200m to the south west.

## 4.0 SITE GEOLOGY & MINING

4.1 The BGS Digital Geological Map of Great Britain at 1:50,000 scale has been consulted and we would report as follows:-

4.2 No superficial strata is shown overlying the site.

4.3 The site is shown to be underlain by the Lepton Edge Rock Formation consisting of Sandstone.

4.4 There does not appear to be any fault lines in the vicinity of the site.

4.5 The Consultants Coal Mining Report states that two seams of coal have been worked beneath the site at 92-139m depth and was worked in 1953. In addition to this, the report states there are no probable unrecorded shallow mine workings.

4.6 The property is not in an area that is likely to be affected at the surface from any planned future workings.

4.7 There are no known coal mine entries within, or within 20 metres of, the boundary of the property.

4.8 The Coal Authority Report states that there has been no damage notice or subsidence claims made to any property within 50 meters of the site, since 31 October 1994.

4.9 The BGS borehole record for the former shaft shows 0.6m of sandstone overlying shale to a depth of 40m below existing ground levels, where there is a 2m thick layer of worked ground from the extraction of the underground coal. At this depth and working thickness, it is considered unlikely it would affect the development at the surface.

4.10 The Coal Authority have confirmed that the site is not within a shallow mine working area.

## 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 required.

### 5.2 Landfill Sites

There are no recorded historical landfill sites in the vicinity of the development.

### 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 Licensed Discharge Consents within 250m of the site.

There are no recorded pollution incidents to controlled water within 250m 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 The site has been shown as undeveloped since 1854. To the west a colliery was present from 1894 to 1908 which had been redeveloped for residential use by 1984. From 1953 to the present day there has been primarily residential development in the vicinity of the site.

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**

| Human Exposure Pathway | Site Residents | Construction Workers |
|---|---|---|
| **Soil Ingestion** | YES | YES |
| **Consumption of Home Grown Vegetables** | YES | NO |
| **Dermal Contact** | YES | YES |
| **Dust Inhalation** | YES | YES |
| **Gases/Vapours** | 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, 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 Site investigation works were undertaken on two separate occasions, 24th September 2021 and 18th October 2022, using an 14 tonne tracked excavator with 600mm wide bucket. A total of nine trial pits were excavated, with six being used for soak-a-way testing. The location of the trial pits are indicated on the plan in Appendix A. A large excavation was undertaken on the second visit to facilitate deeper excavations to determine if soakaways would work on a larger site area. TP08 was excavated to a depth of 3.50m, excavating through the sandy clay layer to hopefully identify a suitable sandstone sub-stratum in the western area of site.

7.2 Materials encountered in the trial pits were examined and categorised. Trial pit 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. Repeat soakaway tests were undertaken where the infiltration rate and time allowed.

7.4 The site investigation works were designed to achieve comprehensive site coverage within the proposed development area. The location of the trial pits was pre-determined based on the likely soakaway locations for the development and to clearly identify the sub strata on site.

7.5 Soil samples were removed from the natural 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 eight samples from the natural 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, as well as 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 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 soils and sandy clay overlying mudstone in the upper half of the site, with a shallow depth of soils and sandy clay overlying sandstone/ sand with sandstone gravels in the lower half of the site.

8.1.3 At the surface of all the trial pits was rough grass over a dark brown sometimes loamy, sometimes desiccated topsoil. The topsoil varied in thickness between 0.15 and 0.25m across site.

8.1.4 Below the topsoil in TP01, TP02 & TP08 was a 1.5-1.60m thick layer of sandy clay. The firm sandy clay was becoming less sandy with depth. Beneath the clay was an additional layer of very weak highly weathered mudstone was encountered at 1.80-3.50m below ground level.

8.1.5 In both TP03 & TP07 in the central area of site, there was a 0.15-0.60m thick layer of very sandy clay/ sand beneath the topsoil. At the base of this was a 0.40-1.10m thick layer of weak light brown highly weathered sandstone which was excavated as sub-angular gravels. TP03 was terminated within the sandstone layer at 1.40m deep, however in TP07 an additional 2.10m thick layer of very weak highly weathered mudstone was encountered below the sandstone layer which was excavated down to 3.40m deep.

8.1.6 In TP05 & TP06 in the lower south eastern half of the site, a 0.80-0.90m thick layer of sandy clay with occasional sandstone gravels was encountered. At the base of this was a 0.90-1.20m thick layer of horizontally bedded sandstone becoming firm with depth. TP04 & TP09 were also located within the lower eastern area of site, however beneath the topsoil in these trial pits, the weathered sandstone layer was encountered straight away. This sandstone layer was excavated as gravels & flags within a sandy matrix.

8.1.7 The sides of all the trial pits remained stable.

8.1.8 As discussed previously in the report, six of the trial pits were used to carry out soakaway tests in order to obtain infiltration rates across the site.

8.1.9 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 2 below:-

**Table 2 Summary of infiltration rates**

| SOAKAWAY NUMBER | INFILTRATION RATE m/s x$10^{-6}$ | | |
|---|---|---|---|
| | TEST 1 | TEST 2 | TEST 3 |
| TP03 | 41.7 | 24.9 | - |
| TP04 | 415.2 | 319.7 | - |
| TP05 | 91.2 | 59.7 | 82.9 |
| TP06 | 2.94 | - | - |
| TP07 | 0.75 | - | - |
| TP09 | 106.1 | 108.9 | 80.1 |

8.1.10 Infiltration rates between 0.75 and 415.2 x $10^{-6}$ m/s were recorded across site. The shallower trial pits located in the lower eastern half of the site generally recorded a faster infiltration rate.

8.1.11 The result of the geotechnical analysis undertaken on the sample of clayey soil indicates the clay to be of low to intermediate plasticity (Plasticity Index 12-16%). 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. It should be noted however that limited clay was encountered on site. The test certificate is contained in Appendix C.

## 8.2 GROUNDWATER

8.2.1 No groundwater was encountered during the trial pit investigation.

8.2.2 It should however 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.

## 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 toxilogical/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 Combined testing from the two investigations have resulted in 8 samples being tested for contaminants. 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 3.

**Table 3**

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

| CONTAMINANT | SGV MG/KG | CONCENTRATION IN ALL SOILS. MG/KG | No. OF SAMPLES EXCEEDING GUIDANCE VALUES | PERCENTAGE OF SAMPLES EXCEEDING GUIDELINE VALUE |
|---|---|---|---|---|
| **Arsenic** | 37 (4) | 6.7-29 | 0/8 | |
| **Cadmium** | 22 (4) | <0.1-0.4 | 0/8 | |
| **Chromium (Total)** | 130 (2) | 15-21 | 0/8 | |
| **Lead** | 200 (4) | 14-170 | 0/8 | |
| **Mercury (Total)** | 40 (1,5) | <0.05-0.35 | 0/8 | |
| **Selenium** | 250 (1) | <0.5-1.7 | 0/8 | |
| **Copper** | 2400 (1) | 20-54 | 0/8 | |
| **Nickel** | 180 (1) | 17-39 | 0/8 | |
| **Zinc** | 3700 (1) | 84-110 | 0/8 | |
| **Sulphate** | 0.24 (3) | 0.04-0.09 | 0/8 | |
| **Thiocyanate** | 50 | <0.6-2.0 | 0/8 | |
| **Sulphide** | 250 | <10-59 | 0/8 | |
| **Naphthalene** | 2.3 (1) | <0.1-0.2 | 0/8 | |
| **Benzo(a)pyrene** | 5 (4) | <0.1-1.7 | 0/8 | |
| **PAH (Total)** | 40 | <1.6-23 | 0/8 | |
| **Phenols** | 760 (1) | <0.3-0.5 | 0/8 | |
| **Asbestos** | No fibres | None | 0/5 | |
| **pH** | 6-8 | 5.0-6.9 | 0/8 | |



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

(3) BS 8110 1985 Table 6.1

(4) Category 4 Screening Levels

(5) Unless there is considered to be historical site usage that would result in elemental and methylmercury compounds to be present, the inorganic mercury SGV is used as this is the most prevalent for of mercury present in the natural environment.

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

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

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

9.2.11 There were no elevated levels of sulphate recorded in the samples taken from site, however, pH values as low as 5.0 were recorded. 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) No elevated levels of contaminants

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/negligible** risk to end users from localised ground contamination on-site.

No 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 existing topsoil is scraped and stockpiled behind protective fencing prior to development commencing on site. This will prevent cross contamination during construction works. The topsoil should be screened to remove any unsuitable materials prior to being re-laid on site.

Based on the site area of 3232$m^2$, and an average topsoil depth of 0.3m, there is approximately 3232 x 0.2 = 646$m^3$ of topsoil on site. To achieve a sampling rate of 1 per 250$m^3$, 646/250 = 2.58, 3 samples total would be required. As 5 samples of topsoil have already proved clean from contaminants, no further samples are required, and we can confirm that the topsoil on site is suitable for re-use in soft landscaped areas.

**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**

No elevated levels of contaminants have been recorded 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 levels of sulphate recorded in the samples taken from site, however, pH values as low as 5.0 were recorded. 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 overlying a clayey sand/ sandy clay with a solid sandstone/ mudstone bedrock. For initial design purposes we would envisage a safe bearing capacity of 100kN/m2 where foundations are cited into the clayey sand/ sandy clay strata and 150kN/m2 where foundations are extended onto the weathered sandstone/ mudstone strata.

10.1.2 We would therefore initially suggest that the proposed two/three storey residential constructions should be constructed on strip/trench fill footings founded entirely onto the solid sandstone/ mudstone strata. Where solid sandstone is encountered within the excavations, the foundations should be deepened to lie entirely onto the sandstone strata to avoid differential settlement. The foundation widths will vary dependent upon the line loadings calculated and bearing strata.

10.1.3 However, it should be noted that proposed levels may need to be raised above existing ground levels due to the existing slope of the site and final highway design. In this instance, piling or other methods, may be the better foundation option. We would recommend that the final foundation design is to be determined following detailed examination of the final site levels and required foundation depths.

10.1.4 All foundations should be placed below a line of 45˚ drawn up from the base of any services or other structures.

10.1.5 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.

10.1.6 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.

10.1.7 There were no elevated levels of sulphate recorded in the samples taken from site, however, pH values as low as 5.0 were recorded. 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”.

10.1.8 Foundations that are close to where soakaways are proposed should be deepened to ensure they are wholly placed onto a solid sandstone strata.

10.1.8 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 to intermediate volume change potential. It should be noted however that limited clay was encountered on site.

## 10.2 CONTAMINATION ASSESSMENT

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

10.2.2 No asbestos recorded in the samples taken from site.

10.2.3 It is recommended that the existing topsoil is scraped and stockpiled behind protective fencing prior to development commencing on site. This will prevent cross contamination during construction works. The topsoil should be screened to remove any unsuitable materials prior to being re-laid on site. The tests have proved that the topsoil is suitable for re-use.

10.2.4 Should any 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.

## 10.3 SURFACE WATER DRAINAGE

10.3.1 The soak-a-way tests undertaken throughout the site proved infiltration rates between 1 and 415 x $10^{-6}$ m/s. The sides of the trial pit excavations remained stable during the soak-a-way tests and proved a higher lateral infiltration rate at shallower depths within the weathered sandstone strata. Infiltration rates for soakaway design purposes should be based on the lowest recorded infiltration rate in that area unless further soakaway testing is undertaken on the final proposed soakaway locations.

10.3.2 We would therefore propose that infiltration methods would be a suitable long term method of surface water disposal. The soak-a-ways should be designed to be shallow with wide excavations to maximise the infiltration potential. However, this could result in larger areas of land taken up on site and minor alterations to the proposed planning layout dependent on the size of soakaway specified. Soakaways should be located a minimum of 5m from the proposed properties.

10.3.3 We propose that a single large soakaway should be constructed to the north-eastern half of the site which would provide adequate surface water drainage for the proposed development.

10.3.4 The designs and specifications for any soakaways would need to be agreed with the LLFA and Building Control.

10.3.5 It is possible that permeable paving could be utilised on site as it could provide additional SUD's treatment and improve the surface water drainage strategy for the proposed development.

## 11.0 SUGGESTED FURTHER WORK

11.1 Further samples of topsoil to be taken to confirm the suitability of the material for re-use on

## 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

J.Farrar. HND

Checked by

M. Huddleston. MEng

November 2022

# APPENDIX A

**Site Location Plan**

**Dwg No. E21/7885/03 – Site Investigation Plan**

**Dwg No. E21/7885/32 - Typical Site Conceptual Model**




# Existing Site Plan

Scale 1:1250

0 10 20 50 100m



## NOTES

| REVISION - DATE | DRWN | CHKD |
|---|---|---|
| **0** - 15.10.21 INITIAL ISSUE | PB | ED |

**FOR COMMENT**

**7 WEST LANE**
**GOMERSAL**
**CLECKHEATON**
**BD19 4DL**

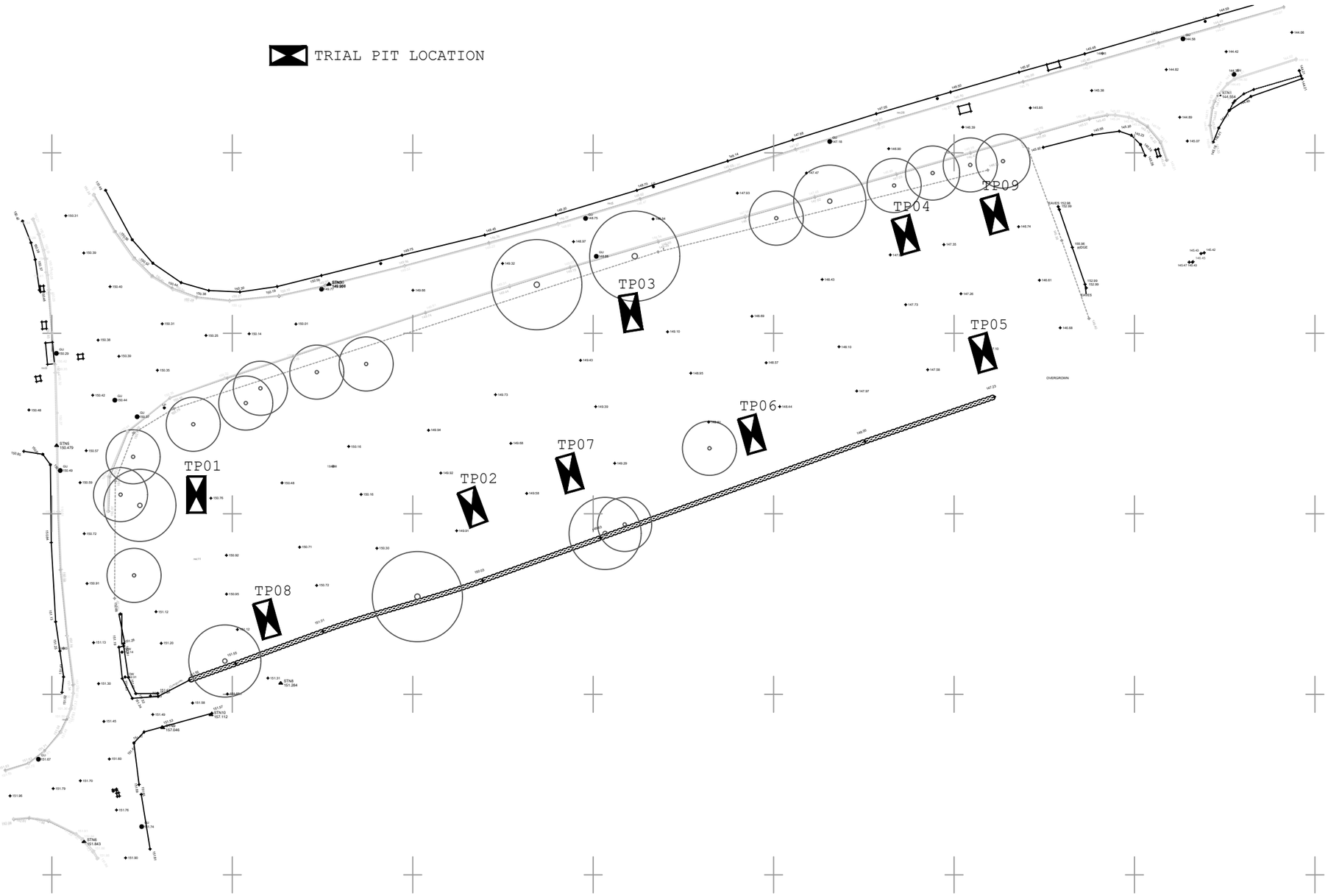
**FOR**
**RHODES HOMES**

**EXISTING SITE PLAN**

Scale **1:1250**

HALLIDAY CLARK
ARCHITECTS
Halliday Clark Limited
1 Lower Railway Road
Ilkley LS29 8FL
T 01943 604 123
E info@hallidayclark.co.uk
W hallidayclark.co.uk

Dwg. No. **917.01(00)001** Rev. **--**




**Haigh Huddleston & Associates**

Civil Structural Engineering Consultants

Firth Buildings, 99 - 101 Leeds Rd, Dewsbury, WF12 7BU t 01924 464342 f 01924 450662

e martin@haighhuddleston.co.uk

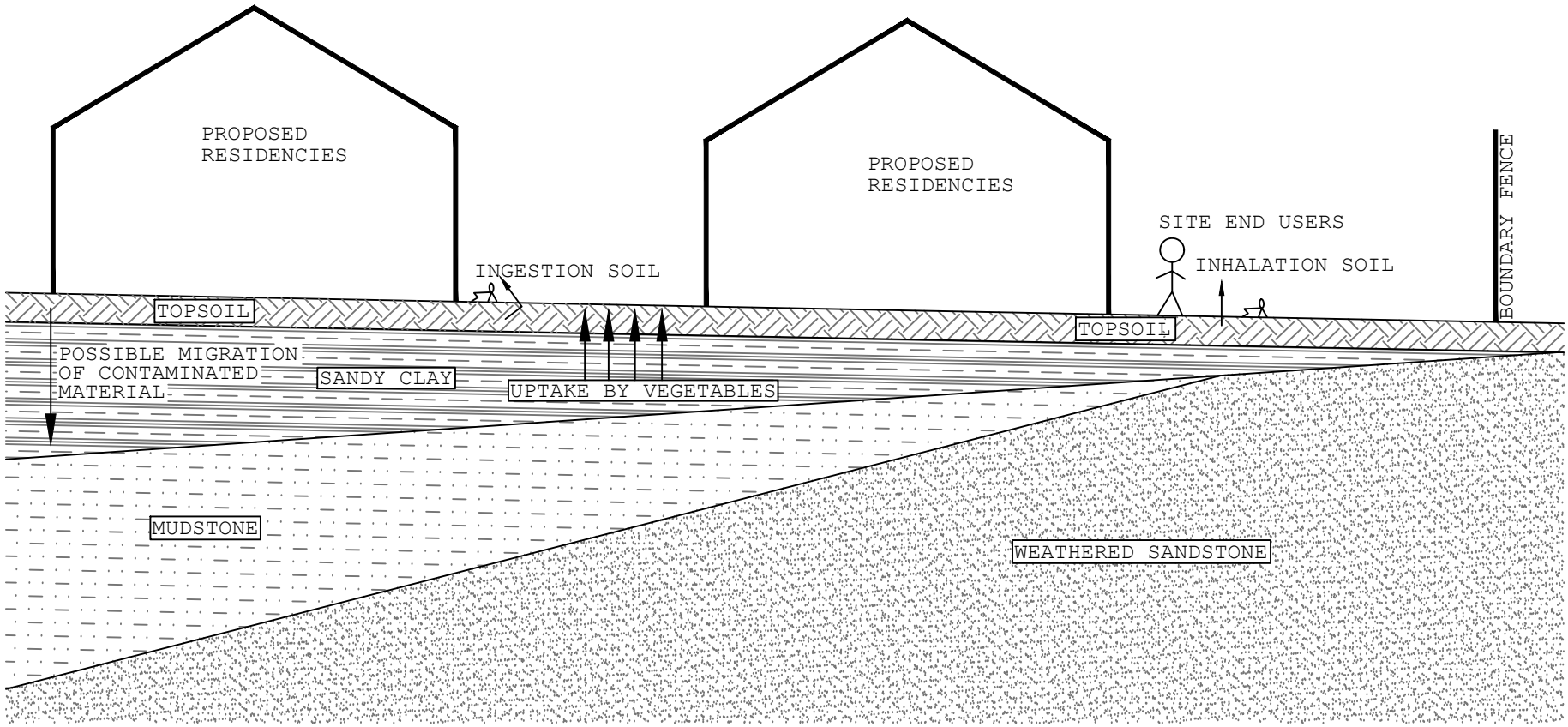
**Client**
RHODES HOMES

**Project**
WEST LANE, GOMERSAL

**Detail**
SITE INVESTIGATION PLAN

| Scale | Dwn | Chkd | Date | Dwg No. |
|---|---|---|---|---|
| 1:500@A3 | CM | MH | Oct'21 | E21/7885/003A |

Rev A. Additional Trial Pits added. 19.10.22 JF




**Haigh Huddleston & Associates**

Civil Structural Engineering Consultants

Firth Buildings, 99 - 101 Leeds Rd, Dewsbury, WF12 7BU t 01924 464342 f 01924 450662

e martin@haighhuddleston.co.uk

| | |
|---|---|
| Client | Rhodes Homes |
| Project | West Lane, Gomersal |
| Detail | Typical Site Conceptual Model |

| Scale | Dwn | Chkd | Date | Dwg No. |
|---|---|---|---|---|
| NTS | JF | | Nov'22 | E21/7885/32 |

# APPENDIX B

## Trial Hole Logs

## Soakaway Calculations

# TRIAL HOLE NO. 1

Haigh Huddleston & Associates
Civil & Structural Engineering Consultants
Firth Buildings, 99 - 101 Leeds Road, Dewsbury, WF12 7BU
t 01924 464342 f 01924 450662 e martin@haighhuddleston.co.uk

| | | | |
|---|---|---|---|
| **Client :** | **RHODES HOMES** | **Job No :** | **7885** |
| **Site :** | **WEST LANE, GOMERSAL** | **Date :** | **24 SEPTEMBER 2021** |

| | | |
|---|---|---|
| **0.0** | | |
| | **0.2** | Dark brown topsoil. Sample taken at 0.2m. |
| **0.5** | **0.5** | Firm light orangish brown sandy clay. |
| **1.0** | | Firm brown slightly mottled grey clay.<br>Sample taken at 0.8m. |
| **1.5** | | |
| | **1.8** | |
| **2.0** | | Weak brown/grey weathered mudstone excavated as horizontal shale within a clayey matrix. |
| | **2.2** | Difficult to excavate with JCB 3CX |
| **2.5** | | |
| **3.0** | | |
| **3.5** | | |
| **4.0** | | |

**REMARKS:**

| | |
|---|---|
| Ground water encountered during excavation | NO |
| Sample taken | YES at 0.2 & 0.8m. |
| Sides of excavation remained stable | YES |
| Level | …… |

**NOTES:**

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# TRIAL HOLE NO. 2

Haigh Huddleston & Associates
Civil & Structural Engineering Consultants
Firth Buildings, 99 - 101 Leeds Road, Dewsbury, WF12 7BU
t 01924 464342 f 01924 450662 e martin@haighhuddleston.co.uk

| | | | |
|---|---|---|---|
| **Client :** | **RHODES HOMES** | **Job No :** | **7885** |
| **Site :** | **WEST LANE, GOMERSAL** | **Date :** | **24 SEPTEMBER 2021** |

| | | |
|---|---|---|
| **0.0** | | |
| | **0.25** | Rough grass over dark brown topsoil. Sample taken at 0.1m. |
| | **0.3** | Firm orangish brown very sandy clay. |
| **0.5** | | Firm brown mottled grey friable clay. |
| **1.0** | | |
| **1.5** | | |
| | **1.8** | |
| **2.0** | **2.0** | Weak dark grey weathered mudstone excavated as horizontally bedded shale. Difficult to excavate with JCB 3CX |
| **2.5** | | |
| **3.0** | | |
| **3.5** | | |
| **4.0** | | |

**REMARKS:**

| | |
|---|---|
| Ground water encountered during excavation | NO |
| Sample taken | YES at 0.1m |
| Sides of excavation remained stable | YES |
| Level | …….. |

**NOTES:**

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# TRIAL HOLE NO. 3

Haigh Huddleston & Associates
Civil & Structural Engineering Consultants
Firth Buildings, 99 - 101 Leeds Road, Dewsbury, WF12 7BU
t 01924 464342 f 01924 450662 e martin@haighhuddleston.co.uk

| | | | |
|---|---|---|---|
| **Client :** | **RHODES HOMES** | **Job No :** | **7885** |
| **Site :** | **WEST LANE, GOMERSAL** | **Date :** | **24 SEPTEMBER 2021** |

| | | |
|---|---|---|
| **0.0** | | |
| | **0.15** | Rough grass over dark brown desiccated topsoil. Sample taken at 0.1m. |
| | **0.3** | Firm brown very sandy clay. |
| **0.5** | | Weak light brown highly weathered sandstone excavated as sub-angular gravels. |
| **1.0** | | |
| | **1.4** | Moderately strong brown sandstone unable to excavate further. |
| **1.5** | | |
| **2.0** | | |
| **2.5** | | |
| **3.0** | | |
| **3.5** | | |
| **4.0** | | |

**REMARKS:**

| | |
|---|---|
| Ground water encountered during excavation | NO |
| Sample taken | YES at 0.1m. |
| Sides of excavation remained stable | YES |
| Level | …….. |

**NOTES:**

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# TRIAL HOLE NO. 4

Haigh Huddleston & Associates
Civil & Structural Engineering Consultants
Firth Buildings, 99 - 101 Leeds Road, Dewsbury, WF12 7BU
t 01924 464342 f 01924 450662 e martin@haighhuddleston.co.uk

| | | | |
|---|---|---|---|
| **Client :** | **RHODES HOMES** | **Job No :** | **7885** |
| **Site :** | **WEST LANE, GOMERSAL** | **Date :** | **24 SEPTEMBER 2021** |

| | | |
|---|---|---|
| **0.0** | | |
| | **0.15** | Rough grass over brown loamy topsoil. Large root. |
| | | Medium dense orangish brown sand with sandstone gravels. |
| **0.5** | | Sample taken at 0.6m. |
| **1.0** | | |
| | **1.4** | Moderately strong light brown sandstone difficult to excavate. |
| **1.5** | | |
| **2.0** | | |
| **2.5** | | |
| **3.0** | | |
| **3.5** | | |
| **4.0** | | |

**REMARKS:**

| | |
|---|---|
| Ground water encountered during excavation | NO |
| Sample taken | YES at 0.6m. |
| Sides of excavation remained stable | YES |
| Level | …….. |

**NOTES:**

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# TRIAL HOLE NO. 5

Haigh Huddleston & Associates
Civil & Structural Engineering Consultants
Firth Buildings, 99 -101 Leeds Road, Dewsbury, WF12 7BU
t 01924 464342 f 01924 450662 e martin@haighhuddleston.co.uk

| | | | |
|---|---|---|---|
| **Client :** | **RHODES HOMES** | **Job No :** | **7885** |
| **Site :** | **WEST LANE, GOMERSAL** | **Date :** | **18 October 2022** |

| | | |
|---|---|---|
| **0.0** | | |
| | **0.3** | Rough grass over dark brown topsoil with occasional small rootlets. |
| **0.5** | | Firm light brown very sandy clay with occasional sandstone gravels. |
| **1.0** | **1.1** | |
| **1.5** | | Moderately strong light brown weathered sandstone – horizontally bedded. |
| **2.0** | **2.0** | |
| **2.5** | | |
| **3.0** | | |
| **3.5** | | |
| **4.0** | | |

**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. 6

Haigh Huddleston & Associates
Civil & Structural Engineering Consultants
Firth Buildings, 99 -101 Leeds Road, Dewsbury, WF12 7BU
t 01924 464342 f 01924 450662 e martin@haighhuddleston.co.uk

| | | | |
|---|---|---|---|
| **Client :** | **RHODES HOMES** | **Job No :** | **7885** |
| **Site :** | **WEST LANE, GOMERSAL** | **Date :** | **18 October 2022** |

| | | |
|---|---|---|
| **0.0** | | |
| | **0.2** | Rough grass over dark brown topsoil. |
| **0.5** | | Medium dense orange brown slightly clayey sand with numerous angular gravels of sandstone. |
| **1.0** | **1.1** | |
| **1.5** | | Moderately weak becoming strong light brown horizontally bedded sandstone.<br><br>NB Sandstone more tightly bonded than TP05. |
| **2.0** | **2.3** | |
| **2.5** | | |
| **3.0** | | |
| **3.5** | | |
| **4.0** | | |

**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. 7

Haigh Huddleston & Associates
Civil & Structural Engineering Consultants
Firth Buildings, 99 -101 Leeds Road, Dewsbury, WF12 7BU
t 01924 464342 f 01924 450662 e martin@haighhuddleston.co.uk

| | | | |
|---|---|---|---|
| **Client :** | **RHODES HOMES** | **Job No :** | **7885** |
| **Site :** | **WEST LANE, GOMERSAL** | **Date :** | **18 October 2022** |

| | | |
|---|---|---|
| **0.0** | | |
| | **0.3** | Rough grass over dark brown topsoil. |
| **0.5** | **0.9** | Medium dense light brown sand with numerous angular gravels of sandstone. |
| **1.0** | **1.3** | Moderately weak light brown sandstone excavated as horizontally bedded flags within a sandy matrix. |
| **1.5** | | Very weak brown / grey highly weathered mudstone. |
| **2.0** | | |
| **2.5** | | |
| **3.0** | | |
| | **3.4** | |
| **3.5** | | |
| **4.0** | | |

**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. 8

Haigh Huddleston & Associates
Civil & Structural Engineering Consultants
Firth Buildings, 99 -101 Leeds Road, Dewsbury, WF12 7BU
t 01924 464342 f 01924 450662 e martin@haighhuddleston.co.uk

| | | | |
|---|---|---|---|
| **Client :** | **RHODES HOMES** | **Job No :** | **7885** |
| **Site :** | **WEST LANE, GOMERSAL** | **Date :** | **18 October 2022** |

| | | |
|---|---|---|
| **0.0** | | |
| | **0.2** | Light brown loamy topsoil. |
| **0.5** | | Firm light brown very sandy clay with occasional tree roots with occasional grey mudstone gravels with depth. |
| **1.0** | | |
| **1.5** | | |
| **2.0** | | |
| | **2.4** | |
| **2.5** | | Moderately strong light brown mudstone excavated as angular gravels. |
| **3.0** | | |
| **3.5** | **3.5** | |
| **4.0** | | |

**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. 9

Haigh Huddleston & Associates
Civil & Structural Engineering Consultants
Firth Buildings, 99 -101 Leeds Road, Dewsbury, WF12 7BU
t 01924 464342 f 01924 450662 e martin@haighhuddleston.co.uk

| | | | |
|---|---|---|---|
| **Client :** | **RHODES HOMES** | **Job No :** | **7885** |
| **Site :** | **WEST LANE, GOMERSAL** | **Date :** | **18 October 2022** |

| | | |
|---|---|---|
| **0.0** | | |
| | **0.2** | Rough grass over dark brown topsoil. |
| **0.5** | | Weak light brown weathered sandstone excavated as gravels and flags within a sandy matrix. |
| **1.0** | | |
| **1.5** | | |
| **2.0** | | |
| | **2.1** | |
| **2.5** | | |
| **3.0** | | |
| **3.5** | | |
| **4.0** | | |

**REMARKS:**

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

**NOTES:**

……

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# Soil Permeability test

TP03

**Site** West Lane, Gomersal

**Date** Sep-21 **(Test 1)**

**Client** Rhodes Homes

**Job No.** E21/7885

**Pit dimensions** m

| | |
|---|---|
| **Length** | 2.2 |
| **Width** | 0.65 |
| **Depth** | 1.4 |

| Time | Time into Test Mlns | Dip Reading mm | Vol cu.m | Vol Change cu.m | Contact area Avge sq.m | Permeability lit/ sq.m/sec |
|---|---|---|---|---|---|---|
| 11.35 | 0 | 840 | 0.80080 | | 4.62200 | |
| 11.38 | 3 | 870 | 0.75790 | 0.04290 | 4.45100 | 0.05254 |
| 11.40 | 5 | 920 | 0.68640 | 0.07150 | 4.16600 | 0.13829 |
| 11.47 | 12 | 980 | 0.60060 | 0.08580 | 3.82400 | 0.05114 |
| 11.55 | 20 | 1010 | 0.55770 | 0.04290 | 3.65300 | 0.02391 |
| 12.08 | 33 | 1040 | 0.51480 | 0.04290 | 3.48200 | 0.01542 |
| 12.35 | 60 | 1075 | 0.46475 | 0.05005 | 3.28250 | 0.00913 |
| 13.04 | 89 | 1170 | 0.32890 | 0.13585 | 2.74100 | 0.02592 |
| 13.09 | 94 | 1180 | 0.31460 | 0.01430 | 2.68400 | 0.01757 |

**Not Emptied completely. Terminated at 1180 Dip Reading.**

BRE Value 0.01853030 lit/ sq.m/sec

Average Permeabilty Value: 0.041739889 lit/ sq.m/sec

# Soil Permeability test

TP03

**Site** West Lane, Gomersal

**Date** Sep-21 **(Test 2)**

**Client** Rhodes Homes

**Job No.** E21/7885

**Pit dimensions** m

| | |
|---|---|
| **Length** | 2.2 |
| **Width** | 0.65 |
| **Depth** | 1.4 |

| Time | Time into Test Mlns | Dip Reading mm | Vol cu.m | Vol Change cu.m | Contact area Avge sq.m | Permeability lit/ sq.m/sec |
|---|---|---|---|---|---|---|
| 13.21 | 0 | 825 | 0.82225 | | 4.70750 | |
| 13.22 | 1 | 855 | 0.77935 | 0.04290 | 4.53650 | 0.15469 |
| 13.25 | 4 | 880 | 0.74360 | 0.03575 | 4.39400 | 0.04448 |
| 13.28 | 7 | 915 | 0.69355 | 0.05005 | 4.19450 | 0.06475 |
| 13.42 | 21 | 970 | 0.61490 | 0.07865 | 3.88100 | 0.02319 |
| 14.06 | 45 | 1015 | 0.55055 | 0.06435 | 3.62450 | 0.01191 |
| 14.44 | 83 | 1055 | 0.49335 | 0.05720 | 3.39650 | 0.00715 |
| 15.02 | 101 | 1060 | 0.48620 | 0.00715 | 3.36800 | 0.00196 |
| 15.23 | 123 | 1080 | 0.45760 | 0.02860 | 3.25400 | 0.00654 |
| 15.44 | 143 | 1095 | 0.43615 | 0.02145 | 3.16850 | 0.00557 |
| 16.00 | 159 | 1095 | 0.43615 | 0.00000 | 3.16850 | 0.00000 |
| 16.32 | 191 | 1100 | 0.42900 | 0.00715 | 3.14000 | 0.00118 |
| 16.45 | 204 | 1105 | 0.42185 | 0.00715 | 3.11150 | 0.00293 |
| 16.52 | 217 | 1105 | 0.42185 | 0.00000 | 3.11150 | 0.00000 |

BRE Value 0.01673530 lit/ sq.m/sec

Average Permeabilty Value: 0.024949926 lit/ sq.m/sec

# Soil Permeability test

TP04

**Site** **West Lane, Gomersal** **Date** Sep-21 **(Test 1)**

**Client** **Rhodes Homes** **Job No.** E21/7885

**Pit dimensions** m

| | |
|---|---|
| **Length** | 2.2 |
| **Width** | 0.6 |
| **Depth** | 1.4 |

| Time | Time into Test Mlns | Dip Reading mm | Vol cu.m | Vol Change cu.m | Contact area Avge sq.m | Permeability lit/ sq.m/sec |
|---|---|---|---|---|---|---|
| 11.52 | 0 | 1190 | 0.27720 | | 2.49600 | |
| 11.54 | 2 | 1290 | 0.14520 | 0.13200 | 1.93600 | 0.49639 |
| 11.56 | 4 | 1370 | 0.03960 | 0.10560 | 1.48800 | 0.51402 |
| 11.58 | 6 | 1400 | 0.00000 | 0.03960 | 1.32000 | 0.23504 |

**Emptied within 6 minutes.**

BRE Value 0.48098540 lit/ sq.m/sec

Average Permeabilty Value: 0.415150439 lit/ sq.m/sec

# Soil Permeability test

TP04

**Site** **West Lane, Gomersal** **Date** Sep-21 **(Test 2)**

**Client** **Rhodes Homes** **Job No.** E21/7885

**Pit dimensions** m

| | |
|---|---|
| **Length** | 2.2 |
| **Width** | 0.6 |
| **Depth** | 1.4 |

| Time | Time into Test Mlns | Dip Reading mm | Vol cu.m | Vol Change cu.m | Contact area Avge sq.m | Permeability lit/ sq.m/sec |
|---|---|---|---|---|---|---|
| 13.08 | 0 | 1000 | 0.52800 | | 3.56000 | |
| 13.10 | 2 | 1140 | 0.34320 | 0.18480 | 2.77600 | 0.48611 |
| 13.12 | 4 | 1195 | 0.27060 | 0.07260 | 2.46800 | 0.23074 |
| 13.13 | 5 | 1260 | 0.18480 | 0.08580 | 2.10400 | 0.62555 |
| 13.15 | 7 | 1275 | 0.16500 | 0.01980 | 2.02000 | 0.08002 |
| 13.19 | 11 | 1335 | 0.08580 | 0.07920 | 1.68400 | 0.17819 |
| 13.22 | 14 | 1400 | 0.00000 | 0.08580 | 1.32000 | 0.31735 |

**Emptied after 14 minutes.**

BRE Value 0.24913720 lit/ sq.m/sec

Average Permeabilty Value: 0.319659599 lit/ sq.m/sec

# Soil Permeability test

TP05

**Site** West Lane, Gomersal

**Date** Oct-22 **(Test 1)**

**Client** Rhodes Homes

**Job No.** E21/7885

**Pit dimensions** m

| | |
|---|---|
| **Length** | 1.5 |
| **Width** | 0.7 |
| **Depth** | 2.0 |

| Time | Time into Test Mlns | Dip Reading mm | Vol cu.m | Vol Change cu.m | Contact area Avge sq.m | Permeability lit/ sq.m/sec |
|---|---|---|---|---|---|---|
| 10.13 | 0 | 1610 | 0.40950 | | 2.76600 | |
| 10.15 | 2 | 1670 | 0.34650 | 0.06300 | 2.50200 | 0.19932 |
| 10.17 | 4 | 1700 | 0.31500 | 0.03150 | 2.37000 | 0.10776 |
| 10.27 | 14 | 1745 | 0.26775 | 0.04725 | 2.17200 | 0.03468 |
| 10.38 | 25 | 1800 | 0.21000 | 0.05775 | 1.93000 | 0.04266 |
| 10.48 | 35 | 1850 | 0.15750 | 0.05250 | 1.71000 | 0.04808 |
| 10.56 | 43 | 1900 | 0.10500 | 0.05250 | 1.49000 | 0.06836 |
| 11.06 | 53 | 2000 | 0.00000 | 0.10500 | 1.05000 | 0.13780 |

BRE Value 0.04758817 lit/ sq.m/sec

Average Permeabilty Value: 0.091235042 lit/ sq.m/sec

# Soil Permeability test

TP05

**Site** West Lane, Gomersal

**Date** Oct-22 **(Test 2)**

**Client** Rhodes Homes

**Job No.** E21/7885

**Pit dimensions** m

| | |
|---|---|
| **Length** | 1.5 |
| **Width** | 0.7 |
| **Depth** | 2.0 |

| Time | Time into Test Mlns | Dip Reading mm | Vol cu.m | Vol Change cu.m | Contact area Avge sq.m | Permeability lit/ sq.m/sec |
|---|---|---|---|---|---|---|
| 11.26 | 0 | 1610 | 0.40950 | | 2.76600 | |
| 11.31 | 5 | 1690 | 0.32550 | 0.08400 | 2.41400 | 0.10811 |
| 11.44 | 18 | 1760 | 0.25200 | 0.07350 | 2.10600 | 0.04170 |
| 11.56 | 30 | 1800 | 0.21000 | 0.04200 | 1.93000 | 0.02891 |
| 12.14 | 48 | 1870 | 0.13650 | 0.07350 | 1.62200 | 0.03832 |
| 12.30 | 64 | 1940 | 0.06300 | 0.07350 | 1.31400 | 0.05215 |
| 12.40 | 74 | 2000 | 0.00000 | 0.06300 | 1.05000 | 0.08883 |

BRE Value 0.03790963 lit/ sq.m/sec

Average Permeabilty Value: 0.059669333 lit/ sq.m/sec

# Soil Permeability test

TP05

**Site** West Lane, Gomersal

**Date** Oct-22 **(Test 3)**

**Client** Rhodes Homes

**Job No.** E21/7885

**Pit dimensions** m

| | |
|---|---|
| **Length** | 1.5 |
| **Width** | 0.7 |
| **Depth** | 2.0 |

| Time | Time into Test Mlns | Dip Reading mm | Vol cu.m | Vol Change cu.m | Contact area Avge sq.m | Permeability lit/ sq.m/sec |
|---|---|---|---|---|---|---|
| 13.02 | 0 | 1595 | 0.42525 | | 2.83200 | |
| 13.06 | 4 | 1650 | 0.36750 | 0.05775 | 2.59000 | 0.08876 |
| 13.17 | 15 | 1735 | 0.27825 | 0.08925 | 2.21600 | 0.05627 |
| 13.37 | 35 | 1780 | 0.23100 | 0.04725 | 2.01800 | 0.01860 |
| 13.51 | 49 | 1870 | 0.13650 | 0.09450 | 1.62200 | 0.06181 |
| 14.00 | 58 | 2000 | 0.00000 | 0.13650 | 1.05000 | 0.18920 |

BRE Value -0.15583601 lit/ sq.m/sec

Average Permeabilty Value: 0.082930132 lit/ sq.m/sec

# Soil Permeability test

TP06

**Site** West Lane, Gomersal

**Date** Oct-22 **(Test 1)**

**Client** Rhodes Homes

**Job No.** E21/7885

**Pit dimensions** m

| | |
|---|---|
| **Length** | 1.5 |
| **Width** | 0.7 |
| **Depth** | 2.3 |

| Time | Time into Test Mlns | Dip Reading mm | Vol cu.m | Vol Change cu.m | Contact area Avge sq.m | Permeability lit/ sq.m/sec |
|---|---|---|---|---|---|---|
| 11.02 | 0 | 1690 | 0.64050 | | 3.73400 | |
| 11.06 | 4 | 1710 | 0.61950 | 0.02100 | 3.64600 | 0.02371 |
| 11.09 | 7 | 1720 | 0.60900 | 0.01050 | 3.60200 | 0.01610 |
| 11.17 | 15 | 1760 | 0.56700 | 0.04200 | 3.42600 | 0.02490 |
| 11.27 | 25 | 1810 | 0.51450 | 0.05250 | 3.20600 | 0.02639 |
| 11.49 | 47 | 1845 | 0.47775 | 0.03675 | 3.05200 | 0.00890 |
| 11.58 | 46 | 1860 | 0.46200 | 0.01575 | 2.98600 | -0.08695 |
| 12.13 | 71 | 1870 | 0.45150 | 0.01050 | 2.94200 | 0.00236 |
| 12.30 | 88 | 1880 | 0.44100 | 0.01050 | 2.89800 | 0.00353 |
| 13.04 | 122 | 1900 | 0.42000 | 0.02100 | 2.81000 | 0.00361 |
| 13.36 | 154 | 1915 | 0.40425 | 0.01575 | 2.74400 | 0.00295 |
| 13.52 | 170 | 1930 | 0.38850 | 0.01575 | 2.67800 | 0.00605 |
| 14.06 | 184 | 1935 | 0.38325 | 0.00525 | 2.65600 | 0.00234 |
| 14.34 | 212 | 1950 | 0.36750 | 0.01575 | 2.59000 | 0.00357 |
| 15.04 | 242 | 1960 | 0.35700 | 0.01050 | 2.54600 | 0.00227 |
| 15.12 | 250 | 1965 | 0.35175 | 0.00525 | 2.52400 | 0.00431 |

BRE Value 0.00762345 lit/ sq.m/sec

Average Permeabilty Value: 0.002936568 lit/ sq.m/sec

# Soil Permeability test

TP07

**Site** West Lane, Gomersal

**Date** Oct-22 **(Test 1)**

**Client** Rhodes Homes

**Job No.** E21/7885

**Pit dimensions** m

| | |
|---|---|
| **Length** | 2.3 |
| **Width** | 0.75 |
| **Depth** | 3.4 |

| Time | Time into Test Mlns | Dip Reading mm | Vol cu.m | Vol Change cu.m | Contact area Avge sq.m | Permeability lit/ sq.m/sec |
|---|---|---|---|---|---|---|
| 13.27 | 0 | 2915 | 0.83663 | | 4.68350 | |
| 13.40 | 13 | 2915 | 0.83663 | 0.00000 | 4.68350 | 0.00000 |
| 13.52 | 25 | 2920 | 0.82800 | 0.00862 | 4.65300 | 0.00257 |
| 14.10 | 43 | 2920 | 0.82800 | 0.00000 | 4.65300 | 0.00000 |
| 14.35 | 68 | 2920 | 0.82800 | 0.00000 | 4.65300 | 0.00000 |
| 15.07 | 100 | 2930 | 0.81075 | 0.01725 | 4.59200 | 0.00194 |
| 15.13 | 106 | 2930 | 0.81075 | 0.00000 | 4.59200 | 0.00000 |

BRE Value 0.00070445 lit/ sq.m/sec

Average Permeabilty Value: 0.000751619 lit/ sq.m/sec

# Soil Permeability test

TP09

**Site** West Lane, Gomersal

**Date** Oct-22 **(Test 1)**

**Client** Rhodes Homes

**Job No.** E21/7885

**Pit dimensions** m

| | |
|---|---|
| **Length** | 2.5 |
| **Width** | 0.6 |
| **Depth** | 2.1 |

| Time | Time into Test Mlns | Dip Reading mm | Vol cu.m | Vol Change cu.m | Contact area Avge sq.m | Permeability lit/ sq.m/sec |
|---|---|---|---|---|---|---|
| 14.51 | 0 | 1720 | 0.57000 | | 3.85600 | |
| 14.52 | 1 | 1740 | 0.54000 | 0.03000 | 3.73200 | 0.13179 |
| 14.54 | 3 | 1780 | 0.48000 | 0.06000 | 3.48400 | 0.13858 |
| 14.56 | 5 | 1830 | 0.40500 | 0.07500 | 3.17400 | 0.18774 |
| 14.59 | 8 | 1860 | 0.36000 | 0.04500 | 2.98800 | 0.08114 |
| 15.01 | 10 | 1900 | 0.30000 | 0.06000 | 2.74000 | 0.17458 |
| 15.11 | 20 | 1970 | 0.19500 | 0.10500 | 2.30600 | 0.06936 |
| 15.16 | 25 | 2000 | 0.15000 | 0.04500 | 2.12000 | 0.06778 |
| 15.20 | 29 | 2020 | 0.12000 | 0.03000 | 1.99600 | 0.06074 |
| 15.26 | 35 | 2050 | 0.07500 | 0.04500 | 1.81000 | 0.06569 |
| 15.35 | 44 | 2100 | 0.00000 | 0.07500 | 1.50000 | 0.08392 |

BRE Value 0.08211628 lit/ sq.m/sec

Average Permeabilty Value: 0.106132380 lit/ sq.m/sec

# Soil Permeability test

TP09

**Site** West Lane, Gomersal **Date** Oct-22 **(Test 2)**

**Client** Rhodes Homes **Job No.** E21/7885

**Pit dimensions** m

| | |
|---|---|
| **Length** | 2.5 |
| **Width** | 0.6 |
| **Depth** | 2.1 |

| Time | Time into Test Mlns | Dip Reading mm | Vol cu.m | Vol Change cu.m | Contact area Avge sq.m | Permeability lit/ sq.m/sec |
|---|---|---|---|---|---|---|
| 15.43 | 0 | 1620 | 0.72000 | | 4.47600 | |
| 15.45 | 2 | 1670 | 0.64500 | 0.07500 | 4.16600 | 0.14464 |
| 15.49 | 6 | 1770 | 0.49500 | 0.15000 | 3.54600 | 0.16209 |
| 15.51 | 8 | 1810 | 0.43500 | 0.06000 | 3.29800 | 0.14611 |
| 15.58 | 15 | 1880 | 0.33000 | 0.10500 | 2.86400 | 0.08114 |
| 16.09 | 26 | 1950 | 0.22500 | 0.10500 | 2.43000 | 0.06010 |
| 16.22 | 39 | 2000 | 0.15000 | 0.07500 | 2.12000 | 0.04227 |
| 16.33 | 50 | 2100 | 0.00000 | 0.15000 | 1.50000 | 0.12557 |

BRE Value 0.06924249 lit/ sq.m/sec

Average Permeabilty Value: 0.108845170 lit/ sq.m/sec

# Soil Permeability test

TP09

**Site** West Lane, Gomersal

**Date** Oct-22 **(Test 3)**

**Client** Rhodes Homes

**Job No.** E21/7885

**Pit dimensions** m

| | |
|---|---|
| **Length** | 2.5 |
| **Width** | 0.6 |
| **Depth** | 2.1 |

| Time | Time into Test Mlns | Dip Reading mm | Vol cu.m | Vol Change cu.m | Contact area Avge sq.m | Permeability lit/ sq.m/sec |
|---|---|---|---|---|---|---|
| 16.39 | 0 | 1710 | 0.58500 | | 3.91800 | |
| 16.42 | 3 | 1755 | 0.51750 | 0.06750 | 3.63900 | 0.09925 |
| 16.45 | 6 | 1800 | 0.45000 | 0.06750 | 3.36000 | 0.10716 |
| 16.47 | 8 | 1825 | 0.41250 | 0.03750 | 3.20500 | 0.09520 |
| 16.50 | 11 | 1850 | 0.37500 | 0.03750 | 3.05000 | 0.06661 |
| 16.57 | 18 | 1890 | 0.31500 | 0.06000 | 2.80200 | 0.04882 |
| 17.07 | 28 | 1930 | 0.25500 | 0.06000 | 2.55400 | 0.03734 |
| 17.13 | 34 | 1980 | 0.18000 | 0.07500 | 2.24400 | 0.08684 |
| 17.21 | 42 | 2045 | 0.08250 | 0.09750 | 1.84100 | 0.09945 |
| 17.30 | 51 | 2100 | 0.00000 | 0.08250 | 1.50000 | 0.09146 |

BRE Value 0.05964875 lit/ sq.m/sec

Average Permeabilty Value: 0.080084338 lit/ sq.m/sec

# APPENDIX C

## Chemical Analysis of Samples

## Geotechnical Analysis of Samples

# Certificate of Analysis

| | | | |
|---|---|---|---|
| *Certificate Number* | 21-20748 | *Issued:* | 07-Oct-21 |

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

| | |
|---|---|
| *Our Reference* | 21-20748 |
| *Client Reference* | 7885 |
| *Order No* | (not supplied) |
| *Contract Title* | West Lane, Gomersal |
| *Description* | 5 Soil samples. |
| *Date Received* | 29-Sep-21 |
| *Date Started* | 29-Sep-21 |
| *Date Completed* | 07-Oct-21 |
| *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*

Adam Fenwick
Contracts Manager

mCERTS
THE ENVIRONMENT AGENCY'S MONITORING CERTIFICATION SCHEME

UKAS TESTING
2139

# Summary of Chemical Analysis
# Matrix Descriptions

*Our Ref* 21-20748
*Client Ref* 7885
*Contract Title* West Lane, Gomersal

| Sample ID | Depth | Lab No | Completed | Matrix Description |
|---|---|---|---|---|
| TP01 | 0.2 | 1911793 | 07/10/2021 | Brown sandy CLAY including some rootlets |
| TP01 | 0.8 | 1911794 | 07/10/2021 | Brown sandy CLAY |
| TP02 | 0.1 | 1911795 | 07/10/2021 | Brown sandy CLAY including some rootlets |
| TP03 | 0.1 | 1911796 | 07/10/2021 | Brown sandy CLAY including some rootlets |
| TP04 | 0.6 | 1911797 | 07/10/2021 | Brown very sandy CLAY |

# Summary of Chemical Analysis
# Soil Samples

*Our Ref* 21-20748
*Client Ref* 7885
*Contract Title* West Lane, Gomersal

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | **Lab No** | 1911793 | 1911794 | 1911795 | 1911796 | 1911797 |
| | | | **.Sample ID** | TP01 | TP01 | TP02 | TP03 | TP04 |
| | | | **Depth** | 0.20 | 0.80 | 0.10 | 0.10 | 0.60 |
| | | | **Other ID** | | | | | |
| | | | **Sample Type** | SOIL | SOIL | SOIL | SOIL | SOIL |
| | | | **Sampling Date** | 24/09/2021 | 24/09/2021 | 24/09/2021 | 24/09/2021 | 24/09/2021 |
| | | | **Sampling Time** | n/s | n/s | n/s | n/s | n/s |
| **Test** | **Method** | **LOD** | **Units** | | | | | |
| **Metals** | | | | | | | | |
| Arsenic | DETSC 2301# | 0.2 | mg/kg | 21 | 9.6 | 28 | 25 | 6.7 |
| Cadmium | DETSC 2301# | 0.1 | mg/kg | 0.2 | < 0.1 | 0.2 | 0.2 | 0.2 |
| Chromium | DETSC 2301# | 0.15 | mg/kg | 19 | 19 | 19 | 21 | 21 |
| Copper | DETSC 2301# | 0.2 | mg/kg | 41 | 29 | 46 | 44 | 20 |
| Lead | DETSC 2301# | 0.3 | mg/kg | 81 | 20 | 87 | 170 | 14 |
| Mercury | DETSC 2325# | 0.05 | mg/kg | 0.24 | < 0.05 | 0.34 | 0.28 | < 0.05 |
| Nickel | DETSC 2301# | 1 | mg/kg | 17 | 29 | 20 | 20 | 39 |
| Selenium | DETSC 2301# | 0.5 | mg/kg | < 0.5 | < 0.5 | 0.7 | < 0.5 | < 0.5 |
| Zinc | DETSC 2301# | 1 | mg/kg | 96 | 110 | 92 | 110 | 84 |
| **Inorganics** | | | | | | | | |
| pH | DETSC 2008# | | pH | 6.2 | 5.0 | 5.8 | 5.5 | 6.3 |
| Thiocyanate | DETSC 2130# | 0.6 | mg/kg | 1.8 | < 0.6 | 1.9 | 2.0 | 0.7 |
| Organic matter | DETSC 2002# | 0.1 | % | 6.8 | 0.6 | 5.4 | 5.3 | 0.6 |
| Sulphide | DETSC 2024* | 10 | mg/kg | 24 | 27 | 16 | 27 | < 10 |
| Sulphate as SO4, Total | DETSC 2321# | 0.01 | % | 0.09 | 0.04 | 0.09 | 0.08 | 0.05 |
| **PAHs** | | | | | | | | |
| Naphthalene | DETSC 3301 | 0.1 | mg/kg | 0.1 | < 0.1 | 0.1 | < 0.1 | < 0.1 |
| Acenaphthylene | DETSC 3301 | 0.1 | mg/kg | < 0.1 | < 0.1 | < 0.1 | < 0.1 | < 0.1 |
| Acenaphthene | DETSC 3301 | 0.1 | mg/kg | 0.3 | < 0.1 | 0.3 | 0.1 | < 0.1 |
| Fluorene | DETSC 3301 | 0.1 | mg/kg | < 0.1 | < 0.1 | 0.2 | 0.1 | < 0.1 |
| Phenanthrene | DETSC 3301 | 0.1 | mg/kg | 0.9 | < 0.1 | 1.1 | 0.8 | < 0.1 |
| Anthracene | DETSC 3301 | 0.1 | mg/kg | 0.2 | < 0.1 | 0.3 | 0.2 | < 0.1 |
| Fluoranthene | DETSC 3301 | 0.1 | mg/kg | 1.9 | < 0.1 | 1.5 | 1.6 | < 0.1 |
| Pyrene | DETSC 3301 | 0.1 | mg/kg | 1.8 | < 0.1 | 1.7 | 1.8 | < 0.1 |
| Benzo(a)anthracene | DETSC 3301 | 0.1 | mg/kg | 1.0 | < 0.1 | 0.7 | 0.8 | < 0.1 |
| Chrysene | DETSC 3301 | 0.1 | mg/kg | 0.9 | < 0.1 | 0.6 | 0.7 | < 0.1 |
| Benzo(b)fluoranthene | DETSC 3301 | 0.1 | mg/kg | 0.8 | < 0.1 | 0.5 | 0.5 | < 0.1 |
| Benzo(k)fluoranthene | DETSC 3301 | 0.1 | mg/kg | 0.5 | < 0.1 | 0.4 | 0.4 | < 0.1 |
| Benzo(a)pyrene | DETSC 3301 | 0.1 | mg/kg | 1.3 | < 0.1 | 0.8 | 0.9 | < 0.1 |
| Indeno(1,2,3-c,d)pyrene | DETSC 3301 | 0.1 | mg/kg | 0.8 | < 0.1 | 0.5 | 0.6 | < 0.1 |
| Dibenzo(a,h)anthracene | DETSC 3301 | 0.1 | mg/kg | 0.3 | < 0.1 | 0.1 | 0.2 | < 0.1 |
| Benzo(g,h,i)perylene | DETSC 3301 | 0.1 | mg/kg | 0.8 | < 0.1 | 0.5 | 0.7 | < 0.1 |
| PAH Total | DETSC 3301 | 1.6 | mg/kg | 12 | < 1.6 | 9.4 | 9.5 | < 1.6 |
| **Phenols** | | | | | | | | |
| Phenol - Monohydric | DETSC 2130# | 0.3 | mg/kg | 0.5 | < 0.3 | 0.4 | < 0.3 | < 0.3 |

Key: * -not accredited. # -MCERTS (accreditation only applies if report carries the MCERTS logo). n/s -not supplied.

# Summary of Asbestos Analysis
# Soil Samples

*Our Ref* 21-20748
*Client Ref* 7885
*Contract Title* West Lane, Gomersal

| Lab No | Sample ID | Material Type | Result | Comment* | Analyst |
|---|---|---|---|---|---|
| 1911793 | TP01 0.20 | SOIL | NAD | none | D Wilkinson |
| 1911795 | TP02 0.10 | SOIL | NAD | none | D Wilkinson |
| 1911796 | TP03 0.10 | SOIL | NAD | none | D Wilkinson |

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* 21-20748
*Client Ref* 7885
*Contract* West Lane, Gomersal

## Containers Received & Deviating Samples

| Lab No | Sample ID | Date Sampled | Containers Received | Holding time exceeded for tests | Inappropriate container for tests |
|---|---|---|---|---|---|
| 1911793 | TP01 0.20 SOIL | 24/09/21 | GJ 250ml, PT 1L | | |
| 1911794 | TP01 0.80 SOIL | 24/09/21 | GJ 250ml, PT 1L | | |
| 1911795 | TP02 0.10 SOIL | 24/09/21 | GJ 250ml, PT 1L | | |
| 1911796 | TP03 0.10 SOIL | 24/09/21 | GJ 250ml, PT 1L | | |
| 1911797 | TP04 0.60 SOIL | 24/09/21 | 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

# Certificate of Analysis

| | | | |
|---|---|---|---|
| *Certificate Number* | 22-21328 | *Issued:* | 31-Oct-22 |

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

| | |
|---|---|
| *Our Reference* | 22-21328 |
| *Client Reference* | 7885 |
| *Order No* | (not supplied) |
| *Contract Title* | WEST LANE |
| *Description* | 3 Soil samples. |
| *Date Received* | 24-Oct-22 |
| *Date Started* | 24-Oct-22 |
| *Date Completed* | 31-Oct-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* 22-21328
*Client Ref* 7885
*Contract Title* WEST LANE

| Sample ID | Depth | Lab No | Completed | Matrix Description |
|---|---|---|---|---|
| TP05 | 0.2 | 2075138 | 31/10/2022 | Brown gravelly, sandy CLAY including some rootlets |
| TP06 | 0.1 | 2075139 | 31/10/2022 | Brown gravelly, sandy CLAY including some rootlets |
| TP07 | 0.5 | 2075140 | 31/10/2022 | Brown gravelly, sandy CLAY including some rootlets |

# Summary of Chemical Analysis
# Soil Samples

*Our Ref* 22-21328
*Client Ref* 7885
*Contract Title* WEST LANE

| | | | | Lab No | 2075138 | 2075139 | 2075140 |
|---|---|---|---|---|---|---|---|
| | | | | .Sample ID | TP05 | TP06 | TP07 |
| | | | | Depth | 0.20 | 0.10 | 0.50 |
| | | | | Other ID | | | |
| | | | | Sample Type | SOIL | SOIL | SOIL |
| | | | | Sampling Date | 18/10/2022 | 18/10/2022 | 18/10/2022 |
| | | | | Sampling Time | n/s | n/s | n/s |
| **Test** | **Method** | **LOD** | **Units** | | | | |
| **Metals** | | | | | | | |
| Arsenic | DETSC 2301# | 0.2 | mg/kg | 22 | 29 | 16 |
| Cadmium | DETSC 2301# | 0.1 | mg/kg | 0.3 | 0.4 | 0.2 |
| Chromium | DETSC 2301# | 0.15 | mg/kg | 19 | 19 | 15 |
| Copper | DETSC 2301# | 0.2 | mg/kg | 49 | 54 | 30 |
| Lead | DETSC 2301# | 0.3 | mg/kg | 86 | 97 | 34 |
| Mercury | DETSC 2325# | 0.05 | mg/kg | 0.28 | 0.35 | 0.07 |
| Nickel | DETSC 2301# | 1 | mg/kg | 21 | 20 | 18 |
| Selenium | DETSC 2301# | 0.5 | mg/kg | 1.7 | 1.5 | 1.3 |
| Zinc | DETSC 2301# | 1 | mg/kg | 110 | 100 | 98 |
| **Inorganics** | | | | | | |
| pH | DETSC 2008# | | pH | 6.9 | 6.3 | 6.4 |
| Thiocyanate | DETSC 2130# | 0.6 | mg/kg | 1.8 | 2.0 | 0.7 |
| Total Organic Carbon | DETSC 2084# | 0.5 | % | 4.1 | 6.0 | 1.3 |
| Sulphide | DETSC 2024* | 10 | mg/kg | 59 | 27 | < 10 |
| Sulphate as SO4, Total | DETSC 2321# | 0.01 | % | 0.09 | 0.09 | 0.04 |
| **PAHs** | | | | | | |
| Naphthalene | DETSC 3301 | 0.1 | mg/kg | 0.2 | < 0.1 | < 0.1 |
| Acenaphthylene | DETSC 3301 | 0.1 | mg/kg | 0.3 | < 0.1 | < 0.1 |
| Acenaphthene | DETSC 3301 | 0.1 | mg/kg | 0.6 | 0.2 | < 0.1 |
| Fluorene | DETSC 3301 | 0.1 | mg/kg | 0.5 | < 0.1 | < 0.1 |
| Phenanthrene | DETSC 3301 | 0.1 | mg/kg | 3.1 | 0.8 | < 0.1 |
| Anthracene | DETSC 3301 | 0.1 | mg/kg | 0.7 | 0.2 | < 0.1 |
| Fluoranthene | DETSC 3301 | 0.1 | mg/kg | 3.9 | 1.1 | 0.2 |
| Pyrene | DETSC 3301 | 0.1 | mg/kg | 3.8 | 1.1 | 0.2 |
| Benzo(a)anthracene | DETSC 3301 | 0.1 | mg/kg | 1.7 | 0.5 | < 0.1 |
| Chrysene | DETSC 3301 | 0.1 | mg/kg | 1.8 | 0.4 | < 0.1 |
| Benzo(b)fluoranthene | DETSC 3301 | 0.1 | mg/kg | 1.5 | 0.7 | < 0.1 |
| Benzo(k)fluoranthene | DETSC 3301 | 0.1 | mg/kg | 0.8 | 0.3 | < 0.1 |
| Benzo(a)pyrene | DETSC 3301 | 0.1 | mg/kg | 1.7 | 0.6 | < 0.1 |
| Indeno(1,2,3-c,d)pyrene | DETSC 3301 | 0.1 | mg/kg | 1.2 | < 0.1 | < 0.1 |
| Dibenzo(a,h)anthracene | DETSC 3301 | 0.1 | mg/kg | 0.2 | < 0.1 | < 0.1 |
| Benzo(g,h,i)perylene | DETSC 3301 | 0.1 | mg/kg | 0.9 | < 0.1 | < 0.1 |
| PAH 16 Total | DETSC 3301 | 1.6 | mg/kg | 23 | 5.8 | < 1.6 |
| **Phenols** | | | | | | |
| Phenol - Monohydric | DETSC 2130# | 0.3 | mg/kg | < 0.3 | 0.3 | < 0.3 |

Key: * -not accredited. # -MCERTS (accreditation only applies if report carries the MCERTS logo). n/s -not supplied.

# Summary of Asbestos Analysis
# Soil Samples

*Our Ref* 22-21328
*Client Ref* 7885
*Contract Title* WEST LANE

| Lab No | Sample ID | Material Type | Result | Comment* | Analyst |
|---|---|---|---|---|---|
| 2075138 | TP05 0.20 | SOIL | NAD | none | Lee Kerridge |
| 2075139 | TP06 0.10 | SOIL | NAD | none | Lee Kerridge |

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* 22-21328
*Client Ref* 7885
*Contract* WEST LANE

## Containers Received & Deviating Samples

| Lab No | Sample ID | Date Sampled | Containers Received | Holding time exceeded for tests | Inappropriate container for tests |
|---|---|---|---|---|---|
| 2075138 | TP05 0.20 SOIL | 18/10/22 | GJ 250ml, PT 1L | | |
| 2075139 | TP06 0.10 SOIL | 18/10/22 | GJ 250ml, PT 1L | | |
| 2075140 | TP07 0.50 SOIL | 18/10/22 | PT 1L | | Naphthalene, PAH FID |

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. 785043

1774

| | | | |
|---|---|---|---|
| Date | 25-October-2021 | Contract | West Lane |

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

For the Attention of Martin Huddleston

| | | | |
|---|---|---|---|
| Samples submitted by client | 01/10/2021 | Client Reference | |
| Testing Started | 01/10/2021 | Client Order No. | |
| Testing Completed | 25/10/2021 | 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

# SUMMARY OF SOIL CLASSIFICATION TESTS

In accordance with clauses 3.2,4.3,4.4,5.3,5.4,7.2,8.2,8.3 of BS1377:Part 2:1990

| Exploratory Position ID | Sample Ref | Sample Type | Depth (m) | Moisture Content % | Liquid Limit % | Plastic Limit % | Plasticity Index | % <425µm | Description of Sample |
|---|---|---|---|---|---|---|---|---|---|
| TP01 | | B | 0.80 | 19 | 38 | 22 | 16 | 85 | Brown slightly gravelly sandy CLAY |
| | | | | | | | | | |
| TP02 | | B | 0.80 | 13 | 33 | 19 | 14 | 84 | Brown slightly gravelly sandy CLAY |
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**STRUCTURAL SOILS LTD**

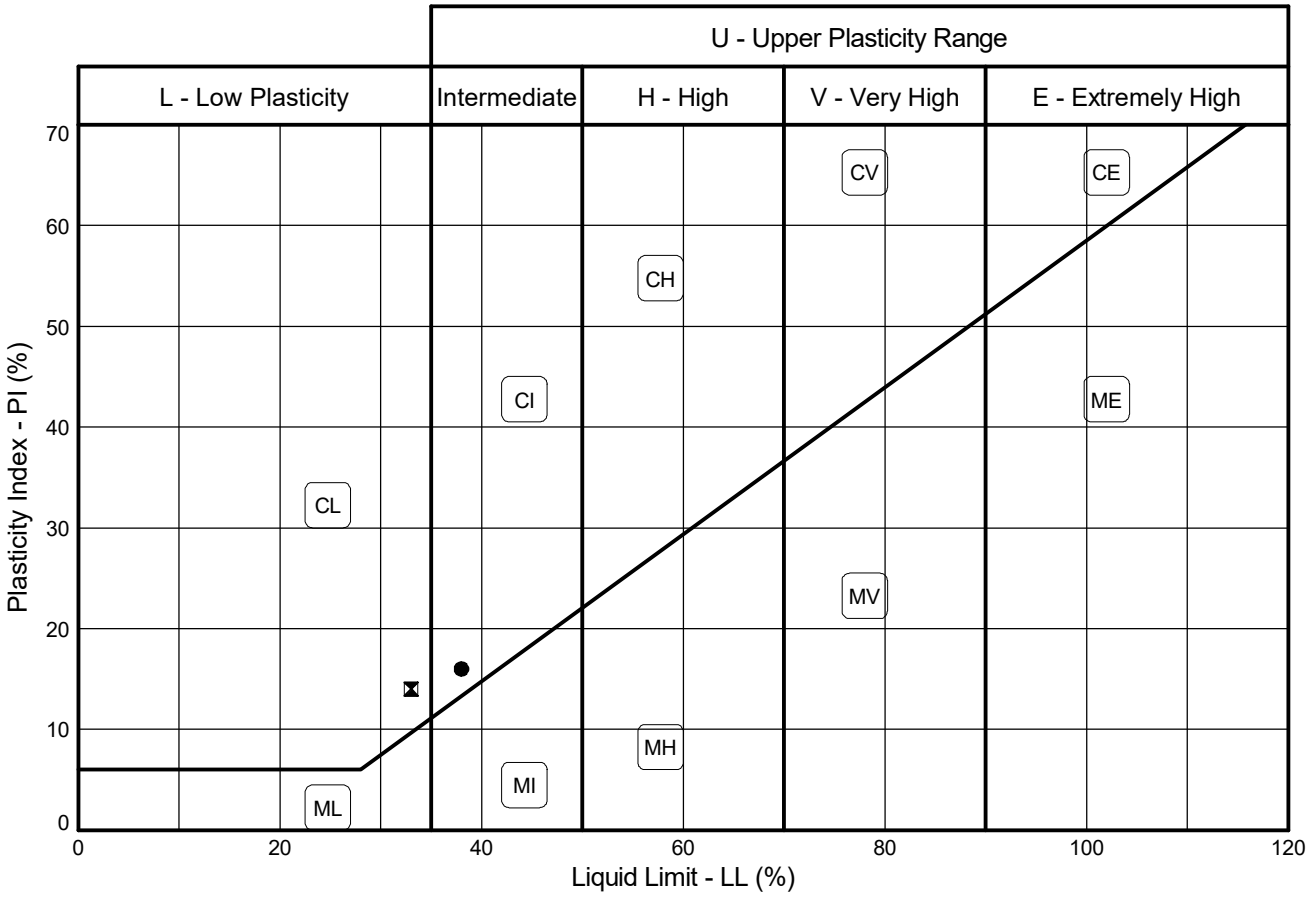
Contract: **West Lane**

Contract Ref: **785043**

AGS

# PLASTICITY CHART - PI Vs LL

In accordance with BS5930:2015
Testing in accordance with BS1377-2:1990




| Sample Identification | | | | BS Test Method # | Preparation Method + | MC | LL | PL | PI | <425µm | Lab location | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Exploratory Position ID | Sample | Depth (m) | | | % | % | % | % | % | | |
| ● | TP01 | B | 0.80 | 3.2/4.3/5.3/5.4 | 4.2.4 | 19 | 38 | 22 | 16 | 85 | C | |
| ⊠ | TP02 | B | 0.80 | 3.2/4.3/5.3/5.4 | 4.2.4 | 13 | 33 | 19 | 14 | 84 | C | |
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# Tested in accordance with the following clauses of BS1377-2:1990.

3.2 - Moisture Content
4.3 - Cone Penetrometer Method
4.4 - One Point Cone Penetrometer Method
4.6 - One Point Casagrande Method
5.3 - Plastic Limit Method
5.4 - Plasticity Index

+ Tested in accordance with the following clauses of BS1377-2:1990.

4.2.3 - Natural State
4.2.4 - Wet Sieved

Key: * = Insufficient material to perform standard test, NP = Non plastic.

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


STRUCTURAL SOILS
The Potteries
Pottery Street
Castleford
W. Yorkshire WF10 1NJ


| Compiled By | | Date |
|---|---|---|
| Francesca Bennett | FRANCESCA BENNETT | 25/10/21 |

| Contract | Contract Ref: |
|---|---|
| **West Lane** | **785043** |

AGS

# 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: **25/10/2021 15:49:38**.

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
West Yorkshire
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: **West Lane** | Job No: **785043** |

# SUMMARY OF SOIL CLASSIFICATION TESTS

In accordance with clauses 3.2,4.3,4.4,5.3,5.4,7.2,8.2,8.3 of BS1377:Part 2:1990

| Exploratory Position ID | Sample Ref | Sample Type | Depth (m) | Moisture Content % | Liquid Limit % | Plastic Limit % | Plasticity Index | % <425µm | Description of Sample |
|---|---|---|---|---|---|---|---|---|---|
| TP08 | 1 | B | 0.00 | 12 | 39 | 27 | 12 | 84 | Brown slightly sandy slightly gravelly clayey SILT |
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**STRUCTURAL SOILS LTD**

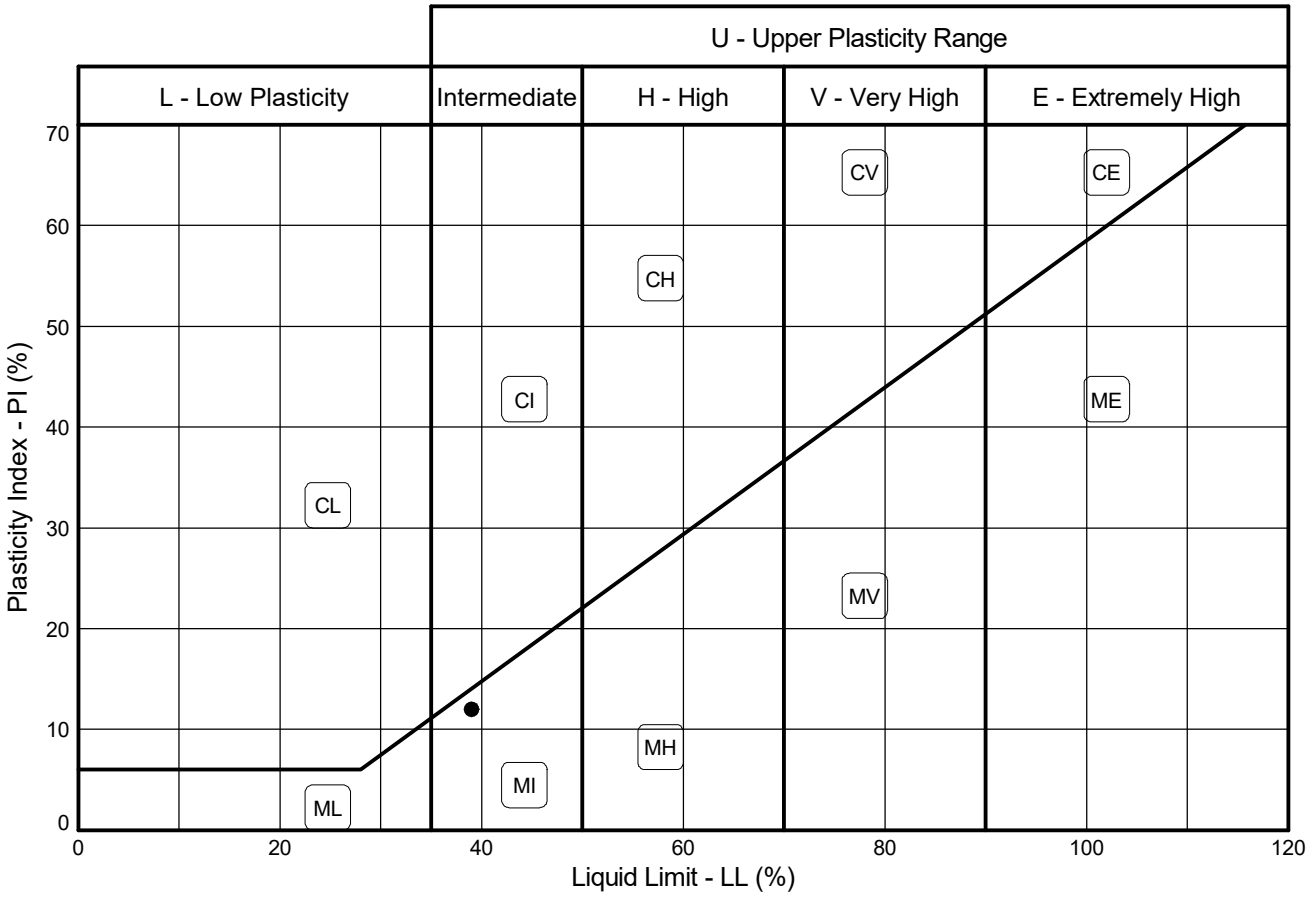
Contract: **West Lane**

Contract Ref: **785330**

AGS

# PLASTICITY CHART - PI Vs LL

In accordance with BS5930:2015
Testing in accordance with BS1377-2:1990




| Sample Identification | | | | BS Test Method # | Preparation Method + | MC | LL | PL | PI | <425µm | Lab location | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Exploratory Position ID | Sample | Depth (m) | | | % | % | % | % | % | | |
| ● | TP08 | 1B | 0.00 | 3.2/4.3/5.3/5.4 | 4.2.4 | 12 | 39 | 27 | 12 | 84 | C | |

# Tested in accordance with the following clauses of BS1377-2:1990.

3.2 - Moisture Content
4.3 - Cone Penetrometer Method
4.4 - One Point Cone Penetrometer Method
4.6 - One Point Casagrande Method
5.3 - Plastic Limit Method
5.4 - Plasticity Index

+ Tested in accordance with the following clauses of BS1377-2:1990.

4.2.3 - Natural State
4.2.4 - Wet Sieved

Key: * = Non-standard test, NP = Non plastic.

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


STRUCTURAL SOILS
The Potteries
Pottery Street
Castleford
W. Yorkshire WF10 1NJ


| Compiled By | | Date |
|---|---|---|
| | LAURA SCHRAMM | 12/11/22 |

| Contract | Contract Ref: |
|---|---|
| West Lane | 785330 |

# 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: **15/11/2022 15:02:01**.

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
West Yorkshire
WF10 1NJ

Hemel Laboratory
18 Frogmore Road
Hemel Hempstead
Hertfordshire
HP3 9RT

Tonbridge Laboratory
Anerley Court, Half Moon Lane
Hildenborough
Tonbridge
TN11 9HU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|---|---|---|
| **STRUCTURAL SOILS LTD** | Contract: **West Lane** | Job No: **785330** |